

## COMMISSION B2

## Data and Documentation

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## COMMISSION B2 WORKING GROUPS

<b>Div. B / Commission B2 WG</b>	<b>Data Driven Astronomy Education and Public Outreach (DAEPO)</b>
<b>Div. B / Commission B2 WG</b>	<b>Data Representation</b>
<b>Div. B / Commission B2 WG</b>	<b>Designations (Functional WG)</b>
<b>Div. B / Commission B2 WG</b>	<b>Preservation and Digitization of Photographic Plates</b>

## TRIENNIAL REPORT 2018–2021

As an empirical science, astronomy depends critically upon observational data and its interpretation. Extracting the full scientific potential of astronomical data is a process that often occurs over the course of many years and through the combined efforts of generations of researchers. As modern astronomy has become increasingly multi-wavelength, and even multi-messenger, the ability to combine data from multiple epochs and multiple instruments has also become increasingly crucial. Such long-term scientific exploitation and data synthesis is only possible through the establishment and management of well-defined and well-curated astronomical data collections. IAU Commission B2’s mission is to acknowledge the central role of data in the field of astronomy. It focuses specifically on the manifold aspects of defining, managing, archiving, preserving and sharing astronomical data and documentation.

The new era of data-intensive facilities has taken particular momentum during this triennium with four SKA precursors coming on-line almost simultaneously: ASKAP (Australia), MeerKAT (South Africa), Aperitif (the Netherlands), and FAST (China). Various related data reduction and archiving centres (e.g., the Inter-University Institute for Data Intensive Astronomy, IDIA, and the CSIRO ASKAP Science Data Archive, CASDA) have also become available.

In general, the triennium 2018-2021 has been highly affected by the COVID-19 pandemic with many meetings being postponed or turned virtual. The B2 Commission has been mainly active through its working groups, one of which has been approved as “functional” in 2019 (WG Designations). The other three WGs will ask for continuation into the next triennium.

## 1. Working group reports

### 1.1. *IAU Data Driven Astronomy Education and Public Outreach (DAEPO)*

by Chenzhou Cui (Chair)

The DAEPO WG was officially announced in April 2017, and renewed after the Vienna GA in 2018. During the past triennium, the WG organised or co-organised several meetings and WG members participated actively in some of them. One of the most important achievements of the WG in 2019 was to push the cooperation between the International Virtual Observatory Alliance (IVOA) and the International Planetarium Society (IPS). The year 2020 was a very unusual year with the COVID-19 pandemic changing the way of everyone lives and works. It seriously affected the traditional education and public outreach, because these activities rely on face-to-face communication and need people to get together, which is not safe in the pandemic. In contrast, online education and popular science activities are booming due to the strong demand. Projects and activities in line with the idea of DAEPO also been greatly affected in many ways.

The following list summarises the WG's activities during the past triennium.

- At the IAU GA in Vienna 2018, Sze-leung Cheung, president of the IAU OAO, hosted a Focus Meeting (FM14) with the title “IAU’s role on global astronomy outreach, the latest challenges and bridging different communities”.

- In May 2019, members of the WG attended the IVOA Interoperability meeting in Paris, France. WG member Mark SubbaRao, President of the IPS, gave a keynote speech on the topic “Data to Dome” to bring real scientific data to be presented in planetariums.

- WG chair Chenzhou Cui, together with Shanshan Li, hosted the Astronomy for Development Forum in Xinchang, China (20–21 June 2019) as part of the 2nd China–South Africa Workshop on Big Data Challenge in Astronomy. The forum was organised by the DAEPO WG, the IAU OAD and the OAD East Asia Regional Office (EA-ROAD). Astronomy for development, data-driven astronomical education and public outreach activities as well as experiences in China, South Africa and East Asian countries were exchanged and shared.

- The DAEPO WG was a support IAU Scientific Body of the IAU Symposium Astronomy for Equity, Diversity and Inclusion (IAUS358), which was held in Tokyo on 12–15 November 2019. As a roadmap to action within the framework of the IAU 100th Anniversary, the symposium aimed at all astronomy professionals that wish to bring inclusiveness to their research and diversity to their teams, practices, work environments and institutions. WG member Beatriz Garcia was on the SOC and chaired a session and a discussion.

- In 2019, the DAEPO WG, together with FutureLab and KAGGLE, organised two contests encouraging college students to use AI algorithms to analyse astronomical data. Over one thousand students from several countries took part in the events.

- On 20 August 2020, The fourth WorldWide Telescope (WWT) Guided Tour Contest Award Ceremony was held at the Guangdong Experimental High School with online broadcast. As part of the China-VO DAEPO initiatives, the contest aims at inspiring participants through the design of the WWT guided tour, improving their ability of scientific and technological innovation, and cultivating their spirit of teamwork.

- The IVOA Education Interest Group (EduIG), together with the DAEPO WG and IAU OAD, organised its first virtual meeting on 31 August 2020. It was aimed at exchanging experiences people made with remote teaching during the COVID-19 pandemic around the globe. The virtual meeting was jointly organised by IVOA EduIG, DAEPO WG and IAU OAD. DAEPO WG members gave talks to provide their experience and opinion about remote teaching and learning.

- The first DAEPO WG Plenary Meeting was held on 22 September 2020 as a virtual meeting. On the agenda were discussions of topics relating to how to involve more people to use astronomical data in school and the difficulties caused by the COVID-19 pandemic. Cooperation between the IAU-OAD and IVOA was proposed to encourage members to work together for a common goal. ESAsky toolkit, Data2Dome, astronomical data for undergraduate education and training programs were discussed as well.

- Several WG members were on the SOC committee of the IAU Symposium 367 “Education and Heritage in the Era of Big Data in Astronomy. The first steps on the IAU 2020-2030 Strategic Plan”, which was held online on 8–12 December 2020. The primary aim of the symposium was to provide a global vision of Education and Heritage in the frame of the goals of the IAU

Strategic Plan, as well as to outline a road map and a global astronomy education agenda for the next decade, while honouring the education from the past.

## 1.2. IAU Data Representation

by Jessica D. Mink (Chair)

The Data Representation Working Group was formed under IAU Commission B2 in 2018 to encompass forms of encoding digital astronomical data in addition to the standard FITS format. In the age of larger and larger telescopes producing larger and larger amounts of data with more and more ways to describe that data, the developers of software to support those telescopes and their instruments were running up against the limitations of FITS and creating their own solutions. Since its inception in 1991, the annual Astronomical Data Analysis Software and Systems (ADASS) Conference has hosted a FITS Birds of a Feather (BoF) session where the astronomical software community has kept track of changes in the FITS data standard and heard about the need for new format designs.

In 2016, at the meeting at Trieste, Italy, it seemed like a good time to extend the IAU's involvement beyond FITS to include other structured astronomical data formats by subsuming the FITS Working Group as a FITS Special Expert Group into an enlarged Astronomical Data Representation Working Group, which was authorized by the IAU under in 2018.

Since then, the various extended formats have mostly gone their own ways. Though we've heard reports and discussed possible agreements at the annual ADASS meetings, no progress has been made in creating a new standard format. Those developing the new formats have suggested improvements to FITS which could make data from those new formats more accessible to software not written by those who developed the new instruments. Some improvements along the lines of those desires are being considered for addition to the FITS standard, such as longer keywords and multiple-line keyword definitions in data headers. Another problem has been that those developing the new formats tend to be neither IAU members nor have as strong desire to join, so the Structured Data Format Special Expert Group remains unpopulated.

In 2020, ADASS gave its annual Software Award to Bill Pence, developer of the widely used CFITSIO data access software package and longtime FITS Working Group member. In the "New and Old Data Formats" BoF, Lucio Chiappetti, current FITS SEG chair, presented current FITS SEG proposals which could become changes in the standard to make FITS a better component in the new world of structured data formats, which are still not ready for standardization themselves.

Since future international data format standard development looks to remain in FITS for the near future, the chair and the FITS SEG decided to propose a return to a single FITS Working Group in 2021, with an additional application for becoming a Functional WG.

Publications 2018-2021:

**ADASS 2017:** Mink, Jessica, "Birds of a Feather Session on Astronomical Data Representation Formats" in "Astronomical Data Analysis Software and Systems XXVII". ASP Conference Series, Vol. 522, Proceedings of a conference held (22-26 October 2017) at Sheraton Santiago Convention Center, Santiago de Chile, Chile. Edited by Pascal Ballester, Jorge Ibsen, Mauricio Solar, and Keith Shortridge. San Francisco: Astronomical Society of the Pacific, 2020, p.691

**ADASS 2018:** Mink, Jessica; Diaz, Rosa; Shortridge, Keith; Jenness, Tim, "Data Formats BoF" in "Astronomical Data Analysis Software and Systems XXVIII". ASP Conference Series, Vol. 523, proceedings of a conference held (11-15 October 2018) at The Hotel at the University of Maryland, College Park, Maryland, USA. Edited by Peter J. Teuben, Marc W. Pound, Brian A. Thomas, and Elizabeth M. Warner. San Francisco: Astronomical Society of the Pacific, 2019, p.701

**ADASS 2019:** Mink, Jessica; Diaz Rosa; Fernique, Pierre; Michel, Laurent; Louys, Mireille; Landais, Gilles, "Data Formats BoF", to be published in "Astronomical Data Analysis Software and Systems XXIX". ASP Conference Series, Vol. xxx, proceedings of a conference held (6-10 October 2019) at the MartiniPlaza Conference Center, Groningen, the Netherlands.

**ADASS 2020:** Mink, Jessica; Diaz, Rosa; Chiappetti, Lucio; Raugh, Anne; Seaman, Robert; Shupe, David, "Standardizing New and Improving Old Data Formats in Astronomy", presented at Astronomical Data Analysis Software and Systems XXX, held online 8-12 November 2020.

1.3. *IAU Working Group Designations*

by Marion Schmitz (chair)

The WG Designations has been accepted as a functional WG in May 2019. The WG clarifies existing astronomical nomenclature and helps astronomers avoid potential problems when designating their sources. The most important function of WG Designations is overseeing the IAU REGISTRY FOR ACRONYMS (for newly discovered astronomical sources of radiation: see the website <http://cdsweb.u-strasbg.fr/cgi-bin/DicForm> which is sponsored by the WG and operated by the Centre de Données astronomiques de Strasbourg (CDS). The Clearing House screens the submissions for accuracy and conformity to the IAU Recommendations for Nomenclature (<http://cdsweb.u-strasbg.fr/iau-spec.html>). From its beginning in 1997 through March 2021, there have been 355 submissions and 325 acceptances.

1.4. *IAU Working Group Preservation and Digitization of Photographic Plates*

by R. Elizabeth M. Griffin

The IAU WG for the Preservation and Digitization of Photographic Plates (WG PDPP) was created in 2000 as a direct result of a surge in interest in the future (or fate) of astronomy's large but distributed archive of historical observations on glass plates; estimates of the number range from 4 million to 10 million. In the interests of comprehensive studies of our universe the astronomical community needs access to those past data, and our WG seeks to create the right environment for that to happen. Since 2018 the membership has been revised, and now contains new members who are also participants of a recent initiative (the Glass Plates Group, largely formed among astronomical librarians and archivists) to understand the potential of these collections and their correct management. The GPG holds monthly meetings, which the WG PDPP can join, and by working steadily through the desiderata (history, preservation, handling, cleaning, documenting, storing and finally digitizing), we hope to establish a network of experts who can advise as appropriate, and recognize the potential of each collection and which of the desiderata to pursue.

The WG PDPP will presently elect a new leader, an SOC, and a Web master who can coordinate developments through the WG's IAU Web page. Furthermore, the effort, time and resources required to follow through this programme fully will clearly take more than the three years allocated to a regular WG, and the WG is preparing an application to become a Functional WG.

Anja C. Schröder  
*president of the Commission*