

DIVISION B / COMMISSION B2:

Data and Documentation

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COMMISSION B2 WORKING GROUPS

Div. B / Commission B2 WG Designations & Nomenclature — Functional

Div. B / Commission B2 WG FITS — Functional

Div. B / Commission B2 WG Preservation and Digitization of Photographic Plates — Functional

INTERCOMMISSION WORKING GROUP

Div. B / Commission B2-B5 WG Laboratory Astrophysics Data Compilation, Validation and Standardization

COMMISSION B2 TRIENNIAL REPORT 2021–2024

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 acknowledges this central role of data in field of astronomy and focuses specifically on the manifold aspects of defining, managing, archiving, and sharing astronomical data and documentation.

On 17 June 2021, the composition of the new Division Steering Committees (DSC) and Commission Organizing Committees (COC) for the next triennium, resulting from the IAU elections, was announced. Following the XXXI General Assembly Business Sessions of the IAU, the new COC of Commission B2 took office as of September 2021. The new COC created a Google mailing list for daily information exchange and held an inaugural Virtual Meeting. The renewal of Working Groups was completed in the second half of 2021. Currently, there are 3 functional Commission WGs and one Inter-Commission WG. In addition, working closely with the International Virtual Observatory Alliance (IVOA) and IAU Division B, a Functional WG proposal regarding the Virtual Observatory was submitted to the IAU EC. The Division FWG was approved by the EC in October 2021. In 2022, the Commission B2 webpages were kept updated. Some commission members attended to the IAUGA in Busan.

In 2023, the chair, Chenzhou Cui, attended the S20 on behalf of the B2 Commission. The Group of Twenty (G20) is the premier forum for fostering international cooperation on topics of global importance with impact on growth, economy and sustenance. The Science-20 (S20) Engagement Group supports G20 by fostering an official dialogue with the scientific community of member states and providing evidence-based policy recommendations. Under the ‘Connecting Science to Society’ sub-theme, an online S20 meeting entitled “Astroinformatics for Sustainable Development” was held on the 6th and 7th of July, 2023, to present various aspects of the burgeoning field of Astroinformatics, with a focus on global data, and regional and global collaborations, ensuring it is action-oriented, ambitious, decisive, and inclusive, providing ample opportunities to share best practices and bold plans to promote technologies and innovations. The activity was led by IAU Commission B3. More details including the schedule and speakers/panelists can be found at:

<https://s20india.org/science-policy-webinar-astroinformatics-for-sustainable-development>
<https://sites.astro.caltech.edu/~aam/S20/index.html>

As of 2024, the challenges facing large-scale astronomical data management are both real and immediate, while new facilities such as the LSST and SKA are bound to increase the scale of these data challenges by orders of magnitude. The explosive development of AI technology presents astronomy research with new opportunities and challenges. IAU Commission B2 will continue to serve as the forum for supporting the astronomical society

in all matters related to data and documentation, and to be the IAU's vehicle for communication and collaboration with other international data organizations such as CODATA and the Research Data Alliance.

The Commission OC asks to be confirmed/renewed for 3 more yrs, up to the 2027 GA. The Commission OC agrees with the formation of a new WG 'Data Representations' which will include the current WG 'FITS'.

1. Working Group Activities

1.1. Designations and Nomenclature

The aim of the Working Group, created in 1997, on Designations and Nomenclature of IAU Commission B2 is to clarify existing astronomical nomenclature and to help the astronomical community to avoid potential problems when designating their sources. Especially, the WGD&N ensures that new acronyms permit the identification of astronomical objects in an unambiguous way. One essential function of the WGD&N is overseeing the [Dictionary of Nomenclature of Celestial Objects outside the Solar System](#) (about 15,000 acronyms), which is under the responsibility of the IAU WGD&N and operated by the Centre de Données astronomiques de Strasbourg (CDS). The Dictionary of Nomenclature is the keystone of the databases NED and SIMBAD, and of the Name Resolver Sesame. For newly discovered sources or new surveys, astronomers can submit their new acronym to the WGD&N via the [form on the website](#). The Clearing House, the active mailing list of the Working Group, screens the submissions for accuracy and conformity to the [IAU Recommendations for Nomenclature](#). During the past triennial period this Working Group has submitted two reports:

- https://www.iau.org/static/science/scientific_bodies/working_groups/311/wg-311-annual-report-2022-2023.pdf
- https://www.iau.org/static/science/scientific_bodies/working_groups/311/wg-311-annual-report-2021-2022.pdf

1.2. FITS

The FITS (previously Data Representation) WG consists of the FITS Special Expert Group (FITS SEG) and the Structured Data Expert Group (SDEG).

A WG for Data Representations (an expanded WG FITS) will help ensure and maintain the fluent interoperability of telescope data that has not only made multi-wavelength astronomical research commonplace, but has also made astronomy's data management practices the envy of many other disciplines. The WG FITS has been the custodian and advocate for the Flexible Image Transport System format since it was formally endorsed by the IAU in 1982; however, the more recent data landscape has broadened substantially, and many new facilities are exploring alternatives to the FITS standard in order to manage their issues of data scale and complexity. The WG FITS will therefore be expanded, and renamed Data Representations. It is vital to manage a careful and minimally disruptive transition from FITS to more modern and capable data representations, and in order to assure that continuity we plan to retain the FITS governance structure through a FITS Subcommittee that is part of the new WG. Subcommittees focused on other data representation standards can also be created as needed.

1.3. IAU Preservation and Digitization of Photographic Plates

The WG for "Preservation and Digitization of Photographic Plates" was formed in 2001. Its mandate is to encourage efforts to digitize plates, and to act as a watchdog (e.g., to send alerts if report arrives that an observatory is making moves to disband its plate archive). During the triennial period this WG submitted the following report:

- https://www.iau.org/static/science/scientific_bodies/working_groups/313/wg-313-annual-report-2021-2022.pdf

In addition, in 2022 the following report was submitted by the WG chair Elizabeth Griffin in 2022:

WG, Preservation & Digitization of Photographic Plates (PDPP)
Report to Commission B2, 2022 March 31

This Working Group was first established in 2000, in response to the stormy passage, and ultimate acceptance by GA 2000, of IAU Resolution B3, Safeguarding the information in photographic plates. Early WG members were mainly observational astronomers who had spent many years carrying out and perfecting techniques for handling plates as required specially for their own research. The WG produced a Newsletter (on an irregular timescale), "SCAN-IT", which carried reports from observatories with plate-vaults, described experiments with different types of digitizing engines, plus snippets of interest to the group, notices of relevant papers in the literature, etc. It ran to six editions.

In due course a number of members retired, or withdrew from activities in retirement, and the group's output slowed down, mainly as it awaited an injection of younger members to join. That injection has now happened, rather unexpectedly. Many observatories or university departments, not having a clear guide as to the potential of their plate vaults, or any experienced guides, had bequeathed their collections to a physical archive in the care of their librarian or archivist, leaving the librarians to seek help and advice by starting a Glass Plates Group. A few professional astronomers learned about this initiative and joined the Group, and one of the first recommendations was that the Group align itself with the WG PDPP, thereby endowing it with a recognition that could quickly prove valuable.

A mandate, timetable and sub-groups were to be discussed by the Glass Plates Group at an in-person conference to be held in 2022 May in Chicago. Unfortunately the complications of Covid19 regulations had not receded sufficiently for the meeting to go ahead, so it has been postponed until 2023, but we are now consolidating the plans (given this different category of new members), and have offered a co-Chair to one of the professional astronomers who recently joined. Because a complete generation of research astronomers and technicians has now gone through the system without any experience of working with data on photographic plates, it has become the more important, and urgent, that the PDPP WG define and pursue clear guidelines for proceeding with (a) educating and (b) assisting researchers, and not necessarily historians, regarding understanding, appreciating, and using data from plates in a way that particularly enhances the potential of long-term time-domain studies, especially (but not exclusively) as applied to bright or Galactic objects. This is to become the immediate goal of a re-energized WG. One practical plan is to display posters to this end at appropriate astronomy meetings. The WG warmly welcomes new members, particularly among those with professional interests in managing photographic plates for science. IAU membership is an advantage but is not a requirement.

The future of astronomy's rich heritage is in increasing danger from accidental or natural loss and from destruction through ignorance. We must raise awareness of the fragility of the situation, and treat it as a matter of increasing concern. To do so will need a joint effort on the part of all research astronomers. The long-term support of the IAU is also essential.

It is becoming urgent to persuade those whose duties include protecting archives of astronomy's photographic plates to join a worldwide effort to rescue the scientific information which the plates carry before it becomes degraded by natural ageing, or wilfully destroyed through ignorance ("Nobody uses plates nowadays"). It may be true to say that they are no longer used as detectors, but the great Truth is that the information which they carry is unique and cannot be replaced.

One new step in the right direction is due to a team in China, who have built a couple of large but portable scanners and which they are hoping to transport around. They are organizing a conference in late April 2024, in virtual mode but based in Shanghai, to discuss the many features of digitizing plates (both images and spectra). One essential component of such a conference is to identify a small sample of test-plates and circulate them to other organizations with scanners, in order that the outputs can be compared and discussed critically. This conference is being arranged under the patronage of the IAU's WG PDPP.

Anyone wishing to take part, and who may need more details (including the dates, which are difficult to pin down owing to the time zones concerned) is encouraged to contact Elizabeth Griffin at "r.elizabeth.griffin@gmail.com".

2. Inter-commission Working Group Activities

2.1. Laboratory Astrophysics Data Compilation, Validation and Standardization: from the Laboratory to FAIR usage in the Astronomical Community

A large variety of atomic and molecular data are used in astronomy and astrophysics. They are used both for the analysis of astronomical spectra and for the development of astronomical models of a wide variety of astronomical objects.

The overall objective and goals of the B5-B2 working group " Laboratory Astrophysics Data Compilation, Validation and Standardization : from the Laboratory to FAIR usage in the Astronomical Community " is to provide a platform where to discuss the FAIR (Findability, Accessibility, Interoperability, Reuse) usage of laboratory astrophysics data in astronomy and astrophysics. The working group would cover items such as managing, archiving, and sharing atomic and molecular data of interest to astronomers, assessing the validation processes of those data, assessing the documentation, the referencing processes and the tools needed for an optimized use by the astronomical community, and would define timely and regular roadmaps and analysis to support the community.

The implementation of the actions will be through supporting focused collaborations and/or in person/virtual meetings and/or sessions in workshops and conferences where laboratory astrophysics data producers and users can discuss the various issues. The target communities include both the research community and the high education community (master and PhD students) as new methodologies for data usage should be implemented at an early stage.

This WG submitted the following annual report

- https://www.iau.org/static/science/scientific_bodies/working_groups/335/wg-335-annual-report-2022-2023.pdf

as well as a triennial report from which we list the WG main activities:

Commission B2 – B5 WG, TRIENNIAL REPORT 2021-2024: Activities

The initial actions of the WG were linked to the first milestone of the WG, i.e., to establishing an overview of the state of the art for the involved communities. Those activities led to one contributed and 2 invited presentations in conferences, to 5 seminars at institutes in France and in Korea, to presentations to the IUPAC, to the IVOA, to the VAMDC Annual Meeting and to its Board of Directors and to 3 refereed proceedings to be published in 2024, one of them being a white paper. In addition through those presentations we met the objectives of connecting to various communities and to international bodies that deal with standardization in physics/chemistry and in astronomy.

A Commission B5 Zenodo community has been created (cb5-labastro). It includes all activities of the B5 commission encompassing the B2-B5 WG activities. This community can be used for any purpose linked to the "Laboratory Astrophysics Data" activities : <https://zenodo.org/communities/cb5-labastro/>.

Study of the state of the art of practices in the database community as well as in the astrophysics community related to the tools commonly used to analyse astronomical data and to numerical codes used to model astronomical media. Two on-line surveys were designed for this purpose: A database survey and an astro Codes/Tools survey. The preliminary results of the surveys were presented at the WG session organized at the IAU GA in Busan, 2022.

The WG organised a session (<https://zenodo.org/records/6979299>) at the IAU GA, Busan 2022, entitled "Laboratory Astrophysics Databases: from the provider to the user: encouraging FAIRness". The SOC was composed of the WG members in addition to IAU members from a variety of commissions/divisions, providing a broad representation of the IAU community and scientific bodies. That session's proceeding (Dubernet et al, (2024) (10.1017/S1743921323000327)) and a talk's proceeding (Rengel (2024)(10.1017/S1743921323000327)) are included in the proceedings of the Symposium "IAUS 371: Honoring Charlotte Moore Sitterly: Astronomical spectroscopy in the 21st century" held at the Busan 2022 general assembly .

A large survey on state-of-the art was presented in the Keynote Lecture "Atomic and Molecular Databases - Open Science for better science and a sustainable world" at the IAUS 371 symposium (<https://zenodo.org/records/7070971>). The conclusions of our WG were also presented at the SPIG2022 conference (<http://spig2022.ipb.ac.rs/>) "Towards a Global Network for Laboratory Astrophysics Activities and Data: Better science and a sustainable world" (<http://spig2022.ipb.ac.rs/>).

The WG contacted the VAMDC Consortium (<https://vamdc.org>) and suggested to perform a FAIR analysis of the VAMDC infrastructure. Dr C.M. Zwolf (Paris Observatory, France) performed the FAIR analysis of the VAMDC using a FAIR model from RDA. This led to a contribution at the IAU GA Busan 2022, to a contributed talk at the ICAMDATA conference (<https://www.icamdata2022.it/>) and to a proceeding, as well as to a presentation at the french section of the IVOA (ASOV) in Spring 2023 (<https://asov.obspm.fr/journees-asov-2023/>)

The WG interacted with the IVOA, the major international body for the standardization of exchanges of astrophysical data, so that A&M data citation be considered in the standards of the IVOA in astro tools and numerical codes (this is an outcome of the surveys of databases providers).

Finally a white paper (Dubernet et al (2024), (doi: 10.1017/S1743921323000261)) has been written in collaboration with an extended community, and it will be published in the IAUS 371 symposium proceedings. We provided our white paper to the large survey (<https://www.nsf.gov/mps/ast/aaac/labastro.jsp>) that has been performed on "Laboratory Astrophysics" in the USA.