

DIVISION B **COMMISSION 5**

DOCUMENTATION AND ASTRONOMICAL DATA *DOCUMENTATION ET DONNÉES ASTRONOMIQUES*

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WORKING GROUPS

Astrostatistics and Astroinformatics
Designations
FITS
Libraries
Virtual Observatories, Data Centers
and Networks
Time Domain Astronomy

Eric Feigelson, Pravjal Shastri
Marion Schmitz
Lucio Chiappetti
Marsha Bishop, Robert Hanisch
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Rob Seaman

TASK FORCE

Preservation and Digitization of
Photographic Plates

Elizabeth Griffin

TRIENNIAL REPORT 2012-2015

1. Introduction

IAU Commission 5, Documentation and Astronomical Data, continued its mission of promoting and supporting sound practices of data management, data dissemination, and data preservation over the past three years. The Commission also prepared its proposal for continuation, with some changes in emphasis, after the IAU's commission restructuring program. Below we report on the activities of the various Working Groups and the one Task Force in Commission 5.

2. Developments within the past triennium

2.1. Working Group Astrostatistics and Astroinformatics

The Working Group on Astrostatistics and Astroinformatics (WGAA) was inaugurated in 2012 to provide IAU leadership in the application of advanced methodology in astronomical research. The WGAA currently has 126 Division B members from 29 countries on six

continents. It organized three meetings since its formation: 2014 IAU Symposium #306 “Statistical Challenges in Modern Cosmology” in Lisbon, Portugal (<http://sccc21.sim.ul.pt/>), 2015 Focus Meeting #8 at the IAU General Assembly in Honolulu “Statistics and Exoplanets” (<http://exostats.org>), and a 2016 IAU Symposium #325 “Astroinformatics” planned for Sorrento, Italy. Along with similar organizations in astronomy, statistics, and computer science, the WGAA reaches out to the cross-disciplinary community through the Astrostatistics and Astroinformatics Portal (<http://asaip.psu.edu>) which draws ~100 visitors daily. The Portal provides searchable paper abstracts, meetings, jobs, discussion forums, and other resources. As part of the IAU Commission Reform initiative, the WGAA was terminated in 2015 to be replaced by the new Commission on Astroinformatics and Astrostatistics.

Eric Feigelson

2.2. Working Group Designations

The WG Designations continues its diligent work on reviewing and approving acronyms, seeking to avoid conflicts or repetitions and assuring that position-based designations have the appropriate level of precision. Over the past three years, 48 acronyms were submitted for review; 44 of them were approved and registered in the IAU Dictionary of Nomenclature of Celestial Objects, <http://cdsarc.u-strasbg.fr/viz-bin/Dic>.

Instructions on how to refer to an object or designate a new one are posted at <http://cdsweb.u-strasbg.fr/Dic/how.html>, with detailed specifications at <http://cdsweb.u-strasbg.fr/Dic/iau-spec.htx>. The form for submitting a new acronym is located at <http://cdsweb.u-strasbg.fr/viz-bin/DicForm>.

Marion Schmitz

2.3. Working Group FITS

The IAU FITS Working Group (IAUFWG) was created in 1988 under the then Commission 5, Documentation and Astronomical Data, with resolution B2 (http://fits.gsfc.nasa.gov/iaufwg/history/IAU_1988_resolution_b2.html) to maintain the FITS (Flexible Image Transport System) data format existing standards and to approve future extensions to FITS.

In reply to the IAU Questionnaire in Jan 2013 we stated “that the proven durability of the FITS standard, first established in 1979 and currently the main astronomical standard for data storage and distribution makes it an obvious candidate as a functional WG.”

The membership of the IAUFWG remained stable during the triennium at 23 members (http://fits.gsfc.nasa.gov/iaufwg/iaufwg_members.html), either IAU members or (informal) associates. The IAUFWG mailing lists includes also some past members of “historical relevance.”

The liaison with the community of FITS users at large is kept via the FITSBITS mail exploder (<https://listmgr.nrao.edu/pipermail/fitsbits/>).

The IAUFWG has always had a somewhat rigid and slow voting protocol to ensure that changes to the FITS standard are perceived mature by the community with the largest consensus. The original protocol, dating to a pre-Internet age, implied the passage through a further level of geographically based Regional Committees. After careful discussion the Regional Committees were disbanded effective 1 Jan 2014, and contextually the delay time by which a negative vote by a member can hold a new proposal has been reduced to 3 months (http://fits.gsfc.nasa.gov/iaufwg/iaufwg_rules.html and references therein).

We considered also the possibility of improving the membership and voting rules taking into account with different weights the roles of major data handling institutions vs the one of scientific users. A coarse draft proposal by Grosbøl and Dobrzycki exists, but final discussion was postponed because of the IAU commission reform.

Besides the above procedural activities, the standing actions of maintaining the list of registered extensions and conventions, and general liaison with the astronomical community and beyond (e.g. Vatican Library, Library of Congress), the activities of IAUFWG in the triennium have been:

- The approval by incorporation of the long awaited convention for time coordinates in the framework of the World Coordinate System (WCS). The matter was voted in mid-2014, in the form just later published in the paper by Rots *et al.* 2015 (*A&A* **574**, 36). A summary of the paper has been recently (July 2015) incorporated as a new chapter (9) in the latest FITS standard document.

- In late 2013 we started thinking of possible improvements to the FITS standard to meet some perceived shortcomings due to the time elapsed from the original standard definition (in the age of punched cards and magnetic tapes). Five items were initially considered, mainly in the area of FITS metadata: the length of FITS keyword names; the length of string keyword values; the extension of the FITS keyword character set; FITS file versioning; and the overhead in extending FITS headers. A technical group was drawn from the IAUFWG to assess new proposals while also considering the burden on FITS reading and writing software. This group concentrated on a reasonably simple proposal for long keyword names, the inclusion of lower case characters and a few non-alphanumeric characters (including possibly blank space). Although virtually ready, this proposal had not yet been voted, because we felt it more appropriate to vote on conventions (see below).

- For some of the other matters considered in late 2014 we found that existing registered conventions already provided a solution, and it was simpler just to promote them as part of the FITS standard. Therefore another, partially different, technical group was drawn from the IAUFWG, with the idea of drafting text incorporating some of the existing conventions into the standard (not limited to those considered above). Out of 23 conventions (http://fits.gsfc.nasa.gov/fits_registry.html), only 6 were considered applicable to specific types of data, while for the rest incorporation into the standard could be plausible. Among these we gave priority to 9. For one we concluded it would be better to remain a convention (the substring array convention for BINTABLES), while for the others we prepared a draft text to update the FITS standard document in the form of a new chapter (for the two important conventions for tiled compression of images and tables) or section (CONTINUED long string keywords, blank header space reservation, CHECKSUM, minimum and maximum keywords, the Green Bank convention, and INHERIT) and in June 2015 we submitted these to a Public Comment Period. Given the amount of material, there was consensus not to rush the procedure to a hasty vote before the formal end of life of IAUFWG with the IAU commission reform.

Considering all the above unfinished activities, it would be appropriate if the OC of the new Commission B2 would grant to the current members of the past IAUFWG (or a subset thereof) the authority to conclude with the current rules the pending activities for the update of the FITS standard, awaiting the establishment of the Data Representation WG into which the IAUFWG will be folded.

Lucio Chiappetti
Chair of WG FITS

2.4. Working Group Libraries

The Working Group Libraries requested and was granted a Focus Meeting at IAU General Assembly XXIX. The program, entitled “Scholarly Publication in Astronomy: Evolution or Revolution?” was an interesting and information-filled two-day meeting addressing the topics of interest to astronomers, publishers, and librarians. The meeting was well-attended and successful in raising awareness of the complicated and rapidly changing landscape of scholarly publishing.

The work resulting from the Focus Meeting is a recommendation for a white paper documenting the roles and responsibilities of libraries, particularly with regard to emerging roles in curation of digital collections and access to on-line services, enabling the library community to have a common resource for educating astronomers, managers, etc. as well as tools for defending budget, staff, space, etc. This effort will be turned over to the incoming Chairs.

At the IAU XXVIII General Assembly in a one-day meeting held by WG Libraries, the outline of “Best Practices for Creating a Telescope Bibliography” was developed by the participants. Over the next several months, with input from librarians and bibliographers, the document incorporated the best practices for gathering and accounting for information in a telescope bibliography. This document was endorsed by the Commission 5 Organizing Committee on 6 December 2013 and now constitutes a formal recommendation from Commission 5. To identify the observatories that follow Best Practices, WG Libraries began to gather signatures of those who follow it in the development of their observatory bibliographies. This project is on-going and expected to result in a document that is not only recommended and endorsed by Commission 5 (now Commission B2), but endorsed by those who incorporate Best Practices into their telescope bibliographies, leading to cleaner and more meaningful comparisons.

During the Commission 5 Proposal for continuation it was proposed that WG Libraries change its name to WG Information Services to contain and extend the role of the WG Libraries. The incoming Chairs have responsibility for this task.

In conclusion, WG Libraries has grown and prospered, becoming more inclusive for anything related to astronomy libraries and bibliographies, including publishing and data availability and integrity.

Marsha Bishop, Robert Hanisch

2.5. Working Group Virtual Observatories, Data Centers, and Networks

The Working Group on Virtual Observatories has not been active, largely because the International Virtual Observatory Alliance (IVOA) has successfully coordinated the standards development and interoperability work associated with global data discovery and access. The world’s leading data centers all participate in the IVOA. We retained the Commission 5 WG in case it should become necessary to formally endorse IVOA standards as IAU standards, i.e., if the IVOA coordination efforts should at some point lose their momentum.

Robert Hanisch

2.6. Working Group Time Domain Astronomy

The Working Group on Time Domain Astronomy (TDA) grew out of a widely supported proposal to form a new IAU Commission on Time Domain Astronomy. While this proposal was not selected in the 2015 round, we anticipate submitting a revised proposal for the 2018 IAU General Assembly and have requested recognition in the interim as a

Division B WG. We are grateful to Commission 5 for providing us with a home prior to the 2015 GA, and look forward to working with its successor, Commission B2, on numerous issues. Membership in the WG is open and currently numbers 145, including both IAU members and others. Approximately two dozen astronomers were recruited to submit IAU membership applications in coordination with the proposal for the TDA Commission/WG. TDA activities planned and in progress for the next three years include:

- *Hot-Wiring the Transient Universe V*, to be held at Villanova University, 10-14 October 2016

- Letter of Intent submitted for *Southern Horizons in Time Domain Astronomy*, proposed for South Africa in 2017

- TDA WG web page and resource list: <http://timedomainastronomy.net>

- TDA mailing list: <https://pairlist10.pair.net/mailman/listinfo/tda.wg>

Time domain science use-cases often depend on coordinated observing modes, distributed archives, and responsive computational resources, thus TDA is a driver for comprehensive community-wide systems engineering and autonomous infrastructure supporting all kinds of science. The TDA WG welcomes partnerships at all levels of the astronomical community and seeks to build on the IAU's deep foundations.

Rob Seaman

2.7. Task Force Preservation and Digitization of Photographic Plates

The TF Preservation and Digitization of Photographic Plates (PDPP) continues to be active, and to exercise its watchdog role in alerting members or organizations to situations which could have negative impacts on astronomy's archives of heritage materials. Some members are digitizing their own plate collections, as and when equipment, funding and manpower permits; we name specifically the DASCH project at Harvard, which has now made high-quality scans of about 20% of its holdings (from which some 6.7 billion historical magnitudes have been extracted), and the DAO's program to scan its Coudé spectra with the in-house PDS, reaching some 25% of that task to date.

Regarding the past three years three specific missions that were undertaken should also be mentioned:

(a) A request by Shanghai Observatory for advice regarding the selection of best parameters for a plate scanner led to a second visit by the PDPP Chair in October 2012. It included an inspection of the spectrograms from five major Chinese observatories and now stored in a purpose-renovated building. The sad state of some of the plates, brought about by incorrect storage in conditions of high humidity, was pointed out, but corrective action was too late.

(b) In May 2013 a visit by the Chair to Kiev Observatory (supported by a generous IAU grant) in order to set up a collaborative project with the PDPP led to useful initial contacts, but did not receive the expected funding from the Ukraine Government. In June 2015 a strongly supportive letter, endorsed by the IAU, was sent to Kiev Observatory in order to help ensure a continuation of their plate-scanning activities in the light of present difficult circumstances.

(c) The PDPP was represented at "Astroplate-14", a workshop held in Prague in March 2014 to discuss the matter of digitizing heritage plates (mostly) in Europe. A Working Group was set up to coordinate activities, and will report at a follow-up meeting in March 2016.

Elizabeth Griffin

3. Summary

Commission 5 has played a valuable role in supporting key components of research infrastructure for the international astronomy community:

- Standardizing nomenclature for astronomical objects
- Disseminating information regarding statistical and analytical methods, particularly for big data
- Maintaining and extending the Flexible Image Transport System, such that essentially all major observatories and data analysis software systems in use in astronomy read and write data in the FITS format
- Providing a point of contact between the IAU and the International Virtual Observatory Alliance
- Raising awareness of the importance of preserving heritage, pre-digital data collections such as photographic plates and spectra
- Facilitating discussion and planning in the area of time domain astronomy, where the techniques of data analysis touch virtually all fields of astrophysics
- Providing a forum for communication among research librarians in astronomy, and between librarians and the astronomers they serve

We are pleased that the core roles and responsibilities of Commission 5 will continue under the new Commission B2.

Robert Hanisch
President of Commission 5