

COMMISSION 5

DOCUMENTATION AND ASTRONOMICAL DATA

*DOCUMENTATION ET
DONNÉES ASTRONOMIQUES*

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COMMISSION 5 WORKING GROUPS AND TASK FORCE

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TRIENNIAL REPORT 2009–2012

1. Introduction

IAU Commission 5 (<http://www.nao.ac.jp/IAU/Com5/>) deals with data management issues, and its working groups and task group deal specifically with information handling, with data centers and networks, with technical aspects of collection, archiving, storage and dissemination of data, with designations and classification of astronomical objects, with library services, editorial policies, computer communications, ad hoc methodologies, and with various standards, reference frames, etc. FITS (Flexible Image Transport System), the major data exchange format in astronomy, has been standardized, maintained and updated by the FITS working group under Commission 5.

It has been suggested that a new era of astronomical research utilizing large amounts of data, *i.e.*, the 4th paradigm in astronomy, will soon come, and astronomers need to be well-prepared for this new era. Since the data production rate will be 100 to 1000 times larger than that at present, it will be crucial to have a combination of advanced machine learning technologies with immediate access to extant, distributed, multi-wavelength databases. Such an approach is necessary to make these assessments and to construct event notices that will be autonomously distributed to robotic observatories for near-real-time follow-up. Advanced data analyses combined with statistics and data mining will be essential to derive general “rules” and/or “knowledge” on various phenomena in the Universe, as the data volumes will make human inspection and analysis of the data impossible. The most important and exciting astronomical discoveries

of the coming decade will rely on research and development in data science disciplines (including data management, access, integration, mining, visualization and analysis algorithms) that enable rapid information extraction, knowledge discovery, and scientific decision support for real-time astronomical research facility operations. Significant scientific results are expected to be obtained from data-intensive astronomical research in the very near future and beyond, and, Commission 5 needs to take a lead towards the new research paradigm.

2. Developments within the Past Triennium

Highlights of the 2009–2012 triennium include

- IAU Symposium 285 “New Horizons in Time Domain Astronomy”: The symposium was held between September 19 and 23, 2011, in Oxford, the United Kingdom, and was organized by Robert J. Hanisch and Elizabeth Griffin as the co-chairs, together with some other Commission 5 members as the SOC. There were 240 participants.

- FITS: The third version of the FITS Standard Document was published in Pence *et al.* (2010). The new standard is also available on the FITS Support Office Web site at <http://fits.gsfc.nasa.gov>.

In addition, Commission 5 handled other issues as follows:

Commission Name: There was a discussion within the organizing committee if the Commission’s name, “Documentation and Astronomical Data”, should be changed, reflecting increased capacity and importance of astronomical data. There were a few proposals, such as “Astroinformatics”, “Astronomical Data and Data Management”, “Data Management and Information”, “Astronomical Data and Information Management”, and “Astronomical Data and Information”. However, no consensus was achieved.

Proposal on a new IAU Resolution: Commission 5 received a proposal towards a new IAU Resolution regarding better writing styles. The draft Resolution was extensively discussed electronically in the organizing committee, and it was agreed to simplify the draft, and to further discuss the draft Resolution during the Commission’s planned business meeting in Beijing in 2012. The finalized draft Resolution is expected to be submitted to the Executive Committee of the IAU for its approval.

CBAT issue: On May 18th, 2010, Ian Corbett (IAU General Secretary) requested Commissions 5 and 6 to provide their views and perspectives on the possibility of modifying the CBAT activity by means of the VOEvent technologies. Those Commissions were requested to submit their reports by the end of July, 2010. The OC members of Commission 5 and Rob Seaman (USA, chairman of VOEvent WG of the International Virtual Observatory Alliance) developed the following view from Commission 5.

Commission 5 is of the view that introduction of information technologies for the Astronomical Telegram systems would be in line with the primary purpose of the Commission, and welcomes adoption of the VO Technologies to help observers to report newly discovered transient phenomena and to disseminate such information to astronomy communities in the world. Thus Commission 5 would like to provide as much technological support as possible to the IAU EC. Commission 5 believes that the adoption of the VO technologies by the IAU would further accelerate of the astronomical research.

However, Commission 5 would like to draw EC's attention to the following issues that need to be resolved:

1) Although Commission 5 could provide technological support, the Commission itself does not own any resources (e.g., budget and manpower for software development, hardware for servers) for a new system like the CBAT. Therefore it is suggested that the EC consider how the necessary resources might be provided on a long-term basis.

2) It would be a task for Commission 6, not Commission 5, to cross-check newly reported "discoveries" and to "authorize" them as appropriate. Thus both Commissions need to coordinate their roles when designing and developing a new Astronomical Telegram dissemination system. Commission 5 is of the opinion that such coordination would be done by the new Task Force working towards the new system that will be established under Division XII.

Finally, Commission 5 recommends that the chairman of the IVOA VOEvent WG and at least one of the owners/operators of a community-accessible VOEvent broker be members of the above Task Force to ensure that astronomers get the access that they need.

The view above was consolidated with that of Commission 6, and the consolidated report was submitted to the EC.

Science Sessions during the 2012 GA: Commission 5 members submitted proposals towards associated science meetings during the General Assembly in Beijing. One proposal of a special session on "Data Intensive Astronomy" has been accepted; the preparatory process has already been started, chaired by Masatoshi Ohishi (Japan).

2.1. Activity Report of WG Designations

Chair: Marion Schmitz (USA)

Web Sites: <http://cdsweb.u-strasbg.fr/cgi-bin/Dic/iau-spec.htm>

for IAU Recommendations for Nomenclature,

<http://vizier.u-strasbg.fr/viz-bin/DicForm>

for Proposal for Registering a new Acronym, and

<http://cdsweb.u-strasbg.fr/IAU/starnames.html>

for star name history

At the 2009 Rio de Janeiro IAU meeting, Marion Schmitz (Caltech, USA) presided over the Commission 5 Working Group Designations meeting.

The Working Group Designations of IAU Commission 5 clarifies existing astronomical nomenclature and helps astronomers avoid potential problems when designating their sources.

The most important function of WG Designations during the period 2009-2011 was overseeing the IAU REGISTRY FOR ACRONYMS (for newly discovered astronomical sources of radiation; <http://cdsweb.u-strasbg.fr/cgi-bin/DicForm>) which is sponsored by the WG and operated by the Strasbourg Data Center (CDS). The Clearing House, a subgroup of the WG, 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 September 2011, there have been 260 submissions and 211 acceptances. Attempts to register asterisms, common star names, and suspected variable stars were rejected.

Assistance was provided for inquiries about naming exo-planets after Roman-Greek mythology and about a systematic method for creating a more scientific convention for exo-planets. Both of these also involved discussions with IAU Commission 53.

2.2. Activity Report of WG Libraries

Chair: Marsha Bishop (USA)

Co-Chair: Robert J. Hanisch (USA)

Web Site: <http://www.eso.org/sci/libraries/IAU-WGLib/index.html>

The primary activity this triennium for Commission 5 Working Group Libraries has been to broaden the awareness of Working Group Libraries and increase the involvement of astronomy librarians from around the world to strengthen the working relationship between scientific user groups and libraries. In pursuit of this, we worked with Librarians to bring about a confluence of The Library and Information Services in Astronomy (LISA) and Working Group Libraries. While we were unable to schedule a joint meeting for Beijing, we did succeed in expanding the level of interest among astronomy librarians which has led to a more substantial program for Beijing. The program will bring scientists and librarians together to discuss and build on the ability of the library community to provide the information requirements of the scientific community. In addition, shared projects and programs between observatories, operated by librarians, will be reviewed.

2.3. Activity Report of WG FITS

Chair: William D. Pence (USA)

Web Site: <http://fits.gsfc.nasa.gov/iaufwg/>

The WG-FITS is the international control authority for the FITS (Flexible Image Transport System) data format. It is composed of 23 members from major astronomical institutions distributed around the world. The main activities during this triennium have included:

A major revision to the FITS standard document, which contains the formal definition of the FITS (Flexible Image Transport System) data format, was completed by the WG-FITS in 2008. This large document was subsequently published in the *Astronomy & Astrophysics* journal in Pence *et al.* (2010).

During the previous IAU triennium, the WG-FITS established a procedure for registering FITS conventions that are in use in the scientific community. This registry provides a central location on the FITS Support Office Web site (also sponsored and maintained by the WG-FITS) for documenting each convention for posterity. This registry continues to grow: 9 new conventions were submitted during the current triennium, bringing the total number of registered FITS conventions to 20. It is anticipated that several new FITS conventions will be submitted to this registry each year.

Major progress has been made on a document that defines a standard World Coordinate System (WCS) convention for specifying date and time coordinates that are to be associated with astronomical FITS data files. This is the next in a series of documents which have previously defined the standard FITS WCS conventions for spatial and for spectral coordinate systems. A complete draft of this new time WCS document was released for public comment in 2011. The final version of the document is expected to be submitted to the WG-FITS for formal approval in 2012.

2.4. Activity Report of WG Virtual Observatories

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| Chair | Robert J. Hanisch |
| Vice-Chair | Robert D. Bentley |
| Board Members | Beatriz Barbay, Daniel Egret, Toshio Fukushima, George Helou, Peter Quinn |

Web Site: <http://cdsweb.u-strasbg.fr/IAU/wgvo.html>

The Working Group on Virtual Observatories, Data Centers, and Networks arose from discussions at the IAU General Assembly in Prague (2006), and the first meeting of the WG was held during the 2009 General Assembly in Rio de Janeiro. The International Virtual Observatory is one of the rare truly global endeavors of astronomy. Many projects, each with its own goals, have been set up around the world to develop the IVO. The International Virtual Observatory Alliance (IVOA) is an alliance of the VO projects, with the aims of managing communication between VO projects, defining a common road map, and managing propositions for the definition and evolution of IVO standards through the IVOA Working Groups.

The IAU WG on Virtual Observatories, Data Centers, and Networks is the standard-bearer of the International Virtual Observatory at IAU, and it is the primary point of contact between the IVOA and the IAU. Its primary role is to provide an interface between IVOA activities, in particular IVOA standards and recommendations, and other IAU standards, policies, and recommendations. In particular, it raises VO-related topics (e.g. symposia, GA sessions) that should be handled by the IAU (Commission 5, Division XII and executive level). It helps facilitate take-up of VO standards in the broader community, particularly in liaison with national and international data centers, and provides outreach to VO and data management efforts generally in related fields within the IAU (planetary science, solar astronomy, etc.).

The WG brings to the attention of the IVOA Executive any topics it considers to be important for the IVO. It can be consulted by the IVOA Executive on any topic relevant to the international development of the VO. The WG consists of members of IVO projects together with individuals bringing an external view on the long term vision of the VO and other stakeholders. Participants include the president of Commission 5, the chair of the IVOA, a representative of the WG FITS (Commission 5), a representative of the WG on Astronomical Data (Commission 5), and a representative of the WG on International Solar Data Access (Division II).

The WG met on 4 August 2009 in conjunction with the IAU General Assembly in Rio de Janeiro, with approximately 25 people in attendance, representing at least 10 different countries. The meeting began with a discussion of the general goals for the WG and its relationship to other activities within the IAU (e.g., the WG on FITS, also under Commission 5).

Prof. Albert Bruch gave a presentation on Virtual Observatory activities in Brazil, particularly concerning the formation of BraVO, the Brazilian Virtual Observatory initiative. It was suggested that BraVO might be a catalyst for other VO programs in South America and could help to organize regional VO meetings. (This has, in fact, occurred; BraVO will be hosting the IVOA Interoperability Workshop in October of 2012, and will be running a VO school in conjunction with the 2012 annual meeting of the Brazilian Astronomical Society (SAB).)

Various news items were presented and discussed.

- The US Virtual Astronomical Observatory program was expected to begin very soon, with R. Hanisch as Director. (In fact, US VAO funding began in April 2010.)
- The AstroGrid project in the UK was not successful in attaining funding for ongoing operations.
- France's VO program continues on a strong footing.
- C. Corbally (Vatican Observatory) noted that scanned plates had been published to VO standards.

- Argentina plans to constitute a VO program within one year. (The Argentina Virtual Observatory, “NOVA”, was indeed started and joined the IVOA in 2010.)
- Australia plans to renew its VO activities. (In 2010 Australia VO was restored.)
- Japan VO is active and in its operational phase since March 2008. Data from the Subaru telescope is being downloaded through JVO.
- The European VO has begun a program of educational outreach.
- Microsoft’s Worldwide Telescope includes built-in access to VO services. Students as young as 10–12 years are using WWT to build tours of the universe.

Discussion continued concerning the take-up of VO tools and infrastructure within the research community. Efforts need to be made to improve professional outreach and provide a simpler introduction to VO standards. (The IVOA has taken action in this regard, with a much improved document describing the VO architecture and the roles and relationships of the various IVOA standards and protocols. In addition, all IVOA standards that have reached the final stage of “recommendation” (REC) are now available through the electronic preprint *arXiv*, <http://arxiv.org>, and are indexed by ADS, <http://adswww.harvard.edu>.)

Virtual Observatory standards development and discussions on scientific priorities, science applications, data mining tools and technologies, and education and public outreach are conducted in the semi-annual Interoperability Workshops of the IVOA. During this triennium IVOA “Interop” meetings have been held and are planned as follows:

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| 24-29 May 2009 | Strasbourg, France (CDS) |
| 9-13 November 2009 | Garching, Germany (ESO) |
| 17-21 May 2010 | Victoria, British Columbia, Canada (CADC) |
| 7-11 December 2010 | Nara, Japan (JVO) |
| 16-20 May 2011 | Naples, Italy (U. Naples/INAF) |
| 17–21 October 2011 | Pune, India (IUCAA) |
| 21-25 May 2012 | Urbana, Illinois, USA (NCSA) |
| October/November 2012 | São Paulo, Brazil (U. São Paulo) |

Further information about IVOA activities can be found at <http://www.ivoa.net/>.

The WG will meet next during the 2012 General Assembly in Beijing.

2.5. Activity Report of TF Preservation and Digitization of Photographic Plates (TF-PDPP)

Chair: Elizabeth Griffin (Canada)

Web Site: <http://www.lhobs.org/PDPP.html>

The TF-PDPP is a worldwide organization of (chiefly) professional astronomers who maintain a watchdog surveillance over their own, local, national and other collections of astronomical plates and associated (meta) data. The objectives of the PDPP are necessarily long-term, and cannot – should not – be confined to any short-term goals whose realization could then be said to be “completed”. A physical meeting of the members is expensive to arrange, and since many have retired status it is also difficult for the PDPP to hold anything but a token meeting at an IAU General Assembly. However, at IAU S285 held in September 2011, one of the 20 dedicated afternoon workshops was focused on the preservation and digitization of photographic plates, and several PDPP members who were attending the Symposium made contributions.

The existence of the PDPP is becoming more widely known, and queries or messages concerning photographic plates now tend to be (re)-directed to members, which is definitely an improvement compared to just 8 or 9 years ago. Notices of uncatalogued – even

unidentified – plates in South Africa and in Australia have thus been referred to the PDPP, as also have notices of impending abandonment of duplicate series such as Sky Survey materials. In the case of the latter we have been able to energize our network to contact any likely recipients. The PDPP's Website, where its occasional newsletter "SCAN-IT" can be accessed, is currently being transferred to another Webmaster and site.

Important strides have been achieved by DASCH (the project to digitize the world's largest collection, at Harvard), and will thus create a tremendous precedent for PDPP's endeavours.

We are pleased to note the following:

1) DASCH has been offered full support by a benefactor to digitize all the Harvard collection. The images will eventually be placed in the public domain.

2) The DAO (Canada) has commenced scanning its major collections of photographic spectra. Each spectrum is calibrated in both intensity and wavelength, and collapsed into a 1-D spectrum in either 50 or 10 mA steps (depending on the original material). A few hundred spectra are already in the public domain, and can be accessed via the DAO Science Archive within the CADC Web-site.

3) The new rapid scanner (DAMIAN), designed and installed at the Royal Observatory of Belgium in Brussels, is now becoming fully operational. Plans to digitize collections from European observatories are under discussion.

4) Projects have been commenced in China, Russia and elsewhere to digitize national collections. Unfortunately the tasks often depend on volunteer labour, or on grant money whose supply is liable to stall, and are thus prone to delays or discontinuity. However, those projects do not the benefit of purpose-built scanning equipment.

5) The Wide Field Plate Archive, installed in Sofia (Bulgaria), continues heroically to collect meta-data about collections of wide-field plates.

6) The Pisgah Astronomical Research Institute (PARI) has been awarded a major NSF grant to upgrade its infrastructure and physical plant, and will thus be able to reconnect the air-conditioning to the rooms where collections of donated plates are stored.

7) PARI has continued to receive collections of unwanted photographic plates.

8) PARI acquired the two large "Gamma" scanning machines from STScI when they were decommissioned in 2008. To date they have been reassembled and tested mechanically but do not yet have full operational driving software.

A Workshop, to follow up the one held at PARI in 2007, has been funded and organized for April 2012, at the AIP in College Park. The prime goal of this second meeting is to write an Action Plan for astronomy's photographic plates in North America.

3. Future Commission 5 activities

Commission 5 plans to hold the following business sessions during the 2012 General Assembly in Beijing: two sessions for the entire commission and one session each for all WG and TF. Some of WG/TF sessions could be held in parallel.

Special session 15 on "Data Intensive Astronomy" will be held between August 28th and 31st, 2012, in Beijing, China Nanjing.

4. Closing remarks

Commission 5, including its Working Groups and Task Force, has made great progress regarding the data and the documentation issues, as is reported here. Such a successful

progress owes to the talent of all the Commission members. As the president of the Commission, I would like to acknowledge all the effort made by the Commission members, especially by the Organizing Committee members.

Masatoshi Ohishi (NAOJ, Japan)
president of the Commission

Reference

“Definition of the Flexible Image Transport System (FITS), Version 3.0”. W. D. Pence, L. Chiapetti, C. G. Page, R. A. Shaw, & E. Stobie, *A&A.*, 524, A42 (2010).