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## COMMISSION 5: DOCUMENTATION AND ASTRONOMICAL DATA<sup>1</sup>

*(DOCUMENTATION ET DONNEES ASTRONOMIQUES)*

**PRESIDENT: O. Duzhnevskaya**

**VICE-PRESIDENT: F. Genova**

**ORGANIZING COMMITTEE: M.S. Bessell, H.R. Dickel, B. Hauck, H. Jenkner, O.Yu. Malkov, F. Murtagh, K. Nakajima, R.P. Norris, F. Ochsenbein, G.R. Riegler, M. Schmitz, D.C. Wells, R. Wielen & Zhao Youngheng**

### 1. INTRODUCTION

The structure of the Commission 5 approved by XXIV GA consists of 5 Working Groups and 1 Task Group:

- Working Group Virtual Observatories, Data Centers and Networks (Chair F. Genova)
- Working Group on Astronomical Data (Chair R.P. Norris)
  - Task Group on Preservation and Digitization of Photographic Plates (Chair E. Griffin)
- Working Group on Designations (Chair H.R. Dickel, Vice-Chair M. Schmitz)
- Working Group on Libraries (Co-Chairs F. Murtagh and U. Grothkopf)
- FITS Working Group (Chair D.C. Wells)

Information about Commission 5 groups and their activities may be found at:  
<http://www.inasan.rssi.ru/iau/iau5/indexspec.html>

### 2. GENERAL DEVELOPMENTS 2000-2002

During last 3 years the idea of creating of the Virtual Observatories (VO) has become one of the principal ideas of modern astronomy and the most fundamental purpose of our Commission was the participation in the creation of International Virtual Astronomical Observatory. There were principal directions of the research concerns of both Working Group Virtual Observatories, Data Centers and Networks and Working Group on Astronomical Data.

The decision to create a special committee to coordinate common efforts in this direction was very natural. The International Virtual Observatory Alliance (IVOA) was formed in Garching in June 2002.

The most important function of Working Group on Designations during the period 1999-2002 was supervision for the IAU Registry for Acronyms (for newly discovered astronomical sources of radiation).

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<sup>1</sup>Commission of the Executive Committee.

The activities relating to nomenclature and publishing have been incorporated into the new IAU Working Group on Publishing (Chair Michelle Storey), which is now very active.

The activity of Working Group on Libraries which maintains various informational resources is necessary for every astronomer. Series of LISA conferences organised by this group is very useful, and the recent LISA – LISA IV in 2002 in Prague was also very successful.

The delegate of the IAU, the chair of the IAU Commission 5 WG on Astronomical Data Dr. R. Norris attended the 22nd General Assembly of the ICSU Committee on Data in Science and Technology (CODATA) in Baveno/Stresa, Italy (October 2000), and the 23rd General Assembly of CODATA, in Montreal, Canada (October 2002), and submitted an exhaustive report on behalf of the IAU. The report is available at the webpages of Commission 5.

### 3. WORKING GROUPS

#### 3.1. Working Group on Virtual Observatories, Data Centers and Networks (F. Genova)

The rapid emergence of the concept of "Virtual Observatory", driven in particular by the need to federate the existing and forthcoming digital sky archives, both ground-based and space based, led IAU to create the Working Group, as a result of discussions at Commission 5 meeting during GA 24. The proceedings of the two conferences held in 2000, "Virtual Observatories of the Future", (Caltech, June 13-16, 2000) and "Mining the Sky" (Garching, July 31 - August 4, 2000), give an excellent overview of the subject.

Since then, major international and national R&T/Phase A projects got under way, in Europe (AVO), the USA (NVO), UK (AstroGrid), and more recently in Australia, Canada, Germany, India, Russia. Other national projects are also emerging e.g. in France and Japan. These projects aim at documenting the science needs and at studying critical points, architecture and standards for full deployment at a later stage. Interoperability standards are a key element of the Virtual Observatory, and they are actively discussed at the international level, in a working group first set up by the OPTICON European Network.

The conference "Toward an International Virtual Observatory", held in Garching in June 2002, was sponsored by ESO, ESA, NASA and NSF. It gives a recent overview of the scientific motivation, roadmap for development and current status of the Virtual Observatory endeavour. The Virtual Observatory is a science-driven, world-wide project which will benefit to the whole astronomy community, and an International Virtual Observatory Alliance (IVOA) was founded at the time of the meeting. The projects share a common roadmap, and the first milestone (April 2002) is a common standard, VOTable, to exchange tabular data.

The aims and status of the Virtual Observatory will be discussed during GA 25, at Joint Discussion "Large Telescope and Virtual Observatories: Visions for the Future", during Commission 5 meetings, and through demonstrations.

#### 3.2. Working Group on Astronomical Data (R.P. Norris)

*Overview* The management of astronomical data has become an increasingly significant issue in recent years, because of large surveys now routinely producing terabytes of data, and because of the growing importance of www-based data centres, remote observing, data archiving, etc. There have been two dominant issues since the last GA: the Virtual Observatory, and the protection of freedom of access to large databases. The Virtual Observatory work will be described in detail by the VO working group, but some implications have been handled by the WGAD, which will be described here. A major issue for the IAU is the proposed database protection legislation which is opposed by CODATA on behalf of the ICSU.

*CODATA* CODATA is the committee on data in science and technology of the ICSU (International Council for Science), and it serves the role of coordinating data-related activities between the various scientific unions such as IAU and URSI. Given the increasing significance of data issues in astronomy, and the threats to our freedom to distribute these data widely, IAU involvement in CODATA is very important.

Ray Norris represented the IAU at the October 2000 meeting in Italy, and will do so again at the next meeting in Montreal, Canada, in October 2002. CODATA offers significant benefits to the IAU, particularly in terms of (a) looking after our data interests, as in the data protection legislation fiasco, and (b) cross-fertilisation with other disciplines. Because astronomy is a data-intensive discipline, the IAU should continue to play an active role in CODATA, and should perhaps explore ways to obtain even more value from CODATA.

*Database Protection Legislation* There is a worldwide shift towards increased protection for intellectual property. In particular, the World Intellectual Property Organisation (WIPO) has proposed legislation with the very reasonable aim of protecting commercial databases, but with unwanted side-effects which will cause problems for open access to scientific data (see

[http://www.codata.org/data\\_access/summary.html](http://www.codata.org/data_access/summary.html)

for a summary of issues). Similar legislation has been proposed in the US (where it is currently on hold), in the European Union (where it has been enacted), and in other countries. Various groups, particularly in the US, have been arguing that such legislation needs to be modified to protect the way in which scientific data are used, which differs significantly from the usage of commercial data. For example, the proposed WIPO legislation included no "fair use" provisions, so that using small quantities of data for education or research would not be exempt. This is in contrast to copyright law which includes "fair use" provisions which enable, for example, the photocopying of a page on to a transparency for teaching.

Our current freedom of access to public-domain databases (like CDS, NED, etc.) is threatened by this legislation. For example, in Europe, all but a few countries have now enacted legislation. Most have included "fair use" clauses, which permit free use of data for science and education, and other reasonable modifications. But Italy, France, and Greece have no fair use provision, which means that citing data (e.g. quoting redshifts) from a journal published in France is now technically illegal unless you first obtain permission from the author or publisher. In practice, scientists are either unaware of this or are ignoring it. If a publisher chose to enforce this legislation, data centres could be severely affected by the need to maintain a paper trail authorizing use of each item of data, and the virtual observatory could be swamped in a mass of contracts.

*Astronomical Data Archive Issues* The growth of databases from large surveys, and the advent of the virtual observatory, has raised a number of issues around astronomical data. One of these is the need to ensure future freedom of access to astronomical archive data from major publicly-funded observatories, and a resolution to this effect will be tabled at the next IAU GA. Another is the need for the IAU to build its current widely-dispersed set of resolutions, definitions of astronomical quantities, reference frames, etc into a well-defined consistent and easily available set of rules. The WGAD has just initiated a discussion on how this might be achieved.

*Data Formats* Until about 20 years ago astronomy was split into a number of sub-disciplines corresponding to the different wavelengths at which observations were made (optical astronomy, radio astronomy, etc). Each of these tended to use its own data formats, as a result of which it was awkward to combine data from different wavelengths. In 1981 the FITS (Flexible Image Transport System) format was proposed

(<http://fits.gsfc.nasa.gov/documents.html>),

and adopted enthusiastically by all sub-disciplines of astronomy. This permitted easy interchange of data between the sub-disciplines, and was partly responsible for breaking down cultural barriers between these sub-disciplines. As a result, many astrophysicists today

take their data at whichever wavelength is needed to solve the astrophysical problem being addressed. This is probably partly responsible for the current healthy state of astronomy and astrophysics internationally, with new discoveries about the origin and evolution of the Universe being made at a breathtaking rate. While FITS has been enormously and demonstrably successful, astronomical data are now seen by some as outgrowing the 1980s technology on which FITS was based. The Astronomical Data Center (ADC) at NASA's Goddard Space Flight Center

(<http://adc.gsfc.nasa.gov/>)

has taken the lead in applying newer technology such as the eXtensible Markup Language (XML) to solve astrophysics data interchange issues. These include automated data ingest, panchromatic data search, access to large databases, and development of new meta-data standards. Unfortunately, funding for the ADC was cut in October 2002. The implications of this on the pioneering XML work are not yet clear, but may be grave. An even more sophisticated approach has been taken by organisations in US and Europe that are building the necessary components and infrastructure for the Virtual Observatory, resulting in a prototype standard called VOTable, relying on cutting-edge web services and directories.

*3.2.1 Task Group on Preservation and Digitization of Photographic Plates* (E. Griffin) See information at web pages of Commission 5.

### 3.3. Working Group on Designations (H.R. Dickel)

President: Helene R. Dickel Vice President: Marion Schmitz

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

The WG's activities relating to nomenclature and publishing have been incorporated into the new WG on Publishing whose members include many from the WG Designations. The most important function of WG Designations during the period 1999-2002 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 Centre de Données astronomiques de Strasbourg (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 August 2002, there have been 75 submissions and 61 acceptances.

After the successful launch of the Chandra X-ray Observatory in 1999, the Chandra X-ray Science Center, in consultation with the WG Designations, developed a Chandra Source Naming Convention with a requirement that authors submit their acronym to the IAU registry prior to publication. Since the CXO (CXOAA, etc.) and CXOU acronyms were introduced, 17 additional CXO-type acronyms have been accepted by the Registry. Other Observatory Science Teams are following this practice to formulate their naming conventions.

In the 3 years prior to the General Assembly in Manchester, the designation of the components of binary stars became an important topic for the WG Designations. After the multi-commission meeting at that General Assembly, further developments were turned over to the multi-star community (mainly Commissions 26 and 30; see

<http://ad.usno.navy.mil/ad/wds/newwds.html>).

A Special Session (# 3) is being held at the General Assembly in Sydney on "A New Classification Scheme for Double Stars" organized by Division IV and Commissions 5, 8, 26, 30, 40, 42 and 45.

### 3.4. Working Group on Libraries (U. Grothkopf, F. Murtagh)

The IAU Commission 5 Working Group on Libraries aims to moderate between astronomers and librarians. The publication paradigm continues to shift from printed material to electronic formats for scientific literature, leading to an evolved concept of library services and information access. Librarians are taking on new and diversified roles. While demands for traditional services continue, the importance of accessibility and archiving of electronic materials is widely recognized. Long-term solutions are needed in order to guarantee future access to today's knowledge.

The complex problems of emerging technologies as well as preserving existing materials require close cooperation among librarians, scientists, publishers and computer specialists. The LISA IV conference (Library and Information Services in Astronomy IV) provided an excellent platform to discuss the state of the art of information maintenance, delivery, and preservation, to learn from invited experts the directions in which our profession is moving, and to be inspired by a variety of ideas and projects presented by colleagues from around the world. LISA IV was held July 2-5, 2002, in Prague, Czech Republic, and was hosted by the Astronomical Institute of Charles University and the Astronomical Institute of the Academy of Sciences of the Czech Republic. It was attended by more than 100 participants from 26 countries. Sessions focused on physical versus electronic libraries; trends, collaborations and models in electronic publications; networking among astronomy librarians; Virtual Observatory projects; preservation and history of astronomy; bibliometrics; library user requirements; and innovative services and projects in developing countries. The proceedings will be published by the U.S. Naval Observatory; an electronic version will be available on the web at

<http://www.eso.org/libraries/lisa4/>

LISA V is envisioned to take place in approximately 4 years.

Existing projects are maintained and extended, including several digitization projects of historical documents, listings of core astronomy books and journals, a database of annual reports of observatories, and national cooperations among astronomy libraries. Virtual Observatory projects emphasize the need to interlink observing proposals, astronomical data and published papers. The IAU Thesaurus may prove to be of use as a tool for automated information retrieval, provided that necessary updates can be implemented.

For the near future, a close cooperation with the IAU Working Group on Publications is foreseen.

### 3.5. FITS Working Group (D.C. Wells)

Did not present any report.

## 4. MAJOR SCIENTIFIC CONFERENCES

- "Virtual Observatories of the Future", Caltech, June 2000, USA:  
<http://astro.caltech.edu/nvoconf/>
- "Mining the Sky", Garching, July - August 2000, Germany:  
<http://www.mpa-garching.mpg.de/~cosmo>
- 22nd General Assembly of the ICSU Committee on Data in Science and Technology (CODATA), October 2000, Baveno/Stresa, Italy;
- "All-Russian astronomical conference", August 2001, St-Petersburg, Russia:  
<http://urania.astro.spbu.ru/ASTROCONF/after.html>
- "Digital Libraries: Advanced Methods and Technologies, Electronic Collections", Third All-Russian Conference, September 2001, Petrozavodsk, Russia;
- "Euro-Asian Astronomical Society VI congress", May 2002, Moscow, Russia;

- "Toward an International Virtual Observatory", June 2002, Garching, Germany:  
<http://www.eso.org/vo2002>
- "Informational systems in fundamental science", July 2002, SAO RAS, Nizhnij Archyz, Russia:  
<http://www.sao.ru/Doc-k8/Science/resume.html>
- "Library and Information Services in Astronomy IV" (LISA IV), July 2002, Prague, Czech Republic:  
<http://lisa4.cuni.cz/>
- "Virtual Observatories", August 2002, Hawaii:  
<http://spie.org/Conferences/calls/02/as/confs/AS13.html>
- 23rd General Assembly of the ICSU Committee on Data in Science and Technology (CODATA), October 2002, Montreal, Canada:  
<http://www.icsu.org/Structure/IIB/codata.html>
- "Digital Libraries: Advanced Methods and Technologies, Electronic Collections", The Fourth All-Russian Conference, October 2002, Dubna, Russia:  
<http://rcdl2002.jinr.ru/>

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