

COMMISSIONS OF THE EXECUTIVE COMMITTEE

- 5 Documentation and Astronomical Data
 - 6 Astronomical Telegrams
 - 14 Atomic and Molecular Data
 - 38 Exchange of Astronomers
 - 46 Teaching of Astronomy
- 50 Protection of Existing and Potential Observatory Sites

COMMISSION NOT ATTACHED TO A DIVISION

- 41 History of Astronomy

WORKING GROUPS OF THE EXECUTIVE COMMITTEE

- WG on Planetary System Nomenclature
- WG on World Wide Development of Astronomy
- WG on Future Large Scale Facilities

COMMISSION 5: DOCUMENTATION AND ASTRONOMICAL DATA

(DOCUMENTATION ET DONNEES ASTRONOMIQUES)

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1. INTRODUCTION

Four working groups and three task groups of IAU Commission 5 deal specifically with information handling, 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. Information about Commission 5 working and task groups and their activities may be found in <http://nut.inasan.rssi.ru/IAU/>.

As delegate of the IAU, the chair of the IAU Commission 5 WG on Astronomical Data attended the 21st General Assembly of the ICSU Committee for Science and Technology (CODATA), in New Delhi, India (November 1998) and submitted an exhaustive report on behalf of the IAU. The report is available via the Website of Commission 5.

2. GENERAL DEVELOPMENTS 1997-1999

The basic role in the activity of the Commission continue to involve astronomical data centers. The availability and dissemination of astronomical data and information evolved steadily and the astronomical data centres extended their services in various directions. In particular, the centres tend to facilitate graphic comparison and combination of published results from astronomical observations made in different parts of the electromagnetic spectrum.

The importance of electronic publishing in Astronomy is increasing. Most of the major refereed journals have an electronic edition in addition to the paper version. Abstracts of articles in all leading journals are available electronically. The major role in this activity was played by WG on Electronic Publishing headed by Peter Boyce.

Among the astronomical data itself a publication of new large all-sky astrometric catalogues (ACT and TRC), should be mentioned as an important event and continuation of the Hipparcos mission success. Catalogues ACT and TRC, containing about 1 million stars, have been constructed on the basis of two all-sky catalogues: Tycho Catalogue (ESA 1997) - an output of Tycho experiment in the frame of Hipparcos space mission, and Astrographic Catalogue (AC), an output of international program at the beginning of this century.

3. REPORTS FROM DATA CENTERS AND NETWORKS

Over the years the role of Astronomical Data centres has become more and more important. The international, national, and local data centres are the repositories for thousands of catalogues of astronomical objects and for many data tables from journal articles. Major international data centres are the Centre de Donnees astronomiques de Strasbourg, France, the Astronomical Data Center, Maryland, USA, Beijing Astronomical Observatory, Chinese

Academy of Sciences, the Japanese Astronomical Data Center, Tokyo, Japan, the Centre of Astronomical Data (INASAN), Moscow, Russia.

Major observations archives are also maintained, for instance, by the NASA disciplinary Centers : the High Energy Astrophysics Science Archive Research Center (HEASARC) for high energy astrophysics, the Infrared Processing & Analysis Center (IPAC) for infrared astronomy programs, which also maintains the NED database of extragalactic objects, and the Multimission Archive at the Space Telescope Science Institute (MAST), which has primary focus on data sets in the optical, ultraviolet and near-infrared part of the spectrum, and by the European Southern Observatory and ST-European Coordinating Facility.

Local or national institutes hosting collections of catalogues or support data centres are of great importance regionally or even world-wide. Examples are the Inter-University Centre for Astronomy and Astrophysics, Ganeshkind, India, the centre at La Plata Observatory Argentina, and the Canadian Astronomical Data Centre (CADC) at the Dominion Astrophysical Observatory, Victoria, BC. The CADC is one of the world's distribution centres for data from the HST Archive with STScI and ST-ECF, and it holds the CFHT archive. The addresses of all astronomical data centres may be found through the Data and Archive Centre section of Astroweb, e.g. <http://cdsweb.u-strasbg.fr/astroweb/center.html>.

In the period covered by the report, the wealth of available on-line services increased considerably. It is now possible to access the major electronic journals, bibliographic services such as the ADS, the data centers value-added databases, and observation data. A real synergy is building up between distributed services, and it is easy for instance to navigate among bibliographic on-line information. General information retrieval services are also implemented, such as the HEASARC, Starcast (STScI), and AstroGLU implementations of the NASA AstroBrowse initiative. Astronomy on-line service providers maintain a well-established collaboration, for data exchange and the implementation of exchange standards. A successful example is the 19-character bibcode, which describes published information and is shared by all the partners for referring and linking to bibliographic data. The CDS develops several reference services widely used by the international astronomy community:

- SIMBAD, the references database for the identification and bibliography of astronomical objects outside the solar system. A major upgrade took place in 1999, with the transfer of the internal reference system to the HIPPARCOS International Celestial Reference System (ICRS). In October 1999, SIMBAD contains 2,735,893 objects, 7,524,044 identifiers, 108,785 bibliographical references, and 3,093,319 citations of objects in papers. A mirror copy of SIMBAD is provided at ADS/CfA.

- the CDS catalogue service, with the VizieR catalogue Browser. In October 1999, 3249 Catalogues are available from CDS, among which 2672 are available on-line as full ASCII or FITS files, and 2343 through the VizieR browser. CDS documents and releases several hundreds new catalogues and tables published by journals each year. The data is shared with the other data centers. Mirror copies of VizieR are available at the ADC and NAOJ.

- the ALADIN interactive sky atlas was released in February 1999. ALADIN is a versatile cross-identification tool, which allows the user to overlay the data from SIMBAD, NED and VizieR catalogues and logs, on reference images of the sky, the DSS images provided by STScI, plus full resolution images scanned at the Paris MAMA machine for 'crowded' fields.

The CDS also provides bibliographic services, in particular maps for bibliographic search (Kohonen maps), and mirror copies of the ADS, ApJ, AJ and PASP. It also maintains the 'Dictionary of Nomenclature of celestial objects (outside the solar system)'.

The GLU tool, developed by CDS for maintaining links between distributed services, is shared with other partners, especially in the frame of the NASA AstroBrowse and ISAIA initiatives. The emerging XML standard is being implemented. Major future developments include in particular the development of links from the CDS services to observatory archives.

There are about 15,000 hits per day on the CDS web pages, and the CDS services generate about 5,000 queries per day. Regular updates about the CDS activities are published e.g. in the ADASS Conference Series, and in the American Astronomical Society Meetings.

3.1. NASA ADC

The Astronomical Data Center (ADC) at the NASA Goddard Space Flight Center currently holds more than 2700 catalogs in its archive. Most of these catalogs are scientific results in tabular form published in the past five years. They were acquired as direct contributions from the international astronomical community, exchanges with the CDS and other astronomical data centers worldwide. Of its sister data centers, the ADC alone provides a collection of many of its largest and most requested catalogs in the form of a CD-ROM series (Volume 3 in early 1997, Volume 4 in early 1998). The CD-ROMs are especially useful for scientists in countries with poor network connectivity.

The ADC provides web-based tools to support scientific use of its data. Besides allowing search of the holdings by author, title, keywords and categories, the ADC has created a set of quick reference pages to guide the users interested in particular scientific topics. A new AMASE interface enables a search by astronomical classification and attributes. The major thrust of ADC in the past three years has been to address the problem of providing access to large catalogs that cannot be transferred easily via communications networks. Tools were developed to: (1) provide on-line data browsing and visualization; (2) allow subsetting and downloading of portions of a catalog; and (3) provide a programming interface to other data centers to support interoperability and cross-correlation of catalogs and observation logs. The ADC seeks to move its services from a file-based access via FTP to a record-based access, and eventually to a content-based access. Recently, the ADC has embarked on a project to convert its metadata to the extensible Markup Language (XML). This will enable a content-based search of the archive and also facilitate interoperability between distributed data services. The ADC-related publications can be found in the proceedings of the Astronomical Data Analysis Software and Systems VIII (ADASS'98).

3.2. CAD

The archive of Centre of Astronomical Data (CAD), Institute of Astronomy of the Russian Academy of Sciences (INASAN) with 755 astronomical catalogues is available for users via Internet. The catalogues are regularly updated. Several well-known astronomical archive and database copies stored at the INASAN are also available. For instance, a copy of the INES (IUE Newly Extracted Spectra) system is installed at INASAN, which performs National Host activities for IUE. The CAD also maintains, with the collaboration with Puschino Radioastronomical Observatory of Russian Acad. of Sci. Astro Space Center (ASC), a set of pulsar databases (Princeton pulsar catalogue and Puschino-Kalyazin pulsar archive database).

The INTAS project "Integration of the FSU observatories into international astronomical data network" with CDS as the project coordinator, has been finished successfully (7 astronomical institutions are connected to the Internet as a result).

The CAD participates in the CDS activity on electronic publication of astronomical data published in main Russian astronomical journals - *Astronomicheskij Zhurnal* and *Pis'ma v Astronomicheskij Zhurnal*. A software for retrieving and visualization of data from the large all sky surveys USNO-A1.0, USNO-A2.0 was developed and implemented. The new WWW home page of IAU commission 5, which is updated periodically can be accessed through URL <http://nut.inasan.rssi.ru/IAU>.

3.3. ADAC

In these years, the Astronomical Data Analysis Center (ADAC) has opened a lot of mirroring services of world astronomical databases, observational data archive services, image data archive services, as well as developed new service systems for them. These are:

1. Astronomical catalogue services mirrored from CDS and from NASA ADC (since 1995).
2. Mirrored operation of VizieR service of CDS, including large data-bases such as USNO-A2.
3. Journal abstract retrieval service mirrored from NASA ADS and AAS.
4. Mirrored operation of on-line dictionary of nomenclature of celestial objects supported by CDS. The ADC also promotes IAU Nomenclature among Japanese astronomers.
5. Observed data archive services of IUE and HST (HST service is about to begin in the autumn of 1999).
6. Observed data archive services for Japanese astronomical observatories. (The service system is newly constructed as "MOKA3".)
7. Image services of Digitized Sky Surveys, IRAS Sky Survey Atlas, etc. (The service system is newly constructed)
8. A gateway service for Japanese SIMBAD users to CDS, including its financial support.

3.4. ADS

The ADS has greatly extended the coverage of the astronomical literature in the last couple of years. The ADS has about 500,000 references in each of our three main databases (Astronomy/Astrophysics, Instrumentation, and Physics/Geophysics), including an ever increasing number of conference proceedings.

The ADS Article Service now has on-line from volume 1 the *Astronomical Journal*, the *Astrophysical Journal with Supplements and Letters*, and *Astronomy and Astrophysics*, as well as many smaller journals (e.g. national Astronomical Society publications of Japan, Australia, India, etc). Monthly Notices of the Royal Astronomical Society and Publications of the Astronomical Society of the Pacific will be on-line back to volume 1 by the end of 1999, and IAU Symposia soon afterwards.

The usage of the ADS is steadily increasing, with currently about 30,000 users of the ADS Abstract Service per month who retrieve about 10 million references per month. The ADS Article Service has over 15,000 users per month who retrieve about 700,000 pages per month.

To provide better access to ADS services world-wide the ADS has established several mirror sites. Currently we have mirror sites in France, Germany (2), England, Japan, Chile, and India.

3.5. Osservatorio Astronomico di Trieste

The overall system has been described in an invited paper at the ADASS V 5 Conference. The hardware was installed in 1997/1998. Since July 1999, Version 1.2 of the Archive Server software is running at the telescope. The database uses the relational paradigm, image data are handled as FITS files, and user access to the archive has been implemented by means of an HTML-based user interface.

3.6. Data Processing Centres (DPC) for the Planck Mission

The Planck Surveyor is the European Space Agency's mission to map the structure of the Cosmic Microwave Background, in unprecedented detail. Planck will constrain cosmological models and examine the birth of large-scale structure in the Universe. In order to achieve the ambitious results the mission is aiming at, data processing is just as important as the design and implementation of the two instruments (HFI and LFI). Initially, extensive use of simulations will be made; later, during the operations and post-operations phases, the software will need to be adapted and refined on the basis of the observed data. ISDC (Geneva), MPA (Garching), IAS (Orsay), Cambridge and IC London, and OAT and SISSA in Trieste, are in charge of the different steps of data processing and release. OAT and SISSA will extract astrophysical components, document and release data from LFI.

4. WORKING AND TASK GROUPS

4.1. Working Group on Astronomical Data (Ernst Raimond)

Most observatories have saved their observations for many decades. Nevertheless, few of the traditional ground-based observatories have managed to generate an archive of observations in a ready-to-use form, preferred by modern research techniques. Absence of critical information regarding the characteristics of the relevant equipment, and obsolescent or obsolete technology (e.g. in the case of photographic spectroscopy) diminished the usability of the data significantly, even when the original plates or data were stored properly. Very little of the basic operational information has been made public. In recent years astronomical space missions, notably the International Ultraviolet Explorer (IUE) and the Hubble Space Telescope, have shown by example what can and should be done to share observations more widely, thereby exploiting much more fully the information they contain.

Some new enterprises such as the Italian Galileo Telescope being built in the Canary Islands and the European Southern Observatory's Very Large Telescope under construction in Chile are excellent examples of how data-archiving policies can be included right from the start. Improving the usefulness of archives of older observatories is also very desirable. Two, very different, initiatives are worth mentioning in this respect: (i) Recently, NASA has begun to merge its disparate data services and archives into one system, the Space Science Data Services; information: <http://ssds.nasa.gov/>. (ii) The IAU Working Group for Spectroscopic Data Archives is attempting to set up a World Plate Store of photographic spectra in order to safeguard the accessibility of these valuable data for the future.

During the past triennium, most members of the WGAD have been active in many fields concerning astronomical data and information. Raymond Norris (ATNF, Sydney, Australia), vice-chair of the WGAD, has done some work relating the WIPO intellectual property treaty and its possible impact on the future direction of the large databases. Observatory archives of observational data continued their services; some new archives are in the process of being set up. Links to existing observatory archives

<http://cdsweb.u-strasbg.fr/astroweb/center.html>.

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

Astronomy librarians worldwide maintain a considerable number of information resources. These include compilations of astronomy newsletters, observatory publications, and astronomy book reviews, lists of IAU Colloquia and other international meetings, the Union List of Astronomy Serials, directories of astronomy libraries' addresses, and a collection of observatory manuals available in electronic format. Colleagues from observatories in the U.S. have initiated and are involved in long-term projects on digitization and document preservation as well as developing an indexing and distribution system for electronic preprints.

Since 1988, the LISA (Library and Information Services in Astronomy) conferences have provided the opportunity to review the current state of information maintenance, delivery, and preservation, as well as to discuss the changing realm of libraries and librarianship. LISA III, a Euroconference, was hosted by the Instituto de Astrofísica de Canarias (IAC) and was held from April 21-24, 1998, in Puerto de la Cruz, Tenerife, Spain. A fourth LISA conference is envisioned for the year 2002.

In order to mediate between information users/readers and information providers/publishers, astronomy librarians maintain close working relationships with journal publishers, data centers, and abstract service providers. Rising prices of books and journals, changing rights for information users, and guaranteed access to electronic resources over time are only some of the problems that can only be solved through close cooperation of all key players.

4.3. FITS Working Group (Donald C. Wells)

The FITS Working Group [IAU-FWG] controls the standards for FITS, the data interchange and archiving format of astronomy. The original 1979 FITS design had a 'Y2K' problem; in November 1997 the IAU-FWG adopted an agreement to use four-digit year notation in FITS headers, with the original two-digit notation continued as an alternative for years in the range 1900-1999. Interchange of the new convention began in January 1999. During the period 1989-1998 a NASA Technical Panel worked to develop a comprehensive, definitive version of the FITS standards. In September 1999 the document was submitted to the North American FITS committee to start the formal process of adopting it as the FITS standard. Since 1988 there has been an effort underway in the FITS community to agree on standard notation for interchanging information about the astrometric and spectroscopic coordinates of pixels; such information is known in the FITS community as 'World Coordinate System' [WCS] conventions. A final set of WCS revisions was agreed at the ADASS'98 meeting and were completed in May 1999. The WCS proposal consists of three draft papers which can be found at <http://www.cv.nrao.edu/~egreisen/>.

These were discussed at ADASS'99 in October 1999, with the goal of approving them for submission to the FITS regional committees. A FITS Support Office exists as a part of the Astrophysics Data Facility at NASA-Goddard. It works in coordination with the IAU-FWG, and its Web pages are at <http://fits.gsfc.nasa.gov>.

4.4. Working Group Information Handling (P. Boyce)

Some of activities of the Working Group, by information given by F. Murtagh and B. Hauck, are:

1. Fifth Framework Thematic Network, "OPTICON: OPTical, COordination Network for Astronomy".
2. Technical Committee 13, Astronomy and Astrophysics, International Association for Pattern Recognition (IAPR), article requested for IAPR Newsletter, and currently being written.
3. Special issue of IEEE Signal Processing Magazine planned on image and signal processing in astronomy. Contact: R. Molina and F. Murtagh.
4. Multiresolution image and signal processing systems, MR/1 and MR/2, now have their own web site, <http://www.multiresolution.com>
5. Guidelines for scientific publishing (ICSU General Assembly, October 1999), <http://associnst.ox.ac.uk/~icsuinfo/guidelines.htm>

4.5. Task Group on Designations (Helene R. Dickel)

The purpose of the Task Group on Designations of the IAU Commission 5 is to clarify existing astronomical nomenclature and to help astronomers avoid potential problems when designating their sources. To this end, the Task Group has made the following documents available on the World Wide Web: "How to refer to a source or designate a new one" <http://cdsweb.u-strasbg.fr/how.html>; "Specifications concerning designations for astronomical radiation sources outside the solar system" <http://cdsweb.u-strasbg.fr/iau-spec.html>; "Dictionary of Nomenclature of Celestial Objects" <http://cdsweb.u-strasbg.fr/cgi-bin/Dic>; "Registering a New Acronym" <http://cdsweb.u-strasbg.fr/cgi-bin/DicForm> (All available through www.iau.org).

An IAU resolution for the continued development of the recently set-up Registry for New Acronyms was approved at the IAU GA in Kyoto in 1997; it is operated by the CDS as part of the Interactive Dictionary of Nomenclature. There were 4 submissions in 1996, 8 in 1997, 10 in 1998 and 5 submissions and several inquiries in the first half of 1999. So far, the existence of the Registry has spread by word of mouth.

After the GA, members were involved in one or more of the following tasks: 1. Advertising current "IAU Recommendations on Nomenclature". 2. Revising these Recom-

mendations. 3. Developing Guidelines for submissions to the new "Acronym Registry". 4. Successfully getting the FITS 'OBJECT' key word (and others) extended from the minimum support of 8 characters up to 68. 5. Working on an Automated Check for non-conforming designations which makes use of a key word for "object designations" which is present in the LaTeX form of some electronic journals. 6. Re-opening the discussion on designations of extrasolar planets which has expanded into an Electronic Forum on Designations of Stellar Companions. This Forum is comprised of about 25 members from a variety of different commissions and will culminate in a multi-commission meeting at the IAU General Assembly in Manchester: <http://aries.usno.navy.mil/ad/wds/iaumcm.html>

4.6. Task Group UDC 52 (G.A. Wilkins)

The Task Group UDC 52 continued its efforts on introduction of a new revision of the Universal Decimal Classification (UDC 52) for astronomy. Prof. G.A. Wilkins made the last modification of the document in 1997 and made it available to the astronomical community via the Internet.

Olga B. Duzhnevskaya
President of the Commission

5. MAJOR SCIENTIFIC CONFERENCES

*Data Mining and Information Fusion (3rd ESF-CCMA workshop), (18-19 April 1997, Granada, Spain)

* 23rd General Assembly of the International Astronomical Union (18-30 August 1997, Kyoto, Japan), <http://www.tenmon.or.jp/iau97/>

* Converging Computing Methodologies in Astronomy Conference, (17-18 Sept. 1997, Sonthofen, Germany), <http://cfa-www.harvard.edu/~kurtz/CCMAFinalConf.html>.

* Astrophysics with Large Databases in the Internet Age, IXth Canary Islands Winter School of Astrophysics (17-28 Nov. 1997, La Laguna, Tenerife, Canary Islands, Spain), <http://www.iac.es/winschool97/>.

* Library and Information Services in Astronomy III (LISA-III) (21-24 April 1998, Puerta de la Cruz, Tenerife, Spain),

<http://www.iac.es/biblio/lisa/>, <http://www.eso.org/libraries/lisa3/>.

* Astrophysics and Algorithms: a DIMACS Workshop on Massive Astronomical Data Sets (6-8 May 1998, Princeton, NJ, USA),

<http://dimacs.rutgers.edu/Workshops/Astro/index.html>.

* Treasure-Hunting in Astronomical Plate Archives (THAPA) (4 March 1999, Sonneberg, Germany), <http://www.stw.tu-ilmenau.de/~web/workshop/thapa.html>.

* Workshop on "From Information to Knowledge Using Astronomical Databases", 23-25 June 1999. <http://astro.u-strasbg.fr/~ccma/ir-kd.html>

* Dagstuhl Seminar on Computer Science in Astronomy (8-13 August 1999, Wadern, Germany), <http://www.dagstuhl.de/DATA/Seminars/99/sofi.html>.

* The Virtual Observatory, European Science Foundation (ESF) Exploratory Workshop (20-21 September 1999, Strasbourg, France)

<http://www.esf.org/physical/pw/vo/vo.htm>.

* Astronomical Data Analysis Software and Systems Conferences (ADASS)

ADASS VII (14-17 Sept. 1997, Sonthofen, Germany),

<http://ecf.hq.eso.org/adass/adass97.html>.

ADASS VIII (1-4 November 1998, Urbana, IL, USA),

<http://monet.astro.uiuc.edu/ADASS98/>.

ADASS IX (3-6 October 1999, Hawaii, USA), <http://www.cftt.hawaii.edu/ADASS>.

6. MAJOR PUBLICATIONS 1997-1999

* International Co-operation in Dissemination of the Astronomical Data (St. Petersburg, Russia), 1997, *Baltic Astron.* 6, number 2

* Astronomical Data Analysis Software and Systems Conference VI (ADASS'96), 1997, Eds. G. Hunt and H.E. Payne, *Astron. Soc. Pacific Conf. Series* 125;
<http://www.cv.nrao.edu/adassVI>.

* Fifth International Workshop "Data Analysis in Astronomy", 1997, Eds. V.di Gesu, M.J.B. Duff, A.Heck, M.C.Maccarone, L.Scarsi, H.U.Zimmermann, 'The Science and Culture Series- Astronomy', World Scientific Publ., Singapore

* Reports on Astronomy XXIIIA, (part of the Proceedings of the XXIIIrd General Assembly of the International Astronomical Union), 1997, Ed. I. Appenzeller, Kluwer Acad. Publishers, Dordrecht, Netherlands, ISBN 0-7923-4651-3

* From Information Fusion to Data Mining (ESF-CCMA 3rd workshop, Granada, Spain), 1997, Eds. R.Molina, F.Murtagh and A.Heck, *Vistas in Astronomy* 41, part 3

* Astronomical Data Analysis Software and Systems Conference VII (ADASS'97), 1998, Eds. R. Albrecht, R.N. Hook, H.A. Bushouse, *Astron. Soc. Pacific Conf. Series* 145; ISBN 1-886733-65-1

* Advanced Techniques and Methods for Astronomical Information Handling (Proceedings of the ESF-CCMA Conference, Sonthofen, Germany), 1998, Eds. M.C. Maccarone, F. Murtagh, M.Kurtz and A.Bijaoui, Observatoire de la Cote d'Azur - B.P.4229 06304 Cedex 4(France), also available via WWW: <http://newb6.u-strasbg.fr/~ccma/>.

* Library and Information Services in Astronomy III (LISA-III), Eds. U. Grothkopf, H. Andernach, S. Stevens-Rayburn, M. Gomez, proceeding of a conference held at Puerto de la Cruz, Tenerife, Spain, 1998, *Astron. Soc. Pacific Conf. Series* 153, ISBN 1-886733-73-2

* Astronomical Data Analysis Software and Systems Conference VIII (ADASS'98), 1998, Eds. D.M. Mehringer, R.L. Plante, D.A. Roberts, *Astron. Soc. Pacific Conf. Series* 172; ISBN 1-886733-94-5

* Highlights of Astronomy, Volume 11A (as presented at the XXIIIrd IAU General Assembly), 1999, Ed. Johannes Andersen, Kluwer Acad. Publishers, Dordrecht, Netherlands, ISBN 0-7923-5341-2 (0-7923-5342-0)

* Highlights of Astronomy, Volume 11B (as presented at the XXIIIrd IAU General Assembly), 1999, Ed. Johannes Andersen, Kluwer Acad. Publishers, Dordrecht, Netherlands, ISBN 0-7923-5556-3 (0-7923-5555-5)

* Transactions of the International Astronomical Union, Volume XXIIIB (Proceedings of the Twenty-Third General Assembly, Kyoto 1997), Ed. Johannes Andersen, 1999, ISBN 0-7923-5588-1, (together with Alphabetical List of Members, ISBN 0-7923-5589-X).

* StarGuides 1999 - A directory of astronomy, space sciences and related organisations of the world, A. Heck, *CDS Spec. Publ.* - ISBN 2-908064-29-4

* StarWorlds - Web equivalent of Starguides:

<http://vizier.u-strasbg.fr/starworlds.html>.

* StarBits - Web - A dictionary of abbreviations, acronyms, and symbols in astronomy, space sciences and fields, A. Heck:

<http://vizier.u-strasbg.fr/starbits.html>.

* StarHeads - A database of astronomers' Web pages;

<http://vizier.u-strasbg.fr/starheads.html>.

* Internet Resources for Professional Astronomy, 1999, Eds M.Kidger, I.Perez-Fournon, F. Sanchez, lecture Notes of "Astrophysics with Large Databases in the Internet Age", IXth Canary Islands Winter School of Astrophysics, (1997), Cambridge University Press, ISBN 0-521-66308-3. Also: IAC Noticias:

<http://www.iac.es/winschool97/noticias/noticias.html>.