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TRANSACTIONS

OF THE

INTERNATIONAL ASTRONOMICAL UNION

VOLUME XXIA

REPORTS ON ASTRONOMY

Edited by

DEREK McNALLY

General Secretary of the Union



KLUWER ACADEMIC PUBLISHERS

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Foreword

Reports on Astronomy represent a triennial survey of the progress of Astronomy. They are not an abstracting service, such as Astronomy and Astrophysics Abstracts, nor a volume of reviews. An abstracting service aims to be comprehensive, while no review volume can encapsulate the whole of astronomy. Because Reports are contributed by the Commissions of the Union, it covers the whole of Astronomy for the preceeding 3 years terminating for Volume XXIA on 1990 June 30. However, because of pressure of space, Reports cannot be comprehensive but must concentrate on what each Commission considers to be important at the time of compilation. The subjective element thus introduced into the selection of the material is not a bad thing -users of Reports can get a rapid overview of those matters considered of importance in particular subject areas which may well direct their subsequent searches of the literature more fruitfully.

The Commissions have produced their expected high standard in their Reports. The Reports are varied in style and manner of reporting as befits the varied nature of the tasks allotted to each Commission. Nevertheless, Reports constitute a unique triennial record of the trends and directions in astronomy.

I would like to thank each Commission President for organising the compilation of their report and their Organising Committees who frequently were equal partners in the task. I would also express my appreciation to Monique Orine for her work in assembling the reports and for proding (it must be admitted) the tardy few.

I hope this volume will prove as useful to the Astronomical Community as its predecessors.

Derek McNally
General Secretary, IAU
1990 December

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*** No report provided

4 EPHEMERIDES (EPHEMERIDES)

President: P. K. Seidelmann

Vice President: B. D. Yallop

Organizing Committee: V. K. Abalakin, J. Chapront, R. L. Duncombe, H. Kinoshita, Y. Kubo, J. H. Lieske, B. Morando, H. Schwan, Fu Tong.

I. Introduction

This report covers the period from 1 July 1987 to 30 June 1990. The ephemerides that have been published during this period have made use of the system of astronomical constants adopted at the 16th General Assembly of the IAU in Grenoble. At the same time that the use of the FK5 system on the J2000 epoch is increasing and catalogues are becoming available for that system, there is an IAU Working Group on Reference Systems with subgroups on astronomical constants, nutation of the Earth, time and reference frames/origin. The purpose is to define a future reference system and resolve some of the difficulties that occur in the system. It is anticipated that this Working Group will develop recommendations for consideration at the 21st General Assembly of the IAU.

II. International and National Ephemerides

1. The Fundamental System

The computation and publication of Apparent Places of Fundamental Stars (APFS) has been continued at Astronomisches Rechen-Institut at Heidelberg, F. R. Germany. Starting with the volume for the year 1988 the APFS are based on the mean positions and proper motions as given in the FK5, Part 1 ("Basic FK5") which has been published in 1988 (Veroffentlichungen Astronomische Rechen-Institut, No. 32). The number of copies of the APFS has been reduced to 1000.

2. Ephemerides and Astronomical Data

The Japanese Ephemeris (JE), the Nautical Almanac (NA) and the Abridged Nautical Almanac (ANA) have continued to be published for the years 1989, 1990 and 1991 by the Hydrographic Department of Japan (JHD), Tokyo. No major change in the contents has been made after the volume for 1985, in which was introduced a new scheme of computation based on the fundamental reference frame of FK5, numerical integration for the

coordinates of the bodies in the solar system, day numbers in rectangular coordinates and so on. JE for the years 1985 onwards contain the explanation of the method on which the new series of JE are based.

JE for 1990 onwards contains Chebychev coefficients for the Moon's coordinates as a supplement and NA for 1989 onwards includes a supplement containing the coefficients for all the objects which constitute the main body of NA.

The Polaris Almanac for Azimuth determination, the Altitude and Azimuth Observation Almanac for Antarctic Observation and the Abstract from JE also have been compiled annually by JHD.

During the period under review the Astronomical Yearbook of the USSR for the years 1990, 1991 and 1992 have been published by the Institute for Theoretical Astronomy, (ITA), Acad. Sci. USSR, Leningrad. The fundamental ephemerides of the Sun, Moon and major planets were computed on the basis of DE200/LE200. Beginning from the issue for 1990 the Basic part of Fifth Fundamental Catalogue, and from 1992 - its Bright Extension, were introduced into the practice of calculation of the Mean and Apparent Places of the stars. Beginning from 1992 the expressions for the visual magnitudes for major planets, taken from G. DeVaucouleur's review (A. Dollfus. Surfaces and interiors of planets and satellites, 1970) are in use. The first version of the Astronomical Yearbook of the USSR on a floppy disk is now in preparation.

In 1988-1990 the issues of the Marine Astronomical Yearbook and Air Astronomical Yearbook for the years 1989, 1990 and 1991 were prepared by ITA, as well as one issue of Astronavigation Almanac for the years 1991 - 1995.

The Department of Almanac of the Purple Mountain Observatory computes the Chinese Astronomical Almanac, the Chinese Nautical Almanac and the Almanac for Land Surveyors every year.

Her Majesty's Nautical Almanac Office, Royal Greenwich Observatory, (HMNAO) and the Nautical Almanac Office, U S Naval Observatory (USNAO) have continued their cooperative preparation and publication of The Astronomical Almanac, The Nautical Almanac, The Air Almanac, and Astronomical Phenomena.

The Floppy Almanac, providing the basic astronomical data of the Astronomical Almanac, is available from USNAO for each year through 1999. The Satellite Almanac, a floppy disk providing the satellite positions for a period of approximately 10 years, is also available from USNAO.

Bureau des Longitudes, Paris, France (BdL) have published yearly the Connaissance des Temps, the Ephemerides Astronomiques (Annuaire du Bureau des Longitudes) and the Ephemerides Nautiques.

3. Special Publications

Some special publications which merit attention include

"Compact Data for Navigation and Astronomy, 1991 - 1995" by B. D. Yallop and C. Y. Hohenkerk, published by Cambridge University Press and "Equation of Time" by D. Hughes, B. D. Yallop and C. Y. Hohenkerk, published in 1989 Mon. Not. R.A.S. pages 1529 - 1535. Two technical notes from the RGO, #66 by C. Y. Hohenkerk, "Topps, a System for Printing Tables" and #67 by B. D. Yallop and C. Y. Hohenkerk, "Astronomical Algorithms for Use with Microcomputers."

U S Naval Observatory Circulars published during this triennium include #171, "Computer Programs for Sun and Moon Illuminance with Contingent Tables and Diagrams" by P. M. Janiczek and J. A. DeYoung; #172, "Total Solar Eclipse of 17 - 18 March 1988" by A. D. Fiala, J. A. Bangert and W. T. Harris; #173 "Total Solar Eclipse of 2 July 1990" by Fiala, Bangert and Harris; #174, "Total Solar Eclipse of 11 July 1991" by Bangert, Fiala and Harris and #175 "Annular Solar Eclipse of 15 - 16 January 1991: by Bangert, Fiala and Harris.

A series of three papers appeared in the Astronomical Journal in January and April 1989 on the Mean and Apparent Place Computations in the New IAU System. The first two papers dealt with the transformation of catalogue systems to the J2000 system and the last paper with the Apparent Topocentric and Astrometric places of Planets and Stars.

USNAO has prepared a revised version of the Explanatory Supplement. Chapters and sections of this publication have been prepared by HMNAO, Jet Propulsion Laboratory and BdL. The publication should be available in 1991.

Many kinds of ephemerides were prepared in these years, e.g. the astronomical data for all calendars being published in USSR, "The ephemerides for comparison and positioning of the instruments" for the optical observations of the Sun, Moon, and planets at the astronomical observatories of the USSR, and the ephemerides for the observations of the different radio-sources with radio-telescope RATAN-600 (Zelenchukscaya, R.S.F.S.R.).

BdL published Three Supplements to Connaissance des Temps: Ephemerides of the Satellites of Jupiter, Saturn and Uranus that give the differential coordinates of the satellites and tables for the computation of the phenomena of the Galilean satellites - Phenomena and configurations of the Galilean satellites of Jupiter - configurations of the first eight satellites of Saturn. Two main improvements will be introduced in the Supplements to Connaissance des Temps from 1991: Ephemerides of the Martian moons and predictions of mutual phenomena for the Galilean satellites.

BdL have also produced the following ephemerides published in the Notes Scientifiques et Techniques du Bureau des Longitudes: Ephemerides de petites planetes de 1989 a 1991 (S018, S022, S023) - Determination d'orbites de cometes de 1989 a 1991 (S019, S020, S027) - ELP2000/85: une solution au mouvement de la Lune couvrant la periode historique (S021) Construction d'une ephemeride de Phobos issue de la theorie

ESAPHO (S024) - Modelisation des phenomenes mutuels (S030).

An Infrared Point Source Catalog of 15560 sources was prepared by Yang, Xian, He and Yao at Purple Mountain Observatory.

III. Bases of the Ephemerides and Astronomical Data

H. Schwan reports that work on the second part of the FK5 (The FK5 Extension) which is a joint project by ARI and USNO is near completion. More information on the status of the FK5 Extension, which will extend the fundamental system to about magnitude 9.5, is given in the report for Commission 8.

J. G. Williams, X X Newhall, and J. O. Dickey report that three observatories are ranging the moon regularly. The last few years of data from the three sites can be fit with 3 cm scatter. The two decades of lunar laser ranging (LLR) data exceed an 18.6 yr. nodal period permitting the mutual orientation of the ecliptic, equator, and lunar orbit planes to be determined to better than two milliarcseconds and the precession constant to be separated from the principal nutation term. The lunar orbit and lunar physical librations are well determined by the observations and are computed from a simultaneous numerical integration. The mass ratio Sun/(Earth+Moon) is determined to within 0.003. The lunar orbit was accurate enough to permit measuring the relativistic precession to within 2%. The lunar and planetary ranging data can be fit simultaneously.

According to E. Myles Standish, Jr., JPL continues to improve its planetary ephemerides. Since the creation of DE200, a number of observations have been obtained, including both additional standard data (optical transits, radar and spacecraft ranging and lunar laser ranging), as well as a number of newer and more accurate data types (spacecraft tracking files, radio astrometry, photoelectric transits, astrolabe measurements, ring and disk occultations, and improved lunar laser ranging). The improvements since the creation of DE200 are noticeable, especially in the ephemerides of the outer planets. Knowledge from the Voyager fly-bys of the four Jovian planets and from the mutual occultations of Pluto and Charon have enabled the full set of outer planet masses to be determined, thereby eliminating them as sources of orbital uncertainties. The remaining mass uncertainties are primarily those of the asteroids. The forces of Ceres, Pallas and Vesta are modeled separately; in addition, the forces of the outer 300 most important asteroids are modeled using best estimates of their masses, computed from their diameters and taxonomic classes. A new set of ephemerides, completely reduced and integrated in the J2000 reference system, is being created. This will incorporate the full data set, the latest improvements to the data reduction processes and the latest refinements to the gravitational equations of motion.

R. A. Jacobson and J. H. Lieske report that JPL has developed ephemerides for most of the major natural planetary satellites in support of planetary exploration missions. Martian satellite ephemerides were prepared for the Soviet Phobos mission from ground based and spacecraft data. The ephemerides were updated from observations by the Soviet spacecraft. Galilean satellite ephemerides have been updated to "E3" in support of the Galileo project. For the Voyager project, ephemerides of the six inner Saturnian satellites, the five large Uranian satellites and the two Neptunian satellites were prepared. Improved ephemerides based on encounter observations have been prepared for the Saturn satellites. Ephemerides for the nine major Saturnian satellites will be improved for the Hubble Space Telescope and the Cassini mission.

A new basis for the ephemeris calculation is now being set up in ITA (Belikov M. V., Boyko V. N., Glebova N. I., Eroshkin G. I., Rumyantseva L. I., Sveshnikov M. L., Sveshnikova E. S., Trubitsyna A. A., Fursenko M. A., Chunaeva L. I., Shiryaev A. A. "The main stages of the construction of AE89 - the numerical ephemerides of the planets and Moon" - IAU Symposium No. 141 "INERTIAL COORDINATE SYSTEM ON THE SKY" Leningrad, October 1989). The problems solved or in the process of solution are as follows:

- 1) The refinement of the dynamically consistent numerical model of the orbital motion of 9 major planets, the five most massive asteroids and orbital-rotational motion of the Moon;
- 2) The construction of a data base of astrometric observations of the Sun, Moon, and planets (optical, radar, laser);
- 3) The determination of the dynamical parameters of the Solar system from the observations.

A standardized set of transportable computer software, developed on a building-block basis, to provide a computer based almanac is being developed at the USNAO. It is being developed with interfaces to a number of different computers, but with the expectation that the building blocks can be incorporated into other customized software.

The theory and observational data for the satellites of Saturn have been investigated by B. D. Taylor, A. T. Sinclair, P. J. Message, D. Harper, S. Kaimian and P. R. Strugnell. This work resulted in a series of papers published in Astronomy and Astrophysics. Astrometric observations of Neptune and Triton were obtained and compared with theory by D. B. Taylor, H.P. Jones, L. V. Morrison, C. A. Murray and I. P. Williams, and published in Astronomy and Astrophysics.

IV. Observational Data for Improving the Ephemerides

The services of the International Lunar Occultation Center have been continued since 1981. The number of the timing data collected at the Center was 38,644 from 38 countries during the

years 1987 to 1989. Reports containing all the reduced data as well as the station coordinates are published annually. Nos. 6 to 8 were published in the period.

The software for the prediction of the lunar occultations as well as for the treatment of the observations became operational in ITA.

USNAO continued to mail occultation predictions to observers on an annual basis. Photographic observations of the larger satellites of Mars, Jupiter and Saturn were continued at USNAO by Pascu. Charge-coupled device observations of the faint satellites of Jupiter, Saturn, Uranus and Neptune continued by Seidelmann and Pascu using the 61 inch astrometric telescope in Flagstaff, Arizona.

During the "Phobos" campaign of the 1988 Mars opposition, M. Sveshnikov took part in observations of the Martian satellites with lunar-planetary menisk telescope (Ordubad Station of Pulkova Observatory, Azerbaidjan). He has made 63 photographic observations of Phobos and 54 of Deimos.

The problem of regularly obtaining new observations of the Solar system bodies, so urgent for our work, is about to be solved. Now ITA will carry out the coordination of such observations at USSR observatories in frames of the projects "Jupiter" and "Ceres." One of the products of this activity would be the construction of the data bases of observations for personal computers.

For HIPPARCOs mission BdL have established ephemerides of 60 minor planets for the input catalog, as well as ephemerides for Europa and Titan.

V. Organizational Changes

B. D. Yallop delineated the changes at HMNAO. The move of the RGO to Cambridge took place at the end of March 1990. HMNAO transferred with the Observatory to a new building built on a site next to the Institute of Astronomy, Cambridge. The last superintendent of HMNAO, Dr. G. A. Wilkins, retired on 4 July 1989 after 38 years of service in HMNAO. Dr. B. D. Yallop has taken over as head of HMNAO.

The work of HMNAO was paid for by annual grants from the Science and Engineering Research Council and Ministry of Defense until the end of 1989 when it was changed to a repayment basis. This has involved major changes in the methods of working, for example, publications are produced in-house and methods are more automated to reduce checking and cut costs. The office now recovers the money from the sales of the almanacs, charges copyright fees for supplying data to other publishers, and charges for the supply of data to users, including the data for observatories. The income is sufficient to run the office. Any extra income may be used to increase staff or services.

COMMISSION 5: DOCUMENTATION AND ASTRONOMICAL DATA
DOCUMENTATION ET DONNEES ASTRONOMIQUES

PRESIDENT: G. A. Wilkins
VICE-PRESIDENT: B. Hauck
ORGANISING COMMITTEE: O. B. Dluzhnevskaya, C. O. R. Jaschek, J. M. Mead,
L. D. Schmadel, F. M. Spite, W. H. Warren Jr, P. A. Wayman,
G. Westerhout .

REPORT BY THE PRESIDENT FOR THE PERIOD 1 NOVEMBER 1987 TO 30 JUNE 1990

⁵
INTRODUCTION

The aims of this report are, firstly, to review the activities of Commission 5 since the previous report and, secondly, to draw attention to other relevant activities. It is based mainly on contributions (shortened in some cases) from the chairmen of Working Groups and Task Groups, but other items of general interest have been included.

The report on the meetings of the Commission at the IAU General Assembly in Baltimore in August 1988 was published in *Trans. IAU* 20B, 109-118, while the membership is listed on page M10 and the *IAU Style Manual* is printed as Chapter 8 on pages Siii-Sxii and S1-S50. The proceedings of Joint Discussion No. 1 on *New developments in documentation and data services for astronomers* were reported in *Highlights of Astronomy* 8, 67-100. The proceedings of IAU Colloquium No. 110 on *Library and information services in astronomy*, which was held in Washington, DC, just before the General Assembly, were published by the U.S. Naval Observatory in 1989. The Newsletter of the Commission was issued in June 1988 and July 1989.

ASTRONOMICAL DATA (G. Westerhout)

The Centre des Donnees Stellaires (CDS) at Strasbourg, France, continued to provide a regular source of information about a wide range of astronomical-data activities through the bi-annual publication of its *Bulletin d'Information*; its other activities are reported below with the reports of the other principal astronomical data centres. Examples of the proceedings of international conferences and workshops concerned with the compilation and handling of astronomical data that have been (or are to be) published by CDS are: *Digitised optical sky surveys*, Geneva, May 1989; CDS/ESIS Workshop on *The ESIS query environment*, Strasbourg, September 1989 (ESIS = European Space Information System); *Large structures in the universe*, Lyon, May 1990; and *SIMBAD Workshop*, Strasbourg, June 1990.

Carlos Jaschek, the former director of CDS, has written a valuable book on *Data in astronomy*; it was published by Cambridge University Press in 1989.

CODATA. Only four astronomers attended the 11th International CODATA Conference, which was held in Karlsruhe, Germany, in September 1988, and the 12th Conference, which was held in Columbus, Ohio, USA, in July 1990, was similarly largely ignored by astronomers. This is unfortunate since CODATA is a very active organisation dealing with the acquisition, validation, management and distribution of data and with the development and use of database systems and new software and hardware tools. The 1990 meeting was partially devoted to information management for the

worldwide Global Change programme, which has been initiated by the International Council of Scientific Unions; many aspects of database management that are closely related to astronomy and space-science endeavours were discussed. (The special issue no. 41 of *Science International*, the ICSU Newsletter, is devoted exclusively to the activities of the ICSU family and its partners relative to the environment and global change.)

The archiving of observational data. The astronomical community is facing a very rapid growth in the volume of digital data that are obtained directly at the time of observation by both ground-based and space-based instruments, and in addition the information on many thousands of sky-survey photographic plates is being digitised. The volume of such data is several orders of magnitude greater than that of the catalogues of reduced and evaluated data that are now held and made available by the data centres whose reports follow. Many questions arise about the extent to which such data should be archived and made available to the community at large, and in addition decisions are needed about the hardware and software formats that should be used for the archiving and the distribution of the data. These matters will be discussed at a Joint Commission Meeting to be held at the next General Assembly.

Stellar Data Centre at Strasbourg (CDS). The Stellar Data Centre at Strasbourg has been integrated with the Observatory, and Dr M. Creze is the director of the combined organisation. The Commission is greatly indebted to Dr Carlos Jaschek, who has been the Director of CDS for the past 18 years, for all that he has done to develop the CDS facilities and to make them available throughout the world.

The acquisition of new data, the updating of the bibliography and other activities have continued satisfactorily, and version 3 of the SIMBAD database became operational on 30 June 1990. SIMBAD is now accessible by more than 250 institutes throughout the world; access by the U.S. community was greatly improved by a special access facility provided in 1989 through NASA sponsorship. More than 500 catalogues are available for distribution on magnetic tape. The CDS assisted in the establishment of data centres in China, India and Argentina.

The 1990 editions of the *International Directory of Professional Astronomical Institutions (IDPAI)* and of the *International Directory of Astronomical Associations and Societies (IDAAS)* have been published as *CDS Special Publication No. 13* and *No. 14*, respectively. Each contains more than 3000 entries from about 90 countries. Other directories in preparation are *Acronyms and Abbreviations in Astronomy and Space Sciences* (as *CDS SP 15*) and *Astronomy, Space Sciences and Related Organisations of the World* (as *CDS SP 16*).

Soviet Centre for Astronomical Data, in Moscow, USSR. (Director: Dr O. B. Duzhnevskaya) The Soviet data centre maintains the CDS database on magnetic tape and provides a network link to the SIMBAD database. The general catalogue of variable stars, including cross-identifications, is being continuously updated in cooperation with the Sternberg Institute. The first two volumes are available on magnetic tape and two more volumes (on extragalactic objects and the reference catalogue) should be available on magnetic tape by the middle of 1991. The information from about 500 000 hand-written cards is being transcribed onto magnetic tape.

New catalogues have been prepared on: star-formation regions in the Galaxy (about 1000 regions from about 1000 papers); stars exciting diffuse nebulae (nearly 300 objects); and masses and ages of stars (1030) in clusters (12). A database on stars belonging to associations is being constructed. The bibliographic catalogue of star clusters and associations, which is being prepared jointly with scientists from Czechoslovakia, Hungary and eastern Germany, now contains information for about

1500 objects. Over 30 catalogues that were produced by Soviet astronomers were sent to the CDS at Strasbourg.

A draft agreement on direct cooperation between the Soviet Centre and the Astronomical Data Center of the Goddard Space Flight Center is under consideration.

Astronomical Data Analysis Centre, Tokyo, Japan. (Director: Dr S. Nishimura) This new data centre was established at the National Astronomical Observatory in Tokyo on 1 January 1989 as a result of the transfer of the data previously held at the Kanazawa Institute of Technology. Catalogues are obtained by exchange with other countries and are distributed on request. Some validation work is carried out. The archive includes IRAS data.

NASA/GSFC Astronomical Data Center (ADC) at Greenbelt, MD, USA (Director: W. H. Warren Jr) The ADC is part of the very much larger National Space Science Data Center, which covers the Earth and planetary sciences as well as astrophysics and space plasmas. The ADC cooperates closely with CDS and holds over 500 catalogues, many of which are available on-line as well as on magnetic tape. The ADC also provides an on-line information system for catalogues with sophisticated capabilities for searching by title, author, and keywords; it includes an interactive ordering service. The system is being heavily utilised by the astronomical community and is available via SPAN and the Internet.

The ADC has produced, in collaboration with the U.S. Naval Observatory, a new machine-readable version of the *SAO Catalog* that contains positions and proper motions on the J2000.0/FK5 system. Other new products include: an integrated uniform version of the Yale Zone Catalogues; corrected versions of the complete Durchmusterung (DM) catalogues; and a complete cross-index between the designations of the Cordoba and Cape photographic Durchmusterung catalogues.

An experimental CD-ROM disc containing 34 catalogues was distributed to 202 requestors, and the ADC plans to distribute a CD-ROM disc containing over 100 catalogues at the General Assembly in Buenos Aires.

The NASA/IPAC Extragalactic Database (NED) is now available to the world-wide astronomical community for use on an experimental basis. It covers a broad range of data, which are available via electronic networks, such as SPAN. NED has been developed at the Jet Propulsion Laboratory, California, USA.

Other data centres. Other data centres that are based on the CDS catalogues on magnetic tape are at the Zentralinstitut für Astrophysik, Potsdam, Germany, the Beijing Observatory, China, the La Plata Observatory, Argentina, and the Inter-University Centre for Astrophysics, India. There are also numerous centres that specialize in particular objects or wavelength regions, and there are other major centres that hold the data from particular space missions, but there is at present no comprehensive up-to-date list of such centres.

The enormous growth in the rate of acquisition of astronomical data and in the number of objects that are observed by both ground-based and space-based telescopes (the Hubble Space Telescope is expected to transmit up to 2 gigabytes per day) makes it all the more important that both the catalogues of reduced data and the scientific papers that describe and use them should conform to the appropriate recommended standards in respect of such matters as formats, units, designations and bibliographic references.

It is expected that there will be a Joint Commission Meeting at Buenos Aires to examine the practicability of establishing a database on CD-ROM discs for material objects in the Solar System.

FITS STANDARDS (P. J. Grosbol)

The FITS Working Group was confirmed by a resolution of the IAU General Assembly at Baltimore (Trans. IAU 20B, 51-2), which also adopted extensions to the FITS standard for formats for the encoding of astronomical images and associated data. (FITS = Flexible Image Transport System; the new extensions are described in *Astron. Astrophys. Suppl.* 73 (1988), 359-364 & 365-372.) The Group acts as the authority for the standard, and will review, approve and maintain any future extensions. A FITS Support Office was created by NASA at the Goddard Space Flight Center in 1989; it will assist the Group and individual users. One of its first tasks is to prepare a Users Manual for FITS.

The Group has held two meetings (at Charlottesville in January 1988 and at Green Bank in November 1989) and has also carried out its activities by correspondence. The topics considered include: the representation of non-linear coordinate systems; the encoding of single-dish radio data; the adoption of the IEEE floating-point agreement; a proposal for hierarchical keywords; the physical recording standard for FITS files on new high-density devices; and a new extension that would allow the highly-efficient storage of arrays and numbers in binary format. Further details may be obtained from the chairman (at ESO, Garching) or from the vice-chairman, D. Wells (at NRAO, Charlottesville).

DESIGNATIONS (F. M. Spite)

After the meeting of the Group in Baltimore, H. Jenkner and W. S. de Boer prepared a summary of the 'Guidelines' on designations that were issued after the General Assembly in New Delhi. This summary is included in the *IAU Style Manual* as Appendix D. The editors of the principal astronomical journals have been requested to include this summary with their instructions to authors; many editors have responded positively, although some minor revisions have been suggested. The summary has the title 'Specifications concerning names, designations and nomenclature for astronomical radiation sources outside the Solar System'; it includes short lists of references and of astronomers who are prepared to give advice about the choice of new designations. It is hoped that the widespread diffusion of these specifications will lead to a reduction in the number of confusions, ambiguities and errors in the literature.

Correct and unambiguous designations are essential to the efficient storage, exchange and retrieval of astronomical data, and so data centres are being encouraged to ensure that the guidelines for designations, as well as the standards for bibliographic references, are followed in databases, such as SIMBAD (CDS, Strasbourg) and NED (JPL, Pasadena). M.-C. Lortet and P. Dubois are preparing a list for on-line consultation of the acronyms that are already in use. A Second Supplement to the 'First Dictionary of the Nomenclature of Celestial Objects' has been prepared by S. Borde and M.-C. Lortet and is to be published in *Bull. d'Inf. CDS*.

The Working Group of Commission 34 on the designations of extended sources has prepared a report that is being circulated for comment. It is clear that the present Guidelines must be extended since they are not adequate to cope with the designation of complicated sources that are observed in different wavelengths.

EDITORIAL POLICY (P. A. Wayman)

The first concern of the new Working Group on Editorial Policy has been the adoption by astronomical journals of the specifications on designations referred to in the previous section. The major task facing the Group is to encourage the

general adoption of the other recommendations of resolution A3 of the last IAU General Assembly concerning the use of SI units and of standard forms for bibliographic references (see *Trans. IAU 20B*, 42-3). These and other aspects of the preparation and publication of astronomical papers are discussed in the *IAU Style Manual*, which is printed in the same volume, and which is also available as a reprint from the IAU Office in Paris. The principal recommendations of the Manual are summarised on pages Six-Sxii. The Group will also consider what changes should be made for the next edition of the Manual.

INFORMATION RETRIEVAL (L. D. Schmadel)

The Working Group on Information Retrieval set itself five tasks in addition to those of the Task Groups on the thesaurus of astronomical terms and on the revision of UDC 52. Progress has been made on some, but not all, of these tasks.

The IAU Vocabulary of astronomical terms was revised again in the light of comments received from astronomers and librarians, and it was then submitted for publication in *Bull. d'Inf. CDS*.

The Group is cooperating with the Group on Designations and with CDS on the standardization of the designations of objects for retrieval purposes. There is also cooperation between the principal abstracting services, which try to maintain a common list.

A concordance showing the relationships between the classifications used by the physics abstracting services (in PACS) and in *Astronomy and Astrophysics Abstracts* (AAA) was finished in 1989. This enables the automatic conversion of AAA chapter numbers into PACS codes.

The maintenance of the guidelines for the preparation of abstracts is largely covered by that of the *IAU Style Manual* and by the above tasks. There is as yet no progress to report on the preparation of user aids for information retrieval in astronomy.

IAU THESAURUS (R. M. Shobbrook)

The preparation of an IAU Thesaurus of astronomical terms has proved to be even more difficult and time-consuming than was expected. The project has received the active cooperation of many librarians but of only a small number of astronomers who are required to provide feedback on the current usage of terms. A meeting was held during the conference of the Special Libraries Association in Pittsburgh, PA, USA, in June 1990 to review progress and to decide on further action. The comments that had been received on Version 2 of the thesaurus were discussed, and it was agreed that the chairman should proceed with the preparation of Version 3 using a software package called LEXICON. It is hoped that this will be ready for presentation at the General Assembly in 1991. This thesaurus is seen as a valuable reference tool for librarians and as a standard for use in the indexing and abstracting of astronomical papers and other publications. The thesaurus may be translated into other languages.

REVISION OF UDC 52 (G. A. Wilkins)

The chairmanship of the FID committee for the revision of UDC 52 (Astronomy and Geodesy) has passed from G. A. Wilkins to Dr I. S. Shcherbina-Samoilova at VINITI in Moscow. (FID = International Federation for Information and Documentation, which is responsible for the maintenance of the schedules of the Universal Decimal