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UNION ASTRONOMIQUE INTERNATIONALE

LIBRARY AND INFORMATION SERVICES
IN ASTRONOMY

Proceedings of the 110th Colloquium of the
International Astronomical Union
held in Washington, DC, U.S.A.
26 July - 1 August 1988



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PREFACE

The principal purpose of IAU Colloquium No. 110 was to provide an opportunity for librarians of astronomical observatories and institutions to meet to discuss common problems and ways of stimulating greater cooperation between libraries in different countries. Others who were concerned with the provision of astronomical information were also invited to attend so that there could be wide-ranging discussions on most aspects of astronomical documentation. In the planning of the program, particular attention was given to new developments in the use of computers and telecommunication networks, but the needs of librarians and astronomers in institutions without access to such facilities were not overlooked. The original concept of a largely informal workshop had to be modified considerably when it was found that the number of participants would be two to three times larger than had been expected. Nevertheless, the program allowed time for general discussions, and these proved to be lively and useful.

The Colloquium was sponsored by IAU Commission 5 (Documentation and Astronomical Data) and was held just before the 20th IAU General Assembly in order to facilitate the attendance of librarians at the Assembly and to encourage the participation of astronomers in the Colloquium. A Joint Discussion which was held on the first full day of the Assembly served as a link between the Colloquium and the ordinary meetings of Commission 5. More importantly, the Joint Discussion, which had the title 'New developments in documentation and data services for astronomers', provided an opportunity for the participation of a much larger number of astronomers in discussions on some of the matters that had been discussed in greater detail at the Colloquium. A joint meeting of Commissions 5 and 46 (The Teaching of Astronomy) also provided a forum for a further discussion on the problems of developing countries in acquiring books and journals for research and teaching.

The local arrangements for the Colloquium were made by staff of the U.S. Naval Observatory and of other institutions in the Washington area; Brenda Corbin carried the main burden of the administrative work, while Ruth Freitag acted as Treasurer and arranged the reception and tours at the Library of Congress. Wayne Warren and Jaylee Mead organized the session and tours at the Goddard Space Flight Center. Many individuals, astronomical institutions, publishers and other organisations contributed towards the expenses and made possible the attendance of many librarians from overseas (see Appendix A). The total attendance was 120 persons, of whom 56 came from 25 countries other than the USA.

The first paper in this volume contains a general overview of the program of the Colloquium and reports on the discussions; it also contains extended summaries of some of the presentations for which no paper has been submitted for publication. This report is based partly on notes taken during the meetings and partly on the written records of the questions and comments that were submitted by those concerned. The papers that follow provide more detail on particular topics; some of the papers were presented orally and others as posters. Some additional reference material has been given in appendices for the general convenience of readers. We would like

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to express our thanks to all the reporters and authors who have made possible this record of this very interesting, useful and enjoyable meeting.

We would also like to acknowledge the assistance that we have received in the preparation of the camera-ready copy; in particular, we wish to thank Annette Hedges of the Royal Greenwich Observatory, Anne Munchel and Mary Dagold of the Space Telescope Science Institute, and LeRoy Doggett of the U.S. Naval Observatory. Finally, we would like to express the thanks of all participants to Gert Westerhout, the Scientific Director of U.S. Naval Observatory, for his enthusiastic support during all stages of this Colloquium, from conception to the publication of these proceedings.

George A. Wilkins
Royal Greenwich Observatory

Sarah Stevens-Rayburn
Space Telescope Science Institute

1989 March 31

ORGANIZING COMMITTEES
 LIBRARY AND INFORMATION SERVICES IN ASTRONOMY
 WASHINGTON, D.C., 1988

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S. Stevens-Rayburn	Space Telescope Science Institute
W. H. Warren, Jr	NASA Goddard Space Flight Center
C. E. Worley	U. S. Naval Observatory

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DORMITORY HOUSING FUND CONTRIBUTIONS

A housing fund was established in order that we might offer housing to those participants who might not otherwise be able to attend. Individual members of the Physics-Astronomy-Mathematics Division of Special Libraries Association contributed to this fund as well as astronomical institutions. We are especially grateful to a publisher who wishes to remain anonymous who very generously matched all personal contributions to this fund.

P-A-M MEMBERS

Anonymous
Brenda Corbin
Karen Croneis
Marlene Cummins
Richard Funkhouser
Joan Gantz
Helen Knudsen
Marion Kreiter
Dorothy McGarry
Joyce Rey-Watson
Robyn Shobbrook
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Cathy Van Atta

ASTRONOMICAL INSTITUTIONS

Association of Universities for
Research in Astronomy, Inc.
National Radio Astronomy Observatory
Space Telescope Science Institute
University of Toronto, Department
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We are especially grateful to Kluwer Academic Publishers for sponsoring our hospitality suite during the conference. A hospitality suite is a real asset as participants can continue discussions in an informal manner, or just relax. Thanks also go to Bruce Pelz (Univ. of Calif., Los Angeles and Chair-elect, Physics-Astronomy-Mathematics Division, Special Libraries Association) who acted as host in the hospitality suite.

SPECIAL LIBRARIES ASSOCIATION - A SPECIAL THANK YOU

The Special Libraries Association (SLA), parent organization of the Physics-Astronomy-Mathematics Division (P-A-M), made a very generous contribution to the conference. SLA clearly recognizes the importance of an international exchange of information and supported the P-A-M Division in its efforts to help organize this meeting. Most of the participants from the United States are members of SLA.

INTERNATIONAL ASTRONOMICAL UNION - THANKS FOR TRAVEL GRANTS

The International Astronomical Union provided funds for travel grants which made it possible for five people to attend this conference who otherwise would not have been able to attend. We appreciate the support of the IAU not only in providing the travel grants, but also in supporting this very important meeting by making it an official IAU Colloquium.

LOGISTICS AND VENUE

A meeting of this type cannot take place without the cooperation of many individuals and organizations. This meeting benefited greatly from the tremendous support provided by the Library of Congress, the Goddard Space Flight Center, and especially the United States Naval Observatory, both during the colloquium and in the months preceding it. The gratitude of all of us involved is extended to these organizations and to their employees for their attention to detail and their cheerful accommodation of every request.

LIBRARY AND INFORMATION SERVICES IN ASTRONOMY

OUTLINE OF PROGRAM

Wednesday, 1988 July 27

Registration, reception and tours at the U. S. Naval Observatory

Thursday, July 28

1. PUBLICATION AND ACQUISITION OF BOOKS AND JOURNALS (G. A. Wilkins)

Keynote address: The future of astronomical literature (H. Abt)

Views of the publishers

Problems of international acquisitions

2. SEARCHING FOR ASTRONOMICAL INFORMATION (S. Laloë)

Words for searching: indexing terms; classification; IAU thesaurus

Facilities for searching: indexing and abstracting services; on-line
bibliographic databases

Getting the documents: union lists and catalogs; using computer networks
and e-mail

Friday, July 29

3. HANDLING AND USE OF SPECIAL FORMAT MATERIALS (C. Hutchins)

Preprints and reprints

Non-printed materials

Observatory publications

4. VISIT TO THE LIBRARY OF CONGRESS (R. Freitag)

Use of optical disks

Saturday, July 30

5. CONSERVATION OF HISTORICAL MATERIALS (B. G. Corbin)

Conservation of books, documents and other items.

6. OTHER LIBRARY ACTIVITIES (J. W. Weigel)

Library administration: role of astronomers; use of computers

Archiving of correspondence and unpublished documents

Support of remote observatories

Resource sharing and cooperative activities

7. REVIEW AND FORWARD LOOK (G. Westerhout)

Documentation and data: the role of Commission 5

Dissemination and retrieval of information

Management of astronomical peculiarities

Maintaining the historical record

Organization of activities

Address: The astronomical library of the future (P. Molholt)

Monday, August 1

8. ASTRONOMICAL DATA CENTERS (W. H. Warren, Jr.)

Data activities at the Goddard Space Flight Center

Surveys of principal sources and centers

Archiving of current observational data

Access arrangements and retrieval techniques.

9. TOURS OF GODDARD SPACE FLIGHT CENTER (J. M. Mead)

The title of each session is followed by the name of the chairperson. See paper 1 for summaries of contributions and discussions on each topic.

Sessions 1-7 (except 4) were held in the Dupont Plaza Hotel, Washington, D.C. Sessions 8-9 were held at the Goddard Space Flight Center, Greenbelt, Maryland.

LIBRARY AND INFORMATION SERVICES IN ASTRONOMY

LIST OF PARTICIPANTS ARRANGED BY COUNTRY

The postal addresses of the participants are given in Appendix 2.

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Australia

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Belgium

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Brazil

Zuleika Berto

Canada

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Eric LeBlanc

Chile

Maria Gómez

China

Huang Bi-kun
Li De-he
Liu Jinming
Wang Ya-hong
Zhou Yunfen

Czechoslovakia

Marek Wolf
Josef Zavrel

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India

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Cathy Van Atta
Rosalind Walcott
Wayne Warren
Susan West
Gart Westerhout
Jack Weigel
Charles Worley
Allen Wynne
Dorothea Zitta

PART 1. OVERVIEW OF THE COLLOQUIUM

REPORT ON THE DISCUSSIONS ON LIBRARY AND INFORMATION SERVICES IN
ASTRONOMY DURING IAU COLLOQUIUM 110 (WASHINGTON, D.C., 1988)

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ABSTRACT. This report provides an overview of the presentations and summarises the discussions at IAU Colloquium 110, which was held in Washington, D.C., on 1988 July 26-30 and at the Goddard Space Flight Center on 1988 August 1. The topics included: the publication and acquisition of books and journals; searching for astronomical information; the handling and use of special-format materials; conservation; archiving of unpublished documents; use of computers in libraries; astronomical databases and various aspects of the administration of astronomy libraries and services. Particular attention was paid to new developments, but the problems of astronomers and institutions in developing countries were also considered. (CR) ←

1. INTRODUCTION

1.1 Background to the Colloquium

The concept of a workshop for astronomy librarians was developed during informal discussions at the 19th General Assembly of the International Astronomical Union (IAU) at Delhi in 1985 December. Only a few librarians attended that meeting, and it was clear that discussions on some topics of concern to Commission 5 (Documentation and Astronomical Data) suffered from the inadequate representation of the providers of the services that are used by astronomers. Moreover, it was recognised that a greater face-to-face exchange of information and ideas between librarians would be very valuable, especially for librarians who do not normally have any opportunity to meet other librarians working in astronomy or related fields. It was agreed that the attempt should be made to organise a workshop just before the 20th General Assembly and to encourage a greater attendance by librarians at the Assembly itself so as to promote further interactions between astronomers and those who provide various kinds of information services. After further discussions and correspondence, proposals were submitted to the IAU Executive Committee for holding an IAU Colloquium at the U. S. Naval Observatory in Washington, D.C., in late July and a Joint Discussion early in the Assembly at Baltimore; it was also requested that participants in the Colloquium be entitled to attend the Joint Discussion even if they did not attend the rest of the General Assembly. In spite of their unusual character these proposals and the request were approved; both meetings proved to be very successful and attracted greater attendances than were originally expected. The presentations and discussions at Baltimore have been summarized by Wilkins (1989). There was necessarily some overlap between the two meetings, but to a large extent the programme for the Joint Discussion on 'New Developments in Documentation and Data Services for Astronomers' complemented that of the Colloquium on 'Library and

Information Services in Astronomy'. Some of the topics were considered at the subsequent meetings of Commission 5 and, where appropriate, discussions about further action were taken (IAU5 1989).

The development of the programme of LISA 1988 from my initial outline draft owed much to the efforts of Ellen Bouton and Sarah Stevens-Rayburn, who were co-opted to the Scientific Organising Committee after they had provided very detailed suggestions for both topics and possible contributors. The new techniques of electronic mail and telefax proved invaluable for the subsequent correspondence.

1.2 Basis of the Report

The Colloquium consisted of sessions of various kinds according to the nature of the topic being considered. In some cases the conventional format of formal papers followed by discussion was adopted, but for many topics the programmed contributions were informal and short (5 or 10 minutes at the most), and were intended to provide introductions to general discussions. As a consequence, it would generally have been inappropriate to attempt to associate the record of the discussions with individual printed papers. Instead this report contains, for each topic, summaries of the prepared contributions and of the discussions. The time available for open discussion was often not long enough, and so participants were invited to submit written questions to the speakers; their replies and other written comments are summarised in the report as 'other comments'. In some, but not all cases, the main speakers have provided short papers that are printed after this report, together with some papers that were originally presented in poster form at greater length. References to these papers are given by numbers, in square brackets, which correspond to the numbers given in the table of contents.

The text of this report is based on notes taken by the author and by other participants (see section 8.3) and on notes provided afterwards by some of those who participated in the discussions. Unfortunately, it has not been possible to include all the material that has been provided, but it is hoped that the report does give both a useful record of the facts and ideas that were presented and a fair account of the differences of opinion that were expressed. The text does not always follow the chronological sequence of the spoken words and it does not always name the persons who spoke. The main aim has been to provide a coherent report that will be of value to many who were unable to attend a very stimulating conference.

1.3 Framework of the Colloquium

For most of the participants this was the first time that they had been able to meet their colleagues from overseas even though they might have corresponded on library matters. The formal programme of technical sessions was embedded in a framework of activities that provided many opportunities for informal discussions at a personal level. The initial registration and reception were held in the library of the U.S. Naval Observatory on Wednesday evening and a picnic lunch was held at the Observatory on Saturday; most took the opportunity to see some of

the telescopes and other facilities. A visit to the Library of Congress on Friday afternoon proved to be interesting and instructive, and the buffet that was generously provided at the end of the visit was much appreciated. The final sessions on Monday, August 1, were held at the Goddard Space Flight Center; the papers and discussion in the morning were followed by a tour of the data center; and in the afternoon participants visited the library, some of the main test and assembly buildings, and the visitors' centre. At this point the Colloquium ended, some of the participants returned to Washington while others went to Baltimore for the IAU General Assembly.

At the Dupont Plaza Hotel, where most of the technical sessions were held, there was a hospitality suite that proved to be very popular in the evenings. An adjacent room contained two terminals that were used, especially in the evenings, for live demonstrations of the use of remote databases for the retrieval of astronomical references and data. The Conference banquet on Saturday evening was enlivened by Dr. Gart Westerhout, the Scientific Director of the U.S. Naval Observatory, when he introduced the after-dinner speaker Prof. Gerrit Verschuur, who in turn gave a witty but thoughtful address. The dinner also provided an opportunity for everyone to thank Brenda Corbin, who had done so much to make the Colloquium an undoubted success; she has since written up her impressions of LISA 1988 and her article (Corbin 1988a) gives further details of its non-technical activities.

The Colloquium was opened by Westerhout, who had enthusiastically supported the proposal for the Colloquium and who had been the active chairman of the Local Organising Committee. The President of Commission 5, G. A. Wilkins, then described briefly the background to the Colloquium and expressed the hope that the Colloquium would justify both the decision of the IAU Executive Committee to support it and all the effort that had been expended in preparing for it. At the end of the Colloquium it was clear that this hope had been fulfilled.

2. PUBLICATION AND ACQUISITION OF BOOKS AND JOURNALS

2.1 The publication of astronomical books and journals

2.11 H. A. Abt: The future of astronomical literature [see paper 2]. Helmut Abt, the editor of the *Astrophysical Journal*, spoke first of all about the problems caused by the growth in the volume and cost of astronomical journals; he advocated a wider adoption of page charges and large, general journals. He also considered the ways in which new technology might be used and the possibility of replacing printed journals by a central memory bank that would allow readers to select the papers that they wish to read.

2.12 G. Kiers: The pricing of commercial publications. Gerrit Kiers, of the Kluwer Publishing Company, spoke of the make-up of the prices of commercial astronomical publications. Apart from direct production costs (editing, composition, paper, printing and binding) the commercial publisher has to pay royalties to authors (or to the IAU, in the case of IAU publications), advertising costs, overheads and

dividends to shareholders; most of the publications are sold through agents and booksellers, so that the final sale price is usually at least 50% higher than the amount received by the publisher. The publisher's profit margin is small. Commercial publishers take on specialist books for which the number of copies sold is small, but they must print enough copies to avoid small reprint runs. Moreover, they do not have the benefit of subsidies from page-charges or other sources.

2.13 P. Boyce: The pricing of astronomical journals. [3] Peter Boyce illustrated his talk by reference to the policy and experience of the American Astronomical Society (AAS). The aim is to produce journals of high quality at a price that just balances costs and revenue; the AAS journals are published by the American Institute of Physics (AIP). The Society faces the conflict between rising production costs and falling numbers of subscriptions. New technology will make, at most, a small reduction in production costs; at present, submission of papers in electronic form is not cost effective. It is not practicable to limit the size of the journal to keep down the subscription. Finally, he referred to a paper by Barschall (1988), who advocates that authors should submit their papers to journals that have a low cost per character.

2.14 Discussion. Del Frate wondered whether the high data-rate from the Space Telescope would lead to a corresponding increase in the number of papers published; Abt noted that the International Ultraviolet Explorer (IUE) mission had generated about 1000 papers so far, but he considered that the number of astronomers is the main factor in determining the number of papers that are prepared. Ratnakar enquired about the acceptance rate for the Astrophysical Journal and whether the quality of the submitted papers is falling. Abt said that about 90% of papers are accepted; there seemed to be no evidence for any drop in quality. The acceptance rate in astronomy tends to be higher than that in science generally, and this is in turn much higher than that in sociology. This appears to be due to the small number of astronomical journals and to referees being expected to give reasons for rejection; papers are improved and resubmitted to the same journal. Buscombe was concerned that the delays in publication due to the refereeing process had increased considerably over the past 50 years. Abt said that the average reviewing time for the Astrophysical Journal is 28 days; delays do occur if a paper has to be referred to a second referee or to an arbitrator. Papers are published about 6 months after acceptance. Robinson enquired about Kluwer's pricing policy for proceedings, and was told that the price is largely determined by the number of pages and the estimate of the sales; the mark-up to cover all overheads and provide a safety margin usually varied between 6 and 12% of the production cost. Shobbrook commented that the large difference between the prices of paperback and the hardback editions of the proceedings of IAU symposia is tempting librarians to buy and then bind the paperback edition. Kiers replied that the paperback editions are provided, at the request of the IAU, as a service for individual astronomers and, since this does not give any profit, this would be

withdrawn if the sales of the hardback editions to libraries fall any further. Abt suggested that librarians should patronise journals that imposed page charges since these reduce the costs to the library.

2.15 Other comments. In response to written questions by Knudsen about page charges, Abt pointed out that this system is dominant in the USA, but is not permitted in some countries; there are factors other than page charges which influence authors in the choice of journals for the submission of their papers. Referees and editors have the responsibility to ensure that papers are not verbose or redundant; papers are getting longer largely because projects are becoming more complex and cannot be adequately described in a few words. Stevens-Rayburn was also concerned at the increases in the number of pages and in the number of authors per paper; Abt said that there had been a significant increase in the number of pages per author. Molholt was concerned that external pressures (relating to promotion or grants) were leading to unjustified increases in the number of papers per author.

Ilyas drew attention to the savings that would follow from the more widespread adoption of a large page, double-column format for journals. This reduces the volume of paper used and leads to savings in the costs to the publisher of production and postage and to the librarian in shelving and binding. He also advocated greater standardization between astronomical journals in their requirements for the style of the manuscripts and the inclusion of the titles of papers in references. He pointed out that the relative cheapness of journals that have page charges is of benefit to developing countries.

2.2 The problem of international acquisition

2.21 H. Knudsen: Introduction. In introducing the members of the panel on the problems of international acquisition, the moderator, Helen Knudsen, recalled that Weigel had attended a meeting of astronomical librarians at the IAU General Assembly at Hamburg in 1964. [The record of the meeting of Commission 5 at Hamburg (IAU5 1966, p. 106) states that "Dr Pecker made a personal statement calling attention to the absence from Commission 5 of both astronomical librarians and editors of astronomical journals ..."; it was decided to set up a permanent working group of the Commission. It appears (IAU5 1966, p. lxxvii) that the International Federation of Library Associations formed a Working Group of astronomy librarians at its meeting in The Hague in 1966, and Weigel spoke there on the classification system of the Library of Congress. The working group of Commission 5 was allowed to lapse in 1970 (IAU5 1971, p. 88).]

2.22 O. B. Dluzhnevskaya: Problems in the U.S.S.R. [4] Olga Dluzhnevskaya said that in the USSR the amount of western currency that is allocated to scientific librarians is sufficient to pay for only the principal astronomical journals; very little is available for the purchase of monographs. She requested that more western publications be made available by exchange, either directly with observatories or through the Academy of Sciences. She drew attention to the recent editions of the General Catalogue of Variable Stars and to its supplements.

2.23 J. Weigel: Difficulties for western nations. [5] Jack Weigel mentioned two sources of difficulty that are encountered by western librarians in obtaining journals and books from the Soviet Union and other parts of the world; the small number of copies printed and the lack of timely information about new publications. He agreed that greater use of flexible exchange agreements could be useful, but many observatories, for example, no longer produce their own publications. He suggested that there is also a need for a greater exchange of information about new publications, and he wondered if the IAU Information Bulletin might increase its coverage beyond IAU publications.

2.24 S. S. de Guerra: Problems of developing countries. [6] Selma de Guerra said that the problems in developing countries also arise mainly from the lack of foreign currency, but they are compounded by the demands for advance payment and by delays and losses in the post. She would like to be able to obtain books on approval and she finds that central purchasing by a group of institutions in the same area is helpful. Other sources of difficulty are the different subscription years of journals and dealers who are not interested in titles that are not easy to obtain.

2.25 Lui Jinming: Problems in China. [7, 8] Lui Jinming drew attention to the procedures and problems of the purchase of publications, which are similar to those in other countries. Chinese astronomical journals are, however, produced in observatories, which would like to receive other journals in exchange. Chinese librarians would also like to receive more preprints even though, as he recognised, China is not able to produce well-printed preprints for exchange.

2.26 Discussion. In opening the discussion, Knudsen urged the librarians present to ensure that the preprints of their organisations are sent to the libraries of countries such as China. Schmitz suggested that publications might be better distributed in machine-readable form, rather than in printed form, but this raised a chorus of objections; in particular, it was considered by Knudsen that observatories that have problems in obtaining journals would have greater problems in obtaining and then using, say, magnetic tapes, which vary in format and require the use of expensive equipment. Warren pointed out that authors should, however, supply machine-readable versions of data tabulations to one of the principal data centres. Wilkins suggested that a major obstacle to full exchange arrangements is the inability of western astronomers to read papers in languages like Russian and Chinese; he suggested that publications intended for exchange should be translated into English or, as a minimum, should contain long abstracts in English. Shobbrook considered that the title and contents pages of all journals should be given in English, as well as in the original language, so that the journals can be correctly identified and the papers can be easily catalogued for retrieval purposes. Hutchins requested a list of Chinese journals for which an English-language edition is published in China. They include: Acta Astronomica Sinica, Acta Astrophysica

Sinica, Publications of the Beijing Astronomical Observatory, and Progress in Astronomy; the translations are not published at the same time as the originals.

Buscombe congratulated those responsible for making the General Catalogue of Variable Stars so widely available and said that copies of some catalogues of the Northwestern University are available on request. Mattei enquired where preprints and reprints should be sent to ensure that recent findings are incorporated in the catalogue, and was told that they should be sent to the Library of the Academy of Sciences of the U.S.S.R. in Moscow.

3. SEARCHING FOR ASTRONOMICAL INFORMATION

3.1 Words for searching

3.11 L. D. Schmadel: Indexing terms. [9] Lutz Schmadel, the editor of Astronomy and Astrophysics Abstracts (AAA), said that AAA uses about 100 subject categories for arranging the abstracts and now uses a list of about 1500 primary terms and 700 secondary terms, as well as object designations, in preparing the index. Each document is indexed by not more than 5 keywords. The Working Group on Abstracting Guidelines has suggested (Schmadel 1985) that there should be a standard list of keywords, but as yet there is no agreement on the form of compound terms or on such matters as spelling and the form of abbreviations.

Wilkins referred briefly to the draft of an IAU Vocabulary that had been sent by P. Lantos, the chairman of the Working Group on Classification. It contains about 1150 terms; they have been divided into eight subject areas. It was to be considered by Commission 5, which would decide whether this Vocabulary should be included in the new IAU Style Manual. [The decision was 'no'.]

3.12 V. Alladi: A Review of classification systems. Vagiswari Alladi described and compared the principal characteristics of the four classification schemes that are currently used for astronomy.

Universal Decimal Classification (UDC): this is a faceted hierarchical system in which the current schedule for astronomy (52) was prepared with the participation of members of Commission 5. The user must have a good knowledge of the subject. The revision process is slow and cumbersome.

Library of Congress (LC): This is very convenient for US users since the Library of Congress assigns the numbers for books. The schedule for astronomy (QB) is very limited especially in respect of recent developments.

Physics and Astronomy Classification Scheme (PACS): this is a four-level hierarchical arrangement used for arranging abstracts; it is not good for the arrangements of books and it does not cover topics outside physics. [See 13b]

Astronomy and Astrophysics Abstracts: this provides only a list of about 60 subject headings in astronomy that may be related to the principal astronomical headings in PACS. It is not suitable for use outside AAA.

In using any classification scheme there is always the problem that any book or paper is rarely concerned with only one topic; UDC does, however, provide ways of specifying the various topics or aspects covered. Since there is no unique way in which this can be done, relevant items may be missed, especially in manual searches. In AAA the index in each volume is provided to assist in the retrieval of relevant abstracts, but the index terms used may not include the keywords given in the paper.

3.13 G. A. Wilkins: Revision of UDC 52. [10]. Wilkins explained why he considered that Commission 5 should participate actively in the revision of UDC 52, and he invited interested participants to meet in the evening to discuss how best this could be done. [Several of the librarians present offered to help, but more participation by astronomers is needed.]

3.14 R. M. Shobbrook: The IAU thesaurus of astronomical terms. [11]. Robyn Shobbrook first of all expressed her delight that the discussions in Delhi in 1985 in which she had participated had led to this colloquium. The discussions in Delhi had indicated the need for a thesaurus of astronomical terms and she had agreed to initiate the development of one. Such a thesaurus, which will show preferred and related terms, will be invaluable to librarians, and it should also be important for users of bibliographic databases. A draft listing has been prepared with the assistance of a panel of helpers, but a considerable amount of effort will be required to complete and check the thesaurus. In particular, assistance is needed from astronomers, and appropriate computer facilities must be available.

3.15 Discussion. Buscombe recalled the frustration that he had felt as a result of delays in books being made available because of the lack of classification numbers; he had resorted to assigning LC numbers himself for his catalogues. He had also noted that the classification schemes used were out of date and did not recognise the existence of subjects such as radio astronomy. [The latter criticism does not apply to LC or UDC, in which the appropriate codes are QB475 and 52.77.] Shobbrook admitted that there are often delays in cataloguing books in large university libraries and that the classification schedules are not completely satisfactory; she also saw the need for better communication between librarians and astronomers since, for example, a cataloguer needs to understand both the subject matter and the system used for classification. Bryson confirmed the need for the involvement of working astronomers by reference to her experience in compiling the terms for R and S in the draft thesaurus; the sources that she had consulted had contained terms that are no longer in use. Collins would like to see new terms included quickly in the thesaurus, but the classification scheme should not be changed frequently. Molholt considered that the use of classification numbers for locating books on

shelves will become less important as more users browse through the database rather than the books; it is, however, desirable that books be indexed in greater depth, at least down to chapter level.

Much of the discussion concerned the development and application of the thesaurus. Kulkarni suggested that it would be useful to study non-astronomical publications, such as Mathematical Reviews, which include some astronomical material. Lubowich enquired whether the use of descriptor pairs would be recommended to add further precision; Shobbrook replied that terms could be combined by the use of Boolean-logic operators. Davies referred to the question posed by Alladi about the desirability of having only one classification scheme for astronomy; she felt it would be more important to encourage the use of one thesaurus by the classification schemes. Stevens-Rayburn enquired whether the various sources, such as the American Institute of Physics (AIP) would use the new thesaurus; if not, it would add to the present confusion. Shobbrook commented that her Director also wanted an assurance that the thesaurus would be used; she hoped that the discussions at the Colloquium and at the following IAU General Assembly would lead to the services giving their support to the further development of the thesaurus. Knudsen drew an analogy with the SAO star catalogue, which combined data from different catalogues and became a de facto standard for certain purposes; she considered that the thesaurus would combine other lists of terms in an effective way and would become the standard. Molholt stressed the importance and value of the new thesaurus and offered encouragement and support in the continuation of the work; she had been involved in the creation of a thesaurus for art and architecture, and so was well aware of the amount of effort and costs involved. She felt that a well constructed, comprehensive vocabulary, which has been validated by both subject specialists (namely astronomers in this case) and by information specialists (namely librarians, abstractors and publishers), is of critical importance to every discipline as information moves from print to electronic format.

Various suggestions for the funding of the completion and maintenance of the thesaurus were put forward, including UNESCO, and an appeal to the major astronomical institutions; it was suggested that one of the principal abstracting services might offer appropriate facilities, although Davies feared that this might lead to over emphasis on terms for, say, space technology or physics. Wilkins suggested that a Working Group of Commission 5 should control the thesaurus.

3.2 Facilities for searching

3.21 H. Z. Knudsen: Astronomy and Astrophysics Monthly Index. Knudsen (1988) described the Astronomy and Astrophysics Monthly Index as "cheap, quick and dirty"; it does, however, cover a wide range of serial publications and gives complete information about conference proceedings. All authors are listed alphabetically on the yellow pages, and there is a permuted titles section on white pages. The index is available on magnetic tape with appropriate search routines.

3.22 L. D. Schmadel: Astronomy and Astrophysics Abstracts. [12]. Schmadel described the new procedures of the Astronomisches Rechen Institut (ARI) at Heidelberg for the production of the familiar and invaluable Astronomy and Astrophysics Abstracts. The aim is complete and accurate coverage with emphasis on fast delivery and the provision of tools for information retrieval. The magnetic tape containing the text is used for the composition of the printed volumes and for inclusion in the physics database of the Fachinformationszentrum (FIZ) at Karlsruhe.

3.23 D. A. Lubowich: Products of American Institute of Physics (AIP). [13a] The publications of AIP cover about 10% of the world's output of astronomical papers. The bibliographic information about each paper is included in the AIP database and is made available in a variety of ways. Each entry has a PACS subject code [13b] and pairs of descriptor terms (keywords).

3.24 J. Rey-Watson: On-line bibliographic resources. [14] Before reviewing briefly each bibliographic database that contains significant amounts of information about astronomical publications, Joyce Rey-Watson drew attention to the SIMBAD database of the Strasbourg Data Centre (CDS). This has the advantage that it is possible to search by the name of an object, even if the name does not occur in either the title or the abstract, or by appropriate properties of the objects of interest (see also 5.32 and [39, 40]).

3.25 W. Lück: Physics Briefs. [15] Wolfgang Lück said that the Physics Briefs database PHYS is made available by FIZ (see 3.22) through the STN network, which has nodes at Frankfurt, Columbus and Tokyo. The astronomical entries are now compiled in collaboration with ARI and will include the AAA classification code and index terms as well as the PACS codes, keywords, and object designations. On average there are 2K characters per entry and searches may be made on 24 fields and their intersections.

3.26 M. Collins: The INSPEC database. [16] Mike Collins said that the INSPEC database has a very broad coverage and includes the principal astronomical journals. New services for searching for chemical compounds and numerical data are now available.

3.27 Discussion. The participants had ample opportunity to ask further questions and to gain experience of the use of the databases mentioned in the preceding short contributions since the speakers also gave demonstrations of the use of two terminals that had been brought to the hotel. During the meeting Knudsen added that the A & A Monthly Index cannot be put on diskette for a personal computer (PC). Lück said, in response to an enquiry by Dravins, that the AAA data will not be made available separately on magnetic-tape (as had been announced earlier by ARI). Serban suggested that the author and subject indexes of AAA and of the astronomical sections of Referativnyi Zhurnal and Bulletin Signaletique should be combined together. Russo drew attention to the European Space Information System [17], which involves 5 laboratories in the current pilot project.

3.3 Getting the documents

3.31 J. Bausch: US Union List of astronomical serials. [18] Judith Bausch said that discussions on a Union List of the US holdings of astronomical serials started in 1972 and the first edition was distributed in 1983; librarians were invited to submit additional information for inclusion in a new edition.

The second edition is now being prepared on a Macintosh diskette; additional titles and information such as ISSNs are being added. The list will include non-US holdings that are notified. In response to a question by Kitt about the format in which information should be submitted, Bausch requested that the format given in the first list should be followed, and she added that guidelines are available on request.

3.32 A. R. Macdonald: UK Union list of serials. [19] Angus MacDonald said that the decision to compile a UK union list of serials was made at a meeting of astronomy librarians in 1981. The list is based on the holdings of five astronomy libraries, but it is not restricted to astronomical serials. The list was distributed as computer printouts, but on-line access or microfiche would be more suitable.

3.33 Discussion. Fishburn suggested that it would be better to form a separate European union list rather than to add European holdings to the US list. Bausch and Corbin both considered that the aim should be to form an international list, and should cover historical series as well as current journals.

Knudsen said that access to European resources has proved to be very valuable. Huang considered that the extension of the US list would be very useful. Information about astronomical organisations from which librarians and others may wish to obtain information is given in the directories published by the Strasbourg Data Centre [20].

3.34 G. Russo: Introduction to computer networks. [21] Guido Russo listed the four main wide-area networks (WANs) that are used for scientific purposes by the scientific communities in North America, Europe and some other places around the world. Gateways between them allow both the transmission messages by electronic mail (e-mail) and remote login, which allows a user to carry out processing on a distant computer. Planned increases in transmission rates will remove some of the current limitations. It is possible to make connections to the networks through the X25 packet-switching system (PSS) of the international public telephone networks; this is often cheaper than the use of a leased line.

3.35 C. R. Benn: Introduction to electronic mail. [22] Chris Benn, who is the co-author of a world electronic-mail guide (Benn & Martin, 1989), claimed that e-mail is bringing about a revolution in astronomy and that it is quick, cheap and easy to use. Librarians are already finding it to be a good way of making enquiries about wanted

items. There is a need for greater standardisation in addresses. The system could be used for the distribution of astronomical news and for the exchange of software.

3.36 Discussion. Collins said that amateurs are also using e-mail for the reporting of discoveries, but there needs to be a system to filter out misidentifications, as in the case of reports to the IAU Telegram Bureau. Laloë said that the IAU Circulars are available by e-mail to those who subscribe to the printed version. Mattei enquired if there is a way of knowing that an e-mail message had reached its destination. Benn replied that some systems have an acknowledgement capability and the sender should be told if the message is not delivered within a stated time. Shobbrook pointed out that local software can be used to simplify the input of addresses or to provide alternative routes.

3.4 The dissemination and retrieval of information

3.41 S. Laloë: Review. [23] During the review and forward-look session Suzanne Laloë gave a brief, but densely-packed review of the methodology and aids for the retrieval of information from the point of view of a librarian. She discussed: types of information required, including the need to keep up with new work in the field; tools that are available, including the importance of a good classification system to aid browsing amongst the books in the local library; indexes and words for searching; other services, in which the key element is cooperation; and the variety of sources of information. Finally she emphasised the importance of the simplest method: to talk and ask questions.

4. THE HANDLING AND USE OF SPECIAL-FORMAT MATERIALS

4.1 Preprints and reprints

4.11 A. Ratnakar: Importance of preprints. [24] Aspari Ratnakar spoke first of all about procedures for handling preprints at the Raman Institute in India, where the main interest is in radio astronomy and which receives about 500 preprints per month. Since preprints are not distributed regularly to all observatories he suggested that all authors should be asked to send one copy to a nominated place which would prepare a consolidated list on a subscription basis; he also suggested that journals should be asked to make available lists of papers that had been submitted for publication.

4.12 M. Gómez: Handling of preprints. [25] Maria Gómez, the librarian at La Silla in Chile, said that preprints are displayed in special racks in the 'Astronomy Lounge' for one month before being moved to the Library. Reprints have diminished in importance, as well as in number, and are only retained if the original journal is not taken by the Library. She considered that e-mail may eventually make preprints obsolete.

4.13 E. Bouton and S. Stevens-Rayburn: The NRAO/STScI system for preprints. [26] Ellen Bouton and Sarah Stevens-Rayburn jointly described the cooperative project between the National Radio Astronomy Observatory (NRAO) and the Space Telescope Science Institute (STScI) for the maintenance of a database of information on preprints. The considerable amount of effort required is justified because preprints are the most heavily used part of the library collections. The system provides clear evidence of the publication of very similar papers in different places. The list of acquisitions is distributed bi-weekly (at no charge) on paper and by e-mail.

4.14 Discussion. There appeared to be general agreement that it would be useful if complete information about preprints could be available from one source. Bouton and Stevens-Rayburn agreed to try (within the limitations of their resources) to make their listing more widely available, and so all authors should be encouraged to send their preprints to NRAO or STScI; each library has, however, only one assistant. Buscombe was concerned that preprints are often superseded by later versions; Stevens-Rayburn said that the reference to the published version is given in the listing as soon as it is known. Sachtschal expressed the view that preprints should be distributed only for papers that had been accepted for publication. Wilkins commented on the request by Ratnakar for lists of submitted papers; he felt that editors would be reluctant to issue such lists since they could be used to discover which papers had been rejected; some journals already published lists of papers that have been accepted.

Primack suggested that the effort of collecting information about preprints and other sources of astronomical information should be shared between several libraries; she suggested that queries could be posed and answered by electronic mail. This could, however, impose a considerable burden on the host institutions and so a bulletin-board system appears to be more appropriate. Kulkarni suggested that the preprint database could be distributed on diskettes; Knudsen indicated that she would consider doing this for non-western libraries, although Ratnakar pointed out that many libraries do not have appropriate computing equipment.

4.2 Non-printed materials

4.21 C. O. R. Jaschek: Survey of non-printed materials. [27] Carlos Jaschek was, unfortunately, prevented from attending the Colloquium but the summary of his talk was read out to provide a review of the advantages and disadvantages of different media (microfiche, magnetic tapes, diskettes and optical discs) for the storage and retrieval of information.

4.22 C. Van Atta: Sky-survey materials. [28] Cathy Van Atta gave an informative survey of the procedures used at the National Optical Astronomy Observatories (NOAO) at Tucson to store sky-survey materials (prints, films and plates), whose value she estimated to be about one million dollars. At NOAO these materials are the responsibility of a scientific photographer, but about 20 of the participants indicated that they had the responsibility for the care of such materials.

4.23 M. E. Gómez: Handling of microfiche. [29] Maria Gómez discussed the procedures and problems involved in the storage and use of microfiche which are received from a variety of sources. Unfortunately, some of them are poorly produced and lack proper referencing information. Each microfiche is identified by an assigned serial number and is indexed by author, title and publication.

4.24 Discussion. It was emphasized during the discussion that professional advice should be sought about the use of plastics for the storage of photographic materials as some can affect the emulsion or print surfaces quite badly. Van Atta said that prints are sometimes kept between glass sheets; in reply to a question she said she had been advised that it is not wise to keep plates on wooden shelving. The Ohio overlays are stored with the plates and prints at NOAO and STScI. Van Atta has a useful list of atlases etc. that are shelved with the prints of the Sky Survey, and will send a copy on request.

Buscombe commented that catalogues on microfiche are available from CDS and can be used conveniently with a portable reader. Wang wondered whether there was any way in which microfiche could be connected to computerised retrieval systems and enquired how specific material can be found. Hutchins considered that the microfiche should be kept in the pocket in the journal and not stored separately.

Fishburn drew attention to the need to provide retrieval facilities for slide collections, which can be quite large. ESO catalogues them on a database in 10 subject categories; for each slide details of the title, producer, copyright, reference numbers, etc. are kept.

Kiers considered that microfiche would be superseded by a new storage medium which is marketed under the name of 'softstrip'. The information, which may be text, data, software, graphics or sound, is encoded in a condensed binary form that can be printed on plain paper. The printed 'data strips' can be read by an inexpensive reader that can be connected to a personal computer. Kluwer Publishers are experimenting with its use in journals. Dudley added that the strips can be photocopied even if partially obscured by some stains, but not if the paper is creased. [The system is a joint venture of Cauzin Systems, Inc., (Waterbury, Conn., USA) and the Eastman Kodak Co. It is marketed by separate companies in Europe; their administrative headquarters is Softstrip International Ltd., 53 Bedford Square, London, WC1B 3DP, England.] Hutchins called attention to the inclusion by Pergamon Press of softstrips that contain the tables of contents of their journals in the computer-science field.

Sachtschal asked for advice on the handling of magnetic tapes that contain catalogues, etc. Primack expressed the view that the tapes are best kept by the computer department, which should have a suitable air-conditioned environment for their storage as well as the facilities for reading and copying them. The library should have to keep appropriate documentation about the contents and formats of the tapes. Mattei said that the AAVSO tapes are copied at least once every 3 years. These recommendations appeared to be generally agreed, although Leblanc said that at DAO the tapes are on-line, as otherwise they are

not used. Warren [30] has provided a useful review of appropriate procedures for building and maintaining a library collection of astronomical catalogues in machine-readable form.

Kulkarni asked for information about the availability of non-bibliographic databases. Hutchins advised him to consult the publications of CODATA (see section 5.11) and Rey-Watson drew attention to the demonstrations by INSPEC of on-line access to numerical databases.

4.3 Observatory publications

4.31 K. Kaminska: A view from eastern Europe. [31] Kinga Kaminska, opened the panel discussion on observatory publications by presenting the view of a librarian from an observatory (in Warsaw) that had lost a lot of its stock during the war and that had only very limited funds for the purchase of books and journals. She welcomed observatory publications that could be obtained by exchange and she drew attention to the need for a clear numbering system for each series.

4.32 M. Cummins: Classification of observatory publications. [32] Marlene Cummins, the moderator of the panel, pointed out that traditionally observatory publications have been shelved according to place, but this is inadequate and leads to many problems, especially as many types of publication are issued by observatories and other astronomical institutions. She now uses the Anglo-American Cataloguing Rules (AACR2) to classify them. Reprints are kept only when the journal is not held.

4.33 A. Fishburn: Procedures in a small institute. [33] Anne Fishburn gave a detailed account of the procedures used in her library for handling observatory publications and similar items, such as preprints and reprints. She also drew attention to the need to ensure that copies of all such publications are sent to the editors of Astronomy and Astrophysics Abstracts and to the value of keeping up the exchange system. She did, however, regard the handling of reprints as a waste of resources. She recommended that librarians ensured that the word 'librarian' or 'library' occurs in the address given for the exchange of publications and that acknowledgement cards are returned whenever they are enclosed with the publications.

4.34 J. Gantz: Further comments on observatory publications. [34] Joan Gantz described some of the facilities and procedures of the library of the Mount Wilson and Las Campanas Observatories. She referred to the problem of identifying publications which are printed only in unfamiliar scripts; photocopies of the title pages are kept in a file for comparison with newly received issues and for showing to visitors who might be able to translate them. The Observatory now sends out only its Annual Report, but she is grateful for all material received in 'exchange'.

4.35 Discussion. Cummins said that her institution sometimes sends out a subscription to J. RAS Canada in lieu of observatory publications for exchange purposes. Before opening up the discussion, she asked for a show of hands by those who wished to receive copies of reprints rather than a list; only a few did so. Fishburn commented that responding to requests for reprints is itself quite costly. Matthei said that AAVSO has a large library but no budget for journal subscriptions, so that it welcomes reprints for exchange purposes.

Weigel pointed out that observatory publications (including original contributions, reprints and annual reports) may be fully catalogued and integrated with other serials (including journals). He recognised that it is expensive in effort, but it does have the virtue of consistency and simplifies both retrieval by readers and reshelving by library staff.

Bouton enquired about the extent to which libraries are responsible for the distribution of observatory publications and obtained quite a large (15) affirmative response. Rey-Watson noted that SAO Reports were published at the rate of only one or two each year and the distribution of preprints had been cut back to save money; preprints may be requested by subject area. Primack considered that observatory publications (including preprints) are often sent to university departments rather than to the main university library, and so she would welcome more information about them; she recognised, however, that others felt that such a library should not hold preprints, for example. Knudsen said that the suggestion had been made that a list of editors of observatory publications should be prepared by PAM; it seems clear, however, that the librarian is usually a suitable contact for enquiries about such publications, which often have no single editor.

Marion Schmitz started a lively discussion by enquiring about the value and handling of Ph.D. theses. It was soon established that many libraries do hold such theses and that they are of interest to both staff and visitors; Stevens-Rayburn said that she also tries to obtain the theses of visiting astronomers. Laloë's view that each institution should keep and catalogue the theses of all persons who worked or studied there was generally agreed. Leblanc said that all US theses may be obtained from University Microfilms and his institute has a standing order for microfiche copies; paper copies are only obtained to meet definite requirements; European theses are listed on the INIS database, and are also available on microfiche. Barbara Ford-Foster said that non-US theses can be obtained through the Center for Research Libraries in Chicago, although membership may be required. Buscombe pointed out that theses are listed in AAA.

4.4 The management of astronomical peculiarities

4.41 C. Hutchins: Review. [35] In her brief review of session 3, Carol Hutchins referred first of all to the variety of ways in which librarians deal with preprints and to the need for more information about the policy and practice in countries, such as the USSR and China, that are, at present, unable to produce preprints easily. She noted that reprints are less important now, but she considered that

observatory publications are an indispensable part of any astronomical collection, even though they present problems and their use is difficult to assess.

5. ASTRONOMICAL DATA CENTRES

5.1 Surveys of astronomical data centres

5.11 Introduction. The session on astronomical data centres was held at the Goddard Space Flight Center (GSFC) and the participants were welcomed by Jim Green (Head of the National Space Science Data Center) on behalf of Frank B. McDonald (Associate Director and Chief Scientist), who was unable to attend. It had been intended that Carlos Jaschek would give an introductory review of the activities of the Strasbourg Data Centre (CDS) and of its links with other data centres, but he had been unable to travel to Washington. Although CDS was primarily concerned with star catalogues on magnetic tape, it now includes data on a much wider variety of astronomical objects (but excluding Solar System objects) and the data are also available on microfiche and on-line. Copies of the magnetic tapes are distributed, as a matter of course, to the astronomical data centres at GSFC and the Astrophysical Institute at Potsdam, so that the data are more readily available in North America and Eastern Europe.

The information bulletin that is published twice each year by CDS contains a wide variety of articles about relevant topics, as well as information about its current services. A directory of astronomical data sources has been published by CODATA (Jaschek 1980); it covers data on the Sun and Solar System, but is now rather out of date. The CODATA Newsletter gives information about current activities and publications on data for science and technology; it is available from the CODATA Secretariat, 51 Blvd. de Montmorency, 75016 Paris, France.

5.12 J. Green: The National Space Science Data Center. Green gave a general review of the role and holdings of the NSSDC, which is the largest of NASA's data centres. The data archive covers the Earth and planetary sciences as well as astrophysics and space plasmas; at present it contains, for example, 20 thousand magnetic tapes and 41 thousand microfiche. Information about the data and some key datasets are available on-line through many networks; optical discs are used for on-line data storage. A new astrophysics master directory shows where data are held. The Astronomical Data Center (ADC) cooperates closely with CDS and holds over 500 catalogues; about 30 catalogues will be made available on CD-ROM. The current objectives are: (a) to transfer more data from off-line to on-line status; (b) to complete a data restoration programme for old tapes; (c) to compress the data for both transmission and storage; and (d) to extend the on-line service to full 24-hour coverage.

5.13 Discussion. During the discussion the following points were made by Green and Warren. A manual about the use of the master directory is in preparation; Warren will be the contact for any problems. The catalogues on CD-ROM will be in the form of ASCII files

with FITS headers so that they can be loaded into ordinary computer memory for processing. The Center does not hold raw observational data, although this possibility is under consideration. On-line access from countries that are not linked to any of the scientific networks is possible through the use of public PSS telephone lines.

Ratnatunga enquired whether arrangements could be made with editors of journals to ensure that most catalogues published in journals are made available on machine-readable media from a single data centre. Warren commented that the data centres do contact authors after publication in order to acquire data for archiving and dissemination. There have already been discussions about the possibility of editors sending copies of submitted papers to data centres to check that all objects are designated properly; this would also serve to alert the data centres to papers containing useful data.

5.2 Archiving of observational data

5.21 C. R. Benn: The La Palma data archive. [36] Chris Benn described the procedures that had been developed for the archiving of the digital data that are recorded during observations with the three telescopes on La Palma that are managed by the RGO; much of the software has been written in the Netherlands. The data recorded represents both the received signal and the status of the telescope, of the detector and of weather at the time of observation. The data are copied on La Palma so that the observer can take home a copy for reduction and analysis, while the original is eventually sent to the UK for inclusion in the data archive, which is regarded as a national facility. A catalogue of the observations is compiled by RGO and the observed data are made available for general use after one year. Each observer is expected to identify the objects observed, but a test showed that for about 10% of the entries the objects could not be recognised easily, although they could be deduced from status data (Benn and Martin 1987). An international directory of observations, coupled with access to such data archives, would be of great benefit.

5.22 F. Ochsenbein: The ESO data archive. [37] Francois Ochsenbein explained that the ESO data-archive project is not yet fully tested. The rate of data acquisition is expected to be about 5 to 10 gigabytes per year (GB a⁻¹) per telescope. Optical discs will be used in addition to magnetic tapes and video cassettes for data storage. The general procedures and policy are similar to those for the La Palma archive. An observer may request, in exceptional cases, that the list of observed targets be omitted from the catalogue during the initial 1-year 'proprietary period'.

5.23 C. Imhoff: The IUE data archive. Cathy Imhoff gave a brief introduction to the International Ultraviolet Explorer project since the participants would have the opportunity to see the IUE Control Center on their way to lunch. The IUE data archive has been in existence for much longer than those for ground-based telescopes. In his talk Green mentioned that the IUE archive contains data for 61 thousand images on mass-storage devices. On-line access via SPAN has

led to a large increase in the number of requests for data. A description of part of the IUE archive was given in the poster paper by Barylak et al [38].

5.24 Discussion. Warren commented that archiving the data from ground-based observations is more complex than for spacecraft data since there are usually more instruments that can be used in a variety of ways and conditions. In reply to a question, Benn said that there are no plans to insist on the use of standard designations for objects observed by the La Palma telescopes; the questioner commented that the need for a standard way of identifying the objects observed had already been recognised in the IUE project.

5.3 Access and retrieval

5.31 V. Thomas: SPAN. Valerie Thomas described the Space Physics Analysis Network (SPAN) and how it could be used to obtain access to astronomical data (Green 1988). There are four major nodes in the USA and another in Europe (at ESOC); there are links to other networks and also to Japan, Australia, New Zealand and Chile. Various explanatory documents and a directory are available. Warren said that it is hoped that SPAN will adopt ISO standards so as to increase still further its value to the international astronomical community.

5.32 P. Dubois: SIMBAD. [39 and 40]. Pascal Dubois explained that the SIMBAD database contains at present about 2.5 million (M) identifiers (names) of astronomical objects, 1 M measurements and 0.75 M bibliographic references. The retrieval of references and/or data can be by name, by position, or by some combination of criteria, such as range of magnitude or radial velocity. The ambiguity and multiplicity in the names of objects presents a major complication, although the user need specify only one name. The main database is in Paris and access is possible by PSS or ordinary telephone lines, as well as through various networks. Warren said that a direct link from GSFC to SIMBAD is to be established for the benefit of users in North America.

5.33 B. Jacobs: DAVID. Barry Jacobs explained that the Distributed Access View Integrated Database System (DAVID) will provide a method of joining databases of different formats in such a way that the user can use just one enquiry language and need not be aware of the different characteristics and operating environments of the databases to which he refers. Various layers will be interposed between the database and the "library" of the local area network to which the user has access. The system will be used with the Space Astrophysics Data System and SPAN.

5.34 J. Price: The LC optical-disc project. During the visit to the Library of Congress on July 29, Joe Price, the Head of the Science and Technology Division, gave a brief talk about a pilot project on the use of optical discs for the storage of information. The capacity of a disc is such that it is feasible to store images of the documents rather than bibliographic information about the documents, and 100 discs may be mounted in a "juke box" which allows access to any disc in a few seconds. The user of the system in a reading room of the library can, for example, read almost immediately on the screen of the terminal

the text of a selected paper without having to wait several hours (or even days) for the retrieval of the paper copy of the journal. Tests were also carried out with music, drawings and photographs.

When answering questions, Price said that the results had justified the concept and that equipment for full-scale operation would be ordered once a proper choice of standards could be made. In the long term it may be possible to abandon the storage of the original documents. The system could be used to store optical images, but there would be a considerable loss in resolution.

5.35 Discussion. There was no time for further discussion of these contributions, but the participants then went on a brief tour of the NSSDC facilities; those who attended the IAU General Assembly were able to see demonstrations of the use of SPAN and SIMBAD in the exhibition area.

6. CONSERVATION AND ARCHIVING

6.1 Conservation of books, photographs and instruments

6.11 M. Roosa: The care of books. [41] The contribution by Mark Roosa, of the National Preservation Office in the Library of Congress, began with an audiovisual presentation on the care of ordinary books in libraries. This showed vividly the damage that could be caused, for example, by shelving books too loosely or too tightly and by compressing their spines when making photocopies. He then went on to discuss the special care that should be taken of rare books. Boxes may be used to provide physical protection, but the most important task is to control the environment - light, temperature and humidity - in order to reduce the rate of chemical degradation. When such books are being used they should not be opened fully, but supported on foam pillows or stands; the pages should be held down lightly; and any temporary marker slips should be acid free and should be removed quickly.

The exhibition of books involves extra risk of damage; for example, a display case acts like a greenhouse. A few simple rules are: do not place display cases near radiators or in direct sunlight; do not place lights inside the display cases; avoid fluorescent lights and, if possible, fit UV filters; support open books in cradles; and use narrow bands of polythene to hold pages down.

6.12 J. Dudley: Conservation from the perspective of a librarian. Janet Dudley, who had been Senior Librarian and Archivist at the Royal Greenwich Observatory, illustrated her talk by reference to her experiences at the RGO, which has a very extensive archive of documents, some of which predate the founding of the Observatory in 1675, as well as a collection of rare books. After her appointment she had eventually obtained approval to set up a conservation laboratory and to employ a professional conservation officer and a half-time assistant. (Unfortunately, the recruitment of the assistant was blocked, and so, until recently, the conservation officer had to carry out all the work himself; in the past year or so he has had some occasional untrained help.) A major task has been to improve the

storage conditions of the documents, many of which had been folded and bound in thick volumes, which were kept on open shelves. The documents were separated, unfolded when necessary, and placed flat in boxes made from acid-free materials. The more important documents were cleaned and deacidified, and the most valuable early documents were repaired; the latter task is time-consuming and requires considerable skill and knowledge. Similarly, some of the most valuable books in the collection have been treated, rebound and boxed; the original covers have been kept separately. She mentioned two basic tenets of conservation: the first is never to do anything that is irreversible (e.g., protective backing paper must be removable); and the second is never do anything that obscures or changes the custodial history (e.g., do not bleach the paper to make it look cleaner). Moreover, a detailed record of what has been done should be kept; photographs showing, at least, the initial condition of the document are very useful for this purpose. The RGO archive includes a great deal of photographic material (plates, film and prints), which has been given special attention; for example, the 100-year-long series of photographs of the Sun have been placed in purpose-made protective sleeves, after first copying any data recorded on the original decaying envelopes.

6.13 M. Vargha: The care of obsolete instruments. [42] Magda Vargha, gave a brief history of the library of the Konkoly Observatory from 1635. Although it is traditional for librarians to keep the book collection intact, she pointed out that astronomers do not normally attempt to preserve obsolete instruments. It is sometimes difficult to identify the purpose and/or manner of use of some instruments that have survived. She recommended that librarians should aim to collect records of all the instruments of their observatories in addition to keeping books about instruments.

In this context it is appropriate to draw attention to the following resolution (IAU 1966):

The International Astronomical Union requests all concerned to save from damage or destruction astronomical instruments of historical interest: these are considered to be important documents in the history of science. Where it is not possible to preserve such instruments in situ, directors of observatories and others are requested to do everything possible to ensure that they are preserved in museums.

6.14 Discussion. Shobbrook asked for advice on the control of 'silver fish' (an insect found in books and mouldy places), which had reached the AAO library in the books purchased from the Radcliffe Observatory (UK/South Africa). Roosa advised against seeking help from a local pest-control officer who might rush in with a spray that would affect the people in the rest of an air-conditioned building; careful consideration is needed. The Yale Library froze infested volumes to kill such insects. Kitt warned against putting books and document boxes directly on the floor; they should be placed on slatted boards to allow the circulation of air and to reduce the risk of accidental water

damage. Dudley suggested that all librarians should make 'disaster plans'; for example, to find a local refrigeration plant that would take books or documents that had been soaked by water from fire hoses.

Worley had used many old volumes when gathering data for a large astronomical database and had found that many of the pages were brittle and that even careful use had caused much damage. Moreover, the leather bindings were often in poor condition, and he wondered what could be done to preserve them. Roosa suggested that they be boxed or wrapped in polyester but rebinding might be necessary. Dudley suggested that cleaning and dressing the leather would be beneficial.

Corbin confirmed that astronomers are careless of obsolete instruments and gave examples of past dumping by the U. S. Naval Observatory; on one occasion a curator from the Smithsonian Institution had been alerted and he had rescued them from the dump truck. She urged librarians to endeavour to ensure that important instruments are preserved.

6.2 The archiving of correspondence and other unpublished documents

6.21 J. Dudley: General problems of the archiving of astronomical records. Janet Dudley reviewed the principal problems that arise in archiving the unpublished records of the activities of an astronomical institution; she hoped that her comments, although based on the situation in England, would be widely applicable. There is a great variety in the type of documents and other forms of records that are generated in the administration of the activities and in the scientific work that leads to the published papers. The administrative papers may be organised in a systematic way, but there is often little control over the filing of the papers of individual astronomers, who may regard them as personal property. In selecting which records should be kept and which may be destroyed it is necessary to bear in mind that some records may prove to be valuable for research purposes which are quite different from those for which they were produced. Nevertheless, a balance must be struck between the risks of destroying worthwhile records and the costs of storage and conservation of worthless records. The retention of records should not be left to chance, but a regular review and appraisal procedure should be adopted. She summarized the criteria for selection and guidance on procedures that are discussed in her paper (Dudley 1989).

6.22 S. Débarbat and A.-M. Motais de Narbonne: Correspondence, unpublished papers and data. [43, 44] Suzanne Débarbat and Anne-Marie Motais de Narbonne presented jointly their views of the importance of the preservation of correspondence and other unpublished documents that are generated in the course of astronomical research. Their comments confirmed and complemented those by Dudley, and were illustrated by some examples of the value, and difficulties of use, of old documents in the archives of the Paris Observatory. Finally, Narbonne suggested that a joint working group on archives should be set up by IAU Commissions 5 and 41.

6.23 Discussion. During the brief moment that remained for discussion before lunch, Vargha put forward the view that the best way to preserve old documents is to publish them; in that form they are then available to many persons. [Editor's comment: the enormous volume of such material would make publication in book form prohibitively expensive, although copies of important collections are sometimes available on microfilm. The main problem today is how to ensure that an adequate record of current activities is available to the researchers of the future.]

6.3 Maintaining the historical record

Brenda Corbin [45] gave an overview of the sessions on conservation and archiving. She sought an indication of views about the suggestion that a joint working group of Commissions 5 and 41 should be established to draw up guidelines for use in the selection of material for archiving; a show of hands indicated a wide measure of agreement on this point. She emphasised that conservation is relevant to institutions that have only modern material as well as to those with historical collections. She considered that optical discs would supersede microfilm as a way of making back-up copies of unique material and of ensuring that journals will continue to be available (Corbin 1988b), but she hoped that the U. S. Naval Observatory would continue to keep its paper copies!

7. OTHER LIBRARY ACTIVITIES

7.1 Library administration: the role of astronomers

7.11 The views of the Panel. A panel of three members, namely William Buscombe, Marek Krosniak and Marek Wolf, had been invited to open a discussion on the role of astronomers in the administration of libraries. Owing to a misunderstanding, none of them had been educated as a librarian, and all three took the viewpoint of an astronomer. Buscombe spoke as the user of a large university library in which the selection and processing of the astronomical collection was done by persons who were not familiar with the subject, and he drew attention to some of the problems that arise in such a situation even when astronomers were consulted; there were often no astronomers on the library committee. Krosniak considered that it is not sufficient for astronomers to serve in an advisory capacity on a library committee. He argued that it is easier for an astronomer to pick up librarianship than for a librarian to pick up astronomy, although he did accept that librarians should be recognised as full members of the astronomical community. Wolf considered that only an astronomer can choose what to buy, can introduce new terminology correctly and can teach young astronomers about the holdings of the library.

7.12 Discussion. Corbin was the first professional librarian to speak. She pointed out that most astronomical libraries have committees composed of astronomers who choose books for the collection, but who sometimes cannot agree on the choice. Wilkins spoke as an astronomer who had seen how much time was wasted by astronomers on such

committees; he had been asked to take on the administrative responsibility for the RGO library but he had pressed for the appointment of an experienced, professional librarian. Such a person has a deeper knowledge of library techniques and resources (such as reference books) and a broader view of the role of the library, and can make decisions about book and journal acquisitions after appropriate informal consultations with members of the user community, which is likely to include engineers and other specialists. April Love also disputed the view that astronomers know best about collection development; many astronomers take a very narrow view that is greatly affected by their own research interests. She gave an example of a well-known astronomer who had objected strenuously to the purchase of books on the history of astronomy for a university library even though there was a degree course on the history of science on the campus.

7.2 Use of computers in libraries

7/21 E. Sachtschal: Use of computers in small libraries. [46] Edith Sachtschal described the ways in which a computer is used for the ESO library. There are separate databases for preprints and observatory publications and for periodicals. A wide variety of lists can be generated and the printed output is produced using LATEX software; renewal letters can be produced in three languages.

7.22 S. Stevens-Rayburn: Use of computers to improve library services. [47] Sarah Stevens-Rayburn gave examples of the wide range of uses of computers at the Space Telescope Science Institute. The database covers all the holdings of the library including books, and the system can provide statistical information as a selection aid. The library is strongly dependent on the computer system, but microfiche and listings are kept for back-up purposes when the computer is down or overloaded.

7.23 Wang Ya-hong: Computer system of the Shaanxi Observatory. [48] Wang Ya-hong described briefly the computer system for library management and information retrieval that had been developed at the Shaanxi Astronomical Observatory. It runs on IBM personal computers and consists of subsystems that cover a very wide range of purposes. It is expected that it will be adopted in many institutes of the Chinese Academy of Sciences.

7.24 P.-H. Dale: A proposal for cooperation between libraries. [49] Paul-Henri Dale drew attention to a library software package that had been developed jointly by universities in Dortmund and Leuven, and he suggested that a sub-group of astronomical libraries should be formed within the existing users group for this software.

7.25 Discussion. Wilkins said he had seen the Shaanxi system in operation and he had been impressed by its facilities; Chinese characters could be displayed and printed. Li said that it is planned to include the abstracts of Chinese papers in the system. There was, unfortunately, then no time for further discussion of these contributions but later Wilkins suggested that more use should be made of diskettes (floppy discs) and CD-ROMs for making information available to institutions that do not have easy access to international

computer networks. He gave as examples the availability of diskettes that are more than equivalent to the Astronomical Almanac and of CD-ROMs that replace bulky volumes of abstracts in other disciplines. The poster paper by Robyn Shobbrook [50] provides an example of the conversion of a library-card catalogue to computer files that can be transferred on tape to other remote sites or accessed from remote terminals.

7.3 Support of remote observatories

7.31 E. Bouton: Report on group meetings. Ellen Bouton reported briefly on the discussions about the support of remote observatories that had been held during the evening of July 28. Very great differences in size, distance and facilities had been found; there were many differences in the procedures for dealing with, for example, the ordering of books and journals. A common problem was that the headquarters librarian has responsibility but not control, and it is difficult to ensure that someone at the remote site does take care of the day-to-day operations of the library.

7.32 Discussion. Many of the points raised during the lengthy discussion have been mentioned in the accompanying paper by Bouton and Gómez [51]. Shobbrook emphasised the value of providing a guide to the resources at the remote site; this should include such details as the location of copying facilities. This is particularly important if the resources are split between several buildings since funding is rarely sufficient for more than one copy. She carries out a stocktaking every two years and has been pleased to find that the losses from the remote site are much less than those from the headquarters library. Knudsen and Lastovica considered that astronomers could help themselves by giving more thought in advance to their likely needs for information as well as for equipment. Quick and reliable transport of materials is a common need, but sometimes this is vitiated by the lack of appropriate support and procedures at the remote site to ensure that the materials are made available immediately after receipt. Warren put the view of an astronomer that the journal collection at the remote site should be for reference only, and that microfiche are adequate. Some of the budget should be used to provide background reading for cloudy nights, but the remote site should not be used as a dump for surplus stock. In some cases, recreational reading should be provided for families as well as staff; Wilkins mentioned that Janet Dudley used to go beyond the call of duty by sending to La Palma video tapes of popular television programmes.

7.4 Resource sharing and cooperative activities

7.41 E. Lastovica: Introduction to the panel discussion. [52] Ethleen Lastovica introduced the panel discussion on resource sharing by pointing out that this is the essential theme of the conference, but that the discussion should concentrate on how help could be provided to institutions that were in the greatest need.

7.42 B. Gertner: The exchange of duplicates. [53] Barbara Gertner stressed the importance of the exchange of duplicates for small libraries in countries such as Poland whose currency is not convertible. She recognised that the exchange is often not equivalent and she noted that there had been a dramatic fall in the number of lists of duplicates which she received. She hoped that the personal contacts made at the Colloquium would prove to be very useful.

7.43 M. Vargha: Another view of the exchange of duplicates. Magda Vargha said that although she came from a similar country she had a different opinion of the value of the circulation of lists of duplicates. She felt that this was expensive and often useless since only a few items are of interest. Instead she suggested that one organisation should act as a clearing house for both offers and wants. She too saw great value in personal contacts.

7.44 J. Davies: Resource sharing in a local community. [54] Jenny Davies explained that her prepared contribution was concerned with resource sharing within the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and other organisations in Australia, such as the Anglo-Australia Observatory. She had been surprised to find out how extensive the cooperative arrangements were, and she felt it was time to extend them internationally.

7.45 A.-M. Motaïs de Narbonne: Information sharing. [55] Anne-Marie Motaïs de Narbonne considered that it is more important to share information than documents. Every library, however small, has local information that could be of interest to others, and the spreading of electronic mail and telefax offers the opportunity to set up an international information-exchange programme.

7.46 Discussion. Sachtschal opened the discussion by drawing attention to the possibility of obtaining back runs of journals from retired astronomers and to the risk that import duties might be payable even for gifts. Bouton volunteered to act as a clearing house for lists of duplicates. Knudsen said that she would send a copy of the next SLA/PAM Newsletter to all registered participants. Ilyas reminded participants of the book donation programme of the Third World Academy in Trieste (to which attention had been drawn in IAU Commission 5 Newsletter No.3); he considered that a network of contact points should be set up, but it was pointed out that the participants in the Colloquium could serve this purpose. The poster paper by Huang Bi-kun [56] discusses the importance of the exchange of serials and other publications for the Chinese astronomical society. In response to a request by Davies for a list of organisations distributing material to developing countries, Fishburn drew attention to a recent letter in Nature about the Australian programme for collecting surplus books and journals for distribution to tertiary institutions in South-East Asia and the Pacific (Watters 1988). Corbin felt that the discussion confirmed the need for an international union list of the holdings of astronomy libraries. Van Atta pointed out that material that is sent should be properly wrapped since empty envelopes are of little value.

Wilkins said that resource sharing would be the main topic of a joint meeting of Commissions 5 and 46 at the IAU General Assembly (IAU5 1989).

7.5 Miscellaneous contributions

7.51 J. Price: Library of Congress. During the afternoon visit to the Library of Congress on July 29, John Price, the Deputy Head of the Science and Technology Division spoke about its work and resources. The Division holds about 3.5 million scientific books, 7.5 million reports and 60 thousand serials; there is also scientific material in other divisions. The Science Reading Room is open to the public and is in the John Adams Building. The Division issues 'Tracer Bullets' on a wide variety of topics to provide leading references to the literature. Special projects undertaken by the Division include: the bibliography on Comet Halley, which was prepared by Ruth Freitag (who acted as treasurer for the Colloquium), and for which the addendum now outnumbers the original; a bibliography on 'cold regions', and the Antarctic in particular; and the book 'The Tradition of Science' by Leonard Bruno (LC, 1987). The Division holds complete sets of the standards of ISO, USA (ANSI), USSR and China. In answer to questions, he and Joe Price (the Head of the Division) gave further information as follows: the Division has 6 reference librarians (although the nominal complement is 9); rare scientific books are kept by the Rare Book Division; the Division aims to keep one copy of every scientific 'book' (except for clinical medicine and technical agriculture), including, for example, all the reports issued by NASA; if a loan request cannot be met from stock, an attempt will be made to obtain a copy, but if necessary other services (for example, the British Library Document Supply Centre) will be approached; and the publisher of a book must supply a copy to Library of Congress if copyright in the USA is claimed or registered.

7.52 G. A. Wilkins: The role of IAU Commission 5. George Wilkins opened the review and forward-look session on July 30 by giving his views on the future role of IAU Commission 5, of which he is the President. He first of all explained that Commission 5 differs from most other commissions in that it is regarded as an advisory sub-committee of the IAU Executive Committee and membership of it is not counted against the rule that a person shall not be a member of more than three Commissions; moreover, the President serves two 3-year terms, not one as is usual. Most, but not all, of the technical activities of the Commission are carried out by working groups, whose members need not be members of the Commission, although they often become members. The working groups on astronomical data and on designations are likely to continue as at present; the group on classification and information retrieval will need to include the development of the thesaurus of astronomical terms, while the group on abstracting guidelines ought to be replaced by a revised group on editorial policy whose members would be involved in the improvement of the Style Manual. This Colloquium has shown clearly that we need to devise some way of developing the contacts and ideas that have been generated here and, in particular, Commission 5 should become more actively concerned with library affairs; this will probably be best

achieved by establishing close links with the Physics-Astronomy-Mathematics Division of the Special Libraries Association (SLA/PAM). It also appears that the Commission should be involved in the development of guidelines for archiving, but this would need to be done in cooperation with Commission 41 on the history of astronomy. It has also been suggested that the Commission might be the appropriate place for a working group on such topics as electronic-mail and the exchange of computer software. He saw a busy and productive 3-year period ahead; he hoped to continue to produce the Newsletter and he requested that more items for inclusion be sent to him by members and others interested in the activities of the Commission.

7.53 J. W. Weigel: The organisation of activities. Jack Weigel spoke briefly on points that had arisen during session 6, of which he had been chairman. He considered that the general view was that astronomy libraries should be run by professional librarians, rather than by part-time astronomers, although the enthusiasm and knowledge of interested astronomers should be harnessed. It is clear that many libraries of eastern Europe, Asia and other continents still depend heavily on the exchange of publications and duplicates, and more needs to be done to facilitate this process. Both IAU Commission 5 and SLA/PAM are relevant to the task of extending the cooperation between libraries. He recommended that librarians from countries other than those in North America should get involved in PAM, which should develop links with the astronomers in Commission 5.

7.54 Discussion. Pauline DiGioia suggested that one way by which the 'haves' could assist the 'have-nots' would be for each 'have' to 'adopt' one of the 'have-nots'. Astronomers in the former could be encouraged to make available surplus material that could be offered to the latter, who would know that they could turn to the former for advice and assistance. [Subsequently, Marlene Cummins, of the University of Toronto, offered to help to organise such adoptions; any librarian who is interested in giving or seeking help is invited to write to her.] Janet Mattei expressed the wish that more astronomers had been present at the Colloquium to see and hear the evidence of the devotion of astronomy librarians to their work and of their concern to help others. She went on to say that she had used the INSPEC database and had found ten references to 'softstrip'; she felt that this new technique could revolutionize the activities at AAVSO and elsewhere.

Wilkins welcomed Weigel's recommendation that more librarians should join PAM, and he suggested that consideration should be given to holding regional meetings outside North America; it would be fruitful to hold a meeting in Europe, for example. Rey-Watson drew attention to the SAO poster paper [60] on documentation for computer software; she hoped that the collection would be kept up-to-date, and that material could be made available on loan. Finally, Kulkarni said he had been disappointed that there had been no discussion of user education, which he felt to be very important, particularly as computer-aided instruction (CAI) techniques are now available. He suggested that this topic be considered at a separate session at the next meeting.

7.6 The future of astronomy libraries

7.61 P. Molholt: The future of astronomy libraries. [57] Judy Bausch introduced Pat Molholt; she referred to her long-term membership of PAM and to her past presidencies of both PAM and SLA; although she began her career in an astronomy library, she is now carrying out research on artificial intelligence. In her stimulating address, Molholt indicated the ways in which she considered that new technology and the application of artificial-intelligence (AI) techniques will change still further the role of the library and of the librarian. More information will be available in electronic form and expert systems will be able to assist the enquirer to find wanted information directly. (Current systems usually provide information about where the required information might be found.) There will be less personal contacts between the users and the librarians, who will be designing systems and organising knowledge,. To conclude her address she showed a video giving a vision of a future in which a computer (with aural and oral facilities) is able to organise the social life of a university lecturer as well as to assist him in the preparation of a lecture. She admitted, however, that as yet computers do not have the power to understand and use natural language in such an advanced way, nor to pull together many different kinds of information to produce new results.

7.62 Discussion. Westerhout thanked Molholt for her scholarly and challenging talk and then opened a general discussion by asking whether such fast retrieval of information could be expected. Molholt felt that such speeds would be achieved on a timescale of 15 to 20 years. Garrison expressed his concern at the way in which the high costs of the new facilities are 'locking out' those groups who cannot afford them, or who for political reasons cannot obtain them. He instanced the use of electronic mail which is not available to many major astronomical centres so that the astronomers concerned cannot participate actively in the affairs of the Commission of which he is president. He feared that the gulf would become much wider unless the problem is addressed now. Dudley wondered whether the human mind could keep up with the new systems, but Molholt felt that there be a corresponding development in aptitude for working in an electronic environment.

Stern enquired about how electronic publications would be paid for when there are no paper copies to buy. Molholt admitted that economics will be a real problem, but already it is necessary to pay for access to bibliographic databases; she then referred to the problems of rewarding the creators of the information and of copyright in the new environment. Weigel wondered who will be responsible for archiving the information on a permanent basis when the current databases are commercialised; Molholt admitted that there is no agency in the USA that has this responsibility, although she felt that some European countries are better organised. Buscombe had the further concern that the system could be destroyed almost 'at the flick of a switch' with a result that would be comparable to the burning of the library at Alexandria by Justianian. On that sombre note the session was closed.

8. CONCLUSIONS

8.1 Other papers. Some of the poster papers and other material that were made available at the Colloquium do not fit easily under any of the headings used in this report of the proceedings and so they have been included in part 8. They cover such topics as the history of information exchange in astronomy [58], the identification of research in progress [59], notes on activities in particular countries or institutions [60-63], and a summary of the responses to the questionnaire about astronomy libraries [64].

8.2 Actions to follow. The presentations and discussions during the Colloquium were clearly of great benefit to those who took part; they provided information about current activities and ideas that could be followed up by individuals on return to their home institutions. Some of the discussions showed the need for further cooperative action, either within the information-service community or within the wider astronomical community represented by the IAU. The following list of such actions is given to serve as a check list for consideration in SLA/PAM, in IAU Commission 5 and at the next appropriate international conference.

Section Action

- 2.2 Improve international distribution of publications
- 3.13 Revise UDC classification for astronomy (52)
- 3.14 Complete development of the thesaurus of astronomical terms
- 3.33 Construct international union list of astronomy serials
- 3.35 Simplify and encourage use of e-mail for information exchange
- 4.14 Develop an international system for listing of preprints
- 4.22 Provide guidance on the storage of photographic records
- 4.3 Encourage the better distribution of observatory publications
- 6.12 Provide guidance on the conservation of books and documents
- 6.13 Encourage the preservation and documentation of obsolete astronomical instruments of historical interest
- 6.22 Set up a joint working group with IAU Commission 41 to provide guidance on the selection of unpublished documents for archival purposes.
- 7.52 Encourage wider membership of SLA/PAM and set up link with IAU Commission 5
- 7.54 Set up a programme in which the 'haves' provide advice and assistance to the 'have-nots'

Many of the matters were discussed again during the IAU General Assembly at Baltimore at Joint Discussion 1 (Wilkins 1989) and in the meetings of Commission 5 (IAU5 1989). In some cases it was decided to set up new working groups in Commission 5, but for others no formal procedures have yet been established. Much has still to be done!

8.3 Acknowledgements. I am grateful to all the participants who provided notes on their questions and comments, and to Ellen Bouton and her assistants, who collected, sorted and listed the notes. I would also like to thank Ellen and Janet Dudley, who themselves took notes for me during the discussions, Sarah Stevens-Rayburn, who pointed out errors in my draft of this report, and Annette Hedges, who has turned my initial rough drafts into a polished typescript.

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PART 2. PUBLICATION AND ACQUISITION OF BOOKS AND JOURNALS

THE FUTURE OF ASTRONOMICAL LITERATURE

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I. INTRODUCTION

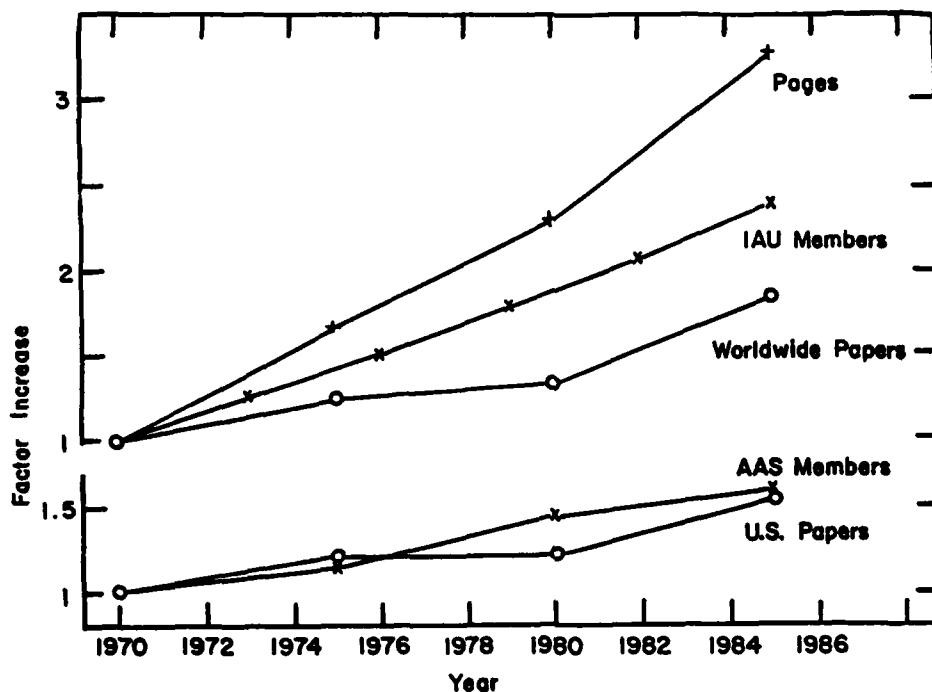
This is a historic occasion for astronomical librarians because, in many cases, this is your first opportunity to meet each other in person and to discuss mutual problems. Astronomical librarians have always been more internationally minded than most librarians and people, because you are used to exchanging literature with even the most distant observatories and countries, independent of political and transportation barriers. However, some of the problems that you now face cannot be solved alone, so we meet partly to cooperate in finding solutions. This meeting was also planned to learn what is being done in new technologies and information retrieval so that we will become aware of current and coming opportunities and changes.

A college president was once asked what are the greatest problems that he faced. Without hesitation he said "Salaries for the faculty, parking for the students, and football for the alumni!" So what are the greatest problems for astronomical libraries? As I see them, they are (1) our journals and books are growing so rapidly that most libraries have run out of shelf space, (2) the costs of those journals and books are growing faster than most library budgets, and (3) we wonder about the coming technologies, and how our library will change in coming years. Therefore I would like to discuss these three problems of space, costs, and future technologies with regard to journals and other publications.

II. SPACE

Many, but not all, journals are growing at exponential rates with doubling times as short as about 10 years. Most libraries cannot expand that fast. What is to be done? Will this growth rate continue indefinitely? If so, how can journals fit onto the shelves?

First let us look at the current growth rate and what drives it. The first graph shows data for the interval 1970 to 1985. At the bottom are the numbers of American astronomical papers and



monographs as listed in Astronomy and Astrophysics Abstracts; they have grown from 2923 papers in 1970 to 4527 papers in 1985, an increase of 55%. But during that time the number of members of the American Astronomical Society grew by 60%. So in general, the number of papers published is proportional to the number of astronomers, or the average number of papers published per astronomer is constant. I do not see a leveling off in the number of professional astronomers, so you can expect a continued increase in the size of our literature.

If we look at the worldwide astronomical literature, we see a parallel growth until about 1980 and then a more rapid growth; all the papers listed in Astronomy and Astrophysics Abstracts grew from 7772 in 1970 to 14302 in 1985, an increase of 84%. But during that time the number of IAU members increased by 139%. Evidently the IAU is accepting more people who are not frequent publishers of research papers. But we see that the number of worldwide papers is increasing steadily because of increasing numbers of astronomers. Again there is no evidence in sight of a leveling or decrease of astronomers, so the literature will continue to increase.

But you librarians are not concerned with numbers of papers, but rather with numbers of pages published. That is increasing even faster than the number of astronomers because the papers are increasing in length. The top curve shows the data for the Ap.J., A.J., and PASP combined, and shows an exponential increase with a doubling in 9.3 years. So that is the problem faced by your librarians. Some of this is diminished by journals growing taller, not just fatter, and printing more words per page, but the number of cubic meters of journals is growing at an exponential rate.

Why are papers getting longer? I do not know for sure. Astronomical papers were constant in content from 1900 to World War II but since then they have grown from an average of three pages to 11 pages, normalized to 1000-word contents. I hope that it is because authors can now do much more with their data with their new computer and detector technology and increased astrophysical capabilities. Also the accumulation of knowledge requires more intercomparisons of results. I do not see this trend changing.

I see three solutions to the space problem. One is to share collections. If two astronomical libraries exist in the same city, they can split between them some of the journal subscriptions that they need. Or through electronic mail the needed papers can be transmitted quickly from one city to another, so libraries no longer have to be as complete as before. Second, a solution that the physics librarians are looking forward to is having journals produced on compact disks, such as CD-ROMs. They propose subscribing to both paper and compact disk forms, and then throwing away the paper editions after about two years. A third solution is to have most or all libraries connected to a central memory bank. Then to read, or make a copy of, a given paper, one needs only to know the 30- or 40- digit code to find it in the memory. Undoubtedly at some future time most or all of the scientific literature of the world will be available in a central memory bank. Then the astronomical librarians will have to decide what part they wish to keep on their shelves and what part to access by computer. I suspect that the choice will be determined by cost or usage. For those journals and books used frequently, it may be cheaper to buy them on compact disk. For those used rarely, it may be cheaper to connect with the central memory bank.

Compact disks are cheap; a \$15 CD can store as much material as a cubic meter of printed material. But the costs of journals involve funding the whole editorial, typesetting, and printing operation. Compact disks may save only the paper costs, which are typically 5% of the total production costs. Therefore compact disk subscriptions will not be significantly cheaper than paper editions.

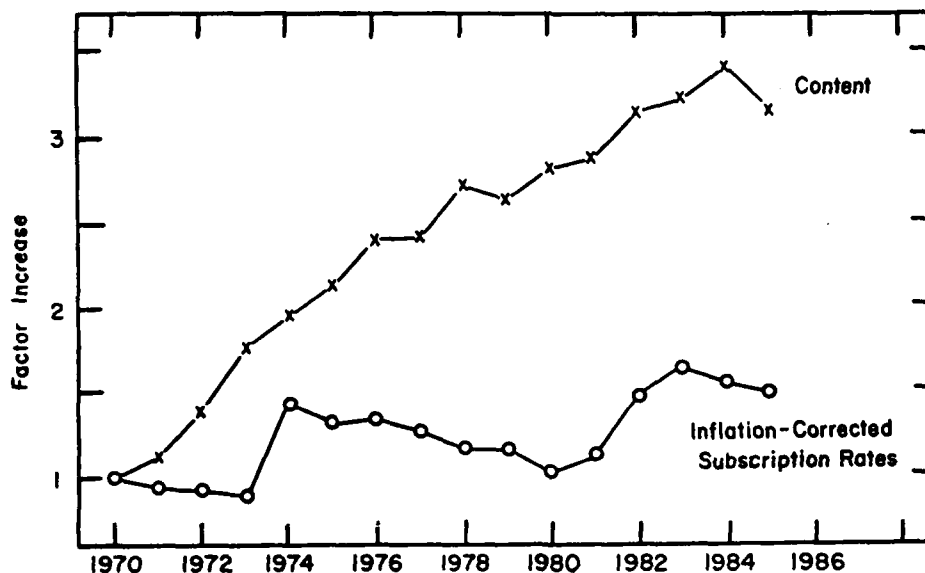
One thing that I do not recommend is intermediate or dead-end solutions. For instance, we started publishing the *Astrophysical Journal* on microfiche because I thought that librarians would welcome the large reduction in shelf space. We found that essentially no libraries subscribe to the microfiche edition because, I am told, the microfiche sheets "walk out of the libraries." Will compact disks walk out of libraries? They probably contain so much material that it will be worthwhile devising a security system for them. Microfilm is too slow for access to be practical.

What we learn from this discussion of space is: do not expect journals to grow smaller and do not expect a relief until we have journals on compact disks or by access to a central memory bank of literature. In the meantime, share collections.

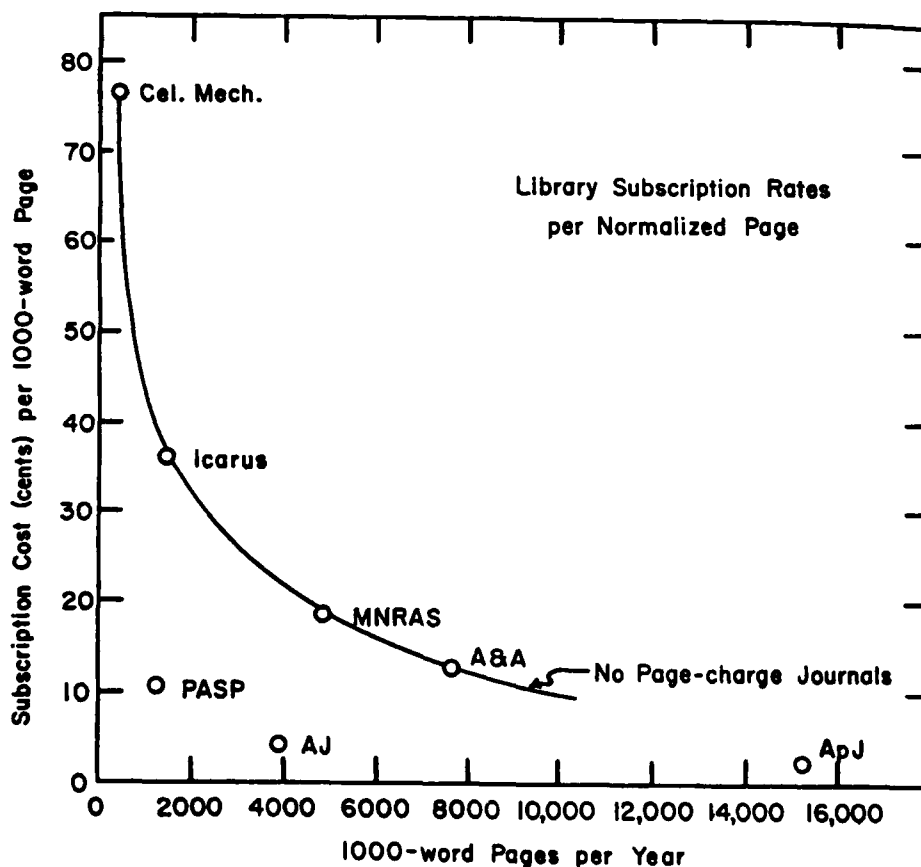
III. COSTS

Why are journal costs increasing by about 16% per year, which is faster than most library budgets are increasing, and what can librarians do about that?

The next graph shows, at the bottom, the library subscription rates, corrected for inflation, for the *Astrophysical Journal*. We see that the rate has increased by only 55% in 15 years, or an average of 3% per year. At the top is the relative Journal content, normalized to 1000-word pages; it has grown by more than a factor of 3. What has happened is that improvements in technology have nearly paid for the increased content. Those improvements include computerized typesetting, competitive bidding, larger printing presses, and the most efficient page size for the presses. If your journal expenditures are growing more rapidly than 3% per year, it is due mainly to inflation, adverse money exchange rates, and the proliferation of small expensive journals. Secondary factors are increasing numbers of journals, inefficient production techniques, and profit taking.



The next graph shows the library subscription costs for various astronomical journals. The costs are expressed as cents per page of 1000 words content. At the bottom are the journal contents in 1000-word pages per year. We see two things. First, for the journals with no page charges, there is a simple inverse relation between cost and size. It is such that if you double the journal content, the cost per page is divided by two. You could have guessed that because the subscription rates are roughly the same for all these journals, namely between \$350 and \$1000 per year, but the contents range over a factor of 20. This relation tells you that small journals are inefficient and that you get much more for your money in the large general journals. Of course individual astronomers like small specialty journals because they are interested in a larger fraction of the papers contained. But individuals do not pay for the production of the journals. They pay only for the paper, printing, and mailing of their own copies, while the libraries pay in addition for all of the editorial and composition costs. So to save your budgets, campaign against small inefficient journals.



Let me give an example. Celestial Mechanics and the Astrophysical Journal had nearly identical subscription rates in 1987 of \$349 and \$375, respectively. If all the Celestial Mechanics papers were put into the Ap.J., the subscriptions rates for the Ap.J. would not change, the Celestial Mechanics papers would be published in half the time, individuals and libraries subscribing to only one of these journals would pay the same amount for the combined material, but libraries subscribing to both journals would save 50%.

The other thing shown by this graph is that the journals charging page charges are cheaper by a factor of about 4. That occurs because they tend to receive 2/3 of their income from page charges and, as non-profit journals, they do not have the 30% profit that commercial publishers strive to attain.

The system of page charges is such that the organizations that publish the most papers pay a much larger share of the costs of producing the journals than the organizations that publish very few papers. For instance, Harvard, Goddard Space Flight Center, Colorado, Caltech, and Arizona each pay more than \$50,000 per year to support the Ap.J. while small organizations publishing only one or two papers per year pay \$1000-\$2000. Yet ironically it is the small organizations that resent the system of page charges and would prefer that all the income come from subscription costs, which means that all organizations pay the same amount.

What we conclude from this discussion of costs is (1) hope for further improvements in technology, (2) favor the larger journals as the more efficient method of publication, and (3) campaign against the subdivision of journals and small specialty journals.

IV. FUTURE TECHNOLOGY

Looking first at the distant future, I can guess what journals will be like. The reviewing process will probably be similar to the present one except that most transmissions between authors, editors, and referees will be by electronic mail and will progress much quicker. Then once a paper is acceptable scientifically, it will still go to the publisher for editing and composition. But because papers will be in a computer-readable form, the editing, composition, and input from the authors should take less than 10 days. Once that has been achieved, the paper will be placed into the central memory bank and all readers can read it on their computer screens. Journals will not consist of issues of several dozen papers published at regular intervals, but will rather be a continuing sequence of papers to which are added new papers as they are processed. A reader will ask his computer what has been added in, for instance, the previous week; he will be given the list and allowed to read the papers that he wishes to see. I am not sure how journals will charge the readers - perhaps by annual fees or by the number of times they are called.

But that long-term goal cannot be attained immediately because (1) most papers are not submitted in a computer-readable form using the same software, (2) readers are not connected to a central memory bank, and (3) that central memory bank does not yet exist.

The intermediate system may be journals like the present ones but available on compact disks and paper. A difficult question to answer is whether most readers will be willing to read papers on computer screens or on paper copies that are computer printouts. The reluctance of most astronomers to use microfiche suggests that the current generations, at least, may not adapt. But the possibility of producing hard copies does not involve expensive equipment and can be a backup.

On a short-term basis let us look at current developments. I am glad to report that the editors of the three largest astronomical journals met in Paris in May and came to tentative agreements for similar requirements of authors in 20 areas. For instance, why should authors have to remember, or program their word processors to remember, that some journals use Roman numerals for table numbers and others use Arabic numbers? Or some use capital letters for section headings while others use decimal numbers? The editors even tentatively agreed on using short abbreviations for astronomical journals to save journal space and authors' time in writing papers. The aim is not to make all journals look alike, but rather to minimize the differing requirements of authors.

Another current development is the increased use of electronic mail for communications. About 10% of our referee reports now come by electronic mail and three-quarters are done on word processors.

A third current development is the submission of manuscripts on diskettes or computer-readable form. Some physics journals have been accepting those for several years and may be at the point that those manuscripts are cheaper to process. Astronomical journals are starting to experiment. The main difficulty is that there are many software systems (Tex, MATHOR, TROFF, etc.) and we are waiting to see which dominates. Because typesetting constitutes about one-third of the journal expenses, there is potentially a similar saving in journal costs.

Finally, this meeting will discuss at length the progress that has been made in the indexing of papers and the retrieval of information about papers and astronomical objects. For 15 years the Astrophysical Journal has been placing the appropriate subject headings directly on the published papers so (1) the compilation of annual and five-year indexes can proceed continuously, using only clerical help, and (2) readers will become used to where those papers will be indexed. But much more is now being done, such as the system developed by Dr. Avrett of on-line computer access of titles and abstracts of papers accepted or published recently by several journals; the data centers in Strasbourg and Goddard to provide computer-readable catalogs, sources of information, and to sort out duplicate designations of astronomical objects; the abstracting services of Astronomy and

Astrophysics Abstracts and similar services in the other sciences; the SPIN network and other search systems, plus the Institute for Scientific Information's Science Citation Indexes and other services to locate information. Without these important tools, we waste time in duplication and fail to realize relevant facts. We will learn much at this meeting about all these services.

To summarize this discussion of future technologies, I see changes occurring nearly monthly in the direction of common styles requirements of authors, computer-readable manuscripts, and greatly improved data retrieval sources. At some future date most or all of our journal reading may be via computers.

I close with the question whether our libraries will gradually change from having neat shelves of books and friendly librarians who add more books and maintain order, to a roomful of computer terminals and an expert on how to retrieve information from them?

Thank you for listening and I wish you an enjoyable and informative meeting!

JOURNAL COSTS: JOURNAL PUBLISHING AS PART OF A SOCIETY'S OPERATIONS

Dr. Peter B. Boyce
American Astronomical Society

I. Summary

Scientific Societies have a broad range of goals, all aimed at advancing their area of science. Journal publishing is but one important task of a society. Subscription prices are normally set within the broad context of all the society's programs. By using a normalization procedure it is possible to evaluate the relative costs and effectiveness of journals. Normalized costs to libraries of scientific journals vary by nearly 100-fold. In general, society published journals are very cost effective. In particular, the AAS journals rank among the leaders in terms of cost and effectiveness.

II. Goals of a Scientific Society

Scientific societies generally have been established for the purpose of advancing a particular branch of science. In response to this broad overall purpose, most scientific societies have set up a number of diverse programs designed to achieve various specific goals in support of their particular science. In general, the foremost goal of a society is to promote the communication of research results among the practitioners in the field. At present this is normally done by organizing scientific meetings and by publishing scientific journals. It is important to differentiate between the dissemination of research results, which is the goal, and the publication of journals, which, at present is the most effective way to achieve that goal. However, the time may come when journal publication, as it is now done, will no longer be the preferred way to inform one's colleagues about recent advances in the field.

A society which is narrowly focussed on dissemination of research results will not be effective in today's research environment. Other goals, and the programs to achieve them, are important. For instance, as most other societies do, the American Astronomical Society has a number of additional goals. These include providing information to the membership to keep them up to date on recent developments (AAS Newsletter), making communication with colleagues easier (AAS Membership Directory), providing centralized job services (AAS Job Register and Job Placement Centers), providing funds for research expenses (AAS Small Research Grant and International Travel Grant Programs), fostering excellence through a series of awards (Russell Lectureship and other awards), encouraging science education (Astronomer for a Day Program for high school teachers) and astronomy education (Shapley Visiting Lecture Program), and, finally, promoting an awareness of the science of astronomy among the public and within the federal government.

Above all, in order for a society to be effective, it must remain solvent and it must maintain a strong and active membership. Although scientific societies are committed to the highest intellectual activities, they must, in the end, operate in a businesslike manner. This includes making sufficient money from their income-producing activities to finance the important non-income programs and to keep the reserves at a prudent level. It is the task of the governing body of the society to evaluate the programs and the sources of income and balance the worth of each program against the prices needed in the form of dues, subscriptions and other charges to support the society's programs.

III. Integrating Journals into a Society's Financial Structure

An effective scientific journal must maintain scientific integrity and archival quality while at the same time reaching a broad audience. The pricing structure of the journal has to be integrated into the

overall goals, needs and programs of the society. How this is done varies from one society to another. Some societies use income from journals to finance their other programs, thus keeping their dues low and encouraging the growth of a large membership and enhancing the overall effectiveness of the society. On the other hand, the AAS keeps the journal finances separate from other society programs and prices the journals at a level which is anticipated to be sufficient to cover the expenses and maintain the reserve funds of the journals. This keeps the price of the subscriptions low, but puts a burden on the members who pay higher dues than most other similar societies.

IV. Measuring the Effectiveness of Journals

The sharply rising cost of scientific journals has become an item of concern, both within the library community and among societies, whose members are dependent upon those same research libraries. As described by Helmut Abt in this volume, there are several causes. More papers are being published, and journals are getting larger. The cost of journal production continues to rise, although substantial efforts to use new technology have kept this increase to a minimum. The number of subscriptions shows a small, steady decline. Fewer subscribers must pay for a total growing cost. Finally, the page charges have been reduced, or even eliminated, in many journals, forcing the subscribers to pick up a larger percentage of the total production cost.

Whatever the causes, libraries are being forced to prune their lists of journals. In making these choices it is important to consider more than the price of the subscription. Barschall (1) has argued that journal formats show a wide variation in the number of pages per volume and the number of characters per page. He computes a normalized cost, the cost to libraries per 1000 characters, and argues that this is the cost which should be considered in assessing the value of a publication. The results of applying Barschall's technique to astronomical journals is given in Figure 1 for the ten least expensive astronomy journals. There is a wide range in the normalized library subscription cost. For instance, the cost to libraries of the Astrophysical Journal is about five times cheaper than Astronomy and Astrophysics and ten times cheaper than Icarus. There are several other journals which are even more expensive.

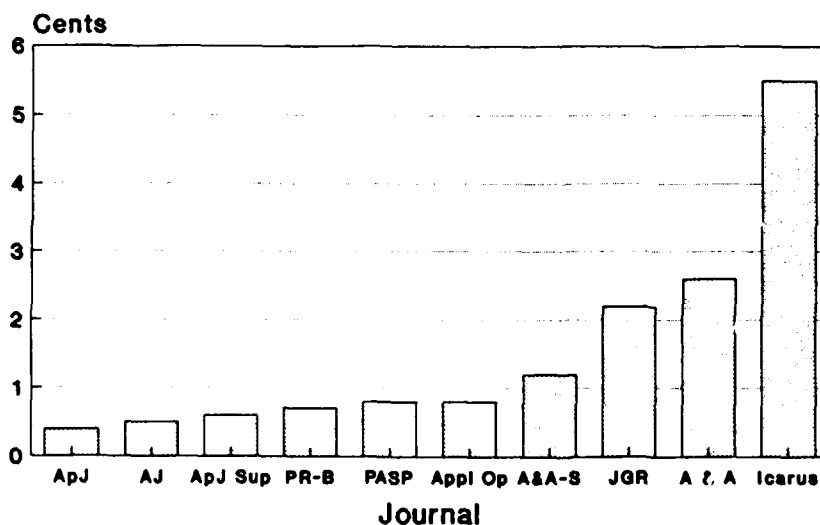


Figure 1: Cost of Journals to Libraries in Cents per 1000 characters (1985)
Data collected by Peter B. Boyce

In this comparison, the society journals have an advantage because they often charge the authors for manuscript preparation on a per page basis. Nevertheless, as pointed out by Barschall (1), the correction for this effect is small in comparison to the range of prices exhibited. For the *Astrophysical Journal*, which derives just over one-half its income from page charges to authors, the normalized cost to libraries would double or, at most, triple if no page charges were levied. The five-fold and ten-fold differences which occur can not be explained by differences in page charge policy.

However, the real value of a publication can not just be measured by the purchase cost. The importance and use of the contents must be factored in. Barschall has recently (2) expanded his study to include the number of citations which he combines with the cost to give a normalized cost/impact ratio. Barschall tabulates the cost/impact ratio for the publications of a number of societies. As shown in Figure 2, the publications of the AAS, taken as a whole, are the most effective of any surveyed by Barschall.

V. Conclusion

The publication of Journals is but one segment of a society's services to its membership and the scientific community it represents. Pricing strategies vary from publisher to publisher. In the case of the scientific societies, the goal is to achieve an overall program which will most effectively advance the field of science. Societies are aware of the budgetary pressures on research libraries and are working to minimize subscription costs while still maintaining sufficient income to cover the cost of publication. The success of the cost containment efforts of the AAS are evident in the low cost per character and low cost per citation reported here and in other recent studies.

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2. Henry H. Barschall, *Physics Today*, 41, 56, 1988

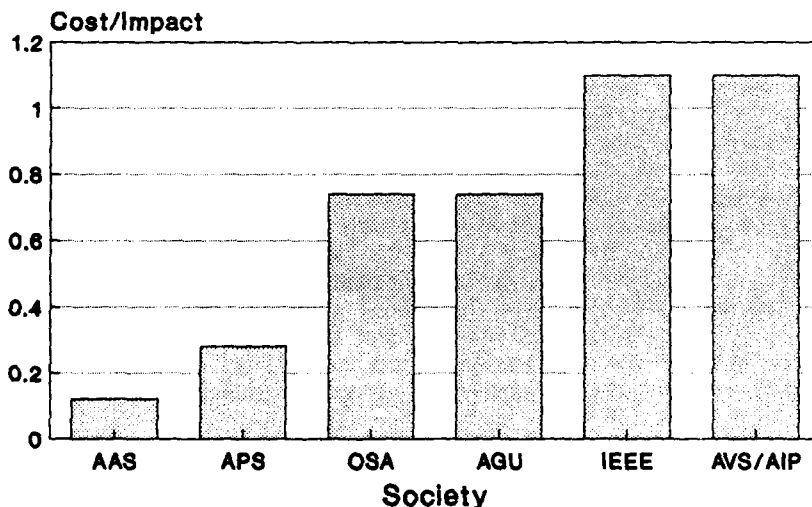


Figure 2: Average Cost/Impact Ratio: A comparison of Societies
Data from Barschall (2)

ASTRONOMICAL LITERATURE ACQUISITIONS IN THE U.S.S.R.

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ABSTRACT. Ideas are presented relating to the problems encountered by astronomical libraries in the Soviet Union.

To begin with, I would like to note that scientific libraries in the Soviet Union are generally found to be those which belong to the system of scientific institutions. These include the U.S.S.R. Academy of Sciences, the Academies of Sciences of the Soviet Republics, etc. The scientific libraries are subordinate to their corresponding academies and ministries, and use their own channels to exchange scientific literature with institutions of other countries.

One of the most authoritative and well-known libraries in the Soviet Union is the Lenin Library in Moscow. It is under the jurisdiction of the U.S.S.R. Ministry of Culture and provides services for anyone wishing to use it. The U.S.S.R. State Committee for Science and Technology also has its own library which is called the Main Scientific and Technical Library and is also situated in Moscow. This library collects information about all the books and journals on science and technology available at other Soviet libraries and provides this information on request.

In Leningrad there is the Main Library within the system of the U.S.S.R. Academy of Sciences. It has two branches in Moscow: the Library of Natural Sciences of the U.S.S.R. Academy of Sciences and the Library of Social Sciences of the U.S.S.R. Academy of Sciences. The All-Union Institute of Scientific and Technical Information, within the system of the U.S.S.R. Academy of Sciences, and the U.S.S.R. State Committee for Science and Technology analyses the world's scientific literature and publishes journals of abstracts in all branches of science and technology.

These, as well as the large university libraries, have facilities permitting the selection of necessary books and papers, and subscriptions to periodicals. They can copy materials on readers' requests, including microfiche, microfilm, etc.

The libraries of the U.S.S.R. Academy of Sciences provide assistance in funding the libraries of observatories and institutions of the

U.S.S.R. Academy of Sciences at their request.

A similar system obtains at the libraries of the Academies of Sciences of the Soviet Republics and of the U.S.S.R. Ministry of Higher Education. Moscow State University Library performs these functions.

Now about the way in which libraries are funded. Naturally, there are no difficulties in automatic subscription for Soviet books and periodicals. There is also an automated international system of a summary catalogue of the editions of socialist countries. With the help of this system, Soviet libraries allocate funds for the purchase of scientific literature published in socialist countries.

As for foreign literature, there are two ways to obtain it: by purchase or by exchange. The large libraries listed above and practically all libraries of the astronomical observatories and institutes have a small foreign currency appropriation with which to purchase foreign literature. But this amount is so small that, as a rule, there is only enough to subscribe to a few principal astronomical journals. For this reason the international book exchange is very important. I would like to illustrate this importance with a few figures. The Lenin Library exchanges editions with 3290 organizations from 116 countries, including 23 astronomical organizations in 21 countries. The State Public Scientific and Technical Library deals with 1000 exchange partners from 70 countries, half of them capitalist countries.

In the Soviet Union 129 organizations participate in book exchange. The database of the State Public Scientific and Technical Library stores all information about book exchanges of Soviet Libraries. This information is used to create exchange lists for distribution worldwide. In this connection, institutions and observatories that publish monographs, journals and proceedings have the advantage over those which do not publish. For example, the Astronomical Council of the U.S.S.R. Academy of Sciences publishes five titles and distributes them among approximately 300 institutions worldwide, receiving in exchange 12 periodicals from 6 countries, for a total value of about \$1500.00US. Between 1000 and 1500 items are received annually from 80 foreign observatories and astronomical institutions. Thus the total value of periodicals received by the Astronomical Council of the U.S.S.R. Academy of Sciences on the exchange basis is approximately equal to the value of the items purchased with foreign currency.

In the Ministry of Higher Education, the Moscow State University Library has coordinated the book exchange program since 1854. The Sternberg Astronomical Institute and the libraries of 60 institutes of higher education exchange books on their own. As in the system of the U.S.S.R. Academy of Sciences, relatively low allocations of foreign currency are made for subscriptions to the main journals. For example, the Sternberg Astronomical Institute subscribes to 11 journals, at a total cost of \$3000US per year, while as little as \$200US is left for the purchase of monographs. Thus the book exchange is vital to us.

Moscow State University exchanges books with 85 libraries of 57 universities in the U.S. In the system of the U.S.S.R. Academy of Sciences, 6 libraries exchange with 26 American observatories. The staffs of these libraries have asked me to thank these exchange partners, especially the Library of Congress. For any library which might be interested in participating in the book exchange program, I have information about the titles which the Lenin Library, the Moscow University Library, the Astronomical Council Library, etc. exchange, as well as a list of titles desired.

As has been seen, it is most difficult for astronomy/astrophysics libraries to purchase books, especially as the agency Mezhniga sells Soviet books in many countries without buying foreign editions, depriving our libraries the opportunity to exchange. Therefore I ask the directors of the libraries represented here today to implement a direct book exchange program with Soviet observatories through the Library of Natural Sciences in Moscow. This library could undertake to inform observatories and institutes wishing to exchange books with Soviet institutions about astronomy books to be published in the U.S.S.R. as well as informing them of the titles desired by our observatory libraries. Those wishing to carry out this activity may contact either me or the Library of Natural Sciences in Moscow. There is also the alternative of exchanging publications directly between libraries. Advance information about the several astronomical titles published annually by the Astronomical Council of the U.S.S.R. Academy of Sciences is available to any library requesting it; information is also available from us on the titles we desire to receive.

I would like to discuss our interlibrary loan system. To find a needed book, central libraries use the automated Summary Catalogue of foreign serials, the database of the Institute of Scientific and Technical Information (and others), as well as the databases of other countries. They also photocopy paper and copy microfiche and microfilm editions. During 1987, libraries of institutions of the U.S.S.R. Academy of Sciences sent out 1200 requests to 223 libraries of 34 countries, 1000 of them to 10 libraries of socialist countries and 1100 to 200 libraries of capitalist countries. In response, they received 765 items, most of them from the U.S.A. (especially from the Library of Congress), Great Britain, the Netherlands, and the Federal Republic of Germany.

During the same year about 1500 requests from 64 libraries of 19 countries were received. Of these requests, 14% were for Soviet literature; the rest of them were for foreign literature. Most of the requests were from socialist countries (Bulgaria, Cuba, Romania). The ratio of requests received to literature distributed is 1:17 for the socialist countries and 33:1 for the capitalist countries. The majority of requests from socialist countries (80%) were for foreign publications. All this indicates a low representation of foreign literature in Soviet and socialist libraries. Our libraries also have difficulty

buying interlibrary loan request forms because of the acute shortage of foreign currency.

Finally I would like to address one more question which is closely associated with the difficulty of obtaining Western scientific literature. Many of you may know that the General Catalogue of Variable Stars is published by the Astronomical Council of the U.S.S.R. Academy of Sciences, and the Supplements to the Catalogue of Clusters and Associations (by Ruprecht, Balazs and White) are published in collaboration with astronomers in Czechoslovakia and the German Democratic Republic. Both of these catalogues are compiled based on the analysis of newly published data, for the lack of which the work becomes all too complicated. I would like to ask your advice on how best to solve this problem. Shall we ask observatories to send reprints of papers and information about other publications of scientists on these topics to the Astronomical Council, or are there any other ways to overcome the lack of timely data?

Thank you for your consideration.

DIFFICULTIES FOR WESTERN NATIONS IN OBTAINING PUBLICATIONS FROM OTHER NATIONS

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1. PROBLEMS

For science librarians in the developed nations of the West, the difficulties of obtaining publications from other parts of the world seem to center around two interconnected factors: the number of copies printed of each publication and the availability of timely information about publication plans. For example, as quite a few people in today's audience are aware, many advanced research publications from the Soviet Union are issued in relatively small quantities. As a result, libraries in the West must often order Soviet books in advance of publication in order to have a reasonable chance of obtaining them. By the time a specific title from the Soviet Union gets listed in the national bibliography, Knizhnaia letopis', copies are no longer available for purchase. With respect to periodicals, the limited number of copies has an effect both on new orders and on claims. An order to initiate a subscription must be submitted several months in advance of the first issue of the volume which is to start fulfillment of the subscription. Otherwise one or more issues will be missed; only those issues actually published after the subscription has taken effect will be received by the subscribing library. After a subscription is firmly established, there is always a possibility that a particular issue may not be received by the subscriber. Libraries in the West are accustomed to sending in a claim for each missing issue, but this is seldom effective in the instance of Soviet periodicals, since few (if any) extra copies are printed.

Given the small size of the print runs, it obviously would be very useful for would-be purchasers to obtain information on forthcoming books and new periodicals as early as possible. Many Soviet books are indeed listed in Novye Knigi and other catalogs far in advance of publication, but the listings are not inclusive of all publications. Furthermore, the availability of Novye Knigi and other bibliographic tools is not equal for all astronomical libraries. Those libraries attached to university library systems will experience relatively little difficulty in obtaining the vital information, but this is much more of a problem for

observatory libraries which lack direct contact with specialists in non-Western languages and publications. Thus it is a common experience for librarians in the West to learn of a relatively new Soviet publication only after it has become effectively out-of-print.

(Although these comments have used the Soviet Union as an example, the same difficulties with limited printings and belated publication information occur in a number of other nations as well.)

2. SOLUTIONS

Happily, the cited problems occur less often in the field of astronomy than in some other subject areas. Much astronomical literature is distributed on an exchange basis; this assures the rapid dissemination of new publications automatically by the issuing agencies. Exchange agreements are especially valuable because they may be expanded beyond their original scope. If a library maintains exchange relations with libraries abroad, it is often possible to ask the exchange partner to search for a particularly needed title; or, lacking the availability of a title in the original paper format, to microfilm a copy for the requesting library. The latter expedient is useful both for filling gaps in one's serial collection and also for acquiring the texts of monographs which have been printed in very small quantities. However, not all observatories and universities with interests in astronomy have publications of their own to use as exchange material. Furthermore, even in astronomy some publications must be obtained by purchase.

Several large countries in the West do have vendors who specialize in publications from eastern Europe or from other parts of the non-Western world. On occasion a much-desired publication will turn out to be available from the back stock of one of these vendors, but this is very difficult to predict. Even if specialist vendors are used, it is still very advantageous to submit orders well in advance of the publication date of the wanted items.

Another possibility might be an increase in the exchange of timely information among astronomers and astronomy librarians. Advanced information about details on certain publications, such as the International Astronomical Union's *Symposia and Colloquia*, are published in each issue of the I.A.U.'s Information Bulletin. It might be interesting to explore the benefits of publishing data in the Information Bulletin about other astronomical materials--those books and new periodicals that are most likely to be "elusive" and difficult to obtain outside their country of origin.

PROBLEMS OF INTERNATIONAL ACQUISITIONS

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ABSTRACT. Both problems and solutions are included in a contribution to a panel discussion on the free (and not so free) flow of astronomy/astrophysics publications across political boundaries.

1. INTRODUCTION

There has always been the need to obtain all kinds of foreign books, periodical publications, bulletins, irregular publications from other astronomical observatories and from commercial publishers, but the difficulty of acquiring foreign materials adds innumerable obstacles to the job of some of the serials librarians. Factors contributing to the problem are:

- (a) Required evidence of advance payment before an import/export license is issued (e.g., the ESO Atlas).
- (b) Postal system problems: delays (sometimes for months) due to strikes; loss of parcels.
- (c) Breakdowns of communications between countries.
- (d) Payment problems: we can only transfer a certain amount of currency abroad. (Unofficial information has reached me just recently that this restriction may be lifted in the near future.)

2. BOOKS

In spite of these difficulties, it is possible to obtain library materials in our field, chiefly through agreements with dealers and publishers. Agreements are sometimes made with the publishers, but they often could be made with a dealer. Purchasing plans are numerous, but of these only a few are relevant to our branch of science.

There are several ways of obtaining astronomy/astrophysics books, such as: the standing order (for I.A.U. Symposia, Colloquia, etc.), selection of titles from catalogs, or selection from "on approval" shipments. The last possibility may be the best choice for those with tight budget restrictions, since one can evaluate the books personally

before committing funds, and return those books for which there is less need.

3. PERIODICALS

Periodical publications are one of the most important tools for specific researchers, who want to see everything published in their fields. Lack of funds and the escalating cost of periodical subscriptions makes it impossible to acquire even those titles which the researchers consider the most necessary. Don't give up the ship! Everyone is having these problems.

Thanks to centralized ordering, we have had fewer problems since 1974, when the University of Cordoba (through its Administration Department) began purchasing periodicals for all its libraries from one single dealer. As a small highly specialized library, with a small budget, we are careful to order only those journals most in demand. A priority number is given to each journal title. If funds are cut, the title list is also cut, from the lowest priority number.

Through central ordering the University of Cordoba renews the subscriptions several months in advance. Some titles run from January to December, and others from July to June. The irregular journals need special handling. The Observatory library is able to choose its dealer, but in fact, no one agency or dealer is able to give completely satisfactory service in all phases of acquisitions.

Some titles can only be obtained through the society which publishes them. As a result of all of these factors, it would be necessary to maintain contacts with three or four sources, and yet be prepared to make individual purchases beyond these sources.

Experience has shown that in any change of subscription status, there always occur gaps and duplications, and sometimes dealers are uninterested in servicing titles which are difficult to locate or hard to keep current. This is especially true of titles which are published in a different place each year or by different sponsoring institutions: irregular publications of conferences, university publications, international conferences, symposia, colloquia, congresses, etc.

4. EXCHANGE

An effective way of obtaining current material is through exchange. Fortunately we exchange publications with most of the world's astronomical observatories, and in this way have sometimes been able to complete our collections of proceedings of conferences, symposia, etc.

FOREIGN ASTRONOMICAL LITERATURE ACQUISITIONS IN CHINA

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ABSTRACT. Foreign astronomical literature acquisition in China is accomplished in two ways: (1) by exchange of publications between China and foreign countries, and (2) by purchase of foreign publications.

1. EXCHANGE

So far as I know, all the observatories in China have been sending their publications abroad. In return, they have received many kinds of foreign astronomical publications: annual reports, special publications, reprints and preprints, proceedings, books, and a few periodicals and other publications.

Some of them are very useful to Chinese astronomers and can only be obtained through exchange; therefore we think that this is a very important source for acquiring foreign astronomical publications for Chinese astronomers.

In recent years some Chinese editors have been exchanging their journals directly with foreign editors. I think that this is a reasonable way to obtain foreign astronomical literature. Chinese editors and foreign editors could arrange an exchange agreement on the basis of equality and mutual benefit.

Some observatories, such as the Zo-Se Observatory and the Purple Mountain Observatory, were established many years ago. These two observatories have been receiving a great variety of foreign publications while other observatories might not be as well supplied, since their history is not as long. It is worth mentioning that Ms. Huang Bikun, of the Purple Mountain Observatory, and Ms. Zhou Shuqun, of the Shanghai Observatory, have made great efforts towards encouraging international exchange of astronomical literature.

At Shanghai Observatory, we have been sending our publication ANNALS OF THE ZO-SE OBSERVATORY abroad since 1966. From 1979 onwards we have also been distributing both the ANNALS OF THE SHANGHAI OBSERVATORY and special publications such as the TIME SERVICE ANNUAL REPORT. Meanwhile we have received many publications from foreign countries, and we are grateful for their cooperation.

Of course, I know that Chinese publications are very difficult for a foreign astronomer to read. This is a problem yet to be solved. I think that more and more Chinese publications should be published in English, if it is at all possible to do so. Since 1987 the PUBLICATIONS OF THE BEIJING OBSERVATORY has been published in English.

2. PURCHASE

I must point out here that the usual way to get foreign publications is to purchase them indirectly.

All the observatories and many universities in China have been subscribing to foreign astronomical periodicals from the China National Publications Import and Export Corporation. At present there are more than 100 astronomical periodicals which can be ordered from CNPIEC. These periodicals are published in 19 different countries, a fact which sometimes contributes to a delay in their being received in China. Chinese astronomers working at one observatory can borrow publications from other observatories or university libraries. Such resource sharing is important in every country.

3. HOPE

We hope that preprints will become increasingly available to all observatories. This is a challenge which will require cooperation from many sides; the solution is not obvious at present. I will be very pleased if this conference produces some useful techniques to solve the problems associated with this need. Chinese periodicals have almost no preprint distribution, since our research publishing funds are very limited and the printing facilities are not the most modern. We hope that foreign publishers and observatories will understand our situation and will not hesitate to give us your opinions and suggestions.

THE ASTRONOMICAL PUBLICATIONS IN CHINA

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1. INTRODUCTION

At present there are three different kinds of astronomical publications in China: journals, observatory publications and special publications.

Four journals are issued regularly: *Acta Astronomica Sinica*, *Acta Astrophysica Sinica*, *Progress in Astronomy* and *Astronomy Amateur*. There are five observatory publications available: Publications of Beijing Astronomical Observatory, Publications of Purple Mountain Observatory, Publications of Shannxi Astronomical Observatory, Publications of Yunnan Astronomical Observatory and Annals of Shanghai Observatory, Academia Sinica. Also several special publications have been published regularly, i. e. Chinese Solar-Geophysical Data (CSGD), Monthly Solar Activity, Time and Frequency Services Bulletin, Time Service Annual Report, etc.

Most of these publications were established after the late 1970's, except *Acta Astronomica Sinica* and *Astronomy Amateur*. This shows, from one side, that Chinese astronomy has been making rapid progress since then.

Of course, Chinese astronomers may contribute their papers to general journals, such as *Scientia Sinica*, *Science Bulletin* and *Chinese Journal of Space Science*, etc. The 292 papers published (1973-1987) in these three journals are about 10% of the total number of papers in the above astronomical publications.

In the second section, the three kinds of astronomical publications are described, and a statistical summary of 2965 papers published in the past 35 years (1953-1987) is given.

In the final section, the future of astronomical publications in China is presented briefly.

2. PUBLICATIONS

The formal names of publications, the date of establishment, the numbers of papers and the editors of publications are given in Tables 1, 2, 3. A statistical summary of papers published in 1953-1987 is given in Fig. 1. These data have been collected from journals and observatory publications as well as three general journals: Scientia Sinica, Science Bulletin and Chinese Journal of Space Science.

It is obvious that more than 300 papers have been published annually in these publications during 1984-1987. This number is ten times as large as in the 1950's. A gap appears in Fig. 1 for the period of 1967-1971. Although the statistical data may be incomplete, we are sure that it shows the rapid growth in Chinese astronomy during the past decade.

Table 1. Journals (up to 1987)

Formal Name	Date of Establishment	Regular Intervals	Total Issues	Papers	Editors
1. Acta Astronomica Sinica	1953	quarterly*	71*	>843*	The Chinese Astronomical Society
2. Acta Astrophysica Sinica	1981	quarterly	28	~260	The Editorial Staff
3. Progress in Astronomy	1983	quarterly	18	300	The Editorial Board
4. Astronomy Amateur	1965**	monthly	153	-	The Editorial Staff

*Two issues per year before 1979; not including its supplements and those papers in the supplements; it ceased publication in 1967-1973

**It ceased publication in 1968-1978.

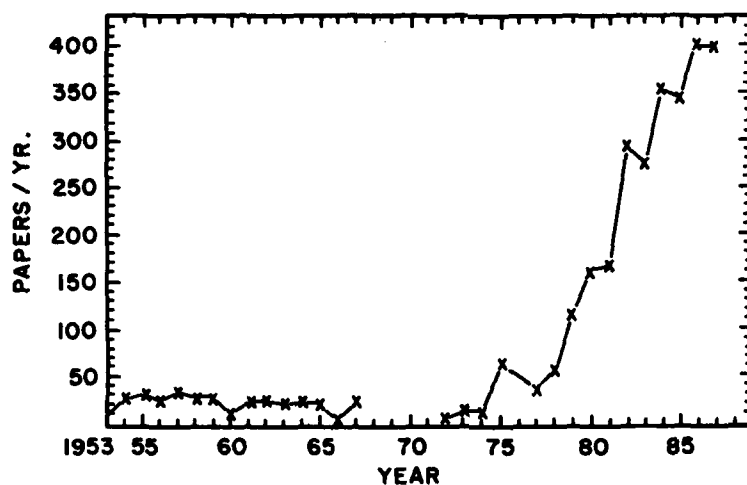


Fig. 1. A statistical summary of 2965 papers published in 1953-87. These data have been collected from 12 publications: 4 journals, 5 observatory publications and 3 general journals.

Table 2. Observatory Publications (up to 1987)

Formal Name	Estab- lishment	Inter- vals	Total Issues	Papers	Editors
1. Publications of Beijing Astronomical Observatory	1972	irreg- ularly		>258	Beijing Astro- nomical Obser- vatory
2. Publications of Purple Mountain Observatory	1982	quar- terly	24	194	The Editorial Committee
3. Publications of Shaanxi Astronomical Observatory	1978	irreg- ularly	14	>168	The Editorial Committee
4. Publications of Yunnan Astronomical Observatory	1977	semi- annual- ly	25	351	The Editorial Committee
5. Annals of Shanghai Observatory, Academia Sinica	1979*	annual- ly	9	299	The Editorial Committee

*Before 1966, the formal name was Annals of Zô-Sè Observatory. It ceased publications in 1967-1978.

Table 3. Special Publications (up to 1987)

Formal Name	Establishment	Regular Intervals	Total Issues	Editors
1. Chinese Solar-Geophysical Data (CSGD)	1971	monthly		Editorial Group of CSGD, Beijing Astronomical Observatory**
2. Monthly Solar Activity	1981	monthly	84	Solar Physics Division Yunnan Astronomical Observatory
3. Time Service Annual Report*	1973	annually	15	First Division, Shanghai Observatory
4. Time and Frequency Services Bulletin	1979	monthly	99	Shaanxi Astronomical Observatory
5. Atomic Time Bulletin	1979	monthly	102	Time and Frequency Division, Shanghai Observatory
6. Chinese Astronomy Abstracts (CAA)	1987	quarterly		Editorial Board of CAA, Beijing Astronomical Observatory

*After 1984, the formal name is Annual Report (ERP).

**Purple Mountain Observatory, Yunnan Observatory and Beijing Geomagnetic Observatory also do some of the editorial work.

3. FUTURE

At present, most of the publications mentioned above are published in Chinese, which is very difficult for foreign astronomers to read. Therefore we believe that more and more publications should be published in English if it is possible to do so. It is worth pointing out that Dr. T. Kiang established the English-language Chinese Astronomy* in 1977, and since then a great number of papers published in *Acta Astronomica Sinica* and *Acta Astrophysica Sinica* have been translated into English. This journal promotes communication between astronomers of China and other countries. All Chinese astronomers are very grateful to him for his hard work. In the near future, we must pay great attention to the modernization of the printing process, especially to micro-computer controlled phototypesetting systems, for the purpose of speeding up the publication of Chinese astronomical papers.

Finally I am very thankful to all observatory editors for offering me many copies of their publications. Without their help I would not have been able to finish this work.

*After 1981: Chinese Astronomy and Astrophysics

PART 3. SEARCHING FOR ASTRONOMICAL INFORMATION

WORDS FOR SEARCHING - KEY WORDS

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ABSTRACT. The importance of key words for information retrieval processes in astronomical bibliographies and data bases is stressed. Construction principles of astronomical vocabularies are discussed with special regard to the practice at 'Astronomy and Astrophysics Abstracts'.

I. INTRODUCTION

Astronomy and astrophysics are for some reasons unique cases in the framework of the exact sciences. Astronomers only can observe their research objects and cannot handle them in a laboratory. Most astronomical observations cannot be repeated so that all results must be preserved permanently. For an astronomer, the passage of time makes a repetition of an observation impossible. Therefore, the need for a somewhat condensed schedule of the entire astronomical literature throughout the world was already recognized in the early 18th century.

The need for a suitable indexing system arises from the large number of documents in the field of astronomy and astrophysics. Actually, we are faced with more than 20,000 papers, books, reports and other documents in these areas (see Fig. 1). The growth rate (Davoust and Schmadel, 1987) is very roughly proportional to the time and it seems from our counts that the material published doubles every 15 to 20 years. In the 19 years from 1969 to 1987 'Astronomy and Astrophysics Abstracts' abstracted and indexed more than 300,000 documents which were produced by more than 600,000 authors.

The question arises how one can find a special document or - more precisely - a selection of papers with similar characteristics out of this huge bulk of material. It is obviously very easy to pick up a certain paper with given bibliographic standard informations. The situation changes completely, however, if one is interested to find out all documents with one or more 'common' features. For this purpose one has to assign some characteristic indexing terms to a document which describes a certain facet of the scientific content. By means of these indexing terms it will be possible to do a single-minded retrieval work.

The use of proper key words greatly facilitates this task.

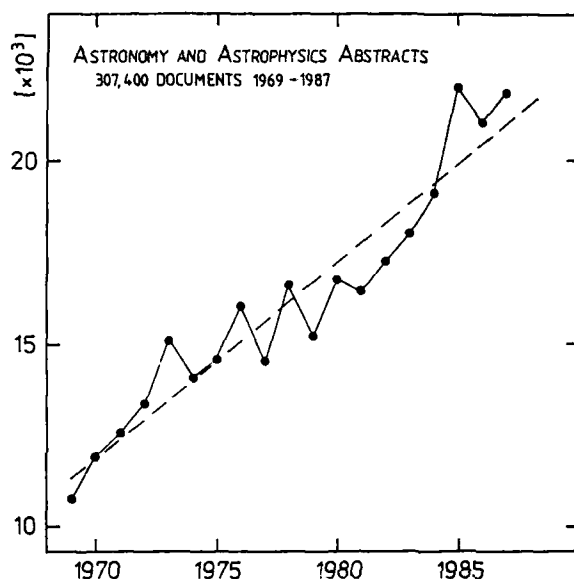


Fig. 1: Trend of the publishing activity of astronomers

II. CLASSICAL BIBLIOGRAPHIC ITEMS

A simple query for reference purposes could be accomplished by the exploitation of some standard bibliographic items (Schmadel, 1985): title of the document, name(s) of the author(s), or a precise source declaration. It is easily possible to find any document on the bases of formatted fields which is defined by means of these parameters. It is, however, impossible to compile a 'package' of documents with one or more scientific aspects in this way. For this purpose one has to apply a higher query level (Adorf and Busch, 1987) by using certain descriptive characteristics of a paper. We have three possibilities to realize this.

The construction of subdivisions to the entire material according to scientific principles - classificatory key words - establishes only a very coarse break down. 'Astronomy and Astrophysics Abstracts' provide more than 100 categories for classification aims. The attachment of a publication to only one category, however, is a difficult undertaking and it is - by no means - a well-defined procedure with unique results. A retrieval which is only based on these classificatory key words undoubtedly will yield too many references. The extensive use of cross

references to further categories concerning some different aspects of a document is necessary to limit the query result.

If a paper deals with a special astronomical 'object' and if we mention the object designation in our list of indexing terms, then we are easily able to retrieve the paper. This procedure, however, will only yield the desired result if one uses a 'standardized' form of object designations. We all know about the numerous difficulties in the designation area with the danger of acronym confusions and even with the detrimental effects of purely spelling differences. A retrieval by means of object designations is, of course, impossible in all cases of purely theoretical papers. Under these circumstances there only exists the possibility of looking for certain phrases or descriptors which characteristically should appear in a paper dealing with a special field of knowledge.

We focus here on the construction of key words or free descriptors as a central resource for retrieval purposes and we comment on some problems involved.

III. PRINCIPLES AND PROBLEMS

The assignment of key words to a given document will allow to consider a lot of diverse aspects. This procedure, however, strongly depends on the availability of a sufficient number of descriptors. Furthermore, a vocabulary of astronomical terms has to be widely accepted by the astronomical community. Based on our experience in the classification and indexing area at 'Astronomy and Astrophysics Abstracts' we introduced a list of free descriptors some ten years ago. It was our aim to compile a descriptor framework which should also serve as a first approximation of an astronomical thesaurus, i.e. a hierarchical list of relevant terms. The number of entries of such a key word list is an important supposition for the dissemination and world-wide acceptance. We found from a detailed analysis of the subject index entries in our AAA volumes that only about 1,500 descriptors will be sufficient to characterize all important aspects of an astronomical document. It has also been shown that the use of single key words is in many cases not adequate to describe a given fact precisely.

The descriptors can be roughly divided into three main categories:

- (1) descriptors for classes of objects (c.f. the terms 'Minor Planets', 'Delta Cephei Stars', 'Spiral Galaxies',
- (2) key words, describing attributes or properties of celestial objects such as 'Masses', 'Diameters', 'Rotation', or 'Chemical Composition',
- (3) very general descriptors like 'Models' or 'Formation' and very specialized ones (c.f. 'Kirkwood Gaps' or 'FK5 System'). Beyond that we find in this third class descriptors for methods (c.f. 'VLB Interferometry') or astronomical instruments (c.f. 'Bolometers' or 'Ritchey-Chretien-Telescopes'). This is a rather heterogeneous category.

Our counts have revealed that the great majority of key words is composed of members from the first two categories. This means that the connection of an object class with a special property yields a fairly good description of an aspect of the content of a paper.

It is important to notice that we preferably use pairs of key words which, mathematically spoken, means the application of the Boolean AND connection. Let us study an example: The key word 'Orbits', for instance, is a fairly general descriptor which can be attributed to a large variety of astronomical objects ranging from the planets over binary stars to, say, galaxies in clusters. A retrieval using only the term 'Orbits' therefore will yield a large number of papers with completely different scientific aims. Only the addition of a second explaining key word will limit the retrieval target area. If we combine, for instance, the term 'Orbits' with the term 'Minor Planets' then we have a good description of the fact that the document in question deals with problems of dynamical astronomy in the solar system. This combination procedure yields the result that we are able to describe the most important facets of a paper with only a few such key word pairs. At AAA we usually limit ourselves to the assignment of not more than five pairs. We demonstrated by test runs that this method is sufficient for a single-minded literature search.

Actually, we use at AAA a vocabulary of 2,343 single-term items. Bearing the unwished dispersion effects of very general as well as of very specific terms in mind, we have flagged these components in our vocabulary. This means that these signed descriptors do not appear as entries in the AAA subject indexes.

Some difficulties in the construction of key word lists should be summarized briefly. One problem is given by the use of plurals as well as singulars for the same item. We should consider both forms as possible. Further differences between published descriptor lists are given by slightly different arrangements of descriptor components. There obviously is no great difference between, for instance, the terms 'Space Distribution' and 'Distribution in Space' and we should standardize the shorter version throughout. For the implementation of vocabularies into a retrieval software one should also limit the number of characters to a certain maximum. One should furthermore limit the extent of usable characters to capital and small letters and to apostrophes and hyphens - subscripts, superscripts and numbers should be avoided. It is clear, too, that spelling differences (c.f. 'CCD' versus 'C.C.D.') should be avoided as far as possible.

One major point of importance is given by the use of synonymous items. The terms 'Minor Planets' and 'Asteroids' exactly have the same meaning as does, for instance, the phrases reference frames and reference systems. We propose to accept only one version out of many existing synonymous descriptors.

Any vocabulary is a living structure which has to be improved with the development of our science. Ten years ago, the term 'Cosmic Strings' was unknown and it will surely happen that some 'classic' phrases will pass away in the near future.

IV. CONCLUSION

Efforts are being made to construct a commonly agreed compilation of descriptors and to install an astronomical thesaurus thereof. This will greatly facilitate not only the work of librarians and of the people from the abstracting services and data bases, but it will be of value to all scientists who are forced to pursue literature retrieval for their own research work. IAU Commission 5 therefore urges all authors, editors, and publishers of astronomical documents to frequently use standardized key words. This additional information is an essential means for proper indexing and is thereby an important supposition for the further and wider spread of scientific ideas and results.

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THE REVISION OF THE UNIVERSAL DECIMAL CLASSIFICATION FOR ASTRONOMY

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ABSTRACT. The Universal Decimal Classification system is widely used throughout the world for the arrangement of books in libraries and for the indexing of papers and reports as an aid to the retrieval of information. It is a comprehensive and language-independent system. The classification for astronomy and related topics (UDC 52) is used by many persons whose main interests are outside astronomy as well as by astronomical specialists. It is important that the classification be kept up to date, but the revision of UDC 52 is now overdue, as the last major revision was made in 1975 and published in 1977. It is clearly the responsibility of IAU Commission 5 to provide expert advice to the International Federation for Information and Documentation (FID) on the revision. Persons who are willing to participate in the work of revision are invited to write to the author, who is the current chairman of the relevant revision committee.

1. THE USE OF UDC 52

The Universal Decimal Classification (Robinson 1979) is a comprehensive scheme for indexing information in all *branches of knowledge* as a coherent pattern of interrelated subjects. It is used to control the storage of books and other documents in an orderly manner and to provide a language-independent method of describing concisely, but yet precisely, the content of any document from many different points of view. Its notation, which is based on arabic numerals that are recognised throughout the world, facilitates the international exchange and retrieval of information, while its decimal structure allows indexing to be carried out to any desired depth in any part of the schedule. UDC is widely used throughout the world, although in the USA the Library of Congress system is predominant for the cataloguing of books. UDC is maintained by the International Federation for Information and Documentation (FID), although schedules in various languages are issued by national standards organisations.

The schedule for astronomy (in UDC 52) is used in many astronomical libraries and in an even larger number of general libraries. It is desirable that the schedule be kept up to date for the convenience of all who use the system. The full schedule for UDC 52 was last published over ten years ago (BSI 1977). Since that time there have been major developments in astronomy, and so the schedule needs to be extended to cover new types of object and phenomena, new methods of

observation and new concepts. The schedule also needs to be modified to reflect our new ideas about the nature and structure of the observed universe.

2. THE REVISION PROCEDURES

The responsibility for proposing changes to the schedule for UDC 52 clearly rests mainly with Commission 5 of the IAU, although it is the responsibility of FID to ensure that such changes are consistent with the general policy and structure of UDC. Proposed changes are always circulated by FID for comment before they are adopted. The last revision with which the IAU was concerned took place in 1973-75 and concerned mainly the subdivisions 520, 521, 523 and 524; the schedules for 522 and 525 were cancelled and are now available for new uses, as is 526 since at about the same time a new schedule for 528 (Geodesy, etc.) was introduced. The schedules for 527 Navigational astronomy and 529 Chronology were left largely unchanged, although they too were also in need of major revisions. The schedule for 528 now needs further revision to take into account the development of new techniques that have revolutionised the practices of surveying and cartography in recent years. Thus, it is now appropriate to consider the whole of 52, even though the first concern of the IAU must be the updating of 520/524.

I inherited from D.A. Kemp, who was the driving force behind the previous revision for astronomy, the chairmanship of the FID Revision Committee on UDC 52. So far I have been unable to devote an adequate amount of time to this task, but I hope to be able to take it up properly in 1989. Any persons who have suggestions for improving the present schedules are invited to send them to me, but I would be particularly glad to hear from any persons who would be willing and able to assist in the detailed work of review and revision of the schedule and its index. After the last revision I drafted a handbook on the use of UDC for astronomy; but it was never published; I hope that it will prove to be useful during the coming revision and that it will itself be revised and then published.

3. EPILOGUE.

Since speaking on this topic at Washington and Baltimore I have had several offers of help from librarians, but I would be glad to hear from a few astronomers who would be prepared to make their expertise, and time, available to the revision committee.

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T-REX: A COOPERATIVE THESAURUS BUILDING PROJECT FOR THE INTERNATIONAL ASTRONOMICAL UNION

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I. INTRODUCTION

Astronomers and librarians have been experiencing difficulties in keeping up with the amount of published literature. The astronomer tries to keep abreast in his particular field and the librarian in the management, control and retrieval of scientific information. The 1980's have seen a revolution in the methods for information storage and retrieval and in particular the advent of the online database. The speed of processing information for storage has been embraced by all, however little thought has been given to *how* we shall achieve effective high precision recall of documents.

Many librarians firmly believe the best road to success in information retrieval from automated systems is provided by vocabulary control. Contrary to belief, free text or natural language searching alone does not lead to high precision recall. Consistency and integrity of the online catalogue can only be achieved with the addition of a controlled vocabulary. With today's technology it is possible to maintain the best of both worlds. The controlled vocabulary is used to index the major concepts of a given document over and above the natural language used within the document.

II. BACKGROUND TO THE PROJECT

The international project for the development of an astronomy thesaurus was undertaken at the request of the International Astronomical Union (IAU). The project was affectionately dubbed T-REX by the collaborators. It was begun in 1986 with an initial feasibility investigation. This attracted several volunteers to assist in the compilation of the first draft of preferred terms. The volunteers are librarians from Australia, United Kingdom, United States, India and Canada: each compiled terms for a nominated section of the alphabet. I have attempted to coordinate all efforts in producing the first draft list for submission to Commission 5 at this General Assembly. It is important for scientists and astronomy librarians to discuss the thesaurus, the need for it, and its implications; particularly in the efficient retrieval

of information in our libraries and for its use in online databases locally, nationally and internationally.

The American National Standard for "Guidelines for Thesaurus Structure, Construction and Use" (1.) defines a thesaurus as:

"A thesaurus is a compilation of words and phrases showing synonymous, hierarchical and other relationships and dependencies, the function of which is to provide a standardized vocabulary for information storage and retrieval systems."

III. THE RATIONALE BEHIND THE THESAURUS PROJECT

I think we must agree there is a need to standardise the terminology in the field of astronomy and astrophysics. There is increasing specialisation in astronomy since no one can be a specialist in all areas. Librarians as the interface between the scientists and the stored information are expected to organise and retrieve promptly and efficiently documents and/or bibliographic references; we maintain that it is possible, but not likely, that we can do this effectively without some guide to the terminology.

Results of a questionnaire (Fig 1.) relating to the use of subject headings in astronomy libraries revealed that librarians are compiling their own *ad hoc* systems with little knowledge of the subject field or of the subject approach to information; indeed there are many libraries in this field without subject access to their collections. Therefore a thesaurus or guide to the terminology showing preferred terms together with the relationship of broader, narrower and related terms (BT, NT, RT's) will mean the achievement of some kind of standardisation which will be of enormous benefit in preparing search strategies for automated and manual library systems and in the allocation of keywords for scientific papers destined for publication.

It is important to realise that at this time there is no standardised list of terms in the field of astronomy and astrophysics although there are other specialist thesauri which attempt to cover the fringes of the subject e.g. NASA and INSPEC. Several of our major reference journals have their own keyword lists and I will not attempt to discuss their shortcomings for our purposes because they were designed to facilitate the compilation of the subject index to the journal itself. However it should be realised that the format of these subject keyterms in our major reference journals will NOT facilitate the retrieval of documents from any computer database system. Most commercial databases and in-house database software prefer the usage of terms with a unit concept and linked by boolean operators i.e. and, or, not. This is the format adopted for the IAU thesaurus.

IV. THE BENEFITS OF AN ASTRONOMY THESAURUS FOR THE SCIENTISTS AND FOR THE LIBRARIANS

- i. The standardisation of terminology will lead to the improvement of astronomy information services worldwide particularly with the increased use of online databases and networking.
- ii. Editors and writers of scientific papers will benefit with the provision of an internationally recognised list of key terms endorsed by the IAU. The 1st Dictionary of Nomenclature was the first step towards standardisation.
- iii. With the application of computers in all areas of library management a standardised list of terms will help eradicate *ad hoc* systems, develop understanding and increased expertise in subject analysis, improve search strategies in online retrieval of information and thus save in terms of time and particularly online costs. Overall there will be an improvement in the identification, organisation, and retrieval of all types of documents related to astronomical research.

V. THE COSTS INVOLVED

Although the IAU requested the thesaurus, it is not its policy to fund such projects, but when it is accepted it will endorse and publish the work. Perhaps Commission 5 could review this policy because funding is urgently required to proceed with this project in terms of manpower and software to reach the next level in the development of the thesaurus.

Initially the costs of compiling a thesaurus are high in terms of time and labour. The unique method of international collaboration for this project has meant the costs of the T-REX project have been kept to a minimum for the preliminary draft. Staff time and labour have been met by each institution and volunteer. Future work will need to be accomplished as part of the normal day-to-day tasks of the librarians involved because thesauri are never really finished and regular maintenance or updating will need to be done.

VI. THE PROBLEMS AND HOW ASTRONOMERS CAN HELP

- Comprehension

I hesitate to reveal that in my experience scientists generally have little knowledge or concept of what a thesaurus is. Unfortunately I strongly suspected that not many librarians do either so this project has been an education process for all involved, myself included. My interest in this project came about because I was in the process of converting the AAO card catalogue to a computer database since we had no previous subject access to our records.

Until confronted with retrieval problems many will not see the need or the relevance of a thesaurus; lack of knowledge of on-line databases in this field is one major problem. We are all in the process of re-education in this era of online catalogues. Unless we come to grips with improving input and access it will be a case of 'garbage in - garbage out'. Cochrane (2) an expert in subject indexing maintains "If adequate control is not built into the subject control mechanism before searching begins, the search product will be disappointing...the usefulness of what comes out of a file depends entirely on what has been put in and how it has been put in".

- Consistency

Each of the collaborators came to the project with their own ideas and perceptions of what was required, even though rules and a standard was adopted. Scientists need to assist us to iron out problems with terminology, for example synonyms in particular areas such as variable stars.

- Classification numbers

Some difficulty has been encountered with the allocation of American Institute of Physics (AIP) classification numbers. This was mainly due to a term's abstract nature and/or lack of context. Help is needed from the scientist to allocate appropriate classification numbers.

VII. THE FUTURE

I hope T-REX is not destined to become extinct! A great deal of work has been done and still has to be done. I am sure Commission 5 did not have any idea what was involved when they requested the work to be done. A thesaurus IS necessary but I think some financial assistance should be provided for the continuation of this vital project. Most thesauri I have read about have taken five years to produce. With some financial assistance and some help from the scientists the next more refined version of T-REX might be ready by the time the next General Assembly comes around.

Librarians will be involved in the testing of the thesaurus over the next year. In this way we will identify inaccuracies and omissions and any anomalies associated with preferred term usage. It is inevitable that there will be national and local differences, but there must be an attempt to resolve these differences with the objective of producing a reliable, authoritative, internationally acceptable list of terms.

Meanwhile the terms can be sorted using the AIP classification numbers into specialisations. When sorted the lists can be sent to various subject specialists to assess the accuracy and completeness. I would like to emphasise that I am concerned that

not enough work has been done by scientists in the compilation of the list. Only *they* know the terminology well.

VIII. CONCLUSION

Remember the old cliché — 'Oh what a tangled web we weave'. It is especially relevant when we practice to retrieve.

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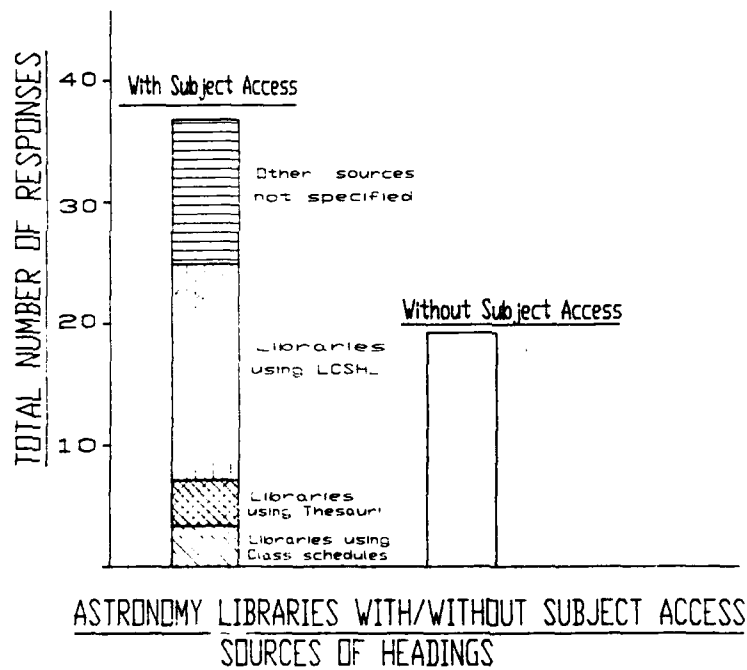


Fig. 1.

ASTRONOMY AND ASTROPHYSICS ABSTRACTS - PRESENT STATUS AND FUTURE PLANS

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ABSTRACT. The methods of the abstracting and indexing work at the 'Astronomisches Rechen-Institut' are briefly outlined. Actually used procedures as well as projected developments of the bibliographic data base 'Astronomy and Astrophysics Abstracts' are summarized.

I. INTRODUCTION

'Astronomy and Astrophysics Abstracts' (AAA) is now going into its 20th year of existence. Altogether, our service stands in a 90 year lasting tradition of abstracting and indexing work of publications on astronomy, astrophysics, and their border fields. For more than three quarters of this century the abstracting work constitutes an important task of the 'Astronomisches Rechen-Institut' (ARI).

The evolution of the 'Astronomischer Jahresbericht' and its direct successor AAA was for many decades marked by a steady progress (Fricke, 1969; Schmadel, 1979). This situation changed some years ago in a breath-taking manner due to the rapidly increasing demand for information and documentation services. The widespread availability of powerful computers forced the producers of data bases to adopt new production and dissemination methods. For many decades our aim was the almost complete coverage of all documents in our field with the highest possible accuracy standards concerning the usual bibliographic data as well as the exact classification of the publications according to the scientific content (Schmadel, 1982). The situation nowadays is changing towards a fast delivery not only of the fundamental bibliographic details but also of additional tools for quick and comprehensive retrieval purposes. These additional tasks require an increasing use of computer methods and they, too, will considerably change the working practice of our collaborators.

More and more documents become available in a machine-readable form which demands a completely new treatment in comparison to our traditional working methods. The introduction of electronic means in our work provides as a by-product the possibility to perform retrospective literature searches. Consequently, efforts are made to

install the informations on a data bank for on-line use.

II. Present Status

The principal stages of the abstracting and indexing work at AAA can be divided into three steps:

- (1) classification and indexing,
- (2) text recording and correction processes, and
- (3) compilation of index informations and other cumulative data.

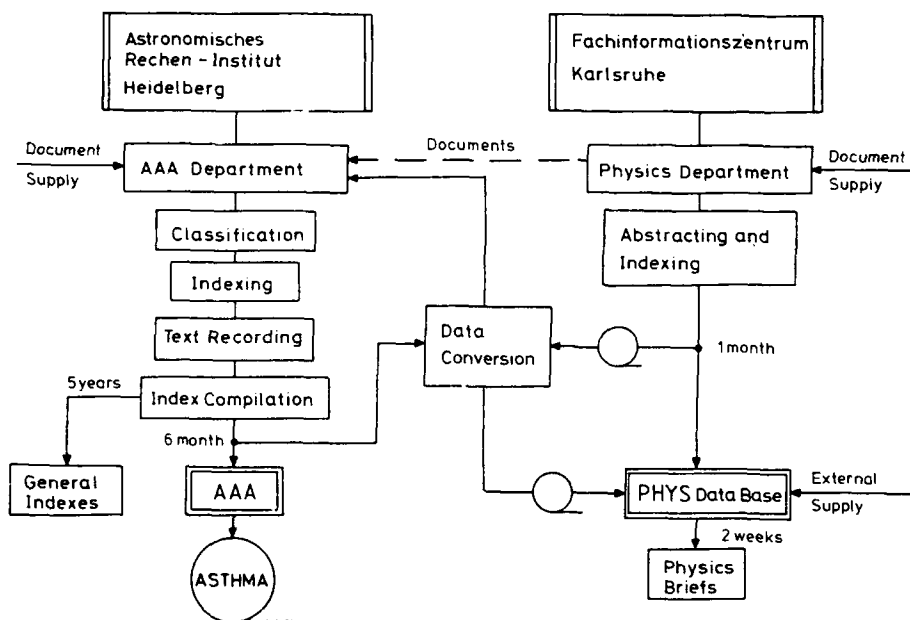


Fig. 1: Cooperation ARI - FIZ

For classification purposes we divide our field of interest into 13 schematic complexes with 106 subject categories. This subdivision is greatly facilitated by the fact that the astronomical objects are particularly well suited for the formation of categories. Our classification system is closely oriented to the philosophy of the old scheme of the 'Astronomischer Jahresbericht'. The experience has demonstrated that the category subdivisions can be maintained for a

long period and that progress in research only implies minor changes in the classification scheme.

We - as a general rule - only use the original documents. The paper is first classified according to the main scientific aspect. In many cases this procedure obviously is not sufficient to describe all facets of a given paper properly. Then, a so-called cross reference containing the title of the document and a reference to the main category is established. A running number within each subject category is added. The abstract itself consists of either the author's summary or of an abridgement or modification or of a completely new version. We preferably use, however, the author abstracts in order to preserve as much original information as possible. Efforts are made to limit the abstracts' length to approximately 50 to 100 words. The preparation of a comprehensive, clear, and concise summary of a document is a rather time-consuming task. The scientific treatment is finished by the assignment of characteristic key word combinations and by the compilation of the catalog designations of all astronomical objects mentioned in the specific document. We usually limit the number of key word pairs to 5 and we actually index up to 25 objects per paper. The scientific co-workers are also responsible for the correct transliteration of, for instance, Slavic author names and for the accuracy of the remaining bibliographic data.

Our technical staff records the complete bibliography consisting of the title, the author names, the source of information, the number of the main category, the running number, the cross references, the abstract, and the index informations. Until 1983 this was done by means of IBM composers. The produced output sheets had to be sorted manually and compiled into complete pages for the offset reproduction. The index informations were recorded on punched cards. Starting with Vol. 33 in 1983, all the recording, correction, and data processing work was done by means of only two somewhat modified ITT 3030 8-bit microcomputers. The introduction of these intelligent terminals has greatly facilitated the production process. The procedure yields a complete pattern ready for photocopy printing.

This method enables us to construct the magnetic tape data base ASTHMA - which stands for ASTronomy and astrophysics abstracts Heidelberg Magnetic tape - which can be used for indoor retrieval tasks. In 1985, we announced the distribution of this data base in response to several inquiries from the users of our service. In the meantime, however, the ARI signed a treaty with the Karlsruhe Fachinformationszentrum (FIZ) which defines a close cooperation between our two institutions. Our material will - in part - be incorporated within the PHYS on-line data base and therefore a separate publication of ASTHMA has become obsolete.

The compilation process of the index data is fully automated. All informations in the subject and object indexes are checked against the actual AAA Vocabulary and our AAA List of the Nomenclature of Celestial Objects. For the author indexes we compare all entries with a list of approximately 20,000 names of authors which appeared in our back volumes five times or more. In this way we reduce the error rate per

printed character to the order of a few ppm.

The AAA staff actually consists of seven scientists, one translator for the Russian publications, and four part-time secretaries for the text recording work. The bulk of material is rather large in relation to these figures. Each volume contains more than 10,000 references to documents published over a half year time span. Every effort is made to ensure that the average time interval between the receiving date of the original documents and the publication date of the abstracts will not exceed eight months. This time span is in many cases near to that achieved by monthly abstracting journals. We feel that our system of accumulation over six months offers the advantage of greater convenience for the user. Therefore, we actually do not intend to change the frequency of issue of AAA. Future problems with regard to the size of our volumes will possibly be overcome by splitting up the material into two parts.

We regularly scan approximately 1,000 astronomical periodicals and publications of observatories and institutes. Since 1969 we have recorded more than 300,000 abstracts. The total number of fully retrievable index informations amounts to about 1.2 million items. The number of characters of one AAA volume is of the order of 10 MBytes.

After the publication of ten volumes, covering five calendar years, we publish a general index of author names, assigned key words, and object designations referring to the AAA number of the documents.

III. FUTURE PLANS

As stated above, we started to cooperate with the Karlsruhe FIZ. It is our common aim to share the input work and to interchange our results. This will be done by an off-line exchange of materials via magnetic tapes (see Fig. 1). At the ARI we actually develop the necessary software for a local computer network. We will connect a total of nine IBM compatible micros with direct access to a central file server. The network will allow a very fast access to a number of auxiliary routines as well as to a quite large data storage system. We will also realize an on-line connection to the PHYS data base for retrieval tasks. The cooperation will evidently save a lot of manpower in the technical input area. The substantial abstracting and indexing work of AAA, however, will remain unchanged. Provisions have been made for an automatic conversion of the two very different classification schemes. We will, too, make an effort in order to standardize the used indexing terms.

It is important to state that the content of the AAA volumes will remain unchanged. Our material will be added to the PHYS data base probably every month. The astronomical documents in PHYS will then be enlarged by the AAA classification number, the key words, and the object designations. As far as the document abstracts are concerned, we agreed that each institution will prepare its own version. This treatment possibly will imply that there are some slight differences between the printed version of AAA and the content of the astronomical references in the PHYS data base.

The information exchange will become effective at the end of this year. We strongly hope that the retention of the printed AAA volumes as well as the additional offer of an on-line access via PHYS will be of benefit to the astronomical community.

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Abstracting and Indexing Services of the American Institute of Physics

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The American Institute of Physics (AIP) is composed of ten member societies (e.g., American Astronomical Society, American Geophysical Union, The American Physical Society) representing 90,000 physicists, astronomers, and geophysicists.

AIP publishes and produces 12 journals (e.g., *The Astronomical Journal*) for six member societies, 9 AIP owned publications (e.g., *Journal of Chemical Physics* and *Physics Today*), 21 translation journals (e.g., *Soviet Astronomical Journal*), AIP conference proceedings, books, bulletins, directories, reports, etc. AIP publishes over 160,000 pages of scientific research annually.

The scientific staff of the Scientific Classification Division is responsible for writing abstracts of scientific articles (when not provided by the authors), determining the appropriate Physics and Astronomy Classification Scheme (PACS) subject categories, and selecting appropriate descriptor terms/keywords (representing the total information content of an article) for each of the articles included in the AIP database.

For each scientific article the title, author(s) affiliation, and location, journal name, journal volume, journal page, PACS subject categories, descriptor terms/keywords, and abstracts are included in the AIP database (approximately 40,000 article per year containing 80% of the U.S. physics research). PACS is presented in another paper at this colloquium.

The AIP database is used to produce the Searchable Physics Information Notices (SPIN) database, which includes the abstracts from articles and related information from 60 publications by AIP and its member societies. SPIN is available directly from AIP or online through the DIALOG Information Retrieval Service.

AIP publishes the quarterly Current Physics Index (CPI) containing the abstracts and additional information from 50 AIP publications.

AIP also produces an Advanced SPIN which contains only the title, author(s), and abstract for articles accepted for publication and is available online. The Advanced SPIN database is used to produce two printed abstract journals, *General Physics Advance Abstracts* (GPAA) and *Physical Review Abstracts* (PRA). AIP provides the SPIN tape to the Department of Energy for inclusion in the online Energy Data Base and the printed *Energy Research Abstracts*. AIP also provides the SPIN tape to Fachinformationszentrum Energie, Physik, Mathematik (FIZ) semi-monthly for inclusion in the Physics Briefs Database which covers the worldwide physics literature (130,000 new records annually). The Physics Briefs Database is used to produce the printed abstract journal *Physics Briefs* and the computerized database (PHYS) which is available online from STN International.

Abstracts and related information from articles published in AIP journals and publications are available online through the Physics Briefs database (PHYS) within one month of publication date. This is two to three months faster than the inclusion of such articles in existing physics abstract services. *Physics Briefs* and the PHYS database are available in North America from the Marketing Services Division of AIP. For large university users of physics databases, AIP's Marketing Division offers a yearly flat fee of \$2450 which includes unlimited database searching, online displays, and offline prints.

PHYSICS AND ASTRONOMY CLASSIFICATION SCHEME—1988

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The most recent version of the astronomy and astrophysics sections of the Physics and Astronomy Classification Scheme—1988 (PACS) is presented. Copies of the PACS are available upon request from the American Institute of Physics.

The PACS Categories are used to:

1. Order articles in abstract journals.
2. Order articles in preparation of the table of contents for some journals.
3. Prepare annual subject indices for some journals.
4. Assign referees by some journal editors.
5. Improve the relevance of articles retrieved from computerized databases.
6. Order books in some scientific publisher's catalogs.

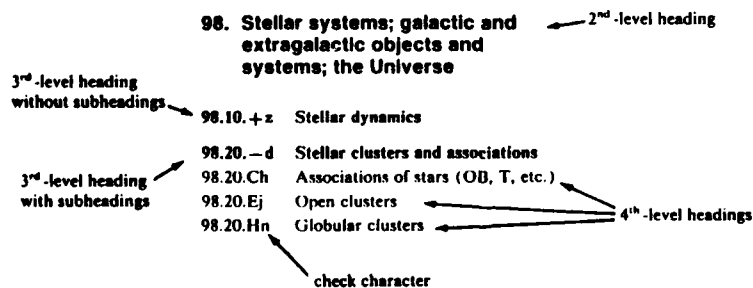
A sample of PACS—1988 is given below to illustrate the hierarchical nature of PACS subject categories. Recent additions to the PACS include 3rd level headings for the properties of planets, planetary satellites and galaxies. An alphabetical index is included in the PACS booklet which directs the user to the appropriate PACS term.

Because the American Institute of Physics is constantly updating and revising PACS, suggestions for modifications are encouraged from the library professionals and the astronomical community.

Please send any suggestions to the PACS editor, American Institute of Physics, 500 Sunnyside Blvd., Woodbury, New York 11797.

PACS HIERARCHY ILLUSTRATION

1st-level heading → **90. GEOPHYSICS, ASTRONOMY,
AND ASTROPHYSICS**



ONLINE BIBLIOGRAPHIC RESOURCES IN ASTRONOMY AND ASTROPHYSICS

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Online searches may be performed in astronomy and astrophysics either by OBJECT or by SUBJECT. Until recently, although object searches could be performed on a variety of databases in the physical sciences, results were poor and incomplete. Only if an object were mentioned by name in the title or abstract could one hope for any hits at all. The greatest blessing to befall the astronomical community was the advent of SIMBAD (Sets of Identifications, Measurements and Bibliography for Astronomical Data), a database in which searches are conducted by OBJECT only. It is produced and accessible from the Centre de Donnees de Strasbourg (CDS), Observatoire Astronomique, and is the result of many years of arduous work by a few dedicated astronomers and computer scientists. It is comprised of the merging of two earlier databases, the Catalog of Stellar Identifications (CSI) and the Bibliographical Star Index (BSI).

SIMBAD now contains more than 700,000 objects, of which 600,000 are stars and 100,000 nonstellar objects, for which 2,500,000 identifications and 1,000,000 measurements exist, plus more than 750,000 references from papers in the "top 90" astronomical journals and conference proceedings. Unlike the subject databases, entire articles are scanned, and all objects to which reference is made in the text are included.

SIMBAD has no printed equivalent. Online access is available to the CDS computer at Paris-Sud, and objects can be searched by a wide variety of catalog identifications. Some objects are known by thirty or more "aliases," and input of any one of them will generate a list of the others. Basic data are given, followed by measurements and bibliography, for stars from 1950, and from 1983 for nonstellar objects. SIMBAD can also be searched by coordinates, which generate a list of all objects within a defined radius which can then be examined individually. There is also the capability of performing highly sophisticated range searches when required.

The following databases carry the best coverage of astronomy and astrophysics for SUBJECT searching, and most are available from commercial vendors. Results from subject searches can be very good indeed, and the advent of SIMBAD augments, rather than detracts from, their usefulness.

PHYS.

Based on PHYSIKALISCHE BERICHTE (PHYSICS BRIEFS). This is available from 1979 via STN International, Columbus, OH, from Fachsinformationzentrum (FIZ), Karlsruhe, FDR. This service will incorporate material from ASTRONOMY AND ASTROPHYSICS ABSTRACTS, published by the Astronomisches Rechen-Institut, Heidelberg, FDR, early in 1989. This long- and eagerly-awaited event should make PHYS the database-of-choice for astronomical subject searches, covering as it does a wide variety of international publications. Abstracts are available.

INSPEC.

Based on SCIENCE ABSTRACTS, including SCIENCE ABSTRACTS, SECTION A: PHYSICS ABSTRACTS, published by the Institution of Electrical Engineers, Ltd., London, England, is distributed internationally by Information Services in Physics, Electrotechnology, Computers and Control, Inc. All areas of physics, including astrophysics, are covered from 1969 to date. The capability of searching by numerical values, e.g., wavelength and frequency, have recently been added, making this a powerful tool.

NASA/RECON and AEROSPACE DATABASE.

Based on NASA/SCIENTIFIC AND TECHNICAL AEROSPACE ABSTRACTS (STAR) and INTERNATIONAL AEROSPACE ABSTRACTS (IAA), this is available commercially as THE AEROSPACE DATABASE in the United States. This is the oldest and most comprehensive of sources, starting in 1962, and covers not only astronomy, but all aspects of space science. Abstracts are available.

SCISEARCH.

This is based on the printed SCIENCE CITATION INDEX, published by the Institute for Scientific Information, Inc. (ISI) of Philadelphia, PA. It is available online from 1974. Although SCISEARCH covers all areas of science, the coverage of astronomical publications is good. The unique feature here is that, in addition to regular bibliographic coverage, citations are also indexed, allowing the course of research to be tracked by listing citations to an original paper, which may have been published well before 1974. There are no abstracts.

CURRENT CONTENTS: PHYSICAL, CHEMICAL AND EARTH SCIENCES.

Published by ISI as above. Based on the weekly publication of the same name, this consists of tables of contents of scientific journals, including core astronomical journals, which are often indexed in advance of publication.

ASTRONOMY AND ASTROPHYSICS MONTHLY INDEX.

This is published by Olivetree Associates, Sierra Madre, CA, both in text and machine-readable form. This bridges the six-month gap between the publication of volumes of ASTRONOMY AND ASTROPHYSICS ABSTRACTS, and is issued monthly (no abstracts). For more information, call (818) 356-4008, or SPAN DEIMOS::LIB.

DISSERTATION ABSTRACTS ONLINE.

Based on DISSERTATION ABSTRACTS INTERNATIONAL, and published by University Microfilms International, Inc., of Ann Arbor, MI. Covers U.S. theses back to 1861, on all subjects, with extensive abstracts.

Various other valuable, though general, databases include NTIS (National Technical Information Service) and SPIN (Searchable Physics Information Notes), produced by the American Institute of Physics.

There are also a number of databases that can be accessed without charge through their parent organizations, for example (and there are many others):

LUNAR AND PLANETARY BIBLIOGRAPHY is compiled by the Lunar and Planetary Institute, Library Information Center, Houston, TX. The online search service gives access to 24,000 references relating to lunar science, the Moon, planets and their satellites, comets, asteroids, meteorites, and space utilization and colonization. The database can be accessed by a number of networks, including NASA SPAN and OMNET. For more information, contact (713) 486-2191, or LPI::STEPHEN on SPAN.

APJLETT and APJAJ are files held at the Harvard-Smithsonian Center for Astrophysics, which can be accessed online by anyone with a modem, or with access to SPAN. APJLETT lists papers accepted for publication in ASTROPHYSICAL JOURNAL, PART 2, LETTERS, complete with abstracts. APJAJ lists titles and authors from the tables of contents of all papers appearing in the ASTROPHYSICAL JOURNAL, PARTS 1 AND 2, the SUPPLEMENT series, and the ASTRONOMICAL JOURNAL published since January 1, 1987. Instructions for access to this database are printed at the end of each issue of the ASTROPHYSICAL JOURNAL.

The PHYS Database : A New Cooperation with AAA

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Since 1979 the Fachinformationszentrum Karlsruhe produces the bibliographic database PHYS which covers the worldwide literature in physics. The database is available on STN International. The database contains about 1,2 million citations in all fields of physics ranging from mathematical physics, elementary particles and field theories, nuclear, atomic and molecular physics, optics, acoustics and fluid dynamics, plasma physics, condensed matter physics, materials science, physical chemistry and biophysics up to geophysics, astronomy and astrophysics. The annual update contains more than 120.000 citations. The database is updated bimonthly. All kinds of literature are included from journal articles, conference papers, books and reports up to dissertations. The citations in the database are in English, publications in other languages have translated English title and abstract. Astronomy and astrophysics are covered in PHYS completely as possible. In 1987 there were more than 21.000 citations in these fields. There are many citations which are classified in PHYS into other fields like atomic or plasma physics and optics and which are not numbered to astronomy but may have a specific relevance for astronomers.

In 1988 an agreement was signed between the Fachinformationszentrum Karlsruhe and the Astronomisches Recheninstitut (Heidelberg) to share the input for PHYS and the printed reference journal *Astronomy and Astrophysics Abstracts* (AAA). This agreement guarantees that from 1989 on all citations in AAA will be included in the PHYS database. Since 1984 to 1988 the overlap in astronomy and astrophysics in both products was between 80% and 95%. The differences were mainly due to the greater number of reports in astronomy in AAA.

Since 1986 the PHYS database uses the same nomenclature for astronomical objects as AAA to designate celestial objects given only in the full text of the publication. These designations are standardized according to the rules worked out by the Astronomisches Recheninstitut.

In Fig. 1 a typical example for a citation in the PHYS database is given. Up to 24 different searchable fields are possible ranging from title (TI), authors (AU) with affiliations and country information, the source (SO), in this case a journal article from *Astronomy & Astrophysics*, an English abstract (AB), a classification code (CC) according to the PACS-classification and controlled terms (CT) out of the PHYS-Thesaurus (hierarchical) with more than 24.000 keywords. The standardized object designations are given as a title augmentation below the title.

AN 88(20):103185 PHYS
 TI New active galactic nuclei from the IRAS deep fields.
 IRAS 05261-2040; IRAS 06081-3337; IRAS 06229-6434; IRAS 07384-6713; IRAS 08020-1055;
 IRAS 10360-0654; IRAS 11402-6641; IRAS 12179-3013; IRAS 12215-1107; IRAS 12295-1413; IRAS
 12397-3333; IRAS 13112-2952; IRAS 13556-6951; IRAS 15112-1108; IRAS 15320-2631; IRAS
 16168-4742; IRAS 16488-0501; IRAS 16534-0110; IRAS 17258-7622.
 AU Keel, W.C.; Grijp, M.H.K. de (Sterrewacht Leiden (Netherlands)); Miley, G.K. (Space Telescope
 Science Inst., Baltimore, MD (USA))
 SO Astron. Astrophys. (Sep 1988) v. 203(2) p. 250-254
 ISSN 0004-6361; CODEN AAEJA
 CY GERMANY, FEDERAL REPUBLIC OF
 DT Journal
 TC Experimental
 LA English
 AB We present the first results of a program to identify new active galactic nuclei from the
 IRAS pointed observations (AOs), using their far-infrared flux distributions as pointers to
 objects with a high probability of being active galaxies. These data show that as many as
 60% of candidates selected in this way are in fact active nuclei, including both broad- and
 narrow-line objects. Their redshift distribution is consistent with expectations based on a
 similar search of the IRAS Point-Source Catalog and the fainter flux limits of the AO data.
 (orig.)
 CC +9850
 CT FAR INFRARED RADIATION; RED SHIFT; +IRAS; +ACTIVE GALAXY NUCLEI; RADIATION FLUX;
 OPTICAL IDENTIFICATION

Figure 1

Much emphasis is given to a high actuality of the citations in PHYS. The database is produced with many special arrangements with publishers to get the journal articles in a very early production stage. The most important US journals are added to the database by a cooperation with the American Institute of Physics (AIP) directly in machine-readable form.

Starting 1989 the AAA classification (CCAA), AAA keywords (CTAA) and the object designations (AO) will be searchable in additional fields.

Besides the STN user manual for PHYS the Fachinformationszentrum Karlsruhe produces some additional user aids for the PHYS database, e.g. user aids in astronomy and astrophysics (including all standardized catalog designations for astronomical objects, greek letter transformations and stellar constellations), the thesaurus and the alphabetic descriptor list, the PHYS classification etc. All these publications are written for online users of the PHYS database and are available on request from the Fachinformationszentrum Karlsruhe.

A NEW DIMENSION TO RETRIEVAL

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Abstract

Searching in online databases for specific numerical data and for chemicals by formulae has always been difficult or, at best, complex. Two new additional indexing services were introduced to the INSPEC database at the beginning of 1987 to overcome these problems: Chemical Indexing - for searching all kinds of inorganic compounds and material systems, and Numerical Data Indexing - for limiting searches to a specific value or range of values of a particular physical quantity. The literature of SN 1987A, the first supernova to be discovered in 1987, is used to demonstrate the powers of these new indexing tools and how they compliment traditional retrieval aids such as classification, descriptors, and identifiers.

1. Introduction

Visitors to the INSPEC stand at exhibitions and conferences round the world often ask what is "new" on INSPEC in addition to the 240,000 records we at present add to the database each year. Usually we have news of some new product derived from the latest section of the file and a few leaflets to read. Now we have something quite different, something extra that is being added to the database that will give retrieval from the INSPEC Database a new dimension: Chemical and Numerical Data Indexing.

2. Background

Previous studies had indicated that although INSPEC is primarily a bibliographic database there was nevertheless a considerable amount of chemical formulae and numerical data on each record that was at best difficult and at worst impossible to retrieve. For example, on some systems it was impossible to differentiate between cobalt (Co) and carbon monoxide (CO) because there was no lower case facility. Things were even worse when dealing with semiconductors and metallic glasses where for example one had to consider all possible rotations of AlGaAs and the various notations for mixtures. In the astronomy section we had even experimented with numerical data written into the identifier field in a controlled format but searching in ranges still proved difficult.

3. New Developments

Chemical Indexing and Numerical Data Indexing (NDI) was introduced at the beginning of 1987 by creating two new fields which would appear on appropriate records. All the major online systems that make the INSPEC Database available offer a form of search facility for the new indexing. Some only allow searching of the NDI entries as if they are text strings, but Dialog, ESA/IRS and STN treat the data as numbers permitting retrieval of both spot values and ranges.

4. Applications

The new indexing is primarily intended to act as a fine tuning mechanism during an online search. Consider a literature search on SN 1987A in the Large Magellanic Cloud, the first supernova to be covered by our new indexing. By mid-1988 there were already over 300 papers discussing this object from which to choose. In the past this set could have been reduced to say just the ultraviolet observations by using either classification code (A9580M) or descriptor (ULTRAVIOLET ASTRONOMICAL OBSERVATIONS). Now you can be more specific. Using the NDI facility you can restrict the search to just those papers describing observations around say 300 nm.

However the new indexing could prove to be a powerful retrieval tool in its own right. Consider a subsequent search for any papers discussing the ultraviolet spectrum of atomic oxygen, not just in SN 1987A. This would involve other astronomical, atmospheric, and laboratory spectra. The new Chemical Indexing would allow you to select oxygen as an element and the numerical indexing would again restrict the search to the UV or to a specific wavelength. This could be more efficacious than using the descriptors OXYGEN and ATOMIC SPECTRA in combination with classification codes.

5. Future

There is a small thesaurus containing the 43 NDI quantities and their units. It is possible that this list will evolve. At present for example there are no means of retrieving magnetic field strengths and dates would be a valuable addition although a Julian Day Number would probably have to be used as in variable star work. We may even have to reconsider the permitted range of values in the NDI which, for all practical purposes, is $1.0E-70$ to $9.9E+70$ (DIALOG can in fact handle values in the range $5.4E-79$ to $7.2E+75$). A recent paper in Astronomy and Astrophysics discussed the rotation period of the Universe which

is suggested to be longer than $10^{135-155}$ years - you can imagine what the computer said after it had converted this to seconds!

THE EUROPEAN SPACE INFORMATION SYSTEM - ESIS

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ABSTRACT. The general users requirements for the ESIS project are presented.

Early this year, the European Space Agency approved and funded a pilot project for a European Space Information System (ESIS). What is an information system? This term has a large variety of interpretations, most dependent on the professional spheres in which it is used. ESIS will essentially possess the characteristics of an environment within which users can obtain, exchange and deposit information related to space physics. In particular, this means the possibility to:

- obtain observation data or information about instruments, other users or applications available for specific tasks,
- exchange scientific data, papers, software or simply mail with co-investigators,
- put results of research projects into the system, to make them available to other colleagues.

The query for information will be done in discipline specific, not computer specific terms. The system shall be able to analyse and process the user vocabulary, including keywords, objects identifications, query parameters and shall also interpret properly synonyms and acronyms. This functionality will be built into a discipline oriented query language which will include notions of parameters and object classes.

Another fundamental feature of the ESIS environment shall be the possibility to combine measurements from different databases and archives, not via a general purpose correlation processor, but with an ensemble of tools to study and establish dataset correlations.

Several facilities will provide interconnection and information services such as electronic mail, bulletin boards, directories of users, applications and services, and file transfer. Furthermore, full function gateways to major research networks such as SPAN, EARN/BITNET, JANET will be implemented.

Particular attention will be devoted to the user interface, which shall provide a uniform access to these functions and shall support a

large number of input devices as well as a selection of dialogue modes, e.g. menus, forms and prompting.

In order to build a system with these capabilities, it is necessary to integrate many different components, such as network elements and database systems, but it is also necessary to develop new concepts. The most appropriate environment for this kind of requirements is, in our opinion, the development of prototypes in a pilot project. Experience has shown that when standard software development methodologies are applied to research tasks, this may have disastrous results. In a research task, both the design and functionality may often change, and only an evolutionary prototype approach can follow these changes.

However, a large part of the system will consist of standard components such as network applications, operating system interfaces and database interfaces, where standard development methodologies apply.

Given the topic of this colloquium, it is of interest to look at the ESIS approach to bibliographic databases.

Commercial services of this kind are better known and more often used in managerial circles than within the scientific community, but ESIS will probably change this status. Bibliographical databases permit full-text searches on references by formulating queries in a keyword sensitive manner, possibly providing additional parameters like author or journal names. The intrinsic power of these facilities lies in the fact that users apply their own vocabulary - keywords, object names or even composed terms - to their search, allowing them to concentrate on concepts and ideas rather than in query language constructs. In the ESIS framework, bibliographic databases will play a major role for they provide the basis for making space data archives available to the large scientific community. Their integration in the correlation environment will permit the users to access information in their language and will provide the general reference space in which other information is embedded. At least the following databases should be considered within the pilot phase:

- Astronomy and Astrophysics Abstract, compiled and produced by the Astronomisches Recheninstitut (ARI) in Heidelberg
- the NASA bibliographic database
- the INSPEC database, produced by the Institution of Electrical Engineers, England
- the PASCAL database, produced by the Centre National de Recherche Scientifique in Paris, France.

Access to the last three is already available at ESA-IRS, Frascati, Italy.

THE UNION LIST OF ASTRONOMY SERIALS

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I would first like to present a little history of this project. I started working at Yerkes Observatory in March of 1972 and found out about the informal meeting in June of that year of observatory and astronomy librarians meeting at Harvard-Smithsonian after the Special Libraries Association meeting in Boston. I arranged to go to that one-day meeting to meet some of the people working in the field; especially in order to know who to call for some good advice once in a while.

My notes from the business meeting that day tell me that "a Union List of Observatory Publications/Astronomy Journals was discussed; no decision." So I first heard about a union list of astronomy journals in 1972, but it may have been discussed many years before that. The Union List was further discussed at meetings in Pittsburgh in 1973, Toronto in 1974, Chicago in 1975, Denver in 1976, etc., etc.,

This was all long before the explosion of personal computers and word processing. Several valiant attempts were made in trying to get the project organized, including a noble effort by Pat Molholt, then at the University of Wisconsin in Madison. Pat had a computer program written which would organize the titles alphabetically. She also tried to get LC-MARC format into the program. However, Pat soon thereafter left the University of Wisconsin, as did her successor in the Astronomy Library, and the project died for a while. Kathy Strand reported on a typing project at the 1980 SLA meeting in Washington, D.C. At the Atlanta meeting in 1981 it was said that a typed list of 2000 titles existed. Industrious P-A-M members had collected titles from various bibliographic tools -- *Astronomy and Astrophysics Abstracts*, *Bibliography of Noncommercial Publications*, *Astronomisches Jahrbuch*. This was when I became involved. Kathy Strand sent me the typed lists and I put the titles into a single computer list (trying to eliminate duplicate titles). I then started checking the list against my own library's card catalog. I added my own holdings as I went along, and added more titles held by my library which were not on the original list and deleted titles which seemed to be nonastronomical or not strictly astronomy (physics, geophysics, geodesics, meteorology, mathematics, general science, etc.). After some rechecking and double-checking, I sent the master list to Pat Moholt who then photocopied it and sent out copies to the librarians who had agreed to add their own holdings and more new titles.

I then added the other library's holdings to the computer file as I received them. Entries changed from library to library; cross references were added where necessary. I am not a cataloger so I try to resolve these differences as best I can. Some librarians sent photocopies of the title pages of series where there was some

question of the correct entry. This is the most helpful way of solving problems; sometimes catalog cards help, especially if they contain information about the history of an observatory.

That was the basic procedure for compiling the first edition of the *Union List of Astronomy Serials*.

The first edition was finally printed and ready for distribution in late 1983. (In astronomical terms not such a long time after all.) The P-A-M Division secured a loan from the Special Libraries Association to pay for the printing. However, only 187 copies were sold, and we barely made enough money to cover expenses. Although not perfect (no union list ever is, I think), I think it is a valuable bibliographic tool, especially for small observatories far away from a large collection of serials.

The second edition is now in the works. The computer file is now on a Macintosh computer diskette, approximately 430 K in size. (If anyone would like to receive a working copy on a diskette, see me after the session. I could also send you the files over E-mail.

The basic procedure remains the same. I enter titles and holdings as I receive them, and try to work out the differences in cataloging schemes from various libraries. I am adding the International Standard Serials Number (ISSN) where I can find it. I am adding more titles, especially in the area of space sciences, so the list has grown much larger. I am correcting typographical errors and other types of errors from the first edition when I find them. For instance, I may ask librarians to clarify their holdings where the entry indicates that the run consisted of volumes 1 to 12, numbers 1-148. If the librarian has indicated that the library hold 1-10 does that mean volumes 1 to 10, or issues 1 to 10? Sometimes I can tell from the context, and sometimes I cannot, so these problems need to be resolved. I would like this document to reflect accurately, as nearly as possible, what has been published by observatories and astronomical societies. In a field where the early literature especially seems to be somewhat ephemeral, I think we need a source which contains some history as well as pertinent information about holdings.

More complicated problems arise when an observatory closes or moves to a new location. Publications change title (the rule, rather than the exception, it seems, in astronomy publications!!), but the numbering might not change or begin over again. These sorts of problems also have to be resolved. Some I can handle by checking the Yerkes Observatory collection but many I cannot. That is why the second edition, with the addition of holdings from non-U.S. libraries, will be a more nearly perfect product, I hope. I would like to ask everyone who received a copy to check especially their own observatory titles and clarify any problems or errors; also to clarify any problems or errors if they have information about other observatories in their country. If anyone here did not receive a gratis copy last December or January, let me know sometime during the meeting -- I have some extra copies with me and will be glad to give you one. This is a spare time project for me so I do not want to project a deadline at this time, but I will try to do as much as I can in the next few months. If any of you brought your lists along, I will be happy to take them back to Yerkes with me.

THE UNION LIST OF SERIALS IN ASTRONOMY LIBRARIES OF THE UK

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HISTORY

The compilation of a common listing of the serials holdings of the main astronomy libraries in the UK was proposed at the first Meeting of Astronomy Librarians of the UK held at the Institute of Astronomy in Cambridge in March 1980. The Library of the Royal Observatory in Edinburgh was at that time already engaged in a project to catalogue its serials holdings and at the same time to compile a separate, briefer, computerised listing for use in the library. Although the original idea had been that the proposed union list should record only the astronomy serials held by the participating libraries, the Royal Observatory Library offered to assume responsibility for the project as a natural development of its own list and to construct a union list that would record the complete serials holdings of all the participating libraries as it was felt that this would be of even greater benefit to these libraries.

Because the work on the project could proceed only as a background activity within the Library (the Librarian was both editor and compiler) and because software for the project was still to be developed, the project could not be started in earnest until 1984. The delay meant, however, that we were able to concentrate on the computerisation of our own list and this was completed towards the end of 1983.

Of the institutions represented at the meeting in 1980 the following have been included in the project: the Institute of Astronomy at Cambridge, Nuffield Radio Astronomy Laboratories at Jodrell Bank, the Royal Astronomical Society, the Royal Greenwich Observatory and ourselves at Edinburgh.

It is possible that we might also be able to incorporate selected holdings from libraries covering supporting subjects and from astronomical collections in other public-access libraries. We have in fact already been invited to include the astronomical holdings of such major libraries as the British Library Lending Division and the new Scottish Science Library which will open in Edinburgh in 1989.

SOFTWARE

Software for the project was written in-house originally in FORTRAN IV but was subsequently rewritten in FORTRAN 77 and a recent development has been the construction of a screen-based file management system which will offer a more efficient and user-friendly method of working with the data.

FACILITIES

We can provide at present the following types of output:

The Union List itself and:

- i. A list of each library's own holdings (full listing or current titles only)
 - ii. Listing by location within each library (full listing or current titles only)
 - iii. Shelflists (full listing, or current titles only)
- and even....
- iv. Listing of serials not held by a library but held by other participating libraries. This is useful as a stockcheck.

And should in future also be able to offer:

- i. Listings of observatory publications (by country A-Z and alphabetically by place within each country)
- ii. Listings of observatory publications alphabetically by observatory

Whether the list could be developed further (e.g., in conjunction with the US and any other such Union list) and whether indeed it should be so developed are possible topics for discussion. However, it is a fact that we ourselves, knowing the demand that such a project makes on the resources of a busy research library, would not be able to contemplate the diversion of further effort into such a project but would nevertheless be willing to contribute data.

FORMATS

The Union list itself and the separate listing of each library's own holdings have until now been distributed to participating libraries on standard computer printout. The list continues to grow, however, and this method of publication will become more impractical. The number of entries on the file at present has reached 3400 and will exceed 4000 by the time all of the holdings have been incorporated. This already represents over 500 pages of computer printout and we are now therefore considering other means of distributing the list. Microfiche is the most obvious immediate alternative but it might also be possible to make the file available on-line over the academic networks such as JANET or even to offer it to one of the information retrieval services such as ESA-IRS or DIALOG. What exactly that would involve, however (who, for example, would provide the necessary software), has not been investigated.

CONCLUSIONS

When we originally agreed to take this project on and further proposed that its scope should be enlarged, we did so in the belief that it would be 'a good thing to do' and were, perhaps naively, not too daunted by the task. Because the project has taken so long our enthusiasm for it has at times been sorely tried, but now that the end of the project is in sight (in so far as this stage can be called the end) we are keen to continue. We believe that our initial enthusiasm for the list will prove not to have been misplaced and the community of astronomical libraries will derive some benefit from it.

ASTRONOMICAL DIRECTORIES

A. Heck & J.L. Halbwachs

C.D.S.

Observatoire Astronomique

Strasbourg - France

Astronomical directories are available as CDS Special Publications. They provide practical data that one seeks to have always at one's disposal on astronomical organizations and related items of interest.

Over the years, these directories have proved to be very effective tools not only for improving national and international relationships in amateur and professional astronomy, but also for helping amateur astronomers, laypersons and public bodies to easily contact astronomical organizations as the need arises.

IDPAI 1989 (CDS Special Publication 12 - about 500 pages) will be the second edition of the International Directory of Professional Astronomical Institutions. It will gather *more than 2600 entries from about 80 countries*: professional astronomical observatories and institutions; organizations, universities, departments, groups or companies employing astronomers or researchers in astronomy; related entries of general interest: IAU adhering organizations, professional associations, funding organizations, academies, as well as bibliographical services, software producers, journals, publishers, manufacturers, dealers, etc.

IDAAS 1989 (CDS Special Publication 13 - about 600 pages) will be the ninth edition of the International Directory of Astronomical Associations and Societies. It will gather *more than 2500 entries from about 80 countries*: associations, societies, groups, clubs of professional and/or amateur astronomers; parent associations and societies; public observatories; planetariums; related entries of general interest: IAU adhering organizations, bibliographical services, software producers, journals, publishers, manufacturers, dealers, etc.

In each publication, the information is given in an uncoded way for easy and direct use. For each entry, all practical data available are listed: city, postal and electronic-mail addresses; telephone, telex and telefax numbers; foundation year; number of members or staff astronomers, main activities; titles, frequencies and ISS-Numbers of periodicals produced; names and geographical coordinates of observing sites; names of planetariums; awards, prizes or distinctions granted; and so on.

The entries are listed alphabetically in each country. At the end of the volume, an *exhaustive index* gives a breakdown not only by different designations and acronyms, but also by location and major terms in names. *Sub-indices* of academies, awards, bibliographical services, dealers, funding organizations, IAU adhering organizations, ISS- and ISB-Numbers, journals, manufacturers, observatories, planetariums, publishers, software producers, etc. are also provided as well as *statistics* on the contents (number of entries per country, memberships, years of foundation) and a list of telephone and telex national codes.

Additional information can be obtained from:

C.D.S. - Directories
Observatoire Astronomique
11 rue de l'Université
F-67000 Strasbourg
France
phone: +33-88.35.82.16
telex: 890506 starobs f
EARN/BITNET: U01105@FRCCSC21.

Ideal for astronomical mailings, *stickers* with the addresses contained in the IDAAS and IDPAI master files (permanently updated) are also available. The names of the countries can be printed in various languages. A selection of countries is also possible. Request information by A. Heck at the address above.

Finally it is intended to put the directories on line together with the CDS SIMBAD database. Suggestions and comments in this respect and on other topics (as the content of future paper editions) are welcome.

BASIC PRINCIPLES OF COMPUTER NETWORKING

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ABSTRACT. The basic principles of networks, the terminology used and the features offered by the most commonly used systems are summarized.

If you ask one hundred computer experts what is the key point now and in the near future of all computer systems, at least ninety of them will answer "telecommunications". As a matter of fact, computer installations have evolved from centralized resources shared by many people, in the early 70's, to distributed processing, in which each user has his own computer, in the early 80's, to network processing, in which each user has access to more than one computer, some local, some remote, each running specialized applications. Consequently, the need to exchange information between computers has evolved over these years, and is in fact the key to this new kind of processing. However, most of us use the services provided without having a clear idea of what is involved. Although this is probably an indication that network computing has reached its goal, it is also evident that a minimum understanding of the terminology and corresponding concepts may help improving the quality of usage of such systems. It is with this aim, following a request from Dr. Wilkins, that I am writing these short notes, which will therefore not be very technical, but only explicative of terms and concepts.

First of all, it should be evident that the physical location of computers plays a major role in determining the services provided: the technology used to connect computers within a single building, for example, cannot be the same as the one used to connect computers hundreds of miles away from each other. Computers connected within short distances are usually referred to as Local Area Networks (LAN), as opposite to Wide Area Networks (WAN), which imply a wide geographic distribution. Among the several possible implementations of LANs, the most successful one has been Ethernet, jointly developed by DEC, Intel and Xerox in the 70's, but now used by most manufacturers of mini computers, personal computers and workstations, including Sun, Apollo, HP, etc. Ethernet allows for a 10 Mbit/sec (nominal) transfer rate, and can extend, by means of repeaters, up to 10 km in length, connec-

ting up to about one hundred computers. The physical medium may be a special cable (the 'base' Ethernet) as well as the normal coaxial cable used for TV or even the simple twisted pair of telephone connections. Fibre optics are also allowed, to travel long distances without loss of signal. One key feature of Ethernet is its capability of accommodating different domains at the same time, so that a single Ethernet installation may have DECnet as well as TCP/IP running simultaneously. DECnet is the communication software used on all DEC machines, in particular on the VAX/VMS family of computers, but it is also available on workstations from other vendors (e.g. Sun and Apollo) as an option. TCP/IP is the standard communication software on all machines running the UNIX operating system. Each computer may also have both methods of communication installed, so a user may have the need to know when to use each of them. The 10 Mbit/sec transfer rate of Ethernet is, as already said, nominal: the overhead is often such that only 30-40% of such a transfer rate is attained by the end user application. However, it is still high enough to allow basically all services, including file transfer of any size, remote inter-process communication, remote procedure call, and of course e-mail (user-to-user). Of particular interest is the possibility of having "file-servers": computers with a lot of disk space on-line, which serve the requirements of diskless stations over the Ethernet. In this way, workstations with their own CPU and video can stay in the office environment, while disks (and tapes) stay in a central location, where particular environmental conditions can be maintained. This also allows to add workstations to the LAN without need of reconfiguration, and at the cost of a base system only. Servers could also maintain special devices to be shared by users, e.g. an optical disk archive in order to make available to all users huge amounts of information, which could not otherwise be duplicated easily. The conclusion is that not the resources of a single, personal computer, but that of all the LAN, are made available to all users. But this is not enough, because users have to communicate over distances well over those allowed by LANs. One of the services provided by the LAN - or, better, by a specialized computer over the LAN - is that of a communication processor, which connects the system to one or more distant services, which, in turn, could be the communication processor of another LAN. It is the set of these remotely connected computers that forms the WAN. This can be either homogeneous or heterogeneous. In a homogeneous network, all computers talk the same protocol and therefore allow - at least in principle - the same kind of capabilities offered by LANs; however, the connection to different computers is done using lines provided by the PTT's, at a speed which is generally 9600 bits per second or - in the best cases - 56 Kbits per second, not even comparable with the 10 Mbits per second offered by Ethernet for example. As a consequence, file transfer (of moderate size), remote login and e-mail are the only services provided by such kinds of networks. In Europe, examples of homogeneous WANs are the STARLINK in UK and ASTRONET in Italy, with VAX computers, and EARN, with IBM computers. A heterogeneous WAN has the purpose of connecting different brands of computers to provide a minimal service, which often is only e-mail. The advantage is in the

number of computers connected, which is often very high: an example is the U.S. Arpanet, which connects something like 5000 computers. In a homogeneous network, connection to other networks is possible through the use of "gateways", which are hardware/software systems installed on a single node, and allow forwarding of e-mail and file transfer. As an example, ASTRONET uses a gateway in ESRIN to communicate with SPAN, and another in Pisa (or Bologna; both owned by INFN) to communicate with EARN/BITNET. We will not go into details of each network, and how to use a gateway to send e-mail messages, since this is covered by the paper of Chris Benn in these Proceedings.

As we said, remote login is not always offered as a service, and to overcome the deficiency, it is now possible to use the services of PPSN (Public Packet Switching Networks), like Telnet in USA, Datex-P in Germany, etc. These are PTT-supplied services, of easy installation on any computer that allows direct connection for remote login (and in some cases for mail) to any other computer with the same connection, all over the world. The service - usually referred to as X.25 connection - has the only drawback of the cost, particularly high if crossing borders, but is very popular among scientific users because of its easiness and for the acceptable speed.

We will conclude this short discussion on computer networks by looking at the future: this is - by no doubt - given by the ISO/OSI standard, a seven-layer communication standard agreed upon by all PTT's, and which is only now becoming available on the market (and not yet to its full extent). It will provide a unique way of exchanging information between computers of different manufacturers, supporting e-mail, file transfer and remote login. We anticipate its full diffusion in the early 90's.

ELECTRONIC MAIL

Chris Benn **CRB@UK.AC.RGO.STAR** on JANET

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I - Introduction

Astronomers have always had a special need for rapid communication over large distances, partly because of their interest in experiments requiring long baselines. Examples: Eratosthenes' measurement of the circumference of the Earth; determination of longitude at sea; solar-eclipse tests of general relativity; very-long-baseline interferometry. Of these, at least the second has prompted innovations in communications techniques (beginning with the Greenwich time ball).

More recently, the pressing need to travel widely for clean air and aether, and the international flavour of the resulting collaborations, has given astronomers particular incentive to explore the latest communications innovation: electronic mail.

Electronic mail travels across data-communications networks which straddle the planet like overlapping spiders' webs. Most large computers are connected to them. Electronic mail is cheap, quick and convenient, and for text transmission offers an attractive alternative to other communications media. In particular, it allows astronomers separated by great distances to interact with some of the informality with which they might chat over coffee.

II - The networks

To send an electronic-mail message, it is necessary to know the address (username and computer name) of the intended recipient, and the name of the network to which the computer is connected. The networks most commonly used by astronomers are listed below:

Network	Area	Example electronic-mail address
ACSNET	Australia	FRED@AAOEPP.OZ.AU (Fred at AAO)
BITNET/EARN	North America / Europe	FRED@SEMAX51 (Fred at Uppsala)
INFNET	Italy (academic DECnet)	ASTB01::FRED (Fred at Bologna)
INTERNET	USA (ARPA net etc.)	FRED@ASTRO.AS.UTEXAS.EDU (Fred at Texas)
JANET	UK academic network	FRED@UK.AC.RGO.STAR (Fred at RGO)
SPAN	USA / Europe space network	SCIVAX::FRED (Fred at STScI)
UUCP	Worldwide (UNIX)	...MCVAXIENEAI/ASTOLIFRED (Fred at Lund)
PSI/X.25	Worldwide	505228621001::FRED (Fred at CSIRO)

There are many other national networks, for example FUNET in Finland, JUNET in Japan and STARLINK in the UK. Links with the Soviet Union and China are imminent, and many developing countries are becoming accessible.

The gateways between the networks allow millions of individual users to send electronic messages to one another's terminals. However, after tacking on instructions for propelling a message through the gateways, an electronic-mail address can become a veritable jungle of acronyms and punctuation marks, and the ugly syntax may intimidate novice users.

III - The RGO guide to electronic mail

To make network mail more accessible to the astronomical community, I have compiled, in collaboration with Ralph Martin of RGO, a short guide to help users master the idiosyncracies of the subject, and a directory of electronic-mail addresses for astronomers. The directory lists electronic-mail addresses (username, computer name and network name) for ≈ 3000 astronomers worldwide and electronic-mail, telephone, telex, fax and postal addresses for ≈ 200 observatories. Paper and electronic copies of the guide and directory are available from the author. Readers are encouraged to submit requests by electronic mail.

Updates of the directory are distributed every 6 months, by electronic mail, to representatives at each of 150 institutions worldwide. These representatives are responsible for local distribution and for providing update information for the next edition. Readers who find that their entries in the directory are incorrect, or who can't find them at all, should contact the author.

IV - Pitfalls and problems

The networks are now quite reliable, with few black holes. If a message is obstructed *en route*, it will usually be bounced back to the sender with a helpful explanation of what happened. The commonest problem, affecting maybe 5% of transmitted messages, is that the computer at the receiving end is comatose. The machine may for example have been switched off for the weekend, or it may be down for maintenance. Some mailers will keep trying to get through, and will only give up after a set number of hours have elapsed.

Machine names and routings still change, but for astronomers, who tend to be itinerant, electronic-mail addresses are nearly as durable as postal ones (perhaps journal editors should encourage inclusion of authors' electronic-mail addresses at the head of papers).

Size limits, typically 100000 bytes (characters), are often encountered on the UUCP network. They can be evaded by chopping the message into chunks and sending it piecemeal.

Sometimes a message is rejected by the destination computer, usually because: the username has ceased to exist; or the user has inadequate discspace in which to store the message; or the user has accidentally protected his mail file against writing by other users.

A message which negotiates all these hurdles will arrive, but it may have been trimmed (often to 80 characters per line), and/or corrupted. Special characters such as '{' and '}' are particularly susceptible to mis-translation when being passed between computers using different character codes (e.g. ASCII, EBCDIC). Much to the distress of T_EX users, beloved of such esoteric characters, the corruption is usually irreversible. A pragmatic solution is global replacement of all special characters by unusual strings before mailing, the recipient of the message being required to carry out the reverse edit. For example, '{' might be represented by ';;{', and '}' by ';;}'.

Electronic mail is not secure. Incoming mail is stored in ordinary disk files, and these can often be read by other users of the computer. Only encryption guarantees privacy. A codeword-driven encryption/decryption program is available from the author.

Speed of transmission varies from network to network and with geographical distance. Most messages arrive within seconds or minutes, but inter-network messages can take hours. In fact, the latter often achieve about the same mean ground speed as the hilltop-to-hilltop bonfire method used in ancient Mesopotamia, albeit with a higher bit rate.

V - Naming conventions

Most computer usernames are constructed from initials (e.g. LDV), from surname (e.g. DAVINCI) or from first initial + surname (e.g. LDAVINCI). The last of these conventions has been adopted by many large observatories, including NOAO and NRAO. It generates usernames which are easy to guess, but which are unlikely to be duplicated. In continental Europe, matters are slightly complicated by the use of accents, which are sometimes translated into extra vowels in the username.

Many sites support institutional usernames, such as DIRECTOR, INFORMATION, LIBRARY and POST-MASTER. Don Wells of NRAO has suggested that standard usernames for observers and operators at telescopes might be constructed, e.g. as OBS_x and OP_{Rx}, where *x* is the abbreviated name of the telescope.

Great confusion is caused by mixing the characters 0, Ø, I and 1 in the names assigned to users or computers. They are difficult to distinguish, particularly when handwritten. The inelegant EARN computer name DGAESØ51, for example, might easily be read as DGAES051, unless the reader spots the embedded initials of the European Southern Observatory. An even worse source of confusion is the Scandinavian letter Ø, which resembles the symbol used by programmers to represent a zero.

VI - The future

Electronic mail is a novel technology. I think that it may prove as stimulating to astronomy as, say, the advent of cheap air travel, or the invention of a new type of detector. It is revolutionising communications between astronomers, and will doubtless take over many of the roles currently occupied by post, telephone, telex, fax, conferences and even publication. I would like to highlight two examples: software exchange, and dissemination of news and ideas.

Much of the software which an astronomer needs already exists, but it's usually easier to write one's own than to obtain a tape copy of somebody else's. With electronic mail, the transmission of computer programs becomes cheap, quick and easy. No index of computer programs useful to astronomers yet exists, but one is being prepared by the software working group of Commission 5.

Electronic mail is an ideal medium for the transmission of news. Issues of an electronic journal containing electronically-submitted news items about telescopes, satellite launches, conferences, new software etc. could be compiled and transmitted quickly and at very little cost, to nearly all the observatories in the West. Such a journal could not include sophisticated figures, but it could offer a speedier and more comprehensive coverage than the current confetti of newsletters, and it would be easier to search for keywords.

An electronic journal might also be a suitable medium for the dissemination and discussion of ideas. At present, this takes place mainly through the literature (on a long timescale), at conferences (at considerable cost), or through personal contact (within a limited circle). Electronic dissemination might help to scatter half-baked thoughts on fertile ground, and thus bring to fruition ideas which would otherwise have perished.

Electronic mail is already well-established in the business and academic worlds, and is poised to invade the home. Telecommunications companies are predicting integrated fibre-optics networks for TV, telephone and electronic mail to most homes, and are anticipating the availability of associated facilities for video-mailing, language-translation and even speech-recognition within a few years. In France, a substantial fraction of homes are already equipped with government-supplied computer terminals. Electronic mail is obviously here to stay, perhaps as a harbinger of the global electronic village envisioned by Arthur C. Clarke and others.

SEARCHING FOR ASTRONOMICAL INFORMATION

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Searching for astronomical information can mean trying to answer such diverse questions as :

- diameter of the earth ?
- objects with a redshift > 4 ?
- ubv data for stars within 3 degrees of
 $\alpha = 10\ 45.2$; $\delta = +12\ 51$
- very recent paper by XXXX ?

What are the tools we have ? Libraries and data centers, which have to help us get any information by taking the greatest care in the :

- classification
- lists of terms

they use, and by communicating with each other to have the most comprehensive service.

In Session 2, we heard of what is available to the astronomical community (including the latest products such as Astronomy and Astrophysics Monthly Index and SIMBAD, as well as the more "classical" like Astronomy and Astrophysics Abstracts, INSPEC,...) and what still needs to be done to improve retrieval of information (construction of a thesaurus, union lists of serials, wider use of electronic communications).

But I think we should always keep in mind that often, a simple phone call to a colleague, a visit to the scientist next door, an electronic message to "someone who might know someone who knows"... will provide more relevant answers than the most sophisticated tools.

So, never forget the simplest and cheapest way to get good information : TALK to other people!

PART 4. HANDLING AND USE OF SPECIAL-FORMAT MATERIALS

PREPRINT INFORMATION SERVICE AT THE RAMAN RESEARCH INSTITUTE LIBRARY

A. Ratnakar
Raman Research Institute
Bangalore 560 000
India

An important channel of communication in many scientific fields is "Preprints." The Astronomical Community uses this method very effectively for speedy communication. One of the main reasons for the prevalence of this practice in Astronomy is to reduce the time gap between the submission of an article and its actual publication in a scientific journal. Preprints are circulated by Astronomers among their colleagues. Libraries receive preprints either from authors or from institutions at which the authors are working.

Radio astronomy is one of the major fields of research activity at the Raman Research Institute. Recognising the importance of Preprint literature in Astronomy, the Library at the Raman Research Institute started collecting Preprints relevant to Radio Astronomy. The Library presently receives preprints from about forty institutions/observatories from all over the world.

Preprints received in the library are displayed immediately after their receipt in an area visited by Astronomers daily (coffee lounge in our case). Preprints remain in this area for about ten days after which time they are kept in the library from where one can borrow them.

Retrieval and Dissemination:

When a preprint is received in the library, the relevant details viz, author(s), title, observatory/institution from where it has come, key words and wherever it is given, the title of the journal to which it is submitted are stored in the computer. Whenever it is required one can get information "on line" about a preprint using any one of the above identifiers. There is a terminal in the library which is connected to a VAX 11/780 computer.

Presently, information about 500 preprints has been stored in this data base. Every fortnight a list of preprints received is printed out and this list is sent to a few astronomical libraries in the country. In return, the library also receives lists of preprints received at other libraries. These lists are however mostly from within the country. In addition to these, a few institutions (Institute of Astronomy, Cambridge,

California Institute of Technology, Pasadena) send the list of preprints issued by their organisations. These lists are scanned for getting any preprint of interest to Astronomers at this Institute.

Suggestion for wider dissemination of information about Preprints:

1. As not all libraries receive preprints issued from every observatory/institution, it is very important that a system is evolved wherein a list is generated of recent preprints brought out by various observatories. For this we should identify an organisation and request the various astronomical observatories/Astronomers to send to this organisation a copy of their preprint or at least information about it as soon as the preprint is ready. Perhaps Commission 5 of the IAU could send a circular with such a request. When such an arrangement is made, the organisation identified for this purpose can generate a list of preprints received or issued once a fortnight. Libraries can receive a copy of such a list by paying a small subscription to cover the cost of production and postage.
2. To persuade *Current Contents* (published weekly by the Institute of Scientific Information, Philadelphia) to cover the preprint list suggested above.
3. Some of the Astronomy/Astrophysics journals like *Monthly Notices of the Royal Astronomical Society*, *Astronomy and Astrophysics*, *Journal of Astrophysics and Astronomy*, should be requested to give a list of articles received by them for publication. This is currently done by *Astrophysical Journal*. This would certainly help us to know about possible new preprints.
4. To explore the possibility of some international data base which can be accessed on line including preprints in their data base.

HANDLING OF PREPRINTS

M. E. Gómez
European Southern Observatory
Library La Silla
Casilla 19001 - Santiago 19
Chile

At La Silla, we receive on average between 90 and 130 preprints a month from institutions all over the world. The preprints are extensively used by our staff as well as visiting astronomers who come to perform observations at La Silla. Most of the preprints are received as donations, others are requested directly from the publishing institute.

The European Southern Observatory has among other publications, its ESO Scientific Preprints. At La Silla, the library does not deal with the distribution of these preprints, since this is made directly from ESO in Garching, FRG.

As soon as the preprints arrive to the library, they are stamped, included in a list to be distributed at the end of the month, and displayed on the shelf at the Astronomy Lounge. The Astronomy Lounge is a special room dedicated to informal astronomical discussions. It contains shelves where preprints, and the latest main astronomical journals are displayed. In this inspiring atmosphere, astronomers may meet to discuss about their last research and get ideas for new projects.

The importance of the preprints was amply proved after the SN1987a was discovered. For example, the results from the research made at ESO was made available to a larger public in the form of an ESO Scientific Preprint containing several papers. Since preprints normally appear several months earlier than the printed version of the papers, many astronomers receive first news about advances in their field from such preprints.

The shelf for the preprints has 96 slanted compartments, one for every preprint, which are placed vertically from top to down. If the space is not sufficient, the preprints published by the same institute are assigned to the same compartment, leaving the last one on top.

The preprints are on display for one month. At the end of the month, they are moved to a plastic cabinet with drawers which contain the old preprints for one year separated by months. The old preprints from the previous year for the same month

are removed and distributed to anyone interested.

Before this, it is checked if they have been published in a journal or book not available at the library. If this is the case, they are kept under the publishing institution.

The ESO Scientific Preprint series published by ESO is bound and kept as observatory publication.

As a way to inform interested users about the preprints that have arrived, a monthly list ordered by author is also distributed as well as displayed in the library. This list also includes the observatory publications and books received during the last month.

The information in this list includes:

- author
- home institution of the first author
- title
- name of the publishing institution, if the home institute of the first author is different
- name of the series, as well as number, month and year of the publication

While the preprints continue to be an important source for the latest astronomical news, the importance of the reprints has diminished. Most of the reprints we receive are contributions from astronomical observatories, that we keep only if we do not have the original publication. Others are directly requested from the authors.

However, with the existence of modern photocopying machines, reprints are not used anymore as a way of getting a personal copy of the publication you are interested in. Maybe in the near future the importance of also the preprints will diminish due to modern electronic distribution systems. Already now, some astronomers are sending their latest papers to interested persons via electronic mail.

PREPRINT DATABASES AT N R A O AND S T Sc I

Ellen Bouton	Sarah Stevens-Rayburn
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HISTORY AND DEVELOPMENT OF SYSTEM

A couple of different facts coalesced in the mid-70s that forced us to try to come up with a manageable scheme for handling preprints. First, as librarians at the National Radio Astronomy Observatory, we were charged with tracking papers by NRAO staff and by visitors using NRAO telescopes to provide an annual listing of staff and visitor publications and to aid in compiling statistics on telescope use.

Second, staff and visitors kept asking for preprints -by series and/or by author, subject, or cover color- and the number of preprint series being received had increased to the point where we could no longer *always* pull that information off the tops of our heads. So, after consulting with colleagues who had similar concerns, we put together a database in 1978, modestly based on the highly successful Preprint/Antipreprint lists produced by the Stanford Linear Accelerator Center. We decided to produce a biweekly list of new papers received and an as-needed list of recently published papers. The scientific staff were very enthusiastic from the beginning, seeing that our efforts would make their efforts to keep up with the literature that much easier.

The database was set up on an IBM mainframe with separate fields for (a) control number indicating year and biweekly period, (b) institutional abbreviation and preprint number, (c) authors, (d) title, and (e) citation.

The advent of the biweekly RAPsheet (Radio Astronomy Preprints) in mid-1978 was greeted with great enthusiasm by staff, as were the lists of previously announced preprints with their citations (the unRAPsheets) and the weekly printout of the entire preprint database by author/title used as a reference source in the library. We also produced regular lists by institution of preprints received so that preprints in series could be identified without having to keep them all after they had been published. Online searching of the database was extremely cumbersome, so we did virtually none in the years the database was on the IBM mainframe.

In mid-1983 when SS-R went to the Space Telescope Science Institute, she carried with her a tape of the database and spent four months setting it up on the VAX and getting the software written to produce the lists, known there as the STEPsheet (Space TElescope Preprints). The VAX allowed for online searching and other niceties that the IBM did not.

At the end of 1985, NRAO replaced the IBM mainframe with a Convex, keeping the existing VAXs. The RAPsheet went on the VAX using INMAGIC, database management software designed to handle library and bibliographic information. NRAO now had much more flexibility in the ways to use the database, added some fields (e.g., code for NRAO telescope used), and had online searching both in the command language version and using an in-house designed menu-driven system.

MECHANICS

Incoming preprints are added to the database as received, then displayed with incoming mail. Those that are part of a regular numbered series are also checked in as exchanges.

NRAO database record looks like this:

ID 8803001

INST/1 NRAO-88/13

INST/2 STSI-244

INST/3 JPL-242

AU/1 ANTONUCCI, R.R.J.; ULVESTAD, J.S.

TI/1 A Large New Family of Compact Radio Sources in the Starburst Nucleus of NGC 253

CITE Ap. J.

NRAO 4

PROP

PS u

STScI record looks like this:

88-05#STSI-244;JPL-151#ANTONUCCI, R.R.J.; ULVESTAD, J.S.#A large new family of compact radio sources in the starburst nucleus of NGC 253#Ap. J.\$

When the mail is put away, preprints are displayed in alphabetical order by first author in separate shelving section.

The tables of contents of *all* astronomy journals, general science journals (*Nature*, *Science*, etc.), and meeting proceedings are cross checked with a list of unpublished preprints to find citations. Other journals are scanned for astronomy or instrumentation papers. At NRAO, the author index of each *Physics Abstracts* issue is also run against the list of unpublished preprints; citations for approximately two papers per PA issue are picked up, usually from journals or meeting proceedings not received in the library or for preprints received after publication. Newly published papers are pulled from the display shelves and citations added to database; codes are changed to indicate the paper is newly published rather than unpublished. Although this is very labor-intensive, one needs to remember that most of this was being done anyway in tracking NRAO papers, without the benefits provided by having the database.

Records for published papers then appear like this:

ID 8803001

INST/1 NRAO-88/13

INST/2 STSI-244

INST/3 JPL-242

AU/1 ANTONUCCI, R.R.J.; ULVESTAD, J.S.

TI/1 *A Large Family of Compact Radio Sources in the Starburst Nucleus of NGC 253*

CITE Ap. J. 330: L97-L100, 1988

NRAO 4

PROP

PS n

88-05#STSI-244;JPL-151#ANTONUCCI, R.R.J.; ULVESTAD, J.S.#A large family of compact radio sources in the starburst nucleus of NGC 253#Ap. J. 330: L97-L100, 1988*

Biweekly RAP and unRAPsheets are produced and distributed to NRAO staff and to approximately 85 individuals and libraries outside NRAO. After distribution, code N for newly published papers is changed to P for published. Biweekly STEPsheets are copied and stuffed in mailboxes of those who want hard copy and distributed electronically to individuals at STScI as well as to places as far away as Hawaii, Argentina, and England. As at NRAO, the outside distribution has expanded primarily because staff who move on want to take the service with them. Biweekly STEP and RAPsheets are offset by one week. They are exchanged between the two libraries by e-mail, allowing each of us to edit the other's current list and append to our own a list of preprints received only at the other's institution.

ANNUAL HOUSEKEEPING

At the end of each year, published preprints received in the preceding year are off-loaded into a separate file; we have kept these files since they are useful for searching by key word, or while waiting for the Ap. J. annual index to appear. Thus, in 1988, the database contains all unpublished preprints, regardless of receipt date, and all published papers (with citations) received in 1988 and 1987. AT STScI, all STScI papers, published and unpublished, are kept in the main database; at NRAO this is not done, but one could pull out NRAO papers from the older database if needed. We both produce yearly listings by institution for the regular numbered preprint series, although we are not sure they are much used now that online searching is so easy. We also remove all unpublished preprints older than two years from our main display areas, although we do keep them in a separate area.

To give some idea of database size, the NRAO database, before 1986 papers were off-loaded at the end of 1987, had 3744 papers in it, of which 1454 were unpublished. On 20 July 1988 there were 3207 papers in the database, of which 1602 were unpublished. STScI figures are very close: the list in December 1987 had 4018 total and 1435 unpublished, and on July 19 had 3792 total and 1502 unpublished. Total differences are probably attributable to the 1987A database that is merged with the STEPsheet, since all 1987A papers are added whether a preprint is received or not.

COMMENTS

It takes a lot of time, but is one of the most heavily used parts of the entire library collection. Visitors from other institutions make a point of allowing time to browse through the collection. Staff remain wildly enthusiastic about the cumulated printout as a reference tool – they look for a published paper there before looking in the journal indexes. The online system is searched heavily, even by those who don't get the biweekly lists. In addition to helping the staff, it also helps the librarians enormously in keeping up with meetings and being able to tell people with a fair degree of certainty that if it appears as unpublished in the database, it is really likely it is unpublished.

PROBLEMS

1. Preprints that arrive after the journal version has appeared in print.
2. Same preprint arriving from several different places. The system can track them so they all appear on the appropriate institutional list, but we have to identify them or we end up with multiple entries for the same preprint.
3. Multiple preprints under a single cover – if you file by author, you either take them apart or risk users being unable to find any but the first paper.
4. Abstracts or poster papers that appear as preprints: STScI had 45 and NRAO 50 preprints in the database from IAU Symposium 129 – most were 2 pages or under.
5. People who use the STEP or RAPsheets as a finding guide for what to rip off.
6. Finding citations for things that appear in journals or proceedings we do not receive.
7. Staff who decide every six or eight months to clean their office of accumulated preprints; since we have no idea how long they have had the paper, it means a lot of work checking things against journal tables of contents to avoid entering published papers into the database as unpublished.
8. Not enough hours in the day.

NON-PRINTED MATERIALS

C. Jaschek

Centre de Données de Strasbourg (CDS)
CNRS-URA n° 654
Observatoire Astronomique de Strasbourg
11 rue de l'Université
F- 67000 Strasbourg
France

Many modern catalogues and/or observing lists are too large for easy printing in a magazine, or have too short a life to be economically worth printing as a catalogue or a book. We have therefore two ways of presenting them:

- a) on microfiche
- b) on tape (or diskette).

One could add computer print-outs, but by experience there are mostly made for private use.

Microfiches have never become very popular, although they are quite handy for long catalogues. The Henry Draper catalogue, weighting 10 kgs occupies 14 microfiches weighting 42 grams and can be accommodated in a common envelope. Durability of good microfiches is guaranteed for several decades and its price is cheap. Except thus for the reading device, which is bulky, the microfiche is a handy way to store information, especially when only small amounts of information are to be retrieved.

Magnetic tapes are now the main support for data archiving. They are very efficient for storage, but need a computer to be readable. Among its drawbacks we have its weight (2 kg), relative fragility for transportation and its short life. If not used, after a few years one gets problems when reading it. With regard to the volume of information, on one magnetic tape one can put the whole SAO catalogue, which occupies 2600 printed pages. A tape costs about 20 US\$, whereas the four printed volumes may costs about 5 times that amount.

Diskettes are smaller and cheaper and can be easily shipped. However their storage capacity is about one percent of a magnetic tape, whereas its cost is about ten percent of that of a tape. Diskettes at present are thus reduced to small catalogues, equivalent to about 50 printed pages.

And finally we have as a promise the optical numerical discs. At present we find large discs, and the compact disc which can stock the equivalent of about 5 tapes. Manufacturers claim a long life, but since we have no sufficiently long experience, the life time estimates of 20-30 years may be or may not be realistic. If a common standard can be agreed upon, these devices are the support for catalogues and observational archives.

STORING SKY SURVEYS AT NOAO

Cathaleen Van Atta
Kitt Peak National Observatory
National Optical Astronomy Observatories
P. O. Box 26732
Tucson, Arizona 85726

At NOAO/Tucson the various sky surveys are not kept in or kept by the Library. Instead, the person who is responsible for their acquisition, care, handling and preservation, is someone whose area of expertise is scientific photography and instrumentation, and he has given me the information that follows.

At NOAO we have a very complete set of the sky surveys. In Tucson we have one set of the Palomar survey on print and one on glass, the ESO/SRC southern atlas, red and blue, on glass and film, the SRC infrared atlas on film, the SRC equatorial atlas on glass, the ESO quick blue survey on glass, and original KPNO telescope plates on glass. At the observatory on Kitt Peak there are two sets of the Palomar survey on print. Basically, all of these can be divided by format into three kinds: paper print, film, and glass. I will tell briefly what we do with each.

At the mountain location we have two sets of the Palomar prints: one in the administration building adjacent to the library and one at the 4-meter telescope. The storage system used for these, which is also used at CTIO, was devised by Helmut Abt. A pair of prints, the red and the blue, is inserted back-to-back into a folded transparent plastic protector (14 1/4" x 17 1/4" with the fold on the 14 1/4" side) with a sliding plastic strip (1/8") along the spine on which a label is placed giving the appropriate coordinates. The plastic protectors were custom-made in 5 guage vinyl to fit the prints. These are stored 18 pairs to a drawer in three 20-drawer filing cabinets (Steelcase files, 52" high, 18" wide, and 28" deep with drawers 2" high, 16" wide, and 26" deep inside). In this way, the prints are well protected, clearly marked, and easily accessible. Over the years we have had many requests for information on how these are stored because visiting astronomers have been so impressed. Unfortunately, the last time we ordered the plastic protectors the price had become extremely expensive and the filing cabinets are no longer being manufactured.

The print set downtown is stored in a filing cabinet with three drawers that are 20" wide, 14 1/2" high and 24" deep. The prints are stored in manila folders along with the Ohio overlay grids. The folders are held vertically by welded frames we added which have 13 vertical steel panels per drawer that serve as dividers. The whole unit is bolted to the wall since it is very heavy. The drawers are quite crowded, so these prints are much less accessible and more subject to wear than the sets on the mountain. In the same room, equipment is kept which can be used with the prints and plates. These are: a light table for general viewing, a Polaroid camera to copy prints for finding charts, a 35mm copying camera mount, and a two coordinate Grant measuring engine for high precision measuring. Further down the hall is a PDS microdensitometer which digitizes data off the plates.

Adjacent to this room is the Sky Survey Room, where the film and glass copies are kept. In actual practice, before being stored, our film copies are turned into glass copies because they are mounted between two sheets of glass (single strength, picture quality) - rather like a sandwich - and taped around the edges. This is because the film copies would be very difficult to work with in that format and because the plastic envelopes in which they arrive would not give adequate protection for the high volume of use at NOAO. Also, the original glass plates of the Palomar survey and the ESO/SRC atlases are covered with glass to seal off the emulsion and for protection while handling. Therefore, both the film and the glass copies end up being stored in the same manner. The Sky Survey Room has 4 rows of metal cabinets with either 4, 5, or 6 shelves per cabinet unit, and retractable locking doors. They have 15 dividers on each shelf that are inserted into slots and hold the plates vertically to better support the weight of the glass. The plates are inserted into envelopes which are marked on the outer edge with the coordinate numbers.

While the Sky Survey Room has had several changes made to protect the plates, the storage conditions are not yet as good as they could be due to limited funds. All the seams and ceiling openings have been sealed, fire doors with steel jambs have been installed and sealed with weather stripping, any frame walls have been covered with two layers of fire code sheet rock while the remaining walls are concrete block, and a Haylon fire system has been installed. The light fixtures have special filters over fluorescent tubes to keep the ultraviolet to a minimum. The room does use the building's air conditioning system, although special dampers have been installed that will close off the system in an emergency. Actually, the chance of a fire in the room is quite remote, but these measures should protect the area from damage if something else happens elsewhere in the building - smoke or water damage from a fire or a broken pipe. The cabinets have a baked enamel finish which prevents outgassing of the paint, and no other harmful materials are used for storage. For those who would like more information on this, new standards on the storing of photographic

images are: ANSI-PH 1.45.1981 (Practice for Storage of Processed Photographic Plates) and ANSI-PH 1.53-1986 (Processed Films, Plates and Papers - Filing Enclosures and Containers for Storage).

The prints and plates are available to our staff and visitors and to anyone from outside the Observatory who writes to the Director asking permission to use them. They can be used in the adjacent room for copying finding charts or with the overlay grids or for making measurements as needed. The original KPNO telescope plates are kept under lock, but can be borrowed with special permission from the Director if needed for scientific research. All of the 4-meter and some of the other telescopes' plates are listed in a computer file of which printouts are available in the Tucson and mountain libraries.

Obviously, there are many other ways to store and handle the sky surveys. If time permitted, further points for discussion could include: who should have responsibility for organization, use and care of the sky surveys — librarians or astronomers; different ways of storing them; restrictions on their use; precautions to keep from damaging them; and the preservation of photographic images. Any of these would bring a number of different opinions since the needs of each observatory, number of users, and funds available differ greatly.

HANDLING OF MICROFICHE

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European Southern Observatory
Library La Silla
Casilla 19001 - Santiago 19
Chile

The microfiche received at the Library E.S.O. - La Silla, come from different sources: old journals out of print, articles in current journals which often include microfiche for long tables, catalogs and figures not suitable for normal printing, and larger catalogues of data (IUE, IRAS, etc.). These microfiche, coming either in journals or being a publication themselves, are ordered in the same way:

- Every microfiche is assigned a running number.
- Three cards are typed: the main one being by author, the second one by title of the article, and the third one by title of the journal. In addition, the running number that identifies the microfiche is typed on the upper right corner of each card. The total amount of microfiche that make up the article or publication is given at the lower center of each card.
- The cards are kept in a special catalogue cabinet labeled *Microfiche*, in strict alphabetical order, where the cards by author, title, and publication are mixed together.
- The microfiche themselves are kept in a plastic tray with fiche separators and index dividers with insertable label holders. These label holders are placed at an interval of every five fiche separators. The holders display the running numbers of the microfiche.
- In addition, every fiche separator carries on its front side an adhesive label which contains the same information as that found on the main card.
- Finally, in the cases where articles in printed form contain additional information on microfiche, the running number of the microfiche is entered at the beginning of the article.

LIBRARY COLLECTIONS OF MACHINE-READABLE ASTRONOMICAL CATALOGS

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ABSTRACT. Major astronomical facilities generally use a large number of machine-readable catalogs and data sets. These are requested over a long period of time, usually by individual staff members who seldom request data through their library services. An important drawback of this procedure is that the same catalogs are often requested by different persons at the same institute, thus requiring a duplicate effort on the part of the service organization (usually the data centers) and longer than necessary delays for the persons requesting data. It is suggested that libraries at major facilities build collections of important data sets and maintain library catalogs of these collections for use by staff astronomers. This paper discusses simplified and efficient methods of building such collections and details possible ways of storing and retrieving particular catalogs easily when they are required by staff members.

1. INTRODUCTION

The use of machine-readable astronomical data in basic research, telescope and satellite pointing and guidance, automated data collection and reduction, and educational applications has grown dramatically over the last decade. The wide availability of data through the international network of astronomical data centers and the dedication of data center personnel to the tasks of acquiring and disseminating high quality and well-documented data have contributed significantly to this increased usage of large computerized catalogs and other data to study problems that were done manually by former generations of astronomers.

The increasing use of centralized library facilities for computerized data and bibliographical searches has opened possibilities for the maintenance of library collections of machine-readable data sets that can be made available to all staff members of observatories and research institutions. (A similar project is currently underway for software documentation [Rhodes, Kurtz, and Rey-Watson 1988].) While the current trend in data acquisition is for individual astronomers to request data for their own use from central repositories, increased workloads on data centers having limited staff and facilities have had the general effect of producing longer turnaround times for the processing of requests. One solution to this problem is for observatories and institutes having major library facilities and qualified staff to interact with the data centers directly to build collections of machine-readable data sets and documentation for use by all local personnel needing these data. This would not only decrease the currently heavy burden now placed upon central data repository personnel, but would also open possibilities for the exchange of data and documentation among the astronomical institutes themselves without intervention by the data centers.

This paper outlines a method for building and maintaining a collection of machine-readable astronomical data sets at a library facility in order that they may be made available to local researchers and educators as needed.

2. BUILDING A LOCAL ARCHIVE

A localized archive of astronomical data sets can be accumulated by requesting individual catalogs and other data from the nearest central repository (Astronomical Data Center [ADC], Centre de Données de Strasbourg [CDS], Soviet Centre for Astronomical Data [SCAD]) as they are needed. The local archive would currently consist of a set of master magnetic tapes and their backups corresponding to the categories of data maintained at the data centers and given in, for example, the ADC *Status Report on Machine-Readable Astronomical Catalogs* (SR) published regularly in the *Astronomical Data Center Bulletin* and distributed separately to requesters. Of course, very large data sets, such as spectra from the *International Ultraviolet Explorer* (IUE) and survey images from the *Infrared Astronomical Satellite* (IRAS) would require separate collections of tapes, but most of the astronomical catalogs, atlases, and collections of spectral data included in the SR can be stacked on a single set of tapes corresponding to the categories of astrometric, photometric, spectroscopic, cross identifications, combined and derived, miscellaneous, and nonstellar data used in the SR. As additional data sets are acquired from the data center, they are written to the correct tapes corresponding to their designations in the numbering system of the data centers. Thus, a set of fourteen tapes (seven "use" and seven "backups") can be used to maintain a large part of the collection of frequently used catalogs.

As individual master tapes and their corresponding backups become full, additional tapes are added for that category only. This procedure keeps the archive "under control," so to speak, and allows individual data sets to be located easily (as shown in the next section). All backup tapes should be stored in a separate location, of course, to decrease the probability of destruction of both sets of tapes simultaneously.

3. MAINTENANCE OF THE ARCHIVE

3.1 The Archive Medium

The master tape archive should, of course, be maintained on the highest density tapes available to the local institution. The quantity of data makes at least 6250 bpi almost mandatory, and higher densities, such as the 38,000 bpi cartridge-type tapes now being marketed, are a distinct advantage. This is the case not only for storage capacity, but also because of the more reliable recording techniques of the higher densities. While 6250 bpi quality tapes can be expected to last several years between failures with fairly heavy use, the new cartridge tapes are guaranteed to develop ≤ 2 I/O errors per decade. As the more advanced technologies, such as Write Many Read Many (WORM) optical disks and higher density tape, become available, procedures for archive storage and maintenance will be simplified.

In the current world of magnetic tapes, however, one does need to be concerned with I/O errors and tape replacement. Tapes should be stored in a constant temperature and reasonably dust-free environment. When a tape goes bad, its corresponding backup should replace it as the "use" tape and its first use should be to create a replacement backup on a new tape. This procedure ensures that the master tapes are recycled to decrease the possibility of both primary and backup tapes developing I/O errors simultaneously.

There is also the possibility of maintaining the archive on a mass storage system with only a set of backup tapes. The current computer being used by the ADC to maintain its archive and to disseminate the data is the IBM 3081K system of Goddard's NSESCC (NASA Space and Earth Sciences Computing Center). This system has an attached IBM 3850 mass storage system with a capacity of 360 gigabytes; it currently holds the entire IUE archive of extracted spectra (some 61,000 spectral images). However, while magnetic tapes allow block sizes of up to 32K bytes (32,760 bytes actual maximum), the mass storage system uses IBM 3330-type format that only allows a maximum block size of 13,030 bytes. Thus, because data transfer charges are assessed per block of data, it costs less to transfer data from tape to tape than from mass storage to tape, and this is significant for the large catalogs maintained by the ADC. This constraint will probably no longer prevail for the next generation of mass storage devices, which will allow larger block sizes.

3.2 The Archive Record

To enable the retrieval of specific data sets when they are required by local users, a complete and concise record of the contents of each master tape must be kept. At the ADC, this is done by maintaining an online data set for each tape. These data sets contain information about each file of every catalog on every archive tape. The information contained in each data set includes catalog number, file number within the catalog, catalog name, file name, block size, logical record length, and number of logical records. A software program then computes additional parameters and produces a **MAGNETIC TAPE FILE RECORD** for each master tape. An example of such a record is shown in Figure 1. The program computes the length of each file and the total length of tape used, which is necessary information for transferring individual catalogs to users' tapes and for keeping a record of the amount of space available on the master. An asterisk (*) indicates that a file has been superseded by a later edition of a data set. Master tapes are periodically cleaned up and re-created, whence all flagged files are removed from the tapes and migrated to a tape of superseded catalogs. Since the tape files are not included in the file record data set, it is only necessary to delete the superseded record and rerun the program for that tape. Records are added to the master tape data set from another data set containing file records for all catalogs in the archive. The program is also used to generate file records for requesters' tapes that are generated by funneling catalogs from the master tapes to each requester's tape. Thus, users of the facility receive a complete record of their tapes that is generated automatically after the tape is created.

4. SUMMARY AND CONCLUSIONS

Major centers of astronomy having centralized library facilities are encouraged to produce and maintain local archives of machine-readable astronomical data sets by acquiring the data from central repositories and creating their own archiving and retrieval systems. Such a procedure will allow local users to obtain data that they need much faster and will decrease the burden now placed on the astronomical data centers. A regional data center, the Canadian Astronomy Data Center (CADC), is already operational at the Dominion Astrophysical Observatory and has produced a user's manual (Justice, Durand, and Crabtree 1988); a similar data center has been proposed for Australia (Tuohy 1987). The CADC maintains not only a wide variety of data sets for distribution to Canadian astronomers, but also provides a basic collection of services as well, including access to the STARCAT (Space Telescope ARchive and CATalog) system developed at the ST European Coordinating Facility and the European Southern Observatory, the SIMBAD (Set of Identifications, Measurements and Bibliography for Astronomical Data) data bank of the CDS, and a variety of local data reduction programs.

Further information and assistance with the creation of local archives of astronomical data can be obtained by contacting the author.

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ASTRONOMICAL DATA CENTER

MAGNETIC TAPE FILE RECORD

Name: Master Tape 5A1 ; Date: 24 JUL 1988; Density: 6250 bpi; Coding: EBCDIC; Tracks: 9

Catalog Number	File Catalog Name	File Name	Type File	Number of Blocks	BLOCKSIZE Max Min	Blocking Factor	RECFL	Number of LRECL Records	Length (feet)
5032	Stars < 25 pc (Woolley et al. 1970)		1	9	32670 28890	242	FB	135	2150
5031	Kinematic Data 0-85 Stars (Mead Hill 1981)		2	8	32757 28461	183	FB	179	1440
5801	Nearby Stars (Gliese 1969) Selected		3	5	32720 20320	409	FB	80	1890
5802	Yale Bright Star 3rd Ed (Hoffleit 1964)		4	57	32754 7676	162	FB	202	9110
5902	Yale Bright Star with GC Data (Nagy 1978)		5	37	32634 31302	98	FB	333	9110
5825	1 Yale Bright Star 4th Ed (Hoffleit 1982)	Data	6	60	32648 5088	154	FB	212	9110
5825	2 Yale Bright Star 4th Ed (Hoffleit 1982)	Remarks Intro	7	1	4480 4480	56	FB	80	56
5825	3 Yale Bright Star 4th Ed (Hoffleit 1982)	Remarks	8	33	32736 3036	248	FB	132	7959
5701	Nearby Stars (Gliese 1969)		9	8	32750 18209	250	FB	131	1889
5836	1 Yale Bright Star Suppl (Hoffleit 1983)	Introduction	10	12	32720 240	154	FB	80	412
5836	2 Yale Bright Star Suppl (Hoffleit 1983)	Data	11	17	32648 31164	511	FB	212	2611
5836	3 Yale Bright Star Suppl (Hoffleit 1983)	Remarks	12	8	32704 2256	197	FB	64	3581
5045	1 Comb List Astron Sources 3.1 (1985)	Data	13	955	32702 22908	229	FB	166	188076
5045	2 Comb List Astron Sources 3.1 (1985)	Notes	14	1	18320 18320	229	FB	80	229
5045	3 Comb List Astron Sources 3.1 (1985)	Flux Notes	15	1	3920 3920	49	FB	80	49
5039	1 Fourth Orbits Visual Binaries (1983)	Introduction	16	1	21040 21040	263	FB	80	263
5039	2 Fourth Orbits Visual Binaries (1983)	Data	17	12	32736 9372	248	FB	132	2799
5038	3 Fourth Orbits Visual Binaries (1983)	Notes	18	2	32720 16400	409	FB	80	614
5038	4 Fourth Orbits Visual Binaries (1983)	Description	19	2	32720 13360	167	FB	80	167
5840	1 Ultraviolet Star Cat UCL (Carnochan 1978)	Data	20	249	32760 10920	126	FB	260	31290
5840	2 Spectroscopic Bin 7 (Batten et al. 1978)	References	21	3	32640 3672	160	FB	204	978
5840	3 Spectroscopic Bin 7 (Batten et al. 1978)	Table I	22	1	32720 12800	409	FB	80	152
5048	1 Field Type II Cepheids (Harris 1985)	Table II	23	1	1840 10640	152	FB	70	56
5048	2 Colors, Lum, Mot Nearest K-M Giants (1966)	Catalog	24	3	32760 344	455	FB	72	1012
5705	1 Data Inv Space-Based Obs 1.1 (DISCO) 1986	References	25	271	32686 3658	131	FB	118	74821
5051	2 Data Inv Space-Based Obs 1.1 (DISCO) 1986	Data	26	7	32640 3672	160	FB	80	131
5840	1 Spectroscopic Bin 7 (Batten et al. 1978)		27	1			FB	204	978
5840			28	7			FB	204	978

Totals: Number of Catalogs: 16

28

837

Figure 1. An example of a MAGNETIC TAPE FILE RECORD for an ADC master archive tape.

OBSERVATORY PUBLICATIONS AND THEIR SIGNIFICANT ROLE IN ASTRONOMICAL LIBRARIES

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The Library of Warsaw University Observatory is a small one, but it is one of the oldest astronomical libraries in Poland. The library collection has been gathered almost since the beginning of the Warsaw Observatory, that is since 1825. Although a large part of our collection was burned during the Second World War, the remaining part contains many unique items. Scholars doing research in the area of the history of astronomy often find our collection very helpful in their work.

Observatory publications play a significant role in my library. In general, we have limited possibilities for buying publications with hard currency. Therefore, any free publications obtained by my library constitute an extremely valuable source of information about new research and discoveries all over the world.

I find the situation (or the tendency towards the situation) in which the number of observatories editing and distributing their publications gradually decreasing really unfortunate. The libraries distribute, or tend to distribute, a list of publications instead of the publications themselves. This, in my opinion, is absolutely insufficient.

There are publications from forty-one countries in my library – approximately five hundred titles – most of them however, as I have mentioned already, either have ceased publication, or are no longer being sent to us.

The cataloguing in my library is abbreviated. We register only the basic bibliographic details; that is, title, imprint (place and publisher), opening date of the library's holdings, and the last issue if the publication has ceased. Updating is not being done in the catalogue itself. In order to find out the latest issue held, one has to go to the shelf. Therefore from my point of view, clear and simple numbering of the publications is extremely important and it makes their arrangement easier for the readers and library staff as well. There is a special room for observatory publications, where they are arranged alphabetically in the following order: country; name of observatory, institution, or place within the country; and title of publication of the particular institution. The last criterion of arrangement is, of course, always issue number. The only exceptions are those specific issues that are astronomical catalogues, which are shelved in the room with other catalogues and atlases, and are considered to be and registered as catalogues. There is a note in the catalogue

that tells where that particular issue can be found. Ephemeris are stored until their validity expires.

Finally, being the librarian of a small library in a small country, I can only say that, although acquisition of smaller numbers of materials creates fewer problems in comparison to the problems being discussed here, it is obvious that the more publications we get, the better and fuller information we can provide to our astronomers. We librarians of small libraries are always grateful for any publications generously sent to us by our bigger and wealthier colleagues.

AN OBSERVATORY PUBLICATIONS RECLASSIFICATION PROJECT

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David Dunlap Observatory/Department of Astronomy
University of Toronto, Canada

In our library we define observatory publications as all materials disseminated in serial form and on its own behalf, by an observatory, astronomical institute or university department. Included are annual reports, research reports, reprints, newsletters, and monograph series. Preprints, though fitting the description, are handled separately. Excluded and catalogued separately are individual monographs and users manuals. Sometimes items such as catalogues and atlases are catalogued and shelved elsewhere with a dummy left in the appropriate place.

Traditionally, libraries have shelved observatory publications alphabetically according to the city or town in which the observatory is located. Reference tools such as Astronomy and Astrophysics Abstracts and the Bibliography of Non-commercial Publications have used that arrangement too. One of the problems of this system is that without a number, it does not provide a single, unique, identifier for observatories with many locations. The same holds true in cases where there are many observatories in one location. In addition, the location may not be known or the library's arrangement may have idiosyncracies.

An alternate system is to arrange the materials alphabetically by the name of the observatory. Problems can arise with this system when an observatory is known by two different names, or is known most often by an abbreviated name or the name of its telescope, or when the observatory name changes or when a previously "independent" observatory starts publishing under an umbrella with others. Added to all that is the problem of multiple languages and the question of transliteration vs. translation.

Most of these difficulties can be alleviated by assigning a number to each publication. This provides an identifier which is unique (unlike places) and invariable (unlike names). Access can be facilitated by generous cross-references. Before the start of the project our collection had neither of these features.

The decision was made to use the LC call number QB4 ("Observations. By name of the issuing observatory.") for all observatory publications, cutting them according to the name of the institution rather than its location. Using QB4 has the desirable effect of collocating all serial publications of any given institution.

AACR2 was used to determine form of name and main entry.

Variations of name were resolved by using A & A Abstracts with the American Astronomical Society Bulletin and the current issue of the publication itself as supplementary sources. If not found elsewhere, non-roman names were transliterated according to the table found in the introduction of the A & A Abstracts. The large number of names starting with "observatory" and "university" were interfiled, regardless of spelling.

Once the name of the issuing body was established and a number assigned, individual publications could be cuttered according to title. For example, the Annals of the Bosscha Observatory are QB4.B677 A5. Its Contributions are QB4.B677 C6.

Reprints from serials held by the library were listed and discarded.

Each observatory's publications are taken off the shelf and brought to a work area. Work sheets are made up for each publication, giving it a number and other cataloguing information. The blank work sheets are made up in such a way that information lines can be completed or stroked out, as necessary. If no issues have been received recently the Bibliography is checked to see whether the series is really discontinued. If it is not, a letter is sent requesting reinstatement of our name on the mailing list and missing back issues if possible. The items are then set aside for binding or are labelled and returned to the shelf. The work sheets are set aside and the cards are typed and filed in batches, along with the kardex card.

In addition to the traditional card catalogue we also have a word processing file of our holdings which may include cross-references. This is a useful working and reference tool.

Having the project only partly done makes it much more difficult to find things than it was before. But it is also very difficult to find the time to complete a large project such as this. I don't have any solutions except to say that, once started, priority must be given to working on it continuously.

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OBSERVATORY PUBLICATIONS IN THE SMALL INSTITUTE LIBRARY

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1. INTRODUCTION

I can imagine that many of us here represent a small institute library, and we can only look with wonder and envy at the vast collections of the US Naval Observatory and other such large and long-established libraries. We have a library of approx. 10 000 monographs, 13 000 bound serial volumes, 200 current serial titles and a report/observatory publications collection which grows at the rate of about 650 items per annum. In addition we receive about 800 - 1000 preprints a year. We have a staff of 2 and 2 halves. One of our part-time people deals almost exclusively with the ordering and distribution of our Extraterrestrial preprints, reports and reprints.

Observatory publications play an interesting and important role in the literature of astronomy, and constitute a not negligible part of even the smallest library's stock. Careful control is necessary, as only then can the material be exploited to the full. One may often have doubts as to its value, but we dare not venture any qualitative judgements! Our present and future readers must be able to find this material, and it is our duty to store it and make it readily available in our own libraries and, failing that, to provide the means for finding it elsewhere.

2. NATURE OF LITERATURE

One can observe a changing emphasis in the type of observatory publication, at least in the Western context. As more and more astronomers submit their papers direct to the journals there are fewer and fewer series produced by the institutes and observatories themselves, such as Annals, Bulletins, Rendiconti; and in their place is a growing mountain of preprints. In the Eastern European and Asian countries there still exist more of the home-produced series, no doubt because low budgets and unfavourable exchange rates limit journal subscriptions and publication charges. Another growth area is the production of "Newsletters" and "Bulletins" as new institutes and projects spring up.

Another dying breed is, or certainly ought to be, the Reprint series, which I consider quite unnecessary and wasteful of the earth's resources, not to mention the institute of origin's budget. We send out a twice-yearly list of reprints available, and these are distributed while stocks last. In any case, most Western libraries have excellent photocopying and inter-library-loan facilities, and for other, less well-endowed libraries a postcard addressed to the author should suffice.

Preprints, on the other hand, are an important growth area. I have noticed that, even in the last few weeks, several new preprint series have arrived on the scene, mostly with bright eye-catching covers and - fortunately - sequential numeration. They are of particular importance to our readers as the interval between

submission of a paper and its final publication in a journal is constantly increasing. Of course, many astronomers exchange their preprints privately among themselves, but the library should be seen to make itself the centre for receipt and display of information. Preprints do not present too much of an organisational problem to the small library, as by definition their life is of limited duration. If the preprint has not been published within a maximum of 2 years after its first appearance then it probably wasn't of any great importance anyway. It is our policy to discard preprints after about 2 years.

Report literature as produced by NASA, ESA etc is very important, and requires quite a lot of shelf space. At this point I would mention that we file these reports directly under their report numbers, i.e. NASA CP (No.) rather than under a conventional heading under the place. That is an example of a liberty which the small library can permit itself.

The nice thing about most of this type of literature is that it is free, and here we hit on the element of cooperation which plays such an important role. "Exchange", as already indicated by previous speakers, implies that there are two partners. If we are to receive preprints from Observatory X then we should of course be prepared to send them ours in return. This is, I think, of particular importance to the non-Western libraries, and we should really try to foster these exchange links, despite attempts in all our institutes to economise on postage and production costs.

3. PRACTICES

We need to know what we have in our own library and it is also useful to know what other libraries have. This calls for a certain uniformity in cataloguing and establishing headings, at least for the production of union lists, though I think a certain degree of flexibility and pragmatism at a local level can be entertained, for instance, in the use of the vernacular rather than the internationally preferred English version of a town or institute. The smaller library, without the burden of extended responsibility which inevitably falls on the larger ones, is rather fortunate in being able to exercise a certain amount of freedom, some may call it illogicality. We can keep separate files, and have physically separate shelving sequences for preprints, annual reports and the rest, we can decide arbitrarily which headings we establish, putting our users' interests before those of internationally recognised cataloguing rules, but only within our own house. As soon as we decide to cooperate in some scheme, such as Union List of Astronomy Serials, then we have to conform to those rules. In this way we may find ourselves with one set of rules for our readers and another set to follow when contributing to some union list. This would cause some extra work perhaps, but I feel that our first responsibility should be to our own readers.

Most observatory publications are fairly flimsy documents, and some means of protection is required in order to store them adequately. Opinions may vary on binding policy. We do not bind any observatory publications series, partly for reasons of economy, and partly because of incomplete runs. We use pamphlet boxes of A4 and A5 size, and interlocking cardboard drawers (A4 size).

4. USE

The use made of this literature is often difficult to assess, especially in open-access libraries open round the clock. Inevitably, the day after you have consigned to the cellar (if you are lucky enough to have one) some ancient series, your director will come along and ask for it urgently. I know of a certain observatory mountain library, which shall remain nameless, where the secretary responsible for looking after the library was using techniques worthy of Spycatcher or James Bond. Human hairs - her own - were intertwined with the ribbons tied round the boards enclosing the documents, and were still there on inspection weeks later, thus proving that no-one ever read the old stuff, which was only gathering dust and taking up valuable shelf space! No doubt the hairs are still there years later. It is often hard, faced with ever decreasing shelf-space, to justify our custodial function, but in the case of observatory publications, particularly the older material of historical value, I think we may have to take this function seriously, but with discrimination. We should not be afraid to discard old or incomplete series when we know with certainty of another accessible location with a complete set.

I should like to conclude with one or two random comments. The bibliographical control of this literature is most important, and Astronomy and Astrophysics Abstracts is still our main tool, so we should ensure that the editors in Heidelberg receive copies of everything. Librarians ought also to be able to exert some influence within their institute on the format and style of the publications produced. Very often one is frustrated, faced with some Newsletter or Bulletin, by not being able to find even such elementary and necessary information such as the place or complete name of the issuing institute or observatory.

OBSERVATORY PUBLICATIONS

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My library dates back to 1904, shortly after Dr. George Ellery Hale came west from Yerkes Observatory to the sleepy little town of Pasadena, California to start the Mount Wilson Solar Observatory. The classification system used in this new library was published for the International Council by the Royal Society of London. Over time the librarians managed to acquire many complete runs of observatory publications from all over the world, and they were arranged alphabetically according to the place where they were published. University publications have been included in this collection as well.

In our library all new material is placed on a display table in our reading room (pictures of our reading room are on the bulletin board) for one week. Normally the observatory publications are shelved in a room next to the reading room, with a few exceptions: some very old material is kept in a storage area in an adjacent building; oversized atlases are kept in a separate area (near the reading room); preprints are stored for approximately one year in drawers in our reading room; and occasionally an item is placed in the monograph collection, according to subject matter.

Catalog cards are filed showing the place of publication as the main entry. Title cards are filed; only rarely is a subject card needed. Shelf list cards act as charge-in records and are kept in the librarian's office.

Although ten years ago most of our library monographs were reclassified using the Library of Congress classification system, the observatory publications will most likely remain under the Royal Society of London, which serves them well. Any change, if there is to be one, would probably come about if we someday computerize our catalog.

Observatory publications may be bound or loose, newsletters are shelved along with their home collections, and an occasional preprint is made a permanent item if it is so suggested. Duplicates (including major journal reprints) are not kept, and ephemerides, with the exception of The Astronomical Almanac (formerly The American Ephemeris and Nautical Almanac) are usually not kept past a two year period, due to a space problem.

In our observatory the Editor handles the production and distribution of our publications.

SESSION 3 OVERVIEW: MANAGEMENT OF ASTRONOMICAL PECULARITIES

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Session 3 on "Handling and Use of Special Format Materials" dealt with diverse items which are of unique importance in astronomical libraries.

Preprints and reprints are important in several ways. Libraries' collection and dissemination of information about pre-publication journal and conference papers boosts the astronomer's awareness of current research in a timely fashion. Individual libraries' practices range from very basic--the receipt and physical display of preprints--to the more elaborate activities including production of lists, gathering of subsequent publication information about the papers themselves, construction of local databases listing preprints, and electronic network exchange of listings.

There was a consensus that the sending of reprint series is far less important than it was in years past.

We heard a call for formal recognition or designation of a central clearinghouse for information about astronomy preprints.

Some parts of the world (China, for example) are not receiving preprints, or information about them, on a regular basis. Reprints themselves may still be considered valuable for retention by some small institutes in eastern Europe which do not have many journal subscriptions.

Observatory publication series are considered indispensable in astronomy collections. They are sometimes accorded special shelving locations. These series present many bibliographic problems and may be variously arranged by geography or by classification number, or otherwise.

It was emphasized by one speaker (Anne Fishburn) that the use of observatory publications is difficult to assess. Libraries must take them seriously, but at the same time exercise pragmatism in managing them. A concern was raised about the need for a central clearinghouse for duplicates of these serials.

Non-print material has always been an important feature in our astronomy libraries. Microfiche has been appropriate for distribution of certain data, such as small catalogs or material ancillary to journal papers. It seems that magnetic tapes are not ubiquitous in our libraries. Magnetic and optical media were not commented upon extensively. Still, there is a great interest in the problems of catalogs or listings of magnetic tapes and also the management of documentation for these tapes. Special environment and handling must be accorded tapes just to maintain readability of the data.

Special physical storage and handling is likewise essential to the preservation of unique collections of visual information contained in sky surveys in their print, film, or glass copies.

Management of the peculiar items found in astronomy libraries poses challenges to us on a daily basis. Creative solutions will continue to arise and be improved via sharing of ideas, and perhaps through joint efforts in some cases.

PART 5. ASTRONOMICAL DATA CENTERS

THE LA PALMA DATA ARCHIVE

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I - Introduction

The Observatorio del Roque de los Muchachos is perched atop a volcanic caldera on the island of La Palma in the Canary Islands, 400 km off the coast of North Africa. Three of the telescopes at the observatory are products of a collaboration between the UK, the Netherlands, Spain and the Republic of Ireland. They are the 1.0-m Jacobus Kapteyn Telescope, the 2.5-m Isaac Newton Telescope and the 4.2-m William Herschel Telescope (which saw first light in July 1987)¹. The telescopes are computer controlled (running under ADAM software), and the observations are recorded primarily in electronic form. Recognising the success of astronomical-satellite data archives, such as that generated by the International Ultraviolet Explorer, a La Palma Data Archive has been established at the Royal Greenwich Observatory. The archive will be used by astronomers wishing to exploit data obtained by other observers, by engineers interested in the performance of telescope and instruments under varying conditions, and for monitoring the way in which the telescope is used.

The archive includes an on-line observations catalogue, and software for querying it, and for generating requests for copies of data. The proprietary period, during which the data may not be copied, is currently 1 year from the date of observation.

At the time of writing, the archive includes about 50 Gbytes of spectroscopic and imaging data, mainly from the Jacobus Kapteyn and Isaac Newton telescopes. Intending users of the facility should address their enquiries to the archive manager at RGO (currently Ed Zuiderwijk, `EJZ@UK.AC.RGO.STAR`).

The software for querying and managing the archive is a Dutch contribution to the La Palma venture. It was written mainly by Ger van Diepen and Ernst Raimond at Dwingeloo (drawing on the electronic-archiving experience of radio astronomers) and is maintained by Dorothy Hobden at RGO. The software is not site-specific, and could be adapted for use by other observatories. It is written in Fortran, the executable code occupying about 3 Mbytes.

II - How the archive works

Observers export their data from La Palma on FITS-format magnetic tapes. Copies of the tapes are shipped to the UK, where the images are processed (but not reduced) into the archive. The tapes generated on La Palma can be read as normal FITS tapes, but incorporate a large number of extra keywords (treated as comments by the standard FITS software). The keywords are grouped into 'packets', according to the type of information which they carry. For example, there is an 'observations' packet, which records among other things the right ascension and declination of the telescope, and a 'detector packet', which records the type and physical status of the detector. The astronomical data are treated as a further packet. The archiving software sorts the data on

¹ The other telescopes at the observatory are the Carlsberg Automatic Transit Circle (UK/Denmark/Spain), the 2.5-m Nordic Optical Telescope (Norway/Denmark/Finland) and the 60-cm solar telescope and 61-cm photometric telescope (both Swedish).

incoming tapes by packet, and generates archive tapes which each contain data of one packet type. Thus an engineer wishing to investigate the past history of a given instrument need only load the tapes containing the relevant packets. The software also generates an observations catalogue (a summary of which is held online), listing the keyword values for each observation made.

The data from the 3 telescopes currently fill about 20 1600-bpi magnetic tapes per week, and this number may increase considerably with the commissioning of prolific instruments such as TAURUS, which generates spectroscopic datacubes occupying several Mbytes each. Space for storing the tapes at RGO is becoming scarce, and consideration is being given to the use of optical disks for long-term storage.

III - Querying the archive

The online observations catalogue includes for each observation the following information: name of the observer, telescope, detector, instrument, type of observation (e.g. ARC calibration), name of object, type of object, wavelength/passband, polarisation accepted, right ascension, declination, zenith distance, integration time, seeing, time/date of observation and proprietary period. The software permits searching of the catalogue on any parameter or combination of parameters. So, for example, an astronomer may list all observations made of Seyfert galaxies, in the right ascension range $7^h - 19^h$, by the Isaac Newton Telescope or William Herschel Telescope, in seeing of better than 1 arcsec. The resulting list may then be sorted by any of the parameters, and may be used to generate requests to the archive for copies of the data.

Remote querying of the archive will shortly be possible over the networks.

IV - Statistical results from the archive

A preliminary observations catalogue for the Isaac Newton Telescope, detailing 9000 observations made during the period 1984 - 86, was used to investigate the way in which the telescope had been used. The results were presented by Benn & Martin (1987). They showed, for example, that the mean yield of integration time at the telescope was 3.4 hours per night, the remainder being used for calibration or observing overheads (e.g. telescope slew), or lost due to poor weather or technical problems. The yield was independent of season, the quality of the weather correlating inversely with the length of the night. This yield-figure is of great interest to observers, engineers and designers. No comparable analysis appears to exist for other ground-based telescopes.

Benn & Martin also showed that, despite there being no constraint on observers to use sensible designations, about 90% of the object-names were recognisable by a simple computer program, a reassuring statistic for archivists.

V - The future

The ambitious electronic archives being constructed by ground-based and orbiting observatories (e.g. at ESO, STScI) furnish the astronomer with a formidable database. Access to these data would be easier if the archivists were to standardise formats where possible. It might even be practicable to generate a combined observations catalogue, for a substantial fraction of the world astronomical community's collecting area.

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THE ESO ARCHIVE PROJECT

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ABSTRACT

Following the Archiving Policy recently defined, observations made at the ESO telescopes will be archived, starting with the large instruments. The FITS format is used extensively for the description of each stored observation, and a Catalogue is built up for retrieval purposes; this Catalogue will be accessible from ESO at Garching and via the existing networks. During the archiving process, special care is taken to homogenize the names of the targets observed.

1. INTRODUCTION

The main reasons to archive the data obtained at the ESO telescopes are: (a) to keep an historical record of the observed objects, for later analysis of possible long-term variabilities (b) to reuse the data for other purposes and therefore avoid the duplication of observations and (c) to allow researches based on the accumulated material, *e.g.* statistical studies, evolution of an object over several years, etc.

General Archiving will first start with the largest ESO telescopes (3.6, 2.2) and the new NTT. The amount of data to be archived is expected to be in the range 5 to 10 Gb/yr/telescope in the short term, but this amount will likely increase in the future.

The Archive is made of two parts shortly described in the following paragraphs: the bulk of the Archive is made of the observed *raw* data, including the information necessary to locate the observation in time and space; and the *catalogue* of the observations is organised as a database, allowing queries to locate the archived data and to judge whether they are suited to a new application.

2. ARCHIVED DATA

2.1 The Archive Format

Each archived data set includes the image stored as a two-dimensional image, together with a description or *header* specifying how the data were acquired. The FITS format (Wells *et al.*, 1981) allows to store binary data together with a complete description of these data. This format was chosen because it has the main advantages of being computer-independent (the Archive can be moved to a different computer without reformatting the data) and being widely known and used in the astronomical community (it was recommended by the IAU).

Any observation is described in the header by means of FITS keywords followed by a numeric or character parameter. Basic FITS keywords defined in the original paper (Wells *et al.*, 1981) are used for very general descriptions: **BITPIX**, **NAXIS**, **NAXIS1**, **NAXIS2** provide the size of each image; **TELESCOP**, **INSTRUME**, **OBSERVER** designate the instrumentation and the observer's name; **DATE-OBS**, **EXPTIME** specify when the observation was performed, and the exposure duration; a **MJD-OBS** keyword (modified Julian date, i.e. $JD - 2400000.5$) is added to have a more accurate date and time stamp; **RA**, **DEC** provide the position of the telescope at the date of observation; **OBJECT** is the original designation of the target, and **TARGET** is a "standard" designation homogenized over the whole Archive. Finally, the observer's comments are listed under the **COMMENT** keyword.

The original FITS scheme does not allow a complete description of all observing peculiarities and instrument setup. A more complete description of the ESO-specific parameters is achieved via a 3-level hierarchy starting with a unique keyword "ESO--OBS", followed by a second keyword that specifies one of the six categories detailed below, and a third keyword that designates the parameter. The categories are:

1. **GENERAL** is related to the observation run (project identification), and to the classification of the observation, as a *scientific*, a *calibration* observation or the observation of a *standard* object.
2. **TELESCOP** describes the telescope setting, e.g. the focus used.
3. **INSTRUME** describes the instrument setting, e.g. the filters used, the dispersive system with its orientation, etc
4. **DETECTOR** describes the parameters of the detector, e.g. its name, mode, status, the gain, the temperatures
5. **CHECKING** provides some key values for checking purposes, e.g. checksum numbers
6. **MIDAS** is only present for processed data, and lists the parameters used to transform raw data into calibrated data.

2.2 The Archive Medium

The large amount of data stored in the Archive requires large capacity storage media. Besides the classical 6250bpi tapes, new large capacity storage media recently became available and were tested at ESO: video cartridge tapes storing as much as 3 Gbytes, with a very attractive cost (about twenty times lower than classical tapes), and WORM (write once, read many times) optical disks with storage capabilities larger than 1 Gbyte. Optical disks are attractive for their direct access capability and the cost of the stored Gbyte comparable to the classical tape, but no standard has yet emerged.

The storage medium still remains an open choice for the ESO Archive. The final solution will likely be a combination of several media, for instance optical disks for frequently used data (e.g. fundamental calibrations), and cartridges for occasionally accessed data.

3. THE CATALOGUE

ESO Archive - Astronomical observations									
Setting				Position			Pixels		
Tel.	3.6m	La Silla		R.A.	Dec.	Air.M/Ep	x	337	
Instrum.	EFOSC						y	520	
Aperture	FREE			Tel.	219.712	-26.4825	1.02	min	167
Filter	V BESSEL	# 420		Target	219.5500	-26.4667	1986.27	Max	16383
Grism	FREE			Target	219.7500	-26.5333	J2000	mean	704
When, Who, Where				Target Designation & Classification					
date	1986/04/10	05:14:27		Original	NGC5496 V 2MIN	Type			
Release date:				Names	NGC 5594				
Exposure time		120			C 1436 -263				
Obs.	Fusi Pecci								
Tape	AD033.030	seq# 4401							
Comments									
-----The Program: Identification, Authors, Title----- 037.06-020 by Fusi Pecci/Buonanno/Corsi/Renzini/ at Bologna/Roma/Berkeley White dwarfs and lower main sequence stars in nearby globular clusters.									

Figure 1: Example of a Display from ESO Archive

The Catalogue is built from the headers of each observation. The layout of the resulting Archive Catalogue, as seen by the astronomer for querying, is shown in Fig. 1; any combination of the fields displayed in Fig. 1 may be used for queries, e.g. a combination of requirements on position, filter and exposure time. This figure incidentally shows typical clerical errors (inversion of digits) that are easily corrected with the procedure used for Archiving Process described in section 5. The title of the accepted proposal is also listed in this figure; this piece of information can be useful to decide whether an observation is suited for a new study.

The Catalogue may be queried via STARCAT, a piece of software developed in collaboration with the STScI; STARCAT is mainly a user interface on top of the data-base. The same STARCAT interface also provides access to some fundamental astronomical catalogues (presently about 35), to preprints and periodicals received at the ESO Libraries, and also allows remote queries sent to the SIMBAD data-base (Dubois, 1988) and to the IUE Vilspa station.

4. ACCESS TO ARCHIVED DATA

The Archiving Policy (van der Laan, 1988) recently defined at ESO grants a proprietary period of one year to the observing team; this propriety period may be extended on request in special cases. The contents of the Catalogue, i.e. the list of the observed targets as well as the title of the observing run, will however normally become public immediately after the end of the observations.

The catalogue will be accessible for queries at the ESO computer facilities in Garching and over computer networks (presently SPAN and X25). Access to non-proprietary data will be possible at ESO Garching; shipment of data from the ESO Archive are subject to a scientific evaluation.

5. ARCHIVING PROCESS

The data acquired at La Silla are sent to Garching at regular intervals for Archiving. The archiving process includes conversion to FITS, checking, and updating the catalogue. The checking consists in classifying the observations (as scientific, calibration, standard object) and some verifications: correct date and time, but also the correctness of the object designation compared to the telescope position. The SIMBAD data-base (Dubois 1988) is used for this purpose: the designation of the objects which are close to the telescope position are compared to the observer's object designation, and the result is stored as the "standard" target designation.

A test over one year of EFOSC (ESO Faint Object Spectrograph and Camera) observations on the 3.6m telescope was performed to ensure the feasibility of the project. The reliability of some key parameters (telescope position, timing parameters, target names) was checked, and some improvements in the acquisition systems will be implemented to ensure a maximal reliability of the archived material.

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THE ON-LINE IUE UNIFORM LOW DISPERSION ARCHIVE

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ABSTRACT

After a decade of IUE observations, the dearchiving rate for IUE data in the public domain is more than 1000 images per month, which is more than twice the number of images taken monthly at both groundstations (ie. Goddard Space Flight Center and the ESA Villafrance Satellite Tracking Station). Considering this high interest in IUE data, an effort was made to improve the accessibility of the IUE archive taking into account the availability of current intercomputer networks.

The result: the IUE Uniform Low Dispersion Archive (ULDA), a further output product (under standard quality control assurance) of the IUE project, supported by an easy to use Support Software Package (USSP). This allows scientists to help themselves to spectra by an interactive search and select procedure followed by a downlink of the data to their own computers for subsequent data reductions.

The underlying concepts of the ULDA together with practical aspects of its installation, distribution and access under the USSP are presented.

Only one month after its distribution in Europe, 4000 spectra have already been chosen from the ULDA, confirming the usefulness of the basic concept.

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SIMBAD : AN ASTRONOMICAL DATABASE

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ABSTRACT : SIMBAD is the astronomical database produced and updated by the Strasbourg astronomical Data Center (CDS). Some guidelines are given how to retrieve the astronomical information.

1. SHORT DESCRIPTION OF SIMBAD.

It must be first noticed that SIMBAD is organized by astronomical objects. To retrieve information on astronomical subjects many tools exist like Astronomy and Astrophysics Abstracts, some online databases (INSPEC, NASA/RECON, PHYS ...) or simply a dictionary. But astronomy is often related to observations and therefore to astronomical objects. Until recently, literature references concerning individual objects were not indexed at all in any of the standard bibliographical work except if they appear in the title of the paper or in an abstract. So it is often difficult to retrieve papers and information concerning one object. This , on the contrary, is the aim of SIMBAD .

SIMBAD concerns by all astronomical objects, except the solar system. It contains about 2,500,000 designations concerning 600,000 stars and 100,000 non-stellar objects (mostly galaxies). In a near future it will contain of the order of 20 million objects. SIMBAD contains about 30 types of data, among them bibliographical references. The bibliography contains references to stars from 1950 onwards, and to all objects from 1983 onwards. SIMBAD is continuously updated at the CDS and for the bibliography also at the Institut d'Astrophysique de Paris and the Paris and Bordeaux Observatories.

2. RETRIEVAL OF INFORMATION.

SIMBAD is organized by astronomical objects. In this way, the interrogation of SIMBAD is not made by keyword but by the name of the objects or a list of objects. Thus there exist three query modes for SIMBAD : the designations of the object or the position in the sky or a combination of criteria. The two last modes gives a list of objects and then the data connected to these objects.

2.1 Retrieving by Designation.

The retrieving of information using the names of the object is hindered by the complexity of the different types of designations for the same object (cf. The First Dictionary of the Nomenclature of Celestial Objects and their Supplements : Fernandez et al. 1983, Lortet and Spite 1986) and by the fact that one object could have as many as 30 different names. For these reasons, SIMBAD contains an important number of cross-identifications.

2.1.1 Multiplicity of Designations.

To illustrate this problem, the different names used for the star Vega are :

ADS 11510A, AG+38 1711, alpha Lyr, 3 Lyr, BD+38 3238, BD+38 3238A, CEL 4636, 1E 183515+3844.3, FK 4699, GC 25466, GCRV 11085, GEN+1.00172167, GJ 721, HD 172167, HGAM 706, HR 7001, IRC+40.322, JP11 2999, LTT 15486, N30 4138, PLX 4293, ROT 2633, SAO 67174, SKY 34103, TD 1 22883, UBV 15486, UBVM 23118, V* alpha Lyr.

2.1.2 Multiplicity of Format.

The multiplicity of names is complicated by the different formats which could be used for the same name. Indeed, for a standard software, the space character is important and, for the computer, the following names are different one from another.

HR 23

HR23

HR 23

or

MCG +01-23-045

MCG +1-23-45

MCG 1 - 23 - 045

MCG +01 - 023 - 0045

...

The SIMBAD's software handles most of these formats. To do this there exist two main rules :

1) There is a space between the name of the catalogue and the number in this catalogue.

2) If there is a sign (+ or -) in the name, the sign must be present.

2.1.3 Multiplicity of Catalogue's Name.

The third problem is the non-standardization of the name of a specific catalogue. For instance HR or BS designate the same catalogue and HR 23 or BS 23 designate the same star. To solve this problem the following guidelines are proposed :

1) Use the "First Dictionary of the Nomenclature of Celestial Objects" and its Supplements (Fernandez et al. 1983, Lortet and Spite 1986) to find the usual designation of the objects.

2) Use online information on SIMBAD to find the usual designation in the database.

If you have a designation beginning with the letter "Z" you could find all catalogue beginning with "Z" which are in SIMBAD using the command : "INFO CATI Z&". Among other, you will obtain information on the catalogue of galaxies made by Zwicky. Instead of "Z" it is possible to use as many letters as necessary. "INFO CATI ..." gives informations on catalogue identifiers. It is also possible to find the identifier by searching the name of the first author of the catalogue with the command "INFO CATA ..." e.g. "INFO CATA ZWICKY&" gives information on all catalogues where Zwicky is the first author. Other possibilities of the "INFO ..." command can be obtained with the command "INFO" alone which displays general information.

2.2 Retrieving by Coordinates.

It is often interesting to search information in a region of the sky, for instance to find an object for which we do not know the right name or to find objects for comparison with another. An easy way is to give accurate or approximate coordinates. Then SIMBAD makes a search in a circle around this position and gives a list of objects. The radius is of 10' but could be modified if necessary.

2.3 Retrieving by a Combination of Criteria.

Another way to obtain a list of objects is to give some criteria (eg. area in the sky, range in magnitude, existence of some specific types of data ...). The search by coordinates is just one peculiar case. There exist about 30 criteria and it is possible to combine them.

2.4 Retrieval of Bibliography.

Because the bibliography is organized in some different way which is not simply connected with the objects, it is possible to retrieve the references using :

- the name of one object quoted in the paper.
- the name of the first author.

The name could be abbreviated with the first letters. This search could also be combined with specifications of the years of publication. The command "INFO AUT 86,87 XYZ" is for a search of bibliographical references published between the years 1986 and 1987 by authors name beginning with "XYZ".

On the contrary the command "INFO REF xxx" displays the author(s), the name of the journal with the number of the volume and page and the title of the paper which has the reference number xxx in SIMBAD.

A comparison of SIMBAD's bibliography with other astronomical bibliographies is presented at another place in this conference (Dubois 1988).

3. ACCES TO SIMBAD.

SIMBAD is accessible through the public packet switching data network : TRANSPAC in France, DATEX-P in Germany, etc. A transatlantic link sponsored by the NASA is implemented in order to provide no-cost access to SIMBAD for all U.S.-based astronomers. It should be noticed that Electronic Mail network such as EARN/BITNET which do not allow remote log-in are not suitable for interactive access to SIMBAD.

The CDS will provide on request an account number for the use of SIMBAD.

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SIMBAD BIBLIOGRAPHY AND OTHER ASTRONOMICAL BIBLIOGRAPHIES

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ABSTRACT : SIMBAD is an astronomical database which includes bibliographical references. Some comparisons are made with other general or specialized astronomical bibliographies.

1. INTRODUCTION

SIMBAD is an astronomical database produced and updated by the Centre de Données de Strasbourg (CDS) at the Strasbourg Observatory (France). SIMBAD contains about 30 types of data, among them are bibliographical references.

Before comparing SIMBAD's bibliography with others, it must be noted that SIMBAD is organized by astronomical objects. In this way, the interrogation of SIMBAD is not made by keywords but by the names of the objects or a list of objects. Thus, SIMBAD contains only a few papers concerning theoretical work except if some objects are quoted in the paper. A thesaurus is replaced here by a list of objects. The following comparisons concern interrogations by object's name.

2. COMPARISONS WITH GENERAL BIBLIOGRAPHIES

2.1 Fach-Informationen Zentrum.

A first comparison is made with the database produced by the Fach-Informationen Zentrum at Karlsruhe (FRG). It concerns 8 objects and its bibliography for the years 1983 and 1984.

Table I

Name of object	Number of references in		Identical references
	SIMBAD	FIZ	
Alfa Lyr	52	17	11
Alfa Tau	32	4	4
T Tau	42	9	7
HZ Her	45	24	18
Zeta Cap	16	6	5
BL Lac	49	29	27
3C 273	116	46	29
PSR 1937+214	<u>54</u>	<u>24</u>	<u>21</u>
Total	406	159	122

The interrogation of the FIZ bibliography could give more references but some of them come from some confusion in the FIZ database. For instance, with the bibliography of alfa LYR (known also as VEGA) FIZ gives also information concerning the spacecraft VEGA, or with the Zeta CAP bibliography FIZ provides information for other Barium stars.

2.2 Astronomy and Astrophysics Abstracts.

This comparison is made for the same objects and the year 1986.

Table II

Name of object	Number of references in		Identical references
	SIMBAD	AAA	
Alfa Lyr	25	12	7
Alfa Tau	22	11	7
T Tau	29	13	8
HZ Her	34	12	8
Zeta Cap	6	3	3
BL Lac	19	18	7
3C 273	69	46	16
PSR 1937+214	<u>21</u>	<u>11</u>	<u>8</u>
Total	225	126	64

For this comparison we may notice that there are more references in AAA for T TAU and BL LAC because no differentiation is made between the star T TAU and the T TAU type stars, or between the object BL LAC and BL LAC type objects. We find also in AAA comparatively more references than in the FIZ bibliography and also more references which are not in SIMBAD. Another comparison made for the year 1985 for 18 other objects and concerning 329 references shows the same result. From these two comparisons we may expect that in 100 references , 80 could be retrieved by SIMBAD, 45 by AAA and 30 by FIZ. Only 25 references are in common.

Therefore if objects are concerned, the bibliography retrieved by SIMBAD is clearly more important than what is found in other bibliographic databases even if they have reviewed a greater number of astronomical publications.

3. COMPARISONS WITH SPECIALIZED BIBLIOGRAPHIES

There exist many specialized bibliographies for different classes of astronomical objects. Here is a comparison with some of them.

3.1 Bibliographies using SIMBAD.

There exists a bibliography for planetary nebulae (Acker et al. 1984) and one for RR Lyr stars (Heck 1988).

In each of these bibliographies appear a few additional references not quoted in SIMBAD.

3.2 IUE bibliography (NASA 1986).

161 papers were checked ; all are in SIMBAD. On the other hand, from SIMBAD it is not possible to know if these papers are based on IUE observations.

3.3 Close binaries (Herczeg 1986).

In the first part of the bibliography which concerns objects, 90% of the papers (209 checked) are in SIMBAD. In the second part which concerns *theoretical* and general questions, 70% of the papers (40 were checked) are in SIMBAD.

3.4 A Peculiar Newsletter.

This bibliography cites information which is not always published and abstracts of preprints. For the latter, 100% were found in SIMBAD (32 were checked for the year 1986 and 1987).

3.5 Variable Stars.

There exists a bibliography made by Huth and Wenzel (Wenzel 1981). A comparison is made with some of the stars of Tables I and II for the year 1980. The results are shown in Table III.

Table III

Name of object	Number of references in		Identical
	SIMBAD	HW	references
Alfa Lyr	17	12	7
Alfa Tau	19	18	10
T Tau	11	17	3
HZ Her	32	29	15
BL Lac	<u>4</u>	<u>1</u>	<u>0</u>
Total	83	77	35

The two bibliographies have about the same number of references but only 25% are in common. This is explained by the fact that, on the one hand, the bibliography of variable stars uses many bulletins of Variable Stars Observers's Associations which are not taken into account in SIMBAD and on the other hand that SIMBAD has more references from the main journals.

4. CONCLUSION

This study based upon more than 1600 bibliographical references shows :

- 1) The difficulty in making an exhaustive survey of papers.
- 2) It may be preferable to locate theoretical subjects via general astronomical bibliographies using a thesaurus or an inverse file of the texts.
- 3) Specialized bibliographies often appear to be a duplication of the survey made by SIMBAD, at least for a major part. However all these bibliographies give some additional information not contained in SIMBAD.
- 4) If the search concerns objects, SIMBAD appears to be very efficient in any case and is often the most effective tool for retrieving a bibliography.

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PART 6. CONSERVATION AND ARCHIVING

CARE AND HANDLING OF BOUND LIBRARY MATERIALS

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ABSTRACT

THE CARE AND HANDLING OF LIBRARY AND ARCHIVAL MATERIALS HAS BECOME A MUCH - DISCUSSED TOPIC IN RECENT YEARS. CONSIDERABLE TIME, EFFORT, AND MONEY ARE BEING INVESTED BY MANY LIBRARIES AND ARCHIVES IN PROTECTIVE HOUSING, REBINDING, CONSERVATION, AND PRESERVATION MICROFILMING PROGRAMS. THESE ACTIVITIES ARE EXPENSIVE. THEREFORE IT MAKES GOOD FISCAL SENSE TO DELAY THE NEED FOR THESE COSTLY ACTIVITIES BY MAKING AN EFFORT TO PRESERVE LIBRARY MATERIALS IN GOOD CONDITION FOR AS LONG AS POSSIBLE.

Proper care and handling can significantly extend the useful life of library volumes and postpone the need for costly treatment, filming, or replacement. This morning I will discuss several handling, housing, storage, and exhibition procedures that will help reduce book deterioration.

Readers generally demand too much of books. The two parts of a volume most affected by use are the spine and the joints (or hinges). Strain on hinges in the course of use can be reduced by not forcing a tight or stiff joint to open flat. Even if the joint is flexible, the hinge can be damaged if the cover is unsupported and allowed to open too far. Books will most often work better if they are set up with both covers open at equal angles relative to the text block. In some cases, when the book is large and the joints very flexible, both covers can lie flat on the table. However, supporting the covers at an angle is usually best. Then both the hinges and the spine are protected as the book is kept from opening too far.

On older books and frequently on books with brittle paper, the spine is often in a condition where pressure exerted on the pages to make them open flat will literally crack the binding in half. A good rule of thumb is that, regardless of the strength or flexibility of a hinge, no book should be opened beyond the distance required to read it comfortably.

In the Rare Book Reading Room at the Library of Congress, we use very simple supports for books with weak or delicate hinges. Pieces of high-density foam, under a soft felt, support the open covers like a cradle. They are easy to construct in various sizes, and with a small stock of cradles on hand most books and angles can be accommodated. Readers are also given bean-filled velvet "snakes" to drape across a page that resists opening. The "snake" safely holds the pages flat and discourages readers from using their elbows or other heavy objects to hold the book open.

Enclosures which are placed between the pages of a book are usually damaging to its pages and binding. Enclosures add extra thickness to the volume and this in turn places unnecessary stress on the binding, particularly at the hinges. This additional stress causes the covers of tightly bound books to detach from the binding.

While most enclosures are pertinent to the history and identity of the book, it is better to house this material outside of the book itself in an acid-free envelope or folder. The folder can be placed next to the book or in a special file designated for this purpose.

At the Library of Congress, each book that receives full conservation treatment is returned to the shelf in a protective box. Often, a book with artifactual value will be returned to the shelf in a box with a portfolio compartment. This portfolio houses any ephemera that go along with the book, such as fragments of the original binding.

For most books, a good binding is sufficient to protect and preserve the text. For many books – particularly rare and fragile books– some additional housing may be desirable to protect it on the shelf (from abrasion, dust, dirt, sunlight) or during handling. Books suitable for protective enclosures might include those with bindings that are:

- 1) fragile,
- 2) particularly adverse to environmental conditions,
- 3) elaborately decorated or tooled,
- 4) vulnerable because of condition, size, or shape,
- 5) deteriorated or damaged,
- 6) covered with unusual material, and/or
- 7) large or odd-shaped.

There are many types of protective enclosures that vary in design and complexity. Some enclosures are relatively easy to construct while others require greater ingenuity and skill. The "phase box", for instance, is simple to construct and is suitable for most books. The double - tray clamshell box - a common design that has been used by book binders for decades - is somewhat more complicated than the "phase box" to construct. The clamshell box consists of two trays, one that fits around the other, with a case or cover wrapped around the outside. It is an efficient design suitable for small books with paper text blocks and with leather, cloth, or paper covers. Special boxes can also be constructed for large, or odd-shaped books, and books with associated ephemera.

In short, a successful protective enclosure should: 1) protect the object it houses from light, dust, and abrasion; 2) be constructed of permanent and durable conservation materials; and 3) allow easy removal of the item, without any design features that could lead to inadvertent damage during removal of the book from its container.

Two other aspects of book care for bound volumes that should also be considered are environmental monitoring & control, and library exhibition.

Most library materials are constructed from organic materials. Some books, because of the materials from which they are made and the manner of their manufacture, have a greater potential for change, and a shorter life expectancy, than others. The only power that most of us have over this natural process is the power to control the rate at which change takes place.

The chemical reactions associated with the breakdown of organic materials need a

certain amount of energy in order to occur. The more energy introduced into a system, the faster the reactions proceed. Heat is an energy source and it is an accepted maxim in chemistry that for every 10^0 C increase in temperature, the rate of chemical reaction doubles. Actually for paper the rate of deterioration more nearly doubles for every 10^0 F. This means that paper in books stored at 80^0 F. will deteriorate twice as fast as in books stored at 70^0 F.

Water facilitates chemical reactions by causing some metals to rust. Moisture also assists in the breakdown of alum into sulfuric acid to make acidic paper. Prolonged exposure to high humidity can lead to the growth of mold.

Light is also a source of energy. In the shorter ultraviolet wave length regions of the spectrum, it can alter the chemical make-up of certain materials in books such as lignin, dyes, and other organic substances. Prolonged exposure to the longer wavelengths of light can also have an equally destructive effect on book materials.

It follows then, that one way in which the rate of deterioration of library materials can be slowed is through the control of the levels of heat, humidity, and light in the environment in which they are stored.

For optimum preservation one must strive to maintain a library environment:

- 1) that is not too hot,
- 2) that is not so humid that mold grows and insects thrive, and
- 3) whose temperature and relative humidity are moderate and don't fluctuate to extremes.

In addition, direct sunlight should be kept from falling on the collections, and light levels and length of exposure to light should be kept as low and short as practical.

To help accomplish the above, there are several instruments which can be used to monitor environmental conditions. Among them are:

- 1) the sling psychrometer (gives temperature and relative humidity readings);
- 2) the recording hygrothermograph (produces a continuous chart that shows temperature and humidity extremes);
- 3) the light meter (gives light level readings in lux or footcandles); and
- 4) the ultraviolet light meter (measures ultraviolet radiation in microwatts per lumen).

Virtually every library places books on public exhibition from time to time. Exhibition is a particularly vulnerable time for bound materials because they are subject to a variety of environmental factors which can accelerate deterioration. Therefore, one should consider the following points when putting a display together:

- 1) Consider as books are being selected for exhibition, whether a given volume is in good condition. Can it withstand the strain of display? If it is damaged or badly deteriorated, schedule conservation treatment prior to display. If this is impossible, perhaps another book in better condition could be substituted.

- 2) Make a note of the book's physical condition prior to putting it in the case-- is the

cover faded; are any of the pages discolored?

3) Keep an eye on the book during its display and again after exhibition. By monitoring it in this way, any negative aspects of the exhibit environment of which you were previously unaware will become apparent, and corrective measures can be taken when mounting the next show.

Most library exhibit cases are either upright or flat-topped rectangular units. They are usually set-up in halls or passageways where the public has easy access to them. To discourage theft and vandalism, make certain that the cases are securely locked and located within sight of library personnel.

The rate of air exchange in exhibit cases is generally slow. For this reason, there exists inside them a micro-environment that, although similar to the overall library environment, is uniquely characteristic of small enclosed spaces. In many ways the case acts like a greenhouse. During the day, lights burning within it or shining on it at close distances from the outside, heat the air so that the temperature inside the case can be much higher than that of the surrounding room. Under certain extreme conditions the air in a case can go through a 30-40° fluctuation in a 24-hour period. Extremes of this sort are very destructive to books, and every attempt should be made to avoid them. If the book to be displayed is very valuable, a display case can be constructed with its own self-contained climate-control system. Most often however, adequate control is possible if a few simple rules are followed. For example, cases should not be placed in front of radiators, or in direct sunlight. Cases should be lit from the outside only, so heat isn't actually being generated inside them.

In addition to generating heat, light also causes damage in other ways. Sunlight is especially bad for books because it contains a lot of the shorter, high-energy, invisible ultra-violet (UV) wavelengths. Fluorescent lights -- found in most libraries -- also contain high levels of harmful UV radiation. Every effort should be made to remove or shield sources of UV light in the exhibition area. This can be done with the use of filtering material (such as UV plastic glazing or UV filter sleeves) or window shades. As mentioned earlier, non-UV emitting light in the visible spectrum can be as damaging to some materials as UV light if it is bright enough and if the exposure time is long enough. Therefore, if prolonged illumination is required, brightness of illumination should be kept as low as possible.

In display, as in handling, book bindings should never be forced into positions they cannot accommodate easily, should not be opened wider than is natural, and should not be restrained in any position with heavy weights. In addition, when books are displayed open, they should be supported along the bottom so they don't sag. All these things can be accomplished by displaying the books in custom-made cradles, made from plexiglas or from 4-ply board. The latter can be constructed easily in-house with inexpensive, commercially available products.

In this paper I have presented some ideas about how bound library materials can be preserved through proper care and handling. Good shelving, combined with careful handling can limit physical wear and tear. The maintenance of an environment in the library that keeps temperature, relative humidity, or light at moderate, stable levels can slow the rate at which chemical changes occur. Proper exhibition can also aid the preservation effort. Taken together, these practices will help prolong the life of a library's entire collection.

THE CARE OF OBSOLETE INSTRUMENTS

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Hungary is a little country with old traditions. Hungarian celebrate the 950th anniversary of the death of the first king Stephan I this year. As regards astronomy, during the Renaissance in the court of the Hungarian king Matthias I there was a modest flowering in astronomy and this continued until 1526, when because of the Turkish occupation, the region was cut off and remained so for centuries. I do not want to list all the tragic historical events. Rather I would like to emphasize what we know by own experiences: what it means to reconstruct destroyed buildings and to try to collect valuable old items that are thrown away by guilty negligence.

Returning to the recent time, according to my experiences that also in peaceful circumstances valuable old things such as books and scientific instruments are in permanent danger. This is true especially when they are not "up to date" but not old enough for antiquarians. Furthermore, the obsolete instruments meet a worse fate. During my working period in the Konkoly Observatory many instruments considered obsolete have been eliminated while the old books have quiet places on our shelves in the library.

With respect to survival, there are many differences between instruments and books. This is the most important difference among them: while an instrument is made in one or in very few copies, the books are printed in hundreds.

One source of trouble is that it is very easy for someone to modify or disassemble an instrument to the point where it is unrecognizable.

While a good librarian knows that she should preserve almost everything for later centuries there is no person whose job is to preserve obsolete instruments.

Hopefully this situation is dealt with better care in other countries.

I know there are many scientists and scholars who are very interested in the old instruments. Also societies have been established by these persons. I wish only to declare the librarians can help this movement founded by lovers of scientific instruments.

The most effective way is to collect and reference completely the old and new books that deal with old scientific instruments. That is also the task of the libraries of the Technical Scientific Museums I know well. But these institutions are relatively new establishments, and their excellent libraries probably could not get all the books that were published centuries before the Museums were founded.

Until recent times, the old instruments, having no possibility to get into scientific museums, were installed in the observatories. This was a very good situation in many ways. You could find in the same place,

the instruments, the printed results made by the help of these items, old letters and diaries that gave description of these instruments, and any other informative documentation.

The situation has changed completely. It is only a rare exception if an observatory has its own museum. We had a rich astronomical collection of old scientific instruments in the Konkoly Observatory before the second World War. Now the instruments are separated from the documentation regarding them. The astronomical librarians do not want to part with the old documents because they fell the best place for them is in the libraries. I fully agree with this. There is a very new fashion in the world, the dynamics of reorganization is the most dangerous disease for old things. The astronomical libraries have a special "historical atmosphere" while the librarians are guarding the old things with special care. They also know well that what today is a current item, will soon have historical value. Supposedly I am very subjective in this question because of my own experiences.

The nucleus of our library was collected in the seventeenth century. Since this time this collection had found a guard - an astronomer or a librarian who felt responsibility for it. But where are the instruments of late Hungarian observatories? Only a small part survived through history and were added to the Hungarian Technical Museum.

I could have said many sad stories on the fate of some old instruments in Hungary. I mention only one: twenty years ago, the very first Hungarian telescope was thrown into the garbage.

However I am dealing with historical tasks I am not an expert of old instruments, my librarian-work would have demanded deeper experiences in this business.

During the last twenty-three years I have had to give detailed information on old astronomical instruments many times. It was a difficult situation if the "lost" instrument came to light again in a totally unrecognizable form. I had no serious problem if these instruments could be identified by the help of well-known textbooks i.e. BION¹, MARINONI², AMBRONN³, or REPSOLD⁴. But in the case that this was impossible, I tried to detect important data in popular books, biographies or the observatory's publications. It would be very useful to list all this second-hand information by means of a computer.

While searching for any documents on late instruments, often without success, I came upon an idea: Wouldn't it be useful if all astronomical libraries had a special documentation of the late instruments that belonged to their observatory? An item might have only two pages, with a photo and a one-page description. It would be a difficult task to start collecting very old documentation now, but records of instruments now becoming obsolete would be easy to organize.

I do not want to burden the librarians with new tasks. We are overwhelmed by manifold new disciplines. With such modern advances as magnetic tapes, optical discs, etc., the library would serve as an efficient center for astronomical research work.

But an astronomical library is not only the center in an astronomical institution. It should be the heart of it. The place where all important information regarding to the previous life of the observatory should be collected.

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CORRESPONDENCE, UNPUBLISHED PAPERS AND DATA : COMMENTS ON MODERN
USE OF OLD ARCHIVES

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1. INTRODUCTION

For a scientific or historical purpose, nowadays astronomers may need to use documents of the past. One can assume they are then, in a situation similar to the one that next centuries searchers will have to face, when using present time documents we will have left them. So, actual experience may help to know what to do or what not to do, dealing with the contents of future archives.

2. THE CASE OF SCIENTIFIC WORK

In astronomy, the most important variable is time. Since in this field, no experiment can be made, the astronomers must watch the universe and an essential task is to observe. Starting from observations, they will set up theories through analysis, treatment, interpretation, or else, starting from theoretical work, they will check their conclusions by comparison with observational data.

In astronomy, another specificity of time is the slowness of the celestial motions in regards to human lifetime. That's why, in many cases, informations on long periods of time have great importance. Due to this fact, astronomers need not only to use contemporary data, but also to use data collected or elaborated by their predecessors.

This implies that such informations have to be retrieved and sometimes it could be difficult through personal hand written papers (Figure 1 and 2). Nowadays computers and typing-machines being often

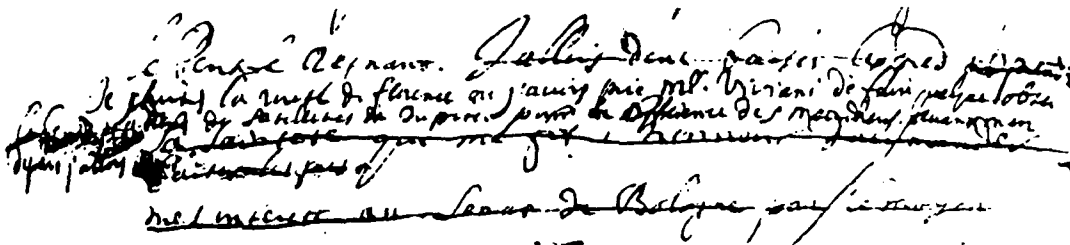


Figure 1. Extrait d'un manuscrit de Cassini. Bibliothèque Observatoire de Paris

used, the work of future generations might be easier. The retrieved data should also be fit for use, i.e. clearly identified and adequately documented.

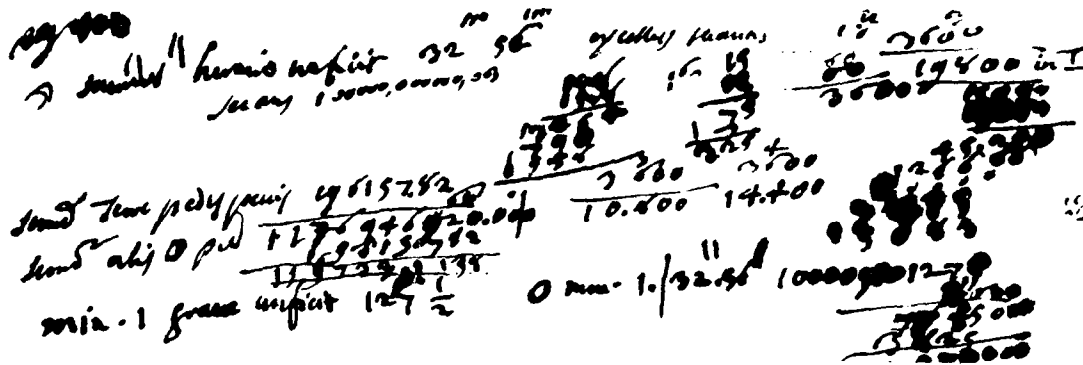


Figure 2. Extrait d'un manuscrit de Cassini. Bibliothèque Observatoire de Paris

In the best cases data are self-sufficient. Such are Cassini's and Picard's observations of the galilean satellites of Jupiter given in true solar time or in mean solar time with the exact location. Thanks to this, their accuracy for the 17th century was first calculated in 1976 (Débarbat 1978) and later, the whole unpublished data from Paris Observatory archives was utilized to test the validity of the J.P.L. ephemerides (Lieske, 1986) used for the spacecraft program : ephemerides errors were proved to have the same order of magnitude (Figure 3).

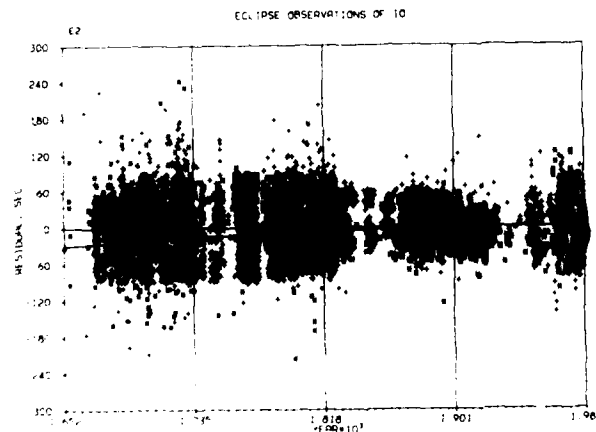


Figure 3. Plot of Observed minus Calculated times of eclipse (in sec) using Ephemeris E-2 for Io from 1652 to 1983. Residuals in sec may be converted to longitude residuals in km by multiplication by -18 km/s. No adjustments to the E-2 ephemeris have been made. The x-axis for zero-residuals for Morrison's values of ΔT and his $\dot{n}_{Moon} = -26.0$ are depicted by the solid curve. Extrait de Lieske 1986

Sometimes, lack of informations relating to observational data may prevent from using them. Such is the case for the observations of the diameter of the sun reported in Picard's notebooks. No doubt since 1982, they are true observational informations (Débarbat 1987) but are they rough data or smoothed data ? Up to now, it has been impossible to know it, so it is impossible to use them properly.

In all cases, observations are unique, not repeatable. Therefore, the use of old data requires the same informations as modern use of recent ones : rough data preferably and, if not possible, processed data with the exact processing method.

3. THE CASE OF SUBORDINATE DOCUMENTS

Subordinate documents are documents which have not been used for publication or documents the purpose of which is not to be published: notes, drawings, letters concerning organisation, instruments, funds raising, correspondences,...

As an example, the responsible person of a new project has much more informations than there will be in published documents. His (her) records contain details which may be of great importance later, so it is a pity that, very often, they are destroyed. This is what happened, at Paris Observatory, to the mid-19th century records of the construction of the dome installed on the upper level. They would yet have been very useful for the actual restoration work.

Development of science always depends on political decisions through allocation of funds and of positions to specific domains. Informations relating to this point are useful to a better understanding evolution of research and also, perhaps, to a better participation to actual decision processes.

As for the past, such informations are mainly found through what may be called every day life, personal and biographical details. As an example, it is only one sentence in one letter that enables us to understand why there are so few financial documents in the Paris Observatory archives of the "Carte du Ciel" : Admiral Mouchez has personally supported the hospitality expenses of the first meeting in 1887.

In our days, such informations are included in reports, minutes of commissions, meetings, rules, financial statements, decisions by councils. Furthermore, the corresponding papers contain more and more scientific argumentation. The importance of these subordinate documents must not be ignored when planning archives organization.

4. THE CASE OF PUBLISHED INFORMATION

One may think that published informations are well preserved and therefore, that it is of no use to keep the corresponding rough documents. It is true that, if Cassini's observations, for instance, had been completely published, we would not suffer so much from the lack of several years of valuable observations, as astronomers do,

in fact, since corresponding notebooks disappeared a long time ago and will be probably missing for ever.

On the other hand, and apart from misprints which can give birth to false results when they deal with figures, very often, there are differences between the published texts and the original ones.

As an example, an article on the improvement of the astrolabe, written in 1955 by Danjon himself, includes a correspondence to him on the subject. Comparison with the original letter, kept in Paris Observatory, shows that the publication is not comprehensive, one sentence missing without any clue to know it.

Very often, published informations give but the final results of a specific program and, in this case, published informations are not convenient for other utilizations concerning other programs. As an example, satellite observations, as mentioned above, which have been used for the checking of modern ephemerides were initially made for longitude determination. If nothing else but the published results (i.e. longitude) have been left, the rough data being destroyed, this recent use would have been impossible.

5. CONCLUSION

From actual examples of current research on documents of the past, we can acquire a certain knowledge of the required conditions of future astronomers' works on our present data and informations.

In some way, we can anticipate some of their needs and also some of the difficulties they will meet. Furthermore, we may be sure that it is impossible to know their real motivations. On the other hand, from unsuccessful searches of important informations which might have been deliberately destroyed, we are aware of the present question : what to keep ?

Concerning the archives, the question of selection is not a comfortable one, neither are the others. Before taking decisions on peculiar points, a global study of organization is necessary. This is the view presented by A.M. de Narbonne.

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CORRESPONDENCE, UNPUBLISHED PAPERS AND DATA : PRESENT MAKING OF HISTORICAL RECORDS

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Research process generates public and formal informations accessible through published documents or public data bases which libraries are used to deal with. It also generates informal, anachieved informations in format of correspondances, notes, calculus, reports, drawings... or other unpublished documents that libraries must not either leave aside.

THE STATUS OF DOCUMENTS

Since fundamental research, versus technological research for instance, implies great personal involvement, informal informations are mainly *issued from individuals or small groups of individuals*. It is probably the reason why this kind of informations and documents is often considered erroneously as private by astronomers deciding by themselves to destroy, to move or leave behind their so-called personal papers. These documents and informations actually belong to the institutions. They must be preserved because they are part of the research production and also because they may be used for astronomical research as it is illustrated in S. Débarbat's communication.

PROCESSING BOOKS AND UNPUBLISHED DOCUMENTS

Obvious differences of materials, a few differences of vocabulary must not hide the unique character of the principle of the preservation of archives and books.

Collecting and selection stand for acquisition ; inventories, like catalogues are both directories which enable public communication, the whole processing being made to meet user's needs.

In the case of archives, communication is illegal as long as a regular period of time is not achieved, according to the types of informations included. Meanwhile, confidentiality must be strictly observed. This induces differences in the methods but the collecting of the matter which may be part of archives presents similitudes with the collecting of the informations necessary to acquisitions and global selection programs are very close to acquisition plans.

COLLECTING

Efficient collecting needs great scientific community involvement. The most comprehen-

sive it is, the most pertinent the selection may be. Permanent organization activated by the archives production units (scientific and administrative) as soon as documents are no more permanently used, is the best way to avoid accidental destructions due to lack of room. On the other hand, strict respect of confidentiality rule will help to avoid deliberate destructions of what some authors might consider as very personal. Periodical reminding of the legal obligations is also necessary. The main line of action will be to obtain large and active cooperation from the "producers". The launching of the program is mainly time consuming. Its success will be followed by need of means, sufficient space being the first.

SELECTION PLAN

Though precise criteria to be finally used are specific of each funds, though selection itself is to be centralized, an approved official selection plan is a useful tool. It will be a guarantee to keep selection as objective as possible by restricting personal or institutional subjectivity. Thus, the task will be easier, thanks to the facilities of systematic decisions and processings : immediate transferring some categories of documents to other better suited institutions ; global predetermined destruction of previously identified duplicates ; non detailed and quick inventories of some other sets... Furthermore, the publication of selection plans will promote cooperation with relative research institutions, exactly as the publication of acquisition plans is a basic tool for resource-sharing on published literature.

Examples and conclusions in S. Débarbat's communication and recommendations in J. Dudley's one, on what to do and what not to do, will be a help to the setting up of practical rules which should fit national regulations and local necessities. Yet, consequences of new methods of astronomical research on archives preservation are also to be taken into consideration.

NEW WAYS OF DOING

New technologies, and specially the reversibility of information storage, make information shortlived and "volatile". No usable traces of electronic mail or phone calls, but much more serious, the question of observational data preservation. These are more and more directly acquired on magnetic supports, immediately processed and less and less completely published. Where would we be if our predecessors had systematically written with a pencil and robbed out their works to use again the paper sheets ?

Other problems come from changes in research management. Old routine observational programs and long term purposes have generated complete and comprehensive publications. Modern management by objectives generates new types of documents : scientific documents that mostly contain selected and specialized informations which may not be adequate to further unexpected aims, administrative documents containing also important scientific argumentation.

The third point is the high concentration of observation means associated to large information exchanges through electronic network and through astronomers' great mobility. Its consequence is the concentration of rough data in few unique data bases associated to the scattering of complementary informations in numerous astronomical research centers.

Furthermore, new technologies and new methods generate larger and larger quantities of information ; so, destruction, instead of selection, is not rare. Astronomical community is in great danger of loosing valuable and quite unique informations.

CONCLUSION

Paris Observatory is more than three centuries old. It keeps papers dating from its foundation and is rich with 18th century documents, papers and instruments as well. More recent archives are not so comprehensive neither so well processed. Last generations of astronomers as other french scientists, have not felt so concerned as their predecessors by preservation question. Great demand has brought the library to initiate a new program on collecting and selecting unpublished documents. The here described processes have been defined in cooperation with archives experts and are to be applied by library staff. It is a long range objective due to the lack of staff and the lack of room. Anyway, it has started ; people begin to be aware of archives. Hopefully, it will go on.

MAINTAINING THE HISTORICAL RECORD

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The session on CONSERVATION OF HISTORICAL MATERIALS covered preservation of library materials and historical instruments, and included an account of how one observatory set up a state of the art conservation laboratory and program. Mark Roosa of the Library of Congress told us in a very lively way what we should be doing to preserve current and rare library materials. Perhaps many of us knew some of these basic principles, but it was good to be reminded of them so that we can more actively apply them in our libraries. Janet Dudley (formerly of the Royal Greenwich Observatory) described the magnificent conservation project which was set up at RGO a few years ago. It would be ideal if such projects could be undertaken at all astronomy libraries which have rare books and archival materials. However, it is apparent that finding funds for conservation is very difficult in many institutions. Magda Vargha of the Konkoly Observatory described the conservation of historical instruments, and reminded us of the terrible things which can happen to these instruments if they are not considered within the historical perspective of the institution.

In the later discussion on archiving of correspondence and unpublished documents, the problem of getting astronomers to save personal papers was presented. Suzanne Debarbat and Anne-Marie Motaïs de Narbonne (both of the Observatoire de Paris) suggested that perhaps the IAU could set up a joint working group sponsored by Commissions 5 (Documentation and Astronomical Data) and 41 (History of Astronomy). This working group could determine the criteria for selecting material to be archived. Astronomers would then have guidance from the IAU indicating which personal papers should be saved and the types of working papers that are important. This problem was then presented by S. Debarbat at the August 1988 meeting of the IAU in Baltimore. The President of Commission 41 (North, 1989), noted that "...personal papers of great importance to the history of astronomy continue to be dispersed or destroyed." He then appointed S. Debarbat "to act on behalf of the Commission in setting up a working party to explore the problem, jointly with Commission 5."

In this overview of maintaining the historical record, I would like to comment briefly on the proposal to preserve 19th century observatory publications via an optical disk project (Corbin, 1988). This project was first discussed by the Physics-Astronomy-Mathematics group within

Special Libraries Association, but at that time archival microfilming was considered as the primary means of preservation. Later the Historical Astronomy Division of the American Astronomical Society joined in planning the project. When it became evident that new technology was becoming available, we decided to put the project on hold until it was feasible to use optical disk technology. We now hope that this project can begin within the next few years.

In the session on CONSERVATION OF HISTORICAL MATERIALS, we learned that we must do everything possible to make sure materials in all different formats survive. However, I would like to note that in the future when absolutely everything is available on optical disk, magnetic tape, or any other electronic format, you can be sure that the U. S. Naval Observatory Library will still have one hard copy of everything (if hard copy still exists), just in case all systems for accessing this material break down!

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PART 7. OTHER LIBRARY ACTIVITIES

Use of Computers in Small Libraries

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Introduction

The library of the European Southern Observatory exists in its holdings since about 1970. The library is still a small one. It contains about 15-20000 books, 240 journal titles, approximately 70 m shelf-space for Observatory Publications and has about 220 square meters surface area. With about the same size we have a second library in La Silla in Chile, the mountain where our telescopes are installed. In Garching we have one and a third (!) librarian(s) and in Chile one librarian as staff. The question is: is it possible and is it necessary to computerize such small libraries and how can we do it with such limited personnel? The answer is yes; it is possible and even worthwhile.

The old slogan: "In America everything is better and bigger" influenced also my library. Astronomers coming from the Library of the Baltimore Space Telescope Science Institute sang a hymn of praise as to how fantastically everything works in this totally computerized library. Well, the younger ones praised, while the opinion of the older generation of astronomers was slightly different! Ergo, not to behave as an old-fashioned conservative librarian, I started to do something in the computer business ; and that is what I would like to talk about today.

I will not use the language of a normal user's manual in its professional explicit approach. Librarians don't even have the time to read such manuals in detail, we did it more using the "do it yourself" method. I will try to show more the librarians' standpoint, how to approach "modernization", how to get over the suffering steps (when you just want to smash your screen), but finally how to enjoy slowly the pleasures of the new system and how even to become fascinated by it .

Preprints and observatory publications on-line

A Database Machine IDM 500/1 (from Britton-Lee) was acquired for ESO and ST-ECF Archive Management at the ESO Headquarters. Up to now two applications for the library have been developed using OMNIBASE and SMART QUERY software. For all output on paper LATEX document processing software is used. As first application we created a PREPRINT DATABASE which can also be used ON-LINE not only for ESO customers but also for any SPAN user or institutes having a connection to a Packet Switching Network. Many speakers mentioned the handling of preprints already, therefore I start immediately to talk about our:

Database for periodicals

As our User's Manual says, the database is a so-called RELATIONAL database which is organised in tables. Each table is quite similar to a printed table in the sense that it is made of columns or fields, and rows and records, which is easy to understand. But only one record taken from one table is listed on the screen. The relational database allows one to connect or join records from different tables sharing some common value. To make the recognition of these common values easier, codes are created: codes for periodicals' titles and suppliers. Five tables are implemented in this prototype database:

- 1) TITLES providing full titles and associated comments for each periodical.
- 2) SUPPLIER listing information about suppliers with full addresses; one letter specifying the language to be used for renewal correspondence. E = English, F = French, G = German.
- 3) ORDERING TABLE providing information about the ordering status of the periodicals: which journal is ordered from which supplier. On this table you see codes only for titles and suppliers and the number of copies to be sent to the different libraries and in which mailing mode: DAM = Direct Air Mail, DSM = Direct Surface Mail. Important in this table is the date which follows the word RENEW, which will be the date when a renewal letter is issued automatically.
- 4) HOLDING TABLE specifying which volumes exist in each ESO-Library. Here you see the code only for the title and abbreviations for the different libraries. An explanation of these abbreviations is shown on the table and later in the Holding list. In the CONT field you have three possibilities: to show whether a publication ceased = blank, whether we stopped a subscription = . , or whether the subscription is normally continued = - . Since one table can show only one record you have to hit the "Find Next Key" (PF3) in order to enter or find the same title for the second or third library. A place for comments associated with the title in this field is available for mentioning notes such as: continued as or formerly ...
- 5) ARRIVAL TABLE quoting the issues arriving daily in the library is foreseen but not yet used. We enter our daily incoming journals still into an old-fashioned Kardex until somebody really convinces me that the alternative is worthwhile.

How to query the library database

There is a special QUERY KEYPAD which looks familiar to the members of the Space Telescope Science Institute Library in Baltimore, because they use the same software as we do. I only want to mention, leaving out all details, that it is very easy to DELETE or to MODIFY any records or to APPEND any new entries in your database.

I come back to the formerly mentioned RELATIONAL Database. You have seen for example that the Supplier code appeared in both ORDERING and SUPPLIER tables. This enables the connection of the two tables, to add to each periodical the complete designation and address of the supplier, and conversely to find out all periodicals supplied by a specified vendor. And herewith I come to the:

Document generation from the library database for periodicals

As mentioned before LATEX is used for all printed output. Just by pressing one button we can produce lists and letters combining the information from the individual tables. The most important list is:

- 1) THE FINDING LIST OF PERIODICALS IN ESO-LIBRARIES which combines the entries of the HOLDING and TITLE tables. Here appear the cross-references which we entered in the TITLE table as comments assigned to the title.
- 2) THE LIBLIST ORDERING shows the connection or relation of three table entries: namely TITLES ORDERING -SUPPLIERS. This list I consider as my "bible". It is produced yearly and helps me to supervise the status of ordering and renewals. I use it for price comparison and claims and many other things.
- 3) THE LIST OF SUPPLIERS filed alphabetically by supplier names, full addresses and codes.
- 4) LIST OF TITLES of periodicals also in alphabetical order of names and codes. The arrangement by code is necessary to check whether a code is used or not. The computer does not allow a duplicate application.
- 5) LIBLIST LA SILLA is the "Bible" for the librarian in La Silla who sees at a glance which periodical she receives directly on the site, in how many copies and from which supplier.
- 6) THE RENEWAL LETTERS for the time being produced in three languages will be my last example. Here you have the combination or relation of three of our tables: SUPPLIER -TITLES -ORDERING. You see in one group together all titles requested from one supplier with the directions where to send the periodicals, in which mailing mode and where to send the invoice. The small letter for the language entered on the supplier table determines the language of the letter itself.

This "personal" touch of my "machine" is certainly the result of the good cooperation between Francois Ochsenbein and me. He worked on the programming and did the impossible -- which I as a crazy librarian wanted him to do -- and this among other things went as far as the creation of the multi-language letters. Compliments to him and his patience with me.

ESO Library - Periodical Titles

table 1	Journal of Optics	
	Code J OPT	Subject
		Periodicity
	Comment associated to the title (e.g. continuation)	
	cont. of: Nouvelle Revue d'Optique	

ESO Library - List of suppliers

table 2	Code	BLACK	Language	E
	Name	BLACKVELL'S		
	Address	Periodicals Division P.O. Box 40 Bythe Bridge Street OXFORD OX1 2EU England		

ESO Library - Holding Table

table 3	Code AAS PB	Lib. LS	1(1969) -	43(1986)	Cont
	Comment associated to the title:				
	Specify in Cont field:		Lib. is ML for Main Library		
	(blank) for ceased publicat.		LS for La Silla		
	- for current subscription		S for La Serena		
	- for ceased subscription		UC for University of Chile, Santiago		

ESO Library - State of periodical ordering

table 4	Journal A&A		Supplier SPRING		
		Copies	Mailing	Cost in	
	Main Library	1	DSH	.	From 25-06-1986,
	La Silla	1	DAM	.	To 31-12-1988,
	La Serena	1	DAM	.	Bill 25-06-1986 no
	Univ. Chile			.	Renew
	Other			.	
	Sum	3		.	

I have no room to print here all the examples of my overheads shown during the talk. But the attached figure with the four tables I consider as essential for the understanding of this article.

USE OF COMPUTERS TO IMPROVE LIBRARY SERVICES AT THE SPACE TELESCOPE SCIENCE INSTITUTE

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There is a wonderful scene near the end of Frank Baum's *The Wizard of Oz* wherein the curtain hiding the wizard is suddenly whipped back and the wizard is exposed as a mere mortal, pushing buttons to make things happen, mostly through illusion. I often think my library users would have the same shock as Dorothy and her friends if they took the time to find out how we go about providing them with information. They'd whip back the curtain and find me madly pushing keys on the terminal, shouting "Ignore that woman over there!" This talk is supposed to be on the use of computers in astronomy libraries or at least in one astronomy library — and it is, but it also about providing an information service when you have only a modicum of information and a great demand for service. Since the Institute library has been in existence for only five years and because of the enormously transitory nature of much of astronomy publishing, we have remarkably little available in-house, particularly of the historical material. That's where the creativity of a wizard (or the computer of the librarian) comes in. We may not have a specific item or we may not have the item *exactly* as requested, but we know who does and we use any and every means possible to obtain the item quickly. We concentrate on providing the specific information needed even if the user is unaware that what was requested may be available in ways other than that suggested in the request. (My favorite example of this phenomenon is the one pointed out by D.A. Kemp of a paper that appeared in five different series plus twice in report form.)

So that users are kept mostly unaware of the lack of inhouse resources, we have set up our library databases so that one may check our holdings or make a request without ever having to come to the Library. Sitting in her office, the astronomer can check the online catalog by specifying any or all of the authors or editors, title, series, corporate authors, publisher, publication year, whether a conference or not, plus a few other obscure access points, developed for the truly desperate. Because the catalog is online, it doesn't have the many limitations of traditional card catalogs; e.g., one really can search for a book that "has something about television-type sensors" or "you know, that meeting in, ah, Coma a few years ago on galaxies." What it still lacks that a card catalog provides is serendipity: although one may put in wild cards for unknown letters or words, one is still more likely I think to turn up a book when unsure of the author or title by using a traditional catalog.

Artificial intelligence will eventually bring that serendipity to computer searching, but has not yet done so.

Okay, the aforementioned astronomer has successfully retrieved several titles that matched her selection criteria; now what? Well, it depends on what she wants. If she merely wants bibliographic information to complete a citation, she hits a key and the full bibliographic record is displayed. If she decides she actually wants to look at the book, she hits another key and the display switches to circulation status, which shows either that the title is "on shelf" or checked out to another person and that person's room number. If she goes and retrieves the book from that person, she can then check it out to herself, also from her office. While the astronomer is doing all of this, the Wizard is keeping notes on what she's up to (Big Sister is watching you...) The system adds an entry to a log file each time the retrieve key is pressed, so that (a) we'll know what sorts of things people want which guides our selection process and (b) we can see what sorts of mistakes they make in searching so that refinements to both the system and the documentation can be made as needed. In addition, each time an item is checked out, a counter in the item record is activated and periodically we generate lists of titles that have circulated a number of times over a given time frame. We also produce periodic circulation statistics based on affiliation (e.g., ESA, Hopkins, etc.) so we'll know who's using the material, and gross classification (e.g., math, astronomy, etc.), again as a selection aid.

The heart of the system is an IDM 500, that is, an intelligent database machine, made by Britton-Lee, using Signal Technology's Smartstar software. The IDM uses a VAX as a front end to process the queries. If the IDM is the heart of the system, then the software developed inhouse, to make it bibliographically- and user-friendly, is its soul, and a slightly tarnished soul it is indeed! Bibliographic records are downloaded from OCLC at the point an order is placed or generated inhouse. Creating the records inhouse is done now only for documents and equipment, but the potential for generating inhouse records for "normal" items exists as well. (I ought to point out here for those who don't know, we also circulate calculators, modems, and computer terminals, along with the usual library fare of books and journals.) When an item is received, the location in the record is changed from ON ORDER to ON SHELF and a barcode is added to the front cover of the item and to the database. This means that new materials are normally ready for circulation within half-a-day at most of their receipt. Since our staff normally want everything the day before they thought to ask for it, it's useful to be able to have most things available before they ask.

I have spent most of my time discussing the online catalog because it's the part of our system that I find the most intriguing. I'm constantly finding out new things it can do. But we haven't yet tied all of our systems together and as time goes on, I'm less sure that I wish to. The IDM is a terrific device, but when the VAX is overloaded, as it frequently is, response time can be painfully slow. We therefore keep a microfiche backup of the catalog and periodically print out lists of titles

and authors so that when the computers are slow or down, the users aren't terribly inconvenienced. Also, having developed the software inhouse, we're at the mercy of good-natured programmers to help us when new releases of the VAX operating system or the database machine software come out. Upwardly compatible software is mostly an illusion in my experience which has made me think seriously about advisability of putting all of my "database eggs" into one database basket. It's been reassuring when the IDM has been down for one reason or another to still be able to provide information and services to our users, almost as quickly.

Non-IDM dependent uses of the computer in the Institute library include

1. maintaining online searchable lists of preprints, reprints, and journals
2. automatic distribution of a biweekly list of preprints and the updated 1987A bibliography to a distribution list both inside and outside of the Institute
3. receipt and re-distribution of IAU circulars
4. receipt of the Astronomy and Astrophysics Monthly Index and distribution of derived bibliographies to scientific staff
5. form letters using T_EX or L_AT_EX for claims, address changes, and so on
6. memo distribution using VAXmail to selected groups of library users (distribution lists include Clusterphiles, Patrons, Hassle, and so on).
7. connecting to various and sundry information retrieval systems, both commercial and not, keeping logfiles thereof and sending results electronically to users.

In summary, we are frighteningly dependent on our electronic wizardry to get our daily work done. It is enormously exhilarating when it all works and enormously frustrating when it doesn't. Where we'll go from here, I would not hazard to guess, but my suspicion is that the library a decade from now will be as different from today's as today's is from the ones of ten years ago. As Dorothy so succinctly put it "Toto, I don't think we're in Kansas anymore."

COMPUTER SYSTEM OF LIBRARY MANAGEMENT AND INFORMATION RETRIEVAL AT THE SHAANXI ASTRONOMICAL OBSERVATORY

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For modern management and full resource sharing among libraries and scientific departments both in Chinese and worldwide observatories, we established the computer system of library management and information retrieval during the period 1984-1987.

The system is composed of ten component sub-systems:

1. Book ordering system. This system can produce orders for books and periodicals, balance accounts, produce statistics as well as claims for outstanding book orders.
2. Book cataloguing system. This system can catalogue books under certain rules while appending new records of books to the databases. It can also produce catalogue cards and produce written reports about the new books.
3. Book retrieval system has the ability to search for a specific book in several ways.
4. Book lending or circulation system. This system is a complete circulation system; including book lending, renewals, waiting lists, and recall of borrowed books.
5. Periodical management system. This system is in charge of processing of periodicals and magazines in the library, including cataloguing, management, and lending.
6. Scientific information retrieval system. One can retrieve scientific information by keywords or in many other ways.
7. Internal material booking system. It can make orders of internal materials, claims for materials outstanding and make exchanges with other observatories and institutions both in or outside the country.
8. Internal material management system. It can do the work that is analogous to that done with books and periodicals.
9. Information relationship system. It handles exchanges of information between institutions.

10. Scientific information network management system. It manages affairs within a certain information network.

The system can handle all of the daily work of a library. It is available for any small and medium library or information department. It is performed on an IBM microcomputer.

Because different libraries have different functions -- for example, some may only have book management, some may have only information affairs -- we have designed the system to be configured for use by any library. All ten sub-systems can be run independently or any of the parts can run with any other of the parts.

The databases are designed according to the same principle. Based on the different functions in book and information management and for system efficiency, we designed different databases. Different sub-systems can run independently or concurrently. There is no repeated work in establishing databases.

We have arranged many retrieval methods to suit various management and readers' needs. One may retrieve by document name, author, classification code, keywords, publisher, publication place, editor, publication date, etc. It also includes logical and special retrievals. One can search by one criterion or several simultaneously. If the reader or librarian only remembers a few words of the title, the required item can still be retrieved.

Many institutes are interested in this system. There are about forty institutes already using it or preparing to use it. The Chinese Science Academy intends to make it the standard system to be used in institutes of the Academy.

A PROPOSAL FOR BETTER COOPERATION AMONG LIBRARIES OF ASTRONOMICAL OBSERVATORIES

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SUMMARY

The cooperation between libraries of astronomical Observatories remains clearly insufficient despite the numerous means of communication now available. The library of the Royal Observatory of Belgium therefore recommends the establishment of a "subgroup" of users (Libraries of Astronomical Observatories) within the already existing DOBIS-LIBIS Users Group.

I. INTRODUCTION

To give a short summary of the present situation with respect to the cooperation between libraries of astronomical Observatories:

- Documentation (on new books, new periodicals, meetings, etc.): very limited exchanges.
- Observatory publications: Great disparity between exchanges according to the countries involved and insufficient in general.
- Loans of publications: The cooperation is often at variance according to the countries and remains generally rather limited.
- Catalogues: The data concerning library catalogues are quite insufficient. It seems that each library is operating in a closed circle.

II. PRESENT MEANS OF COOPERATION

The range of means in communications is steadily increasing:

- Postal services: For the documentation, the exchange of publications and the loan of books, mailing still appears to be the safest and most economical service.

- Telephone, telex, telefax etc: These means of communication are very useful for a rapid contact between libraries.

- The computer allows to establish a network of libraries connected online, e.g. on a permanent basis.

III. PROPOSAL OF THE LIBRARY OF THE ROYAL OBSERVATORY OF BELGIUM

The library of the Royal Observatory of Belgium proposes to all other libraries of astronomical observatories to become a member of the DOBIS-LIBIS Users Group in order to create a "subgroup" of users of these libraries.

Let us briefly introduce DOBIS-LIBIS (DOBIS: Dortmunder Bibliotheksystem) (LIBIS: Leuven's Integraal Bibliotheek Systeem). This software is an I.B.M. product developed by the Dortmund University of the Federal Republic of Germany in conjunction with the Katholieke Universiteit Leuven of Belgium.

This software has been conceived by computer-specialized librarians (and not by ordinary analysts) and is considered by many specialists as being the best system for the administration of libraries. This software is at present known and appreciated in the whole world and its Users Group is now spread over all continents. In the United States, for instance, a number of 13 DOBIS-LIBIS installations were already operational in December 1987.

The establishment of a "subgroup" of users of DOBIS-LIBIS for libraries of astronomical observatories, could provide them with the following benefits:

- Permanent online communication: represents the main advantage of the system. All contacts would be then facilitated: exchanges, requests of documentation etc.

- Loans of publications: immediate information as to the existence of the book and to the possibility to receive it on loan.

- Catalogues: easy access to the catalogues of the other libraries of astronomical observatories and possibility of catalogues exchange on a standard material compatible with the system (a magnetic tape for instance).

- Harmonisation of the methods for the management of these libraries: This is one of the conditions required for an efficient collaboration among themselves.

IV. PRESENT SITUATION

- In Belgium, the situation is as follows:

- The library of the Royal Observatory of Belgium is not yet connected to the DOBIS-LIBIS Users Group. The General Directory of the Ministry of National Education possesses an installation and a project of connection is being considered.

- The Library of the Astronomical Institute at the Katholieke Universiteit Leuven is connected to the DOBIS-LIBIS Users Group.

- Outside of Belgium, it is likely that several libraries of astronomical observatories and institutes operating within the universities are already connected to the DOBIS-LIBIS Users Group. However, we are unable to specify which ones. We invite these libraries to establish contact in order to make an inventory.

V. CONCLUSIONS

A Belgian library of astronomy has tested the DOBIS-LIBIS software and can give evidence of its high qualities. This library invites us to join the DOBIS-LIBIS Users Group to develop closer ties between our libraries for the benefit of science.

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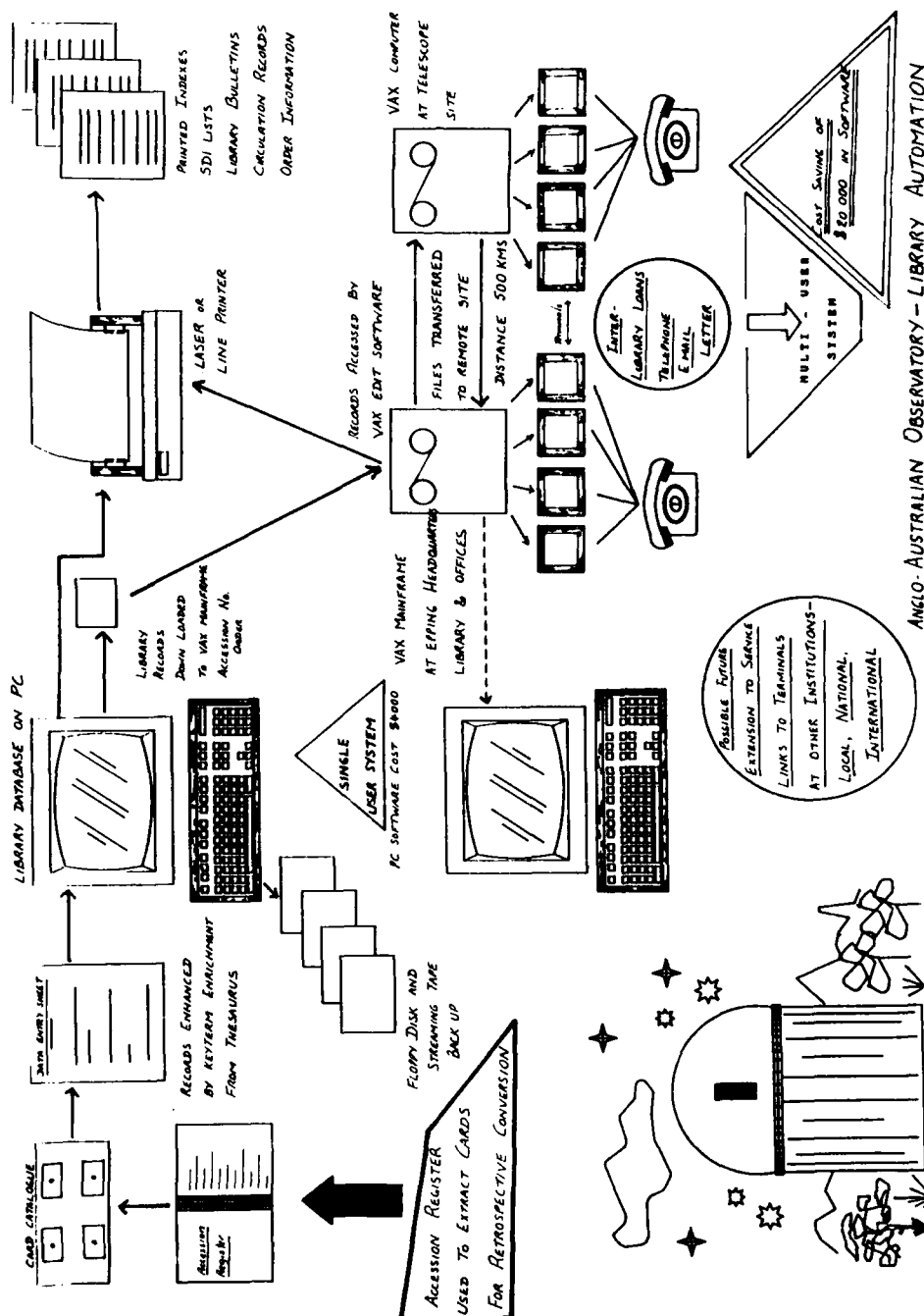
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CONVERSION OF THE ANGLO-AUSTRALIAN OBSERVATORY LIBRARY
CARD CATALOGUE USING PC SOFTWARE

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A commercial software package has been used on a personal computer for the conversion of the Anglo-Australian Observatory card library catalogue. The software is sophisticated but has proven to be extremely flexible and easy to use for any library management task. The software is available at three levels; the AAO has the top level which allows for eight different databases on the one system. Each record may contain up to nine pages or screens of information and there is also a thesaurus facility. Although a multi-user system was preferred the cost of the software was out of the question. The flow-chart (Fig 1.) describes how a multi-user system was created from software designed for a single-user PC. The main files have been down-loaded in accession number order onto the VAX 11/780 minicomputer and these may be accessed on any terminal either at the laboratory headquarters at Epping in Sydney or at the telescope site at Coonabarabran 500 kms north-west of Sydney. The 'read-only' files can be searched using the VAX edit commands and a VAX sort facility is available for a listing of selected items if required. As a substitute measure this is proving to be most useful. Later when the files are too large and searching becomes slow it may be possible to purchase additional copies of the commercial PC software which allows more sophisticated search procedures.

In this way the high cost of multi-user software packages has been avoided but users have not been deprived of access to information on the library resources. This is particularly important at the remote telescope site. A further possibility is to supply copies of the AAO catalogue to other institutions either as a connect online facility or on magnetic tape.



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ADMINISTRATION OF LIBRARIES AT DISTANT SITES AND REMOTE TELESCOPE LOCATIONS

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Many librarians are responsible for libraries at outstations and/or remote telescope sites. Such sites may range in size from facilities with as many personnel as the central headquarters to remote observing stations where only a few people are present at any one time. Sites may be only a few kilometers away, or they may be half way around the world. In an informal evening discussion, concerned librarians discussed issues and problems created by such far-flung library systems.

Budgetary constraints are a primary problem in managing site libraries at most institutions. Staff and visiting scientists want duplicates at the sites of the books and journals they use regularly in their work, but with current prices it is often difficult to provide even the major astronomy journals for site as well as central libraries. Even when researchers are encouraged to do preparatory research before going to observe, some library materials may still be necessary. In the case of larger sites where people work on a permanent basis, larger collections will, of course, be needed. It is especially important at such sites to provide easy access for materials directly involved in preparation of observations, e.g. photographic sky atlases, reference catalogs of astronomical objects, etc. We discussed at length the problems of selection and acquisition of materials for remote libraries, including questions of purchasing and technical processing, binding, inventory, and bibliographic control.

Staffing is another problem, with the librarian at the central headquarters often being responsible for the remote libraries. In many cases, all library care must come from the librarian on occasional visits to the site. Sometimes there is a staff person at the site who can give some minimal care to library, and in a few cases there is actually a full- or part-time professional librarian to staff the site. We agreed that when librarians are fully responsible for libraries in more than one location, they often lack time for anything more than minimal service to the distant locations. Discussion of library staffing also included such issues as lending policies and collection security, library users' manuals and instruction sheets, and the handling of reference questions or requests for specific materials from staff or visitors.

We discussed problems of transporting materials between an institution's libraries, both on a routine basis and in cases where something is needed more quickly. Solutions to transport problems ranged from FAX through air freight and regular internal shuttle runs to the slower solution of surface mail.

We stressed the importance of new technologies such as e-mail, not only in fostering communication between librarians at different institutions, but as a way of maintaining an ongoing dialog between the main library and the librarian or other staff person responsible for the site library.

Librarians have developed a variety of solutions to the problems of administration and care of site libraries. These solutions depend on the distance between libraries, the specific requirements of individual institutions, and the budgetary allocation for the library system. We have differing arrangements to care for our multiple libraries, and we continue to search for better ways to serve our diverse and distant library users.

RESOURCE SHARING AND COOPERATIVE ACTIVITIES IN ASTRONOMICAL LIBRARIES

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The Shorter Oxford English Dictionary defines "resource" as 'A means of supplying some want or deficiency; a stock or reserve upon which one can draw when necessary'. The Collins English Dictionary further defines "resources" as 'a source of economic wealth especially of a country or business enterprise (capital, equipment, personnel, etc.)'.

The essential theme of this Workshop is resource sharing because it has been organized to provide an opportunity for librarians of astronomical observatories and institutions to meet to discuss common problems and ways of stimulating greater cooperation between libraries in different countries. The White House Conference on Library and Information Services held in 1979 outlined the justifications for resource sharing by stating: '...resource sharing is now mandated by the information explosion, the advance of modern technology, the rapidly escalating costs of needed resources, and the wide disparity between resources available to individuals by reason of geographic location or socio-economic position.'¹

Sewell defines "resource sharing" as a term for working out inter-institutional relationships for the benefit of users of library and information services, a field which is now frequently described as changing from a materials-centred to a user-orientated service. He lists the range and interdependence of resource sharing schemes under 2 main categories. Firstly, the exploitation of existing resources facilitated by directories of resources, the exchange of accession lists, and union lists of holdings; referral of readers; interlibrary loans; access to translations; and references to documents through indexes and abstracts. Secondly, he suggests means of improving overall resources through co-ordinated and co-operative acquisitions, joint storage projects and staff education. He stresses that the success of resource sharing projects depends on effective administration, and for this a key tool is the regular monitoring of performance in terms of quantity, quality, and the cost of services in comparison with alternative modes of provision.²

Most of these aspects will be dealt with during other sessions of this Workshop, but this panel, and the audience in general should consider the following points:

1. The effectiveness of duplicates and wants lists, and the value of acquisition lists.
2. The economics of information services are of growing concern. A point to be discussed should be the merits of reciprocal or fee-based sharing of resources.
3. An international forum should be established for the exchange of information between librarians in astronomical observatories and institutions. The P.A.M. Bulletin which is published by the Physics-Astronomy-Mathematics Division of the Special Libraries Association of America, goes some way to achieving this aim, but, I suspect is distributed mainly in the United States.

4. Consideration should be given to the creation of an International Directory of Astronomical Library Resources which will state the acquisitions and resource sharing policy of each library, list the scope of its resources and highlight its special collections.

Informal systems of cooperation are known to succeed to a degree, but if resource sharing is to be truly successful, the needs of the astronomical community must be studied, current programmes evaluated, and new ideas implemented if necessary.

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THE EXCHANGE OF "LISTS OF DUPLICATES" AND ITS IMPORTANCE
FOR ASTRONOMICAL LIBRARIES

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ABSTRACT. Problems of an international exchange and especially of "Lists of Duplicates" which in my opinion are very important for small and not too rich libraries like our Library, are briefly discussed.

Astronomical activities in Torun began in 1945 when the University bearing the name of Nicolaus Copernicus had been organized. Our Library exists in three places: in the Institute of Astronomy in Torun, in the Astronomical Observatory in Piwnice and in the Radio Astronomy Observatory in Piwnice. We have about 8 thousand books and about 6 thousand volumes of journals and publications.

The great part of our collections comes from exchange basis and from gifts sent by other foreign libraries. The reason for this is the inconvertibility of our currency, the Library can not buy individually anything in Western countries. We have only a limited amount of dollars and for that money we can order and buy about 10 books and subscribe 14 Western journals per year. Luckily the most important series in astronomy can be obtained as a continuation of a previous purchase. I think that the above limit is too small for our Library and therefore the exchange is very important for us.

We carry on an exchange with 35 countries. We are sending our *Bulletin of Astronomical Observatory in Torun* to about 200 different astronomical institutions. In return we receive a lot of materials published by these institutions, both small publications and big workshops or reports. Through the kindness of many institutions we receive also some important journals on exchange basis. Of course, it can be seen that in many cases an exchange is not equivalent for both sides. There are many big institutions like NASA or ESA which publish and send to other institutions a lot of publications and workshops.

They are doing this very often free of charge or in return for small and seldom appearing materials. I hope that in spite of such nonequality and of harder financial situation in some astronomical institutions this exchange will be in future as efficient as before. We ought to think here of all small astronomical institutions situated in developing countries, who may not be aware of the possibility of obtaining astronomical publications on exchange basis, and try to help them.

The preparation and sending of library "Search and Duplicate Lists" is a necessary element of the exchange. The "Lists of Duplicates" from other institutions are a important source of supplementing publications and journals missing in the library. I think that in every library some collections are not complete. In our Library, for example, I have no chance to supplement missing materials in other way than from "Lists of Duplicates".

At the beginning of 80s about 10 libraries sent to us such lists. Unfortunately now we receive "Search and Duplicates Lists" only from 2 institutions: NRAO and STScI. A lot of our collections are complete owing to their kindness. Now I have an opportunity to make an appeal to all astronomical librarians to make this effort and publish "Lists of Duplicates" even not too frequently, for instance every two or three years, and send them to others. It will be an occasion both for getting rid of useless materials and for helping libraries in need of these publications.

It must be admitted that an international exchange gives also the possibility for librarians to come into personal contacts and to enter into correspondence with librarians from all over the world. This Colloquium is in a way also the result of such contacts among astronomers and librarians from different institutions. I hope that our meeting will give us the possibility of becoming acquainted which will be helpful in our future work.

RESOURCE SHARING IN THE CSIRO DIVISION OF RADIOPHYSICS LIBRARY

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BACKGROUND

The CSIRO Division of Radiophysics was established as the CSIRO Radiophysics Laboratory in 1939 to conduct radar research. After World War 2 experimental radar instruments were applied to the developing field of radio astronomy. Current areas of research for the Division, which is host to the new Australia Telescope (AT), are radio astronomy, antenna technology, satellite communications, signal processing and microelectronics.

The AT has three observatory sites, all in New South Wales: six antennas near Narrabri, over 500 km from Sydney, the 27-year-old Parkes observatory, 350 km from Sydney, and one antenna near Coonabarabran, between Parkes and Narrabri. Most staff are located at the Division's headquarters in Sydney, where the main library is also located, and small collections are maintained at the Parkes and Narrabri observatories.

THE CSIRO LIBRARY NETWORK

CSIRO has 32 Divisions located on 70 sites around Australia conducting research in a wide range of scientific and technological fields and with libraries located at most sites. The libraries have always formed a close network, with many cooperative activities. Their collective resources provide a major information source for science and technology research in Australia.

Centralized maintenance of subscription placement, cancellation and payment results in considerable financial benefit to the Divisions.

All CSIRO libraries contribute to a union catalogue. Computer-produced microfiche, which commenced production in 1977, were replaced in 1987 by an online catalogue using the Canadian GEAC library system.

Most Divisions selectively add holdings to the on-line National Union Catalogue maintained by the National Library of Australia.

Regular circulation between Divisions of new issues of periodicals is common, thus helping to keep each library's budget in check. However, since astronomy research in CSIRO is confined to the AT, a high level of self-sufficiency in this area is essential.

LOCAL RESOURCE SHARING

Until 1968 the Division was located with what is now the Division of Applied Physics in the grounds of the University of Sydney. Both Divisions still maintain the close ties formed during those years with the libraries in the University's Schools of Physics and Engineering.

Our library also provides most library services for the CSIRO Division of Information Technology, which has groups located in a neighbouring Sydney suburb, and in Canberra and Melbourne. As there is considerable overlap in areas of interest co-location of library services is significant in minimizing unnecessary duplication of effort and purchases.

The headquarters of the Anglo-Australian Observatory is located at the same site as our headquarters in Sydney. An informal cooperative arrangement exists between our libraries and staff have free access to both. A computer-produced shared listing of periodical titles is in preparation and is proving valuable, since users often find a required title is a mere five-minute walk away.

OBSERVATORY LIBRARIES

The remoteness of the AT observatory sites currently necessitates extensive duplication of major periodicals and monographs. Delays in obtaining core material from our headquarters library by mail or courier would be unacceptable for observers, and the cost of facsimile transmission would be prohibitive. Observatory libraries are also essential for on-the-spot research.

The Parkes observatory is geographically isolated from other astronomy institutions. However, the Australian Department of Science Ionospheric Prediction Service has a solar observatory on the Narrabri site, and the University of Sydney School of Physics is building its stellar interferometer there. The IPS staff use our small site library, thus minimizing the need for their own library.

CONCLUSION

It was only as this paper was written that the extent to which our library is involved in cooperative arrangements became apparent. In many areas there is scope for improvement. The most important factor however will always be the willingness of each side to participate, a factor which, to date, has been limited only by the resources available in each library.

RESOURCE SHARING : INFORMATION SHARING

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When we speak of resource sharing, we mostly mean document sharing through union catalogues, list exchanges, interlibrary loans, cooperative acquisition programs... Yet, the first and primary condition of the library network efficiency is information sharing.

Libraries have been quite successful in this field for the last decades but, nowadays, new technology such as electronic mail or telefax offers unequaled facilities to set up and promote a permanent and world wide program of information exchanges liable to meet the increasing needs of punctual responses. From an eight year experience at Paris Observatory library which has been hosting the French national service CADIST [Centre d'acquisition et d'information scientifique et technique], we can assert that, outer demands of informations being at the same time useful information sources, such a quick answer service *does* participate to the improvement of the inner service efficiency.

On the other hand, rich or poor, large or small, old or new, each library can act as a supplier of information as well as a customer. Reciprocity being the right basis of any durable deal, the development of the information exchanges is an inexpensive and simple way to promote larger cooperative programs.

Great and very diversified is the need of information : astronomers' last addresses, information on the adequate plate cabinets, identification of new non commercial series, order address of particular and peculiar documents, local average prices for budget argumentation...

The launching of such a regular service needs neither much time, nor much money. Let the volunteers make themselves known to the library community, let them spread the type of informations they are best suited to provide and the complete address to get in touch with them. Why not start now ?

COLLECTION DEVELOPING AT PURPLE MOUNTIAN OBSERVATORY: SEEKING EXCHANGES
OF FOREIGN ASTRONOMY SERIALS

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ABSTRACT. Foreign exchange of astronomical serials as a means of developing a collection at the Purple Mountain Observatory is discussed.

I. INTRODUCTION

Astronomy is a science that needs the most widespread international cooperation. It is necessary for an astronomical special library to make great efforts at seeking effective ways to obtain foreign publications while also collecting domestic publications. Different libraries have different collections, depending on their needs. Sometimes information sources discarded by one library would just meet the needs of another. Reciprocal agreements through international library exchange programs could make resource sharing mutually beneficial. Libraries on both sides of the agreement could develop their collections and, through sharing, set a standard of international cooperation.

II. PRESENT SITUATION

Library development all over the world has been affected by inflation. Shortage of funds has made it difficult for the Purple Mountain Observatory Library to purchase foreign publications. Apart from cancelling a few rarely-used periodicals, we are seeking other ways in which to solve this problem: through purchasing, gifts, and international exchange.

Astronomy books, core journals, atlases, catalogues, as well as other books and periodicals in closely related sciences generally must be purchased. As astronomy is developing at a high speed, we must obtain information sources in a timely manner. Though astronomy/astrophysics books are of a superior academic level, they are normally published later than periodicals. Recently, much of our budget has been spent on atlases; and the remaining sum purchased foreign books and periodicals are in a ratio of 3 : 7.

Since our library has a good reputation in China, a lot of books and periodicals were presented to us by institutions and scholars from different countries.

The majority are on the want lists of astronomical publications. We have found that little drops of water will make mighty oceans. These gifts increase the library collection and make useful and valuable materials available to our astronomers and scientists.

International exchange is the main way to obtain those publications which are hard to get or hard to purchase, and we rely on this method of acquisition, in order to maintain the relationship of exchange continuously, chiefly to obtain serials, though we receive some internally published monographs and books by exchange also. However, we receive few commercially-available publications. It is clear that the increasing collection of various serials is the result of a good exchange policy.

We stress that purchasing and international exchange have to share out the work and cooperate with one another, so the libraries can avoid unnecessary duplication. Exchange can ameliorate the lack of purchased publications. Sometimes we can get publications from international exchanges without purchasing. At present there are some 1300 astronomy serials published worldwide. Most of them are not commercial. Since the 1980's the library has subscribed to one hundred titles in astronomy which can be purchased from the open market, but we cannot get many of the noncommercial serials. In order to increase our serial collection, we have kept in touch with more than 200 foreign libraries, institutions and scholars in 44 countries through library exchanges. At the same time, we have received 430 astronomy serials and some other journals from our exchange partners. In other words, we have collected over 70% of the publications of observatories and institutes worldwide which are listed in ASTRONOMY AND ASTROPHYSICS ABSTRACTS.

Dr. Gao Lu was the former director of the Purple Mountain Observatory. In the Chinese astronomical community he was the first who engaged in international exchange, starting in 1915. Since then, the observatory has been in touch with over 400 institutions in about 60 countries. In sum, we have received more than 900 serials from foreign countries; that is, two-thirds of the foreign serials in our holdings.

III. ADVANTAGES OF INTERNATIONAL EXCHANGE

At present, international exchange has become an established method of library acquisition. The following advantages are noteworthy:

a) International exchange is the main way to get foreign non-commercial publications. Internal publications of all astronomical institutions are provided through academic exchange with professional institutions and colleagues. These publications are not for sale, but are available on exchange.

b) Timeliness of information is important. In China, it normally takes six to eight months to receive foreign publications on subscription, but we may receive publications by direct mail via international exchange and save much time. In general, we receive monthly periodicals and

preprints within three months: some issues even arrived within their month of publication!

c) Making contributions to supplement one's collection. There are fewer titles on the ordering lists from Chinese libraries to foreign publishers. Because of budget restrictions, we always select only authoritative monographs, or those published in languages in widespread use. Through international exchanges, the library can supplement astronomical publications, especially those that are written in less common foreign languages.

We also try our best to obtain titles of new publications. For instance, preprints of different astronomical institutions are the earliest publications before articles are published in the refereed literature. These preprints can only be obtained through exchanges. We find that missing back issues of periodicals are difficult to purchase on the open market, but can often be obtained from duplicate exchange arrangements.

d) Academic exchanges promote friendship between different countries. International exchange is not a commercial activity. We stress exchange of information without caring about economic considerations. This builds not only academic exchange, but also builds close cooperation between institutions.

Some time ago, Purple Mountain Observatory was unable to offer its publication ACTA ASTRONOMICA SINICA for a period of seven years. Nevertheless, most exchange partners still sent us their various publications. This reflects the true friendship between partners. I express my heartfelt thanks to those dear friends.

IV. SELECTION OF EXCHANGE PARTNERS

The worldwide astronomical community generally takes academic exchange as its purpose. Most librarians adopt open exchange in the field of international exchange. At present, the library of the Purple Mountain Observatory only offers new serials and books which are published by the observatory and the Chinese Astronomical Society. If necessary, we would increase new publications in Chinese astronomy and the related sciences. Because of increases in international postage costs, we have limited funds, but we will enhance the exchange of duplicates in the future.

The publications offered by exchange partners in astronomy and the closely related sciences are welcome, regardless of language. We consider chiefly the following:

- a) Famous institutions of astronomy and their astronomers.
- b) Astronomy serials and books of high academic level.
- c) Publications useful for the Chinese astronomical community, and worthy of long-term use and preservation.
- d) Partners or publications recommended or requested by Chinese astronomers.

V. CONCLUSION

There have been 300 years of international exchange. At present, the method of international exchange is generally adopted by Chinese astronomical librarians. What is the motivating force that gives international exchange such an important role in the library of the Purple Mountain Observatory?

Purple Mountain Observatory was built up in 1934. Since then it has an astronomy library with a satisfactory variety of books and serials, --a good foundation. So it may be enhanced on the basis of a good inheritance. The Observatory directors give support to the publication of various serials and books adopted by Purple Mountain Observatory and the Chinese Astronomical Society. They also support the library's international exchange program as carried out by an experienced professional librarian. Astronomers are the real motivating force for collection development. They draw new rich knowledge from the library; they author new astronomical literature and so contribute to the publications for exchange.

The relationship of astronomers and librarians is like the relationship between fish and water. Astronomers cooperate actively in selecting books and serials and provide us information about publishing news. When they visit foreign astronomical institutions, they promote international exchange of publications. Friendly relations and cooperation between astronomers and librarians exist in our observatory. It makes the library collection grow at a good rate, despite the shortage of funds in foreign currency. As a result, the library has gained the trust of the Chinese astronomers.

Apart from the internal factors, I consider the other factors. Existence of astronomy libraries depends on the development of the science of astronomy. International exchange illustrates this dependency. The relationships, thus, may directly influence our communications with our exchange partners. Meanwhile it is necessary for each of us to have a strong domestic policy supporting international exchange. It is necessary for us to support a strong publishing industry in China so, the outer environment is also an important factor of international exchange.

THE ASTRONOMICAL LIBRARY OF THE FUTURE

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Daniel Bell, of Harvard, has said that "The world society is like a set of giant Calder mobiles, shifting in uneasy balance in accordance with the winds of change, but the exact configurations are difficult to capture - especially for twenty-five years from now." Twenty-five or thirty-five, the number is not important - any look into the future is difficult and risky. In order to get a sense of what the future of astronomy libraries may be, I want to talk about some of the changes that are beginning to take shape and then look at the effect those changes are likely to have on all libraries including those that concern us today - astronomy libraries.

We know, first of all, that technological change associated with computers has been extraordinarily rapid in the past thirty years. We have seen computers shrink from a room full of vacuum tubes and wired boards down to "lap-top" computers which people carry around at meetings and on airplanes. At the same time we have seen the computing power, speed, and storage capacity increase at seemingly unthinkable rates - doubling every few years. Along with these global changes we also find that young people are becoming increasingly familiar and comfortable with computers - in this country and elsewhere, children use them in their first years at school and college freshmen are, in some cases, required to bring them to school, much as they would have taken a slide rule or a typewriter barely a generation ago. These are the broad, sweeping changes that are easy to see. But other more, subtle developments will affect not just the amount of use but also how we use the so called "information technologies."

In contrast to the image they often evoke, libraries are technology-intensive environments. For decades, if not centuries, librarians have turned to technology in its various forms as a means of coping with the ever increasing masses of information in their charge. Until quite recently the adoption of microcards, microfilm and micro computers (to name a few) was simply a means of fiscal survival and a way to do traditional tasks faster and better. The new storage media of microforms and compact disks temporarily solved the problems of storage and preservation, while micro

and main frame computers provided accelerated access to authors, titles, and subjects of the traditional card catalog.

But the world is changing, and the new technologies go far beyond allowing librarians simply to do things faster. Technology now opens up libraries in previously unimagined ways. The barriers to access and use of information, which generations of library patrons have taken for granted, are now thrown aside and, in a very real sense, traditional libraries are fading from the scene. What will wreak such change as to cause the disappearance of the traditional library? Artificial intelligence is a large and critical component of that change.

It is not suprising that people are confused, and even put off by the phrase artificial intelligence. It has two senses. When we speak of artificial flowers we may talk about how real they look, yet they have none of the other properties - the feel, the smell, and the eventual wilt - of flowers. They are imitation - fabricated to look like something they are not. Artificial light or artificial diamonds are also fabricated, but once created they behave like the real thing and serve the functions of natural light or mined diamonds. Individuals who see the promise of artificial intelligence see it as being as useful as natural intelligence and serving many of the same functions as natural intelligence.

A particularly appealing way for information people to think of artificial intelligence is the following: it puts into motion the thinking that is embodied in writing. We are comfortable with the written word, yet it substitutes for the speaker and is artificial in that sense. The link between AI and writing is interesting in that it places AI technology on a continuum which began with the invention of symbol systems in 4,000 or 3,000 BC. The invention of moveable type in the 15th century was revolutionary in its impact on sharing knowledge, and AI, 5 centuries later, is the next giant step along the continuum.

What will AI mean in practical terms - what will it do for our day to day use of information? First of all, it will allow better integration of multiple technologies. Currently we find libraries using compact disks or CD ROMs, microcomputers, dial-up access to large databases as well as local systems for online catalogs and circulation systems. We can look forward to an integration of these and other still-developing technologies all working together more effectively to serve the needs of the individual user. We now have software tools that allow for the integration of text,

graphics, sound, and animation so that, to the user, they appear to be a single medium rather than a set of separate juxtaposed tools. This integration has created a new challenge for designers of information systems. It offers a new medium with which to create a more complete, or all-encompassing, environment for information transfer. The challenge is learning to deploy the medium effectively. We need to learn how to compose creatively in all these media, simultaneously. We are moving toward a new literacy - one which uses all the senses to teach rather than recording abstract symbol systems alone.

One role of today's librarian is to assist the user in determining which information resources to use, and how to get access to them. The days of merely going to the shelf and pulling off what you need are fading fast. Some of the most powerful information tools we have are not on our library's shelves but at the end of a telecommunications link. Such resources are usually expensive to use and difficult to manipulate. They are built to take advantage of a particular body of knowledge or tailored to the needs of a specific clientele. For a non-specialist they can be nearly impossible to use productively. That too is changing as a result of artificial intelligence. Systems which have an overlay of AI will be able to do what the librarian does now - question the user about their needs and provide access to the appropriate systems. Expert systems fulfill such a role in many settings today. They are not yet able to span the breadth or diversity contained in the ordinary library, but that will come. Much of the work that remains to be done in fact calls upon the skills of the librarian. Information must be structured and linked in ways that make it capable of manipulation by computer systems. No profession understands information better than the librarian, yet the librarian has not played a significant role in the field of AI. This is something that should concern each one of us.

Let me move on to another change - the creation of systems that meet the individual needs of a user, systems that are user sensitive. Librarians have traditionally forced individuals into conforming roles. Whether in card catalogs or online catalogs, users had to search using standardized formats, by author, title, or "our" subject headings. They had to view the world as we did or our systems were not useful to them. Although in general terms our minds all operate in comparable ways, within our various cultures the frames of reference are different, and within each culture for every individual the structures and systems of the mind are unique. In the near future users will be free to use their own thought patterns, their own associations and view of the world, to retrieve information.

As increasing amounts of information become available online, users will have entirely new options for identifying what is relevant. Computer-based systems will perform simple mappings between the vocabulary of the astronomer and that of the beginning student. Systems will help users move among files and separate systems regardless of how different they are from one another.

The concept of the personal computer will also change. As the costs of computer time and equipment decline and the cost of human time increases, we will see a growing use of computing directed at individual productivity. Such equipment and software will be personalized to an individual's needs and will change over time as the system "learns" from its human companion how she or he works - how the individual prefers information to be sorted and displayed, what level of error is acceptable for various tasks, what authors or journals are most valued, etc. These qualities describe today's librarians. In the future those functions will be part of an information system, not the responsibility of an individual.

There is a third, and critical, trend - that of the disembodiment of the traditional library. Some kinds of information will remain very much unchanged - popular novels, newspapers, some magazines. For those kinds of information the convenience of print on paper remains critical. For scientific information, however, we will see a dramatic change. A considerable proportion of the scientific literature that we come into contact with on a daily basis is, at some point in its production, in electronic form. In the case of some journals the manuscript is submitted on floppy disks, edited online, and sent to a computer-driven printer. Up until now electronic information available in libraries has primarily been about information - that is cataloging records, citations to articles, etc. Because libraries have held the actual information, the journals and the books, they remained very much in the picture. As increasing numbers of journals become available as full text files, the role of the library changes. Information that is available electronically does not need a library to store it. Users will be able to access it from their offices, the remote observatory, and their homes and they will decide what to print out. Print will still be important but the choice will be the individual's. Just as you go into the library now and photocopy an article, you will eventually look at the journal online and only print off what you really want to study. No one is suggesting astronomers or anyone else will spend hours staring at screens reading *Astrophysical Journal*? They will print out what they want quickly and in a high quality form.

What does this say for the astronomy library and the astronomy librarian? I believe it will mean less face-to-face contact between librarians and patrons - users will have access to information when and where they want it. They will decide what to transfer into print, what to store in a personal database, and what to ignore. Librarians will not be building physical collections as in the past; they will be designing systems and organizing knowledge. I believe there will be a closer correlation between what information is produced and what is needed. There will be less guesswork, because the demand for discrete kinds of information will be easier to track through electronic systems.

We will see at least two levels of "publishing". There will be the traditional, juried, controlled publications with high standards and "credit" toward tenure and promotion for the authors whose papers are accepted. There will also be unjuried, rapidly available information separated into highly specialized subdiscipline files. We have this now in the invisible college which operates between researchers whose electronic mailboxes are constantly busy as selected colleagues send and receive electronic preprints.

The ability of individuals to use their idiosyncratic thought patterns in approaching the information warehouses will demand that librarians create new information structures, ones that enable people to wander around while at the same time providing signposts to show where they are. For instance, how can a user effectively tell where they are in an online journal article? How do they know when they find five references to a topic that some may be only a mention of the topic while others may lead them to an entire article on the topic.

Of course there are broader social issues as well. How do we create systems that do not lock some users out because they are unable to afford the cost of access to the online system? Yes, there will be charges for the new systems. Today's libraries are not free, we all know that even if no user charges are levied. We certainly must assume a future where charges will be imposed for access to information. It is the role of the librarian to assist in the design of systems that are equitable as well as viable, notably providing alternatives for users who cannot pay. There are many challenges as we move forward. Although I feel that eventually there will be more distance between the librarian and the library user, initially it will be necessary to relate very closely to our users. We need to be sure we understand what the astronomer at the telescope

needs, and how to deliver it in a useful way. We need to work with the theoretician as that individual moves about the world of information pulling ideas and facts together building new models of the universe. We must be willing, also, to refine our skills and change our priorities from selecting and preserving information to creating systems which will, one day, replace us, or those who follow us.

PART 8. OTHER PAPERS

MILESTONES OF INFORMATION EXCHANGE IN ASTRONOMY
FROM PREHISTORY TO THE PRESENT

Magda Vargha Konkoly Observatory

"That tho' a Man were admitted into Heaven to view
the wonderful Fabrick of the World, and the Beauty
of the Stars, yet what would be otherwise be Rapture
and Extasie would be but a melancholy Amazement if
he had not a Friend to communicate it to."

Attributed to Archytas by Christian Huygens

T h e B e g i n n i n g s . The origins of astronomy as a science can be traced back to the time when watchers of the sky first began to record the results of their observations and transmit them succeeding generations. The media used by these earliest astronomers were various, from great megalithic monuments like Stonehenge to the clay tablets of the Babylonian ephemerists and the papyrus rolls of the Egyptians.

Even in Antiquity such records were the foundation for the advance of astronomical knowledge. Thus the Chaldean Tables of the Babylonian had a great influence on the development of Greek astronomy. And in 130 B.C. Hipparchus discovered the precession of the equinoxes by comparing his own observations with those of Timocharis a century and a half earlier. Later even Copernicus himself used the results of Timocharis, Ptolemy, and al-Battani.

P e r s o n a l C o n t a c t s . From earliest times personal contact between astronomers has been a vital channel for the communication of astronomical knowledge. Thus Thales of Miletus reputedly attended the school on Cos founded by Babylonian sage Berossus, and Pythagoras of Samos acquired much of his basic knowledge on his travels to Egypt and the East. In 1267 the Persian astronomer Jamal al Din visited his Chinese colleagues in Peking in connection with the compilation of the Ilkhani Tables.

C e n t e r s o f R e s e a r c h . The exchange of information between astronomers is greatly facilitated by centers of research and repositories of learning. An early example is the House of Wisdom founded in Bagdad by the calif al Mam'un in the 9th century. From the 13th century onwards universities have played a similar role in Europe. The existence of Latin as an international language facilitated communication and made it possible for scholars to teach everywhere in Europe.

C o o p e r a t i v e V e n t u r e s . Ambitious undertakings demand collective effort. Thus the terrestrial survey in China directed by Nankung Jueh and I-Hsing in 725 involved simultaneous observations carried out in nine different places. Later a truly international group

of Moslem astronomers completed Ilkhani Tables in 1272, while a similar collective effort produced the Alfonsine Tables under the authority of Alphonso X. of Castile in 1252.

P r i n t i n g. The pace of development accelerated tremendously after the invention of movable type in the 15th century, making possible a much more vigorous circulation of information. Astronomers could now easily compare their results with those of their colleagues. The whole body of accumulated information became universally available. A celebrated example is the famous *Historia Coelestis* of Tycho Brahe. An important milestone was the publication of the first astronomical yearbook, the *Connaissance des Temps*, first published in 1679 and continuously published until the present.

O b s e r v a t o r y P u b l i c a t i o n s. The 18th century saw the development of every form of cooperative astronomical activity under the stimulus of brilliant astronomers with extraordinary organizing ability. One of these was the Hungarian-born astronomer Maximilian Hell of the Royal Observatory in Vienna. He published the first regular observatory publication, the *Ephemerides Astronomicae*, a special astronomical yearbook containing, besides the usual astronomical tables, articles, news, observations, letters, descriptions of instruments, etc. The *Ephemerides Astronomicae* and its successors were the first regularly circulating astronomical publications.

I n t e r n a t i o n a l C o o p e r a t i o n. The first international project between modern nation-states was undertaken by French and English astronomers preparing for the return of Halley's Comet in 1758-59. Joseph Nicolas Delisle, who had close personal contact with Edmund Halley, played a leading role in the preparations. He also organized the first astronomical expedition, for observing the transit of Venus in 1761 and 1769.

C u r r e n t B i b l i o g r a p h y. Another outstanding organizer of international cooperation was Jerome Lalande, who through his extensive correspondence influenced astronomical research throughout the whole Europe. To his credit is also the first publication of a current bibliography of astronomical literature.

Astronomers' M e e t i n g s a n d P e r i o d i c a l s. Franz Xaver von Zach organized the first astronomers' meeting in Gotha 1798. Two years later he organized a team of 24 astronomers to undertake a systematic search for the hypothetical planet between Mars and Jupiter. In the same year he published the first astronomical periodical, the *Monatliche Correspondenz*, which was soon followed by other journals.

I n t e r n a t i o n a l O r g a n i z a t i o n s. In 1863 the *Astronomische Gesellschaft* was formed in Heidelberg. From its inception it had an international character. Of the 23 original members, 16 came from abroad. The Central Bureau - a telegraph service - was established in Kiel 1882. It made possible instant dissemination of the newest discoveries.

R e t r o s p e c t i v e B i b l i o g r a p h y. The first retrospective astronomical bibliography was published in Brussels in 1887-1889 by J.C. Houzeau and A Lancaster. Ten years later the Astronomische Gesellschaft organized the regular publication of a current bibliography, the Astronomischer Jahresbericht .

M a p s a n d C a t a l o g s. Ever increasing cooperation and mutual assistance between observatories made possible increasingly ambitious catalogs and star charts, such as the AG Katalog, Potsdam Durchmusterung, Cape Photographic Durchmusterung, Carte de Ciel, etc.

The International Astronomical Union (IAU). The growing volume and variety of international contacts and cooperation created a demand for an international organization of astronomers to coordinate this activity. The International Astronomical Union was founded in Brussels in 1919. Even in the difficult days of World War II the IAU Central Bureau continued to further the flow of information between astronomers.

N e w f o r m s o f c o o p e r a t i o n. In the years after the War new forms of international cooperation developed. An example is the european journal Astronomy and Astrophysics, edited and published by astronomers from several different countries. Observatories built and maintained by several nations in common are an even more conspicuous instance of the deepening spirit of internationalism.

Recent years have seen an explosive growth in the means of collecting, storing, and distributing astronomical information. Nevertheless, even as in Antiquity, personal contact and correspondence between astronomers remains one of the most important means of sharing the results of research and stimulating new endeavors. " 'Twould be but a melancholy amazement if had not a friend to communicate it to."

IDENTIFYING ACADEMIC PHYSICAL SCIENCE RESEARCH IN PROGRESS

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For the scientist working on a research problem, books and journals serve mostly as archival records documenting what has been done and who did it. But the researcher usually has difficulty when he wants to determine what areas are currently being researched. Personal communication is a widely-used method of obtaining information, but one which is often inefficient and incomplete, especially as the number of colleagues working in a particular area of interest expands. Beyond this, current awareness of research in progress is available only by consulting an array of sources: preprints and lists or indexes of preprints, newsletters and annual reports, letters, journals, reviews of research, directories of research grants, directories of graduate faculties or research facilities and their interests, indexes of theses and dissertations, indexes of progress reports, papers presented at conferences and lists and indexes of these papers, and lists of articles submitted or accepted for publication.

The challenge of research in progress is two-fold: identifying what research is being done, and identifying findings and results of the research. These two aspects are usually intertwined. The literature of this area is non-conventional, sometimes referred to as "grey" literature. It not only occurs outside the usual channels of production and distribution, but generally escapes bibliographic control. Because of problems, bibliographic control and provision of documents has tended to be done by only a few specialized organizations such as national or international organizations specializing in all literature of a certain subject field, or in grey literature. Academic libraries have not usually included this literature in their collections. The grey literature has not been acquired on a regular basis or formally cataloged. If academic libraries are to fully support research at their institutions, they will need to include grey literature. More information on this category of literature needs to be available to librarians.

I propose a new information system for current academic research in the physical sciences, worldwide. This system is based in academic libraries which agree to serve as "clearinghouse" for certain subject areas. Each obtains information from surveys, lists of research in progress, preprints, articles accepted for publication, internal or technical reports, newsletters, and other such sources. Emphasis will be placed on research not well covered by existing national and international indexes such as those done by National Technical Information Service. Items will be indexed so that names of people, centers of research, and subjects may be pulled out. The system will connect people to people as well as people to print information.

This poster paper presents an approach to providing information on current academic physical sciences research and results. An array of tools and methods available for finding out what research is being done and identifying findings of the research are listed and samples are provided. A worldwide information system to identify and disseminate needed information is proposed.

AN ASTRONOMICAL SOFTWARE DOCUMENTATION COLLECTION AT THE SMITHSONIAN ASTROPHYSICAL OBSERVATORY

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ABSTRACT

We have established a library collection of documentation for software used in the reduction of astronomical data. We make some recommendations to the authors of documentation in addition to discussing the future directions of this collection. Instructions on how to contribute to and access this collection are provided.

I. INTRODUCTION

While working to establish this collection, we have encountered the view among authors of noncommercial astronomical software documentation that their works are too insignificant to be included in a library collection. This is understandable since library collections of documentation are a recent development. Producers of software, like other users of libraries, are essentially unaccustomed to seeing software documentation on library shelves.

This condition is unfortunate and every effort needs to be made to see that it is changed. Software is so essential to reduce and analyze the sheer volume of astronomical data collected by instruments, that without it much research would be greatly impeded. The need for software documentation is equal to that for other scientific books and, like books, documentation constitutes a major effort requiring many hours of writing and revising.

Authors of documentation should regard their efforts with the same respect they would a scientific paper or book intended for publication. Certainly, authors are encouraged to include title pages in their documentation and avoid the following omissions: the author's name, title, date of publication, the place of publication and publisher, and introductory remarks describing what the program does. Authors are also encouraged to paginate their works and to avoid title inconsistencies from cover and spine to title page.

II. FUTURE DIRECTIONS

We hope that libraries at other astronomical observatories will make efforts to establish similar centralized collections of documentation. Doing so would free astronomers from the task of acquiring and keeping current on documentation, thus assisting them in their efforts to analyze data. Libraries are the best places to locate collections of documentation, since the process of acquiring documentation and subscriptions to related newsletters is like that of acquiring books and subscriptions to journals. Designating the task of acquiring and maintaining subscriptions to a library staff person would insure that the collection be kept current, thus providing an invaluable service to its users.

Through research, a collection of this type might reveal changes in the ways data are processed, manipulated and analyzed. Certainly, an archeologist of astronomy would include software as part of the astronomer's tool culture, and a collection of documentation might someday be a major resource for a thesis on the history of astronomical data reduction software. For this reason, it is imperative to collect and archive documentation for those programs no longer in use. It is also important to do the same for those older versions of software where superseding versions show significant changes.

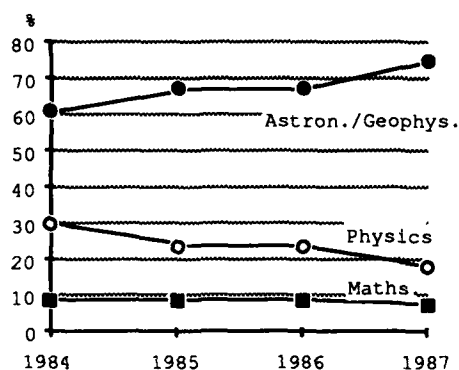
A list of documentation currently available and information about the collection is available from

Software Documentation Collection
Smithsonian Institution Library
60 Garden St., MS 56
Cambridge, Massachusetts 02138 USA

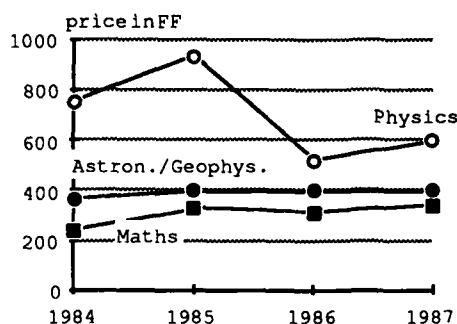
PHYSICS AND MATHEMATICS ACQUISITIONS IN FRENCH LIBRARIES SPECIALIZED IN ASTRONOMY: SOME COMMENTS

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A.M. MOTAIS de NARBONNE, Observatoire de Paris, France

The importance of physics and mathematics in astronomical research has been growing for the last twenty years; yet, the volume of book acquisitions in the relating fields has been decreasing in most french libraries⁽¹⁾ specialized in astronomy (graph 1).

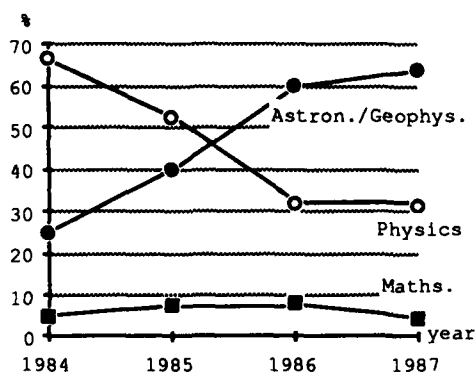


1. Ratio of the acquired titles

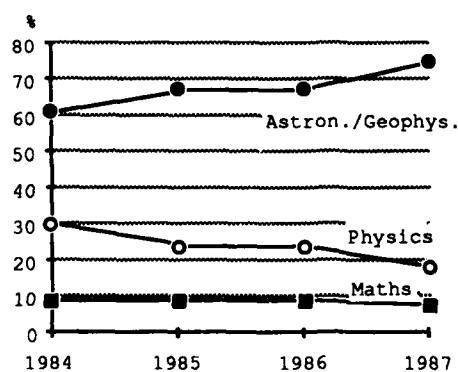


2. Evolution of book prices

Compared amount of book acquisitions in astronomy, physics and mathematics



3. middle size libraries

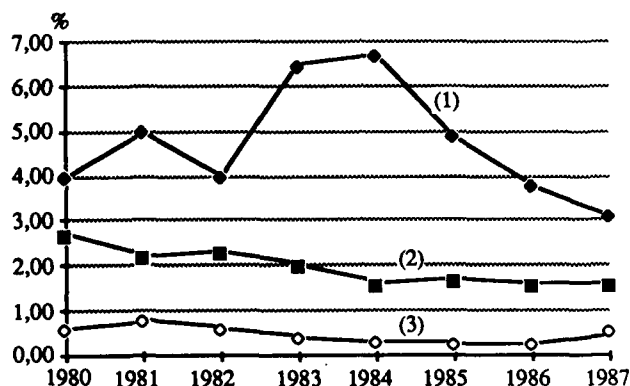


4. other libraries

(1) 5 small libraries and 2 larger ones have kindly provided us with their acquisition data

Great are the consequences of the physics book high prices (graph 2) on the acquisition volume and more drastic is the selection when the total amount of acquisitions is low, i.e. in small libraries (graphs 3 and 4). Yet, the restriction of acquisitions has not generated increasing inter-library loans in the relating fields and national service (CADIST) acquisitions in physics and mathematics have also been dropping. This point, connected with the concomitant general growth of astronomical book accessions, leads us to explain the contradictory observations as mentioned above here from the astronomical publication contents.

5. Compared volume of physics and mathematics in astronomical publications



Curve (1): ratio of "Physical Processes" (section 9 and 12) in Astronomy & Astrophysics⁽²⁾

Curve (2): ratio of physics papers (section 022) in Astronomy & Astrophysics Abstracts

Curve (3): ratio of mathematics papers (section 021) in Astronomy & Astrophysics Abstracts

Until quite recently, works were published in separate scientific documents or separate sections of serials, according to their types: observational data and results apart from theoretical works. Present astronomical publications, containing more theoretical argumentation, are more comprehensive by themselves: their use needs not so many additional documents in physics and mathematics as it did before.

This is corroborated by the decrease of purely theoretical works published by astronomers (graph 5 and Davoust's study, J.A.F., 1987, n° 29, p. 35).

Is it a local phenomenon, is it a general evolution? Further investigations would be necessary to know it.

(2) 1983-1987 data have been kindly communicated by F. Praderie

LIBRARY AND INFORMATION SERVICES IN CHINESE ASTRONOMY

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The development of the library science marks the progresses of science and culture in a country or a district. The study courses and results of a research institute are strongly reflected by its library and information work. The development of the astronomical research, the collection of astronomical observations, and the manufacture of astronomical instruments and equipments, etc., are all being made progress by library and information services to consult scientific foundation, to seek method, and to derive needed nourishment. The astronomical library and information service system is growing and expanding with continuously providing information to the astronomical study. In this paper I shall give some introductions about the Libraries and Information Divisions of astronomical observatories in our country.

I. THE LIBRARY

There are astronomical information service systems in existent astronomical observatories, stations, and some universities. Most of them are established based on the small information rooms and every one did not have many books and had only 1-2 librarians. By now, a quite complete system consists of the library, the information room, the editorial department of publications and the modern service equipments for typewriting, duplicating, typerecording, microfilm-reading, computer retrieve searching, etc. Rough statistical figure shows that the total number of the collected books in the libraries of our astronomical observatories and stations is more than 300,000 which involve the research fields of Astronomy, Earth-science, Space-science, Mathematics, Physics, Electronics, and Computer-science, etc. For most of the observatories or stations, the foreign publications amount to more than 60%, which does not involve the directly exchanged information with foreign astronomical unites and astronomers. The library of observatory pays attention to the availability of books, so that the demand for collection is speciality, but not extensity. There are differences in the types of the collections between the libraries of different observatories because of the different emphasis of research field. However, some nucleus of periodicals should be collected with complete volumes. There are some complete sets in Shanghai observatory's and the Purple Mountain observatory's library. For example, the Ap. J. and MN of RAS, A. AP., etc., are collected from the first volume published in last century to the current volume. Some Russian journals in whole set are collected also. In addition, the complete sets of various Star Map and Star Catalogs are col-

lected, too.

The Yunnan Observatory is a new one and it was established in 1970's, so it has a shorter history. The collection is characterized in new. A lot of new foreign books were bought at the International Book Fair directly, besides acquire books through conventional order from China National Publications Import & Export Corporation. Therefore, the library can provide the relatively foreign books to the scientific staff and the new research information is transferred as quickly as possible.

The forms of services in most of the libraries are mainly manual, the computer searching service has not been established popularly. As the major of the library patrons come from same observatory, so a lot of tedious formalities in management may be avoided. The reading conditions are very good and the reading rooms are comfortable and convenient. A sampling investigation has ever been made by the library of Yunnan Observatory, and about two thirds of the staff think that the ensure rate of literature offered by this library is 75%-50%. They can perform research tasks by taking use of this library.

II. INFORMATION SERVICE

(1) For most of the staff, their reading ability of foreign language is good, some of them have high ability in speaking, listening and writing. Therefore, selecting research subject, searching literature, etc. can be performed by themselves. The task of the Library and Information Division is emphatically to provide the information resource services, to announce the list of recent acquisitions in time, to provide information tracking on special topics for some important subjects or extended themes and new technological terms.

(2) The publications edited and issued by each observatory or station introduce the astronomical research accomplishments of Chinese astronomers to the world. As the medium of propagating scientific information, they are helpful for us to strengthen international association with foreign friends. We know that many of our publications are welcomed in abroad. Besides the <<ACTA ASTRONOMICA SINICA>>, <<PROGRESS IN ASTRONOMY>>, <<ACTA ASTROPHYSICA SINICA>>, we have been publishing the Publications of Observatory and the Reference Materials (most of them are translations). So far about 14 kinds of observatory's publication are being published in China.

(3) There are various methods and forms in information services adopted by each observatory's Library and Information Division in order to transfer information quickly. We have established relationship with hundreds units of dozens countries to exchange the information. The exchanged information is valuable and is welcomed by our scientific research staff. We can also get the information through the private communication with foreign astronomers.

(4) It is very effective to connect the Library and Information Divisions of observatories or stations to a network to perform the information services. Besides exchange the experiences of information services, it supplies a possibility for carrying out some great research subjects cooperatively. Not only the observatories and stations, but also the astronomical departments of some universities, space-science and Earth-science institutes have taken part in this network. The <<CHINESE ASTRONOMY ABSTRACT>> is published by this in-

formation network (from 1987) and the editorial department is composed of its members. The CAA is supported by the famous astronomers of our country and will be put on sale abroad in future.

III. THE ESTABLISHMENT OF COMPUTER MANAGEMENT SYSTEM

After several years' effort, there is a great progress in applying computer to library and information service system. For example, the system, developed by Library and Information Division of Shaanxi Astronomical Observatory, is not only practical, but also easy to operate (in Chinese and English). The same construction is in progress at the other Library and Information Divisions, too, but their speeds are different from each other. On the other hand, a work to establish astronomy science database started not long ago. It is hopeful that the computer network will be established in the near future. The effective resource share will be realized by the fully utilize of various data centres over the world, information source will be extended and the transfer speed of information will be promoted. An epoch-making progress in astronomy information services of China will take place.

THE AAVSO AND ITS VARIABLE STAR DATA BANK

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ABSTRACT

The American Association of Variable Star Observers (AAVSO) is the largest organization of variable star observers in the world that coordinates observations, and evaluates, compiles, processes, publishes, and disseminates them to the astronomical community. The organizational structure of the AAVSO, its visual and photoelectric observing programs, data management, publications, and services to the astronomical community are discussed.

I. ORGANIZATION

The American Association of Variable Star Observers (AAVSO) was founded in 1911 at Harvard College Observatory to coordinate variable star observations made largely by amateur astronomers, evaluate the accuracy of these observations, compile, process, and publish them, and make them available to professional astronomers. In 1954, it became an independent, private research organization, and today, with members in 43 countries, the AAVSO is the largest organization of variable star observers worldwide. Funding for Association operations comes from the interest from an Endowment Fund established by members, membership dues, grants from US government agencies and private foundations, subscriptions and sales of AAVSO publications, and data user fees.

The scientific activities of the AAVSO are coordinated by the Director of the Association, who is a professional astronomer.

II. OBSERVING PROGRAM

The AAVSO Visual Observing Program contains 3600 variable stars. Stars best suited for visual observations have amplitudes of variation more than one magnitude ($\Delta m \geq 1$). Therefore pulsating variables (long-period, semiregular, irregular, R Coronae Borealis, RV Tauri, Cepheid, RR Lyrae types), eruptive variables (nova, dwarf nova, recurrent nova, nova-like, symbiotic types), nebular and flare stars, quasars with optical variability, and eclipsing binaries make up the visual observing program. The accuracy of the visual observations is between ± 0.2 and

± 0.4 magnitude and the limiting magnitude is 16.5. The AAVSO Photoelectric Observing Program contains 50 stars with amplitudes of variation less than one magnitude ($\Delta m \leq 1$) such as semiregular, symbiotic, RV Tauri, R Coronae Borealis, and irregular variables. Most of these stars are also in the visual observing program, as they show long-term, large-amplitude variations. Thus, the photoelectric and the visual observing programs complement each other. The accuracy of photoelectric observations is ± 0.008 magnitude. AAVSO finder charts are available for most stars in the program, with the variables and comparison stars of known magnitudes identified.

III. DATA MANAGEMENT

AAVSO Headquarters receives between 240,000 and 265,000 000 observations yearly, more than 50% of which come from observers outside of the USA. These observations are computerized and processed using AAVSO microcomputers and Digital VAX computers at the Harvard-Smithsonian Center For Astrophysics. Over 6 million observations of variable stars have been compiled since the AAVSO's founding in 1911. Of these, 4 million observations from 1963 to the present are in computer-readable form on magnetic tapes, chronologically by star. Light curves of all program stars are kept up-to-date. AAVSO observations from 1911 to 1963 are being computerized at AAVSO. When this project is completed, the AAVSO will have computer-readable variable star data files, of mostly large-amplitude stars, going back 75 years and more.

IV. PUBLICATIONS OF AAVSO

Journal of the AAVSO: (Semi-annual) Scientific papers on variable star research presented at meetings and additional papers submitted to the Journal; Reports of AAVSO Committees; Annual Report of the AAVSO Director; Treasurer's Report; Table of AAVSO Observers' annual totals; Book Reviews; Letters to the Editor;

AAVSO Bulletin: (Annual) Annual predictions of maxima and minima of long period variable stars;

AAVSO Circular: (Monthly) Preliminary results on some eruptive and other interesting variable stars; Director's request for more data on selected stars;

AAVSO Alert Notices: (Irregular) Mail hotline to alert observers to discoveries of novae, supernovae, and other rare activities of variable stars, and to inform them of requests from astronomers for simultaneous observing;

AAVSO Monographs: (Irregular) Computer-generated long-term light curves (20 years or more) of AAVSO observations, one star per Monograph;

AAVSO Reports: (Irregular) Computer-generated light curves of variable

stars in the observing program of AAVSO, usually covering an interval of 1000 days;

AAVSO Photoelectric Photometry Newsletter: (Quarterly) News on AAVSO photoelectric photometry activities, unusual behavior of small-amplitude stars and requests from astronomers for photoelectric observations;

AAVSO Solar Bulletin: (Monthly) Daily American and International sunspot numbers; Sudden Ionospheric Disturbance data;

AAVSO Newsletter: (Irregular) Information and news about AAVSO members and activities;

V. SERVICES TO THE ASTRONOMICAL COMMUNITY

AAVSO data, both published and unpublished, are disseminated to about 100 astronomers per year on request. AAVSO services are sought by astronomers a) to receive real-time, up-to-date information on unusual stellar activity; b) to assist in scheduling and executing variable star observing programs using earth-based large telescopes and instruments aboard satellites; c) to request optical coverage of observing targets and immediate notification of their activity during earth-based or satellite observing programs; d) to correlate optical data with spectroscopic, photometric, and polarimetric multi-wavelength data; e) to carry on collaborative statistical analysis of stellar behavior using long-term AAVSO data.

AAVSO data may be obtained by writing to the Director and stating the purpose of the request and the type of AAVSO data or services needed. When real-time information or simultaneous optical coverage is requested, the Director alerts observers via AAVSO Alert Notices distributed to about 500 observers and members. She receives the data from observers via telephone, evaluates the accuracy of the observations, and transmits them to the interested astronomer. This type of collaboration between the AAVSO and the professional astronomer has enabled the successful execution of many observing programs, particularly those using satellites such as Apollo-Soyuz, High Energy Astronomical Observatories 1 and 2 (HEAO 1 and 2), International Ultraviolet Explorer (IUE), and the European X-Ray Satellite (EXOSAT). A significant number of rare events have been observed with these satellites as a result of timely notification by the AAVSO.

The AAVSO plays an important role in astronomy in providing accurate, long-term variable star observations and real-time information for research.

SUMMARY OF A SURVEY OF ASTRONOMY LIBRARIES

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ABSTRACT. A questionnaire about astronomy libraries was distributed in June 1988. The returns from 54 libraries are summarised; they show a large range in size, scope and procedures. Many libraries are connected to networks that give access to bibliographic databases, but only a small number use local computers for cataloguing. Some comments on the returns are given.

1. INTRODUCTION

A questionnaire on astronomy libraries was distributed in June 1988 with IAU Commission 5 Newsletter No. 3 in the hope that it would be possible to present a summary of the information at IAU Colloquium No. 110 on Library and Information Services on Astronomy. The initial response was insufficient, but further copies of the questionnaire were distributed at the Colloquium in Washington and at the IAU General Assembly in Baltimore in August. So far 54 returns have been received and so it seems worthwhile to summarise and comment on them. It is our hope that more librarians will respond and we will then prepare and distribute a full report on the survey.

The persons completing the questionnaires were asked to give qualifying remarks if the question or item was not appropriate to their situations. The questionnaire was as follows:

1. Name of organization and subdivision (if any) to which this questionnaire refers:
2. Is the library in one place or several? Where?
Approximate area: square metres
3. Is the library primarily for astronomy?
4. Approx number of books: Total: Before 1600: before 1900:
Approx number of journals received: by purchase: by exchange:
Approx number of books (excluding journals) purchased each year:
5. Number of library staff:
Approx number of users: Staff: Students: Other:
6. Do you allow your users open access to the shelves?
Do you allow your users to take (a) books and (b) journals away from the library?
7. Do you have significant use of microfilm or microfiche?
8. Do you keep a book catalogue on cards? or on computer?
9. Name of computer network (if any) to which library has access:
Name(s) of bibliographical database(s) used by the library:
10. Does the library have any special collections?
11. Is the library responsible for an archive of unpublished documents?
12. Is the library responsible for any photographic plates?
13. Is the library responsible for any publishing activities, such as production of newsletters?
14. Does the library (or other special group in the organisation) have any responsibility for the management of data held on magnetic tape?
15. Does the library (or other special group in the organisation) have any responsibility for management of data held on optical discs?

2. SUMMARY OF ANSWERS

(1) The answers to the first item showed that:

12	libraries belong to	Observatories of Official Research Centers
10	" " "	University Observatories
8	" " "	University Research Institutes
7	" " "	Astronomical Faculties of Universities
4	" " "	Astronomical or Astrophysical Institutes of Official Research Centers
4	" " "	University Libraries
3	" " "	Observatories of Independent Research Centers
3	" " "	National Observatories
2	" " "	International Research Centers
1	library is in a Private Observatory	

Two questions arise: What are the best conditions for an astronomy library? What patron is considered as optimum for these libraries? One thing is certainly sure: for a library the most important condition is continuity, and the most difficult problem for a well-operating library is reorganization.

(2) Almost half of the 54 libraries are in two or more places. It is very natural if we think of the numerous mountain stations. But in some cases separation in several places is a direct consequence of reorganisation. About 30% of the libraries are in two places, and 17% are in three places. If a library operates in more than one place it must buy the most important books and journals in duplicate, thus causing some financial problems.

The areas of the libraries vary from 9 square metres to 2000 square metres. The average area is 260 square metres.

(3) Many branches of science are collected in the various astronomy libraries. Interest in computer sciences has grown rapidly; in the majority of libraries, however, primarily astronomical books are collected.

(4) The numerical data on the collections show a range in size from 400 to 88000 books and from 5 to 1000 in the number of journals obtained each year. It is very astonishing that the libraries - even the older ones - have very few old items, presumably because they had to part with the old ones for some reason. Nowadays a dangerous idea is flourishing in libraries. It says "The most valuable things can find better security in central places". It is not true at all. In the place where they are well-known and used sometimes, they surely have better conditions for preservation.

In almost all libraries there are many difficulties with the increase of the library stock. The most difficult problem is uncertainty. There were some very personal remarks regarding this problem on the questionnaires. The astronomical books are printed in relatively few copies; if one failed to order a book in time, it is very difficult to get it later. Not to mention the older astronomy journals! It is one of the most painful things in a library to stop ordering a journal that has been received for some decades by the library. The numerical data show that the exchange of publications among astronomy libraries is an important factor in developing collections.

(5) Comparing the numbers of users with the numbers of books and journals shows that in the astronomy libraries there are relatively big collections in proportion to the numbers of users. We think an astronomy library is in a very special situation among other libraries. Here most books and journals are used day after day (catalogs, textbooks, maps, etc.); the number of

books and journals is not related to numbers of users as closely as in other libraries. There are many books that are essential for all astronomers. In an observatory almost all the astronomical staff use the library every day.

Similarly, it is seen that in comparison with the size of the collections very few persons work in these libraries. 1-2.5 librarians are working in 61% of them, 3-9 librarians are working in 22% of the libraries, and 10% of the libraries have no librarians at all.

(6) In almost every library open access to the shelves is allowed for the users. In all libraries they also can take books away from the library. Only in two libraries (one of the two is the Konkoly Library) is it forbidden to take them outside the Institution. We think this rule is very useful. For example in our library there are many irreplaceable astronomical books that are the only copies in the country.

In 16 astronomy libraries the users cannot take away journals from the libraries. One librarian commented the answer "yes" with the remark "unfortunately". There is another remark: "It is not allowed but they do it unofficially".

(7) As far as microfiche and microfilms are concerned, they are used significantly in only 24 libraries.

(8) The library catalogs are kept mostly on cards. In 14 libraries the catalogs are also computerized. There is only one place where the catalogs are available only on computer. But there was a most interesting answer "on card: no; on computer: not yet".

(9) It is astonishing that, while over half of the libraries are connected to computer networks and to databases, only a few libraries have computerized their own catalogs. It is very probable that nowadays library collections are not the most important sources of information in the observatories. Information comes in various forms from outside. It can also be seen that there are so many data centers that it is not easy for a library to find the most suitable among them. It may cause us severe financial problems if we are not well informed in this business.

(10) There are various "Special Collections" in half of the libraries. We mention only some of them: "Slides", "Palomar Sky Survey", "Rare Books", "Old Journal Collections", "Papers of late astronomers", "Mathematical Tables", "Airy Rare Books", "Books of Professor Oort", etc.

(11) Among the 54 libraries only 20 libraries have archives. It would be very good to know what has happened to the old correspondences, architectural designs, drawings of the old instruments, old pictures of observatories, the portraits of the late astronomers, etc., where no archives exist. We do not know in how many institutions an archive exists other than as part of the library.

(12) We also cannot imagine what had happened to the older photographic plates. There are only 10 libraries in which the librarians are responsible for the photographic plates. It is very natural that current plates are situated in the rooms of the astronomers, or in a special laboratory. In our opinion it is very useful that the library should keep a catalog of them even if they are kept in another part of the observatory.

(13) There are 12 institutions in which the libraries are responsible for publishing activities. In some cases these publications are connected with library work ("Library Guide", "Library News", "Acquisitions Lists" etc.) In 9 institutions the librarians aid in the distribution of reprint series.

(14) Significant databases on magnetic tapes are available in 22 libraries. The library has responsibility for these tapes in only 4 observatories. Most of these institutions have special computer centers where the tapes are kept. In some observatories the staff members have special collections on magnetic tapes. In some places the tapes are in the computer center, but are catalogued by the library.

(15) Optical discs are the means of the future in astronomy libraries. They are now used in only eight institutions, and there is only one library that is responsible for them. Within some years this situation will very probably change in the astronomy libraries.

3. CONCLUDING COMMENTS

Although the questionnaires returned to us so far represent only a small proportion of astronomy libraries, some very subjective remarks on the current situation in astronomy libraries in general are appropriate here.

We consider our time as a revolutionary period in our libraries. Within a few years we must use the new technical apparatus in all astronomy libraries. These new means will certainly change the traditional library life. Because astronomy libraries can only exist in close cooperation, it is also very important that these alterations should be going on in a coordinated way. We must give and receive new information by the same new means. That is why all astronomy libraries should be connected to some important central databases in the very near future, otherwise the exchange of information between these places would be only formal and not active and mutual.

The library - as these questionnaires also demonstrate - has manifold tasks in an astronomical institution. Among them the most important is to provide current information for the astronomers. But a library is responsible not only for giving valuable information, but its task is also to preserve information by any means. To preserve every important result by the new means needs a new theoretical and technical concept. Our responsibility is to develop these new methods with the assistance of astronomers and computer experts.

APPENDIXES

APPENDIX 1. Acronyms and Abbreviations.

A & A	Astronomy and Astrophysics
AAA	Astronomy and Astrophysics Abstracts
AAO	Anglo-Australian Observatory
AAS	American Astronomical Society
AAVSO	American Association of Variable Star Observers
ADC	Astronomical Data Center
AGU	American Geophysical Union
AIP	American Institute of Physics
AJ	Astronomical Journal
ANSI	American National Standards Institute
Ap.J.	Astrophysical Journal
Appl. Op.	Applied Optics
APS	American Physical Society
ARI	Astronomisches Rechen-Institut
ASCH	American Standard Code for Information Interchange
ASTHMA	Astronomy and Astrophysics Abstracts Magnetic Tape
AT	Australian Telescope
AVS	American Vacuum Society
BSI	British Standards Institution, Bibliographical Star Index
BT	broader term
CAA	Chinese Astronomy Abstracts
CADC	Canadian Astronomy Data Center
CADIST	Centre d'Acquisition et d'Information Scientifique et Technique
Caltech	California Institute of Technology
CD-ROM	compact disk read only memory
CDS	Centre de Donnees Astronomique de Strasbourg
Cel. Mech.	Celestial Mechanics
CPI	Current Physics Index
CSGD	Chinese Solar-Geophysical Data
CSI	Catalog of Stellar Identifications
CSIRO	Commonwealth Science and Industrial Research Organization
CTIO	Cerro Tololo Interamerican Observatory
DAO	Dominion Astrophysical Observatory
EFOSC	ESO Faint Object Spectrograph and Camera
ESA-IRS	European Space Agency Information Retrieval System
ESIS	European Space Information System
ESO	European Southern Observatory
FID	International Federation for Information and Documentation
FITS	Flexible Image Transport System
FIZ	Fachinformationszentrum
GPAA	General Physics Advanced Abstracts
GSFC	Goddard Space Flight Center
IAA	International Aerospace Abstracts
IAU	International Astronomical Union
IDAAS	International Directory of Astronomical Associations and Societies

IDM	Intelligent Database Machine
IDPAI	International Directory of Professional Astronomical Institutions
IEEE	Institute of Electrical and Electronic Engineers
IFLA	International Federation of Library Associations
IRAS	Infrared Astronomical Satellite
ISBN	International Standard Book Number
ISI	Institute for Scientific Information
ISO/OSI	International Standards Organization
ISSN	International Standard Serial Number
IUE	International Ultraviolet Explorer
JGR	Journal of Geophysical Research
J RAS Canada	Journal of the Royal Astronomical Society of Canada
LAN	local area network
LC	Library of Congress
LISA	Library and Information Services in Astronomy [this meeting]
MNRAS	Monthly Notices of the Royal Astronomical Society
NASA	National Aeronautics and Space Administration
NASA CP	NASA conference publication
NOAO	National Optical Astronomy Observatories
NRAO	National Radio Astronomy Observatory
NSESCC	NASA Space and Earth Sciences Computing Center
NSSDC	National Space Science Data Center
NT	narrower term
NTIS	National Technical Information Service
OCLC	Online Computer Library Center
OSA	Optical Society of America
PACS	Physics and Astronomy Classification Scheme
PAM	Physics-Astronomy-Mathematics Division of the Special Libraries Association
PASP	Publications of the Astronomical Society of the Pacific
PC	personal computer
PPSN	Public Packet Switching Network
PR-B	Physical Review - B
PRA	Physical Review Abstracts
PSS	Packet Switching System
RAPsheet	Radio Astronomy Preprint
RGO	Royal Greenwich Observatory
ROE	Royal Observatory Edinburgh
RT	related term
SAO	Smithsonian Astrophysical Observatory
SCAD	Soviet Centre for Astronomical Data
SIMBAD	Set of Identifications, Measurements, and Bibliography for Astronomical Data
SLA	Special Libraries Association
SPAN	Space Physics Astronomy Network
SPIN	Searchable Physics Information Notices
SRC	Science Research Council [now Science Engineering Research Council]

ST-ECF	Space Telescope European Coordinating Facility
STAR	Scientific and Technical Aerospace Reports
STARCAT	Space Telescope Archive and Catalog
STEPsheet	Space Telescope Exhibited Preprints
ST Sci	Space Telescope Science Institute
UDC	Universal Decimal Classification
ULDA	IUE Uniform Low Dispersion Archive
USNO	United States Naval Observatory
WAN	wide area network
WORM	write once, read many [times]

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