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An Astronomer's Guide to On-line Bibliographic Databases and Information Services

Abstract

This document is a guide to on-line bibliographic databases and other information services which might be useful to astronomers. It concentrates on facilities which are either provided within the astronomical community, or which are available free of charge. For each facility listed a brief description is given, together with details of how to access it and how to obtain further information about it. The document aims to provide sufficient information for you to decide which facilities will be useful to you, and then obtain further information on them, rather than providing comprehensive documentation for each facility. It should be possible to access most of the facilities described here from Starlink computers. This document is complementary to SUN/162 which describes some of the observation and data archives available on-line.

Contents

1 Introduction

This document is a guide to on-line bibliographic databases and other information services which might be useful to astronomers. It concentrates on facilities which are either provided within the astronomical community, or which are available free of charge. For each facility listed a brief description is given, together with details of how to access it and how to obtain further information about it. The document aims to provide sufficient information for you to decide which facilities will be useful to you, and then obtain further information on them, rather than providing comprehensive documentation for each facility. The document is aimed at Starlink users in the United Kingdom. However, where practicable, I have tried to provide sufficient information to make it useful to astronomers overseas.

The structure of the document is as follows:

- Part I – bibliographic databases,
- Part II – other information services,
- Part III – INTERNET tools which can be used to access the facilities listed in Parts I and II.

It should be possible to access most of the facilities described here from Starlink computers. This document is complementary to SUN/162 which describes some of the observation and data archives available on-line. There is some overlap between the two documents because some of the systems described in SUN/162 include bibliographic information.

The recent compilation *Intelligent Information Retrieval: The Case of Astronomy and Related Space Sciences* edited by A. Heck and F. Murtagh (see Section 28) covers very similar topics to this document. However it is more concerned with the rationale behind the developments, rather than being a cookbook of what is available and how to access it. You are referred to it for a more comprehensive discussion of many of the developments reported here.

Many of the facilities described in this document, particularly those overseas, but also increasingly ones in the United Kingdom, are accessed through the INTERNET communications network (which is, more accurately, an interlinked set of communications networks, all running a common communications protocol). A wide variety of facilities are available through INTERNET, and some powerful and sophisticated software tools are becoming available to access them. An excellent and thoroughly recommended introduction to the INTERNET, and the facilities and services available in it, is *The Whole Internet User's Guide and Catalog* by Ed Krol (see Section 28). In particular, this book gives further details of many of the INTERNET tools described Part III.

Because existing facilities evolve and new ones become available I anticipate that the document will be revised periodically. In order that it should remain useful and accurate I welcome corrections, comments and suggestions for additional facilities to include. If you have any such comments please send them to: Clive Davenhall, Department of Physics and Astronomy, University of Leicester, University Road, Leicester, LE1 7RH. E-mail: LTVAD::ACD (Starlink DECNET), 19838::ACD (SPAN) or acd@star.le.ac.uk (JANET and INTERNET).

Part I

Bibliographic Databases

2 Overview

Traditionally locating articles, papers or books on some specific astronomical topic has involved searching through the annual volumes of *Astronomy and Astrophysics Abstracts* published by the Astronomisches Rechen-Institut of Heidelberg, or for older material, its predecessor the *Astronomischer Jahresbericht*. Bibliographic databases containing similar sorts of information have existed as commercial products for well over a decade. Typically such databases contain information covering a wide range of subjects, rather than being specifically astronomical. The INSPEC database described briefly below is typical of such large, commercial bibliographic databases. The use of these systems in astronomy has been reviewed by J.M. Rey-Watson (1988, in *Astronomy from Large Databases* eds. F. Murtagh and A. Heck, Garching: ESO conference and workshop proceedings no. 28, pp453-458) and J.M. Watson (1991, in *Databases and On-Line Data in Astronomy*, eds. D. Egret and M. Albrecht, Dordrecht: Kluwer, pp199-210).

The INSPEC database produced by the United Kingdom Institution of Electrical Engineers (IEE) is a typical large, commercial, multi-subject database. The subject areas which it covers are: physics (including astrophysics), electrical engineering, electronics, computing, control and information technology. It is the principal English-language bibliographic database in these fields.

INSPEC was established in 1969 and coverage is continuous from that date (though the IEE has published abstracts journals on paper for somewhat longer, starting in 1898). INSPEC contains entries for articles appearing in journals and conference proceedings and also for books, reports and dissertations (though books, reports and dissertations amount for only a little over 2% of the entries in the database). For every article entered full bibliographic details and an abstract are given. This abstract is prepared specifically for the INSPEC database and is not necessarily the same as any abstract in the original article. For articles published in languages other than English both the original title and an English translation are provided; the abstract is prepared in English. Entries are selected for timeliness and importance prior to being added to the database, so complete coverage of any journal cannot be guaranteed (though in practice coverage is complete for eminent journals in the core subjects of the database).

In October 1993 INSPEC contained about 4,500,000 entries, with new entries being added at a rate of about 250,000 entries *per annum*. These entries are selected from articles in about 4300 journals and nearly 2000 conference proceedings *per annum*. All the eminent astronomical journals are covered.

INSPEC may be accessed in a number of ways. It can be supplied on magnetic tape for users to process with their own software. A CD-ROM version is also available, which comes with search software for IBM PC compatible personal computers. Finally, it can be accessed on-line from a number of third-party vendors. Typically such vendors will make a number of bibliographic databases available, having homogenized their appearance and customized their contents to a greater or lesser extent. This method is the usual way of accessing the databases and there are many such database vendors.

In principle, automatic searches of electronic bibliographic databases are less tedious, time consuming and error prone than manual searches of a printed book. However, usually these database systems have been difficult and expensive to use, and in practice only trained librarians have accessed them. Improvements in computer hardware and software are making access to these databases easier. BIDS (see Section 3, below) is the first national on-line bibliographic information system designed for routine use by non-expert users.

In addition to the large multi-discipline bibliographic databases, a number of specifically astronomical bibliographic databases have been developed within the astronomical community. These databases are typically limited in scope, perhaps only covering some aspect of astronomy, but are usually available free of charge. Some of the systems available are described below.

There is some overlap between the bibliographic databases described here and the observation and data archives described in SUN/162. In particular, SIMBAD, NED, ADS, and ESIS, which all contain bibliographic information, are described in SUN/162. The bibliographic aspects of the ADS and ESIS were not covered in SUN/162, so they are summarized in Section 4, below. Conversely, the bibliographic aspects of NED and SIMBAD were covered adequately in SUN/162, so the description is not repeated here. However, to recap briefly, SIMBAD contains bibliographic data, without abstracts, for individual objects and NED contains bibliographic data, with abstracts, for individual extra-galactic objects. A charge is made for the use of SIMBAD.

None of these systems are direct replacements for *Astronomy and Astrophysics Abstracts*. Rather, they complement the paper *Abstracts* by permitting large and complex searches which were not practical hitherto.

3 BIDS

BIDS (Bath Information and Data Services) is run by the Computing Service of the University of Bath under the ægis of CHEST[1] and provides on-line access to a number of bibliographic databases. BIDS is the first national on-line bibliographic information system designed for routine use by non-expert users. Currently, BIDS provides access to three databases:

- ISI,
- Inside Information,
- Embase.

Embase is a bio-medical database that is unlikely to be of interest to astronomers. The remaining two databases are discussed further below. In order to use BIDS services you must be associated with a subscribing institution. Institutions subscribe to the various BIDS services individually; a given institution will not necessarily subscribe to them all. BIDS services are not available outside the United Kingdom. The BIDS data are copyright and their use is subject to agreements between CHEST and the vendors of the databases. These agreements usually permit use for 'teaching, research and personal educational development', but exclude consultancy and services where the data are used commercially. In case of doubt you should consult the text of the

[1] Combined Higher Education Software Team; an organization which negotiates licence arrangements for software on behalf of United Kingdom Higher Educational Institutions.

agreement for the database which you wish to use, which is accessible on-line through the BIDS service in question.

In order to gain access to BIDS services you should, in the first instance, contact your local University (or Institutional) library, who should be able to advise. If your institution subscribes to the appropriate service, you will be required to sign a form agreeing to the conditions for using it, and you will be given a username, password and a user guide. BIDS services are accessed via JANET or INTERNET. Local arrangements for logging on to them will vary, but will probably be done from a computer belonging to your university's computer centre, rather than a Starlink machine.

3.1 BIDS ISI

BIDS ISI provides access to three multi-disciplinary citation indices: the Science Citation Index (SCI), the Social Science Citation Index (SSCI) and the Arts and Humanities Citation Index (A&HCI). These citation indices are supplied and owned by the Institute for Scientific Information Inc. (ISI) in the United States. They contain details of articles drawn from over 7000 journals and the Index to Scientific and Technical Proceedings (ISTP) which contains details of the papers presented at over 400 conferences *per annum.* For each article, bibliographic details, but not abstracts, are available. Keywords for each article have been included since 1990. The period covered is from 1981 to the present. The database is updated once per week. Articles on astronomical topics are usually within the scope of the SCI, though the A&HCI contains some articles about the history of astronomy. Table 1 shows the astronomical journals which are covered by the BIDS ISI SCI. It excludes any physics or general journals which carry astronomical papers except *Nature.*

Virtually all the 'old' (pre-1990) universities have subscribed to BIDS ISI, though subscription amongst the former polytechnics is less complete. It can be accessed from a dumb terminal. Once you have logged on to it, a simple menu system allows you to perform searches to identify articles of interest, examine their details and obtain copies of these details, via e-mail, on your host computer. Such details can optionally be directed straight to a Starlink computer, and do not necessarily have to go to the university computer centre machine that you are using to access BIDS. An important feature of BIDS ISI is the ability to find all the citations of a given article. A table of contents can be displayed for recent issues of a selected journal. Also you can request a paper copy of selected articles (a charge is made for this service). All these facilities are described in the short, but entirely adequate, user guide.

The advantages of using BIDS ISI include: the simple, menu-driven user interface, which is easy to learn and use, the large number of journals and conference proceedings covered and the ability to find all the citations of a given paper. The principal disadvantage is probably the lack of abstracts. Additionally, the user interface, though easy to use, is of limited functionality. In particular, the details of selected articles must be individually inspected and retrieved. Searches can only operate on a single year, so they must be repeated if a range of years is to be covered. The search cannot be limited to astronomical journals, which is both an advantage and a disadvantage; astronomical papers in non-astronomical journals will be found automatically, but spurious references may also be found. Finally, searches must be for words, not numbers. This restriction precludes searches for many astronomical object designations.

Acta Astronomica
Advances in Geophysics
Advances in Space Research
Annual Review of Astronomy and Astrophysics
Annual Review of Earth and Planetary Sciences
Astronomy and Astrophysics Review
Astrophysics and Space Science
Astronomy and Astrophysics
Astronomy and Astrophysics Supplement Series
Astronomische Nachrichten
Astronomical Journal
Astronomicheskii Zhurnal
Astrophysical Journal
Astrophysical Journal Supplement Series
Astrophysical Letters and Communications
Bulletin of the Astronomical Institutes of Czechoslovakia
Classical and Quantum Gravity
Earth and Planetary Science Letters
Earth-science Reviews
ESA Bulletin-European Space Agency
ESA Journal-European Space Agency
General Relativity and Gravitation
Geophysical and Astrophysical Fluid Dynamics
Indian Journal of Radio and Space Physics
IAU Symposia
Icarus
Journal of Astrophysics and Astronomy
Journal of Geophysical Research-Planets
Journal of Geophysical Research-Solid Earth and Planets
Journal of Geophysical Research-Space Physics
Journal of Geophysical Research-Solid Earth
Journal of Physics of the Earth
Journal of the Royal Astronomical Society of Canada
Monthly Notices of the Royal Astronomical Society
Meteoritics
Nature
Observatory
Proceedings of the Astronomical Society of Australia
Proceedings of the Indian Academy of Sciences-Earth and Planetary Sciences
Proceedings of the Lunar and Planetary Science Conference
Physics of the Earth and Planetary Interiors
Publications of the Astronomical Society of Japan
Publications of the Astronomical Society of the Pacific
Quarterly Journal of the Royal Astronomical Society
Revista Mexicana de Astronomia y Astrofisica
Soviet Astronomy Letters
Space Science Reviews
Transactions of the Japan Society for Aeronautical and Space Sciences

Table 1: Astronomical journals covered by the BIDS ISI database

3.2 BIDS Inside Information

BIDS Inside Information provides details of articles appearing in the 10,000 most requested periodicals at the British Library Document Supply Centre, Boston Spa. It is a new database and the period covered is only since October 1992. It is however, very up to date, with the details of new journals being input within a few days of their receipt. It is anticipated that details for about one million articles will be added *per annum*. For each article full bibliographic details, but not abstracts, are included. Most eminent astronomical journals are covered.

BIDS Inside Information is only available at some universities; fewer institutions have subscribed to it than have subscribed to BIDS ISI. It can be accessed from a dumb terminal. Once you have logged on to it, a simple menu system allows you to perform searches to identify articles of interest and to examine their details. This system is very similar to the BIDS ISI menu system (see Section 3.1, above). It is also possible to display a contents list for a selected issue of a given journal. The details of selected articles can be retrieved, via e-mail, to your host computer and it is also possible to request a paper copy of selected articles (a charge is made for this service).

4 ADS and ESIS

ADS (Astrophysics Data System) is a distributed information system run by NASA. It includes a bibliographic database. This database is a subset extracted from the NASA RECON system, which is supplied by the NASA Scientific and Technical Information (STI) programme. It is compiled from articles appearing in over 200 journals, conference proceedings and internal NASA reports. The subject areas of RECON which are included in the ADS database are listed in Table 2. All the eminent astronomical journals are covered. For each article the service provides full bibliographic details, including an abstract. This abstract was prepared specifically for the RECON system and is not necessarily the same as any abstract in the original publication. The period covered is from 1975 to the present. Complete coverage of any of the sources is not guaranteed.

Currently (November 1993) the ADS bibliographic database is only available to users outside the United States on an experimental basis. It is possible that in the future the service may be restricted to users within the United States.

ESIS (European Space Information System) is a distributed information system run by ESA. It also includes access to a bibliographic database. This database is also extracted from the NASA RECON system and is very similar to the one available through the ADS.

See SUN/162 for details of accessing the ADS and ESIS. You should beware, however, that the current speed of data communication lines in Europe makes ESIS un-usable at most institutions. The imminent release of a client-server version of ESIS may improve this situation.

Reference:

The ADS abstract service is described by M.J. Kurtz, T. Karakashian, C.S. Grant, G. Eichhorn, S.S. Murray, J.M. Watson, P.G. Ossorio and J.L. Stoner, 1993, in *Astronomical Data Analysis Software and Systems II*, eds. R.J. Hanisch, R.J.V. Brissenden and J. Barnes, Astronomical Society of the Pacific Conference Series, **52**, pp132-136.

Subject	NASA classification
Astronomy	**89**
Solar Astronomy	89-01
Stellar Astronomy and Cosmology	89-02
Meteors and Meteorites	89-03
Astrophysics	**90**
Gravitation	90-01
Astrophysical Plasmas	90-02
Lunar and Planetary Exploration	**91**
The Moon	91-01
Planetary Sciences and Exploration	91-02
Solar Physics	**92**
Space Radiation	**93**
Cosmic Radiation	93-01
Solar Radiation and Activity	93-02
Radiation Belts	93-03

Table 2: RECON subject areas included in the ADS database

5 STELAR

STELAR (STudy of Electronic Literature for Astronomical Research) is a project to investigate computerized access to astronomical literature. It is managed by the Astrophysics Data Facility (ADF) at the NASA Goddard Space Flight Center. Its formal goal is to 'explore the use of electronic means for improving access to scientific literature; using astronomical publications to evaluate distribution, search and retrieval techniques for full text and graphics display.' There are several aspects to the STELAR project, and much of the work is still experimental, rather than running an operational system. However, as a pilot project, a database of bibliographic details, including abstracts, for articles appearing in eight eminent astronomical journals (see Table 3) is publicly available. These abstracts have been supplied by NASA/STI from a database prepared for the NASA RECON system by an independent abstraction service. They were prepared specifically for the RECON system and are not necessarily the same as any abstract in the original publication. The database contains some articles dating back to the 1960s, though the coverage is pretty complete since the mid-1970s. The database is updated approximately fortnightly.

The STELAR database can be queried with WAIS (see Section 25), though first you should obtain a copy of the source file `abstracts.src`. A copy of this file can be obtained from the European Space Telescope Coordinating Facility (again see Section 25, especially Table 17).

Further information on the STELAR project can be obtained by sending an e-mail message to: stelar-info@hypatia.gsfc.nasa.gov (INTERNET).

References:

M.E. Van Steenberg, 1992, in *DeskTop Publishing in Astronomy and Space Sciences*, ed. A. Heck (World Scientific, Singapore), pp149-154.

A. Warnock, J.E. Gass, L.E. Brotzman, M.E. Van Steenberg, D. Kovalsky and F. Giovane, October 1992, *Amer. Astron. Soc. Newsletter* **62**, insert p10.

Astrophysical Journal
Astrophysical Journal Supplement
Astronomical Journal
Publications of the Astronomical Society of the Pacific
Astronomy and Astrophysics
Astronomy and Astrophysics Supplement
Monthly Notices of the Royal Astronomical Society
Journal of Geophysical Research

Table 3: Journals covered by the STELAR database

M.E. Van Steenberg, J.E. Gass, L.E. Brotzman, A. Warnock, D. Kovalsky and F. Giovane, October 1992, *Amer. Astron. Soc. Newsletter* **62**, insert p11.

M.E. Van Steenberg, Fall 1992, *NSSDC News*, **8**, number 3, p14.

A. Warnock, M.E. Van Steenberg, L.E. Brotzman, J.E. Gass, D. Kovalsky and F. Giovane, 1993, in *Astronomical Data Analysis Software and Systems II*, eds. R.J. Hanisch, R.J.V. Brissenden and J. Barnes, Astronomical Society of the Pacific Conference Series, **52**, pp137-141.

6 Lunar and Planetary Bibliography

The NASA Lunar and Planetary Institute (LPI), Houston provides a bibliographic database for lunar and planetary studies. It is accessed as part of the information services offered by the LPI (see Section 16). After logging on, simply select the appropriate option from the menu. The database is searched using simple menu-driven software; just follow the instructions. Public access to the database is allowed, so anyone can browse through it. However, you must register if you want to save the results of your searches as files on the LPI computers (for example, so that you can retrieve copies to your local machine). Instructions for registration are included in the menus.

7 SISSA Preprint Archive

The International School of Advanced Studies (SISSA/ISAS), Trieste[2] operates an electronic archive of preprints of astronomical papers. In many ways this archive is intended as a replacement for the traditional system whereby preprints of papers are exchanged between astronomical institutions, but without the associated costs and delays. The system operates as follows: authors submit an electronic copy of their preprint to the archive. The preprint then becomes publicly available, so that anyone may examine it, and if they so desire, retrieve a copy. The system operates completely automatically.

The archive is intended to cover the entire field of astronomy, astrophysics and cosmology. It was established in April 1992 and by August 1993 contained some 245 preprints, with a further

[2] The full postal address is: Scuola Internazionale Superiore di Studi Avanzati (International School for Advanced Studies), Via Beirut, 2-4 – 34014, Trieste, Italy.

135 cross-references to preprints in other archives maintained by SISSA (see below). Preprints are added at a rate of about thirty five per month. The preprints cover a wide variety of astronomical topics, but with cosmology predominating. By April 1993 about 1200 users had accessed the archive.

Preprints are stored as either simple text files, or Latex or Tex source files. In some cases the diagrams associated with a preprint may not be included.

The archive can be accessed in two ways: by standardized commands submitted using e-mail and by anonymous ftp. The former is the preferred method of using the archive. In this mode you issue mail messages with standard commands in the 'subject' field (the text of the messages should be blank) and send them to the archive. It replies, also by e-mail, with the requested abstracts, preprints or information. Some of the facilities available include:

- getting information on the preprints available,
- retrieving selected abstracts and preprints,
- 'subscribing' to the archive, so that you will receive automatically details (including title, authors and abstract) of new preprints as they are added to the archive (reluctantly I must admit that I have not tried this facility because I do not fancy being bombarded with e-mail messages containing abstracts of papers on cosmology),
- contributing your own preprint.

Full details of using the system can be obtained by sending an e-mail message with the single word `help` in the subject field and no text in the main body to address astro-ph@babbage.sissa.it (INTERNET). Preprints in the archive are arranged by the month in which they were entered, and a list of the months for which preprints are available may be obtained by sending a message with the single word `listing` in the subject field, and again no text in the main body to the same address. There do not appear to be any facilities to search the entire archive for preprints by a given author or on a given topic.

The details of accessing the system via anonymous ftp (see Section 22) are as follows:

INTERNET address: babbage.sissa.it or 147.122.1.21
Username: `anonymous`
Password: Type your username and e-mail address

Once you are connected, the relevant directories are `listings` which contains abstracts and `papers` which contains the full text of the preprints. Each preprint is kept in its own subdirectory, the name of the subdirectory being the internal number assigned to it by the archive.

In addition to the astronomy, astrophysics and cosmology archive, SISSA maintains several other archives which are relevant to various branches of physics. These archives operate in exactly the same way as the astronomy one, but have a different e-mail address. They are listed, together with their addresses, in Table 4.

8 Other Preprint Archives and Lists

In addition to the SISSA archive, preprint collections are maintained at the Los Alamos National Laboratory and the European Centre for Nuclear Research. Both of these collections cover many

Subject	Electronic mail address
astronomy, astrophysics and cosmology	**astro-ph@babbage.sissa.it**
condensed matter	cond-mat@babbage.sissa.it
functional analysis	funct-an@babbage.sissa.it
general relativity and quantum cosmology	gr-qc@babbage.sissa.it
phenomenological high energy physics	hep-ph@babbage.sissa.it
formal high energy physics	hep-th@babbage.sissa.it
nuclear physics theory	nucl-th@babbage.sissa.it
database of e-mail addresses	e-mail@babbage.sissa.it

Table 4: Preprint archives available at SISSA

branches of physics, rather than being specifically astronomical. They may, however, contain some preprints of interest to astronomers. Also the Space Telescope Science Institute and the National Radio Astronomy Observatory maintain on-line lists of their preprint collections.

The article by G. Taubes (see Section 8.1, below) serves as a general introduction to preprint archives as well as a description of the Los Alamos archive.

8.1 LANL

The preprint archive at the Los Alamos National Laboratory (LANL), New Mexico may be queried either remotely using standardized mail messages or via anonymous ftp. To obtain further information on the archive send a blank e-mail message with `HELP` in the subject field to address hepth@xxx.lanl.gov (INTERNET).

The details of accessing the system via anonymous ftp (see Section 22) are as follows:

INTERNET address: xxx.lanl.gov or 128.165.23.9
Username: `anonymous`
Password: Type your username and e-mail address

Reference:

G. Taubes, 26 February 1993, *Science*, **259**, pp1246-1248.

8.2 CERN

The preprint archive at the European Centre for Nuclear Research (CERN), Geneva includes all preprints produced at CERN, a copy of the LANL archive and various other documents. It is accessed via anonymous ftp (see Section 22), the details being as follows.

INTERNET address: asis01.cern.ch or 128.141.201.136
Username: `anonymous`
Password: Type your username and e-mail address

Once you are connected, type `cd preprints` to select the directory containing the preprints. This directory is divided into a large number of subdirectories, one per institution (or group of institutions) which have submitted preprints.

8.3 STScI

The Space Telescope Science Institute (STScI), Baltimore maintains an on-line list of its preprint collection. The collection includes: all refereed papers published using Hubble Space Telescope (HST) observations, papers written at the STScI and preprints received from external institutions. It covers a wide range of astronomical topics. The list contains only bibliographic details, not the full text of the preprint, nor an abstract. When a preprint in the list is published its full bibliographic details are added. The list contains about 5000 entries and is updated fortnightly.

The list can be queried with WAIS (see Section 25), though first you should obtain a copy of the source file `stsci-preprint-db.src`. A copy of this file can be obtained from the European Space Telescope Coordinating Facility (again see Section 25, especially Table 17).

8.4 NRAO

The National Radio Astronomy Observatory (NRAO), Charlottesville, Virginia maintains an on-line list of its preprint collection. The collection includes papers written at the NRAO and preprints received from external institutions. It covers a wide range of astronomical topics. The list contains only bibliographic details, not the full text of the preprint, nor an abstract. When a preprint in the list is published its full bibliographic details are added. The list covers the period from October 1986 to the present and on the 1st May 1993 contained about 13,000 entries. It is updated once per week.

The list can be queried with WAIS (see Section 25), though first you should obtain a copy of the source file `nrao-raps.src`. A copy of this file can be obtained from the European Space Telescope Coordinating Facility (again see Section 25, especially Table 17).

9 Journal Tables of Contents

Tables of contents for recent issues of journals can be displayed using either BIDS ISI or BIDS Inside Information (see Sections 3.1 and 3.2). Two alternative systems are available, which, unlike BIDS, can be accessed from outside the United Kingdom.

9.1 CfA

The Harvard-Smithsonian Center for Astrophysics (CfA), Cambridge, Massachusetts maintains tables of contents for the following journals: *Astrophysical Journal, Astrophysical Journal Supplement, Astronomical Journal* and *Publications of the Astronomical Society of the Pacific*. The period covered is from January 1988 to the present.

The details of accessing the system are as follows:

INTERNET address: cfa$n$.harvard.edu (where $n = 3, 4, 5, 7$ or 8)
Username: `APJAJ`
Password: No password required; captive account

In order to access this system, you should log on to a local Starlink Unix system and type, for example:

```
telnet cfa3.harvard.edu
```

Reply `APJAJ` in response to the 'Username:' prompt; no password is required. You will be logged into a captive account and some introductory information will be displayed. Thereafter simply follow the instructions.

9.2 STScI

The Space Telescope Science Institute (STScI), Baltimore maintains a table of contents for the *Publications of the Astronomical Society of the Pacific* (PASP). Abstracts for the individual papers are also available. This system is new and coverage only extends from January 1993 to the present.

The system is accessed via anonymous ftp (see Section 22). The details are as follows:

INTERNET address: stsci.edu or 130.167.1.2
Username: `anonymous`
Password: Type your username and e-mail address

Once you are connected to the system type `cd pasp` to select the directory containing the abstracts. The files in directory `pasp` are all text files suitable for printing. The contents and abstract for each monthly issue of the journal are kept in a separate file. These files have names of the form:

```
contents_yy_mm
```

For example, file `contents_93_02` contains details for the February 1993 issue. The remaining files contain a miscellany of useful information pertaining to PASP, for example, instructions on preparing papers for submission.

10 Choosing a Bibliographic Database

All the systems listed here have their strengths. The one which you will find most useful depends as much on your requirements and circumstances as the inherent strengths and weaknesses of the system.

The bibliography at the Lunar and Planetary Institute is the obvious choice for lunar and planetary studies.

The SISSA preprint archive is certainly worth investigating if you are interested in cosmology or related fields.

Similarly, you should try the STScI preprint list if you are interested in HST observations.

If you are looking for references pertaining to an individual, named astronomical object then you should use either SIMBAD or NED: NED for external galaxies and other extra-galactic objects and SIMBAD for everything else. Remember that NED has abstracts and SIMBAD does not.

Also you must register to use SIMBAD, and a fee is charged. Both SIMBAD and NED include a dictionary of synonyms for astronomical object designations. Most astronomical objects have several different designations[3], any of which can appear in article titles and abstracts. A dictionary of synonyms allows data and references to an object to be identified, irrespective of which of its designations the user supplied. This facility is very useful when searching for named objects. BIDS ISI is particularly unsuitable for searching for named astronomical objects because a feature in the BIDS ISI search software prevents numbers being included in the search strings. This restriction precludes searches for most astronomical object designations.

If you are searching for some specific topic rather than an object designation then the choice is probably between BIDS ISI (if you have access to it) and one of the systems derived from the NASA RECON system. I suspect that BIDS ISI offers a wider range of journals and more complete coverage of those journals, but it does not have abstracts, which the RECON based systems do. Thus, use one of the RECON based systems if abstracts are important to you and BIDS ISI if they are not. Which of the three RECON based systems (ADS, ESIS, STELAR) you would choose depends on which you can get access to most conveniently. There seems little to choose, in terms of journal coverage, between the ADS and ESIS systems. You would probably only use STELAR if you could not get adequate access to either ADS or ESIS and were prepared to accept the limited number of journals covered by STELAR.

Both the NRAO and STScI preprint lists are sufficiently extensive to offer a reasonable alternative to BIDS ISI, and they have the advantage that, unlike BIDS ISI, they are accessible outside the United Kingdom.

Finally, it is worth remembering that the printed *Astronomy and Astrophysics Abstracts* offer extremely comprehensive coverage; none of the on-line systems are as exhaustive.

[3] For example, some of the alternative designations for Aldebaran are:

α Tau,	(Bayer Letter),
87 Tau,	(Flamsteed number),
BS 1457	(Yale Bright Star catalogue),
HR 1457	(Revised Harvard Photometry),
BD +16° 629	(Bonner Durchmusterung),
HD 29139	(Henry Draper catalogue),
SAO 094027	(Smithsonian Astrophysical Observatory catalogue).

Part II

Information Services

11 Overview

This section lists a miscellany of astronomical information services other than bibliographic databases and observation archives. The distinction between the various sorts of facility is not always clear. For example, STEIS (see Section 15) can be used to access both the HST data archive (see SUN/162) and the STScI preprint collection (see Section 8.3). Most of the systems listed are specifically astronomical. However, the final few items are more general, but nonetheless potentially useful.

The list of services discussed here is by no means complete. A number of additional facilities can be accessed via STEIS (see Section 15). Some of these services are listed in Tables 5 to 9. Section 15 includes details of how to access them.

12 IAU Circulars

Astronomy is an observational science. Often events occur which require the rapid dissemination of information in order to facilitate further observations of new or transient phenomena. Examples include unexpected behaviour in variable stars, or newly discovered novae, supernovae, comets or asteroids. There is a well-established system of International Astronomical Union (IAU) Circulars and Minor Planet Circulars which distribute such information to subscribing observatories and institutions. This system, which predates electronic computers, distributes the Circulars on paper. It is run by the Central Bureau for Astronomical Telegrams and Minor Planet Center, Smithsonian Astrophysical Observatory, Cambridge, Massachusetts 02138 in the United States.

It is now possible to receive the IAU Circulars and material from the Minor Planet Circulars as e-mail messages. In order to receive these e-mail copies it is necessary to subscribe to the printed circulars and a modest additional charge is made. Also there are restrictions on re-distributing the electronic version of the circulars outside your institution. Typically several circulars are issued per week.

For further information contact B.G. Marsden, the Director of the Bureau for Astronomical Telegrams or D.W.E. Green, the Associate Director. Their e-mail addresses are marsden@cfa.harvard.edu and green@cfa.harvard.edu respectively (INTERNET).

13 Solar and Auroral Activity

Reports of solar and auroral activity can be obtained from the University of Lethbridge, Alberta. You should access this service from a Starlink Unix system. Brief details of the information available and how to access it are as follows.

- A solar and geophysical activity report, updated at three-hourly intervals. To access it type:

  `finger solar@xi.uleth.ca` or `finger solar@142.66.3.29`

- A solar and geophysical activity report, updated daily. To access it type:

  `finger daily@xi.uleth.ca` or `finger daily@142.66.3.29`

- A report including predictions of auroral activity, sightings of auroras, aurora watches etc. This information is updated hourly. To access it type:

  `finger aurora@xi.uleth.ca` or `finger aurora@142.66.3.29`

Note that these reports are accessed using the Unix command `finger`. No username or password is required. The reports can be quite lengthy and are probably best retrieved into a text file. However, unfortunately, the `finger` command when used across INTERNET inserts an unprintable character at the end of each line, which makes the resulting file unsuitable for display. A Unix magic incantation to remove this character prior to writing to the file is, for example:

```
finger aurora@xi.uleth.ca | sed '1,$s/.$/ /' > aurora.lis
```

This example writes the auroral activity report to file `aurora.lis`.

A database of solar and auroral activity is also maintained at the University of Lethbridge, and can be accessed by anonymous ftp (see Section 22). The details are as follows:

INTERNET address: xi.uleth.ca or 142.66.3.29
Username: `anonymous`
Password: Type your username and e-mail address

Once you are connected, the relevant directory is `/pub/solar`. File `00-index.txt` in this directory contains an index of the database contents. A particularly useful file is `/pub/solar/Docs/glossary.doc` which gives a glossary of technical terms used in the reports.

Further information and assistance can be obtained from Cary Oler, e-mail Oler@rho.uleth.ca (INTERNET).

14 Finding Usernames and Electronic Mail Addresses

Several facilities are available to assist you to find the username and e-mail address of a colleague whose name and institution you already know. Some of these facilities are summarized below.

14.1 Lists of Starlink Users

All Starlink computers contain files holding lists of Starlink users. The details differ between VAX/VMS and Unix systems.

14.1.1 VAX/VMS

On Starlink VAX/VMS systems lists of users and related information are kept in the following files:

`LADMINDIR:USERNAMES.LIS` lists local Starlink users at your node,

`ADMINDIR:USERNAMES.LIS` lists all Starlink users at all nodes,

`ADMINDIR:UNIXNAMES.LIS` lists Starlink Unix users and gives codes for their locations,

`ADMINDIR:LOCATIONS.LIS` explains the codes used to describe the locations of Starlink users.

All these lists are updated regularly. The local `USERNAMES.LIS` is more likely to be up to date than the Starlink-wide version, though the latter is probably more self-consistent. All the files are simple text files, and can be searched using standard operating system commands, for example:

```
SEARCH  ADMINDIR:USERNAMES.LIS  Davenhall
```

14.1.2 Unix

On Starlink Unix systems lists of users and their addresses are maintained in file `/star/admin/unixnames`. It is a simple text file, and can be searched using standard operating system commands, such as `grep`.

14.2 International List of Astronomical Electronic Mail Addresses

Chris Benn and Ralph Martin of the Royal Greenwich Observatory, Cambridge have compiled a comprehensive list of the e-mail addresses of astronomers throughout the world. This list is distributed widely and is available at most (but not all) Starlink sites. Your site manager should be able to advise whether it is available at your site.

The utility `email` is provided on Starlink VAX/VMS systems to search these files for a given user. This facility is not available on Starlink Unix systems. If the lists are available at your site, simply type, for example:

```
email  Davenhall
```

Normally you will not need to know the names and locations of the files holding these lists, but for completeness they are usually:

`LDOCSDIR:ASTROPERSONS.LIS` which gives, for each person listed, their username, e-mail address and a code for their institution.

`LDOCSDIR:ASTROPLACES.LIS` which gives, for each astronomical institution listed, its e-mail address, and telephone and fax numbers.

`LDOCSDIR:ASTROPOSTAL.LIS` which gives, for each astronomical institution listed, its full postal address.

In all cases the files are simple text files, so you can, if you so desire, search them with standard operating system commands, edit them in read-only mode etc. Note, however, that the details of a given institution occupy several lines of `ASTROPLACES.LIS` and `ASTROPOSTAL.LIS`.

In addition to the Starlink versions, these lists are distributed widely, so you may be able to access them, even if you are not a Starlink user. Versions can be accessed through the ADS and ESIS. A copy of the list is also available through STEIS (see Section 15). The procedure to access this version is as follows.

1. Connect to STEIS using gopher (see Section 15.1; the following description assumes you are using an X-terminal gopher client).
2. Choose menu `STEIS search tools` and then menu `Search Astronomer EMail Address (STScI version)`.
3. A window will appear containing a box labelled `Search of:`. Enter the surname of the person you are looking for in this box, and hit return.
4. After a few moments a window will appear with a box containing the words `Matches for` *the-surname-you-entered*. Double-click on this text and information about the person will be displayed.
5. When you have finished click on the boxes marked either 'done' or 'previous directory' to retrace your steps through the menus.

The lists are updated annually and any comments or additional information are gratefully received. They should be sent by e-mail to email@ast-star.cam.uk (JANET and INTERNET).

Documentation:

A description of the lists is available in *Electronic Mail* by C.R. Benn and R. Martin, 1993. If the lists are installed on your node this document will be held as file
`LDOCSDIR:ASTROGUIDE.TEX`. It is a Tex source file.

A number of other directories of astronomers and astronomical institutions are also available. They are reviewed by A. Heck (1991, in *Databases and On-Line Data in Astronomy*, eds. D. Egret and M. Albrecht, Dordrecht: Kluwer, pp211-224).

14.3 Non-Astronomical Users

A number of more general services for finding the e-mail addresses for users outside the astronomical community are available. These services, often called 'white pages' (in an analogy to a telephone directory), are beyond the scope of this document, but are described in *The Whole Internet User's Guide and Catalog*, especially Chapter Ten (see Section 28).

One simple but useful facility is the Unix command `finger`. Usually this command can be used in the common case where you want to find out the username of a colleague, but you already know (or can find out) the INTERNET address of a computer running Unix which he uses.

Beware however, that some systems will refuse remote `finger` requests. ¿From a Starlink Unix system simply type:

`finger` *surname*`@`*host*

for example `Davenhall@star.le.ac.uk`. If an INTERNET connection to the given address can be established, some information about the user, including their username, will be displayed. The same technique can be used in the less common case where you know a username and want to find the corresponding actual name of its owner. Here you would type, for example:

```
finger  acd@star.le.ac.uk
```

and the same information would be displayed.

A given name may also be substituted for either the surname or username, but there are a couple of reasons why this approach is usually less satisfactory. Firstly, a given name is less likely to be unique (in the case of ambiguity all the matches are displayed) and more importantly there is no way to predict whether the system will know someone by their proper given name or some contraction or nickname based on it (Dave for David etc). Usually it is better to use the surname.

If you want to find out about a user on your local machine simply omit the INTERNET address. For example:

`finger Davenhall` or `finger acd`

15 STEIS

The Space Telescope Electronic Information System (STEIS) is maintained by the Space Telescope Science Institute (STScI), Baltimore. It provides a variety of information about the Hubble Space Telescope (HST) and the STScI. It also allows convenient access to a number of other astronomical information services. Some of the facilities available include:

- copies of HST documents, such as proposal instructions, instrument handbooks, a manual for the data archive and cookbooks. Both PostScript and simple text file versions are available,
- some of the HST operational files, including: the satellite status, the weekly summary and the time line. If you have been awarded HST observing time you can search these files to check on the progress of your observations,
- access to the HST data archive (see SUN/162),
- a version of the Royal Greenwich Observatory's worldwide list of astronomer's e-mail addresses (see Section 14.2),
- the STScI preprint list (see Section 8.3),
- remote access to the STELAR bibliographic database (see Section 5),

- access to a large number of other astronomical information services which are available on the INTERNET.

The preferred method to access STEIS is to use gopher. However, it can also be accessed using the World Wide Web, anonymous ftp and remotely using a listserver. Details of all four of these methods are given below. Further information and assistance can be obtained by sending an e-mail message to usb@stsci.edu (INTERNET).

STEIS provides convenient access to a large number of other astronomical information services. The services available (in November 1993) are listed in Tables 5 to 9. You should note: the number of services available is increasing, some of the services are not always available, and some of them do not seem to have been set up very well: *caveat emptor*. Most of these services can be accessed through STEIS using gopher and they can all be accessed through STEIS using the Web. Details are included in the appropriate section, below.

Astronomical Institute, Utrecht University
Astrophysics Data System (ADS)
Cagliari Astronomical Observatory
Canadian Astronomy Data Centre
Center for EUV Astrophysics EUVE Guest Observer Center
Centre de Données astronomiques de Strasbourg (CDS)
European Space Information System
Institute of Astronomy and Royal Greenwich Observatory, Cambridge
Mount Stromlo and Siding Spring Observatories
NASA / Goddard Space Flight Center
NASA / Langley Research Center
NASA / Scientific and Technical Information Project
NASA / Space Science Data Operations Office
NASA / STELAR Project STELAR
National Center for Atmospheric Research NCAR
National Optical Astronomy Observatories NOAO
National Radio Astronomy Observatory NRAO
National Solar Observatory
Planetary Data System, NASA JPL
Princeton University Observatory
Sloan Digital Sky Survey (Fermilab)
Space Astrophysics Laboratory, Ontario
Space Index
STECF Space Telescope European Coordinating Facility
STScI Space Telescope Science Institute
University of Massachusetts at Amherst Department of Astronomy
University of Southampton, Astronomy Group
UUNA Astronomy Listings

Table 5: World Wide Web resources available through STEIS

Australian National Telescope Facility
Canadian Astronomy Data Center
Center for EUV Astrophysics EUVE Guest Observer Center
Chilean Weather Forecast
Goddard Space Flight Center (NSSDC)
Harvard-Smithsonian Center for Astrophysics Theory Group
High Energy Astrophysics Science Archive Research Center
Institute of Astronomy and Royal Greenwich Observatory, Cambridge
Johnson Space Center, NASA
National Center for Atmospheric Research
NASA Network Application and Information Center (NAIC)
National Optical Astronomy Observatories
LANL Physics Information Service
Physics Resources (Experimental)
UCO/Lick Gopher Information Service

Table 6: Gopher resources available through STEIS

AAS Job Register
AAS Meeting Abstracts
AAS Summer 92 Meeting
AAS Summer 93 Meeting
AAS Winter 93 Meeting
Astronomy Site Addresses
Astronomy Person Addresses
Astronomy Postal Addresses
EROS Data Center
NASA Directory of WAIS Servers (STELAR)
NASA Missions
NSSDC CD-ROM
SPACEWARN
STELAR Voyager Images (experimental)
STScI Searchtools

Table 7: WAIS resources available through STEIS

AXAF Science Center
Compton/GRO Guest Observer Facility - GOF
Compton/GRO News - GRONEWS
DIRA2, Bologna
Einstein On-Line Service - Einline
ESA Data Dissemination Network
ESIS - Astronomy
ESIS - Space Physics
ESO Bulletin Board
ESOSAT Database - ESTEC
HST Archive
IPAC IRSKY Remote Access Tool
IPAC XCATSCAN Catalog Scanning Tool
IRAS Low Resolution Spectra
IUE VILSPA Archive
JCMT Data Archive
La Palma Data Archive
Lunar and Planetary Institute
Lyon-Meudon Extragalactic Database (LEDA)
NASA/IPAC Extragalactic Database - NED
National Oceanic and Atmospheric Admin. Database
NSI On-Line Network Aide - NONA
Planetary Data Systems (JPL)
SIMBAD
StarWays - European Space Information System - ESIS
STECF STARCAT
STECF STINFO
UK and ESO Schmidt, AAT Plate Catalogs
VLA Information System

Table 8: `Telnet` resources available through STEIS

American Astronomical Society
Anglo-Australian Observatory
Arecibo Observatory
Big Bear Solar Observatory
Canada France Hawaii Telescope
Centre de Données astronomiques de Strasbourg (CDS)
Cerro Tololo Inter-American Observatory
Compton/GRO FTP Directories
Dominion Astrophysical Observatory
ESIS ftp Tree
ESIS User Guide
European Southern Observatory
EUVE Guest Observer Center
High Altitude Observatory
Infrared Processing and Analysis Center (IPAC)
JPL Public Access
Joint Astronomy Centre (UKIRT and JCMT)
Kitt Peak National Observatory
Lowell Observatory
Lunar and Planetary Institute
Meetings List (CFHT)
NASA Research Announcements
National Radio Astronomy Observatory
Parkes Radio Observatory
sci.astro.hubble Archive
SIMBAD
Smithsonian Astrophysical Observatory (SAO)
Solar, Auroral, Ionospheric, Information
Steward Observatory
ST-ECF Archives
VLA Sky Survey
Wilcox Solar Observatory (Stanford Univ.)
WIYN - KPNO

Table 9: ftp resources available through STEIS

15.1 STEIS via Gopher

The preferred method of accessing STEIS is gopher (see Section 24). If you access gopher from a local client the details will be specific to your site; your site manager should be able to advise. If you are using an X interface then first you must redirect X output to your terminal. The details will vary, but your site manager should be able to advise. Then type perhaps:

```
xgopher stsci.edu 70
```

If you are accessing gopher on a remote client you should log on to it and then find the STEIS server by working through something like the following menu items (the details may vary between clients):

```
Other Gopher and Information Servers
USA
General
Space Telescope Electronic Information System
```

To access other astronomical information services, choose STEIS menu `Astronomical Internet Resources` and then the service you require.

15.2 STEIS via the Web

Details of accessing STEIS through the Web (see Section 26) are as follows. The URL of the STEIS Astronomical Information Resources home page is:

```
http://stsci.edu/net-resources.html
```

(note that the last character is the letter 'l', not the digit '1'). To navigate to STEIS from the public Web client at CERN, use the following list of links:

`The Virtual Library`
`Astronomy and Astrophysics`
`See also Space` (the last link in the list)
`Space Telescope Science Institute electronic information service`

A similar route should be possible from most Web clients.

To access other astronomical information services, choose either link `Astronomical Internet Resources` or `STEIS WWW Top Level` and then the service you require.

15.3 STEIS via Anonymous ftp

The details of accessing STEIS using anonymous ftp (see Section 22) are as follows:

INTERNET address: stsci.edu or 130.167.1.2
Username: `anonymous`
Password: Type your username and e-mail address

15.4 STEIS Listserver

STEIS provides a 'listserver' to which you may subscribe. Once you have subscribed it will automatically mail you a copy of some frequently used files whenever they are updated. The files available (in November 1993) are listed in Table 10.

Description	Filename
Lists observations for the coming year	`long-range-plane`
Detailed weekly schedule of observations	`timeline`
Daily activity/instrument status reports	`hst-status`
List of all observations completed to date	`completed-observations`
Point spread functions for the WFPC †	`wfpc-psf-library`
Delta flat field information for the WFPC †	`wfpc-delta-flats`
Information about the Faint Object Camera (FOC)	`foc-news`

†Wide Field and Planetary Camera

Table 10: Files available from the STEIS listserver

You may choose which of the files you receive. To use the system you send e-mail messages to username listserv@stsci.edu (INTERNET). The subject field should be blank and the text should comprise standardized messages as follows.

- To subscribe to a file the message text should be:

  `subscribe` *filename* *your-name*

  where *filename* is one of the filenames listed in Table 10 and *your-name* is your full name.

- To 'unsubscribe' to file *filename:*

  `unsubscribe` *filename*

- For a summary of the commands available: `HELP`

16 Lunar and Planetary Institute

The NASA Lunar and Planetary Institute (LPI), Houston provides a number of services relating to lunar and planetary studies. These services include:

- a bibliographic database (see Section 6),
- the Image Retrieval and Processing System (IRPS),
- information and abstracts for meetings,
- the electronic journal *Lunar and Planetary Information Bulletin.*

The primary means of accessing the system is `telnet` and you need a VT100 compatible terminal. The details are as follows:

INTERNET address: lpi.jsc.nasa.gov or 146.154.14.11
Username: `LPI`
Password: No password required; captive account

Log on to a local Starlink Unix system and type either:

`telnet lpi.jsc.nasa.gov` or `telnet 146.154.14.11`

In response to the 'Username:' prompt reply `LPI`; no password is required. Once logged on you will enter a simple menu system. Use the arrow keys to navigate the options and hit return to select an option.

Some of the LPI services can also be accessed using anonymous ftp (see Section 22). The details are as follows:

INTERNET address: lpi.jsc.nasa.gov or 146.154.14.11
Username: `anonymous`
Password: Type your username and e-mail address

Note that the LPI computers are VAXes running the VMS operating system, and hence when specifying directories within ftp you should use the VAX/VMS notation. Various data are available. For example, directory `[ANONYMOUS.AMLAMP]` contains a database of meteorite falls in Antarctica. Retrieve files `README.1ST` and `README.2ND` from this directory for details of this database.

17 JCMT

Two information services are available for the millimetre-wave James Clerk Maxwell Telescope (JCMT) in Hawaii: JCMT_FILESERV and JCMT_INFORM.

17.1 JCMT_FILESERV

JCMT_FILESERV is a file distribution service provided by the Joint Astronomy Centre (JAC), Hawaii. You interrogate this service by e-mail and it responds with e-mail messages containing the requested information. Information in the service is divided into a number of 'packages', and each package comprises one or more files. The name of an individual file comprises the package name and a 'part name', in the form `package.part`. Table 11 lists the packages available (in November 1993).

You use the system by sending e-mail messages to username JCMT_INFO@jach.hawaii.edu (INTERNET). The subject field should be blank and the text should comprise standardized messages as follows.

- To list all the packages available: `LIST`
- To retrieve all the parts of package *package:*

  `SENDME` *package*

Description	Package
Information pertinent to requests for JCMT time	APPLICATIONS
General information for visitors	HAWAII
Job opportunities	JOBS
Monthly JAC news	NEWS
Technical/administrative articles from Newsletter	NEWSLETTER
Basic information on planet fluxes etc.	PLANETS
Information to allow planning observing runs	PLANNING
Source position information for pointing etc.	POINTING
Notes on UKT14 polarimeter	POLARIMETER
Information on JCMT 'front ends'	RECEIVERS
JCMT/HP bookings form	RESERVATIONS
SCUBA progress news items	SCUBA
JCMT schedule access	SCHEDULE
Information on the service observing programs	SERVICE
Notes and information on JCMT spectrometers	SPECTROMETER
JCMT usage statistics	STATISTICS
Information on UKT14 (a photometer)	UKT14
User Guide (incomplete)	USERGUIDE

Table 11: JCMT_FILESERV packages

- To retrieve part *part* of package *package:*

  `SENDME` *package.part*

- For further information: `HELP`

Several commands may be included in a single message, but each must occupy its own line.

Further information and assistance may be obtained by sending an e-mail message to JCMT_INFO-Mgr@jach.hawaii.edu (INTERNET). Queries about the JCMT receivers may be sent to Henry Matthews, e-mail: HEM@jach.hawaii.edu (INTERNET).

17.2 JCMT_INFORM

JCMT_INFORM is a captive account on the Starlink VAX cluster at the Royal Observatory Edinburgh (ROE). The details of accessing it are:

INTERNET address: star.roe.ac.uk or 192.108.120.10
Username: `JCMTINFORM`
Password: No password required; captive account

Log on to a local Starlink Unix system and type either:

`telnet star.roe.ac.uk` or `telnet 192.108.120.10`

In response to the 'Username:' prompt reply `JCMTINFORM`; no password is required. The facilities available include:

- recent articles from the JCMT newsletter,
- several useful utility programs,
- a version of the current JCMT observing schedule,
- access to the JCMT data archive (see SUN/162). Note that access to the archive is under the menu for the utility programs.

Further information may be obtained from Graeme Watt, e-mail: GDW@star.roe.ac.uk (INTERNET).

18 NISS

National Information Services and Systems (NISS) is an extensive information system available at the University of Bath. It provides access to a large number of information services and databases, including a number of bibliographic databases. None of this information is specifically astronomical, but nonetheless much of it is potentially of interest.

NISS is accessed via the United Kingdom JANET academic network and via INTERNET. It can be accessed from sites outside the United Kingdom. The details are as follows:

INTERNET address: niss.ac.uk or 193.63.76.2
Username: No username required; captive account
Password: No password required; captive account

¿From a Starlink Unix system you would type:

`telnet niss.ac.uk` or `telnet 193.63.76.2`

No username or password is required and you will be presented with a simple menu. The main items on this menu correspond to the various services offered by NISS. They are listed in Table 12 and a brief explanation for each is given below.

The NISS Bulletin Board (NISSBB)
The NISS Public Access Collections (NISSPAC)
The NISS Wide Area Information Server (NISSWAIS)
NISS Newspapers and Journals Services

Library Catalogues (OPACs)
Campus Information Systems
Bibliographic Services (for example, Melvyl, CARL, STN, BUBL)
Directory Services (for example, Yellow Pages, Paradise, WAIS)
Archive Services (for example, HENSA, Mailbase, BIRON)
General Services (for example, Guest-Telnet, ASK, CONCISE)

Table 12: NISS services

The NISS Bulletin Board (NISSBB) is intended to facilitate the exchange of information within the United Kingdom Higher Education Community. Amongst the topics covered are: the use of computers in education, training and seminars and jobs.

The NISS Public Access Collections (NISSPAC) provides on-line catalogues of software and datasets held at United Kingdom Higher Education Institutions. Currently three such catalogues are available:

- the NISS Software and Datasets Catalogue,
- the VAX/VMS Applications Software Directory,
- the CHEST (Combined Higher Education Software Team) Directory; a list of commercial software packages for which academic discounts are available.

The NISS Wide Area Information Server (NISSWAIS) is an alternative method of searching the NISS collections using WAIS (see Section 25).

NISS Newspapers and Journals Services provides on-line access to back-issues of newspapers and journals. Currently only *The Times* newspaper is available. The text for the current edition is not available. Since mid-April 1993 editions have been added at about 11:00pm on the day after publication. Editions of the *The Sunday Times* are added on the Wednesday following publication. This service is available under an agreement between CHEST and the American Cybercasting Corporation (ACC).

Library Catalogues (OPACs) provides access to On-line Public Access Catalogues (OPACs) at educational establishments. Catalogues are available for a substantial number of United Kingdom Higher Education Institutions.

Campus Information Systems provides access to Campus Wide Information Systems (CWISs) at educational establishments. Catalogues are available for a significant number of United Kingdom Higher Education Institutions.

Bibliographic Services provides access to a number of bibliographic databases, covering, for example, medical and chemical subjects (Data-Star), library holdings (OCLC, Melvyl), and mathematics communications and publishing (**e-MATH**). You have to register to use some of these databases. Instructions for registration are included in the on-line help information.

Directory Services provides access to a number of directory services, including information about the European Economic Community (ECHO), worldwide information on computing organizations (PARADISE X.500) and distance teaching and education information (ICDL). There is also access to Archie (see Section 23) and WAIS (see Section 25). However, WAIS is accessed using the `swais` client which is difficult and unfriendly to use.

Archive Services provides access to a number of archives, including PC and Unix software archives (HENSA and UKUUG respectively) and the information exchange service MailBase.

General Services provides access to a miscellany of services, including the on-line information service for German Universities (ASK), the e-mail and computer conferencing service EuroKOM and news about the JANET network.

Inquiries about NISS services should be sent to the appropriate e-mail address in Table 13.

General queries	niss@niss.ac.uk
NISSBB	nissbb@niss.ac.uk
NISSPAC	nisspac@niss.ac.uk
NISS Gateway	gateway@niss.ac.uk
NISSWAIS	nisswais@niss.ac.uk

Table 13: E-mail addresses for inquiries about NISS services

19 General Summaries of INTERNET facilities

A large number of services providing a great deal of diverse information can be accessed via the INTERNET. Most of this information is non-astronomical, though much of it is potentially useful. Even a summary of the services available is beyond the scope of this document. However, various summaries are available. Some useful and readily available ones are listed below. The December and Yanoff lists are updated frequently and distributed widely. Copies can be obtained from a number of sources. However, the sources given are maintained by the authors, and thus by using them you will retrieve the most recent version of the lists.

The Whole Internet User's Guide and Catalog (see Section 28). The final part of this book is an extensive catalogue of INTERNET information services.

The December List This list is compiled by John December (e-mail: decemj@rpi.edu, INTERNET). It provides an extensive set of references and other pointers to sources of information about the INTERNET, computer networks in general and computer-mediated communication. A copy may be retrieved by anonymous ftp (see Section 22). The details are as follows:

INTERNET address: ftp.rpi.edu or 128.113.1.5
Username: `anonymous`
Password: Type your username and e-mail address

The list is held in file `pub/communications/internet-cmc`.
File `pub/communications/internet-cmc.readme` may also be of interest.

The Yanoff List This list is compiled by Scott Yanoff (e-mail: yanoff@csd4.csd.uwm.edu, INTERNET). It comprises an extensive list of on-line information services, arranged by subject. There are several ways to retrieve this list, though perhaps the most convenient is anonymous ftp (see Section 22). The details are as follows:

INTERNET address: csd4.csd.uwm.edu or 129.89.7.4
Username: `anonymous`
Password: Type your username and e-mail address

The list is held in file `pub/inet.services.txt`. For details of other ways of retrieving the list type:

```
finger  yanoff@csd4.csd.uwm.edu
```

Internet Resources Guide The United States National Science Foundation (NSF) has compiled an extensive *Internet Resources Guide*. This document is currently available by anonymous ftp (see Section 22). The details are:

INTERNET address: ds.internic.net or 198.49.45.10
Username: `anonymous`
Password: Type your username and e-mail address

The *Guide* is held as file `/resource-guide/resource-guide.ps.tar.Z`. It is a PostScript file which has been compressed and entered into a tar archive. See Chapter Six of *The Whole Internet User's Guide and Catalog* (see Section 28) for a description of how to un-compress and unpack such a file. However, before you retrieve and print out a copy you should realise that it is a weighty tome.

Files containing the individual chapters are also available, and you could retrieve these if you are only interested in a particular topic. Table 14 lists The topics covered in each chapter. These files are also kept in directory `/resource-guide`.

Topic	Chapter
Computer Centres	1
Libraries	2
Archives	3
Directories	4
Service providers	5
NIC	6
Miscellaneous	M

Table 14: Chapters of the NSF *Internet Resources Guide*

The *Internet Resource Guide* will continue to be available for some time, but there will be no further development of it. It will be replaced by an on-line system which can be searched for information on a specific topic. For further information on these developments send an e-mail message to admin@ds.internic.net (INTERNET).

20 Public Domain Software

A large amount of public domain software is available on-line across the INTERNET. The software available includes both specifically astronomical software and more general software which may be of interest to astronomers. Finding and obtaining public domain software is beyond the scope of this document, but an excellent introduction is given by E.D. Feigelson and F. Murtagh (1992, *PASP*, **104**, pp574-581).

Various public domain software archives may be accessed through the `Archive Services` menu of NISS (see Section 18). Archie (see Section 23) is useful for searching for software.

Users outside the United Kingdom might be interested to know that most of the Starlink Software Collection is publicly available, free of charge, for use by astronomers in non-commercial, non-profit making research. The items which cannot be supplied are commercial products such as the NAG numerical algorithms library. For further details contact the Starlink Software Librarian, Rutherford Appleton Laboratory, R68, Chilton, DIDCOT, Oxfordshire, OX11 0QX, United Kingdom, e-mail: star@star.rl.ac.uk (INTERNET).

Part III

INTERNET Tools

21 Overview

A number of tools are available for accessing information held on remote computers linked to your local machine by the INTERNET network. These tools range from simple simulated remote logins which allow you to examine and retrieve remote files to complex hypertext browsers which allow you to read distributed, structured documents whose components are scattered around the world. Some of the facilities described in the previous sections are accessed using these tools; for example the STELAR database (see Section 5) is queried using the tool WAIS. The tools also allow access to a plethora of other information, most of it non-astronomical. Necessarily this section presents only a very brief summary of the tools, orientated towards providing enough information to allow you to use them to access the facilities described in previous sections. More thorough discussions are given in *The Whole Internet User's Guide and Catalog* and *Intelligent Information Retrieval: The Case of Astronomy and Related Space Sciences* (see Section 28).

In order to use many of the tools you must run an appropriate 'client' program which interacts with the remote facility. You can run a client in one of two ways: either install an appropriate client on your local Starlink machine or login remotely to a machine which already has a client installed. The former option is preferable. There are perfectly adequate, public domain versions of the clients available free of charge and there is no reason not to install them on your local Starlink machine. Usually these clients are for Unix systems. Similarly, in practice, most of the remote facilities will run on Unix systems, though many different sorts of computers can be connected to the INTERNET, so occasionally you may encounter a non-Unix machine.

Clients for some or all of the tools may already be installed at your site; your site manager should be able to advise. Some of the following sections give explicit instructions for installing clients. If no such instructions are given you can use Archie (see Section 23) to find a suitable client, though in practice you will probably find one in the Unix public domain software archive maintained at Imperial College London. However, it is neither possible nor desirable for you to install clients yourself. You should consult your site manager and, if a client is not already installed, he will locate and install one on your behalf (provided, of course, that he judges that it will be compatible with the proper operation of your Starlink node). As usual for Unix there are several different versions of each client: one for X-terminals, one for dumb terminals, another which provides extra features etc. Your site manager will choose one which bests suits local conditions.

Finally, many of these tools are relatively new and are still being enhanced. You will sometimes encounter problems when using them: *caveat emptor*.

22 Anonymous ftp

Many of the facilities described in Parts I and II allow you to retrieve files from them using the so-called 'anonymous ftp' mechanism. ftp (file transfer protocol) is an INTERNET facility for copying files between computers. Normally it requires you to have a username on both the host and destination computers. Anonymous ftp is a variant which allows you to retrieve files from a remote computer without having a username on that computer. A full description of anonymous ftp is beyond the scope of this document. However, a brief summary is given below.

ftp is best used from a Starlink Unix system. Type:

`ftp` *remote-address*

where *remote-address* is the INTERNET address of the remote system which you wish to access. Either the alphabetic or numeric version of the INTERNET address may be used. For example, to connect to STEIS (see Section 15) you would type:

`ftp stsci.edu` or `ftp 130.167.1.2`

If a connection can be established successfully you will be prompted to supply a username (or login name) and password. You should respond as follows:

Login: `anonymous`
Password: Type your username and e-mail address

Most anonymous ftp sites will also accept `ftp` as the login name. By convention your username and e-mail address should be given in the form 'username@address', for example `acd@star.le.ac.uk`. You are now ready to examine and retrieve files from the remote system. Various versions of the ftp program are available, and the commands differ slightly between them. However, the following frequently used commands, some of which are similar to the corresponding Unix commands, are usually available.

`cd` *directory* – select directory *directory* as the current directory on the remote machine[4].

`dir` – list the files in the current directory.

`get` *filename* – retrieve a copy of file *filename* to your local computer. ftp should be in ASCII mode when retrieving text files and in binary mode when retrieving binary files (see commands `ascii` and `binary`). A description of compressed and archived ('tar') files is beyond the scope of this document; see Chapter Six of *The Whole Internet User's Guide and Catalog* (see Section 28). However, it is worth noting that ftp should be in binary mode when retrieving such files.

`pwd` – display the current directory.

`ascii` – switch to ASCII mode; ASCII is the default mode.

`binary` – switch to binary mode.

`help` – will often display information about the commands available.

`quit` – exits ftp.

[4]Directories are usually specified using the Unix notation. If the remote system is not running Unix you may have to use the notation appropriate to its operating system.

A useful trick for displaying the contents of a remote file on your terminal is the command:

`get` *filename* `"| more"`

Documentation:

ftp is described in Chapter Six of *The Whole Internet User's Guide and Catalog*, Chapter Six (see Section 28).

Some additional useful documents can be obtained by anonymous ftp from Dartmouth College, Hanover, New Hampshire. The details are:

INTERNET address: pilot.njin.net or 128.6.7.38
Username: `anonymous`
Password: Type your username and e-mail address

Once connected you should select directory `pub/ftp-list`. The following files may be useful.

`ftp.help` An introduction to using ftp (unfortunately you have to be at least moderately familiar with ftp to retrieve a copy).

`suggestions` A set of useful hints about setting up your own anonymous ftp site.

`ftp.list` A list of anonymous ftp sites, with a summary of the type of software available at each site. There are entries for about 900 sites. Maintenance of the list was discontinued in December 1991 because the development of systems like Archie (see Section 23) reduced the need for it.

23 Archie

Archie is a system for locating remote files. It allows you to search for files which are available by anonymous ftp throughout INTERNET, without having to know the details of the machines and directories where they are held. Using Archie it appears to be possible to search all the anonymous ftp directories as though they were a collection of directories on your local machine. Archie works as follows. There are a number of Archie servers around the world. Each server knows about the various anonymous ftp directories. It regularly interrogates these directories to determine which files they contain, and saves the result. When you run Archie you interrogate these lists of files. All the Archie servers are identical.

Archie is easier to use if you have some idea of what the file you are looking for is called. It is probably most useful (and used) for finding software.

If you access Archie from a local client the details will be specific to your site; your site manager should be able to advise. If you are using an X interface then first you must redirect X output to your terminal. The details will vary, but your site manager should be able to advise. Then type perhaps:

`xarchie` or `archie`

the former invokes a client with an X-terminal interface. If you do not have a local client you must run Archie remotely from a server. The most convenient server for Starlink users is at Imperial College London. To access it type:

```
telnet archie.doc.ic.ac.uk   or   telnet 146.169.11.3
```

Users outside the United Kingdom might find another server more convenient. Table 15 gives a list of them. Usually you will choose the one geographically closest to you. Remember that they are all equivalent.

Country	INTERNET address	INTERNET number
Australia	archie.au	139.130.4.6
Austria	archie.edvz.uni-linz.ac.at	140.78.3.8
Austria	archie.univie.ac.at	131.130.1.23
Canada	archie.uqam.ca	132.208.250.10
Finland	archie.funet.fi	128.214.6.100
Germany	archie.th-darmstadt.de	130.83.22.60
Israel	archie.ac.il	132.65.6.15
Italy	archie.unipi.it	131.114.21.10
Japan	archie.wide.ad.jp	133.4.3.6
Korea	archie.kr	128.134.1.1
Korea	archie.sogang.ac.kr	163.239.1.11
Spain	archie.rediris.es	130.206.1.2
Sweden	archie.luth.se	130.240.18.4
Switzerland	archie.switch.ch	130.59.1.40
Taiwan	archie.ncu.edu.tw	140.115.19.24
United Kingdom	**archie.doc.ic.ac.uk**	**146.169.11.3**
United States (Maryland)	archie.sura.net	128.167.254.179
United States (New England)	archie.unl.edu	129.93.1.14
United States (New Jersey)	archie.internic.net	198.48.45.10
United States (New Jersey)	archie.rutgers.edu	128.6.18.15
United States (New York)	archie.ans.net	147.225.1.10

Table 15: Archie servers

In response to the 'login:' prompt reply `archie`; no password is required. Once you are logged on, type `help` for information on the commands available. A full description of Archie is beyond the scope of this document. However, a brief introduction is given below. This discussion refers to the dumb-terminal Archie client, which is the version accessed remotely at Imperial College. The X-terminal client has the same functionality, though the interface is different.

Suppose that you were searching for an archie client to install on your local machine, and guessed that such a client would have the string 'archie' as part of its name. You would type:

```
set search sub
```

to specify that searches were to operate on substrings, rather than requiring an exact match to the entire file name. Then perform the search:

```
prog archie
```

and a list of files (and their locations) which match the criterion will be displayed. You can mail a copy of this back to your local computer so that you can examine it at your leisure by:

`mail` *your-INTERNET-e-mail-address*

for example `mail acd@star.le.ac.uk`. When you have finished, type `quit` to exit Archie. `whatis` is another useful command. It searches a database containing a description of each file known to Archie and can be used to find files relating to some topic. Once you have found the names of such files you can locate them in the usual way using `prog`.

Documentation:

Archie is described in Chapter Nine of *The Whole Internet User's Guide and Catalog* (see Section 28).

It is also described by E. Emtage in Chapter Seven of *Intelligent Information Retrieval: The Case of Astronomy and Related Space Sciences* (see Section 28).

24 Gopher

Gopher is a tool which allows you to browse through the INTERNET identifying and displaying information of interest. Its name is a pun on this purpose; its function is to 'go fer' things. Gopher presents remote directories as though they were a hierarchy of local directories or menus and allows you to navigate through them whilst hiding the details of the addresses of the remote machines and the directory paths. Once you locate files of interest you can display them; text files will be listed and more capable, X-terminal based gopher clients can also display images. Files may also be retrieved to your local computer. Gopher does not allow you to access any information which could not be made available using anonymous ftp or `telnet`, but it does make accessing this information much simpler.

There are various gopher servers around the world. They are all inter-linked, so it does not much matter which one you access first, though if you know that you are going to access a given facility, such as STEIS (see Section 15), you may as well go straight to the appropriate server. If you access gopher from a local client the details will be specific to your site; your site manager should be able to advise. If you are using an X interface then first you must redirect X output to your terminal. The details will vary, but your site manager should be able to advise. Then type perhaps:

`xgopher` or `xgopher stsci.edu 70`

The former accesses the default server for your client, the latter a specified server. If you do not have a local client you must run gopher from a public access client on a remote computer. A list of public access clients is given in Table 16. For example, to access the European public client you would type:

`telnet gopher.sunet.se` or `telnet 192.36.125.2`

In response to the 'login:' prompt reply `gopher`; no password is required.

Gopher allows you to navigate through the directory tree on the server you are using. When you encounter files rather than directories you may examine them and retrieve copies. Somewhere

Area	INTERNET address	INTERNET number	Login
Australia	info.anu.edu.au	150.203.84.20	info
Ecuador	ecnet.ec	157.100.45.2	gopher
Europe	**gopher.sunet.se**	**192.36.125.2**	**gopher**
North America	consultant.micro.umn.edu	134.84.132.4	gopher
North America	gopher.uiuc.edu	128.174.33.160	gopher
North America	panda.uiowa.edu	128.255.40.201	panda
South America	tolten.puc.cl	146.155.1.16	gopher
Sweden	gopher.chalmers.se	129.16.221.40	gopher

Table 16: Public gopher clients

in the directory tree for the server (usually quite close to the top) there will be an entry called something like `Other Gopher and Information Servers`. Selecting this entry displays details of other gopher servers and allows you to select one of them (in a transparent way which gives the appearance that you are just navigating to another directory). You may then examine the directories of this server, or proceed from it to yet another server.

Documentation:

Gopher is described in Chapter Eleven of *The Whole Internet User's Guide and Catalog* (see Section 28).

It is also described by F. Anklesaria and M. McCahill in Chapter Nine of *Intelligent Information Retrieval: The Case of Astronomy and Related Space Sciences* (see Section 28).

A list of frequently asked questions (FAQs in INTERNET jargon) about gopher is available by anonymous ftp from STEIS (see Section 15.3). It is held as file `.Gopher-FAQ` in the top level directory. Note that because the file name begins with a dot it will not appear in normal Unix directory listings.

25 WAIS

Wide Area Information Servers (WAIS) is another tool for locating, searching and retrieving remote information. It is based on the ANSI Z39.50 draft standard for remote searches. It is usually used for searching text, but can be used for any information for which an appropriate index has been built. WAIS is the primary interface to several of the bibliographic databases described in Part I. This note concentrates on using WAIS to access these databases. A more comprehensive (and balanced) description is given in *The Whole Internet User's Guide and Catalog*, Chapter Twelve (see Section 28).

A WAIS client may already be installed at your site; your site manager should be able to advise. If your site does not have a client installed you can obtain one by anonymous ftp (see Section 22). The details are as follows:

INTERNET address: think.com or 131.239.2.1
Username: `anonymous`
Password: Type your username and e-mail address

You should copy file `/public/wais/wais-8-b5.tar.Z`. Installation instructions are included in this tar file.

Alternatively, you could use Archie (see Section 23) to locate a suitable client. Note however that the dumb-terminal client `swais` is particularly unfriendly and difficult to use; the X-terminal version is much to be preferred. Also note that you cannot install the client yourself; your site manager must do so on your behalf.

WAIS tries to hide the details of where the server which hosts the documents that you are searching is located. It is possible to search a 'directory of servers' to find suitable servers, and then interrogate them in greater detail to find the information that you are looking for. However, if you know you want to search one of the bibliographic databases described in Part I you can bypass this step. The procedure is as follows.

1. Create a directory called `wais-sources` as a subdirectory of your login directory.

2. For each database that you are going to access you need to insert in this directory a 'source file' describing how to access it. By convention these source files have file type `.src`.

   Fortunately copies of the relevant source files are kept at the ESA Space Telescope European Coordinating Facility, Garching bei München, from where copies may be retrieved by anonymous ftp (see Section 22). The details are:

   INTERNET address: ecf.hq.eso.org or 134.171.11.4
   Username: `anonymous`
   Password: Type your username and e-mail address

   The source files are in directory `pub/swlib/various-wais-sources`

3. Table 17 gives the names of the source files for the various bibliographic databases. You may as well retrieve copies of all three because you will end up trying them all. Also it is worth quickly perusing the directory because you might spot some other source files that look interesting.

Database	Section	Source file
STELAR	5	`abstracts.src`
STScI preprint list	8.3	`stsci-preprint-db.src`
NRAO preprint list	8.4	`nrao-raps.src`

Table 17: WAIS source files

You are now ready to use WAIS. You will probably run WAIS from an X-terminal and first you must redirect X output to your terminal. The details will vary, but your site manager should be able to advise. Then type perhaps:

```
xwais &
```

An outline of the procedure to find articles is as follows (this description assumes that you are using the X-terminal WAIS client).

1. Click on the 'new question' button. This button is labelled `New` and is enclosed in the `Question` box, in the upper half of the window.
2. A new window should appear. Click on the button marked `Add source`. Yet another window with a list of all your sources should appear.
3. Choose the source corresponding to the database which you wish to search by double-clicking on it. For example, double-click on `nrao-raps.src` to choose the NRAO preprint lists. This source should then be listed as an active source.
4. In the box labelled `Tell me about:` enter the words which you wish to search for. You can enter as many words as you like, separated by spaces. The order of the words is not important. Hit return to start the search.
5. A list of articles which satisfy your criteria will be displayed. You can select an article by clicking on it. There are facilities for displaying all the information about the article (which will include the abstract in the case of STELAR) and saving the details as a text file on your local machine. Such files are created in directory `wais-documents`, which is a subdirectory of your login directory.

There are a number of problems or restrictions with the WAIS software which you should be aware of. Firstly, because WAIS is not designed specifically for bibliographic searches it does not contain facilities to limit the search to a given journal or range of years.

The search software looks for articles containing all the words you have supplied. That is, the words are combined using a logical (or boolean) 'and' operation; there are no facilities for making more complex searches involving other logical operators, such as 'or' or 'not'[5]. However, the search will find articles containing most of the words specified, as well as articles containing all of them. For each article it selects, WAIS makes an estimate of how well the article matches the search criteria you specified. This estimate is expressed as a number in the range 0 to 1000. This feature is known as 'relevancy feedback'. The searches match only exact words, not substrings which are part of a word. This behaviour can cause problems because of plurals and variant spelling. As an example of the sort of problem which can arise, suppose you were searching for a catalogue of multi-colour photometry of planetary nebulae. As the search string you might enter: 'catalogue multi-colour photometry planetary nebulae'. Rendered into American this search string becomes 'catalog multi-color photometry planetary nebulas'[6]. Because WAIS will still select an article even if not all the words in the search string occur in it, the recommended procedure is to enter all relevant variant spellings.

Finally, the WAIS client is rather poor at reporting errors, particularly when it cannot establish a connection to a remote server. Some of the bibliographic databases are quite often unavailable (at least, when accessed from the United Kingdom); if you appear not to be able to get through you should simply try again later.

Documentation:

WAIS is described in Chapter Twelve of *The Whole Internet User's Guide and Catalog* (see Section 28).

---

[5] Standard WAIS clients such as `xwais` do not support boolean operators or 'wild cards' in searches. However, recent versions of the Z39.50 standard include these concepts. Some more recent clients and servers which understand the revised protocol provide these facilities.

[6] I am not being entirely fair here: 'nebulae' is the preferred plural in both American and British English, but, sadly, 'nebulas' often occurs in both.

It is also described by J. Fullton in Chapter Eight of *Intelligent Information Retrieval: The Case of Astronomy and Related Space Sciences* (see Section 28).

Thinking Machines Corporation has compiled a bibliography of WAIS. It is available via anonymous ftp (see Section 22). The details are:

INTERNET address: wais.com or 192.216.46.98
Username: `anonymous`
Password: Type your username and e-mail address

It is held in file `/pub/wais-inc-doc/bibliography.txt`.

A list of frequently asked questions (FAQs in INTERNET jargon) about WAIS is available by anonymous ftp from STEIS (see Section 15.3). It is held as file `.WAIS-FAQ` in the top level directory. Note that because the file name begins with a dot it will not appear in normal Unix directory listings.

26 World Wide Web

The World Wide Web (WWW, or just 'the Web') is a hypertext system in which components of documents can be distributed around the INTERNET. A full description of either the Web or hypertext is beyond the scope of this document. However, briefly, hypertext offers an alternative to traditional, linear narrative text. In a hypertext document the author selects certain words or phrases as 'links'. Links are highlighted in some way when a hypertext document is displayed and a reader may choose to display further information on a link, rather than continuing to read the document sequentially. If he does so, further information pertaining to, or describing the link will be displayed. This text may itself contain further links. Thus a reader may 'navigate' through a hypertext document, investigating the topics which interest him to the depth that he chooses[7]. The first page to appear when a hypertext client (or 'browser' in hypertext terminology) is started is called the 'home page'. Usually the home page contains introductory material.

The novel concept of the Web is that components of a Web document may be scattered around the INTERNET, rather than limited to a single machine. Also, Web links may lead to WAIS indices, gopher menus and `telnet` connections to remote facilities.

You will probably access the Web from an X-terminal. First you must redirect X output to your terminal. The details will vary, but your site manager should be able to advise. Then you will probably type something like:

```
xmosaic
```

The home page will be displayed and you can either follow the linear narrative of the text, or explore links, as you choose. In the `xmosaic` browser links are either shown in a different colour, or by underlining (depending on whether or not you are using a colour X-terminal). On the basis of limited experience, compared to the clients for some of the other tools, `xmosaic` seems to make more onerous demands on the local computer, so the performance may be somewhat sluggish.

Your client will be set up to access the home page of a given document by default. Every Web document has a unique 'Uniform Resource Locator' (URL[8]) which identifies it. You can

[7] In a large hypertext document with many links it is possible for a reader to loose track of where he is. This unfortunate condition is aptly referred to as being 'lost in hyperspace'.

[8] Previously the acronym stood for 'Universal Resource Locator'.

control the default document by specifying the URL. For `xmosaic` the default URL is specified by setting an environment variable prior to starting the browser. For example:

```
setenv  WWW_HOME  http://stsci.edu/net-resources.html
```

(note that the last character is the letter 'l', not the digit '1'). This URL specifies the index of Astronomical INTERNET resources available as part of STEIS (see Section 15.2).

Much of the development of the Web occurred at the European Centre for Nuclear Research (CERN), Geneva. This institution runs a public access Web browser. If a client is not available at your site you can access it to try out the Web. From a Starlink Unix machine type:

`telnet info.cern.ch` or `telnet 128.141.201.74`

You will be logged on to the client without having to give a username or password. This client has a simple user interface suitable for dumb terminals. Links are indicated by numbers in square brackets ('[ ]') immediately after the linked text. You simply type the number of the link to proceed to its text, or hit return to carry on with the main document. One route in the CERN client which may be of interest is to proceed first to the `The Virtual Library` link and thence to the `Astronomy and Astrophysics` link.

Documentation:

The Web is described in Chapter Thirteen of *The Whole Internet User's Guide and Catalog* (see Section 28).

It is also described by B. White in Chapter Ten of *Intelligent Information Retrieval: The Case of Astronomy and Related Space Sciences* (see Section 28).

A list of frequently asked questions (FAQs in INTERNET jargon) about the Web is available by anonymous ftp from STEIS (see Section 15.3). It is held as file `.WWW-FAQ` in the top level directory. Note that because the file name begins with a dot it will not appear in normal Unix directory listings.

Getting Started with NCSA Mosaic by M. Andreessen, May 1993 is an introductory article about the `xmosaic` client. However, it is intended more for site managers who have to install it than for users. It includes details of how to obtain a copy of the client. It is available through Starlink as MUD/147.

Hypertext and Hypermedia by J. Nielsen, 1990 (Academic Press, San Francisco). This book is about hypertext in general, rather than being specifically about the Web.

The issue of *Communications of the ACM* for July 1998 contained a special section devoted to hypertext. However, it was about hypertext in general, rather than specifically about the Web (indeed, it predates the Web).

27 The Relation Between Gopher, WAIS and WWW

Gopher, WAIS and the Web are all similar in that they are all sophisticated tools for interrogating and retrieving remote information, and all are implemented using a 'client-server' model. In fact, they are more similar than might be apparent from their description in the previous sections because if a facility is accessible by one of the tools it is probably accessible by the other two. Specifically:

- gopher can search WAIS databases (though the relevancy feedback is lost),
- the Web can search gopher and WAIS databases (preserving any feedback).

The difference between the tools is the paradigm they use to represent information.

Gopher represents each item of information as either a menu, a document, an index or a `telnet` connection.

WAIS represents all information as an index, and everything selected by searching an index is a document.

The Web represents all information as a hypertext document, which optionally may have links to other documents, and which may be searchable.

The different paradigms are best suited to different sorts of tasks and the tools complement each other.

Part IV

28 Further Reading

- *The Whole Internet User's Guide and Catalog* by Ed Krol, 1992 (O'Reilly and Associates Inc, Sebastopol, California). This book is an excellent introduction to the INTERNET and the tools available for it.
- *Intelligent Information Retrieval: The Case of Astronomy and Related Space Sciences* eds. A. Heck and F. Murtagh, 1993 (Kluwer, Dordrecht). This book covers much the same field as the present document, but is more concerned with the principles behind the facilities provided, rather than being a cookbook of what is available and how to access it.
- *A Guide to Astronomical Catalogues, Databases and Archives available through Starlink* by A.C. Davenhall, March 1993 (SUN/162). This SUN includes descriptions of SIMBAD, NED, ADS and ESIS, all of which contain bibliographic information.
- F. Murtagh and H. -M. Adorf in *The ESO Messenger (El Mensajero)*, June 1993, Number **72**, pp45-47. This paper is similar in scope and purpose to the present document.
- *Network Resources for Astronomers* by R.J. Hanisch, October 1992 and *On-line Data and Information in Astronomy* by H. Andernach, February 1993. These documents are similar to the present document and SUN/162 and describe many on-line databases and archives, some of which contain bibliographic information. They are available through Starlink as MUD/135 and MUD/136.

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