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Centre de Données astronomiques de Strasbourg (CDS)

Observatoire Astronomique de Strasbourg

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SIMBAD

User's Guide

&

Reference Manual

SIMBAD III **Version 1.3** **January 1996**

Contents

Chapter 1

Access to SIMBAD

In order to access SIMBAD, you should use a terminal or a micro–computer connected either to Internet, to a national public data transmission (X.25) network or to SPAN.

XSimbad: Users having access to a workstation or an X terminal are encouraged to install the XSimbad client application on their local site (see section 2.7): this application will manage the interface with the database, and propose a set of buttons and pull-down menus, thus avoiding the need to memorize the command language described in the present User's Guide.

1.1 SIMBAD access request

Potential users must apply for database access by contacting the CDS Director (see section 1.4). This can be done by electronic mail, or by filling a form on the World-Wide Web.

A personal Userid and Password will be provided to applicants.

The user can change his/her password by invoking the command **password** within SIMBAD.

The applicant must also obtain access to an appropriate computer network for connection to the SIMBAD host (please check with your computer manager). SIMBAD is currently accessible through Internet (TCP/IP), SPAN (DECNET) and X25 public networks. Electronic Mail networks (such as BITNET) which do not allow remote log-in are NOT suitable for interactive access to SIMBAD (but can be used for batch mode queries, see chapter 10).

A gateway to SIMBAD, funded by NASA, is available at SAO (Cambridge, U.S.A.). U.S. users should consult connection instructions distributed to them by the U.S. agent (see addresses, below).

1.2 Access to the database server

Access through Internet is given by:

telnet simbad.u-strasbg.fr or **telnet 130.79.128.4**

Access through SPAN, from any SPAN node running VMS, is given directly by:

set host simbad or **set host 18099**

In the *Unix* world, the SIMBAD node is also known as **17.691**.

Access through TRANSPAC and national public (X.25) networks is available by entering the following number:

020806707049733	from outside France
16707049733	from France

SIMBAD may also be accessed, in France, through TELETEL: dial **36 13** and then type the TRANSPAC number **#16707049733**.

The information given in the present section is subject to modification. For up-to-date information, please use the contact addresses given below, or the World-Wide Web service: `http://cdsweb.u-strasbg.fr/Simbad.html`

1.3 Access to the database services

On the prompt "login:", type:

`login:` ***your username***

`Password:` ***your password***

this will give you direct access to the SIMBAD application.

Please note that these entries are case-sensitive, and that the userid is usually in *lower-case* letters. The password can be changed at any time by typing **password**. For security reasons it is important to avoid names, first names, and in general any word coming from a dictionary.

1.4 Contacts for Inquiries

All kinds of inquiries, requests for help, etc. can be addressed by electronic mail to:

Internet: **question@simbad.u-strasbg.fr**
SPAN: **SIMBAD::QUESTION**

Comments from users are very welcome at the same e-mail address. Reports of errors or omissions are very useful to help us improving the database contents.

Other points of contact are:

The Director of the CDS		CDS, Observatoire Astronomique 11, rue de l'Université 67000 Strasbourg France
	Tel:	+33 88 15 07 20
	Fax:	+33 88 25 01 60
	Internet:	question@simbad.u-strasbg.fr
U.S. Users (all problems and questions)		Joyce M. Watson Smithsonian Astrophysical Observatory 60 Garden Street Cambridge, MA 02138, U.S.A.
	Tel:	+1 (617) 495 7264
	Fax:	+1 (617) 495 7199
	Internet:	simbad@cfa.harvard.edu
	SPAN:	CFA::SIMBAD

If the SIMBAD database was helpful for your research work, the following acknowledgment would be appreciated:
This research has made use of the SIMBAD database, operated at CDS, Strasbourg, France
We would also appreciate receiving a preprint or reprint of the relevant papers, at the following address:
CDS, Observatoire de Strasbourg
11, rue de l'Université
67000 STRASBOURG, France

Inquiries, requests, and comments can be addressed by electronic mail to:
Internet: question@simbad.u-strasbg.fr
SPAN: SIMBAD::QUESTION

Chapter 2

Introduction

2.1 SIMBAD

The SIMBAD database is managed by the Centre de Données astronomiques de Strasbourg (CDS).

SIMBAD is the acronym for:		**S**et
	of	**I**dentifications,
		Measurements
	and	**B**ibliography
	for	**A**stronomical
		Data.

The main authors of the SIMBAD software are Marc Wenger, François Bonnarel, and Soizick Lesteven (CDS, Strasbourg).

The updating of SIMBAD is a continuous process resulting from a collaboration with the following institutes:

bibliography: Institut d'Astrophysique de Paris, Observatoire de Paris and Observatoire de Bordeaux

photometry: Observatoire de Genève and Institut d'Astronomie de Lausanne;

astrometry: Astronomisches Rechen Institut, Heidelberg;

galaxies: NASA/IPAC Extragalactic Database and Observatoire de Lyon.

2.2 This SIMBAD manual

The present User's guide describes the *SIMBAD III* software which was first released on July, 1st 1990. The present version of the User's Guide has been prepared by Daniel Egret (CDS, Strasbourg) from contributions by Marc Wenger (CDS, Strasbourg), Joyce M. Watson (SAO, Cambridge), Françoise Genova (CDS), François Ochsenbein (CDS), and François Bonnarel (CDS).

Part I tells you how to access to SIMBAD and presents a first session, as example.

Part II (chapters 5 to 13) is a short User's Guide containing all you need to know for a simple use of SIMBAD.

Part III (chapters 14 to 26) presents more advanced features and lists all the commands related to SIMBAD agents (including filter, format, and environment variables).

Part IV (chapters 27 to 29) is a short Reference Manual.

Finally, the last part gives some additional useful tables.

In the text, commands you have to type as such are printed in **bold face**, while parameters or names you have to replace by your own choice are typed in ***bold italic***. Prompts or data coming from SIMBAD are usually given in `tty` font.

Comments and suggestions are welcome concerning the software or this User's Guide (for instance by sending a message to: `question@simbad.u-strasbg.fr` or `SIMBAD::question`).

2.3 Centre de Données Astronomiques de Strasbourg (CDS)

The CDS is located at the Observatoire Astronomique de Strasbourg (France). CDS is operated under an agreement between French Institut National des Sciences de l'Univers (INSU) and Université Louis Pasteur, Strasbourg (ULP). CDS personnel created and implemented the SIMBAD data bank and maintain its data and software system.

SIMBAD was created by merging the Catalog of Stellar Identifications (CSI) and the Bibliographic Star Index (see References) as they existed at the Meudon Computer Centre until 1979. The resulting data base was then expanded by the addition of source data from the many catalogs connected to the CSI and by new literature references. The database was extended to galaxies and other non-stellar objects in 1983.

The first on-line interactive version of SIMBAD was released in 1981, at the Centre de Calcul de Strasbourg-Cronenbourg (CCSC) and operated there until December 1984, when it was moved to the Paris-Sud Informatique (PSI) Univac 1190 computer at Orsay, France and operated there until June 30, 1990. The database is now hosted on a Unix server, at the Strasbourg Observatory. Connections are available through Internet (TCP/IP), through public data transmission networks (X25 protocol), and through DECNET (SPAN) network.

The database management system of SIMBAD has been developed by the CDS, using the concepts of object-oriented programming. The term *SIMBAD* in this User's Guide will refer both to the data base itself and to the software system used.

2.4 SIMBAD features

SIMBAD features can be summarized by:

- ▹ The language is based on the concept of agents (using the concepts of object-oriented programming).
- ▹ Database queries can be made mainly through:
  - ⋄ identifiers (names of astronomical objects),
  - ⋄ sets of coordinates (retrieving all objects in a given direction) and
  - ⋄ sampling criteria (or *filters*).
- ▹ Output of data is driven by formats. The user may write his/her own formats or modify existing ones. Output files can be saved and mailed to the user.
- ▹ The user interface is adaptable to user preferences: line by line on simple terminals, or with full screen management on more sophisticated terminals. In the present version of the user's guide, we will mainly describe the command mode (line by line). The X Window interface (XSimbad) carries its own on-line documentation.
- ▹ An online hierarchical help system, with context sensitivity.

2.5 Contents of the data base

The SIMBAD data base presently contains information for:

- ▹ about 800,000 stars;
- ▹ about 200,000 nonstellar objects (galaxies, planetary nebulae, clusters, novae and supernovae, etc.).

The only astronomical objects specifically excluded from SIMBAD are Solar System bodies.

For each object, the following data are included when available (see chapter 15 for more details):

- ▷ basic data:

  stars : coordinates, spectral type, blue and visual magnitudes, and proper motion;

  galaxies : coordinates, blue and visual integrated magnitudes, morphological type, and dimension;

- ▷ cross identifications of stars and galaxies from more than 1300 source catalogues, either completely or partially included in the data base. A complete list of the nomenclature used is available as the *Second Reference Dictionary of the Nomenclature of Celestial Objects outside the Solar System* (Lortet *et al.*, 1994). This information is available on-line through the **info** command (see chapter 12).

- ▷ observational data (also called *measurements*), for more than twenty different data types. A list of these types is given in the Appendix.

- ▷ general bibliography for the object, including references to all published papers from the journals regularly scanned (currently about 100 titles), and prototype access to abstracts for a few recent periodicals. Articles are scanned in their entirety, and references to all objects mentioned are included in the bibliography.

  The updating of SIMBAD is a continuous daily process performed through a collaboration with the Institut d'Astrophysique de Paris and the Paris and Bordeaux Observatories. The references are updated very soon after reception of the journal issues, and in some cases directly from the journal table of contents, through agreements with the Editors.

A more complete description of the contents of SIMBAD is given in chapter 15.

2.6 Updating SIMBAD

The SIMBAD database is being maintained, developed and updated on a daily basis. We describe here some of the efforts undertaken by CDS and collaborating institutes in order to provide the users with the most complete view of the published data related to astronomical objects outside the solar system.

New data (bibliographical references, identifiers, basic data), and new acronyms are being entered day after day; this is done as a result of a continuous survey of the astronomical literature, under the responsibility of Institut d'Astrophysique de Paris with the collaboration of Paris, Bordeaux, and Strasbourg observatories (see Laloë et al., 1993 and 1995).

On the other hand, large astronomical catalogues with their own identifiers and measurements are added after a cross-matching procedure which frequently spans over many months and involves external collaborations (examples of catalogues recently integrated or still under scrutiny are the PPM catalogue (Positions and Proper Motions, Röser and Bastian 1993), the Hipparcos Input Catalogue (Turon et al. 1993), the IUE (International Ultraviolet Explorer) Log of observations, and the CCDM (Catalogue des Composantes d'Etoiles Doubles et Multiples; Dommanget 1989).

The data contained in SIMBAD are also permanently updated, as a result of errata, remarks from the librarians (during the scanning of the literature), quality controls, or special efforts from the CDS team to better cover some specific domains (e.g., multiwavelength emitters and complex objects). Requests for corrections, errata, or suggestions are regularly received from SIMBAD users through a dedicated e-mail address (`question@simbad.u-strasbg.fr`).

Corrections of errors are made under the responsibility of CDS astronomers coordinated by Gérard Jasniewicz. All the remarks received from the users are very welcome, as they help us to improve the database contents through the scrutiny of specialists' eyes.

2.7 The XSimbad Interface: a new view on SIMBAD

A graphical, more intuitive, user interface to SIMBAD, taking benefit of the X Window environment is also available for distribution to all potential SIMBAD users working in a Unix environment. It operates on X–terminals or Workstations running OSF/Motif.

XSimbad is available as a *client* package, that can be installed on the user's own workstation or computer system, and which will manage the connection and interactivity with the SIMBAD server in Strasbourg. The functionalities provided to the SIMBAD users (such as query modes, sampling procedure, on-line help, etc.) are presented as buttons, menu-buttons, or pull-down menus, in a simple and self-explanatory way.

The interface has been designed in coordination with similar projects (databases and information systems) in Europe and in the U.S. in order to bring up the best solutions for the users from the whole astronomical community.

2.7.1 From SIMBAD to XSimbad

It is important to note that this interface constitutes an additional layer on top of the existing software (the SIMBAD III application, working with line-by-line commands) which will be maintained and will remain accessible to those who wish to keep their familiar environment, prize the swift use of line over menu commands, or simply don't have access to X–terminals.

The user is asked to install a piece of software on his/her own workstation or computer system, in order to run the X Window interface locally, as a *client* program. The main reason for using a client program is to optimize the response time by transmitting only database queries through the network, and leaving the screen painting to the local computer.

The current interface (`xsimbad version 1.1`) gives access to all the data and almost all the functionalities of the SIMBAD astronomical database. However the procedure for creating new formats is not part of the X Window interface (new formats can still be created using the command line syntax, and used under the new interface). New functionalities will also be gradually added, some of them specific to this interface: namely, those which need graphical capabilities (sky plots, and visualization of spectra or images).

The SIMBAD users will be kept informed of the further evolutions of this project, which should help a wider users' community to access the SIMBAD data, and will eventually bring new tools for browsing, retrieving, or visualizing the data.

2.7.2 How to install xsimbad

The `xsimbad` application can be fetched from the `anonymous ftp` space on the CDS archive server: `ftp cdsarc.u-strasbg.fr` (directory `pub/simbad`), or from the WWW server (see below).

You will have to choose the application corresponding to your machine and operating system: SUN/OS, SUN/Solaris, DEC/Ultrix, DEC/Alpha, HP/UX, IBM/AIX, SGI are currently supported.

2.8 Charging policy

SIMBAD is a charged service. Users need to register, and get a userid/password from the CDS staff (or from the U.S. agent for American users).

In the U.S. there is no invoicing for the end-user because the charges are covered globally by NASA for all U.S. users.

Starting January 1995, the same situation is also true for users from ESO and ESA member states, through an agreement signed with ESO and ESA/ST-ECF.

Special arrangements also exist or are currently being negociated with other countries, including Canada, Russia, and Japan.

Please contact CDS if you want to know the policy applied to your situation, or if you have any question or suggestion related to this matter.

2.9 Documentation on the World-Wide Web

Documentation and news about SIMBAD and related CDS activities can be found on the World-Wide Web. The "SIMBAD home page" gives access to the following documents:

- ▷ Hypertext version of the SIMBAD User's Guide
- ▷ LaTeX version of the User's Guide
- ▷ XSimbad client software
- ▷ Recent news concerning the database
- ▷ and more...

The URL address is `http://cdsweb.u-strasbg.fr/Simbad.html`

Bibliography

[1] Dommanget, J. (1989), The CCDM Astrometric Catalogue for Double and Multiple Stars, in “Star Catalogues: A centennial tribute to A. N. Vyssotsky”, Ed. L. Davis Press, p. 77.

[2] Egret, D., Ochsenbein, F. (1994), CDS Inform. Bull. **44**, 57.

[3] Egret, D., Wenger, M. & Dubois, P., *The SIMBAD astronomical database*, 1991, in *Databases and On–line Data in Astronomy*, M.A. Albrecht & D. Egret (eds.), Kluwer Academic Publishers, p. 79-88.

[4] D. Egret, M. Crézé, F. Bonnarel, P. Dubois, F. Genova, A. Heck, G. Jasniewicz, S. Lesteven, F. Ochsenbein & M. Wenger (1995), “A global perspective on astronomical data and information: the Strasbourg astronomical Data Center (CDS)”, in *Information & On-line Data in Astronomy*, D.Egret & M.A.Albrecht (Eds.), Kluwer Acad. Publ., 163.

[5] Laloë, S., Beyneix, A., Borde, S., Chagnard-Carpuat, C., Dubois, P., Dulou, M.R., Ochsenbein, F., Ralite, N., Wagner, M.J. (1993), *CDS Inform. Bull.* **43**, 57.

[6] Laloë, S. (1995) in Proceedings of the LISA-II Conference, *Vistas in Astronomy*, **39**, 179.

[7] Lortet, M.C., Borde, S., and Ochsenbein, F. (1994), *Astron. Astrophys. Suppl.* **107**, 193.

[8] Ochsenbein, F., Bischoff, M., and Egret, D., *Microfiche edition of CSI (Catalog of Stellar Identifications)*, 1981, Astron. Astrophys. Suppl. **43**, 259-261.

[9] Ochsenbein, F., *The Bibliographical Star Index*, in *Automated Data Retrieval in Astronomy*, ed. C. Jaschek and W. D. Heintz, I.A.U. Colloquium **64**, 1981, Dordrecht, D. Reidel Publishing Company, 1982, p. 171-173.

[10] Röser, S. and Bastian, U. (1993), *CDS Inform. Bull.* **42**, 11.

[11] Turon, C. et al. (1993), *CDS Inform. Bull.* **43**, 5.

[12] Various articles that have appeared in *CDS Information Bulletin* in recent years (especially the series *SIMBAD: new features* which started in Bulletin **40**).

Part I

FIRST STEPS

Chapter 3

Short SIMBAD Help

The present chapter is a short summary of the main SIMBAD commands.

3.1 To search by astronomical object (chapter 5)

At the '`simbad search ->`' prompt, type the astronomical object *identifier*, for example:

`simbad search -> HD 9902`

You will first receive the basic data and identifiers for the object. You can then type one of the following keywords:

`{identifier} display ->`	`[CR]`	all data
	basic	basic data
	id	identifiers
	data	all measurements
	cat	measurements from catalogue ***cat***
	bib	bibliographical references
	bye	leaves the current object

The following parameters can be set:

bibyears *year/year*	limits bibliography by years (4 digits)
equi1 *yyyy*	sets first equinox (e.g. `1950`)
equi2 *yyyy*	sets second equinox of displayed coordinates

Example: `bibyears 1988/1992`

Important: Note that keywords (like `bibyears` or `equi1`) should be typed in *lower-case* letters.

3.2 To search by coordinates (chapter 6)

Enter the R.A. and Dec. you wish to search (not forgetting the + or − of the declination) in the following way: `HH MM +DD MM` ... Example:
`simbad search -> 01 23 +45 56`

Queries by galactic or ecliptic coordinates are available with the following syntax: `g=`***gal-coo***, `e=`***ecl-coo***. Example:

`simbad search -> g=220.12 -6.75`

The following parameters can be set:

cooradius *dd mm*	changes the radius; default: 0°10'
cooequinox *year.d*	set equinox of input coordinates; default: 1950.0

The result is a list of objects which can be displayed as follows:

`simbad-coolist display ->`	**all**	displays the complete list of all objects
	+***n***	n objects from the current one
	n	object # n
	bye	leaves the current object list.

3.3 To search all objects near one object

Type the object name preceded by a '∼', as follows:
`simbad search -> ~Sirius`

The result is a list of objects, as in a search by coordinates. You may also wish to increase the default radius for this search, using the **cooradius** command mentioned above.

3.4 To search by filter (chapter 8)

First, choose a name for the filter, and assign it by typing:
`simbad search ->` **/session use filter** ***filtername***
You will receive the following prompt:
`filter set ->`
*here, type [CR], then **i** for input mode with the `vi` editor, or enter directly the text of the filter:*

Example of filter :
```
FIELD 10 00 -12 00 DIM 2/2
MB 6.5/9.0
CAT SAO
```

*type [esc] then **:wq** for leaving the editor* `filter set ->` **bye**

for processing the filter, type the filter name preceded by a quote:

`simbad search ->`**'*filtername***

3.5 To search from lists (chapter 9)

Let's assume you have prepared on your computer a file containing a list of identifiers (one per line) for which you want to get SIMBAD data. First, send the file to your SIMBAD account, by invoking `ftp simbad.u-strasbg.fr` from your home computer. Then select the data to be collected by typing:

basicdata	coord, mag, sp. type and p.m. (default value)
bibliography	only references codes
maxdata	all available data

Then, submit your list of identifiers (or of coordinates):

`simbad search ->`	**idlist *filename***	for identifier list
	coolist *filename*	for coordinates list

Bibliographical references may be displayed once at the end of a session, using the command:

reftext

3.6 Output control and Log file (chapter 11)

log	keeps a log of the session in a file 'simbad.log'
sendlog *user@node.domain*	sends the log file through e-mail (Internet)
sendlog *user@node.bitnet*	(EARN/Bitnet)
sendlog *node::user*	(or SPAN)

cont or **c**	for continuous display mode
page or **p**	to restore page by page mode

undisplayed	to stop screen display
displayed	to restore screen display

3.7 To create a format (chapter 19)

`simbad search ->` **/session use format *formatname***

`ff set ->`

*here, type [CR], then **i** for input mode, then enter the text of the format, e.g.:*

```
ID(20) HD|NGC|1
COO (27)
FIN
```

type [esc] then ***:wq*** *for leaving the editor*

`ff set` **-> bye**

`simbad search` **-> /env set FM-IMMEDIATE=*formatname***

3.8 Help (chapter 12)

At any prompt, you can obtain a context-sensitive help by typing a question mark: **?**

Details about catalogue names can be obtained from the **info** command:

info -help	lists the main functions of the command
info cati AB	lists catalogues with acronyms starting with `AB`
info cato X	lists catalogues dealing with X-ray sources (object type)
info cata *Author*	lists catalogues with first author named ***Author***
info cat *keyword*	lists catalogues according to presence of specified word in title or remarks

Documentation and hot news about the SIMBAD database and related CDS activities can be found on the World-Wide Web. The URL address is:
`http://cdsweb.u-strasbg.fr/Simbad.html`

3.9 Leaving SIMBAD

At any prompt, type:

session exit *or* **stop**

General hint: to leave any command prompt type **bye**; to call any command, type the full command name (example: **simbad search**).

Chapter 4

First session

Once you have reached SIMBAD, you receive the first prompt:

```
simbad search ->
```

This prompt must be seen as a partial command that the user will complete with search parameters in order to formulate a query.

The parameters can be:

- ▷ **A single identifier** to obtain the data corresponding to an astronomical object. The syntax of an identifier is detailed in chapter 5.
- ▷ ~ **followed by a single identifier** to obtain all objects within a given radius around the given object (default radius: 10 arcmin.).
- ▷ **Coordinates** to get all objects within a given radius around the central position (default values: 10 arcmin. radius and equinox 1950).
- ▷ **A filter name** to make a sample. How to create a filter is explained in chapter 17. The filter name must be preceded by the character ' (quote).
- ▷ **A reference code** to get the corresponding full reference.
- ▷ **Some commands** allowing modification of the query environment can also be issued at any prompt.

Example: Imagine you want to get all available data for an object. Type the object name (here: HD 9902) and push the [CR] key. You will first obtain basic data and alternate identifications (aliases) of the object.

`simbad search ->` **HD 9902**

```
Type: Variable Star
Coord 1950 = 01 34 24.66  +20 26 45.8 sp type = G5
Coord 2000 = 01 37 08.52  +20 42 01.6 mb, mv =  9.3        8.7
 gal = 137.13 -40.91
 pm =  +0.062  [   7]   -0.038  [   9]
------------------------------------------------------------------------------
AG+20 146                 BD+19 269                 HD 9902
YZ 0 1190                 SAO 74827                 YZ 20 465
1E 0134.3+2027            1E 0134.4+2027            PPM 90943
V* BG Psc                 EXO 0134.4+2026
------------------------------------------------------------------------------
Measurements:
pos: 1    PM: 1     SAO: 1
------------------------------------------------------------------------------
References: 9
------------------------------------------------------------------------------
{HD 9902} display ->
```

You can, for instance, type one of the following keywords:

`{identifier} display ->`	`[CR]`	all data
	basic	basic data
	id	identifiers
	data	all measurements
	cat	measurements from catalogue ***cat***
	bib	bibliographical references
	bye	leaves the current object

Example: You want to list all the information available (basic data and identifiers, observational data or measurements, and bibliographical references) for the star HD 9902. The output will be as follows:

```
{HD 9902} display -> [CR]

==== HD 9902 (Variable Star)
Coord 1950.0 = 01 34 24.66  +20 26 45.8 mb, mv =  9.3        8.7
Coord 2000.0 = 01 37 08.52  +20 42 01.6 sp type = G5
 gal = 137.13 -40.91
 pm =  +0.062  [   7]   -0.038  [   9]
------------------------------------------------------------------------------
AG+20 146                 BD+19 269                 HD 9902
YZ 0 1190                 SAO 74827                 YZ 20 465
1E 0134.3+2027            1E 0134.4+2027            PPM 90943
V* BG Psc                 EXO 0134.4+2026
------------------------------------------------------------------------------
pos  |    alpha       delta    |me.al me.de|equi  epoch |     reference     |
------------------------------------------------------------------------------
```

```
pos  |01 34 24.712 +20 26 45.43 | .20   .23 |1950 1958.68|1971IAUCo...7.....L|
PM  | pm-ra [ m.e ]| pm-de [ m.e ]|     reference     |
-------------------------------------------------------
PM  |  +.082[ .009]|  -.038[ .009]|1971IAUCo...7.....L|
SAO  |   alpha          delta    : m.e| pm-ra :m.e| pm-de :m.e|
           reference     |
-------------------------------------------------------------------------------

Do you want to see more ?   y
```

Answer here **y** or [CR] for one more page; **c** if you want everything (continuous mode); **n** to stop.

```
SAO m|01 34 24.660 +20 26 45.81  : .19|  +.062:007|  -.038:009|
      1966SAO...........|
------------------------------------------------------------------------------

1995A&A...295..147F: FAVATA  F., BARBERA  M., MICELA  G. and  SCIORTINO S.
    <Astron. Astrophys., 295, 147-160 (1995)>
    Lithium, X-ray  activity and rotation  in an X-ray  selected sample of
    solar-type stars.
  Comments:  1E 0009.9+1407  misprint for  1E 0009.9+1417,  1E 1751.0+7045
            misprint for 1E 1751.0+7046, 1E 1109.8+3606 misprint for ???
  Notes: Available at CDS: abstract

1994A&A...285..272T:   TAGLIAFERRI  G.,  CUTISPOTO   G.,  PALLAVICINI  R.,
    RANDICH S. and PASQUINI L. <Astron. Astrophys., 285, 272-284 (1994)>
    Photometric and spectroscopic studies  of  cool  stars  discovered  in
    EXOSAT X-ray images II. Lithium abundances.
  Notes: Available at CDS: abstract

1993A&A...277..428F: FAVATA  F., BARBERA  M., MICELA  G. and  SCIORTINO S.
    <Astron. Astrophys., 277, 428-438 (1993)>

Do you want to see more ?   y

    A search for  yellow young  disk population  stars among  EMSS stellar
    X-ray sources by means of lithium abundance determination.

1993IBVS.3840....1K:  KAZAROVETS E.V., SAMUS N.N.  and GORANSKIJ V.P. <IAU
    Inform. Bull. Var. Stars, 3840, 1-27 (1993)>
    The 71st name-list of variable stars.
  Notes: Available at CDS: <CDS Catalogue: II/195>

1991ApJ...378...77G:    GIOMMI   P.,   TAGLIAFERRI   G.,   BEUERMANN   K.,
    BRANDUARDI-RAYMONT G., BRISSENDEN  R., GRASER  U., MASON  K.O., MITTAZ
    J.D.P., MURDIN  P., POOLEY G.,  THOMAS H.-C. and  TUOHY I. <Astrophys.
    J., 378, 77 (1991)>
    The EXOSAT high galactic latitude survey.
```

```
  Dictionary: <EXO HHMM.m+DDMM> N=233

1991ApJS...76..813S:  STOCKE J.T., MORRIS S.L.,  GIOIA I.M., MACCACARO T.,
    SCHILD  R., WOLTER  A., FLEMING  T.A. and  HENRY J.P.  <Astrophys. J.,
    Suppl. Ser., 76, 813 (1991)>
    The Einstein  Observatory extended medium-sensitivity  survey. II. The
    optical identifications.
  Notes: Available at CDS: <CDS Catalogue VII/152>

1990ApJS...72..567G: GIOIA M.,  MACCACARO  T.,  SCHILD  R.E.,  WOLTER  A.,
    STOCKE  J.T., MORRIS S.L. and HENRY  J.P. <Astrophys. J., Suppl. Ser.,
    72, 567-619 (1990)>
    The  Einstein  Observatory   extended   medium-sensitivity   survey.I.
    X-ray data and analysis.
  Notes: Available at CDS: <CDS Catalogue : VII/152>

1989ApJ...340.1011F:  FLEMING  T.A.,   GIOIA   I.M.   and   MACCACARO   T.
    <Astrophys. J., 340, 1011-1023 (1989)>
    The  relation between X-ray  emission and rotation  in late-type stars
    from the perspective of X-ray selection.

1981ApJ...245..163V: VAIANA  G.S., CASSINELLI J.P.,  FABBIANO G., GIACCONI
    R.,  GOLUB L., GORENSTEIN P., HAISCH B.M., HARNDEN F.R., JOHNSON H.M.,
    LINSKY  J.L., MAXSON C.W., MEWE R., ROSNER R., SEWARD F., TOPKA K. and
    ZWAAN C. <Astrophys. J., 245, 163-182 (1981)>
    Results from an extensive Einstein stellar survey.

{HD 9902} display -> bye

simbad search ->
```

The bibliographic references are displayed in decreasing chronological order, i.e. the most recent references are displayed first. It happens frequently that the number of bibliographical references available for one object is quite large, so that it becomes useful to display only the references published within a given year range.

The following example shows how to display the bibliographical references published in 1994 or 1995, in which the star Arcturus is mentioned.

First note that Arcturus is called in SIMBAD `NAME ARCTURUS` following the rule that an identifier should include a catalogue name (hence the generic catalogue of star names: `NAME`). However, you can input `ARCTURUS` which will also be recognized, as mentioned in the message at the first line of the following answer to your query:

```
simbad search -> ARCTURUS

       Your identifier (ARCTURUS) is translated to: NAME ARCTURUS
Type: Variable Star
Coord 1950.0 = 14 13 22.749 +19 26 30.96 mb, mv =  1.19  V?  -0.04
```

```
Coord 2000.0 = 14 15 43.458 +19 12 36.73 sp type = K1.5III
 gal =  15.14 +69.11
 pm =  -1.098  [   1]   -1.999  [   1]
------------------------------------------------------------------------------
HD 124897                GEN# +1.00124897          SKY# 26028
SAO 100944               UBV M 20076               NSV 6603
HR 5340                  BD+19 2777                IRC +20270
CSV 101433               SV* ZI 1054               GC 19242
N30 3229                 LHS 48                    * alf Boo
TD1 17351                Ci 20 843                 PLX 3242
GJ 541                   * 16 Boo                  NAME ARCTURUS
FK4 526                  GCRV 8341                 JP11 2486
ROT 2044                 UBV 12551                 LFT 1084
LTT 14184                IRAS 14133+1925           RAFGL 1693
PPM 130442               AG+19 1335                USNO 850
HIC 69673
------------------------------------------------------------------------------
Measurements:
GEN: 1    UBV:13    V*: 1     pos: 2    GJ: 1     TD1: 1    PM: 4
MK:32     JP11: 4   uvby: 4   PLX: 5    GCRV:41   ROT: 2    SAO: 1
IRAS: 1
------------------------------------------------------------------------------
References: 797
------------------------------------------------------------------------------
```

{NAME ARCTURUS} display -> bibyears 1994/1995

{NAME ARCTURUS} display -> bib

1995A&A...293...87K: KJELDSEN H. and BEDDING T.R. <Astron. Astrophys., 293, 87-106 (1995)>
Amplitudes of stellar oscillations: the implications for asteroseismology.
Notes: Available at CDS: abstract

1995A&A...293..107D: DONATI J.-F., HENRY G.W. and HALL D.S. <Astron. Astrophys., 293, 107-126 (1995)>
Activity, rotation and evolution of the RS CVn system {lambda} Andromedae.
Notes: Available at CDS: abstract

1995AJ....109..350H: HATZES A.P. <Astron. J., 109, 350-358 (1995)>
Spot and chromospheric activity on the RS CVn star DM Ursae Majoris.

1995ApJ...439..917D: DE LA REZA R. and DA SILVA L. <Astrophys. J., 439, 917-927 (1995)>
Lithium abundances in strong lithium K giant stars: LTE and non-LTE analyses.

```
Do you want to see more ?   y

1995ApJ...440..210C:  CHAVEZ M., MALAGNINI M.L. and MOROSSI C. <Astrophys.
    J., 440, 210-215 (1995)>
    New synthetic Mg2 indices.

1995ApJ...442..381L:  LINSKY J.L., WOOD B.E., JUDGE P., BROWN A., ANDRULIS
    C. and AYRES T.R. <Astrophys. J., 442, 381-400 (1995)>
    The transition regions of Capella.

1995ApJ...442L..61S:  SUTMANN G. and CUNTZ M. <Astrophys. J., 442, L61-L64
    (1995)>
    Generation  of  mass  loss  in  K  giants:  the  failure  of  global
    oscillation modes and possible implications.

1995ApJS...96..223A: AYRES T.R., FLEMING  T.A.,  SIMON  T.,  HAISCH  B.M.,
    BROWN A.,  LENZ D., WAMSTEKER W., DE  MARTINO D., GONZALEZ C., BONNELL
    J.,  MAS-HESSE J.M., ROSSO C., SCHMITT J.H.M.M., TRUMPER J., VOGES W.,
    PYE J.,  DEMPSEY R.C., LINSKY  J.L., GUINAN E.F.,  HARPER G.M., JORDAN
    C., MONTESINOS  B.M., PAGANO I.  and RODONO M.  <Astrophys. J., Suppl.
    Ser., 96, 223-259 (1995)>

Do you want to see more ? n

{NAME ARCTURUS} display -> bye
```

Note that once you have finished with one object, you have to type **bye**, which leads you to the main prompt:

`simbad search ->`

allowing you to search for something else. You can type **bye** each time you want to go back to the main prompt.

When you have finished, type: `stop` in order to leave the database.

The way SIMBAD commands and prompts are managed is described in more detail in chapter 15.

Part II

USER'S GUIDE

Chapter 5

How to retrieve information for one object ?

On entering the software, you get the first prompt:

```
simbad search ->
```

This prompt must be seen as a partial command that has to be completed with parameters by the user to obtain information from the database.

The parameters can be:

- ▷ **A single identifier** to obtain the data corresponding to an astronomical object (*this chapter*).
- ▷ ~ **followed by a single identifier** to obtain all objects within a given radius around the given object (default radius: 10 arcmin.).
- ▷ **Coordinates** to get all objects within a given radius around the central position (chapter 6).
- ▷ **A filter name** to make a sample (chapters 8 and 17).
- ▷ **A reference code** to get the corresponding bibliographical reference (chapter 15).

5.1 Object identifiers: how to type them

The syntax of an identifier is the following:

- ▷ the abbreviated catalogue name (one to four characters), followed by

▷ a number or a name within the catalogue.

Examples:

```
HD 187642
M 31
BD+8 4236      or     BD +8 4236     or     BD +08 4236
```

Altair, α Aquilae, and RR Lyrae are listed as:

```
NAME ALTAIR       * ALF AQL     and       V* RR LYR
```

where `NAME`, `*`, and `V*` are the catalogue names.

5.1.1 Naming conventions in SIMBAD

SIMBAD offers an efficient management of the possible variations in the naming of astronomical objects with the *sesame* module and the *info* database of nomenclature of celestial objects (see Egret, 1992 and 1993).

The Dictionary of Nomenclature

A list of the catalogue names, abbreviations, or acronyms used (including cluster nomenclature) is available in the *Second Reference Dictionary of the Nomenclature of Celestial Objects outside the Solar System* (Lortet et al., 1994).

This Dictionary is available on-line, through the CDS WWW server, and as a SIMBAD functionality: it is the `info cat...` series of commands (see chapter 12).

Specific catalogues

Object names such as Vega and Altair, but also Barnard's star or Crab Nebula, are stored in the database in a specific catalog called "NAME", while star names in constellations, such as alpha Lyrae, are stored as catalogue "*", and variable stars (R Aquarii) in the catalogue "VAR".

You generally can simply type the name (`Vega`, `Altair`, or `alf Lyrae`): the name resolving module will make the internal conversion.

In case of problem, please send us mail at question@simbad.u-strasbg.fr —the special hotline account managed by the CDS team.

Naming astronomical objects within SIMBAD: a few hints

Case sensitivity: SIMBAD is not case-sensitive at this level: `ALF AQL` or `alf Aql` are, for instance, both accepted.

Greek letters: should be abbreviated as three letters: `alf`, `bet`, for α and β, but also `mu.` `nu.` and `pi.` (with a dot), for μ, ν and π. The complete list is given in appendix A.

Constellations: constellation names should be abbreviated with the usual three letters: `alf Boo`, `del Sct`, `FG Sge`, `NOVA Her 1991`. The complete list is given in appendix B.

Multiple systems: Identifiers of a multiple system may generate a list of the objects of the system. For instance, `ADS 5423` calls for the four components, A to D, of the stellar system around Sirius. Be careful: this is true only for some specific identifiers (such as ADS).

Unknown name ?: If `info cati` *name* (where *name* is the catalog acronym) doesn't help, and the identifier you have is not accepted by SIMBAD, or simply not found, try one thing: enter the coordinates of the object; if the object exists in SIMBAD under a different name, you will find it.

If you have the reference of the paper in which the source name was first mentioned you can also look for `info cata` *Author*, where *Author* is the name of the first author of the catalogue, or type the reference code of the paper.

Note also that a catalogue may appear in the `info cati` list, and still be incomplete into SIMBAD.

Generic identifier

An ampersand (&) immediately after an identifier makes a generic interrogation of the objects following a given object (in the order of the catalogue). The ampersand itself can be followed by a number modifying the default number of 10 consecutive objects.

Examples:
`HR 5999&` generates a list of ten objects: `HR 5999`, `HR 6000`, `HR 6001`, etc.
`NGC 2264 1&20` retrieves stars 1 to 20 from the reference list of open cluster NGC 2264.

5.2 Retrieving the data for one object

Imagine you want to list all the information available (basic data and identifiers, observational data or measurements, and bibliographical references) for 3C 371 (a BL LAC object). First, type the identifier:

```
simbad search -> 3C 371
```

```
Type: BL Lac - type object
Coord 1950.0 = 18 07 18.659 +69 48 57.20 mb, mv = 14.4  :
Coord 2000.0 = 18 06 50.673 +69 49 28.14 morph. type = E
 gal = 100.13 +29.17
 dim =  0.32  0.00  ~  (~)
-----------------------------------------------------------------------------
Z 1807.2+6949            Z 340 - 35               UGC 11130
ZW VII 768               3C 371                   4C 69.24
NRAO 548                 1E 1807.3+6949           EQ 1807+69
QSO 1807+698             3C 371.0                 RX J18070+6949
IRAS 18072+6949          LRWR 417                 1H 1803+696
H 1807+698               H 1801+698               S4 1807+698
2E 1807.2+6948           2E 4023                  1ES 1807+69.8
[DML87] 464
-----------------------------------------------------------------------------
Measurements:
RVel: 1   IRAS: 1   Z: 2      Einstein:
-----------------------------------------------------------------------------
References: 195
-----------------------------------------------------------------------------
```

The basic data and the identifiers are displayed automatically. Note that the main prompt has been replaced by the following one:

`{3C 371} display ->`

The software makes the queried astronomical object current ({3C 371} is its name), with the default action **display**. By typing a [CR] , you execute the command as it is shown in the prompt:

{3C 371} display

and receive all the data displayed, according to the current format.

The astronomical object remains current, as well as the action *display* . You can, for instance, display the data again, or any part of them by typing the following keywords :

basic	for basic data
id	for the identifiers
ndata	gives the number of observational measurements
data	for the observational measurements
cat	displays the measurements of catalog ***cat*** (Example: `UBV`)
all	for all the observational measurements
nbib	gives the number of bibliographical references
bib	for the bibliographical references
bibcode	for the bibliographical reference codes
bye	for leaving the object

The keyword **catalog** allows you to generate a permanent change of the environment (i.e. the current format):

catalog ***cat-name cat-type***	for the measurements from a specific catalogue (of name ***cat-name***, or from all catalogues (`A`); the following types of measurements will be displayed, according to the value of ***cat-type***: `F` first measurement `M` mean value or first one if none `A` all measurements

Example: if you are interested only by the UBV photometry of a list of objects, you may type **catalog UBV M**. This will replace the default format (all measurements) by the following: only the mean value available for UBV photometry (if any) is diplayed. This change is valid until the end of the session, unless you restore the default format (all data) by typing **catalog A A**.

The following parameters can be set:

bibyears ***y1/y2***	will limit the display of the bibliography to the given years (papers published between 1980 and 1996: `bibyears 1980/1996` ; papers published in 1994: `bibyears 1994/1994`)
equi1 ***year.d***	will set equinox of the first displayed coordinates (example: `equi1 1950.0`)
equi2 ***year.d***	will set second equinox (example: `equi2 1990.0`)

These parameters and keywords modify the standard (default) format and this change remains valid until the end of the session, unless you restore the default format by typing

```
bibyears 1850/2000

equi1 1950.0

equi2 2000.0
```

You may also create your own keywords within your own format (see chapter 19: "Defining formats").

Example: You want to list the information available for 3C 371. The output will be as follows:

```
{3C 371} display -> [CR]

==== 3c 371 (BL Lac - type object)
Coord 1950.0 = 18 07 18.659 +69 48 57.20 mb, mv = 14.4  :
Coord 2000.0 = 18 06 50.673 +69 49 28.14 morph. type = E
 gal = 100.13 +29.17
 dim =  0.32  0.00  ~  (~)
-----------------------------------------------------------------------------
Z 1807.2+6949            Z 340 - 35                UGC 11130
```

```
ZW VII 768               3C 371                   4C 69.24
NRAO 548                 1E 1807.3+6949           EQ 1807+69
QSO 1807+698             3C 371.0                 RX J18070+6949
IRAS 18072+6949          LRWR 417                 1H 1803+696
H 1807+698               H 1801+698               S4 1807+698
2E 1807.2+6948           2E 4023                  1ES 1807+69.8
[DML87] 464
-------------------------------------------------------------------------------
RVel  | Rvel    (nmes)| rem |dis|     reference     |
-----------------------------------------------------
RVel m|  +15300 (    )|     |   |1973UGC.....1.....N|
IRAS  |  ra, dec (1950)    | err.ellip|     f12      f25      f60     f100 |
        %flux.err. |conf| v|ns|na|  reference        |

Do you want to see more ?   y

--------------------------------------------------------------------------------
IRAS  |18 07 16.9 +69 49 02| 17  8   2|     .25L     .13      .23:     5.64L|
         ~ 10 15  ~|----| ~| 0| 9|1988NASAR1190.....B|
Z  |redshift R|     Reference     |
-----------------------------------
Z  |  .0512   |1995A&AS..109..147B|
Z  |  .051    |1994A&AS..103..349S|
Einstein  |  RA  (1950)  Dec    : Err| Count r.:  Err  | Hard.:  err+  err-|
               Reference      |
--------------------------------------------------------------------------------
Einstein  |18 07 17.5 +69 48 48 :  54|   .06800: .01500|  .231: .029 .029|
           1994HEAO2.C.......M|
-------------------------------------------------------------------------------

1995A&AS..109..147B:  BRINKMANN W., SIEBERT J., REICH W., FUERST E., REICH
    P., VOGES W., TRUEMPER J.  and  WIELEBINSKI  R.  <Astron.  Astrophys.,
    Suppl. Ser., 109, 147-170 (1995)>
    The  ROSAT AGN content  of the 87GB  5 GHz survey:  bulk properties of
    previously  optically identified sources.
  Notes: Available at CDS: abstract, <table1>


Do you want to see more ?   n

{3C 371} display -> basic


==== 3c 371 (BL Lac - type object)
Coord 1950.0 = 18 07 18.659 +69 48 57.20 mb, mv = 14.4  :
Coord 2000.0 = 18 06 50.673 +69 49 28.14 morph. type = E
 gal = 100.13 +29.17
 dim =  0.32  0.00  ~  (~)
-------------------------------------------------------------------------------
```

```
{3C 371} display -> id

Z 1807.2+6949            Z 340 - 35               UGC 11130
ZW VII 768               3C 371                   4C 69.24
NRAO 548                 1E 1807.3+6949           EQ 1807+69
QSO 1807+698             3C 371.0                 RX J18070+6949
IRAS 18072+6949          LRWR 417                 1H 1803+696
H 1807+698               H 1801+698               S4 1807+698
2E 1807.2+6948           2E 4023                  1ES 1807+69.8
[DML87] 464
------------------------------------------------------------------------------

{3C 371} display -> all

RVel  | Rvel    (nmes)| rem |dis|     reference     |
-----------------------------------------------------
RVel m|  +15300 (    )|     |   |1973UGC.....1.....N|
IRAS  |  ra, dec (1950)    | err.ellip|     f12      f25      f60     f100 |
        %flux.err. |conf| v|ns|na|  reference       |
-------------------------------------------------------------------------------
IRAS  |18 07 16.9 +69 49 02| 17  8   2|     .25L     .13      .23:    5.64L|
         ~ 10 15  ~|----| ~| 0| 9|1988NASAR1190.....B|
Z  |redshift R|     Reference     |
-----------------------------------
Z  |  .0512   |1995A&AS..109..147B|
Z  |  .051    |1994A&AS..103..349S|
Einstein  |  RA  (1950)  Dec    : Err| Count r.:  Err  | Hard.:  err+  err-|
               Reference      |
-------------------------------------------------------------------------------
Einstein  |18 07 17.5 +69 48 48 :  54|   .06800: .01500|  .231: .029 .029|
           1994HEAO2.C.......M|

{3C 371} display -> IRAS

IRAS  |  ra, dec (1950)    | err.ellip|     f12      f25      f60     f100 |
        %flux.err. |conf| v|ns|na|  reference       |
-------------------------------------------------------------------------------
IRAS  |18 07 16.9 +69 49 02| 17  8   2|     .25L     .13      .23:    5.64L|
         ~ 10 15  ~|----| ~| 0| 9|1988NASAR1190.....B|

{3C 371} display -> bibyears 1994/1994

{3C 371} display -> bib

1994A&A...282..989G: GEFFERT M., AURIERE  M.,  REQUIEME  Y.  and  MAZURIER
    J.-M. <Astron. Astrophys., 282, 989-993 (1994)>
```

```
    New optical positions  of  the  globular  cluster  X-ray  sources  NGC
    6712:S/X 1850-086 and M 15:AC 211/X2127+119.

1994A&A...285..812B: BRINKMANN W.  and  SIEBERT  J.  <Astron.  Astrophys.,
    285, 812-818 (1994)>
    Spectral properties of X-ray loud extragalactic radio sources.
  Notes: Available at CDS: abstract, <table1>

1994A&A...286..408L: LAINELA M. <Astron. Astrophys., 286, 408-414 (1994)>
    Can  shock models  explain radio  outbursts of  AGN at  millimeter and
    centimeter wavelengths?.
  Notes: Available at CDS: abstract

1994A&A...289..673T: TORNIKOSKI M., VALTAOJA  E.,  TERAESRANTA  H.,  SMITH
    A.G., NAIR  A.D., CLEMENTS S.D. and  LEACOCK R.J. <Astron. Astrophys.,
    289, 673-710 (1994)>
    Correlated  radio  and  optical  variations  in  a  sample  of  active
    galactic nuclei.
  Notes: Available at CDS: abstract

    [etc.]
```

{3C 371} display -> equi1 1900.0

{3C 371} display -> equi2 1990.0

{3C 371} display -> basic

```
==== 3c 371 (BL Lac - type object)
Coord 1950.0 = 18 07 18.659 +69 48 57.20 mb, mv = 14.4  :
Coord 1990.0 = 18 06 56.271 +69 49 22.11 morph. type = E
 gal = 100.13 +29.17
 dim =  0.32  0.00  ~  (~)
------------------------------------------------------------------------------
```

{3C 371} display ->

This prompt remains current as long as you do not quit the astronomical object, after having displayed its data. This is done by typing *bye* :

`simbad-obj display -> bye`

5.3 To search all objects around one object

It may be useful to search all objects, in the database, around a given object. This is done by preceding the name of the object with a ~ as follows:
`simbad search -> ~Sirius`

The result is the list of objects, including the queried one, located within 10 arcmin (default value) around Sirius. The ways to handle a list of objects and modify the search radius are described in the next chapter.

More details about the handling of data related to an astronomical object are given in the chapter 16: “Managing an astronomical object”.

Bibliography

[1] Egret, D. (1992) "SIMBAD : new features (2)", *CDS Inform. Bull.* **41**, 61.

[2] Egret, D. (1993) "SIMBAD : new features (3)", *CDS Inform. Bull.***42**, 69.

[3] Lortet, M.C., Borde, S., and Ochsenbein, F. (1994), *Astron. Astrophys. Suppl.* **107**, 193.

Chapter 6

Accessing by coordinates

6.1 Query by coordinates

The second most common use of SIMBAD is to search by positional parameters, or coordinates.

Such a query will give you access to all objects present in a small circle around the given coordinates. All objects within the specified radius and included in the data base are retrieved and an *object list* is available for scrutiny. You can then examine the selected objects individually, or as a group.

Selected objects are listed in order of increasing distance from the specified position.

The *search near name*, allowing you to find all the objects in a small circle around a given object, is an alternative method to select a list of objects.

6.2 Coordinates format and equinox

The equatorial coordinates must be written in the order α, δ without forgetting the sign for the declination zone. The input may be `hh mm.m +dd mm`, or `hh mm ss.ss +dd mm ss.s`, etc. in free form, but the sign of the declination must be included (even if positive) because this is used to parse the positional values.

The default value for the equinox is the standard equinox in the database (presently: 1950.0). It can be overwritten by the command `cooequinox 2000.0`, if, for instance, you want to input coordinates at the equinox 2000.0.

Note that this equinox value may well be different from the ones corresponding to the coordinates displayed in the basic data. The default values for these two sets of displayed coordinates is (presently) 1950.0 and 2000.0, values which can be modified with the following command: `equi1` ***value***, and `equi2` ***value***.

The coordinates are originally stored in the database under their 1950.0 value. No change of epoch, using the proper motions, is performed. This feature will be implemented later, together with a move to the J2000 IAU standard.

Queries by galactic or ecliptic coordinates are available with the following syntax: `g=`***gal-coo***, `e=`***ecl-coo***. Examples:

```
simbad search -> g=220.12 -6.75
```

```
simbad search -> e=123.1 +11.1
```

The search radius is the same as for the equatorial coordinates.

6.3 To search all objects near one object

The central position of the field can alternatively be given as the name of the object located at the center, preceded by a '∼', as follows:
`simbad search -> ∼Sirius`

The result is the list of objects, including the queried one, located within 10 arcmin (default value) around Sirius.

6.4 Search radius

The default value for the radius is 10 arcmin. However this can be modified by the command **cooradius** ***value*** (the value is to be given as decimal or sexagesimal degrees (warning ! give the value in degrees, not arcmin or arcsec). Here are two equivalent examples of the possible syntax for changing the value to 30 arcmin:

```
simbad search -> cooradius 0 30
```

```
simbad search -> cooradius 0.5
```

This change remains valid until the end of the session (unless you enter a new cooradius value).

6.5 The object list

The query by coordinates produces a list of objects, which can of course consist of only one, or even no object. This list is sorted by increasing distance from the given central position.

You will therefore first interact with an *object list* agent. The agent will display a summary list of all retrieved objects (one line per object). You can display one or several specific objects on the list, save the list, or merge it with another one. How to do that is explained in detail in chapter 18: "Managing an object list". We give here the most useful commands:

`simbad-coolist display ->`	**all**	all objects
	$+n$	n objects from the current one
	n	object # n
	bye	leaves the current list agent

6.6 Example

Enter coordinates required (not forgetting the declination sign):

```
simbad search -> 18 36 +38 40


==== coo 18 36 +38 40  -  5 objects:
#1  |  *|AG+38 1715         |18 36 19.63  +38 43 05.3 |K       |10.6   9.2 |0
#2  |*i*|AG+38 1712         |18 35 15.25  +38 43 06.3 |?       |10.8       |0
#3  |*i*|BD+38 3238E        |18 35 15.5   +38 44 23   |?       |       9.5 |0
#4  | V*|HD 172167          |18 35 14.655 +38 44 09.67|A0V     | 0.03  0.03|911
#5  |  *|GAT 1166           |18 35 45.7   +38 49 26   |G8V     |10.92 10.14|1
```

There are 5 objects within a radius of 10 arcmin. You receive the type of object (asterisk for stars, G for galaxies, etc.), one name, the coordinates (at the first equinox), spectral type, magnitudes, and, at the end, the number of bibliographical references.

Request one of the objects, by number (for example: the second one):

```
simbad-coolist display -> 2


Type: Star in double system
Coord 1950.0 = 18 35 15.25  +38 43 06.3 mb, mv = 10.8
Coord 2000.0 = 18 36 56.01  +38 45 43.5 sp type = ?
 gal =  67.43 +19.23
 pm =  +0.010  [   9]   +0.016  [   8]
-------------------------------------------------------------------------------
AG+38 1712               BD+38 3238B              ADS 11510 B
CSI+38 3238 2            PPM 81557
-------------------------------------------------------------------------------
Measurements:
pos: 1    PM: 1
-------------------------------------------------------------------------------
References: 0
-------------------------------------------------------------------------------
list-obj display ->
```

Note that this brings you to the level of prompt corresponding to one object of the list: type `bye` in order to go back to the list level, where you can continue to request objects from the list.

```
list-obj display -> bye

simbad-coolist display -> 4


Type: Variable Star
Coord 1950.0 = 18 35 14.655 +38 44 09.67 mb, mv =  0.03       0.03
Coord 2000.0 = 18 36 55.377 +38 46 46.78 sp type = A0V
 gal =  67.44 +19.24
 pm =  +0.200  [   1]   +0.285  [   1]
-----------------------------------------------------------------------------
HD 172167                 GEN# +1.00172167          UBV M 23118
SKY# 34103                SAO 67174                 GC 25466
N30 4138                  TD1 22883                 BD+38 3238
PLX 4293                  GJ 721                    IRC +40322
HR 7001                   RAFGL 2208                * 3 Lyr
* alf Lyr                 NAME VEGA                 ADS 11510 A
AG+38 1711                CEL 4636                  FK4 699
GCRV 11085                HGAM 706                  JP11 2999
ROT 2633                  UBV 15842                 1E 183515+3844.3
CSI+38 3238 1             V* alf Lyr                LTT 15486
NSV 11128                 IRAS 18352+3844           SV* SVS101745
CSV 101745                USNO 882                  PPM 81558
-----------------------------------------------------------------------------
Do you want to see more ? y
Measurements:
TD1: 1    UBV:13    PM: 2     pos: 2    GJ: 1     GEN: 1    MK:33
JP11: 5   IRC: 1    CEL: 1    uvby: 7   PLX: 4    GCRV:16   ROT: 2
SAO: 1    Hbet: 3   IRAS: 1
-----------------------------------------------------------------------------
References: 911
-----------------------------------------------------------------------------


list-obj display -> bye
```

Type `all`, or simply hit [CR] in order to repeat displaying the list.

```
simbad-coolist display ->all


#1  |  *|AG+38 1715         |18 36 19.63  +38 43 05.3 |K       |10.6   9.2 |0
#2  |*i*|AG+38 1712         |18 35 15.25  +38 43 06.3 |?       |10.8       |0
#3  |*i*|BD+38 3238E        |18 35 15.5   +38 44 23   |?       |       9.5 |0
#4  | V*|HD 172167          |18 35 14.655 +38 44 09.67|A0V     | 0.03  0.03|911
#5  |  *|GAT 1166           |18 35 45.7   +38 49 26   |G8V     |10.92 10.14|1


simbad-coolist display -> bye
```

6.7 The Guide Star Catalog 1.1 on–line

The Guide Star Catalog, prepared for the operations of the Hubble Space Telescope, is accessible on–line through SIMBAD, for positional queries. The Guide Star Catalog (GSC) was produced and is distributed by the Space Telescope Science Institute (STScI)[1], 3700 San Martin Drive, Baltimore, MD 21218, USA.

The release 1.1, distributed on CD–ROM by STScI, has been coded in compact form and stored on–line on the SIMBAD server.

At any prompt, within SIMBAD, you may type the command `findgsc` followed by the J2000 coordinates of the searched position.

The list of all GSC entries within 10 arc minutes of this position will be displayed in return. The default radius of 10 minutes can be changed by adding on the same command line the code `-r` followed by the new value of the radius (in arc minutes: note that the syntax and the unit differ for technical reasons from the ones used for the `cooradius` when querying SIMBAD).

Example : Looking for the GSC entries with a radius of 3 arcminutes:

```
simbad search ->findgsc 12 34 -5 6 -r 3
 ======== GSC1.1 server  ========  Simbad, CDS, Strasbourg ========
GSC-id        ra   (2000)   dec    pos-e mag mag-e  b c  pl mu    d'  pa
0495400366 12 34 05.92 -05 06 58.0  0.4 12.34 0.40  0 0 0202 T;  1.76 123
0495400366 12 34 05.91 -05 06 57.7  0.3 12.86 0.40  0 0 024P T;  1.76 123
0495401224 12 33 57.95 -05 08 54.3  0.4 15.17 0.40  0 0 0202 F;  2.95 190
```

The information displayed includes GSC identification (region number and number within the region), coordinates at equinox 2000 and their error (in arcsec.), GSC magnitude and error, magnitude band (0 is B from IIIaJ plates, 1 is V from IIaD plates, etc.), object class (0 is star, 3 is non-stellar image), plate name, multiplicity (T if multiple entries from different plates, F if single entry). Distance and position angle with respect to the given position are also displayed.

Note that the GSC is stored as a separate file, outside the SIMBAD database, and does not carry, at this stage, any cross-matching with the SIMBAD entries.

[1]STScI is operated by the Association of Universities for Research in Astronomy, Inc. (AURA), under contract with the National Aeronautics and Space Administration (NASA).

Chapter 7

Bibliography and Abstracts

7.1 SIMBAD bibliography

One of the key features of the SIMBAD astronomical database is the unique coverage of bibliographical references to objects. The bibliographic index contains references to stars from 1950 onwards, and to galaxies and all other objects outside the solar system from 1983 onwards. Presently there are about 1,500,000 references taken from 85,000 papers published in the 100 most important astronomical periodical publications and conference proceedings. Articles are scanned in their entirety, and references to all objects mentioned are included in the bibliography. The scanning of the literature is made possible through a collaboration between the Institut d'Astrophysique de Paris, and the Paris, Bordeaux and Strasbourg Observatories, which has been described by Laloë et al (1993) and Laloë (1995).

A code is assigned to each considered paper. We call it a *bibcode*, in our jargon. This 19-digit bibcode (Schmitz et al., 1995) contains enough information to locate the article (including year of publication, journal, volume, page, etc.). The structure of this code has been defined in close collaboration with the NED group at NASA/IPAC so that both databases apply the same coding convention (as well as other information systems, such as the NASA ADS). This is described in chapter 15.

When one retrieves the bibliography of a SIMBAD object, a list of bibcodes is given, and (according to the options used) these codes are automatically resolved against a bibliographic file which provides the full reference, title and list of authors for each citation.

7.1.1 Query by bibliographical reference code

It is possible to obtain the complete bibliographical reference, from the reference code, by typing it in answer to the `simbad search ->` prompt.

A reference code can be supplied without indicating all the fields: the first reference corresponding to the truncated code will be displayed. However, at least three digits are needed. Am ampersand (&) should be added to the truncated bibcode.

Examples

```
simbad search ->1994A&AS..103..135A
SIMBAD reference code: 1994A&AS..103..135A

1994A&AS..103..135A: ANDRILLAT Y., JASCHEK  M.  and  JASCHEK  C.  <Astron.
    Astrophys., Suppl. Ser., 103, 135-155 (1994)>
    A study of Be stars in the wavelength region around Paschen 7

simbad search ->1994A&AS..103&
SIMBAD reference code: 1994A&AS..103....1A

1994A&AS..103....1A: ADELMAN S.J.  and KNOX  JR J.R.  <Astron. Astrophys.,
    Suppl. Ser., 103, 1-4 (1994)>
    uvby  photometry of the magnetic chemically peculiar stars 63 Andromedae,
    HD 192913, HR 8240, and 108 Aquarii
simbad search ->
```

7.1.2 Searching the bibliographical index

Searching the bibliographical index is possible through the **lookbib** command followed by one or several ***keywords*** or ***author*** name(s). This command performs a simple string search through the complete bibliographical index and retrieves all references containing the character string(s).

Example:

```
simbad search ->lookbib rosat pulsar
1991BAAS...23.1349O
 OGELMAN H., FINLEY J.P., ASCHENBACH B., TRUMPER J., ZIMMERMANN U.
 Bull. American Astron. Soc., 23, 1349 (1991)
 Detection of X-ray pulsations from the Vela pulsar by ROSAT.

1993ApJ...410..323F
 FINLEY J.P., OGELMAN H., HASINGER G., TRUMPER J.
 Astrophys. J., 410, 323-327 (1993)
 ROSAT observations of the LMC pulsar PSR 0540-69.

1994A&A...282L..33P
 PETRE R., GEHRELS N.
 Astron. Astrophys., 282, L33-L36 (1994)
 A ROSAT observation of the transient X-ray pulsar GRO J1008-57.
```

```
1994ApJ...436L.153D
 DANNER R., KULKARNI S.R., THORSETT S.E.
 Astrophys. J., 436, L153-L156 (1994)
 ROSAT observations of six millisecond pulsars.

1994MNRAS.271L..21H
 HELLIER C.
 Mon. Not. R. Astron. Soc., 271, L21-L24 (1994)
 A ROSAT observation of the X-ray pulsars X0142+614 and X0146+612.
 X 1048+593 misprint for X 1048-593 = 1E 1048.1-5937

1994BAAS...26..950S
 SAFI-HARB S., OGELMAN H., FINLEY J.P.
 Bull. American Astron. Soc., 26, 950-951 (1994)
 Rosat observations of the unusual SNR CTB 80 containing the 39.5 ms pulsar PSR
1951+32.

1995ApJ...439..722S
 SAFI-HARB S., OGELMAN H., FINLEY J.P.
 Astrophys. J., 439, 722-729 (1995)
 ROSAT observations of the unusual supernova remnant CTB 80 containing the pulsar
 PSR 1951+32.

simbad search ->
```

Only the titles containing both words (rosat and pulsar) have been retrieved. The query is not case-sensitive.

`lookbib` is a macro command (chapter 25): this means that this command can be typed at any prompt.

7.2 The abstract service

SIMBAD does not include the abstracts of referenced papers. However, abstract services, such a the one created by CDS for *Astronomy & Astrophysics* can already or will be queried from SIMBAD. The situation in this field is evolving rapidly.

An important step, for the CDS, was the creation of an abstract service for *Astronomy & Astrophysics* (main journal and Supplement Series) announced in A&A, 284, E1 (April 1994). This service is made available as part of the CDS World-Wide Web server (Egret and Ochsenbein, 1994), and complements the service already existing for on-line tables of recent papers (Ochsenbein, 1993).

A similar agreement has been implemented with the Publications of the Astronomical Society of the Pacific (PASP) for which the abstracts since January 1994 are available.

Using the reference code as the index key, it becomes now possible to retrieve, for instance, the abstract of a recent A&A paper referenced in SIMBAD. This is done by typing the command `abstract` followed by a reference code, for instance:

```
abstract  1994A&AS..103..135A
```

With the same **abstract** command, it is also possible to search the abstract database for one or several ***keywords*** or ***author*** name(s), very similarly to what is done for the SIMBAD bibliographical index with the **lookbib** command.

An other important source of abstracts is the NASA/STI service (also distributed by ESA in Europe): the subset related to astronomy and astrophysics, is currently made available to the astronomical community by the ADS information system, through various access modes (Eichhorn *et al.*, 1995). The interesting aspect for SIMBAD users, is that ADS includes the SIMBAD bibliographical index as part of the service: this means that the SIMBAD bibcode can be used to retrieve the corresponding abstract as produced by NASA/STI (note that this is often not the original author abstract for copyright reasons).

Prototype implementations have shown that it is feasible, using the client/server approach, to complement the result of a SIMBAD query, with a query to an external server providing the relevant abstract. At the time when this document was written, these new functionalities were in prototype phase: the users will be kept informed of the final implementation of these new features.

Bibliography

[1] Dommanget, J. (1989), The CCDM Astrometric Catalogue for Double and Multiple Stars, in "Star Catalogues: A centennial tribute to A. N. Vyssotsky", Ed. L. Davis Press, p. 77.

[2] Egret, D., Ochsenbein, F. (1994), CDS Inform. Bull. **44**, 57.

[3] Laloë, S., Beyneix, A., Borde, S., Chagnard-Carpuat, C., Dubois, P., Dulou, M.R., Ochsenbein, F., Ralite, N., Wagner, M.J. (1993), *CDS Inform. Bull.* **43**, 57.

[4] Laloë, S. (1995) in Proceedings of the LISA-II Conference, *Vistas in Astronomy*, **39**, 179.

[5] Murray, S., Eichhorn, G., Accomazzi, A., Stern Grant, C., Kurtz, M. (1995), in "Information & On-line Data in Atronomy", D.Egret & M.A.Albrecht (Eds.), Kluwer Acad. Publ., 175.

[6] Ochsenbein, F. (1993), CDS Inform. Bull. **42**, 75.

[7] Schmitz, M., Helou, G., Dubois, P., LaGue, C., Madore, B., Corwin Jr, H. G., Lesteven, S. (1995), "NED and SIMBAD conventions for bibliographic reference coding", in "Information & On-line Data in Astronomy", D. Egret & M.A. Albrecht (Eds.), Kluwer Acad. Publ., 253.

Chapter 8

How to create a list of objects: the filter

8.1 Query by filter (or sampling)

In the Query by filter (or sampling) mode, you can retrieve a list of objects according to specific criteria. These criteria constitute a filter[1].

Note: In general a set of criteria should include some limitations in coordinates. These limitations allow the definition of a range of coordinate boxes including the requested area: all the objects from these boxes are read and checked against the whole set of criteria. SIMBAD has been divided for this purpose into 6145 boxes to allow an optimized access by coordinates.

When a set of criteria includes no limits in sky position, the complete database is scanned — which is a long and relatively expensive process. It may be advisable, in any case, to try the filter on a limited region of the sky in order to validate the set of criteria and output format, before sending a search on the complete database.

8.2 Don't forget the quote

Sampling is done in two steps:

- ▷ First, you need to define a *filter* : this is a set of instructions specifying the sample criteria. Filters can be kept from one session to another. If the filter was created previously, you need to load it in the session.

[1] In fact, the query by coordinates is also a query by filter, where the criteria are a search radius and a given position

▷ Then, you answer the prompt `simbad search ->` with the filter name preceded by a quote. The quote helps to distinguish the filter name from an object name[2]. Your command will look like:

`simbad search ->'`**my-filter**

Sampling generates a selection of all objects from the database fulfilling the specific criteria you have defined.

The result of a sampling is a list of objects. How to handle a list of objects is described in chapter 18.

8.3 Defining a filter

You get access to an existing filter, or define a new one, through the following command: "**session use filter *filtername***" where *filtername* is the name of the filter you want to use for sampling the database.

After this command, if the filter named *filtername* already exists, it appears in the session, for modification (through "***filtername* set** ") or immediate use in a query (`simbad search ->'filtername`).

If no filter agent exists under the name *filtername*, a new one is created, and the command "***filtername* set** " is invoked to allow definition of the sampling criteria using a text editor. Usage of the text editor is described in chapter 26.

A created filter is stored as a file `filtername.ftr` in the home directory.

8.4 Writing filtering instructions

A simple filtering instruction is made of one criterion. Each criterion comprises a keyword and parameters, generally made of a lower limit and an upper limit or some name.

Example:
```
MB 6.5/9.0
CAT SAO
```

Criteria can be combined in the following way:

▷ Criteria written on different lines correspond to the `AND` operator:

[2] This is also related to the object-oriented approach, described in chapter 14. The filter is an *agent*. If you just type its name after the prompt `simbad search ->`, the programme assumes that you want a dialogue with the filter agent. It does not consider the filter name as a parameter to the *simbad* agent and its current verb. To avoid this, you are asked to precede the filter agent name with a quote.

```
MB 6.5/9.0
CAT SAO
```

Select all objects having magnitude B between 6.5 and 9.0 **and** having an SAO identifier.

▷ Criteria written on one line separated by a '|' character correspond to the `OR` operator:

```
MB 6.5/9.0 | MV 6.0/8.5
```

Select all objects having B magnitude between 6.5 and 9.0 **or** V magnitude between 6.0 and 8.5.

Any number of instructions and criteria may be written in one filter. The total size of the resulting sample is not limited.

All available instructions for defining a filter are described in the chapter 17.

8.5 Example

We will create a filter named ***target***, retrieve the corresponding list of objects (SAO stars, of a given magnitude range, in a given field), and then display in more detail the 11th object found.

```
simbad search ->session use filter target
target set ->[CR]
"target.ftr" [New file]
```

*here, type **i** for input mode, then enter the text of the filter*

```
FIELD  18 00  -12 00   DIM  3/3
MB  6.5/9.0
CAT  SAO
~
~
```

*type [esc] then **:wq** for leaving the editor*

```
"target.ftr" [New file] 3 lines, 53 characters
target set ->bye
session use ->bye
simbad search ->'target

#1  |  *|YZC 11 6113        |17 54 48.67  -11 31 42.9 |G0      | 8.4   7.8 |0
#2  |*i*|YZC 11 6127        |17 57 10.11  -11 32 38.1 |A5      | 9.0   8.8 |0
```

```
#3  |  *|YZC 11 6129        |17 57 32.91  -11 15 29.6 |A5       | 8.9   8.7 |0
#4  |  *|HD 164026          |17 56 53.68  -12 20 49.0 |G8/K0IV  | 8.9   7.9 |0
#5  |  *|HD 164047          |17 57 00.06  -12 08 54.5 |A8/A9V   | 8.8   8.6 |0
#6  |  *|HD 164165          |17 57 37.69  -12 59 13.0 |B8/B9III| 7.4   7.4 |1
#7  |  *|HD 163977          |17 56 39.15  -13 01 45.5 |A9V      | 8.6   8.4 |0
#8  |  *|HD 164485          |17 59 07.21  -13 08 51.8 |Ap...    | 8.9   8.7 |0
#9  |  *|YZC 11 6153        |18 01 33.79  -10 54 50.6 |G0       | 8.2   7.5 |0
#10 |  *|YZC 11 6159        |18 02 19.92  -10 30 34.4 |A5       | 9.0   8.8 |0
#11 |  *|YZC 11 6177        |18 05 31.14  -10 33 31.2 |Am       | 8.13  7.81|7
#12 |  *|YZC 11 6160        |18 02 44.46  -11 01 28.6 |A5       | 7.4   7.3 |2
#13 |  *|YZC 11 6157        |18 02 15.66  -11 30 44.6 |A2       | 8.3   8.2 |0
#14 |  *|HD 165361          |18 03 18.29  -12 21 25.0 |F7IV+...| 9.0   8.5 |0
#15 |  *|HD 165781          |18 05 30.04  -12 42 13.6 |A2/A3III| 8.9   8.7 |0
#16 |  *|HD 165546          |18 04 12.82  -13 14 33.6 |A0III    | 8.6   8.6 |0

simbad-list1 display ->11

Type: Star
Coord 1950.0 = 18 05 31.14  -10 33 31.2 mb, mv =  8.13       7.81
Coord 2000.0 = 18 08 17.27  -10 33 01.0 sp type = Am
 gal =  18.59  +4.60
 ./.
------------------------------------------------------------------------------
YZC 11 6177              HD 165830                GEN# +1.00165830
SAO 161101               SKY# 32968               UBV M 22647
BD-10 4616               JP11 2935                TD1 21686
PPM 234074               HIC 88850
------------------------------------------------------------------------------
Measurements:
UBV: 1    MK: 2     JP11: 1   TD1: 1
------------------------------------------------------------------------------
References: 7
------------------------------------------------------------------------------

list-obj display ->bye
simbad-list1 display ->bye
simbad search ->
```

Chapter 17 gives the full list of filter instructions. Chapter 18 describes how to handle object lists resulting from a filter.

Chapter 9

Querying from a list

9.1 Storing a file on the SIMBAD host computer

This query mode implies that a file containing either a list of object identifiers, or a list of coordinates, is stored under your account on the SIMBAD host computer.

This can be done by sending it **from your home computer** by **ftp** (using Internet) or through a **Decnet copy** (using SPAN). The SIMBAD staff takes care of erasing eventually unused files after a few months.

Each line of the file should be an identifier (command **idlist**) or a set of coordinates (command **coolist**). Don't mix identifiers and coordinates in the same file, however, as they are processed differently.

9.2 idlist and coolist

The selection of the data to be collected —defined in the current environment— can be modified by typing:

basicdata	coordinates, mag., sp. type and proper motions. (default value)
listdata	one object per line
bibliography	only references codes
maxdata	all available data

If you are using coordinates, check the **cooradius** and **cooequinox** values (see chapter 6).

Then, use the list of identifiers or coordinates contained in specific file (of name *filename*), as follows:

`simbad search ->` **idlist** ***filename*** for identifier list

`simbad search ->` **coolist** ***filename*** for coordinates list

It often happens that lists of objects have references in common. When this is the case, it may be useful to list only the reference codes for each individual object (option **bibliography**). The 19-digit bibcodes need then be resolved only once at the end, using the command:

`simbad search ->` **reftext**

9.3 Example

Let us suppose you have `ftp`'ed the following file from your home computer to the SIMBAD computer, under the name `list.dat`:

```
HD 1
SAO 2
NGC 3
```

Using the default value (basic data) you will obtain the following output:

`simbad search ->` **idlist list.dat**

```
Type: Star
Coord 1950.0 = 00 02 32.23  +67 33 41.8 mb, mv =  8.8       7.6
Coord 2000.0 = 00 05 08.65  +67 50 23.7 sp type = K0
 gal = 118.57  +5.36
 pm =  +0.007  [   3]   +0.009  [   4]
------------------------------------------------------------------------------
SKY# 146                  HD 1                      SAO 10963
AG+67 4                   AGKR 39                   BD+67 1599
IRAS 00025+6733           PPM 11914                 HIC 422
------------------------------------------------------------------------------
Measurements:
SAO: 1    PM: 2     pos: 2    IRAS: 1
------------------------------------------------------------------------------
References: 4
------------------------------------------------------------------------------
Type: Star in double system
Coord 1950.0 = 00 00 09.61  +80 00 13.8 mb, mv =  8.3       7.7
Coord 2000.0 = 00 02 45.75  +80 16 55.8 sp type = F2
 gal = 120.79 +17.61
 pm =  +0.056  [   6]   +0.025  [   4]
------------------------------------------------------------------------------
SKY# 78                   HD 225020                 SAO 2
```

```
AG+80 1                   AGKR 3                    BD+79 799
GC 4                      TD1 30250                 ADS 5 A
CSI+79 799 2
-------------------------------------------------------------------------------
Measurements:
TD1: 1    SAO: 1    PM: 3     pos: 3
-------------------------------------------------------------------------------
References: 4
-------------------------------------------------------------------------------
Type: Galaxy
Coord 1950.0 = 00 04 42.7   +08 01 23 mb, mv = 14.6  :
Coord 2000.0 = 00 07 16.6   +08 18 05 morph. type = S0:
 gal = 104.58 -52.99
 dim =  1.13  0.21 113 (~)
-------------------------------------------------------------------------------
Z 0004.7+0802             NGC 3                     Z 408 - 35
UGC 58                    MCG+01-01-037             ARK 1
IRAS 00047+0801
-------------------------------------------------------------------------------
Measurements:
IRAS: 1
-------------------------------------------------------------------------------
References: 3
-------------------------------------------------------------------------------
simbad search ->
```

The **selectid** command allows the selection of a specific identifier for the output format of a list (see chapter 18).

Chapter 10

Using SIMBAD in batch mode

10.1 Introduction to SMBMAIL

The facility documented in this chapter is not used in *interactive* mode (i.e. when you log into SIMBAD, and have a dialog with the database management system) but *through electronic mail*, without needing to establish an interactive connection with the SIMBAD host computer.

The **smbmail** facility allows a SIMBAD user to send by electronic mail a file containing a header, an optional list of commands, and a list of astronomical objects or a list of coordinates. After execution, the result of the query is sent back by mail, using an E-mail address provided in a header.

It is especially well suited for long lists or sampling queries (you do not want to keep the connection open while the database is processing the query) or for users who have no easy access to an interactive network. This facility can as well be used through Bitnet or any other network.

The query file should be sent to one of the following addresses:

INTERNET:	smbmail@simbad.u-strasbg.fr
SPAN/Decnet:	simbad::smbmail

10.2 The format

The file must have the following structure: a header (three lines); command lines (optional) announced by the line `commands:`; and a list of object names or coordinates (one per line) announced by the line `idlist:` or `coolist:` respectively. Object names and coordinates should not be included in the same mail.

1. **A header:** It consists of three lines (mandatory) :
   - ▷ the first line should be "`SIMBAD interrogation`".
   - ▷ the second line contains the keyword `username:` followed by your simbad ***username*** (userid)
   - ▷ the third line gives the keyword `mailaddr:` followed by your E-mail address for return. It should have one of the following syntaxes:

INTERNET:	***userid@node.domain***
SPAN (Decnet):	***node::userid***
EARN/BITNET:	***userid@node.bitnet***

   Example:

   ```
   SIMBAD interrogation
   username: u01abcd
   mailaddr: smith@cfa.harvard.edu
   ```

2. **A command list** is optional. If not present, the default values will be used. If it exists, it must begin with the keyword '**commands:**' followed by lines containing SIMBAD commands.

   Example:

   ```
   ...
   commands:
   bibyears 1985/1995
   maxdata
   ...
   ```

   The default format for a search by object name or by coordinates is the display of the basic data.

   Other usual formats can be obtained by the following commands (see also chapter 19 for the syntax):

all data and refs:	**maxdata**
list (one line per object):	**listdata**
bibliographic codes only:	**bibliography**
basic data (default):	**basicdata**

   Note: the result of a search by coordinates is, for each entry, a list of objects (format FM-LIST); the result of a search by object name is, for each entry, generally a single object (format FM-IMMEDIATE), but may also be a list (for instance the components of a multiple system).

   The default formats (see chapter 19) are:
   `FM-IMMEDIATE=fm-immediate` and
   `FM-LIST=fm-immediate`

Most of the SIMBAD commands can be used in batch mode, including formats and filters.

3. **Identifier or coordinates list**: An identifier list begins with **idlist:** as keyword. A coordinate list begins with **coolist:** as keyword. Coordinate lists and identifier lists are to be put in separate mail messages.

   Example 1:

   ```
   ...
   idlist:
   HD 123
   SAO 4321
   *V RR LYR
   ```

   Example 2:

   ```
   ...
   coolist:
   12 34 +56 01
   2 12 45 -01 10 11
   ```

10.3 SMBMAIL examples

Here are some complete examples:

List of identifiers for which all data are required

```
SIMBAD interrogation
username: xxxxxx
mailaddr: SPANOD::userid
commands:
maxdata
idlist:
HD 1
SAO 2
NGC 3
```

Simple query of a coordinate list

```
SIMBAD interrogation
```

```
username: xxxxxx
mailaddr: XXXXXX::yyyy
coolist:
12 30 +30
12 30 +40
12 30 +50
```

Sampling

Here the command section is alone and executes the query (a search of objects in a field). No list section is present.

```
SIMBAD interrogation
username: xxxxxx
mailaddr: XXXXXX::yyyy
commands:
/session use filter fff
FIELD 12 30 +30 DIM 10/10
MB -2/+8
bye
simbad search fff
```

10.3.1 A WWW forms interface

An interface with forms exists on the World-Wide Web, at the following address:

`http://cdsweb.u-strabg.fr/simbad/batch.html`

Chapter 11

Keeping a log of your session

SIMBAD offers you a very simple solution for keeping a log file of all (or a part of) your session, and mailing it back to your home computer.

It is done by using the following commands, at the `simbad search ->` prompt:

log	keeps a log of the session in a file 'simbad.log'
sendlog ***user@node.domain***	sends the log file through e-mail (Internet)
sendlog ***node::user***	(or DECNET–SPAN)

The **log** command opens the file `simbad.log`. The command **sendlog** closes it, and mails it to the given address. The file `simbad.log` contains the SIMBAD output produced between the log and the sendlog command.

Large log files can also efficiently be imported to the user's home site through `ftp` (call `ftp simbad.u-strasbg.fr` from your home computer). The log file is stored in the user's directory on the SIMBAD server.

The following commands will also be helpful:

cont	for continuous display mode
page	to restore page by page mode
undisplayed	to stop screen display
displayed	to restore screen display
/uif set f d	to stop directing output to the log (included in the sendlog command)
>|	(an equivalent shortcut)

These keywords are macros (see chapter 25), generating commands to the UIF (user interface) agent. Chapter 22 describes in more details how to manage the user interface, the log file, and other output files.

Chapter 12

SIMBAD Help

At any prompt, you can obtain a context-sensitive help by typing a question mark: `?`

or a general help by typing `help`

12.1 The info command

Details about catalogue names can also be obtained from the **info** command:

-help	lists the main functionalities of the command
info IAU	lists the IAU Recommendations concerning Nomenclature
info cati *AB*	lists catalogues with acronyms starting with `AB`
info cato *X*	lists catalogues dealing with X-ray sources (object type)
info cata *Author*	lists catalogues with first author named `Author`
info cat *keyword*	lists catalogues according to presence of specified word in catalogue title or remarks

Use of the **-l** option provides a long description, including the authors, the bibliographical reference with the title of the paper. Example:

info -l cati *name*

The info command lists on the screen[1] the contents the *Second Reference Dictionary of the Nomenclature of Celestial Objects* produced —and maintained at Paris and Strasbourg Observatories— by Lortet *et al.* (1994). Efforts are being made (with the support of IAU Commission 5) to solve existing discrepancies or ambiguities which may still appear in this field. The object type corresponding to the catalogue, as well as reference and format as used in the database, are also given.

You can view more pages by pushing the space bar, quit by typing **q**, or learn all the other

[1] using the 'less' tool which allows backward scrolling

possibilities by hitting the '**h**' key.

Special symbols can be used together with the keyword parameter:

`$`	to specify an end of word
`.+` (dot and plus signs)	to replace any non-empty string.

This can be illustrated by the following examples:

`info cati HD`	looks for all catalogue names starting with HD
`info cati HD$`	looks for the HD catalogue (HDE will not be found)
`info cati .+CG`	looks for all catalog names including the string: CG
`info cati .+CG$`	looks for all catalog names ending with CG

Other pieces of information can also be obtained:

info news	lists recent modifications or additions to SIMBAD functionalities
info IAU	lists the IAU recommendations regarding nomenclature of celestial objects outside the solar system
info otype	displays the complete list of object types used for the object classification
info journal	displays the complete list of journal abbreviations used for the bibliographic reference coding (bibcode).
info journal *abbr*	resolves an abbreviation used in the bibliographic reference coding.

The command `help` displays the root of the hierarchical help. Navigating through the topics and subtopics is done in the same way as in the VAX/VMS hierarchical help system.

The most current use of the help agent is to obtain the "topic" screen associated with the current context. This is done by simply typing a question mark: (**?**).

12.2 Documentation on the World-Wide Web

Documentation and news about SIMBAD and related CDS activities can be found on the World-Wide Web. The "SIMBAD home page" gives access to the following documents:

- ▷ Hypertext version of the SIMBAD User's Guide
- ▷ LaTeX and Postscript versions of the User's Guide
- ▷ XSimbad client software
- ▷ Recent news concerning the database
- ▷ and more...

The URL address is `http://cdsweb.u-strasbg.fr/Simbad.html`

Chapter 13

How to leave SIMBAD

When you have finished querying SIMBAD, type at any prompt:

```
stop
```

in order to leave the database.

Typing the word *bye* will also allow you to leave the session:

```
simbad search -> bye
session exit > [CR]
```

You can also type the complete command `session exit` in answer to any prompt.

`stop` is a macro command equivalent to `session exit`.

Part III

MORE ABOUT SIMBAD FEATURES

Chapter 14

Some SIMBAD concepts

You will find in this section definitions of the main concepts encountered during a SIMBAD session: *commands, agents, verbs* and *parameters*. A first idea of the current context will also be given. These concepts are derived from the object-oriented programming, but we have changed somewhat the vocabulary in order to avoid confusion between the *astronomical object* and the *object* in object-oriented programming: we use the following terms of *agent* and *verb* instead of *object* and *method*.

A **command** is the complete instruction sent to the programme for execution. Every command has the following syntax:

AGENT VERB PARAMETERS

The **agent** is the main concept in SIMBAD: all requests from the user will be sent to agents. These requests are made by use of a *verb* and optionally **parameters**. Each agent present in a session has a name. In the first session, we interacted with three different agents:

1/	Simbad:	The SIMBAD database.
2/	{HD 9902}:	The current astronomical object requested in the database.
3/	Session:	The session

The **verb** of the command defines the action requested from the agent. For instance:

simbad search	is a request to *search* sent to the agent *Simbad* .
{HD 9902} display	is a request sent to an astronomical object agent called {HD 9902}, asking it to display the data.
session exit	is a request sent to the agent *session* telling it to close the session.

Each agent knows how to execute several commands.

The list of commands which can be sent to the agent in the current prompt may be obtained by typing &[CR].

The same verb can be used for different agents (display, for instance, can be used to show the instructions in a format or a filter). Of course, each agent will perform the appropriate action when receiving a request.

Agents having the same abilities are grouped in *categories*. We have already discovered the following categories: database, astronomical object, object list, filter, and session.

Several agents of the same category may exist in a session. For example, we are able to use several formats simultaneously, and to compare different astronomical objects.

The **parameters** depend on the command. For each command, there will be related parameters (or, maybe, no parameters). For instance, **HD 9902** —an identifier— is the parameter string for the command **simbad search**. The command **session exit** takes no parameters.

Complete SIMBAD software capability is contained in the knowledge of the available agents, the action verbs for each agent and the possible parameters for each verb.

The number of entities is not very high: about 10 agent categories, 5 to 10 verbs for each of them. The simple SIMBAD queries only use a fraction of those.

The management of a *current context* helps the user by reducing typing: partial commands are built into the prompt, and the user has only to complete them. This context consists of an agent name alone, called the *current agent*, and a *current verb*, or eventually of a complete command: agent verb and parameters. Executing such a complete command requires only a [CR] from the user.

This current context can be overwritten at any moment by typing another command, or just another request (verb and parameters) to the current agent. Let us consider, for example, some possible replies to the prompt `{HD 9902} display ->`

[CR]	generates the full display of the data
`basic`	is a parameter (display only basic data)
`bye`	is a verb for the agent {HD 9902}
`simbad search HR 5999`	is a new command sent to the agent simbad

Interpreting a command typed by the user is always done in the following way: the programme checks if the first word is an agent name, or, if not, a verb known to the current agent. If none of them is recognized, then it considers that the user typed parameters for the current context.

Here is a comparison which should help you to understand the organization of SIMBAD:

> SIMBAD works like a post office: in a post office, you find positions, and, in each of them, an agent trained to perform certain functions: selling stamps, receiving parcels to send, paying postal orders, and so on. Some of these agents may respond to several requests. Others send you to a colleague to carry out your request.
>
> SIMBAD can be seen as a collection of different agents, each executing specific functions through different commands.

Knowing how to use SIMBAD consists of knowing the abilities of all categories of agents and how to interact with them using the commands.

Chapter 15

The Contents of SIMBAD

The SIMBAD data base presently contains information for about 1,000,000 astronomical objects (stars, galaxies, planetary nebulae, clusters, novae and supernovae, etc.).

The only astronomical objects specifically excluded from SIMBAD are Solar System bodies.

In the following, the word *object* will be used to designate a star, nonstellar object, or collection of objects such as a cluster, which correspond to an individual entry in SIMBAD. For each object, the following data are included:

- ▷ basic data (coordinates, magnitudes, etc.)
- ▷ cross identifications
- ▷ observational data for more than twenty different data types.
- ▷ bibliographical references.

15.1 Basic data

The basic data are displayed immediately after the object has been retrieved (immediate format) or when typing **basic** (standard format).

They consist of:

stars : object type, coordinates, spectral type, blue and visual magnitudes, and proper motion (including rms errors).

galaxies : object type, coordinates, blue and visual integrated magnitudes, morphological type, and dimension.

15.1.1 Object type

The hierarchical classification of the objects in SIMBAD is based on the catalogue identifiers (as proposed by Ochsenbein and Dubois, 1992). From *Star* to *Maser source*, or *Cluster of Galaxies*, some 70 different categories, general, or very specific, are proposed (see Appendix F).

This classification aims to help in the selection of objects (through scanning of lists, or use of the filter procedure in SIMBAD). It is also a powerful tool for data cross–checking and quality control.

The classification uses a hierarchy with four levels, reflecting our knowledge of the characteristics of the astronomical object. For instance, an object can be classified as a "Star" (this is level 1). If photometric observations have shown variability of the object, it can be classified as a "Variable star" (this is level 2). Examples of level 3 and 4 are "Pulsating variable", and "Cepheid".

This hierarchy of object types (and lists of possible synonyms) is managed in the database in such a way that selecting variable stars (`V*`) is understood as selecting objects classified as `V*`, and all subdivisions (e.g. `PulsV*`, `Mira`, `Cepheid`, etc.). If the user is only interested in RR Lyrae type stars, he/she will use the `RRLyr` type, leaving aside all other variable stars for which the variability mode is different, or not known.

The classification extends to galaxies and extragalactic objects, to multiple objects, etc. and gives only wavelength information (such as IR or UV source) when no other information is known. A complete list is given on line (type `info otype`) and more details are given in the above-mentioned paper.

This classification has been designed to be practical and useful, and complements other features also available in SIMBAD (morphological type or spectral type information, catalogues, and measurements).

15.1.2 Coordinates

The coordinates are originally stored in the database for equinox 1950.0. They can be computed at a different equinox (see chapter 6 and the EQUINOX1 and COOEQUINOX variables). No change of epoch, using the proper motions, is performed. This feature will be implemented later on, together with a move to the new J2000 IAU standard.

The coordinates are of various sources. When astrometric data are available (`SAO` or `pos` measurements) the most accurate one has been selected.

The coordinates are displayed according to a precision code (stored in SIMBAD together with the coordinates) which can have the following values:

code	definition
0	1 ^{o}
1	1/10 ^{o}
2	1 '
3	1/10 '
4	1 "
5	1/10 "
6	1/100 "
7	1/1000 "

The default format gives equatorial coordinates at equinox 1950 and 2000, as well as galactic coordinates. This can be modified (see chapter 19). Ecliptic coordinates can also be computed on request.

15.1.3 Magnitudes

B and *V* magnitudes are given, when possible, in the Johnson's UBV system. Both magnitudes may be followed by a semicolon meaning they cannot be made homogeneous to the UBV system. *B* and *V* magnitudes are separated by two columns which may contain the following flags:

- ▷ a 'D' flags a joint magnitude in a double or multiple system;
- ▷ a 'V' flags a variable magnitude and is followed by a coded index giving a rough estimate of the amplitude:

code	definition
1	1/100 mag.
2	1/10 mag.
3	1 mag.
4	more than 1 mag.
?	suspected variable

When possible the magnitudes have been taken from the UBV compilation of Mermilliod (Mermilliod, J.-C., 1987: A&A Sup. 71, 413), and from an earlier work by Ochsenbein (1974: A&A Sup. 15, 215). Otherwise the data would come from one of the published papers associated to the object.

15.1.4 Spectral type

The spectral types of stars have been selected in the Michigan Catalogues of Two-Dimensional Spectral Types for the HD stars (Houk N., 1975, and seq.), or in the bibliographical surveys of MK classifications (Jaschek M., 1978: CDS Inf. Bull. 15, 121). In the absence of a full MK classification, the HD spectral type is recorded.

Most of the spectral types need less than 5 characters, but this field can be as long as 36 characters. Complete syntax is given in Appendix D.

15.1.5 Morphological type

The morphological types of galaxies have been selected from the Uppsala General Catalogue of Galaxies (UGC, Nilson 1973), the Morphological Catalogue of Galaxies (MCG, Vorontsov-Vel'jaminov 1962-68), and other catalogues (see Dubois, Ochsenbein & Paturel, 1983).

Complete syntax is given in Appendix E.

15.1.6 Proper motion

The proper motions ($\mu_\alpha \cos\delta, \mu_\delta$) are given in arcsec/year, together with their standard errors (in 1/1000 arcsec/year) within brackets.

The source is SAO or other astrometric catalogue (see `PM` and `SAO` measurements).

15.1.7 Dimension of galaxy

The following data, when available, are given for galaxies (for more details, see Dubois, Ochsenbein & Paturel, 1983):

$\log D_{25}$	is the logarithm of the major axis a expressed in tenths of arc minutes;
$\log R_{25}$	is the logarithm of the ratio a/b where a and b are the major and minor axis;
orientation	orientation angle (in degrees)
(inclination)	inclination (in units of 15° from 0 to 7)

15.2 Cross–identifications

15.2.1 Aliases

Cross–identifications of stars and galaxies have been searched for SIMBAD entries from (currently) about 1400 source catalogues, included, either completely or partially, in the data base.

The list of *aliases*, thus constituted, is one of the unique features of the SIMBAD database.

The **info cat** command (described in chapter 12) gives access to an on-line database of catalogue descriptions, which is maintained up–to–date in coordination with the *Dictionary of Nomenclature for Celestial Objects* produced at Observatoire de Paris and Strasbourg by M.-C. Lortet et al. (1994).

15.2.2 Multiple systems

It is to be noted that for a double system in which the components can be observed separately, SIMBAD will frequently include three entries: A and B components, and an additional entry for AB carrying the observational data and references related to the system as a whole.

15.3 Observational data

Observational data (also called *measurements*) are presently given for the following measurement types:

CEL	Ultraviolet photometry from *Celescope*
Cl.G	Cluster of Galaxies (Abell & Corwin)
Einstein	The Einstein Observatory Soft X-ray Source List
GCRV	Stellar Radial velocities
GEN	$UBVB_1B_2V_1G$ photometry in Geneva photometric system
GJ	Absolute magnitudes and spatial velocities of nearby stars.
Hbet	H_β index (used in connection with Strömgren's uvby photometry)
HGAM	H_γ equivalent width
IRAS	IRAS Point Source Catalog
IRC	KI photometry from *Two Micron Sky Survey*
IUE	International Ultraviolet Explorer (Merged Observation Log)
JP11	$UBVRIJKLMNH$ 11-colour Johnson's photometry
MK	Stellar spectral classification in Morgan-Keenan system
PLX	Trigonometric parallaxes
pm	Proper motions (in 1950 equatorial frame)
pos	Equatorial positions
ROT	Rotational velocities ($V.\sin i$)
RVEL	Radial velocities of extragalactic objects (quasars and galaxies)
SAO	Positions and proper motions from SAO catalogue.
TD1	Ultraviolet magnitudes from *TD1* experiment
UBV	UBV photometry in Johnson's photometric system
uvby	Photometry in Strömgren's photometric system
V*	Data related to variable stars
z	Redshifts (of distant galaxies and quasars)

For each type, one can retrieve individual data with their bibliographical references, and, when available, weighted means computed from existing observed values by specialists in each data type.

A description of measurement types presently included in SIMBAD is given in Appendix G.

15.4 Bibliographical references

Bibliography includes references to all published papers from the journals regularly scanned (currently about 100 titles; the list is given in Appendix H).

Articles are scanned in their entirety, and references to all objects mentioned are included in the bibliography.

15.4.1 Bibliography

One of the key features of the SIMBAD astronomical database is the unique coverage of bibliographical references to objects. The bibliographic index contains references to stars from 1950 onwards, and to galaxies and all other objects outside the solar system from 1983 onwards. Presently there are about 1,500,000 references taken from 85,000 papers published in the 100 most important astronomical periodical publications. The scanning of the literature is made possible through a collaboration between the Institut d'Astrophysique de Paris, and Paris, Bordeaux and Strasbourg Observatories, which has been described by Laloë (1995).

A code is assigned to each considered paper (we call it a *bibcode*, in our jargon): this 19-digit bibcode contains enough information to locate the article (including year of publication, journal, volume, page, etc.). The structure of this code has been defined in close collaboration with the NED group at NASA/IPAC so that both databases apply the same coding system (Schmitz et al., 1995). It is also used by other data centers and information systems.

When one retrieves the bibliography of a SIMBAD object, a list of codes is given, and (according to the options used) these codes are automatically matched against a bibliographic file which provides for each citation the full reference, title and list of authors.

15.4.2 The abstracts

SIMBAD does not include the abstracts of referenced papers. However abstract services are available, and progress are made to allow easy retrieval of the abstracts for SIMBAD users (see page 50).

An important step, for the CDS, was the creation of an abstract service for *Astronomy & Astrophysics* (main journal and Supplement Series) announced in A&A, 284, E1 (April 1994). This service is made available as part of the CDS World-Wide Web server (Egret and Ochsenbein, 1994), and complements the service already existing for on-line tables of recent papers (Ochsenbein, 1993).

A similar agreement has been implemented with the Publications of the Astronomical Society of the Pacific (PASP) for which the abstracts since January 1994 are available.

15.4.3 Bibliographic reference coding convention

The bibliographic reference coding convention has been defined in cooperation with the staff of NASA/IPAC Extragalactic Database (NED), at IPAC (Schmitz et al., 1995).

Reference codes have the following structure:

YYYYJJJJJVVVVMPPPPA

where:

YYYY	Year of the publication.
JJJJJ	A standard abbreviation for the periodical.
VVVV	The volume number (for a journal) or one of the following abbreviations for another publication: B book, C catalogue, P preprint, R report, S symposium, T thesis, U unpublished
M	Specific qualifier for a paper: L letter, p pink page, a-z issue number within a volume, A-K fascicule number, Q-Z to distinguish articles on the same page.
PPPP	The page number.
A	The first letter of the name of the first author (or ':' if uncorrect or incomplete coding).

There are some exceptions to these rules, but they are of minor importance. For a more complete description see Schmitz et al. (1995), or on the WWW server:
`http://cdsweb.u-strasbg.fr/simbad/refcode.html`.

Example: `1991A&A...246L..24M` for *Astron. Astrophys., 246, 24, 1991 (L)*, a Letter to the Editor of A&A, by Motch et al.

15.4.4 Updating

The bibliography is reasonably complete back to 1950 for stars, but only to 1983 for non-stellar objects (although many earlier papers are included for certain objects).

The updating of SIMBAD is a continuous daily process performed through a collaboration with the Institut d'Astrophysique de Paris and the Paris and Bordeaux observatories. The bibliographers in Paris, Strasbourg, and Bordeaux input directly to SIMBAD from journals as they are received in the libraries. It is therefore highly probable that the references are completely up to date.

15.4.5 Comments in the references

Several types of comments are associated with the references in SIMBAD and normally displayed after the reference with the following headings:

Comments: General comments concerning the reference. Example:
`Comments: Table 1, col. 2: FP = CL* NGC 7078 FP`

Notes: Includes indications about the existence of associated electronic tables, or abstracts in the CDS server. These files are currently available via anonymous `ftp` on `cdsarc.u-strasbg,fr`, or through the World-Wide Web server: `http://cdsweb.u-strasbg.fr/CDS.html`. Papers including no object are also flagged (**no object**). Example:
`Notes: Available at CDS: <table3>`

Dictionary: Includes information on how the objects quoted are named in SIMBAD (comments related to the Dictionary of Nomenclature of Celestial Objects; see Lortet et al., 1994). Example:
`Dictionary: Table 3: <CL* NGC 7078 YGBS NNNN> N=1186`

15.4.6 Resolving a bibliographical reference code

It is possible to obtain the complete bibliographical reference, from the reference code, by typing it in answer to the `simbad search ->` prompt.

A reference code can be supplied without indicating all the fields: the first reference corresponding to the truncated code will be displayed. However, at least three digits are needed. Am ampersand (`&`) should be added to the truncated bibcode (see chapter 7).

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Chapter 16

Managing an astronomical object

The present chapter explains how to handle data related to an astronomical object. Simple object queries have been described in chapter 5.

You will interact with an *astronomical object* agent in several circumstances:

- ▷ As a result of a query by identifier, the database sets the queried astronomical object as current context, which is ready to be displayed.
- ▷ After a sample, when you ask the *object list* agent to display a specific object, this object will appear as a new agent.
- ▷ You can also *keep* an object and refer to it at any moment during the session.

16.0.7 The object name

An *astronomical object* agent has a name related to its origin.

After an interrogation by identifier, the agent receives the name used to query it, for example: {`HD 9902`}.

In an object list, the *astronomical object* agent has the name of the *object list* agent, followed by the number of the object in the list.

If it is a kept *astronomical object* , you may give the name yourself in the *keep* command.

16.0.8 The possible actions

An *astronomical object* agent knows the following actions:

display Such a command displays the astronomical object according to the current format (defined by the environment variable FM-STANDARD, see chapter 19: "Defining formats"). By default, a very general format displaying all data is proposed.

The *display* command accepts, as parameters, names of format entries. This allows you to get specific data displayed as long as you interact with the *astronomical object* agent.

The standard format accepts the following parameters:

basic basic data: object type, coordinates, magnitudes, spectral type (or morphological type), proper motions (or dimensions for galaxies)

id identifier list (aliases)

data observational measurements

cat measurements from catalogue ***cat*** (example: `UBV` or `SAO`)

all all the observational measurements

ndata displays the number of observational measurements

bib bibliographical codes and text.

bibcode bibliographical codes. Displaying only the codes is useful when you have a long list of objects, having often common references. Each displayed reference code is put in a *reference list* agent, and this list will be displayed once automatically at the end of the session. It can be also displayed at any moment by typing **reftext** —a macro command asking *display* to the reflist agent.

nbib lists the number of references (in the range set by the BIBYEARS variable).

keep To keep the astronomical object in the session. If you do not keep it, it will be replaced by the next one accessed.

Adding a name to the command will change the current name of the agent.

bye To leave the *astronomical object* agent.

Chapter 17

Sampling and defining filters

How to create a filter has been briefly described in chapter 8. We give here the full details as well as the complete list of instructions.

Sampling consists of interrogation of the data bank according to the specific criteria you define. Objects are selected according to these criteria and a list of selected objects is presented. Sampling is done in two steps:

- ▷ First, you need to choose a name (***filtername*** in the following) and create a *filter* agent containing the sample criteria written as a set of instructions. Such *filters* can be kept from one session to another. So, if the filter already exists, you just load it into the session.
- ▷ Then, you send a command to `simbad search ->` with the filter name as parameter, preceded by a quote character (as explained in chapter 8).

The sample results are managed by an *object list* agent (described in chapter 18).

17.1 Defining a filter

You get access to an existing filter, or define a new one, through the following command:

session use filter ***filtername***

where *filtername* is the name of the filter you want to use for sampling the database.

If the filter named *filtername* already exists, it then becomes available in the session, for modification (through "***filtername*** **set** ") or immediate use in a query (**simbad search '*filtername***).

If no filter agent exists under the name *filtername*, a new one is created, and the command "***filtername* set** " is automatically invoked to allow definition of the sampling criteria. This can be done in a line-by-line mode (entering the criteria one after the other, at the `filtername set ->` prompt) or through a text editor, by pushing the [CR] key as an answer to the prompt. Usage of the text editor is described in chapter 26.

17.2 Writing filtering instructions

A filtering instruction corresponds to one criterion. Each criterion comprises a keyword and parameters, generally made of a lower limit and an upper limit or some name.

Example: `MB 6.5/9.0`

`DATA SAO`

Criteria can be combined in the following way:

- Criteria written on different lines correspond to the `AND` operator:

```
MB 6.5/9.0
DATA SAO
```

  Select all objects having magnitude B between 6.5 and 9.0 **and** having SAO data.

- Criteria written on one line separated by a '`|`' character correspond to the `OR` operator:

```
MB 6.5/9.0 | MV 6.0/8.5
```

  Select all objects having B magnitude between 6.5 and 9.0 **or** V magnitude between 6.0 and 8.5.

- The `!` character is a `NOT` operator for the criteria concerning basic data other than coordinates, and for catalogues and measurements:

```
DATA !UBV
MB !6.5/8.0
```

  Select all objects which do **not** have UBV data, and with B magnitudes which are **not** in the range 6.5 to 9.0 mag.

Any number of instructions and criteria may be written in one filter. The total size of the resulting sample is not limited.

All available instructions for defining a filter are described in the next section.

17.3 Sampling criteria

In this section, we make use of the following conventions:

<u>RADIUS</u>	An underlined word is a keyword and must be written as it is given
$\left\{ \begin{array}{c} C \\ CG \\ CE \end{array} \right\}$	Represents an alternative. Only one of the terms may be chosen
$\boldsymbol{C}$	Is a default value: if you choose it, you don't need to type it (example: the letter C — for equatorial coordinates — in the CIRCLE or FIELD criteria)
`[n]`	Shows an optional parameter

17.3.1 Criteria concerned with coordinates and fields.

Note: In general a set of criteria should include some limitations in coordinates. These limitations allow you to define a range of coordinate boxes which includes the requested area: all the objects from these boxes are read and checked against the whole set of criteria. SIMBAD has been divided for this purpose into small regions allowing an optimized access by coordinates.

When a set of criteria includes no limits in sky position, the complete database must be scanned —a long and somewhat expensive operation.

CIRCLE $\left\{ \begin{array}{ccc} C & \alpha & \delta \\ CG & \ell_{II} & b_{II} \\ CE & lon & lat \end{array} \right\}$ <u>RADIUS</u> radius

Retrieves all objects in a circle defined by the coordinates of the center (given in equatorial, galactic, or ecliptic system) and the radius (in degrees). Don't forget the sign of the declination. The equinox is defined by the filter criterion EQUINOX, see below (default: 1950.0).

Example:
CIRCLE 12 30 +75 10 RADIUS 4 30
CIRCLE CG 120.3 -43.0 RADIUS 6

FIELD $\left\{ \begin{array}{ccc} C & \alpha & \delta \\ CG & \ell_{II} & b_{II} \\ CE & lon & lat \end{array} \right\}$ <u>DIM</u> long/lat

Retrieves all objects in a rectangle defined by its center and full dimensions (in degrees). The equinox is defined by the filter criterion EQUINOX, see below (default: 1950.0).

Example:
FIELD 0 15 -00 0 DIM 5/5

EQUINOX *year*

Changes the value of the equinox used in criteria CIRCLE and FIELD. Use it only if you want to modify the default value (1950.0). It can be written as a decimal number, and should be given before the CIRCLE or FIELD criteria.

Example:
EQUINOX 2000.0

RA α_0/α_1

Defines limits in right ascension at equinox 1950.0.

Example:
RA 12 30/14 00

DEC $\delta_{min}/\delta_{max}$

Defines limits in declination at equinox 1950.0.

Example:
DEC -02/+03

17.3.2 Criteria concerning other basic data:

MB B_{min}/B_{max}

Limits in B magnitude. They can be given with a precision up to 1/100.

Example:
MB 0/6.5

MV V_{min}/V_{max}

Limits in V magnitude. They can be given with a precision up to 1/100.

Example:
MV 8.31/8.75

B-V $B-V_{min}/B-V_{max}$

$B-V$ limits. They can be given with a precision up to 1/100.

Example:
B-V 0.2/0.5

PM lower/upper

Total proper motion limits: $\mu = \sqrt{\mu_\alpha^2 + \mu_\delta^2}$. The units are arcsec/yr.

Example:
PM 0.1/1.0

SP min/max spectral type

Limits in spectral types. The specified limits refer to three independent values: temperature class, luminosity class and peculiarities. See also: SPT & SPL criteria. The way spectral types are coded in SIMBAD is described in Appendix D.

Example:
SP F0I/G5III

SPT min/max temperature class

Limits in temperature class. This specialized criteria can be manipulated more easily than the general one *SP*.

Example:
SPT B5/A9

SPL min/max Luminosity class

Limits in luminosity class.

Example:
SPL Ia/II

OBJECT object type

Selects according to the object type. Possible values are listed in Appendix F and available on-line by **info otype**. The object type classification uses a hierarchy with four levels, reflecting our knowledge of the characteristics of the astronomical object. For instance, an object can be classified as a "Star" (this is level 1), as a "Variable star" (this is level 2), as a "Pulsating variable" (level 3), or a "Cepheid" (level 4). This hierarchy of object types (and lists of possible synonyms) is managed in the database in such a way that selecting variable stars (`V*`) is understood as selecting objects classified as `V*`, and all subdivisions (e.g. `PulsV*`, `Mira`, `Cepheid`, etc.). For more details, see chapter 15, page 75 and Appendix F.

Example:
OBJECT G

17.3.3 Criteria concerning catalogues and measurements:

CAT catalogue name

Selects objects only when they have an identifier in the specified catalogue.

Example:
CAT HD | SAO | GC

DATA measurement name

Select those objects which have measurements in the specified catalogue.

Example:
DATA UBV

17.3.4 Criteria concerning bibliography

BIB $year_{min}/year_{max}$

Selects objects having references in the specified limits.

Example:
BIB 1985/1990

17.3.5 Sort

SORT [+/-]$crit1$, [+/-]$crit2$

Sorts the resulting sample according to a list of sorting criteria.
+ is for ascending order; − is for descending order.
Sorting criteria are among the following list: `OTYPE, RA, DEC, RADIUS, MB, MV, SP, SPT, SPL, PM, B-V.` `RADIUS` is the distance from a center, and applies only associated with the `CIRCLE` keyword. Otherwise the sorting criteria are independent from the sampling criteria.
The SORT command can be written anywhere in the filter.

Example:
SORT -MB, +SP

17.4 Submitting the sampling query

This is made by sending to the agent *simbad* the name of a previously defined filter. The name should be preceded by a quote ('). The reason for that was given in the chapter 8: "How to create a list of objects".

Your command will look like:

`simbad search ->'`***filtername***

Example: You have prepared a filter named **calib** and containing the following instructions:

```
FIELD  18 35.2  +38 44  DIM 5/5
MV  6.5/9.0
DATA UBV | uvby
```

```
filter set -> bye
```

You submit it by replying:

```
simbad search -> 'calib
```

to the main prompt. A list of the astronomical objects belonging to the given field, and fulfilling the other specified criteria will be generated.

Sampling generates an *object list* agent. It is available after the sampling command for displaying objects, be saved, etc. How it works is described in the chapter 18: "Managing an object list".

Chapter 18

Managing an Object list

A SIMBAD query resulting in a list of retrieved objects generates an *object list* agent which remains available after the query.

This *object list* can be used temporarily, for the duration of the session, to display the individual objects it contains. Different ways of displaying are available. The list can also be kept from one session to the other, and maintained as a list of interesting objects. You can add individual objects to such a list, merge different lists generated independently, and perform several other functions.

These *object list* agents have an automatic or explicit naming convention.

18.1 Object list naming convention

When making a query which generates an object list, if you do not specify a name for the *object list* agent, it will be automatically named according to the following system: the nth list generated within a session is named:

database_name`-list`n (ex: `simbad-list1`).

All agents with such names are destroyed at the beginning of the following session.

You can give an explicit name to an *object list* agent by two ways:

1. specifying an object list name when submitting the filter query:
   "simbad search *filtername objectlistname*"
2. or further during the session, by renaming the agent:
   "*object_list* name *newname*"

Object list agents having such names are kept from one session to the other.

18.2 Displaying an object list

The command "***object_list* display *parameters***" allows to display the objects contained in an object list.

There are three possible parameters:

all to display all astronomical objects using the current format

n to display object #***n*** in the list.

+n to display ***n*** objects from the current one in the list

18.3 Selecting a specific identifier for a list

The command `selectid` followed by the name of a catalogue, for example:
`selectid HD`
permits the selection of a specific identifier for a list, e.g., the result of a position or sampling criteria query.

The effect of this command is to change the list format, and display the identification from this catalogue in the identification column, preferably, when the object belongs to this catalogue. The identification listed is unchanged for all objects not pertaining to the catalogue (i.e. in this case, it is simply selected as the first one in the list of aliases existing for the object).

Imagine you want to select all the SAO stars in an area of one degree around a given position. The dialog with the database will look like:

```
simbad search ->/session use filter demo
demo set ->CIRCLE 2 29 -70 49  RADIUS 1
demo set ->CAT SAO
demo set ->bye
simbad search ->'demo
Number of objects found:        9
#1   |  *|CPD-71 122      |02 18 13.3   -70 54 26   |A2V      | 8.7 - 8.7
#2   |  *|CPD-72 181      |02 26 02.0   -71 42 56   |F5V      | 9.5 - 9.1
#3   | **|CPD-70 165      |02 32 26.4   -69 57 48   |F7V      | 9.3 - 8.9
#4   |  *|SKY# 3595       |02 24 46.42  -70 19 35.7 |F0IV     | 8.0 - 7.6
#5   |  *|SRS 18663       |02 26 21.21  -70 07 49.7 |K1II/III|10.0 - 9.1
#6   |  *|CPD-70 164      |02 31 50.5   -70 20 11   |K2III    | 9.4 - 8.2
#7   |  *|CPD-71 138      |02 29 27.8   -71 08 14   |A3m...   | 9.1 - 8.9
#8   |  *|SKY# 3803       |02 33 21.30  -70 59 11.1 |M2III    | 9.5 - 7.9
#9   |  *|SKY# 3945       |02 38 21.89  -70 53 39.7 |K4III    | 8.2 - 6.7
```

Now, typing `selectid SAO` will give you the SAO numbers of the stars retrieved, directly, rather than giving any of their other names.

```
simbad-list1 display ->selectid SAO
simbad-list1 display -> <CR>
#1   |  *|SAO 255872     |02 18 13.3   -70 54 26   |A2V      | 8.7 - 8.7
#2   |  *|SAO 255886     |02 26 02.0   -71 42 56   |F5V      | 9.5 - 9.1
#3   | **|SAO 248596     |02 32 26.4   -69 57 48   |F7V      | 9.3 - 8.9
#4   |  *|SAO 255883     |02 24 46.42  -70 19 35.7 |F0IV     | 8.0 - 7.6
#5   |  *|SAO 255887     |02 26 21.21  -70 07 49.7 |K1II/III|10.0 - 9.1
#6   |  *|SAO 255896     |02 31 50.5   -70 20 11   |K2III    | 9.4 - 8.2
#7   |  *|SAO 255894     |02 29 27.8   -71 08 14   |A3m...   | 9.1 - 8.9
#8   |  *|SAO 255902     |02 33 21.30  -70 59 11.1 |M2III    | 9.5 - 7.9
#9   |  *|SAO 255910     |02 38 21.89  -70 53 39.7 |K4III    | 8.2 - 6.7
```

With the same command you will find easily, after a simple query by position all the SAO stars in the list of retrieved objects within 1 degree of a given position (assuming you have typed `cooradius 1` to change the default 10 arcminutes to one degree).

This is also useful for all generic queries (for instance if you list all the galaxies from the Arp's Atlas of Peculiar Galaxies you may find it helpful to type `selectid APG`). The vertical bar (`|`) can be used as an OR symbol for a priority list of catalogues (see also Chapter 19 for an example of priority list):

```
selectid HD | SAO |NGC
```

The priority list remains effective throughout the session, unless it is replaced by a new one. It is possible to restore the default value (which is the first one in the list of aliases existing for the object) by typing:

```
selectid 1
```

18.4 Object list operations

Note: *The features of this section are not yet available.*

You can perform several operations on *object list* agents:

"***objlist*** **add** ***astrobject***"
"***objlist*** **del** ***astrobject***"
"***objlist1*** **and** ***objlist2***"
"***objlist1*** **or** ***objlist2***"
"***objlist1*** **not** ***objlist2***"

18.5 Managing an object list

Note: *The features of this section are still under development.*

Several commands allows you to manage an object list:

"*objlist* describe "
"*objlist* kill "
"*objlist* set comment *text*"
"*objlist* name *newname*"

Chapter 19

Defining formats

All output presentation for data, on screen or on file, are defined through *format* agents.

During a session, three differents formats are used in three different circumstances:

▷ An immediate format.
It is used for the immediate output when an object is accessed by identifier or by its number in an *object list* .

▷ A standard format.
This format is used while querying data related to a retrieved astronomical object through the command "***astrobj*** **display** ". It may contain named sub–entries which can be given as parameters to the command.

▷ A list format.
Which is used for brief displaying of object list (one line per object), through the command "***objlist*** **display all**"

The software provides default formats for these three usages. As long as you are satisfied with them, you don't need to read the remainder of this chapter.

19.1 Getting your own formats in the session

Defining and using your own formats in SIMBAD is made through the following steps:

1. Create or acquire a new format.

   There are two ways of doing this:

- ▷ The command
  "session use format *formatname*"
  loads an existing format with the given name. If none exists, then a *format* agent with this name is created, you receive the prompt `format-name set ->` and you may write the format instructions (see 2.).
- ▷ The command
  "*formatname* clone *new_name*"
  copies an existing format (a default format or a format you have created; in this case it must be loaded in the session by the previous command), allowing you to modify it, rather than writing all instructions from scratch. With this command, you will be able to copy in your own environment the default formats and edit them.

2. Write instructions or edit the format.

   This is done through the command:

   "*formatname* set "

   You can then choose to enter the format instructions on a line-by-line basis (as answers to the `formatname set ->` prompt) or enter the editor (see chapter 26) by first pushing the [CR] key. This will allow you to display, write or edit the instructions for the format. Note that the last instruction of your format should be: FIN.

3. Make the format available to use.

   Even when loaded in the session, and having its instructions, a format is still inactive: dozen of formats can be present in the session, the programme needs a way to know which one it should use.

   This is done through environment variables. Three variables define the formats to use in the three different cases defined above. They are:

FM-IMMEDIATE	for the immediate format used when accessing an object
FM-STANDARD	for the standard format used by **"*astrobj* display "**
FM-LIST	for the format used for lists in tabular form

   You can check the current value of these variables by asking the *env* agent to display its variables (chapter 20):

   "env display "

   And you will find, among other variables[1]:

[1] The names of the variables (FM-IMMEDIATE, FM-STANDARD, FM-LIST) are typed in upper case letters. The names of the default formats are the same names, but written in lower-case letters.

```
FM-IMMEDIATE="fm-immediate"
FM-STANDARD="fm-standard"
FM-LIST="fm-list"
```

To link your own format to one or several session formats, you need to redefine the corresponding environment variables by the command:

"env set *VARIABLE = yourformat*"

where *VARIABLE* may be any of the environment variables described above[2].

From this moment on, your format will become active when needed.

4. Make the format change permanent

   We have described how to define new formats and make them available to the session. But, while the format file will be kept from one session to another in your directory, it will be replaced by the default formats at the beginning of a new session, unless you modify your user command file. This file contains commands which are executed at the beginning of each session, before you receive the first prompt (it is equivalent to a `login.com` file on VMS, a `.login` or `.profile` file on UNIX for instance).

   You have access to this file, for editing, through a command addressed to the *user* agent (see chapter 23). The name of your user agent is *your username*:

   "*username* set cmdfile"

   which calls the text editor.

   To make a format permanently available, you need to enter the following commands[3] in *cmdfile*:

   ```
   /session use format yourformat
   bye
   /env set FM-IMMEDIATE=yourformat
   ```

   to change the immediate format for instance. You can of course change all formats.

19.2 How to build a format

Formatting instructions are written using an embedded text editor inside SIMBAD software. By default, this editor is the *vi* UNIX editor (see chapter 26).

Formatting instructions are written in the order you want the data to appear. Maximum line length will drive line skips where skips are not explicitly specified.

[2]We recommend using upper-case letters for the variable name and lower-case letters for the format name

[3]The '/' character allows you to address a command to an agent —session or env, here— without making it the current agent; the bye is an answer to the prompt '`yourformat set ->`' generated by the 'session use'

There are two kinds of formatting instructions.

- ▷ **data instructions:** These instructions trigger the display of some data: COO for coordinates, MES for measurements, etc.
- ▷ **presentation instructions:** They are concerned with the disposition of data on the output: SKIP to skip lines, TEXT to insert some general text and so on.

A formatting instruction consists of four parts:

1. **Instruction name**
   This name defines the instruction, like COO, TEXT, SKIP, etc... The complete list is defined below.

2. **General presentation parameters (gparm)**
   Enclosed in parenthesis, these parameters have the following syntax:
   ```
   (output-length, ["introduction text"])
   ```
   The `output-length` is used to give a fixed length to the displayed data. Otherwise, the length will be adjusted to the length of the data. This is especially useful for table output.

   The `introduction text` will be written in front of the corresponding data.

   This part of an instruction is optional.

3. **Specific parameters**
   These parameters depend on the instruction and may have different syntaxes. They will be described for each instruction later on.

4. **Subfield definition (subfields)**
   This part of an instruction allows you to select fields in the data. You need of course to know exactly how the data are usually displayed to be able to select the right fields (see Annex G).

   Subfield definition has the following syntax:
   ```
   (pos,lg[,text]    pos,lg[,text]  ...)
   ```
   As many subfield as you want can be defined. Text should be within quotes. The order can be modified and fields can overlap. Each field is defined by its position `pos` and its length `lg`. `text` is optional: if present, it will be displayed after the subfield.

   Don't use this instruction element if you want the whole data.

Alternative displays:

You can define in a format alternative data to be displayed if one is absent. This is done by writing the different instructions separated by '`|`'.

Examples:

You want to display stars and galaxies in a file. The first have proper motions, the latter have dimensions. You can display this information in the same column by writing the instruction:

```
PM (24) | DIM
```

You want a column with one identifier: HD if it exists, SAO if not, V* if neither HD, nor SAO exist, and lastly, if none of these exist, the first identifier present. This can be done with the instruction:

```
ID  HD | SAO | V* | 1
```

The following section will contain the complete list of formatting instructions. For each of them, you will find the complete syntax and the description of the specific parameters. An example will also be given.

19.3 The formatting instructions

Presentation instructions

SKIP [n]

Skip n lines. The default is skip to the next line.

Example:
SKIP 3

TEXT "*text*"

The text will be written at the current position. The example shows how to separate columns by a vertical line in a table output.

Example:
TEXT "`|`"

Special characters can be inserted, as in C language formats:

`\n`	line feed	`\t`	tabulation	`\f`	form feed
`\r`	carriage return	`\b`	backspace	`\a`	alarm (ctrl-G)
`\377`	Octal number defining any byte.				

IC 'c' n

Insert the specified character ***c***, n times. Use the example to draw an horizontal line 80 char. wide.

Example:
IC '-' 80

FIN

Finish the formatting programme. This must be the last instruction. It has no parameters.

Example:
FIN

 # comment line

This line is a comment line available, for your own use, in the format file. The **COM** keyword has the same effect.

Example:
This is my first format !

LLG *length*

Defines the size of the output record (maximum value: 10240). The default value is 80 characters.
This can be used when creating an output file with the '**>**' special command (see chapter 22).

Example:
LLG 132

19.3.1 Data instructions

OBJID [gparm]

Display a general identifier for the astronomical object. It depends on the origin of the object. If it comes from a query by identifier, then it is the identifier which has been given as a search key. If it comes from a list, then it is the sequential number of the object in the list.
In the following example we leave 10 characters for displaying the object identifier.

Example:
OBJID (10)

$$\textbf{ID [gparm]} \left\{ \begin{array}{c} A \quad [*] \\ 1 \\ [+] \quad catname \quad \texttt{[N=}\boldsymbol{nb}\ \texttt{|}\ \#\ \texttt{]} \end{array} \right\}$$

Display identifiers. The options are:

▷ **A [*]**
Display all identifiers, with a tabulation value of 25 columns. An appended '∗' suppresses tabulation, and provides a more compact display. "`ID` *(lg)* `A`" understands (lg) as the maximum length of the output line, regardless of the parameter LLG.

▷ **1**
Displays the first identifier, independently from which catalogue it comes.

▷ [+] The plus sign can be used to force right-justification of identifiers (e.g. so that `HD      1` is justified as `HD 123456`, rather than the default `HD 1`).

▷ ***catname***
Displays the identifier(s) from the specified catalogue.

▷ [N = ***nb***] [#]
N=*nb* may limit the number of occurrences of ids from the catalogue ***catname***, in exceptional cases when several identifiers from the same catalog do exist;
the number of identifications can itself be displayed by ***catname*** **#** .

Example:
ID A
ID HD | SAO | NGC

$$\textbf{COO [gparm]} \left\{ \begin{array}{c} Q \\ G \\ E \end{array} \right\} \textbf{[1|2] [D|R]} \ [\boldsymbol{equinox}] \ [\boldsymbol{precision}]$$

Equatorial (Q) —default value— Galactic (G) or Ecliptic (E) coordinates.
The default value for the equinox is 1950.0. It can be written as a decimal number.

The precision is a code which can have the following values:

code	definition
0	1 ^{o}
1	1/10 ^{o}
2	1 '
3	1/10 '
4	1 "
5	1/10 "
6	1/100 "
7	1/1000 "

If not specified, the precision will be the one associated with the coordinates in the database. The letter **p** instead of a code generates the display of the SIMBAD precision code, within parentheses.
A precision code followed by a '!' force the coordinates to the given value even if it is smaller in SIMBAD.

Equatorial coordinates display can be completed with the following parameters:

- ▷ 1|2 designates the first (R.A) or second (DEC) coordinate allowing to display only one of the cordinates;
- ▷ D|R allows choice of units as (decimal) Degrees or Radians.

Example:
COO (27,"Eq. coord = ") Q 1990.0 4
COO (27) 1950.0 5!
COO Q1 D

MAG [gparm] [subfields]

Displays the magnitudes contained in the basic data field.

Example:
MAG (8,"mb=") (1,6) ... will display MB on 8 chars

PM [gparm] [subfields]

Displays the proper motions contained in the basic data field.

Example:
PM (20)

DIM [gparm] [subfields]

Displays the dimensions of galaxies contained in the basic data field.

Example:
DIM (20)

SP [gparm] [*length*]

Displays the spectral type stored as basic data.

length defines the number of bytes that are displayed. Most of the spectral types need less than 5 chars, but this field can be as long as 36 chars. Default length is 10 chars. A different value can be given in the *gparm* field in the sense that you can display 10 chars of a spectral type in a 20 char wide column.

Example:
SP 15

MT [gparm] [length]

Displays the morphological type of galaxies.

Same syntax as **SP**.

Example:
MT 10

OBJECT [gparm] [E]

Displays the object type (star or galaxy) as follows: $*$ (star), G (Galaxy), G$*$ (star in external galaxy), or **?** (other non-stellar object).

The **E** (Extended) option displays the object type as a full word (star, galaxy).

Example:
OBJECT (2)

OTYPE [gparm] $\left\{ \begin{array}{c} S \\ E \\ V \\ N \end{array} \right\}$ **[1..4]**

Displays the object type (object classification) in **S**hort display (less than 6 chars), **E**xtended display (can be up to 20 chars), **N**umeric form, or **V**erbose display (extensive explanation).
1 to 4: level of the object type classification scheme to which the object type is to be displayed, see Appendix F.

Example:
OTYPE S4

MES [gparm] $\left\{ \begin{array}{c} A \\ cat \end{array} \right\}$ $\left\{ \begin{array}{c} F \\ M \\ A \\ N \end{array} \right\}$ **[S] [H] [B [*y1* [,*y2*]]] [subfields]**

Display measurements. The different options are:

- ▷ First option $\left\{ \begin{array}{c} A \\ cat \end{array} \right\}$ **A**ll catalogues, or the one specified by its name. The standard formats use here the environment variable **MESCAT** (default value: **A**).
- ▷ Second option $\left\{ \begin{array}{c} F \\ M \\ A \\ N \end{array} \right\}$ To select **F**irst, **M**ean or **A**ll measurements, or give the **N**umber of measurements. If no mean value exists, the first measurement is displayed. The standard formats use here the environment variable **MESTYP** (default value: **A**).
- ▷ Third option [S] To **S**kip a line after the display of each catalogue.
- ▷ Fourth option [H] To print the column **H**eaders.
- ▷ Fifth option [B [*y1* [,*y2*]]] To display the bibliographic text immediately, and eventually restrict the one displayed by limiting the year range (*not yet implemented*).

Example:
MES PLX A
MES MESCAT MESTYP H

REF [gparm] $\left\{ \begin{array}{c} \# \\ nb \\ T \\ F \end{array} \right\}$ **[*y1*,*y2*]**

Display bibliographical reference information according to the following options:

- ▷ #
  displays the number of references.
- ▷ ***nb***
  displays *nb* reference codes (bibcodes) by line.
  These codes are collected by a *reference list* agent. The command **reftext** resolves, once for each bibcode, the reference text. This is automatically triggered at the end of a session.

▷ **T**
displays immediately the text for each reference.

▷ **F**
This option allows full flexibility in the presentation of the reference, using a C -like format with the keywords:

%C	reference code	%T	title
%A	author list	%E	erratum/addendum
%J	journal	%N	note/comment

▷ `[`***y1*,*y2***`]` Limits the display to the specified year limits.

Example:

```
REF T
REF F "authors: %A\nJournal: %J\nTitle: %T\n\n" 1900/1993
```

Chapter 28 gives the full printout of the three main default formats. These formats can be used as templates.

19.3.2 Example

In the following example we will produce a format giving, in one line per object, a selected identifier, coordinates in a unified format (to the tenth of arcsec.), magnitudes and object type. The identifier will be chosen in the following catalogues (in that order): HD, BD, CD, CPD, V*, NGC, IC, or the first one appearing in the database.

In order to create the above format as **ff**, and replace the default (immediate) format by this one, the following command sequence can be used:

`simbad search ->` **/session use format ff**
`ff set ->`
here, type [CR], then ***i*** *for input mode, then enter the text of the format:*

```
ID(20) HD|BD|CD|CPD|V*|WD|GD|NGC|ID IC|1
TEXT "|"
COO (27) 1950.0 5! | IC ' ' 27
TEXT "|"
MAG (16) (1,16," ") | IC ' ' 17
TEXT "|"
OBJECT (2)
FIN
```

type [esc] then ***:wq*** *for leaving the editor*

`ff set ->` **bye**

`simbad search ->` **/env set FM-IMMEDIATE=ff**

Interrogating SIMBAD for one object we get the following output:

```
simbad search -> HR 5999
HD 144668           |16 05 12.78  -38 58 22.7   | 7.41    7.05|*
```

Chapter 20

Environment variables

The SIMBAD software uses a certain number of general parameters, which are made available to the user through environment variables: easy commands allow the user to modify the default values of these parameters (query radius, year range, display format, etc.).

These variables are maintained by an agent called *env* . Actions that can be requested are: *display* and

display to get the list of the currently defined variables,

set to define a new variable or modify an existing one, and

bye to leave the environment agent.

The command **env display** gives the following display, showing the default values of all system defined variables:

```
BIBYEARS = "1850/1999"
COOEQUINOX = "1950.0"
COORADIUS = "0 10"
EDITOR = "vi"
EQUINOX1 = "1950.0"
EQUINOX2 = "2000.0"
FM-BIBLIOGRAPHY = "fm-bibtxt"
FM-IMMEDIATE = "fm-immediate"
FM-LIST = "fm-list"
FM-STANDARD = "fm-standard"
LISTID = "1"
MESCAT = "A"
MESTYP = "A"
```

You can modify all these variables. You can also have them permanently modified by writing the corresponding commands in your user command file. This is described in the section "Getting your own formats" of the chapter 19: "Defining formats".

You can also create new variables (to be used in your own formats for instance).

Here is a short description of these variables (for more information use the index at the end of this User's Guide):

BIBYEARS	Used in default formats to set up the limits of years when displaying the bibliography.
COOEQUINOX	Equinox of input coordinates in query by coordinates
COORADIUS	Radius used in query by coordinates (degrees)
EDITOR	Editor used for format, filter or user command file editing
EQUINOX1	First equinox. This variable is used by all default formats
EQUINOX2	Second equinox. This variable is used to display a second set of equatorial coordinates in the default standard format
FM-IMMEDIATE	Immediate format definition (see chapter 19)
FM-LIST	List format definition
FM-STANDARD	Standard format definition
MESCAT	Measurement catalog(s) to display. This is a variable used by the default standard format (see chapter 19)
MESTYP	Type of measurement to display. This is a variable used by the default standard format

These variables can be used inside a format (or filter): an example is MESCAT and MESTYP, used in the `fm-standard` default format. In this case, if you modify these variables using the command **"env set VAR=*value*"**, the format itself (for instance `fm-standard`) will not be immediately modified, unless you type the command **"format compil"**. And that would have to be done for each format using that variable.

In this case, we recommend use of the command **"session define agent-class *variable=value*"** which modifies the corresponding environment variable **and** recompiles all formats or filters present in the session.

Example:

```
/session define format BIBYEARS=1992/1996
```

Chapter 21

The session

The *session* agent manages the interaction between the user and all other agents in the programme.

1. **For ending the session:** You have to ask the *session* agent to *exit* :

   "session exit "
   This can also be done by typing `stop`.

2. **For accessing or creating new agents in a session:**

   This is done through a command like:

   "session use *agent-class agent-name*"

   The agent classes for which such a command is available are:

database	to have access to another simbad-like database
format	to load or create a new format agent
filter	to load or create a new filter agent
objlist	to recall a previously created object list

3. **For modifying format or filter variables**

   Formats and filters can contain environment variables (as described in chapter 20) such as: MESCAT, MESTYP, etc. If you modify these variables using the command **"env set VAR=*value*"**, the format itself will not be immediately modified, unless you type the command **"format compil "**. And that would have to be done for each format using that variable.

   The command **"session define *agent-class variable=value*"** modifies (or creates) the corresponding environment variable and recompiles all formats or filters present in the session.

Chapter 22

Managing the user interface

The present document describes the user interface as available for simple terminals (VT100), as opposed to XWindow terminals, for which a specific `XSimbad` application is available. If you have access to an X-terminal or a workstation, please refer to page 13, or to the World-Wide Web service of the CDS to find out how to import and install `XSimbad` as a local application on your own workstation.

22.1 The user interface agent

The user interface (*uif*) agent is used for managing the input/output aspects of SIMBAD. It is based on Proteus/Termwindows, an uif toolbox for input/output software, developed at ESO and ST-ECF (Garching).

This agent presently provides two modes of input/output:

1. **a line-by-line (tty) mode** which can be used on any kind of terminal. It allows line by line prompting and answering. Every display is done line by line. This is presently the default value.

2. **a full-screen mode:** designed for VT100 terminals, and which makes use of the Proteus/Termwindows tools. Prompts, data displays, error displays, auxiliary information display, are done on different independent windows.

It is possible to change the input/output mode, but also to modify the source of the input (either terminal keyboard or file) and the output (screen or/and file).

The page display mode (either page by page [20 lines] or continuous) can also be controlled.

Most of the commands are emulated by macro.

22.2 The user interface commands

The user interacts with the *uif* agent with two verbs: *bye* (standard), and *set* . The command **"uif set "** accepts the following parameters:

- ▷ **screen** This parameter has the possible values : **simple**, **usual** (may be abbreviated as **s** and **u**) which select respectively the tty and full-screen mode.

  The same result can be obtained with the macros (see chapter 25): **tty** and **full**.

  Example: here are three equivalent ways to restore the default screen interface[1]:

```
/uif set screen simple
/uif set s s
tty
```

- ▷ **screenoutput** this parameter has two possible values **yes** or **no**. The command **/uif set screenoutput yes**, emulated by the macro **displayed** allows output on the screen (default value). The command **/uif set screenoutput no**, emulated by the macro **undisplayed** stops the screen display (this is something you may wish to do in order to save time while storing the results from SIMBAD into a log file —see chapter 11).

  Example: here are three equivalent ways to stop the text display:

```
/uif set screenoutput no
/uif set s n
undisplayed
```

- ▷ **fileoutput** This parameter has two possible values **incre** and **decre** and requires an additional parameter: ***filename***.

  The command **/uif set fileoutput incre file1.dat** emulated by **'> file1.dat'** opens the file `file1.dat` and forces the output to be directed in this file. Actually, the effect of the > macro command is also to stop the output on the screen.

  The command **/uif set fileoutput decre** emulated by >| closes the last file opened. These commands can be nested (a pile of output files is managed). The effect of >| is also to redirect the output on the screen.

  An important example is the use of these commands for managing a log file of name `simbad.log` through the macro commands:

log	keeps a log of the session in a file 'simbad.log'
sendlog *user@node.domain*	sends the log file through e-mail (Internet)
sendlog *node::user*	(or SPAN/Decnet)

[1] The '/' character used in the macro instruction allows you to send a command to an agent without making it the current agent (and thus staying, for instance, at the `simbad search ->` prompt).

The **sendlog** instruction closes the file, before sending it to the mailer.

Example: How to record the information available for R Aquarii in a file named raqr.dat:

```
/uif set fileoutput incre raqr.dat
simbad search  R Aqr
all
 >|
```

▷ **inputfile** This parameter has two possible values **incre** and **decre** and requires an additional parameter, "***filename***".

The command **/uif set inputfile incre file1.com** forces the commands to be read in the file `file1.com`. It can be emulated by < **file1.com.**.

The command **/uif set inputfile decre** stops the reading of the commands in the last opened input file. It can be emulated by <| or forced by the end of the input file. These commands can be nested. This command can be used for running a full set of commands prepared in advance and stored in a file.

▷ **page** This parameter has two possible values:

yes (the default value) generates an output display page by page, with the question:
`Do you want to see more ?`
being prompted after 20 lines (to which you can answer: **y**es, **n**o, or **c** —this last one generates the continuous mode).

no generates a continuous display (recommended when you are having a log file, see chapter 11).

These commands are emulated by the following macros:
/uif set page yes by the macro **page**,
/uif set page no by the macro **cont**.

Example: here are three ways to stop the page by page display; the first two are equivalent and modify the environment, while the third one (in answer to the mentioned prompt) triggers a continuous display only in the specified context:

```
/uif set page no
cont
Do you want to see more ? c
```

Chapter 23

The user Agent

The user agent allows handling information related to the user profile. The main usage is for storing personal format of macro in the file `user.cmd`.

23.1 Modifying the user's profile

We describe in chapter 19 how to define a new format and make it available to the session. But, while the format file is kept from one session to another in your directory, it will be replaced by the *default* formats each time you begin a new session, unless you modify your personal *user command file*. This file contains commands which are executed at the beginning of each session, before you receive the first prompt (it is equivalent to a `.login` or `.profile` file on UNIX for instance).

You have access to this file, for editing, through the following command, where the name of the agent is *your userid*:

"***userid*** **set cmdfile**"

In the following example we assume your userid is `tv453ab` and we show how to modify the default value of the equinox of coordinates from 1950 to 2000[1]:

`simbad search ->` **tv453ab set cmdfile**
`tv453ab set ->`
here, enter the following text:

```
#  The default equinox will be 2000
/env set COOEQUINOX = "2000.0"
equi1  2000.0
```

[1] The '/' character used in the macro instruction sends a command to an agent without making it the current agent

```
equi2  1950.0
```

type [esc] then ***:wq*** *for leaving the editor*

`tv453ab set ->` **bye**

The same procedure can be used for storing customized macro commands (see chapter 25).

23.2 The user agent commands

The *user* agent allows management and display of various parameters associated with the user's personal profile: full name, address, creation date, privileges, etc. It is possible for a user to interact with his/her user agent (whose name is the simbad *userid* of the user) with the following verbs: *display* , *modify* , *write* , *set* , *bye* .

bye has the standard effect (leaving the agent).

display displays all the information related to the user (*up to now these fields are* not *used; the data related to individual users are handled in a different way*).

modify This verb allows to modify data related to the user. It accepts the following parameters : U for username, P for password, S for Span address, P for PSDN address, E for Electronic mail Address, A for postal address.

These parameters are to be followed by the new value. *Again: this information is currently not used. The user can change his/her password by invoking the command* ***password*** *within SIMBAD.*

write Saves the (eventually) modified user characteristics in the user file.

set With this verb and the **cmdfile** parameter, you can edit and modify your `user.cmd` file. This allows you to store customized default formats and parameters. An example was given in the previous section.

Chapter 24

The internal Mail facility

A *mail* agent manages the messages between the CDS and the user. This comes as a complement to the standard way of sending a message (through electronic mail to `question@simbad.u-strasbg.fr` or `simbad::question`. For sending back files to or from your home computer see chapters 9 and 11).

The user can interact with the *mail* agent with the verbs: *send* , *read* , *save* , *bye* .

send This verb allows the user to send a line of message to the CDS. After the first line, type [CR] for a second line and so on. To finish the input of the mail and send it effectively it is necessary to type **bye** at the beginning of a line.

read This verb allows the user to read a message from the CDS or to be informed that there is no message.

save This verb allows the user to save the content of the message from the CDS in a file, the name of which can be chosen.

bye This verb has the standard effect, except after *send* when it sends the mail effectively to the user, before producing the standard effect (i.e. leaving the mail agent).

Chapter 25

Macro language

The macro language is a feature that allows expert users to define their own commands in SIMBAD, generally by combining several basic commands.

It uses a simple mechanism of text substitution during command analysis. By this way, it is even possible to completely modify the standard mode of querying SIMBAD and interacting with the agents.

25.1 Some definitions

Every command is made of a succession of words separated by spaces. During parsing of a command, the system looks for words corresponding to a macro definition. If such a definition exists, the word in the command is replaced by the definition of the macro. Moreover, if the macro is defined with parameters, the words following the macro name in the command are used as parameters.

A macro is written like simple commands, eventually with arguments (parameters): parameters which will be given at execution time are replaced by **$**$n$, where n represents the nth argument (arguments are words separated by one or several spaces) following the macro name at execution time. In the second example below, myformats is recognized as a macro name, $1 is substituted by *myimmformat* and $2 is substituted by *mylistformat*.

The following special characters can be used:

- **$** — **$**n substitutes the nth argument (word) following the macro name; **$$**n substitutes the whole string of arguments from the nth to the end.
- **;** — The semi-colon (;) is a command separator, allowing one to write several commands on the same line. It is recommended to use quotes surrounding

the complete definition of the macro in order to avoid the analyzer taking this semi-colon into account during the macro definition.

– The '–' character at the end of a line is an indication that the command continues on the next line.

/ The '/' at the beginning of a command sends the command to an agent without making it the current agent, thus avoiding to modify the current context.

Macros are maintained by an agent called *macro* . It is of the same agent class as the *env* agent. So the same actions are available: *display* for displaying the list of existing macros and *set* to modify an existing macro or create a new one.

25.2 Some examples

▷ By defining:

"macro set stop = session exit"

you may modify the ordinary way of quitting a session: you can now type *stop* , rather than typing the complete command **"session exit "**

This is an example of macro without parameters.

▷ You want sometimes to modify both the list format and the immediate format. This needs normally two commands:

```
env set FM-IMMEDIATE = myimmformat
env set FM-LIST = mylistformat
```

You can simplify these commands by defining the following macro:

```
macro set myformats = "/env set FM-IMMEDIATE = $1 ; -
                        /env set FM-LIST = $2"
```

and then use the command at any moment during a session:

```
myformats myimmformat mylistformat
```

▷ You want to interrogate a certain number of objects, obtaining only data given by the *immediate* format —eventually your own one—, but you would like to avoid having to type *bye* after each interrogation to leave the *astronomical object* agent. You can do this by defining the following macro:

```
macro set look = "$$1 ; bye"
```

As defined here, this macro must be used in conjunction with the `simbad search ->` prompt:

`simbad search -> look SAO 234`

... data displayed ...

`simbad search -> look SAO 248`

...

`$$1` is used here, rather than `$1` to indicate that all words typed after the command name must be used as substitution. This is needed here, because we substitute an identifier which consists of a variable number of fields separated by spaces.

These three examples show you how powerful such macros can be. You can of course build your own macros and have them permanently present in your sessions by putting them in your user command file (see chapter 23).

25.3 The system–defined macro commands

A certain number of macros are defined at the system level. You can see them with the command **"macro display "**. You can also replace them by your own definitions.

`macro display ->`[CR]

```
basicdata = "/env set FM-IMMEDIATE=fm-immediate; /env set FM-LIST=fm-immediate"
bibliography = "/env set FM-IMMEDIATE=fm-refs; /env set FM-LIST=fm-refs"
bibyears = "/session define format BIBYEARS = $$1"
catalog = "session define format MESCAT = $1 ; format MESTYP = $2 ; bye ; data"
cont = "/uif set p n"
cooequi = "/env set COOEQUINOX = $1 ; /env set MAJEQUINOX = $1"
cooequinox = "/env set COOEQUINOX = $1 ; /env set MAJEQUINOX = $1"
coolist = "/session host prepcoolist $1 > coolist.tmp ; -
      /uif set i i coolist.tmp; /session host rm coolist.tmp"
cooradius = "/env set COORADIUS = $$1"
coord = "$$1 ; bye"
displayed = "/uif set s y"
equi = "/session define format EQUINOX1 = $1"
equi1 = "/session define format EQUINOX1 = $1"
equi2 = "/session define format EQUINOX2 = $1"
findgsc = "/session host /usr/local/bin/findgsc $$1"
full = "/uif set s u"
fullhelp = "full ; /hhelp display ; tty"
help = "/hhelp display"
ident = "simbad search $$1; bye"
```

```
idlist = "/session host prepidlist $1 > idlist.tmp ; -
      /uif set i i idlist.tmp; /session host rm idlist.tmp"
info = "/session host infoless '$$1'"
infocat = "/session host grep -i \'$$1\' /usr1/dbsimbad/note_cat | more"
listdata = "/env set FM-IMMEDIATE=fm-list; /env set FM-LIST=fm-list"
log = "/uif set f i simbad.log"
lookbib = "macro off; /session host /xb3a/local/bin/simbib $$1; macro on; bye"
maxdata = "/env set FM-IMMEDIATE=fm-standard; /env set FM-LIST=fm-standard"
page = "/uif set p y"
pageno = "/uif set p N"
password = "/Session host passwd"
quit = "session exit"
reftext = "/simbad-reflist display"
selectid = "/session define format LISTID=$1"
sendlog = "/uif set f d ; /session host mail $1 < simbad.log "
stop = "session exit"
tty = "/uif set s s"
undisplayed = "/uif set s n"
_email = "/session host /usr/local/bin/email"
```

Chapter 26

Using the text editor

Some functionalities in SIMBAD software make use of a text editor. This concerns mainly *filter* and *format set*, and the access to the user initial command file.

Presently, the editor called by default is '*vi*'; *emacs* is also available. Your choice of the editor is defined through the environment variable EDITOR, with default value *vi*.

vi is the standard editor delivered with every UNIX system. You will not find here a complete description of it, but rather a subset sufficient for its use in SIMBAD. More details can be found in the UNIX literature.

26.1 Basics

The most important thing to know about *vi* is that it has two modes:

- ▷ a **command mode** in which each keystroke is related to an action to be executed;
- ▷ an **input mode** in which a keystroke effectively inserts the corresponding character into your text, at the cursor position.

The second important thing to know is that most of the commands are made of *normal* characters (like `dd` for deleting a line) and that there is nothing that distinguishes command mode from input mode. So, trying to move the cursor with an action on an arrow key of your keyboard leads to curious effects, since for most terminals such a keystroke generates an *escape sequence* of several 'normal' characters.

The third important feature to remember is how to enter the *input mode* — generally with `i` or `A` keystrokes — and how to go back to the *command* mode — always with the ⟨Escape⟩ key. If you can't find an escape key on your keyboard, you may always use ⟨*Ctrl-[*⟩.

Last, but not least, press the ⟨Escape⟩ key if you don't exactly remember what you did just before: it's always harmless. Notice also the existence of the special command *undo* (`u` key): it *is* useful!

26.2 Detailed Commands

	Leaving the editor
`:wq`⟨*Return*⟩	Save the file and Quit
`:q!`⟨*Return*⟩	Quit without saving your modifications
`:q`⟨*Return*⟩	Quit — you'll be prompted if you did not save your modifications
	Changing to input mode and back to command mode
`i`	Insert text *before* the cursor position
`a`	Insert text *after* the cursor position
`A`	Insert text *at the end* of the current line
`o`	Open a new line *after* the cursor position
`O`	Open a new line *before* the cursor position
⟨Escape⟩	Terminate the input mode
	Scrolling
⟨*Ctrl-L*⟩	Repaint the Screen
⟨*Ctrl-D*⟩	Scroll *Down* a half screen
⟨*Ctrl-U*⟩	Scroll *Up* a half screen
⟨*Ctrl-F*⟩	Scroll *Forward* a full screen
⟨*Ctrl-B*⟩	Scroll *Backward* a full screen
`z.`	Scroll to place the current line in the middle of the screen

Basic cursor moves — moving around your text — are especially important to remember, since these are used as parameters in other operations (yank, delete ...). In the following tables, the symbol $\wr \cdots \wr$ stands for a *Cursor moving sequence*.

There are several entities defined in a text: the characters, the **w**ords made of alphanumeric characters (and the underscore), the **W**ords separated by spaces, the lines, among others. For instance, `compo-site.word` is a single **W**ord made of three **w**ords.

The $(\star)$ symbol in the list of keys means that the command may be preceded by a repetition factor, *e.g.* `5W` to move over 5 **W**ords.

Cursor Move	$(\wr \cdots \wr)$
$(\star)$ `h j k l`	Move the cursor n position left / down / up / right
$(\star)$ ⟨*space*⟩	identical to `l` (right)
`0 $`	Move to the beginning (`0`) or end (`$`) of the line
$(\star)$ `w W`	Move the to the next word (alphanumeric) or Word (space-separated)
$(\star)$ `b B`	Move the to the previous word (alphanumeric) or Word
$(\star)$ ⟨*Return*⟩	Move to the next line
$(\star)$ `-`	Move to the previous line
n`G`	Move to line number n (1 for beginning, default is *last* line)
`%`	Move to the matching bracket
`'`x	Move to marker x (a letter) previously defined by `m`x
Search	
`/`*pattern*	Search for *pattern*
`n`	Position cursor to next occurrence of *pattern*
`N`	Position cursor to previous occurrence of *pattern*
`:set ic`⟨*Return*⟩	ignore case in forthcoming pattern searchings
Special Commands	
`u`	Undo the previous command
`.`	Repeat the last command
⟨*Ctrl-G*⟩	Display file name and current position
`J`	Join the current line with the next one
`m`x	Save in marker x (a letter) the current cursor position

Deleting, changing and yanking (copying) text can use any cursor move ($\wr\cdots\wr$) to specify the limit of the operation. The ($\star$) symbol in the list means that the command may be preceded by a repetition factor, *e.g.* `25dd` to delete 25 lines.

	Delete Text
($\star$) `x`	Delete current character (at cursor position)
($\star$) `X`	Delete previous character (left of cursor position)
($\star$) `dd`	Delete current line
`D`	Delete until end of line (identical to `d$`)
`d`$\wr\cdots\wr$	Delete until position defined by cursor move $\wr\cdots\wr$, *e.g.*
	`d3W` delete three Words
	`dG` delete until end of file
	`dn` delete until next occurrence of *pattern*
	Yank (copy) Text
($\star$) `yy`$\wr\cdots\wr$	Yank current line
`y`$\wr\cdots\wr$	Yank until position defined by cursor motion $\wr\cdots\wr$, *e.g.*
	`yG` yank from cursor until end of file
	Put (paste) Deleted or Yanked Text
`p`	Put deleted or yanked text *after* cursor
`P`	Put deleted or yanked text *before* cursor
	Substitute (change) Text
`r`*x*	Replace letter at the cursor position by *x*
`cc`	Change the current line with new text (until ⟨Escape⟩)
`C`	Change from cursor to end of line with new text (until ⟨Escape⟩)
`c`$\wr\cdots\wr$	Change text until position defined by cursor motion $\wr\cdots\wr$, *e.g.*
	`c3l` change three characters
	`cn` change until next occurrence of *pattern*

Part IV

REFERENCE MANUAL

Chapter 27

Agents and command table

Database	A database like SIMBAD	
verb	parameters	description
search	*identifier*	query the database by an identifier name.
	coordinates	query the database by coordinates, finding all objects in a circle around the given coordinates. The radius of this circle is given by the environment variable COORADIUS.
	'*filtername*	creates a sample using the named filter.
	bibcode	displays the text of the reference. The reference code (bibcode) can be partial, with at least the first three characters, followed by an `&`.
release		To close the data base for this session. It will no longer be available for searches, unless you call it again through the command: "session use database name".
bye		To stop dialogue with the database agent. It remains in the session and can be reused through a command like "database-name search ..."

Session	Manages a session and all the agents	
verb	parameters	description
exit		exits SIMBAD software
use	*classname agentname*	requires access to a new agent belonging to the specified class.
define	*classname VARIABLE= value*	sets the value of an environment variable within a format of a filter and recompiles all the formats and filters.
release	*agentname*	tells the agent to leave the session.
echo	*text*	writes the text directly to the standard output. This is only useful in command files.
host	*text*	directs commands to the Unix shell.
fread	*filename*	reads an external file.
bye		stops the interaction with the session agent.

astrobj	An astronomical object	
verb	parameters	description
display	basic, id, data, bib, *catalog_name*	displays the data according to the current standard format. The parameters designate format entries displaying a part of the data.
keep	[*new-name*]	keeps a copy of the astronomical object. The new name represents the same astronomical object, which can be reused in the session.
bye		leaves the agent. It remains in the session until a new astronomical object is requested.

reflist	Contains the text of all displayed bibliographical references.	
verb	parameters	description
display	*y1,y2* / ?	Displays the text of the bibliographical references contained in the list. They can be limited by years and '?' allows return of the number of available references.
reset		resets the list of references collected during the current session.
bye		Stops dialogue with this agent.

objlist	A list of astronomical objects.	
verb	parameters	description
display	all, n, $+n$, $-n$	displays the list of all (or only n) individual objects in the list.
set	*comment text*	Allows a commentary to be written (which can later be displayed by the describe verb).
describe		Gives details about number of objects, creation date, etc. of an object list.
release		Releases the object list from the session. After this command, it is no longer present, but can be recalled by "session use objlist name".
delete		Deletes a previously saved object list.
bye		Stops dialogue with this agent.

filter	This agent controls sampling by keeping the list of criteria	
verb	parameters	description
display		Lists all the sampling criteria of the filter
set	[*filter criterion*]	Defines the instructions for the filter. In batch mode, the filter will stay in memory and cannot be updated. In conversational mode, the command alone invokes a text editor to write or update the criteria list. Refer to the chapters 8 and 17 for a full description of criteria.
clone	*newname*	Creates a new filter agent receiving the specified newname and the same set of criteria. This is useful to create a new filter agent not from scratch, but by modifying an existing one.
write	[*name*]	Writes on disk a memory filter, created through a batch file. This command is needed to be able to update it. After this operation, the filter is permanent and should not be kept in the batch file.
release		Releases a filter from the session. After this command, it is no longer available, but can of course be recalled by "session use filter name", if it was previously saved.
bye		Stops dialogue with the filter. It quits the current context, but remains available in the session.

format	Controls the formatting of all outputs	
verb	parameters	description
display		Lists all the instructions of the format
set	[*format instruction*]	Define the instructions for the format. In batch mode, the format will stay in memory and cannot be updated. In conversational mode, the command alone enters a text editor to write or update the format. Refer to chapter 19 for a full description of formatting instructions.
clone	*newname*	Creates a new format agent receiving the specified newname and the same set of instructions. This is useful to create a new format agent not from scratch, but by modifying an existing one.
write	[*name*]	Writes on disk a memory format, created through a batch file. This command is needed to be able to update it. After this operation, the format is permanent and should not be kept in the batch file.
release		Releases a format from the session. After this command, it is no longer available, but can of course be recalled by "session use format name", if it was previously saved.
kill		Deletes a format.
compil		Compiles a format (to be used when new values have been assigned to environment variables).
bye		Stops dialogue with this format. It quits the current context, but remains available in the session, and can be an active format.

UIF	User interface management. Screen and file output tuning.	
verb	parameters	description
set	screen, screenoutput, fileoutput, inputfile, page	Allows one to tune the parameters of the screen output: tty or full screen mode; displayed or undisplayed on screen; directed into a file; inputs from a command file; or setting the page by page mode.
bye		To stop dialogue with the *user interface* agent.

macro	Macro language facility	
verb	parameters	description
set	*macro-name* = *macro-def*	Defines a macro. If the definition contains some special characters, such as ';', which would be interpreted by the command analyser, then the definition should be enclosed between quotes. Parameters are defined by $\$n$ for single words, and $\$\$n$ for all words from the nth.
display		Displays all macro definitions managed by the *macro* agent.
on		Switches macro substitution ON.
off		Switches macro substitution OFF. It is recommended to switch macro substitution off before defining new macros.
test	*command*	Allows you to test macro definitions by writing a command. This command will not be executed, but substitutions will be displayed. To work properly, you need to switch substitution off before testing the command. Substitution is automatically switched ON after the test.
bye		To stop dialogue with the *macro* agent.

user	Manages user-related information	
verb	parameters	description
display		displays data related to the coordinates of the user and data related to usage statistics of the database (*not yet implemented*.
modify	U, P, S, P, E, A	allows to modify the password and some other parameters ().
set	cmdfile	opens the user command file `user.cmd` where permanents commands setting up the user environment can be stored.
write		saves the user modified parameters.
bye		leaves the agent.

mail	Mail facility between a user and CDS staff.	
verb	parameters	description
send		Sends messages to CDS staff.
read		Reads messages sent by CDS staff.
save		Saves a mail message in a personal log file.
bye		Leaves the *mail* agent.

help	On-line help (agent name: hhelp).	
verb	parameters	description
display		Displays the root of the hierarchical help.
bye		Leaves the *help* agent.

Chapter 28

Default formats

Three default formats are pre–defined:

FM-IMMEDIATE	for the immediate format used when accessing an object
FM-STANDARD	for the standard format used by **"astrobj display "**
FM-LIST	for the format used to shortly display lists

These formats are listed below:

```
simbad search ->fm-immediate display

#++++++++++++++++
#.IDENTIFICATION fm-immed.fmt
#.ENVIRONMENT    Simbad database
#.KEYWORDS       Formats in Simbad
#.VERSION  1.0   11-Feb-1991
#.PURPOSE        Describes how to edit a named astronomical object
#.COMMENTS       This script tells which parameters of a found astronomical
#               are listed. The present script asks for:
#    - Fundamental data (with position 2 equinoxes + gal)
#    - All identifications (aliases)
#    - Number of existing references
#----------------
#
#      First line: type of object
#
TEXT "Type: "
OTYPE V4 | TEXT " ./."
SKIP 1
#
```

```
#       2nd line: position at equinox.1, and magnitudes
#
COO ("Coord EQUINOX1 = ") EQUINOX1 | TEXT "No coord."
MAG ("      mb, mv = ") (1,18)
SKIP 1
#
#       3rd line: position at equinox.2, and spectral (morphological) type
#
COO ("Coord EQUINOX2 = ") EQUINOX2 | TEXT "No coord"
SP ("    sp type = ") 20 | MT ("     morph. type = ") 20 | TEXT "     ./."
SKIP 1
#
#       4th line: Galactic position
#
COO ("          gal = ") G | TEXT " "
SKIP 1
#
#       5th line: proper motions (star) / dimensions (galaxy)
#
PM ("      pm = ") | DIM ("      dim = ") | TEXT "      ./."
SKIP 1
#
#       Write a separation line (filled with '-')
#
IC - 78
SKIP 1
#
#       Next part: all identifications (indicated by the A option),
#       followed by a separation line (filled with '-')
#
ID A
SKIP 1
IC - 78
SKIP 1
TEXT "Measurements:"
SKIP 1
MES (10) A N
IC - 78
SKIP 1
#
#       Last part: write out the number of references existing between limits,
#       followed by a separation line (filled with '-')
#
TEXT "References: "
REF # BIBYEARS
IC - 78
#
#       That's it, folks...
```

```
#
FIN
```

simbad search ->fm-standard display

```
#++++++++++++++++
#.IDENTIFICATION fm-standard.fmt
#.ENVIRONMENT    Simbad database
#.KEYWORDS       Formats in Simbad
#.VERSION  1.1   22-Jan-1992
#.PURPOSE        Main format (interactive answers) in Simbad
#.COMMENTS       This format is made of several parts:
# 1) basic (fundamental data)
# 2) id (identifiers, or aliases)
# 3) data  (available data)
# 4) bib    (all references)
# The list terminates normally here. Other possible requests:

# -  ndata or nmes   (number of measurements)
# -  catalogue name  (corresponding data)
# -  all (all measurements of all catalogues)
# -  bibcode (abbreviated bibliography)
# -  bibtext (all references) alias of bib
# -  nref or nbib (number of references)
#
#==========================
# basic
#==========================
#
{ basic
SKIP 1
# Type of object, option E (extended object name)
TEXT "==== "
OBJID
TEXT " ("
OTYPE V4 | TEXT "./."
TEXT ")"
SKIP 1
# 2nd line: position(1), magnitudes
COO ("Coord EQUINOX1 = ") EQUINOX1 | TEXT "No coord"
MAG ("     mb, mv = ")
SKIP 1
# 3rd line: position(2), Spectral or Morphological type
COO ("Coord EQUINOX2 = ") EQUINOX2 | TEXT "No coord"
SP ("    sp type = ") 20 | MT ("     morph. type = ") 20 | TEXT "     ./."
SKIP 1
# 4th line: galactic position
COO ("          gal = ") G | TEXT " "
```

```
SKIP 1
# 5th line: proper motion (stars) / dimensions (galaxies)
PM ("       pm = ",1,1) | DIM ("       dim = ") | TEXT "./."
SKIP 1
# Separate from next line
IC - 78
}
#=========================
# id (aliases)
#=========================
{ id
SKIP 1
# All identifiers (option A), and separation line
ID A
SKIP 1
IC - 78
}
#=========================
# data (measurements)
#=========================
#  Note that 2 environment variables are used:
# MESCAT  = the catalogue of data to display (A = all)
# MESTYP  = which data (A=all, F=first, M=mean).
# Use command  /env display
# to find out the meaning of these variables...
{ data
SKIP 1
MES  MESCAT MESTYP H
SKIP 1
IC - 78
}
#=========================
# bib
#=========================
#
# Complete references (option T) are listed.
#
{ bib
SKIP 1
REF T BIBYEARS
}
#
#>>>>>>> Normal END of format.
# What follows can only be executed on request
#
FIN
#=========================================
# bibcode (abbreviated list of references)
```

```
#==========================================
{ bibcode
SKIP 1
#
# 1st line = number of references
#
REF # BIBYEARS
TEXT " Reference(s) ( BIBYEARS ) :"
# Other lines = references, 4/lines (option 4)
SKIP 1
REF 4 BIBYEARS
}
FIN
#==============================================
# bibtext (list of bibliographical references)
#==============================================
{ bibtext
SKIP 1
REF T BIBYEARS
}
FIN
#=============================
# nbib (number of references)
#=============================
{ nbib
SKIP 1
TEXT "Number of references ( BIBYEARS ) : "
REF # BIBYEARS
}
FIN
#==============================
# nref (number of references)
#==============================
{ nref
SKIP 1
TEXT "Number of references ( BIBYEARS ) : "
REF # BIBYEARS
}
FIN
#=======================================
#       ndata  (number of measurements)
#=======================================
{ ndata
SKIP 1
TEXT "Measurements:"
SKIP 1
MES (10) A N
}
```

```
FIN
#=====================================
#       nmes  (number of measurements)
#=====================================
{ nmes
SKIP 1
TEXT "Measurements:"
SKIP 1
MES (10) A N
}
FIN
#=====================================
# all   (all data from all catalogues)
#=====================================
{ all
MES A A H B
}
FIN
#
#======================================
#   catalogues names
#======================================
#
{ CEL
MES CEL MESTYP H
}
FIN
#
{ GCRV
MES GCRV MESTYP H
}
FIN
#
{ GEN
MES GEN MESTYP H
}
FIN
#
        ...  etc.   (all measurement types)  ...
#
{ z
MES Z MESTYP H
}
FIN

simbad search ->fm-list display

#+++++++++++++++++
```

```
#.IDENTIFICATION fm-list.fmt
#.ENVIRONMENT    Simbad database
#.KEYWORDS       Formats in Simbad
#.VERSION  1.0   11-Feb-1991
#.VERSION  1.1   02-Jun-1993   Modif. for new object types
#                23-Jun-1993   Addition selectid
#.PURPOSE        Describes how to edit an astronomical object in a single line
#.COMMENTS       This script tells which parameters should be displayed
#                in a single line (typically the result of a sampling).
#----------------
#
#       List, as a table:
#  ...  sequence number
LLG 80
OBJID (4)
TEXT "|"
#  ...  Type of object (stellar / galaxy / other) in abbreviated form
OTYPE (3) S4
TEXT "|"
#  ...  Identifier: LISTID can be set to any catalogue name (or sequence
#       of catalogues separated by |); the option 1 tells to take
#       the first one in the list (quite a random choice...)
ID (19) LISTID | 1
TEXT "|"
#  ...  Position at equinox specified in the environment
#       To change the equinox, use the command :
#              equi1  value    (e.g.:   equi1 2000.0)
#       or      session define format EQUINOX1 = value
COO (25)  EQUINOX1
TEXT "|"
#  ...  Spectral or morphological type. Parameter is length.
SP (8) 8 | MT (8) 8
TEXT "|"
#  ...  Magnitudes B & V
MAG (11) (1,5," " 12,5)
TEXT "|"
#  ...  Number of references between limits
REF # BIBYEARS
#
#       That's it, folks...
#
FIN
fm-list display ->stop
```

Chapter 29

Special commands

The following special commands, of one or two characters, allow the displaying of some special information, or the setting of some often used parameters (see also chapter 25):

System information display:	
?	invokes the context-sensitive help
&	displays the list of commands of the current agent
:	displays the list of all existing agents in the session
!	displays the stack of current agents

Prompt control:	
.	quits the last element in the current context
/	to type a command that will not remain current (temporary command)

<table>
<tr><th colspan="2">File redirection (and batch mode):</th></tr>
<tr><td>></td><td>filename</td></tr>
<tr><td></td><td>redirects output to the specified file</td></tr>
<tr><td>>|</td><td>stops redirection of output file</td></tr>
<tr><td><</td><td>filename</td></tr>
<tr><td></td><td>redirects input from the specified file (procedure or batch mode)</td></tr>
<tr><td><|</td><td>stops redirection from the input file</td></tr>
</table>

Part V

Appendices

Appendix A

Greek letters coding

Greek letters must be written using the following three letter abbreviations:

α	alf	ι	iot	ρ	rho
β	bet	κ	kap	σ	sig
γ	gam	λ	lam	τ	tau
δ	del	μ	mu.	υ	ups
ε	eps	ν	nu.	ϕ	phi
ζ	zet	ξ	ksi	χ	khi
η	eta	o	omi	ψ	psi
θ	tet	π	pi.	ω	ome

Appendix B

Constellation names

Constellation names (used for Bayer and Flamsteed designations of bright stars: `alf Lyr`, for variable stars: `RS CVn`, for novae: `Nova Her 1991`, etc.) must be written using the following abbreviations:

And	Ant	Aps	Aqr	Aql	Ara	Ari	Aur	Boo	Cae	Cam	Cnc
CVn	CMa	CMi	Cap	Car	Cas	Cen	Cep	Cet	Cha	Cir	Col
Com	CrA	CrB	Crv	Crt	Cru	Cyg	Del	Dor	Dra	Equ	Eri
For	Gem	Gru	Her	Hor	Hya	Hyi	Ind	Lac	Leo	LMi	Lep
Lib	Lup	Lyn	Lyr	Men	Mic	Mon	Mus	Nor	Oct	Oph	Ori
Pav	Peg	Per	Phe	Pic	Psc	PsA	Pup	Pyx	Ret	Sge	Sgr
Sco	Scl	Sct	Ser	Sex	Tau	Tel	Tri	TrA	Tuc	UMa	UMi
Vel	Vir	Vol	Vul		LMC	SMC					

Appendix C

Clusters and Cluster stars

Clusters (and cluster stars) which have no NGC or IC number are called under the generic appellation `Cl` or `Cl*` followed by the cluster names and numbers as described below. The table on the next page lists most of the possible names associated to star clusters — with the exception of NGC and IC.

The following syntax is to be used:

1. A cluster is named `Cl` followed by the cluster name and number (e.g. `Cl Blanco 1`)
2. The designation of a cluster star in the main member list of a cluster is: the cluster name preceded by `Cl` and followed by a running number (Example: `Cl Blanco 1 8` is star #8 in the open cluster Blanco 1).
3. When several lists of member stars exist, the designation is: the cluster name preceded by `Cl*` followed by an abbreviation of the list and the running number of the star in the list (Example: `Cl* Melotte 25 VA 13` is star #13 in the list by Van Altena for Melotte 25 —the Hyades cluster).

Examples of designations of stars in Clusters:

`NGC 2264`	(an NGC cluster)
`NGC 2264 2`	(a star in NGC 2264)
`Cl Melotte 25`	(Melotte 25: the Hyades cluster)
`Cl Melotte 25 1`	(1st star in the main list by Van Bueren)
`Cl* Melotte 25 VA 13`	(13th star in a list by Van Altena).

More details about nomenclature can be obtained by the commands

info cati *name* or
info *-l* cati *name*

the latter being used for a long description, including the authors and full bibliographical references.

Note: a similar system of designation is used for the planetary nebulae (PN), using a prefix `PN`. For instance,

`PN Hb 1` represents the 1st star in the list by Hubble.

A complete list of all such PN lists can be found by the command
info cati PN

Partial List of cluster names

Apriamaswili	King	*Notes:*
Arp	Kron	
Barhatova	Lindsay	NGC 869 = h Per
Basel	Lynga	NGC 884 = χ Per
Berkeley	Melotte	NGC 2632 = Praesepe
Biurakan	Mrk (Markarjan)	Cl Blanco 1 = ζ Scl
Blanco	Palomar (Pal)	Cl Melotte 20 = α Per
Bochum	Pismis	Cl Melotte 22 = Pleiades
Collinder	Roslund	Cl Melotte 25 = Hyades
Czernik	Ruprecht	Cl Melotte 111 = Coma Ber
Deje	Sher	
Dolidze	Sahlbajan	
Dolidze-Dzim	Stephenson	
Dufay	Stock	
Feinstein	Terzan	
Graff	Tombaugh	
Haffner	Trumpler	
Harvard	Upgren	
Haute-Provence	VDB (Van den Bergh)	
Hogg	Westerlund	
Iskurzdajan		

Appendix D

Spectral type coding

The spectral type of a star consists of 4 parts:

▷ A temperature class, with the following order:

1. Stars with subtypes: from O3 to M9
2. White dwarfs: DC to DM
3. Stars without subtypes: from O to M, and R, N, S, C
4. Composite stars.

▷ A luminosity class. The possible values are listed below:

`unknown`	`Ia`	`Iab-b`	`II`	`III/IV`	`V`
`Ia-0`	`Ia/ab`	`Ib`	`II/III`	`IV`	`V/VI`
`Ia-0/Ia`	`Iab`	`Ib-II`	`III`	`IV/V`	`VI`

▷ Precisions:

- ◇ Inaccuracy on temperature or luminosity class: colon (:) written just after the concerned field.
- ◇ Indication related to the spectrum:
  - ○ Overlap : `X`
  - ○ Particular source : `*`
  - ○ Quality : 0 - 7

▷ Peculiarities:

Each of them is represented by one or more letters placed after temperature and luminosity classes:

variable spectrum	v
spectrum with emission lines	e
spectrum interpreted like a shell star	sh
peculiar spectrum	p
spectrum with peculiar profile:	
sharp	s
nebulous	n
very nebulous	nn
spectrum with peculiar elements:	
peculiar CN	CN
weak line	w
metallic lines	m

Appendix E

Morphological type coding

It consists of 4 parts:

The class:	elliptic	E
	spiral	S
	irregular	I
	dwarf	D
	peculiar	P
	with uncertainty	:
The type:	normal	/
	barred	B
	uncertain bar	:
The stage:	ecliptical gal.	from 0 to 9
	gal. S, I or P	O, Oa, a, ab, b, bc, c, cd, d, dm, m
Peculiarities:	r	
	s	
	p	

Moreover, two complete types can be coded if the author found that the type of a galaxy is between two standard types.

Appendix F

Object type coding

The Object Type in SIMBAD is defined as a hierarchical classification, using up to four levels of definition. A presentation of the system can be found in the paper by F. Ochsenbein and P. Dubois (1992), in '*Astronomy from Large Databases II*', A. Heck & F. Murtagh (Eds.), pp 405-410.

Note that SIMBAD emphasizes the physical nature of the object rather than a peculiar emission in some region of the electromagnetic spectrum or the location in peculiar clusters or external galaxies. Therefore objects are classified as peculiar emitters (classes 01. to 07.) only if nothing more about the nature of the object is known, i.e. it cannot be decided whether the object is a star, a multiple system, a nebula or a galaxy.

Each class has normally a standard designation, a condensed one (used in tables) and an extended explanation.

The list below is subject to evolution: you can check the current list at any time with the **info otype** command.

Numeric	Standard name	Cond.	Extended Explanation
00.00.00.0:	Unknown	?	Object of unknown nature
01.00.00.0:	Radio	Rad	Radio-source
01.02.00.0:	Radio(m)	mR	metric Radio-source
01.04.00.0:	Radio(cm)	cm	centimetric Radio-source
01.06.00.0:	Radio(mm)	mm	millimetric Radio-source
01.14.00.0:	Maser	Mas	Maser
02.00.00.0:	IR	IR	Infra-Red source
02.02.00.0:	IR>10mu	IR1	IR source at lambda > 10 microns
02.04.00.0:	IR<10mu	IR0	IR source at lambda < 10 microns
03.00.00.0:	Red	red	Very red source
04.00.00.0:	Blue	blu	Blue object
05.00.00.0:	UV	UV	UV-emission source

```
06.00.00.0: X                X       X-ray source
07.00.00.0: gamma            gam     gamma-ray source
07.03.00.0:   gammaBurst     gB      gamma-ray Burster
09.00.00.0: Gravitation      grv     Gravitational Source
09.03.00.0:   LensingEv      Lev     (Micro)Lensing Event
12.00.00.0: multiple_object  mul     Composite object
12.01.00.0:   Region         reg     Region defined in the sky
12.01.05.0:     Void         vid     Underdense region of the Universe
12.02.00.0:   SuperClG       SCG     Supercluster of Galaxies
12.03.00.0:   ClG                    Cluster of Galaxies
12.04.00.0:   GroupG         GrG     Group of Galaxies
12.04.05.0:     Compact_Gr_G CGG     Compact Group of Galaxies
12.05.00.0:   PairG          PaG     Pair of Galaxies
12.10.00.0:   GlCl?          Gl?     Possible Globular Cluster
12.11.00.0:   Cl*            Cl*     Cluster of Stars
12.11.01.0:     GlCl         GlC     Globular Cluster
12.11.02.0:     OpCl         OpC     Open (galactic) Cluster
12.12.00.0:   Assoc*         As*     Association of Stars
12.13.00.0:   **                     Double or multiple star
12.13.01.0:     EB*          EB*     Eclipsing binary
12.13.01.1:       EB*Algol   Al*     Eclipsing binary of Algol type
12.13.01.2:       EB*betLyr  bL*     Eclipsing binary of beta Lyr type
12.13.01.3:       EB*WUMa    WU*     Eclipsing binary of W UMa type
12.13.02.0:     SB           SB*     Spectrocopic binary
12.13.11.0:     CataclyV*    CV*     Cataclysmic Variable Star
12.13.11.2:       DQHer      DQ*     Cataclysmic Var. DQ Her type
12.13.11.3:       AMHer      AM*     Cataclysmic Var. AM Her type
12.13.11.5:       Nova-like  NL*     Nova-like Star
12.13.11.6:       Nova       No*     Nova
12.13.11.7:       DwarfNova  DN*     Dwarf Nova
12.13.12.0:     XB           XB*     X-ray Binary
12.13.12.2:       LMXB       LXB     Low Mass X-ray Binary
12.13.12.3:       HMXB       HXB     High Mass X-ray Binary
13.00.00.0: Neb              Neb     Nebula of unknown nature
13.01.00.0:   PartofCloud    PoC     Part of Cloud
13.02.00.0:   PN?            PN?     Possible Planetary Nebula
13.03.00.0:   ComGlob        CGb     Cometary Globule
13.06.00.0:   EmObj          EmO     Emission Object
13.07.00.0:   HH             HH      Herbig-Haro Object
13.08.00.0:   Cloud          Cld     Cloud of unknown nature
13.08.03.0:     GalNeb       GNe     Galactic Nebula
13.08.04.0:     BrNeb        BNe     Bright Nebula
13.08.06.0:     DkNeb        DNe     Dark Nebula
13.08.07.0:     RfNeb        RNe     Reflection Nebula
13.08.11.0:     HI           HI      HI (neutral) region
13.08.12.0:     MolCld       MoC     Molecular Cloud
13.08.13.0:     HVCld        HVC     High-velocity Cloud
13.09.00.0:   HII            HII     HII (ionized) region
```

```
13.10.00.0:    PN              PN      Planetary Nebula
13.11.00.0:    HIshell         sh      HI shell
13.12.00.0:    SNR?            SR?     SuperNova Remnant Candidate
13.13.00.0:    SNR             SNR     SuperNova Remnant
14.00.00.0:  Star              *       Star
14.01.00.0:    *inCl           *iC     Star in Cluster
14.02.00.0:    *inNeb          *iN     Star in Nebula
14.03.00.0:    *inAssoc        *iA     Star in Association
14.04.00.0:    *in**           *i*     Star in double system
14.05.00.0:    V*?             V*?     Star suspected of Variability
14.06.00.0:    Pec*            Pe*     Peculiar Star
14.06.01.0:      HB*           HB*     Horizontal Branch Star
14.06.05.0:      Em*           Em*     Emission-line Star
14.06.05.3:      Be*                   Be Star
14.06.16.0:      WD*           WD*     White Dwarf
14.06.16.1:        WD*ZZCet    ZZ*     Variable White Dwarf of ZZ Cet type
14.06.20.0:      C*            C*      Carbon Star
14.06.21.0:      S*            S*      S Star
14.06.23.0:      OH/IR         OH*     Star with envelope of OH/IR type
14.06.24.0:      CH            CH*     Star with envelope of CH type
14.06.25.0:      pMS*          pr*     Pre-main sequence Star
14.06.25.3:      TTau*         TT*     T Tau-type Star
14.06.30.0:      WR*           WR*     Wolf-Rayet Star
14.07.00.0:    PM*             PM*     High proper-motion Star
14.08.00.0:    HV*             HV*     High-velocity Star
14.09.00.0:    V*              V*      Variable Star
14.09.01.0:      Irregular_V*  Ir*     Variable Star of irregular type
14.09.01.1:        Orion_V*    Or*     Variable Star in Orion Nebula
14.09.01.2:        Rapid_Irreg_V* RI*  Variable Star with rapid variations
14.09.03.0:      Eruptive*     Er*     Eruptive variable Star
14.09.03.1:        Flare*      Fl*     Flare Star
14.09.03.2:        FUOr        FU*     Variable Star of FU Ori type
14.09.03.4:        Erupt*RCrB  RC*     Variable Star of R CrB type
14.09.04.0:      RotV*         Ro*     Rotationally variable Star
14.09.04.1:        RotV*alf2CVn a2*    Variable Star of alpha2 CVn type
14.09.04.2:        RotV*Ell    El*     Elliptical variable Star
14.09.04.3:        Pulsar      Psr     Pulsars
14.09.04.4:        BYDra       BY*     Variable of BY Dra type
14.09.04.5:        RSCVn       RS*     Variable of RS CVn type
14.09.05.0:      PulsV*        Pu*     Pulsating variable Star
14.09.05.1:        Mira        Mi*     Variable Star of Mira Cet type
14.09.05.2:        RRLyr       RR*     Variable Star of RR Lyr type
14.09.05.3:        Cepheid     Ce*     Classical Cepheid variable Star
14.09.05.4:        PulsV*semi-reg sr*  Semi-regular pulsating Star
14.09.05.5:        PulsV*delSct dS*    Variable Star of delta Sct type
14.09.05.6:        PulsV*RVTau RV*     Variable Star of RV Tau type
14.09.05.7:        PulsV*WVir  WV*     Variable Star of W Vir type
14.09.08.0:        SN          SN*     SuperNova
```

```
14.09.09.0:       Symbiotic*  Sy*     Symbiotic Star
15.00.00.0:  Galaxy           G
15.01.00.0:    PartofG        PoG     Part of a Galaxy
15.02.00.0:    GinCl          GiC     Galaxy in Cluster of Galaxies
15.03.00.0:    GinGroup       GiG     Galaxy in Group of Galaxies
15.04.00.0:    GinPair        GiP     Galaxy in Pair of Galaxies
15.05.00.0:    High_z_G       HzG     Galaxy with high redshift
15.06.00.0:    AbsLineSystem  ALS     Absorption Line system
15.06.01.0:      Ly-alpha_ALS LyA     Ly alpha Absorption Line system
15.06.02.0:      DLy-alpha_ALS DLy    Dumped Ly alpha Absorption Line system
15.06.03.0:      metal_ALS    mAL     metallic Absorption Line system
15.07.00.0:    RadioG         rG      Radio Galaxy
15.08.00.0:    HII_G          H2G     HII Galaxy
15.10.00.0:    QSO_Candidate  Q?      Possible Quasar
15.11.00.0:    EmG            EmG     Emission-line galaxy
15.12.00.0:    StarburstG     SBG     Starburst Galaxy
15.13.00.0:    BlueCompG      BCG     Blue compact Galaxy
15.14.00.0:    LensedImage    LeI     Gravitationnaly Lensed Image
15.14.01.0:      LensedG      LeG     Gravitationnaly Lensed Image of a Galaxy
15.14.07.0:      LensedQ      LeQ     Gravitationnaly Lensed Image of a Quasar
15.15.00.0:    AGN            AGN     Active Galaxy Nucleus
15.15.01.0:      LINER        LIN     LINER-type Active Galaxy Nucleus
15.15.02.0:      Seyfert      SyG     Seyfert Galaxy
15.15.02.1:        Seyfert_1  Sy1     Seyfert 1 Galaxy
15.15.02.2:        Seyfert_2  Sy2     Seyfert 2 Galaxy
15.15.03.0:      Blazar       Bla
15.15.03.1:        BLLac      BLL     BL Lac - type object
15.15.03.2:        OVV        OVV     Optically Violently Variable object
15.15.04.0:      QSO          QSO     Quasar
--------------------------------------------------------------------------------
```

Appendix G

Description of measurement types

G.1 Overview

Each type of data listed as a result of a SIMBAD interrogation is normally preceded by a *header* which provides a very short title to each listed parameter. This chapter explains the meaning of each of these titles.

Note: the character ˜ in a field stands for *no corresponding value* (unknown value).

There are generally several measurements for each data type; a **m** following the data type, like in the following set of MK classifications:

```
MK  |ds/mss Spectral type                      |     reference     |
---------------------------------------------------------------------
MK m|  /    F4III                              |1975AJ.....80..637M|
MK  |MS/+ 2 F6(M) PEC                          |1975$HOUK.C01.....H|
MK  |  /    F4 III SB                          |1962$MSOM...4.....B|
```

means that the corresponding value (F4III) is the "best" one, i.e. is recommended for non-specialists (in general, when applicable, a mean value).

The following measurement types are presently included in SIMBAD:

CEL	Ultraviolet photometry from *Celescope*
Cl.G	Cluster of Galaxies (Abell & Corwin)
Einstein	The Einstein Observatory Soft X-ray Source List
GCRV	Stellar Radial velocities
GEN	$UBVB_1B_2V_1G$ photometry in Geneva photometric system
GJ	Absolute magnitudes and spatial velocities of nearby stars.
Hbet	H_β index (used in connection with Strömgren's uvby photometry)
HGAM	H_γ equivalent width
IRAS	IRAS Point Source Catalog
IRC	KI photometry from *Two Micron Sky Survey*
IUE	International Ultraviolet Explorer (Observation Log)
JP11	$UBVRIJKLMNH$ 11-colour Johnson's photometry
MK	Stellar spectral classification in Morgan-Keenan system
PLX	Trigonometric parallaxes
pm	Proper motions (in 1950 equatorial frame)
pos	Equatorial positions
ROT	Rotational velocities ($V.\sin i$)
RVEL	Radial velocities of extragalactic objects (quasars and galaxies)
SAO	Positions and proper motions from SAO catalogue.
TD1	Ultraviolet magnitudes from *TD1* experiment
UBV	UBV photometry in Johnson's photometric system
uvby	Photometry in Strömgren's photometric system
V*	Data related to variable stars
z	Redshifts (of distant galaxies and quasars)

The next sections provide more details about each data type included in SIMBAD. Some details concerning the photometric systems were taken from *Introduction to Astronomical Photometry* by Golay, M., 1974, *Astrophysics and Space Science Library* 41, R. Reidel Publ.

G.2 CEL measurements

Celescope catalog of ultra-violet photometry, by Davis et al., *SAO Special Report 350*, 1973.

```
Example:
12345678901234567890123456789012345678901234567890123456
CEL   |  U1 : m.e|  U2 : m.e|  U3 : m.e|  U4 : m.e|peculiarities|
       reference   |
-----------------------------------------------------------------
CEL m|12.45:   ~|12.61: .30|    ~:    ~|    ~:    ~|P,CA,NA      |
1973$CEL..C.......D|
```

Header	*Meaning*
`U1 : m.e`	magnitude in U_1 filter ($\lambda\lambda$ 210-320 nm), and $\sigma(U_1)$
`U2 : m.e`	magnitude in U_2 filter ($\lambda\lambda$ 155-320 nm), and $\sigma(U_2)$
`U3 : m.e`	magnitude in U_3 filter ($\lambda\lambda$ 135-215 nm), and $\sigma(U_3)$
`U4 : m.e`	magnitude in U_4 filter ($\lambda\lambda$ 105-215 nm), and $\sigma(U_4)$
`peculiarities`	Set of peculiarities, as: `N` non-stellar object `R` radiosource `V` variable `P` peculiar spectrum `E` emission lines `M` metallic lines `Sh` shell star `Ca` interstellar lines H & K from Calcium `Na` interstellar lines D from Sodium `A` interstellar absorption at 443 nm

G.3 Cl.G measurements

Cluster of Galaxies: Abell & Corwin, *Astrophys. J. Suppl.*, 70, 1 (1989).

```
Example:
12345678901234567890123456789012345678901234567890123456789012
Cl.G  |D R|Nga |Acl|BMclass|  m1 |   m3 | m10 |m10a | Reference      |
--------------------------------------------------------------
Cl.G  |5 2|112 |   |   III |   ~ |    ~ |   ~ |17.2 |1989ApJS...70....1A|
```

Header	*Meaning*
`D`	Distance class
`R`	Richness class
`N`	number of cluster members between $m3$ and $m3 + 2$
`A`	Cluster classification in Abell's system
`BM`	Cluster classification in the Bautz-Morgan system
`m1`	Weighted mean total V magnitude estimate for the fist-ranked cluster member
`m3`	Weighted mean total V magnitude estimate for the third-ranked cluster member
`m10`	Weighted mean total V magnitude estimate for the tenth-ranked cluster member
`m10a`	Weighted mean total V magnitude estimate for the tenth-ranked cluster member (xxx)

G.4 Einstein measurements

The Einstein Observatory Soft X-ray Source List

```
Example:
Einstein  |  RA  (1950)  Dec    : Err| Count r.:  Err  | Hard.:  err+  err-|
    Reference      |
-----------------------------------------------------------------------------
--------------------
Einstein  |05 31 31.2 +21 59 04 :  31|431.10000:2.00000|     ~:    ~     ~  |
1994HEAO2.C.......M|
```

Header	*Meaning*
`RA Dec`	X-ray position, 1950
`Err`	error on position in seconds of arc
`Count`	count rate in counts/second, in the total Einstein energy band (0.16 to 3.5 keV)
`Err`	error on count rate
`Hard.`	hardness ratio, with error in + and minus (e.g. .457: .154 .157 means 0.457+.154-.157). This quantity is between -1 and +1. It is the ratio of counts(hard)-counts(soft)/(counts(hard)+counts(soft)) 'hard' is the energy band 0.81 to 3.5 keV 'soft' is the energy band 0.16 to 0.81 keV

More documentation can be found on WWW at
`http://hea-www.harvard.edu:80/einstein/eoscat1/doc/unix`, and more generally
`http://hea-www.harvard.edu/einstein/Ein_home/ein_welcome.html` .

G.5 GCRV measurements

Stellar Radial Velocities.

```
Example:
12345678901234567890123456789012345678901234567890123456789012345
GCRV   |  rvel. Q  (nmes)|rem. |dis|     reference     |
-------------------------------------------------------
GCRV m|  -16.8 A  (  72)|     |   |1953$CIWP.6017....W|
```

Header	*Meaning*
`rvel.`	Radial velocity (km/s)
`Q`	Quality from A = *good* to D = *poor*
`nmes`	number of plates
`rem.`	Remarks concerning the radial velocity:
	`E` emission line
	`D` double line
	`3` triple line
	`V` variable
	`V?` suspected variable
	`O` orbit
	`S` standard
	`+` fainter companion
`dis`	dispersion in $\mathring{A}/mm$ at H_γ (approximative)
`reference`	source of the radial velocity

G.6 GEN measurements

Details about the Geneva Photometric System may *e.g.* be found in A&A Sup. 26, 275 (1976). The passbands are characterized by the two parameters λ_0 and μ defined by:

$$\lambda_0 = \int \lambda\, \varphi(\lambda)\, d\lambda \int \varphi(\lambda)\, d\lambda$$

$$\mu^2 = \int (\lambda - \lambda_0)^2\, \varphi(\lambda)\, d\lambda / \int \varphi(\lambda)\, d\lambda$$

	U	B	V	B1	B2	V1	G
λ_0 (nm)	345.6	424.5	550.0	402.4	448.0	540.5	580.5
μ (nm)	17.0	28.3	29.6	19.6	16.3	20.1	20.4

```
Example:
123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
GEN   | U-B   | V-B   | B1-B | B2-B | V1-B | G-B  |Wt : m.e | Vmag |Wt : m.e |
 Remarks    |     reference      |
-------------------------------------------------------------------------------
GEN m| 1.902|  .052| 1.142| 1.274|  .806| 1.067|  2: .092| 4.070|  2: .250|
      VR   |1975A&AS.1976..275R|
```

Header	*Meaning*
`U-B`	color index $U - B$
`V-B`	color index $V - B$
`B1-B`	color index $B_1 - B$
`B2-B`	color index $B_2 - B$
`V1-B`	color index $V_1 - B$
`G-B`	color index $G - B$
`Wt : m.e`	weight and σ on color indices
`Vmag`	V magnitude
`Wt : m.e`	weight and σ on `Vmag`
`Remarks`	Remark flags:
	`V` variable
	`D` multiple
	`B` spectroscopic binary
	$\star$ remark in the original catalogue
`reference`	source of the photometric data

G.7 GJ measurements

These are data related to *nearby stars* (Catalog of stars within 20 parsecs of the Sun by Gliese (*Veröfflichungen Heidelberg Nr 22*), and continuations by Gliese and Jahreiss).

```
Example:
12345678901234567890123456789012345678901234567890123456789
GJ  |  plx :p.e| Mabs  Q|  U |  V |  W |     reference    |
------------------------------------------------------------
GJ m|  .124:005|  .50  B| -17|  -6|  -8|1969GLIES.C.......G|
```

Header	*Meaning*
`plx : p.e`	resulting parallax and probable error
`Mabs`	absolute magnitude (M_v or M_{pg})
`Q`	Quality on `Mabs` from `A` (very good) to `F` (very poor); `P` means that `Mabs` represents M_{pg}
`U`	component of velocity directed to ($b = 0°$, $\ell = 0°$)
`V`	component of velocity directed to ($b = 0°$, $\ell = +90°$)
`W`	component of velocity directed to ($b = +90°$)
`Ref`	reference

G.8 Hbet measurements

The H_β photometric system (Crawford and Mander, 1966, Astron. J. 7, 114) is the flux difference between two filters centered on H_β (4861Å) with widths of 150 and 30 Å respectively. The data are currently compiled by Institut d'Astronomie de Lausanne, at Geneva Observatory (Hauck, B. and Mermilliod, M., 1985, A&A Sup. 60, 61).

```
Example:
1234567890123456789012345678901234567890
hbet  | H-bet|Rnmes|     reference     |
----------------------------------------
hbet m| 2.903|     |1980A&AS...40....1H|
```

Header	*Meaning*
`H-bet`	value of H_β index (in magnitudes)
`Rnmes`	Number of measurements, preceded by the remark
	`S` for standard values.
	`?` for unknown number of measurements.
	`>` for lower bound of the number of measurements.
`reference`	source of the H_β value

G.9 HGAM measurements

Values of the equivalent width of the H_γ line, from Petrie et al., Publ. Dominion Astrophys. Obs. 14, 151, 1973, and continuations.

```
Example:
123456789012345678901234567890123456789012
HGAM  |  width (mes) |     reference     |
------------------------------------------
HGAM  |    2.0 (  2) |1973PDAOV..14..151P|
```

Header	*Meaning*
`width (mes)`	equivalent width of H_γ line ($\mathring{A}$), and number of measurements within brackets
`reference`	source of the H_γ value

G.10 IRC measurements

Infra-red measurements from the *Two micron sky survey*, by Neugebauer and Leighton, Calif. Institute of Technology, NASA, 1969.

```
Example:
```

```
1234567890123456789012345678901234567890123456789012345678901234567890012
IRC  | K-mag(mes) m.e:chi-2| I-mag(mes) m.e:chi-2|     reference      R|
--------------------------------------------------------------------------
IRC m|  2.36(  3) .06: 1.78|E  3.45(  3) .06:14.34|1969$TMSS.C.......N |
```

Header	*Meaning*
`K-mag (mes)`	K magnitude ($2.2\ \mu m$), eventually preceded by a remark `*` magnitude out of scale `E` χ^2 is too large and followed by the number of observations within brackets
`m.e:chi-2`	$\sigma(K)$ and $\chi^2(K)$
`I-mag (mes)`	I magnitude, eventually preceded by the same remark as for K magnitude, and followed by the number of observations within brackets
`m.e:chi-2`	$\sigma(I)$ and $\chi^2(I)$
`reference R`	bibliographic reference, followed by a general remark `R` remark in the original catalogue `?` question mark in the original catalogue

G.11 IUE measurements

(not yet available)

G.12 JP11 measurements

$UBVRIJKLMNH$ Johnson's photometry. Each magnitude measurement is followed by the number of measurements within brackets, or the "special values"

(S) for standard stars
(?) when the number of observations is unknown

```
Example:
1234567890123456789012345678901234567890123456789012345678901234567890
JP11  | U:360 (nmes )| B:450    (nmes )| V:555    (nmes )| R:670    (nmes )|
I:87 0    (nmes )| J:1200   (nmes )| K:2200   (nmes )| L:3500   (nmes )|
M:5000   (nm es )| N:9000   (nmes )| H:1620   (nmes )|     reference     |
JP11  |    .03 (     9)|    .03     (     9)|    .03     (     9)|    .07     (     5)|
    .10     (     5)|    .02     (     9)|    .02     (     9)|   -.02    (?     )|
       ~  (      )|       ~   (      )|       ~   (      )|1966$CLPL...4...99J|
```

Header	*Meaning*
`U (nmes)`	magnitude at $\lambda_{eff} = 360\ nm$
`B (nmes)`	magnitude at $\lambda_{eff} = 450\ nm$
`V (nmes)`	magnitude at $\lambda_{eff} = 555\ nm$
`R (nmes)`	magnitude at $\lambda_{eff} = 670\ nm$
`I (nmes)`	magnitude at $\lambda_{eff} = 870\ nm$
`J (nmes)`	magnitude at $\lambda_{eff} = 1.2\ \mu m$
`K (nmes)`	magnitude at $\lambda_{eff} = 2.2\ \mu m$
`L (nmes)`	magnitude at $\lambda_{eff} = 3.5\ \mu m$
`M (nmes)`	magnitude at $\lambda_{eff} = 5.0\ \mu m$
`N (nmes)`	magnitude at $\lambda_{eff} = 9.0\ \mu m$
`H (nmes)`	magnitude at $\lambda_{eff} = 1.62\ \mu m$
`reference`	source of the photometric data

G.13 MK measurements

This section includes MK classifications in the Morgan-Keenan system from bibliographical surveys (e.g. by Jaschek M.), as well as the Michigan Catalogues of Two-Dimensional Spectral Types for the HD stars (Houk N., 1975, and seq.).

```
Example:
123456789012345678901234567890123456789012345678901234567890123456789
MK  |ds/mss Spectral type                          |     reference     |
---------------------------------------------------------------------
MK m|  /    G2Ibvar                                |1954ApJS....1..175B|
```

Header	*Meaning*
`ds/mss`	Brief description of the dispersive system used: `P` prism `G` grating `S` slit spectrograph `OP` objective prism `MS` Michigan Spectral Survey For `MS` data, a *quality* index is included , in the range $[1 \cdots 4]$ from good to poor, and further notes: `+` the spectral type was found in the literature `X` overlapping spectra `A` averaged spectral classification
`Spectral type`	Spectral classification in the MK system
`reference`	source of the spectral classification

G.14 PLX measurements

This section groups measurements of *trigonometric parallaxes.*

```
Example:
1234567890123456789012345678901234567
PLX  | plx  :p.e|    reference     |
-------------------------------------
PLX  |  .005:004|1952$YUO.1952.....J|
```

Header	Meaning
plx : p.e	Trigonometric parallax π ($''$), and probable error (in $10^{-3''}$)
reference	source of the parallax

G.15 PM measurements

This section groups all measurements of *stellar proper motions*, with the exception of SAO catalogue, listed separately. These data are presently given at equinox and epoch 1950, in the FK4 system.

```
Example:
1234567890123456789012345678901234567890123456789012345
PM  | pm-ra [ m.e ]| pm-de [ m.e ]|    reference     |
-------------------------------------------------------
PM  |  -.026[ .015]|  +.025[ .012]|1971$AGK3.C.......L|
```

Header	Meaning
pm-ra [m.e.]	$\mu_\alpha.\cos\delta$ in $''/yr$, and σ within square bracket
pm-dec[m.e.]	μ_δ in $''/yr$, and σ within square bracket
reference	source of the proper motions

G.16 pos measurements

This section groups all measurements of *stellar positions*, with the exception of SAO data.

```
Example:
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678
pos  |    alpha       delta    |me.al me.de|equi  epoch |     reference     |
------------------------------------------------------------------------------------------------
pos  |22 27 18.484 +58 09 31.78 | .37   .29 |1950 1956.70|1971$AGK3.C......L|
```

Header	*Meaning*
`alpha delta`	α and δ in frame at equinox `equi`, at `epoch`
`me.al me.de`	standard errors $\sigma(\alpha\cos\delta)$ and $\sigma(\delta)$ (in $''$)
`equi epoch`	equinox of the frame, and epoch of the observation
`reference`	source of the position

G.17 ROT measurements

Stellar Rotational Velocities.

```
12345678901234567890123456789012345678
ROT  |Vsini (mes)|    reference      |
--------------------------------------
ROT  | 9    (   )|1970$KwKy.189.....U|
```

Header	*Meaning*
`Vsini`	projected rotational velocity $v \sin i$ (km/s)
`(mes)`	number of measurements
`reference`	source of the rotational velocity

G.18 RVEL measurements

This section deals with radial velocities of *galaxies*.

```
Example:
12345678901234567890123456789012345678901234567890123
RVEL    | Rvel   (nmes)| rem |dis|     reference     |
-----------------------------------------------------
RVEL m|   +5100 (    )|     |   |1973UGC...C.......N|
```

Header	*Meaning*
`Rvel (nmes)`	radial velocity (km/s), and number of measurements
`reference`	bibliographic reference

G.19 SAO measurements

Data extracted from the SAO catalogue (*Star catalog of 258997 stars for the epoch and equinox 1950.0*, 1966) are:

```
123456789012345678901234567890123456789012345678901234567890123
SAO  |   alpha          delta    : m.e| pm-ra :m.e| pm-de :m.e|
 reference         |
---------------------------------------------------------------
SAO m|22 27 18.529 +58 09 31.77  : .04|  +.012:001|  +.005:001|
1966$SAO..C.......S|
```

Header	Meaning
alpha delta	α_{1950} and δ_{1950} for epoch 1950.0 (FK4 system)
m.e	σ of 1950 position ($''$)
pm-ra :m.e	proper motion $\mu_\alpha \cos\delta$ in $''/yr$, and σ
pm-de :m.e	proper motion μ_δ in $''/yr$, and σ

G.20 TD1 measurements

UV fluxes from TD1 satellite, by Thompson et al. (*Scientific Research Council*, 1978); magnitudes and standard errors are derived from absolute fluxes by means of the calibration by Hayes & Latham (A. J. 197, 593, 1975).

```
Example:
1234567890123456789012345678901234567890123456789012345678901234
TD1  |m2740 : s.e|m2365 : s.e|m1965 : s.e|m1565 : s.e|     reference     |
------------------------------------------------------------------------
TD1 m| 5.42 : .13| 5.52 : .36| 5.17 : .53| 4.69 : .31|1978$TD1..C.......T|
```

Header	Meaning
m2740 : s.e.	magnitude at 274.0 nm (effective width 310Å), with σ
m2365 : s.e.	magnitude at 236.5 nm (effective width 330Å), with σ
m1965 : s.e.	magnitude at 196.5 nm (effective width 330Å), with σ
m1565 : s.e.	magnitude at 156.5 nm (effective width 330Å), with σ

G.21 UBV measurements

This section includes UBV data in *Johnson's UBV* system (see *e.g.* Johnson, H.L., 1963, in K.A.A. Strand (ed), *Basic Astronomical Data*, Univ. of Chicago Press, 204) compiled by J.-Cl. Mermilliod from Institut d'Astronomie de Lausanne (Mermilliod, J.-C., 1987, A&A Sup. 71, 413).

```
Example:
12345678901234567890123456789012345678901234567890123456789012345678901
UBV  |      V      B-V     U-B  |Q/nbm|  remarks  |     reference     |
-----------------------------------------------------------------------
UBV  |(*)  3.519   +.432       ~|?  1 |V          |1980ApJS...44..427M|
```

Header	*Meaning*
	The Photometric System is described by the following notes:
	`(C)` Cape U_cBV system
	`(E)` Eggen's
	`(J)` Johnson's 11-colour
	`(*)` Other non-standard system
`V`	V magnitude
`B-V`	$(B-V)$ index
`U-B`	$(U-B)$ index
`Q/nbm`	Qualities on magnitudes, from `A` (very good) to `D` (poor), or number of measurements
`remarks`	The possible remarks are:
	`V` variable
	`V?` suspected variable
	`D` double
	`S` standard
`reference`	Source of the UBV data

G.22 uvby measurements

The Strömgren *uvby* photometric system (see *e.g.* Strömgren B., 1966, Ann. Rev. Astron. Astrophys. 4, 433) is an intermediate passband photometry. The data are currently compiled by Institut d'Astronomie de Lausanne, at Geneva Observatory (Hauck, B. and Mermilliod, M., 1985, A&A Sup. 60, 61). The filters are characterized by the following values:

	u	v	b	y
Central λ (nm)	350	410	470	550
Half-width (nm)	38	20	10	20

```
Example:
123456789012345678901234567890123456789012345678901234
uvby  | b-y  |  m1  |  c1  |nbmes|     reference     |
------------------------------------------------------
UVBY m|  .004|  .157| 1.089|     |1980A&AS...40....1H|
```

Header	*Meaning*
`(b-y)`	color index $b - y$
`m1`	index $m_1 = (v - b) - (b - y)$ (Balmer discontinuity)
`c1`	index $c_1 = (u - v) - (v - b)$ (line blocking)
`Nmes`	number of measurements for color indices. Remarks as: `S` standard values. `?` unknown number of measurements. `>` lower bound of the number of measurements.
`reference`	source of photometric data

G.23 V* measurements

Parameters concerning the variable stars were extracted mainly from the *General Catalog of Variable Stars* by Kukarkin et al. *USSR Academy of Sciences* (3^{rd} edition in 1969, and continuations).

```
Example:
12345678901234567890123456789012345678901234567890123456789012345
V*  |vartyp| Vmax   p   Vmin | period (d)   |  epoch (JD)  |D/rt%|
Reference          |
-----------------------------------------------------------------
V* m|Cd    |  3.90  B   5.09 |     5.3663   | 2427628.86   |30.0 |
1969$GCVS.C03.....K|
```

Header	*Meaning*
`Typ`	Type of variability, summarized below
`Max, p, min`	Maximum and minimum of brightness; `p` specifies the type of magnitudes
`P(d)`	period (in days)
`Ep(JD)`	epoch (in Julian Days), which corresponds to: • **maximum** light for pulsating variables (excluding RV Tau stars), α CVn stars, novae • **minimum** light for eclipsing and ellipsoidal variables RV Tau stars
`D/rt(%)`	Duration of eclipse for Algol type stars, Raising time for all other variable types
`Reference`	source of data

The classification defined in the **3rd** Edition is:

ACV	α^2 CVn	IS	Rapid Irregular
BCEP	β Cep	L	slow irregular
BLLAC	BL Lac	LB	slow late-type irregular
BY	BY Dra	M	Mira
CEP	Long-period Cepheid	N	Nova
CST	constant	NL	nova–like
CW	W Vir	QSO	Quasar
DCEP	δ Cep (Classical Cepheid)	RCB	R CrB
DSCT	δ Sct	RR	RR Lyr
E	Eclipsing binary	RRC	RR Lyr, $P \simeq 0.3d$
EA	Algol-type eclipsing binary	RV	RV Tau (supergiants)
EB	β Lyr–type eclipsing bin.	S	rapid variable
ELL	ellipsoidal	SDOR	S Dor
EW	W UMa–type eclipsing binary	SR	semi-regular
GCAS	γ Cas	SN	Supernova
I	Irregular	UG	U Gem
IA	Irregular of early type	UV	UV Cet (flare)
IN	Irregular in nebula	UVN	UV Cet in nebula
INS	Rapid irregular in nebula	ZAND	Z And symbiotic star
INT	T Tau irregular	ZCAM	Z Cam
		ZZC	ZZ Cet

G.24 z measurements

Redshift data for extragalactic sources:

```
Example:
12345678901234567890123456789012345
Z  |redshift R|    Reference     |
-----------------------------------
Z  |  .0658   |1989ApJS...70....1A|
```

Header	*Meaning*
z	Redshift $z = \sqrt{\frac{1+\beta}{1-\beta}} - 1$ where $\beta = \frac{v}{c}$
Ref	Redshift source

Appendix H

Journals scanned for the bibliography

The following journals and periodicals are currently scanned for the bibliography. A number of additional publications, including colloquia and symposia are scanned or have been scanned, but not in a systematic way.

More details are available on the World-Wide Web, at

`http://cdsweb.u-strasbg.fr/simbad/refcode.html`

SIMBAD Code	Title
A&A..	Astronomy & Astrophysics
A&AS.	Astronomy & Astrophysics Suppl. Ser.
A&ARv	Astronomy and Astrophysics Review
AcA..	Acta Astronomica
AcASn	Acta Astronomica Sinica
AcApS	Acta Astrophysica Sinica
ACiCh	Astronomical Circular (Nankin)
Afz..	Astrofizika
AGAb.	Astron. Gesellschaft Abstract Ser.
AISof	Astrophysical Investigations - Sofia
AJ...	Astronomical Journal
AN...	Astronomische Nachrichten
APh..	Astroparticle Physics
ApJ..	Astrophysical Journal
ApJS.	Astrophys. J. Suppl. Ser.
ApL..	Astrophysical Letters and communications
Ap&SS	Astrophys. & Space Science
Aster	Aster
Ast..	Astronomy
ATsir	Astron. Tsirk.
AuJPh	Australian J. Phys.
AZh..	Astronomicheskij Zhurnal
BAAS.	Bull. American Astron. Soc.
BaltA	Baltic Astronomy
BCFHT	Bull. CFHT
BICDS	Bull. Inf. Centre Données Strasbourg
BOBeo	Bull. Obs. Astron. Beograd
C&E..	Ciel et Espace
ChA&A	Chinese Astron. & Astrophys.
C&T..	Ciel et Terre
ComAp	Comments on Astrophysics and space physics
CoSka	Cont. Astron. Obs. Skalnate Pleso
CR2..	Comptes Rendus Acad. Sci. Ser. II
EL...	Europhysics Letters
EM&P.	Earth, Moon, and Planets
FCPh.	Fundamentals of Cosmic Physics
FoPh.	Foundations of Physics
Gemin	GEMINI Newsletter (RGO)

SIMBAD Code	Title
GriO.	Griffith Obs.
IAUC.	IAU Circular
IBVS.	IAU Inform. Bull. Variable Stars
Icar.	Icarus
IrAJ.	Irish Astron. J.
ISKZ.	Investigations of the Sun and Red Stars
IzKry	Izv. Krym. Astrofiz. Obs.
JApA.	Journal of Astrophysics and Astronomy
JAF..	J. Astronomes Francais
JAVSO	J. American Assoc. Variable Star Obs.
JBAA.	J. British Astron. Ass.
JBIS.	J. British Interplanetary Society
JHA..	Journal for the History of Astronomy
JRASC	J. Royal Astron. Soc. Canada
KFNT.	Kinematika Fizika Nebesnykh Tel. (Kiev)
KoIs.	Kosmic. Issl. (Cosmic research)
LAstr	L'Astronomie
Mercu	Mercury
Msngr	The Messenger
MitAG	Mitt. Astron. Gesellschaft
MitVS	Mitt. Verand. Sterne
MNRAS	Mon. Not. Royal Astron. Soc.
MNSSA	Mon. Not. Astron. Soc. South Africa
MmSAI	Mem. Soc. Astron. Ital.
Natur	Nature
NewSc	New Scientist
Obs..	The Observatory
PASAu	Proc. Astron. Soc. Australia
PASJ.	Publ. Astron. Soc. Japan
PASP.	Publ. Astron. Soc. Pacific
PAZh.	Pis'ma Astron. Zh.
PBeiO	Publ. Beijing Astron. Obs.
PhR..	Physics Reports
PhRvA	Physical Review A
PhRvD	Physical Review D
PhRvL	Physical Review Letters
PhS..	Physica Scripta

SIMBAD Code	Title
PhT..	Physics Today
PNAOJ	Publ. Nat. Astron. Obs. Japan
POBeo	Publ. Obs. Astron. Beograd
PPMtO	Publ. Purple Mountain Obs.
P&SS.	Planetary and Space Sciences
PTRSL	Philosophical Transactions R. Soc. London
PZ...	Peremennye Zvezdy (variable stars)
QJRAS	Quart. J. Royal Astron. Soc.
Rech.	La Recherche
RMxAA	Rev. Mexicana Astron. Astrofis.
RoAJ.	Romanian Astronomical Journal
RPPh.	Reports on Progress in Physics
RvPD.	Revue du Palais de la Découverte
SAAOC	South African Astron. Obs. Circ.
SoByu	Soobshch. Byurakan Obs.
Sci..	Science
SciAm	Scientific American
SciN.	Science News
SSRev	Space Science Reviews
S&T..	Sky & Telescope
S&W..	Sterne und Weltraum
VA...	Vistas in Astronomy

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