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ABSTRACT. This paper is an attempt to provide the background information necessary to find data outside of one's specialized field. The most important computer readable catalogs pertaining to the different stellar parameters are reviewed.

The purpose of my talk is to inform you of the ways in which you may obtain stellar data outside of your specialized field. The fact that specialists and non-specialists require different sources can best be illustrated by the example of a photometrist who needs to know the color of a star. As a specialist, he certainly would not want to use an average color index, but would want to derive his own "best" averages, taking the necessary elements from an observational compilation catalog (OCC). On the other hand, a non-specialist, such as myself, would prefer a critical compilation catalog (CCC) for which a respected photometrist has sifted, judged, weighed, and averaged the observation, so that my average or "best" values will be based upon an expert's recommendation. For instance, the La Plata catalog of MK types is an observational compilation catalog (OCC) -it only compiles observations without adding any additional information. Alternatively, the UBV catalog by Nicolet (1978) is a critical compilation catalog (CCC) -it gives averages but provides no individual values. Even better would be a catalog providing both individual data and averages, such as the uvby $\delta$  catalog by Hauck and Mermilliod (1980) (2057). (Readers wishing more information on different catalog types will find a detailed discussion in Jaschek (1984a)).

In this paper, I will list and briefly discuss the different catalogs available for the various kinds of stellar data. Since the number of existing catalogs is very large -for astrometry alone, Sevarlic et al. (1978) have listed 2,087 for the 70's- my discussion is limited to only the most recent compilation catalogs in each field and among these, priority is given to those readable by machine. This is hardly a very serious limitation if we consider that almost all compilation catalogs are now available in this form.

I suggest that we begin by describing the various ways of ob-

taining data for a given star. Let us consider the following; you have a current designation of a star and want to know:

- a) its observational parameters, and
- b) the papers in which the star has been discussed.

You may contact, either by letter or telex, a data center such as the CDS, or contact it through a computer network (TRANSPAC, TYMNET). You may consult the microfiches of the "Catalog of Stellar Identifications and Supplementary Data" by Ochsenbein et al. (1981) (4009), which provides cross identifications and data for 435,000 stars. It should be clear that if you query the CDS, you will get the state of art at present, rather than for 1980 (575,000 objects). For a recent description of the data base, see Ochsenbein (1984).

With regard to star bibliographies, the CDS now has  $5.5 \times 10^5$  references to  $1.1 \times 10^5$  stars. Non-stellar objects outside the solar system were included since 1983, and are now available upon request. For Vega alone, there are references to 536 paper titles.

After having obtained the main observational parameters and references to the literature on the star, you may proceed to more specialized items, such as spectroscopic orbits, masses, and diameters. I shall discuss some of these items in order of the different parameters, although the order I use is somewhat arbitrary. Beside each catalog title, you will find the author's name, the date, and a second number in parenthesis. This reference number will enable you to obtain a tape version of the catalog from any of the major data centers, namely:

- USA : NASA-ADC, GSFC, Code 680, Greenbelt, Maryland 20771
- USSR : Astronomical Council of the USSR Academy of Sciences, SADC, Pyatnitskaya ul. 48, Moscow 109017
- Japan : Kanazawa Institute of Technology, 7-1, Ogigaoka Nonoichimachi, Ishikawa 921
- German Democratic Republic : Zentralinstitut für Astrophysik, Rosaluxemburgstr. 17, 1502 Postdam
- France: Centre de Données Stellaires, Observatoire Astronomique, 11, rue de l'Université, Strasbourg

All of these data centers work in close cooperation; they exchange catalogs so that you may use the most the convenient center and they use the same numbering system. The numbers of objects in the catalogs which are quoted have been rounded off.

## POSITIONS AND PROPER MOTIONS

The most widely-used catalog is the SAO ( Smithsonian Astronomical Observatory) by Haramundanis (1966) (1001). It provides positions and proper motions for 259,000 stars in the whole sky. However, it should be noted that the SAO is not complete down to a given magnitude since in crowded areas some stars were omitted.

For the northern sky, the AGK3 by Heckmann and Dieckvoss (1975) provides data for 193,000 stars north of  $S = -2^\circ$ . It comes in three versions (1002, 1061, and 1969), each differing in detail. For a discussion of these catalogs, see Fresneau (1981). Nothing similar exists for the southern sky.

Positions for about  $3.6 \times 10^5$  stars are known to an arc second, but most of them are brighter than magnitude ten. Proper motions are known for about the same number of stars (Ochsenbein et al. 1981), but in the AGK2-3 only one-third have proper motions larger than three times its mean error (Fresneau 1978). For stars with very large proper motions one can use Luyten (1955) (1054), which provides 4,500 stars with annual proper motions  $>0''.5/y$ .

A general file on kinematic data of HD and HDE stars may be found in Mennessier et al. (1978). This catalog provides what are considered to be the best available data and contains 178,000 stars, of which  $8 \times 10^4$  possess good proper motions.

## PARALLAXES

For trigonometric parallaxes, one may use the Jenkins catalog (1963) (1081) which contains data for 7,300 stars. However, only a fraction of them have accuracies better than 10% or so. These are "nearby stars" compiled by Gliese and Jahreiss (1979) (5001, 5035). Gliese (1983) reports that about 700 stars have this level of accuracy ( $\Delta M < \pm 0^m.3$ ). A new catalog by van Altena is forthcoming.

## RADIAL VELOCITIES

The standard catalog in this field is Wilson (1953) (3021) which gives average radial velocities for 15,100 stars. Evans (1967) (3047) provides additional average radial velocities for 7,800 stars; however his survey is incomplete and I recommend that users also employ the OCC by Abt and Biggs (1972) (3004), which provides bibliographic references up to 1970, and Barbier (1975) (3038), which updates the literature as far as 1974. A summary of the data in these four publications may be found in Ochsenbein et al. (1981) (5026).

Barbier has announced in a private communication that a new edition of the bibliographic catalog is forthcoming. However, no catalog of average radial velocities is available. Radial velocities are known for about 27,000 stars. Standard stars are listed by Batten (1983).

## PHOTOMETRY

The largest body of non-photoelectric measures is the  $3.6 \times 10^5$  stars reduced to a homogeneous system by Ochsenbein (1974) (5026). These values could be used whenever photoelectric values are unavailable.

Photoelectric measures are known for about  $1.02 \times 10^5$  stars (Mermilliod, 1984). The forthcoming "General Catalog of Photometric Data" by Hauck will provide references to the system in which each of these stars was observed. At present, only a first version of this catalog by Magnenat (1976) (2039) is available. It provides data for  $3.2 \times 10^4$  stars.

For stars observed in given systems, Egret and Philip (1979) (5016) have provided response functions for 33 photometric systems as well as a list of 800 stars used as standards in the seven most widely-used systems.

I shall now comment on catalogs providing information on objects observed in different photometric systems. Table I summarizes the situation to date.

TABLE I : Photometric catalogs

System	Author	Catalog	Number of stars	Notes
UBV	Mermilliod & Nicolet (1977)	2035	53,000	measures
	Mermilliod (1983)	2089	26,000	update of meas.
	Nicolet (1978)	2051	59,000	averages
uvby $\beta$	Hauck and Mermilliod (1980)	2057	20,000	measures and averages
Geneva	Rufener (1981)	2072	14,600	averages
U <sub>c</sub> BV	Nicolet (1975)	2027	7,200	measures and averages
Vilnius	North (1980)	2058	1,900	averages
DDO	McClure & Forrester (1981)	2080	2,200	averages
RI	Jasniewicz (1982)	2075	5,700	measures and averages
UBVRI..N	Morel & Magnenat (1978)	2007	4,500	measures and averages

Infrared observations ( $\lambda > 1\mu$ ) are reported in the "Catalog of Infrared Observations" by Gezari et al. (1982) (6020), which lists sources for 55,000 observations of about  $3 \times 10^4$  objects. There are a number of source catalogs for the ultraviolet region of the spectrum - the most important to date is the "TD1 Four-Band Photometry Catalog" by Thompson et al. (1978) (2059) giving data for 31,000 stars. Other catalogs include the "Telescope Four-Band Catalog" by Davis et al. (1973) (2006) giving data for 5,700 stars, the "ANS Photometry Catalog" (six bands) by van Duinen et al. (1975) (2060) giving data for 3,600 stars and several more dealing with a smaller number of objects.

#### SPECTROSCOPY

For unidimensional spectral types, the most important collection of data in this field has been embodied in the "Henry Draper Catalog" by Cannon and Pickering (1924) (3001) covering 225,000 stars.

Two dimensional types (MK) have been compiled by Jaschek et al. (1964) (3018) for 21,000 stars, and by Kennedy (1983) (3078) for 36,500 additional stars.

Houk is currently reclassifying all HD stars by declination zones; the first volumes of this work are already available; vol. I ( $-90^{\circ}$  to  $-53^{\circ}$ ), Houk and Cowley (1975) (3031); vol. II ( $-53^{\circ}$  to  $-40^{\circ}$ ), Houk (1978) (3051); and vol. III ( $-40^{\circ}$  to  $-26^{\circ}$ ), Houk (1982) (3080), providing types for 97,000 stars.

MK standard stars have been published by Morgan et al. (1978) and by Keenan (1983) for stars later than G0.

Mercedes Jaschek (1978) (3042) has produced a catalog of selected spectral types basing her "best" spectral types on the literature for 31,000 stars.

Spectral classifications for 1,900 stars based upon the ultraviolet region have been published by Cucchiaro et al. (1979) (3053) (TP1 experiment); and by Heck et al. (1984) (3083) for 230 stars, (IUE experiment).

Stars with spectral peculiarities are listed by Egret and Jaschek (1984) (3081); the catalog lists about 25,000 stars belonging to 53 different groups.

Stellar abundancies for 700 stars in the form of  $[Fe/H]$  ratios are given in a bibliographic catalog by G. Cayrel et al. (1981) (3061). A new edition is forthcoming.

For further details on spectroscopic computer readable catalogs, see Jaschek (1984b).

## SPECTROPHOTOMETRY

The two standard catalogs in this field are Breger (1976) (3048), which gives data for 940 stars, and Ardeberg and Virdefors (1980) (3069), which gives data for 380 stars. Glushneva's important catalog (1982), which gives data for 700 stars, does not exist on tape. A list of standards has been published by Glushneva (1983) and additional standards by Taylor (1981).

There are three important spectrophotometric catalogs for the ultraviolet region, Jamar (1976) (3039), giving data for 1,800 stars, and its complement, Macau-Hercot et al. (1978) (2086), giving data for 400 stars. The third is the IUE flux catalog by Heck et al. (1984) (3083), giving data for 230 mostly normal stars. There are a number of other catalogs providing data for smaller number of stars.

## STELLAR ROTATION

The latest catalog is from Uesugi and Fukuda (1982) (3063). It provides average values for 6,500 stars. Standards are provided by Slettebak (1975).

## DIAMETERS

Fracassini et al. (1981) (2061) have produced a bibliographic catalog of the existing determinations for 4,300 stars.

## MASSES

Popper has edited a critical compilation catalog (1980), but it is not available on tape. For additional information see the section on "Binaries".

## POLARIZATION

The only catalog available on this subject is Mathewson et al. (1978) (2034). It provides data for 7,500 stars but no update is available. A list of standards has been provided by Breger and Hsu (1981).

## MAGNETIC FIELDS

The only catalog on this subject is Didelon (1983), which lists magnetic field measurements for 800 stars.

## BINARIES

Worley's "Index Catalog" (1983) (1107) deals with visual binaries giving data for 70,000 objects. The catalog of individual measures is however not yet published. A new catalog of visual binary orbits became recently available (Worley and Heintz, 1983) (5039). The orbit catalog of Batten et al. (1978) (3016), dealing with spectroscopic binaries, provides almost 1,000 orbits. This catalog has been updated by Pedoussaut et al. (1979) (3065). Physical parameters derived from these data are given by Kraicheva (1980) (3057) for over 900 binaries. Eclipsing binaries are included in the catalog of orbits of close binaries by Svechnikov and Bessonova (1984) (3082) which gives data for about 300 pairs.

## VARIABLE STARS

For variable stars, one may use the third edition of the "General Catalog of Variable Stars" by Kukarkin et al. (1971) (2011), providing data for 23,000 stars, and its supplement (suspected variables) by Kukarkin (1981) (2079), giving data for 15,000 additional stars.

A recent bibliography of variable stars by Huth and Wenzel (1981) (6022) provides 290,000 references for 28,000 variables.

## CLUSTER DATA

The standard catalog of open clusters is Lyngå (1983) (7041), providing data for 1,200 objects. Globular clusters are dealt with in the bibliographic catalog of Ruprecht et al. (1983)(7044)(140 objects). Mermilliod (1976) (2029) takes on the more difficult problem of data for stars in open clusters, and provides UBV values and MK classifications for 8,900 and 2,300 stars, respectively, in 223 clusters. Another important catalog is Mermilliod's (1979) (3055) catalog of radial velocities in clusters, giving data for 800 stars in 78 open clusters. A new update is in preparation.

There is no general catalog to date which will enable us to separate open clusters into field clusters. However, Humphreys, et al. (1984) (7046) have taken a step in this direction by compiling a catalog which provides 2,300 objects in associations.

In conclusion, I would like to thank all those astronomers who have devoted their time to catalog making. All of us should regard this worthwhile occupation as a very significant contribution to astronomy, because without it, we would face the impossible task of trying to find information in the haystack of astronomical literature - a literature so dense that for 1982 alone, it was of the order of 300 books and 17,000 papers.

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## DISCUSSION

GLUSHNEVA: With respect to your reference to the Sternberg Institute spectrophotometric catalogue published by Glushneva, et al., the catalogue now includes 867 stars and 7 standards connected directly and carefully with the main spectrophotometric standard Alpha Lyrae.

HAUCK: You have forgotten one catalogue: the Catalogue of Catalogues of the Information Bulletin of the CDS at Strasbourg.

JASCHEK: Yes, indeed!

GRIFFIN: I should like to make two comments. First, I would like to encourage you to keep the Bibliographical Star Index up to date. At present there is a gap of five or six years since the most recent published Index. As a journal editor, some time ago I accepted a paper sent from the CDS containing an analysis of the 1983 Index. I would have preferred to see the Index itself rather than the analysis of it. Please understand that this comment is by way of encouragement and not criticism - we are all very grateful for the existence of the BSI.

JASCHEK: We have a backlog of the microfiches for the BSI, but the BSI itself is up to date. Bibliographical references become available immediately after incorporation, which is one about week after the journal arrives at the library.

We welcome queries of the CDS by TELEEX, letter or computer link.

GRIFFIN: My other point concerns MK types. I noticed that you did not refer to Buscombe's catalogues, and those catalogues, which have no references, are for many purposes unsatisfactory. Is there any way of retrieving MK classifications made in the last ten years?

JASCHEK: Yes, the 1983 edition of the Kennedy catalogue is available from the data centers. It covers the MK literature up to 1982.

GLIESE: Thank you for your very clear description of the situation concerning radial velocity catalogues. As the compiler of a new catalogue of nearby stars I urgently need radial velocity data not necessary with an accuracy of 0.1 km/sec but with 1 km/sec, which is quite sufficient for combination with tangential velocities. How do I find the best data available today, that is, with one value for each star for which different measurements are published? What procedure is recommended?

JASCHEK: This is a task beyond those of any data center; it must be asked of the specialists of velocities. In the case of the CDS I have always refused to get involved in cataloging if no specialist is doing it; this is the only way to guarantee the quality of the catalogues we distribute.

BATTEN: I should mention the concern of a group at Marseille with the production of a new catalogue of radial velocities and the definition of a "best" value of radial velocity.

JASCHEK: Yes, a catalogue is in preparation, but I do not know when it will be ready.

NORDSTRÖM: With respect to Gliese's question about how to find radial velocities for the nearby stars, I would like to mention that a large catalogue, Radial Velocities of 790 Bright Stars (Andersen, et al. 1984), has just been submitted to the Astron. and Astrophys. Suppl. Series. This catalogue contains accurate CORAVEL velocities for all late-type stars in the Bright Star Catalog without previously published velocities. Preliminary values for some of these stars were included in the last edition of the Bright Star Catalogue.

WALKER: While I certainly applaud the accumulation of data into catalogues I think it can lead to problems. The rotational velocity catalogue of Uesugi and Fukuda attempts to put rotational velocities from a number of sources into a single system using linear transformations, but, in my view, many of the transformations are incomplete and as a result the original quality of the data has been lost. It is important, in my view, that the appropriate commissions of the IAU have input when such catalogues are being prepared.

JASCHEK: We accept what the specialists provide us with, but we encourage other specialists to provide us with different answers for the same parameters.

LYNGÅ: In my catalogue I have tried to select references rather than taking mean values. For example, the [Fe/H] for a cluster is a single determination with its reference. It must be in the vein of the purpose of this symposium that we have data, the calibration of which are

known. I don't recommend the other method, that of taking mean values. Particularly, I hope this will guide the selection of radial velocity data.

JASCHEK: Again, it is entirely up to the specialists to determine what they will put into the catalogue!

SCARFE: One matter that is somewhat outside the scope of the specialists is that of cross references between catalogues. Does the CDS provide this kind of information?

JASCHEK: Yes, indeed. The "Catalogue of Stellar Identifications" provides cross identifications for a half million stars and carries up to 40 different designations for a given star. Automatically, when you ask the CDS for data concerning a given star, you also get all the cross-identifications.

ROUNTREE: Do you have any advice for the compilers of catalogues as to the best identification numbers to use for their stars?

JASCHEK: Yes, indeed. 1) Provide always two identifiers; one can be the position, at a specified epoch. 2) Explain the catalogue abbreviations, using the "first dictionary" by Fernandez, Loret and Spite (A & A Suppl. 1983). 3) If you list newly discovered objects, do not call them 1,2,...n but introduce a catalogue abbreviation for future use. Call them CJS01 (Carlos Jaschek, Strasbourg Observatory first object), because otherwise different people will refer in different ways to them, causing unnecessary confusion. 4) If you publish charts, provide the scale, orientation and magnitude of the stars. The leading astronomical journals have recently agreed to act along these lines.

MILLWARD: On a number of the microfiches available from the CDS the objects are listed by CSI number. Now, while there is an HD to CSI cross reference available on fiche, the CSI numbers are not in any order in the catalogues. This makes it impossible to find objects from the fiche at our own institutions without writing to the Data Center.

JASCHEK: We will look into that.