PART V

EXISTING FACILITIES AND FUTURE ROLE OF DATA CENTRES

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SURVEY OF EXISTING FACILITIES

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The purpose of the present paper is to present a review of the existing data centers.

If one knows nothing about a subject, one makes an enquiry, and this is exactly what I have done. The list of addresses to start with was provided by Dr. G.A. Wilkins, chairman of the Working Group on Numerical Data of IAU Commission 5, who had collected a list of data services. I want to thank all colleagues who have answered the questionnaire, which is the basis of the present paper; the answers (and the questionnaire itself) are reproduced in Appendix A of this paper.

I shall start with the definition of "data service". The data service should ensure that reliable data become available promptly and conveniently to the user. Broadly one can specify three different functions of the service, namely

a) compilation
b) evaluation or analysis
c) distribution

The data which are the subject of the work are values of various parameters measured of one or various astronomical objects. Since each datum, to be useful, must carry a source reference, data services are imbricated with documentation services.

It is easy to see that "data services" occupy a very definite place in the organization of research.

We find in the first instance the colleague - or the team of colleagues - who observes a number of astronomical objects and describes the result of the observation by means of a series of

C. Jaschek and G. A. Wilkins (eds.), Compilation, Critical Evaluation, and Distribution of Stellar Data. 205-279.

TABLE 1

Data Dissemination Centers

HM Nautical Almanac Office Ephemerides - Herstmonceux (UK)
Nautical Almanac Office - Washington (USA)
National Space Science Data Center - Washington (USA)
Radio Observatory - Columbus (USA)
Centre de Données Stellaires - Strasbourg (France)
Institut de l'Astronomie Théorique - Leningrad (USSR)
Laboratory for Optical Astronomy - Greenbelt (USA)
Astronomisches Rechen-Institut - Heidelberg (GFR)
Bureau des Longitudes - Paris (France)

symbols for each object; for instance, numbers for magnitude, letters and roman numerals for spectral types. Each of these symbols represents a datum, and we will refer to these as "primary data", i.e. coming from observations.

A second instance is represented by a colleague - or a team of colleagues - who compiles the data regarding one type of objects (masses, radii and magnetic fields of Ap stars) or one type of data for different objects (UBV colors for all stars), or the documentation regarding one type of objects (a catalogue of planetary nebulae) or the documentation concerning one datum (stars observed photoelectrically). The compilation is usually accompanied by some evaluation or analysis of varying degrees of complexity, and the result is presented under the form of a "catalogue". This kind of activity will be described as "data evaluation" and the group which carries it out will be called a "data evaluation center" (DEC).

Usually, but not always, some kind of data distribution is carried out by the "data evaluation centers", the rule being a printed catalogue that crystallizes the knowledge at a given epoch.

A third instance is represented by an organization that combines the results from various "data evaluation centers". Its function lies mostly in the dissemination and the handling of the information through various more or less sophisticated techniques. It does not any longer handle primary data, i.e. original data, but mostly secondary data, i.e. data evaluated at one DEC. This

is what we will call a data dissemination center, or more simply "data center" (DC).

The distinction between a DEC and a DC, which seems easy in theory, is somewhat difficult in practice. In Table 1, I have listed those institutes which seem to fall into the DC category.

The list of all DEC's is given in the Appendix. I have preferred to list all data services, even the smaller ones, because I think it is important to know what exists regardless of its volume. I would be grateful for any additions or corrections to this list.

Table 1 shows that the oldest data centers were the Institutes in charge of astronomical ephemerides; they also pioneered the use of modern computers in astronomy. Only recent years have seen DC's created on purpose.

Quite naturally the increasing volume of data to be handled as one proceeds from one instance to the next imposes an increasing complexity. Whereas DEC's tend to be handled by a single motivated individual on handwritten cards, the DC's are obliged to handle the

TABLE 2

Solar System

Earth, moon and artificial satellites
Central Bureau of the International Polar Motion Service - Mizusawa (Japan)
Department of Applied Mathematics and Computational Techniques - Moscow (USSR)
Bureau International de l'Heure - Paris (France)
Lunar Laser Data Management - Austin (USA)
Lunar Data Center - Houston (USA)
Motions of planets and satellites
HM Nautical Almanac Office Ephemerides - Herstmonceux (UK)
Nautical Almanac Office - Washington (USA)
Computing Laboratory of the Pulkovo Observatory (USSR)
Astronomisches Rechen-Institut - Heidelberg (GFR)
Bureau des Longitudes - Paris (France)
Hydrographic Department of Japan - Tokyo (Japan)
Physical research, motions of smaller bodies, space exploration
Planetary Research Center - Flagstaff (USA)
IAU Planetary Photographs Center - Meudon (France)
Minor Planet Center - Cincinnati (USA)
The Minor Planets, Comets and Satellites Department - Leningrad (USSR)
National Space Science Data Center - Washington (USA)

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information by teamwork on large data handling facilities. This can be shown very well in a tabulation of the different centers made on the basis of the answers to the questionnaire. If one classified the centers as DEC's and DC's, and the handling of the information into two broad types, "handwritten" and "automatized", one finds two facts, namely that half of the DEC's still process handwritten information only and second, that no DC does so. It is surprising that even today, when computing facilities are relatively common, half of the DEC's are still handling handwritten information. The explanation lies probably in the ease with which small amounts of information can be stored and handled.

Let us next review the situation in different parts of astronomy. To do so I defined six areas, namely:

Solar system (excluding the sun)
Sun
Stars
Star systems and non-stellar objects
Physics
Bibliography

This division seems to be clear, although perhaps it is not entirely logical. I will next briefly examine each area, with emphasis on stars, the main subject of the colloquium. Please notice that a given center may be listed at more than one place.

SOLAR SYSTEM

We put into this group all centers dealing with solar system bodies and interplanetary phenomena. We have listed in Table 2 the centers dealing with this subject. Those centers affiliated directly with the ICSU Panel on World Data Centers are listed in Table 3, together with the addresses. No questionnaires are provided for these centers in Appendix A.

TABLE 3

ICSU Panel on World Data Centers

1 - Comet tails, interplanetary scintillations and zodiacal light:	
	Boulder, USA
	Kiev, USSR
	Munich, GFR
2 - Sporadic radio emissions from Jupiter:	
	Boulder, USA
	Moscow, USSR

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TABLE 3, Continued

3 - Interplanetary magnetic fields:
Boulder, USA
Moscow, USSR
Tokyo, Japan

4 - Interplanetary electric fields:
Boulder, USA
Moscow, USSR

5 - Rotation of the earth:
Boulder, USA
Moscow, USSR

Permanent services:
Bureau International de l'Heure
International Polar Motion Service

Addresses:

Boulder: World Data Center A for Solar Terrestrial Physics
Environmental Data Service
NOAA
Boulder, Colorado 80302 USA

Kiev: Cathedra of Astronomy
Observatornij per. 3
KIEV 252053 USSR

Moscow: World Data Center B2
Molodezhnaya 3
Moscow 117296 USSR

Munich: World Data Center C1
Max-Planck-Institut für Astrophysik
Föhringer Ring 6
München 23, Federal Republic of Germany

Tokyo: Prof. T. Obayashi
Institute of Space and Aeronautical Science
University of Tokyo
Komaba 4-6-1 Meguro-Ku
Tokyo 153 Japan

Notes: ICSU = International Council of Scientific Unions.
Boulder, USA is World Data Center A.
Moscow, USSR is World Data Center B.
The permanent services are listed separately; see Table 2.

TABLE 4

Sun

A - SOLAR AND INTERPLANETARY PHENOMENA

	Topic	WDC A	WDC B	Others
A.1	Sunspot Positions, Areas and Classification	Boulder, USA	Moscow, USSR	Freiburg, GFR
A.2	Sunspot Numbers	"	"	Zurich, Switzerland
A.3	Solar Magnetic Fields	"	Crimea	-
A.4	Hα Observations (other than flares)	"	Moscow, USSR	Rome, Italy Freiburg, GFR Meudon, France
A.5	Calcium Plages: Positions, Areas, Maximum Intensities	"	"	Arcetri, Italy Meudon, France
A.6	Combined and Special Optical Observations (Solar Maps, Prominences, Filaments)	"	"	-
A.7	Optical Observations of the Corona	"	"	Pic-du-Midi, France
A.8	Total Radio Flux Measurements	"	"	Toyokawa, Japan
A.9	Radio and Radar Maps of Solar Disk	"	"	-
A.10	Radio East-West Scans of Solar Disk	"	"	-
A.11	Solar X-ray and UV Background Levels	"	"	-
A.12	Energetic Solar Protons and Solar Electrons	"	"	-
A.13	Solar Wind	"	"	Tokyo, Japan
A.16	Monitoring of Total Solar Radiation	"	"	-

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TABLE 4, Continued

C - FLARE-ASSOCIATED EVENTS

	Topic	WDC A	WDC B	Others
C.1	Hα Flares	Boulder, USA	Moscow, USSR	Meudon, France
C.2	Solar Magnetic Field in Active Regions and Their Short-Term Changes	"	"	-
C.3	Solar Radio Events, Fixed Frequency	"	"	Toyokawa, Japan
C.4	Solar Radio Spectrograms of Events	"	"	-
C.5	Solar X-ray Observations	"	"	-
C.6	Sudden Ionospheric Disturbances - Ground-Based Observations	"	"	Ondrejov, Czechoslovakia Slough, UK
C.7	Solar Protons and Electrons - Direct Measurement	"	"	-
C.8	Solar Protons - Riometer	"	"	Slough, UK
C.9	Solar Protons - Ionospheric Vertical Incidence Soundings	"	"	"
C.10	Solar Protons and Electrons - VHF Forward Scatter	"	"	"
C.11	Solar Protons - Other Types of Measurements	"	"	"
C.12	Solar, Ionospheric, or Aeronomical Rockets Launched During an Event	Greenbelt, USA	"	"
C.13	Cosmic Ray Ground Level Increases	Boulder, USA		Itabashi, Japan Umeå, Sweden

(continues)

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TABLE 4, Continued

LIST OF ADDRESSES

Arcetri:	World Data Centre C1 Osservatorio Astrofisico Largo Fermi 5 50125 Firenze, Italy
Boulder:	World Data Center A for Solar Terrestrial Physics Environmental Data Service NOAA Boulder, Colorado 80302 USA
Crimea:	WDC for Solar Magnetic Fields may be reached via WDC B2 (Moscow)
Freiburg:	World Data Centre C1 Professor Dr. K. O. Kiepenheuer Schöneckstrasse 6 Fraunhofer Institut D 78 Freiburg im Breisgau Federal Republic of Germany
Greenbelt:	World Data Center A for Rockets and Satellites Code 601 Goddard Space Flight Center Greenbelt, Maryland 20771 USA
Itabashi:	World Data Centre C2 Dr. M. Wada Cosmic Ray Laboratory Institute of Physical and Chemical Research Itabashi, Tokyo, 173, Japan
Meudon:	World Data Centre C1 Dr. R. Michard Observatoire de Meudon 92 Meudon, France
Moscow:	World Data Center B2 Molodezhnaya 3 Moscow 117 296, USSR
Ondrejov:	World Data Centre C1 for SID Observator Ondrejov-u-Prahy, Czechoslovakia

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TABLE 4, Continued

LIST OF ADDRESSES, Continued

Pic-du-Midi:	World Data Centre C1 Observatoire du Pic-du-Midi Service de la Couronne 65 Bagneres-de-Bigorre, France
Rome:	World Data Centre C1 Prof. M. Cimino Osservatorio Astronomico di Roma Via del Parco Mellini 84 00136 Roma, Italia
Slough:	World Data Centre C1 Appleton Laboratory Ditton Park Slough, Bucks., England SL3 9JX
Tokyo:	Professor T. Obayashi Institute of Space and Aeronautical Science University of Tokyo Komaba 4-6-1, Meguro-ku Tokyo, 153, Japan
Toyokawa:	World Data Centre C2 Solar Radio Emission Professor H. Tanaka Research Institute of Atmospherics Nagoya University Toyokawa, 442, Japan
Umeå:	World Data Centre C1 for Cosmic Rays Dr. S. Lindgren Space Physics Group University of Umeå S-901 87 Umeå, Sweden
Zürich:	World Data Centre C1 Prof. Dr. M. Waldmeier Eidgenössische Sternwarte Schmelzbergstrasse 25 8006 Zürich, Switzerland

In Table 2 one sees several centers devoted to the study of the motions of the bodies of the solar system, whereas only two are oriented to physical aspects and both go mainly for planets. Apparently the natural satellites, other than the moon, receive

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little attention. Curiously, meteors are even more neglected, and an enquiry to the President of IAU Comm. 22 revealed the fact that there exists no international meteorite center. [Note added later on: At the IAU Assembly at Grenoble, Comm. 22 decided to create a meteorite data center at Lund.]

The general impression is that the area is well covered.

SUN

This subject is almost entirely covered by the ICSU Panel on World Data Centers for Solar-Terrestrial Physics (STP) and Rockets and Satellites. Table 4 lists the different phenomena, the centers involved and their addresses. One can say that the coverage is very satisfactory.

STARS

There exists a very great activity in this area, as shown by the long list of centers given in Table 5. To this list one could add further activities which have not been listed, as for example:

- P. Kennedy - Mt. Stromlo (Australia) - MK spectral types;
- P. Bernacca - Asiago (Italy) - V sin i values;
- G. Cayrel - Meudon (France) - abundances of metals in stellar atmospheres.

The situation seems thus to be very satisfactory, but a closer look reveals some exceptions. I have shown previously (Jaschek, 1968) that only in limited fields is the coverage of the data up to date, meaning that a comprehensive catalogue has appeared within the past two years, and this situation remains unchanged. In Table 6, I have tried to summarize the situation at mid-1976, quoting the date of the last comprehensive catalogue.

One special comment corresponds to the topic "spectral peculiarities". The complexity of the problems is well illustrated if one tries to answer the following question: where can one obtain a list of subdwarfs (or of P-Cygni type objects, or of metal-deficient stars)? (The only answer would be: ask Bidelman.) Only for some special types of objects, like Be, Ap and Am stars, etc. does a bibliography exist, and this lack of general coverage is very unfortunate.

In passing, it would be convenient to estimate the speed with which the information grows. It seems possible to assume the growth to be of the exponential type, i.e.

TABLE 5

Stars

Positions and motions

HM Nautical Almanac Office Ephemerides - Herstmonceux (UK)
Nautical Almanac Office - Washington (USA)
Astronomisches Rechen-Institut - Heidelberg (GFR)
Institut de l'Astronomie Théorique - Leningrad (USSR)
Computing Laboratory of the Pulkovo Observatory (USSR)
Bureau des Longitudes - Paris (France)
Space Science Center - Minneapolis (USA)
Hydrographic Dept. of Japan - Tokyo (Japan)

Radial velocities

Compilation of Supplement to RV Catalogue - Austin (USA)
Bibliography of RV - Marseilles (France)

Photometry

(Photométrie Stellaire) - Lausanne (Switzerland)
Dearborn Observatory - Evanston (USA)

Spectroscopic information

Astronomical Data File - Cleveland (USA)

Double stars

Card Catalogue of Minima and Bibliography of Eclipsing Binaries - Cracow (Poland)
* Centro de Dados de Estrelas Duplas - Rio de Janeiro (Brazil)
Catalogues Complémentaires des Binaires Spectroscopiques - Toulouse (France)
Card Catalogue of Eclipsing Binaries - Gainesville (USA)
(Spectroscopic Binaries) - Victoria (Canada)
(Visual Double Stars) - Washington (USA)
(Cat. Orb. d'Etoiles Doubles Visuelles) - Brussels (Belgium)

Variable stars

Variable Stars - Moscow (USSR)

Miscellaneous

Department of Applied Mathematics and Computational Techniques - Moscow (USSR)
(Pulsars) National Astronomy and Ionosphere Center - Ithaca (USA)

Combined data

** Centre de Données Stellaires - Strasbourg (France)
National Space Science Data Center - Washington (USA)
Laboratory for Optical Astronomy - Greenbelt (USA)

* This center has no publications yet.
** Copies of the Strasbourg files are also available through Potsdam, Zentralinstitut für Astrophysik (DDR).
Names in parentheses are given only for quick identification.

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TABLE 6

Coverage of the Different Fields of Stellar Astronomy

Subject	Most Recent Catalogue
Parallaxes	
Trigonometric	Jenkins (1963)
Dynamic*	
Magnitudes	
Visual	Ochsenbein (1974), CDS
Magnitudes and colors	
Continuous updating	Observatoire de Lausanne, see also Centre de Données Stellaires
Spectrophotometry	
Scans	Breger (1976)
Spectral classification	
MK	Kennedy (1975), Centre de Données Stellaires
MK southern sky	Cowley and Houk (1975)
Spectral peculiarity	see text
Composition	
Metal abundance	Morel et al. (1976)
*Detailed analysis**	
Position and proper motions	Haramundanis (1966)
Radial velocities	Abt and Biggs (1972)
Rotational velocity	Bernacca and Perinotto (1970-73) Uesugi and Fukuda (1970)
Radius**	
Binarity	
Visual	Jeffers, Van den Bos and Greeby (1963)
Δm in visual binaries	Wierzbinski (1969)
Orbits of binaries	
Visual	Finsen and Worley (1970)
Spectroscopic	Batten (1967)
Eclipsing	Koch, Plavec, Wood (1970)
Variability	
Main elements	Kukarkin et al. (1969), continuously updated
Bibliography*	
Magnetic fields	Babcock (1958)

* The subject was covered some time ago and coverage is outdated.
** No coverage was ever attempted.

TABLE 7

Growth Index α

Datum	Objects	(Epoch)	Objects	(Epoch)	α
Radial velocities	15 000	(1953)	25 000	(1972)	0.0269
Spectral types	15 400	(1964)	22 500	(1975)	0.0180
Photometry UBV	22 000	(1968)	25 000	(1972)	0.0320

$$N = N_o \, e^{\alpha(t - t_o)}$$

where N_o and t_o are constants and α is the growth index, giving the relative increase per annum. Please notice that this includes only the growth of the number of new objects being measured. The figures of Table 7 show that for rapidly advancing fields the annual rate is of the order of 3%. If one were to measure the total growth, i.e. including re-measurements of already known objects, one would arrive at about 8%. This figure comes from a still unpublished study and shows that every year a large number of objects is being re-measured. Although this is sometimes necessary, it implies also that much duplication exists, which is mostly due to the ignorance of the results published since the last printed catalogue. One say squarely that everything which is not contained in the last catalogue is lost for the astronomer because of "bibliographic inaccessibility". A partial solution is found in the "Bibliographie Cayrel" which the Centre de Données Stellaires is beginning to publish; the bibliography permits one to know if a given star has been mentioned in the recent literature. I say purposely that this constitutes a palliative, because one has to look star by star, since very often one also does not know which objects belong to the class one is searching for.

A glance at Table 6 shows that we are still very far from having a continuous updating, and this is probably the most pressing need to fill in the years to come.

STAR SYSTEMS AND NON-STELLAR OBJECTS

We have grouped here all work done on clusters and galaxies, and also on non-stellar objects because of the small number of centers dealing with such topics. Table 8 quotes the relevant centers.

The first impression one gets is that the effort made to synthetize our knowledge of non-stellar objects (which is admittedly a very wide field) is definitely much less organized than

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TABLE 8

Star Systems and Non-Stellar Objects

Clusters	
	Open clusters - Moscow (USSR)
	Globular clusters - Moscow (USSR)
	Globular clusters - Ontario (Canada)
X-ray objects	
	Laboratory for High Energy Astrophysics - Greenbelt (USA)
	High Energy Astrophysics Division - Cambridge (USA)
Galaxies	
	Extragalactic Astronomy Group - Austin (USA)
Non-stellar objects	
	Radio Observatory, Ohio State - Columbus (USA)
	Variable stars,- Moscow (USSR)

the work on stars. Since I have no firsthand knowledge of the field, I offer only a few comments, hoping that the audience will provide the answers.

1) For non-stellar objects exists the compendium of Dixon, which provides the background for a very large number of objects. The main question is if this is enough, and what remains to be done. It would seem that a number of things - above all bibliographic references - would be very welcome. Some work on special non-stellar objects has been started in France (see the paper by Lortet in this volume), but is as yet unpublished.

2) Despite the very encouraging start given by the Westerbork Group for radio astronomy, it seems also that the field is largely open for somebody trying to cope with the rapidly increasing information.

PHYSICS

Although the centers occupied with the compilation of physical data really fall outside the scope of this listing, I have listed in Table 9 some centers which are well known to many colleagues because of their active role in our field. It should be stressed that many more centers do exist. A complete listing of them can be found in the "International Compendium of Numerical Data Projects", CODATA (1969).

TABLE 9

Physics

JILA Atomic Collision Cross Section Information Center - Boulder (USA)
Data Center on Atomic Transition Probabilities - Washington (USA)
Data Center on Atomic Line Shapes and Shifts - Washington (USA)
Atomic Energy Level Data Center - Washington (USA)

BIBLIOGRAPHY

Under this general title I have listed the different information services which exist in Astronomy. They are included for completeness since they are not primarily data centers. The list is given in Table 10. We find in the first place the abstract services; nothing needs to be said about them, since they are working very well, providing a regular and much appreciated coverage of the literature.

There comes next a group of services which are of a very specific nature, namely the:

a) Bureau International d'Information, which supplies the announcements of catalogues published and where to get them.

b) The undertaking of Davis, who prepares a list of programs for carrying out analytical computations on computers.

c) IAU Depositories for variable stars, which keep original unpublished data.

d) INSPEC, which provides a bibliography and an index of astronomical catalogues.

A third group finally concerns those enterprises which provide bibliography for isolated objects (mostly stars), which are Bidelman's data file and the Cayrel bibliography. The first was being punched by Parsons, whereas the second will be published soon by the Centre de Données Stellaires (see the paper by Ochsenbein and Spite in this volume). Both enterprises are a very great step forward in the rational use of the existing information. The only warning I must issue is that they do not constitute an automatic substitution of the old selected bibliographies (like Merrill and Burwell's bibliography of Be stars), unless the stars are coded in a system which permits the user to find the members of the group he is interested in.

TABLE 10

Bibliography

Abstracting services
- Astronomy and Astrophysics Abstract - Heidelberg (GFR)
- * Referatni Journal - Moscow (USSR)
- Bulletin Signalétique - Paris (France)

Information services and miscellanea
- Bureau International d'Information sur les Ephemerides Astronomiques - Paris (France)
- (Computer Programs) - Chapel Hill (USA)
- IAU Comm. 27 Depositories for Photoelectric Observations of Variable Stars - London (UK)
- International Information Services for the Physics and Engineering Communities - London (UK)

Specialized bibliographies
- Astronomical Data File - Cleveland (USA)
- (Bibliographie Stellaire) - Meudon (France)
- Lunar Data Center - Houston (USA)

* No questionnaire for this service can be provided. The address is: Referatni Journal - Baltijskaya ul., 14 125219 Moscow A-219 USSR.

Names in parentheses are given only for quick identification.

This completes our survey of existing data centers. I think that they cover satisfactorily large portions of our science - the nearest objects being logically the best covered, and the most distant galaxies the least well covered. We could all be very satisfied with this state of affairs, were it not for the disturbing fact that few of our colleagues use the information stocked at these centers. Astronomy in a certain sense is still a science with a nineteenth-century mentality, so that novelties are only slowly accepted. It seems to me that a long effort is due to show to all colleagues the usefulness of data center services.

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Morel M., Bentolila C., Cayrel G. and Hauck B. (1976) In press.
Ochsenbein F. (1974) Astron. Astroph., Suppl. Ser. 15, 215.
Uesugi A. and Fukuda I. (1970) Contr. Inst. Astroph. Kwasan Obs. Kyoto no. 189.
Wierzbinski S. (1969) Contr. Wroclaw Obs. no. 16.

APPENDIX A

The following questionnaire was sent to all data centers.

1. Name of the Data Center (DC), group or section.
2. Affiliation of the DC.
3. Address.
4. Name of the Director, or person responsible.
5. Main objective of the DC.
6. Publications issued by the DC.
7. Publication (if existing) in which the activities of the DC are described.
8. Does your center store the information on hand written cards, punched cards, magnetic tapes and/or others?
9. Are your data files available through interchange, loan, sale?
10. Additional information.

The answers received are reproduced in what follows. Centers are arranged by country, and countries are listed in alphabetical order.

The author would be grateful if omissions and/or corrections were brought to his attention, since he intends to update the file regularly.

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1. Département d'Astrométrie et de Méchanique Céleste.

2. Observatoire Royal de Belgique.

3. avenue Circulaire, 3 - B-1180 BRUXELLES BELGIQUE.

4. Dr. J. DOMMANGET.

5. - Catalog of visual binary orbits (including all orbits, even the most ancient ones, for each binary). This documentation is prepared for different statistics.
   - Catalog of ephemerides of radial velocities (see point 6). The purpose is to provide radial velocity observers with all necessary informations for systematic observing programs for visual doubles, with the ultimate aim of determining the position of the ascending node (researches on the orientation of orbital planes), the masses and parallaxes of the system, etc.

6. Catalogue d'éphéméride des vitesses radiales relatives des composantes des étoiles doubles visuelles dont l'orbite est connue.
   Communication de l'Observatoire Royal de Belgique, série B, N° 15, 1967.
   Second catalogue d'éphémérides des vitesses radiales relatives des composantes des étoiles doubles visuelles dont l'orbite est connue (manuscript in preparation).

7. -

8. Catalog of orbits: on handwritten cards; the most recent orbits are on punch cards.
   Catalog of ephemerides of radial velocities: graphs plotted on cards.

9. Copies of Comm. O.R. ser. B, No. 15 are available upon request. Information on ancient orbits can be provided upon request.

10. Updating of the catalogs is done by the staff.

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1. Centro de dados de estrelas duplas.

2. Observatório Nacional.

3. Rua General Bruce, 586 - São Cristóvão, 20.000 Rio de Janeiro, BRASIL.

4. Dr. Ronaldo Rogério de Freitas Mourão.

5. Collection of all data of visual double stars: astrometric, photometric, spectroscopic and orbital; parallaxes and masses.

6.

7. No.

8. Punched cards, magnetic tapes.

9.

10. The future role of the Double Stars Data Centre is the analysis and informations of the data of visual double stars.

https://doi.org/10.1017/S0252921100053112 Published online by Cambridge University Press

1. Globular Clusters.

2. David Dunlap Observatory (University of Toronto).

3. Richmond Hill, Ontario, Canada L4C 4Y6.

4. Dr. Helen Sawyer Hogg.

5. A card index of all references on globular clusters and a separate index of all references to variables in globular clusters.

6. Catalogue of Variables in Globular Clusters (The Third Catalogue) DDO Publications 6 no. 3 (1973).
Bibliography on Globular Clusters, First Supplement, DDO Pub. II no. 12 (1963).

7. None.

8. Hand written cards.

9. I will supply as much information as I can on specific clusters or subjects. It would not be feasible to supply entire files.

10. Dr. Christine Coutts Clement works on variables in globular clusters here and has access to my files also, so she could supply information in my absence.

1. None.

2. Dominion Astrophysical Observatory.

3. 5071 W. Saanich Rd., Victoria B.C., V8X 3X3, Canada.

4. A. H. Batten.

5. To provide an up-to-date, comprehensive, and critical catalogue of the orbital elements determined for spectroscopic binaries at such intervals as appear warranted by the activity in the field.

6. Catalogue of S.B. orbital elements issued in Publications of Dominion Astrophysical Observatory 13, 119 (1967).

7. -

8. Hand-written cards, but conversion to tapes or punched cards under active consideration.

9. No, but we are ready to give information from them at any time.

10. Computer available at Observatory. Two people work on project. Cordial informal relations maintained with Pedoussaut's group in Toulouse.

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1. Observatoire de Marseille.
2. -
3. 2, Place Le Verrier - Marseille - France.
4. Dr. M. Barbier.
5. Bibliography of stellar radial velocities published after 1970.
6. -
7. Bulletin CDS (Strasbourg) 8, 12 (1975).
8. On punched cards.
9. Through the "Stellar Data Center" at Strasbourg.
10. -

1. Bibliographical Star Index.

2. Observatoire de Paris, Section de Meudon.

3. Observatoire, 92190 MEUDON - FRANCE.

4. R. Cayrel.

5. Supply bibliographic file for stellar objects. See article in information bulletin No. 10 of the CDS, Strasbourg. Also this volume, paper number 27.

6. None.

7. Information Bulletin of the "Centre de Données Stellaires", No. 10.

8. On notebooks.

9. Sale through the "Centre de Données Stellaires".

10. -

https://doi.org/10.1017/S0252921100053112 Published online by Cambridge University Press

1. IAU Planetary Photographs Center (IAUPPC).

2. Observatoire de Paris - 92190 - MEUDON FRANCE.

3. Same.

4. A. Dollfus, R. Servajean.

5. Collecting the photographs of planets collected by telescopic observations throughout the world and the planetary and lunar imaging documents resulting from the space missions.

6. Circulars.

7. Booklet, "The IAU planetary photographs centers." Transactions of the International Astronomical Union since 1961.

8. True pictures in negative or positive or both, and punched cards.

9. For consultation at the center for scientific work, or for reproduction for scientists, free of charge if for small amount. Special case if large amount.

10. 1 curator, 1 documentalist, 1 photographer, 1 technician.

https://doi.org/10.1017/S0252921100053112 Published online by Cambridge University Press

1. Bureau des Longitudes.

2. -

3. 77 Avenue Denfert-Rochereau, 75014 PARIS - France.

4. B. Morando.

5. Publication of ephemerides.

6. La Connaissance des Temps (once a year).
Ephémérides Nautiques (once a year)
Annuaire du Bureau des Longitudes (once a year).

7. -

8. Cards or 9-track tapes.

9. Available free of charge if on cards. If on tape send a blank tape.

10. -

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1. Bureau International d'Informations sur les Ephémérides Astronomiques.

2. Bureau des Longitudes.

3. 77 Avenue Denfert Rochereau 75014 - PARIS - FRANCE.

4. Dr. B. Morando.

5. The purpose of the Information Bureau is to provide information to the international scientific community on the availability of astronomical ephemerides, catalogues of star positions and lists of reduced positional observations for use in astronomical and space research. The Bureau:
   - receives details of astronomical ephemerides that are currently available or in course of preparation;
   - maintains indexed lists of such ephemerides and of cooperating institutions and individuals;
   - publishes from time to time information cards giving summary lists, details of significant new ephemerides and other relevant information; and
   - answers requests for information about the availability of ephemerides in printed or machine-readable form.

   In addition the Bureau may, in appropriate circumstances:
   1) make recommendations to cooperating institutions as to convenient standards for the specification and supply of ephemerides; and
   2) receive details of, and answer questions about, new determinations of astronomical constants, but the Bureau is not expected to carry out original work in this field.

6. Information cards no. 1 to 125 between 1971 and 1976.

7. -

8. The center does not store data but information on printed cards on the data available.

9. The information collected by the Bureau is distributed free of charge to the institutions that request it. It is given on information cards, sequentially numbered.

10. -

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1. Bureau International de l'Heure.

2. Federation of Astronomical and Geophysical Services.

3. 61, avenue de l'Observatoire - Paris 75014 - France.

4. Bernard GUINOT.

5. 1 - The BIH evaluates and makes available the International Atomic Time and the Universal Time Coordinated, which are the worldwide basis for timing the events, in accordance with the recommendations of the Conférence Générale des Poids et Mesures.
   2 - The BIH evaluates the coordinates of the instantaneous terrestrial pole and the universal time UT1, from all the relevant data (classical astronomy, measures on artificial satellites, and, in the near future, lunar distances).

6. Monthly Circular D }
   BIH Annual Report } giving the results.

7. None.

8. On punched cards (recent data). Files on magnetic disks.

9. Magnetic tapes containing the observational data can be sent (subject to reimbursement of the expenditures).

10. -

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1. Centre de Documentation Scientifique et Technique du CNRS.

2. Centre National de la Recherche Scientifique.

3. 26 rue Boyer, 75971 Paris Cedex 20. France.

4. J. H. d'Olier, Director.

5. The aim of the CNRS Documentation Centre is to provide research scientists as well as specialists, academics, doctors, engineers, industrialists, students, etc., in France and abroad, with the scientific and technical documentation necessary for their research and activities. Founded in 1939 to run a scientific library and produce an abstracts journal, the Centre has continued to increase and develop its activities. Thanks to a staff of 400 technicians, engineers, doctors and field specialists, it plays a pilot role in the elaboration and application of documentary techniques. The Centre, with its world-wide multidisciplinary coverage, processes documents in the fields of Exact Sciences, Life Sciences, Earth Sciences and Technology. It has a growing data file drawn from a variety of scientific publications. More particularly, the Bulletin Signalétique Section 120 file, which includes Astronomy, was automated in 1972. It now (end 1976) contains about 90 000 items with a yearly increase of about 18 000 items.

6. Bulletin Signalétique du CNRS (see PASCAL. Plan de classement) 51 Sections, in particular Section 120. Astronomie. Physique spatiale. Géophysique. (ten issues per year).

7. See "Informascience".

8. Magnetic tapes density 800 or 1600 BPI; tracks, 9; code, EBCDIC; label, not present or present (OS standard).

9. Sale.

10. Overall personnel: 400 technicians, engineers, doctors.

    Participation, in company of major foreign documentation centres, in the work of those organisations whose aim is to coordinate questions of scientific documentation: UNISIST, ISO, ICSU-AB (in particular the development of an international classification scheme for Physics within the frame-work of the Working Group in Physics), FID, EUSIDIC, CIDST.

    Conversational under study.

1. Centre de Données Stellaires.

2. Observatoire de Strasbourg.

3. 11, rue de l'Université - 67000 Strasbourg - France.

4. Dr. C. Jaschek.

5. To collect the most important stellar data; to analyze them critically; to make them available to the scientific community.

6. Information Bulletins, Nos. 1-11, two issues per year, 1971-76.

7. See Information Bulletins.

8. Preferably 9 track, 1600 BPI magnetic tapes.

9. Data are available on request, with small service charges. See Information Bulletins for details.

10. -

https://doi.org/10.1017/S0252921100053112 Published online by Cambridge University Press

1. Catalogues complementaires des binaires spectroscopiques.

2. Observatoires du Pic du Midi et de Toulouse.

3. Observatoire de Toulouse, 1 Avenue Camille Flammarion, 31500 Toulouse - France.

4. Dr. A. Pedoussaut.

5. To inform specialists during the long intervals between successive general catalogs. Thus between the Moore-Neubauer (1948) catalog and the Batten (1967) catalog, we published 9 Complementary Catalogs. Since the publication of Batten's (1967) catalog, we have published 3 complements, and a fourth one will be published in the near future. The Observatoire de Toulouse will have published a total of 13 catalogs between 1952 and 1976.

6. - Annales de l'Observatoire de Toulouse, T. XXI (1952) to T. XXXII (1968).
- Astr. Astrophys. Supple. 4 (1971); 10 (1973); to appear (1976).

7. Some very short remarks in Astr. Astrophys. 4 (1971).

8. On handwritten and on punched cards.

9. We have always answered all requests and will continue to do so.

10. Three persons (N. Ginestet, J.M. Carquillat, R. Nadal) have contributed to the assembling of the Complementary catalogs. When the latest complement is ready, we think it can be integrated with that of the "Centre de Données Stellaires" at Strasbourg.

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1. Astronomy and Astrophysics Abstracts (AAA).

2. Astronomisches Rechen-Institut.

3. Astronomisches Rechen-Institut, Moenchhofstr. 12-14, 6900 Heidelberg, Fed. Rep. Germany.

4. Dr. L.D. Schmadel - Editor-in-chief.

5. AAA is devoted to the recording, summarizing and indexing of astronomical publications throughout the world. It is prepared under the auspices of the International Astronomical Union (according to a resolution adopted at the 14th General Assembly in 1970). AAA aims to present a comprehensive documentation of literature in all fields of astronomy and astrophysics. Two volumes with 14000-15000 abstracts are scheduled to appear per year. While each volume contains an author index and a subject index, the magnetic tapes containing the index informations will be used to produce separate index volumes at intervals of a few years.

6. AAA Vol. 1 - 13 (1969-1975) (two volumes annually).

7. Reviews of single volumes in different astronomical journals.

8. The text of the abstracts are written with IBM 72 Composer. Only the index informations are stored on magnetic tapes.

9. The printed volumes may be obtained from Springer-Verlag, 1000 Berlin.

10. a) Sorting programs are written in PL/I. The computations are carried out on an IBM 370/168.

    b) 14 persons: astronomers, translator for the Russian language, typists, key punching operator (some of them only for part-time job).

    c) AAA is a member of the ICSU Abstracting Board.

1. (Data center for astrometric catalogues).

2. Astronomisches Rechen-Institut Heidelberg.

3. Mönchhofstr. 12-14 - 6900 Heidelberg 1 - Fed. Rep. Germany.

4. T. Lederle.

5. At the Astronomisches Rechen-Institut, the improvement of the FK4 and its extension to fainter stars, resulting in a new fundamental catalogue (FK5) is being carried out. In connection with this project, a data file of astrometric catalogues - observing, compiled, and fundamental - in machine-readable form is necessary. Some observatories have contributed by providing catalogues or observational data on magnetic tapes; the greatest part of the file which consists of more than 300 catalogues at present have been key-punched at the Institute. Information on the catalogues which are available is given in the Bulletin du Centre de Données Stellaires and in the B.I.I.E.A. Information Cards.

6. -

7. Bulletin du Centre de Données Stellaires No. 1, p. 10, 1971.

8. On punched cards (80-column) and magnetic tapes (9 tracks, EBCD code).

9. See B.I.I.E.A. Information Card No. 78, 1973.

10. Access to IBM 360/44 and 370/168.

1. Central Bureau of the International Polar Motion Service.

2. International Latitude Observatory of Mizusawa.

3. Mizusawa-shi, Iwate-ken, 023 Japan.

4. Dr. Shigeru YUMI.

5. Main objectives of the IPMS are the continuous determination of the precise position of the Earth's rotation axis which is required for geodetic and astronomical purposes, that is, for determining the positions of the observers and those of the stars observed, and the promotion of studies on relevant problems of the pole motion as the results of the continuous determination mentioned above, that is, a study of the system of astronomical constants, particularly the constants of nutation and aberration, positions of the stars, as well as a geophysical study of a constitution of the Earth and a possible continental drift.

   To meet with the objectives of the IPMS, the Central Bureau collects worldwidely all the observational data, determines pole motion, analyses it and distributes the data and results. Results obtained by the new techniques like the satellite Doppler observation, laser ranging and so on, are also dealt with.

6. Annual Report of the IPMS for the years 1962, . . . , 1973. (Once a year).
   Monthly Notes of the IPMS 1962-Nos. 1-12, . . . , 1975-Nos. 1-11. (12 issues a year).

7. The Europa Year Book 1976 : A World Survey, London.
   The World of Learning 1957-76, London.
   Federation of Astronomical and Geophysical Services (FAGS) (A booklet describing the activities of FAGS on the occasion of its tenth anniversary). UNESCO, 1966.

8. Original data of observations are recorded on hand or type written sheets. All of them are also punched on cards in a machine readable form. They are also recorded on magnetic tapes. Photocopies of original data on a fiche film will be available in the near future.
   Specifications on magnetic tapes are :

(continued)

(continued)

	at present	in the near future
Number of tracks	7	9
Recording	BCD(transformable to the Code IBM 26)	Code IBM 29 and EBCDIC
Density	800 or 556 bits/inch	800 or 1,600 bits/inch
Block length	variable	variable
Block interval	19mm	--

9. a) Data files are available through cost sale.
   b) Annual Report and Monthly Notes of the IPMS in a printed version are available free of charge by duly request at present. Selling system in the future time is under examination.

10. a) Computer
    TOSBAC 3400 Model 51

    b) Personnel
    Computer : 7 person
    Center business : 7 person

    c) Links with
    B I H

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1. Astronomical Division.
2. Hydrographic Department of Japan.
3. Tsukiji-5, Chuo-ku, Tokyo 104, Japan.
4. Akira M. Sinzi.
5. Improvement of ephemerides and catalogues.
6. Data Report of Hydrographic Observations
   Series of Astronomy and Geodesy (issued annually).
7. None.
8. Magnetic tape, 9 tracks, 800 or 1600 BPI.
9. Mostly loan.
10. -

1. Card Catalogue of minima and bibliography of eclipsing binaries.

2. Astronomical Observatory of the Jagiellonian University.

3. ul. Kopernika 27, 31-501 Krakow, POLAND.

4. Prof. dr Andrzej Zięba.

5. The collecting of data for the preparation of ephemerides of eclipsing binaries.

6. "Rocznik Astronomiczny Obserwatorium Krakowskiego", International Supplement /SAC/ founded by T. Banachiewicz, one issue per year.

7. -

8. Hand written cards.

9. The data are available through interchange.

10.

1. Institut d'Astronomie de l'Université de Lausanne et
2. Observatoire de Genève.

3. 1290 Sauverny - SWITZERLAND.

4. Prof. B. Hauck.

5. Collection and homogenisation of photometric data.

6. Rapports internes; rapports internes spéciaux.

7. See papers on the Centre de Données Stellaires, Strasbourg.

8. Magnetic tapes (7 channels, 9 from 1976 on, BCD).

9. Through the Centre de Données Stellaires, Strasbourg.

10. Eight people are engaged in this work. Links are with Strasbourg and IAU Comm. 25 and 45.

1. H.M. Nautical Almanac Office.

2. Royal Greenwich Observatory.

3. Herstmonceux Castle, Hailsham, East Sussex BN27 1RP, UK.

4. Dr. G.A. Wilkins (Superintendent).

5. The principal data activities of H.M. Nautical Almanac Office are currently as follows:
1. The preparation for publication of almanacs and tables containing astronomical data for use by astronomers, navigators, surveyors and others.
2. The computation of ephemerides and other astronomical data for particular places or projects; such data are used for research purposes, or are published in newspapers, diaries, etc., or are used as evidence in legal cases.
3. The prediction, reduction and analysis of occultations of stars by the Moon in order to study the motion of the Moon, the rotation of the Earth, and related matters; most of the observations are made by amateur astronomers in many different countries. Predictions for occultations by the Moon of planets, radio sources and X-ray sources, etc., as well as of occultations of stars by planets and satellites are also made.
4. The maintenance of a library of astronomical ephemerides, star catalogues, etc., on magnetic tape for use by the staff of the Office and of other departments of the Royal Greenwich Observatory. Copies may be made available to others under appropriate conditions.

6. Annually: Astronomical Ephemeris, Nautical Almanac, Air Almanac, Star Almanac for Land Surveyors. From time to time: navigational and mathematical tables.

7. Activities are reported in Transactions IAU in report of Commission 4 (Ephemerides).

8. Mainly magnetic tape (most 1/2-inch, 7-track, 556 rows/inch).

9. Exchange, loan or sale depending on the circumstances, but the Office may decline to meet requests.

10. The Office has access to the ICL 1903T computer system of the Royal Greenwich Observatory and cooperates very closely with the Nautical Almanac Office of U.S. Naval Observatory.

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1. Depositories for photoelectric observations of variable stars.

2. IAU Comm. 27.

3. See under 10.

4. Dr. W. S. Fitch - Steward Observatory - The Univ. of Arizona - Tucson, Ari 85721 - USA.

5. See title.

6. Circular Letters. The Depositories contain 43 series with more than 85,000 observations.

7. Trans. IAU 15-A, 313 (1973).

8. Printed or handwritten material.

9. Yes. Copies available at cost, on request.

10. Copies of files can be obtained from either

Dr. E.W. Maddison, Librarian
Royal Astronomical Society
Burlington House
London, WIV ONL, England

Dr. V.P. Tsessevich
Astronomical Observatory
Shevchenko Park
Odessa GSP 714, USSR

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1. INSPEC (International Information Services for the Physics and Engineering Communities).

2. The Institution of Electrical Engineers.

3. Savoy Place, LONDON WC2R OBL, England.

4. D. Barlow, Director.

5. To provide a comprehensive English language abstracting service in physics (including astronomy and astrophysics), electrical and electronic engineering, computers and control.

6. The services offered by INSPEC are as follows: Physics Abstracts (including approx. 6000 abstracts/year in astronomy and astrophysics), Current Papers in Physics, Electrical and Electronics Abstracts, Current Papers in Electrical and Electronics Engineering, Computer and Control Abstracts, Current Papers on Computers and Control, Cumulative Indexes, Key Abstracts, SDI (Selective Dissemination of Information), Topics, Magnetic Tapes, and On-Line Retrieval (through Lockheed DIALOG, ESA/RECON, and CAN/OLE).

7. INSPEC Matters available from INSPEC.

8. Information is stored on magnetic tapes. The distribution format for INSPEC tape services is based on ISO 2790, the international standard format for bibliographic data interchange. For more details contact INSPEC Retrieval Services Department.

9. Magnetic tape copies of the INSPEC data base are for sale.

10. Bibliography and Index of Astronomical Catalogues, 1951-75, will be available in magnetic tape form and may be regularly updated. For further details contact Mike Collins, F.R.A.S. (Senior Information Scientist), INSPEC, Station House, Nightingale Road, HITCHIN, Hertfordshire SG5 1RJ, England.

1. David S. Evans.
2. Personal scientific enterprise.
3. Department of Astronomy, University of Texas, Austin, Texas 78712, USA.
4. David S. Evans.
5. Compilation of supplement to RV Catalogue.
6. None: proof copies circulated.
7. None.
8. Typescript.
9. Xeroxes available.
10.

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1. Extragalactic Astronomy Group.

2. Dept. of Astronomy, The Univ. of Texas at Austin.

3. Univ. of Texas, R.L.M. 16-316, Austin, TX 78712, USA.

4. Prof. G. de Vaucouleurs.

5. Compilation and reduction of standard systems of morphologic, diameter, magnitude, colors, 21 cm and continuum flux, and radial velocity data on bright galaxies.

6. Reference Catalogue of Bright Galaxies (UT Press 1964). New Reference Catalogue of Bright Galaxies (UT Press 1976).

7. None.

8. All 3 forms are used (mag. tape specs on request).

9. Prior to 1976 mag. tape copies were provided free of charge. After 1976 mag. tape copies will be distributed at cost (possibly through UT Press).

10. Core of group is G. de V., A. de V. and H. G. Corwin, Jr. (with intermittent NSF or UT funding). Variable number of graduate students are employed as Research Assistants depending on NSF funding (lapsed at end 1975). Working relations for radio data exist with Nançay, NRAO, and other centers.

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1. Lunar laser data management.

2. Department of Astronomy, University of Texas at Austin.

3. Austin, Texas 78712, U.S.A.

4. Dr. Peter J. Shelus.

5. The overall objective of the lunar laser data management project is to transform the raw observations produced by the LURE team station into useful observations of the round trip time delay from these stations to specific points on the lunar surface. This general process is constituted by a complex series of individual tasks. The Observatory records consist of laser firing times, photon detection times, system calibration and environmental information. The first step consists of data identification. Since the majority of detected photons are ambient light rather than real signal, this is necessarily a statistical process, the details of which are given by Abbot, Shelus, Mulholland and Silverberg (Astron. J. 78, 784, 1973). This process produces the individual measured time delays, as well as an estimate of the associated uncertainty. These individual measures are then compressed into normal points for use in discussions of the observations. It is the responsibility of this project to provide these data monthly to LURE Team members or subsequent analysis, and to deposit them on a NASA approved semi-annual schedule to the archives of the National Space Science Data Center.

6. No formal publication series.

7. Astron. J. 78, 784 (1973); Astron. J. 80, 154, (1975); Astron. J. 80, 723, (1975).

8. The project maintains its own copies of the raw photon detections on magnetic tape, the filtered observations on magnetic tape and punched cards, and the normal points on magnetic tape and punched cards.

9. Since these data are openly available from the NASA National Space Science Data Center, Goddard Space Flight Center, Code 601, Greenbelt, Maryland 20771, USA (non-US requestors contact COSPAR World Data Center A at the same address), the lunar laser data management project attempts to avoid direct distribution of these data wherever feasible. Under special circumstances, we have made direct transmission of the normal point data on either punched cards or magnetic tape without charge, so long as such distribution is consonant with the NASA approved public data release schedule.

(continued)

(continued)

10. Magnetic tapes at the University of Texas at Austin are written with a Control Data Corporation 6600 computer. The project has, however, developed software capability to write seven track tapes that are compatible with IBM/360 BCD configuration. This activity is funded by NASA as a part of the lunar laser ranging program.

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1. JILA Atomic Collision Cross Section Information Center.

2. Joint Institute for Laboratory Astrophysics.

3. JILA A 305
University of Colorado
Boulder, CO 80309
USA

4. Dr. Earl C. Beaty.

5. The Joint Institute for Laboratory Astrophysics (JILA) maintains an Information Center for collecting information on low energy atomic collisions. The areas we are now actively working in are: electron collision cross sections; photo absorption cross sections; electron swarm and rate data; ion-molecule reaction rates. These data are of particular importance to applications in astrophysics, atmospheric physics and plasma physics. Our products consist of bibliographies, data compilations and critical reviews.

   All Information Center reports will be announced to those on the Information Center's mailing list and will be made available by publication
   1) in a recognized professional journal;
   2) as a report in the National Standard Reference Data Series (these reports will be for sale by the Superintendent of Documents);
   3) or in the JILA Information Center Reports Series (these will usually be distributed free upon request).

   The choice of the mechanism for circulation of such information will depend on the nature of the information, the expected users, and the availability of the publication to the users. We will try then to insure the maximum distribution of this material to the most likely users, with the least inconvenience to them.

6. Unscheduled.

7. None recently.

8. Methods of storing data are chosen to suit the problem.

9. Data is distributed to qualified users on request.

10.

1. High Energy Astrophysics Division.

2. Smithsonian Astrophysical Observatory; Smithsonian Institution.

3. 60 Garden Street, Cambridge, Massachusetts 02138, U.S.A.

4. Prof. R. Giacconi.

5. We plan to maintain a data bank of the observations obtained by the UHURU X-ray observatory covering the period from December 1970 to April 1973. The purpose of this archive is to allow astronomers access to these early X-ray satellite observations when they can add significantly to future analysis or discoveries.

6. Important results are published in the Center for Astrophysics reprint series.

7. None.

8. Data are stored on magnetic tapes and important summaries on microfilm and printout.

9. Data files are not available through interchange, loan, or sale. For access see questions 5 and 10.

10. Access to the UHURU observations can be obtained through the Principal Investigator, Prof. R. Giacconi, under the guidelines of the Guest Investigator program.

1. (None)

2. Morehead Observatory.

3. Dept. of Physics and Astronomy, University of North Carolina, Phillips Hall, Chapel Hill, N.C. 27514, U.S.A.

4. Prof. M.S. Davis.

5. Preparation of a list of programs (not data) for carrying out analytical computations on computers.

6. None.

7. None.

8. Lists are being compiled and will be available in printed form.

9. They will be available to all interested persons or groups.

10. Large, regional, teleprocessing Computation Center available. Central computer: IBM 165. Local computers connected to 165: IBM 360/75, 370/155II.

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1. Minor Planet Center.

2. Cincinnati Observatory, University of Cincinnati.

3. Observatory Place, Cincinnati Ohio 45208, USA.

4. Paul Herget.

5. Collect all minor planet observations. Publish Minor Planet Circulars. Compute elements and ephemerides.

6. Minor Planet Circulars (No. 3938 since 1947).

7.

8. Magnetic tapes. We have more than 160,000 obsv. since 1939 in card-image.

9. Each request is considered upon its merits.

10. The Cincinnati Observatory is also interested in determining new plate constants for the Astrographic Catalogue. The Bordeaux zone has been completed.

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1. Astronomical Data File.

2. Warner and Swasey Observatory of Case Western Reserve University.

3. 1975 Taylor Rd., E. Cleveland, Ohio 44112, U.S.A.

4. William P. Bidelman.

5. The objective of the data center is to facilitate access to all significant known data concerning non-solar system objects. In many cases actual data are included in the data file, and in all cases it is intended to give references to all important published work. Some 60,000 objects are presently contained in the data file. Even in its currently very incomplete form the file has proved extraordinarily useful, and it is believed to be the most comprehensive such file in existence.

6. None issued by the center as such. However two general catalogues have been issued by Dr. Stephenson of the Warner and Swasey Observatory which should be mentioned: "A General Catalogue of Cool Carbon Stars," W. and S. Publ. 1, No. 4, and "A General Catalogue of S Stars," W. and S. Publ. 2, No. 2.

7. Trans. IAU 13A, 1020 (1967).
Publ. Leander McCormick Obs. 16, p. 172-186 (1971).
IAU Symp. No. 50, p. 288 (1973).

8. At present the file is on hand-written cards. However, it has been partially punched at the U. of Texas (see Bull. AAS 6, 217, 1974).

9. I am happy to attempt to answer inquiries concerning any non-solar system astronomical object. The data files are open to all visitors.

10. At the moment the data-file work is supported only by the Observatory, with only one part-time assistant.

1. Radio Observatory.

2. Ohio State University.

3. 2015 Neil Avenue, Columbus, Ohio 43210, USA.

4. Dr. Robert S. Dixon.

5. The objectives of our group are:
   a) To make astronomical data available in computer-readable form.
   b) To organize astronomical information and data so it can be simply comprehended, not only by astronomers, but by all scientists and engineers who have need for it.
   c) To avoid duplication of effort in data gathering and program writing.
   d) To distribute widely useful materials and data to anyone who needs them. These materials include catalogs, maps, charts, photographs, books and overlays.
   e) To promote the use of computers in science.

   We maintain and distribute these two main publications:

   The Master List of Radio Sources, containing discovery (and rediscovery) data for all the 70,000 known radio sources.

   The Master List of Non-Stellar Objects, containing discovery (and rediscovery) data for all the 185,000 known non-stellar objects.

   In addition, we distribute other small catalogs, maps, charts, photographs and books, as described in our catalog of publications.

6. Catalog of Publications; new editions of which are issued periodically.

7. None.

8. Punched cards, magnetic tapes and computer printouts. All 7 and 9 track tape formats available on the IBM 370 computer system can be used.

9. All data files are available for sale, at a cost which equals our costs of duplication and distribution. We are also willing to exchange data files with others who have data that we need.

10. There are 5 people engaged in data organization here, and we have access to IBM 370/168, 1130 and 1620 computers. There are no formal links to other data groups, but we maintain informal periodic contact with other interested groups and individuals.

1. Dearborn Observatory.
2. Northwestern University.
3. 2131 Sheridan Road, Evanston, IL 60201, USA.
4. Prof. William Buscombe.
5. Stellar Spectral Classifications.
6. MK Spectral Classifications, 1974.
7. -
8. IBM cards; 7-track tapes, 556 bpi.
9. Sale.
10. Vogelback Computing Center, CDC 6400.

1. Planetary Research Center.

2. Lowell Observatory.

3. P.O. Box 1269, Flagstaff, Arizona 86001, USA.

4. Dr. William A. Baum.

5. The broad objective of the Planetary Research Center is to advance the state of knowledge concerning the bodies in the solar system, particularly as it relates to their origin and evolution.

Specific current objectives include:

Systematic investigation of visible atmospheric and surface phenomena on Mars, Jupiter, and Venus through the analysis of planetary photographs.

Studies of planets, satellites, and other solar system objects through photometric and polarimetric observations, including those that augment image analysis.

Intensive photographic surveillance of Mars, Jupiter, and Venus by means of a worldwide network of ground-based stations.

Collection, organization, and cataloguing of planetary photographs from all sources.

Maintenance of a facility for guest investigators and the supplying of photographs and data to scientists at other institutions.

Cooperation with or participation in space missions for which our experience is relevant.

Advancement of instrument technology in areas contributing to the other objectives above.

6. (a) Approximately 100 papers published since 1965 in scientific journals; list available.
(b) Status Reports prepared twice a year; copies on request.

7. Trans. IAU 15A, 199-200 (1973). IAU Symposium 65, pp. 241-251 (1974). Planetary and Space Science 21, 1511-1519 (1973). Icarus 12, 435 (1970).

8. Catalog of 120,000 planetary photographs is on punched cards. Printouts (12 vols. to date) available. Magnetic tapes planned.

9. Printouts are easily available. Tapes will eventually be. Punched cards can be duplicated with greater effort.

10. Qualified guest investigators have access to the photographic collection, catalogs, image measuring instruments, computer, and other facilities. Application to the director should include a brief statement of the scientific purpose.

1. Card Catalogue of Eclipsing Binaries.

2. Department of Physics and Astronomy, University of Florida.

3. Gainesville, Florida 32611, U.S.A.

4. Frank Bradshaw Wood.

5. Literature References on Eclipsing Binaries.

6. A Finding List for Observers of Eclipsing Variables.
A catalogue of graded photometric studies of close binaries.
Published at irregular intervals and infrequently (4 issues of former and one of latter to date).

7. Brief discussion in Volume 1, Vistas in Astronomy, Ed. A. Beer (1975).

8. Hand written cards (although the Finding List has been put on punched cards or tape at several institutions).

9. Copies of the cards for any specific systems are supplied on request.

10.

1. Laboratory for High Energy Astrophysics, X-ray Astronomy Group.

2. NASA/Goddard Space Flight Center.

3. Code 661, Greenbelt, Maryland 20771, USA.

4. John Arens and Richard Rothschild.

5. To collect in one place a listing of all X-ray observations of galactic sources in the energy range .1 to 500 keV. Included is source name, position, detector energy range, spectral resolution, temporal resolution, observation date, detector area, observation length, payload vehicle, reference, and comments.

6. Goddard X-document once per year.

7. None yet.

8. Data stored on tape and punched cards.

9. Possible, but no specifics have ever been generated.

10. -

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1. Laboratory for Optical Astronomy.
2. NASA, Goddard Space Flight Center.
3. Code 671, Greenbelt, MD 20771, USA.
4. Dr. Jaylee Mead.
5. To establish a computerized astronomical data retrieval system.
6. No regular publications.
7. B.A.A.S. 6, 21 (1974); B.A.A.S. 8, 346 (1976).
8. Preferably 9-track, 1600 BPI magnetic tapes.
9. Interchange or loan.
10. Access to GSFC IBM 360-75 + 91 computers; two persons engaged in project; work closely with National Space Science Data Center.

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1. National Space Science Data Center.

2. NASA - Goddard Space Flight Center.

3. Code 601, Greenbelt, Maryland 20771, USA.

4. Dr. James Vette.

5. To further use of reduced data and to serve as an active repository for such data, especially in space science.

6. Data Catalog of Satellite Experiments, NSSDC 71-20.
" " " " " , Supplement No. 1 to NSSDC 71-20, NSSDC 73-11.

7. -

8. Any tape specification or punched cards can be handled.

9. Single copies supplied at no cost to scientific workers.

10. Work closely with NASA - Goddard Space Flight Center's Laboratory for Optical Astronomy.

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1. Lunar Data Center.

2. Lunar Science Institute.

3. 3303 NASA Road No. 1, Houston, TX 77058, U.S.A.

4. Dr. Robert O. Pepin, Director of the Institute; Mrs. Frances B. Waranius, Librarian; Mrs. Mary Ann Hager, Photo/Map Librarian.

5. To assemble, catalog, and generally make accessible to the scientific community as complete a collection of lunar data as possible.

6. Lunar Science Information Bulletin No. 1-8 (1974-1975) approximately 4 times per year.

7. Geoscience Information Society Proceedings 5, 71-75 (1975). Special Libraries 66, 407-410 (1975).

8. The information is stored in a variety of published formats. Books, documents, photos, maps, journal articles, etc.

9. Most materials in the Data Center are available on loan to qualified investigators either by individual requests or through standard inter-library loan procedures.

10. We maintain and operate a Moon Literature Bibliography which is stored on a computer disk. Search capabilities exist for authors or title key-words. Searches are done on request. At present, there is no charge for the search service.

1.

2. Cornell University - "National Astronomy and Ionosphere Center".

3. Cornell University, Space Sciences Bld., Ithaca NY 14853, USA.

4. Dr. Y. Terzian.

5. Compilation of observational data on Pulsars.

6. Astrophysics and Space Sciences (1976).

7.

8. Computer cards, magnetic tapes, paper printout.

9. Available on request.

10.

1. Space Science Center.
2. Univ. of Minnesota.
3. Minneapolis, MN 55455 - USA.
4. W. J. Luyten.
5. Proper Motions of faint stars.
6. Proper motion survey with the 48-inch Schmidt telescope I-XLIII (to date).
7. No. I of above.
8. Handwritten cards, magnetic tape, computer print-outs.
9. Available to anyone who wishes to come here.
10. All salient data will be made available to NASA Data Center, Greenbelt, MD 20771, USA.

1. Astrometry and Astrophysics Division.

2. U.S. Naval Observatory.

3. U.S. Naval Observatory, Washington, D.C. 20390, USA.

4. C.E. Worley.

5. Collection, correction, and dissemination of visual double star data to astronomers throughout the world.

6.

7. Bulletin A.A.S. 6, 217, (1974).

8. Punched cards and magnetic tapes (tape can be 7 or 9-track, from 556 to 3200 B.P.I.).

9. Interchange (user sends blank tape and receives data in return).

10. We have access to an IBM 360/45. Two people are engaged in the work.

1. Atomic Energy Levels Data Center.

2. National Bureau of Standards.

3. Washington, D.C. 20234, U.S.A.

4. W. C. Martin.

5. The main objective is the compilation and publication of critically evaluated data on atomic energy levels and spectra. The compiled data include energy levels (with J and g values, configuration and term description), wavelengths and classifications of spectral lines. The bibliographic files of references also include papers with other data such as hyperfine structure, isotope shifts, stark effect, etc. A compilation of the energy levels of iron in all 26 ionization stages was published recently, and similar work for chromium is in progress. A compilation of the levels of the rare-earth elements is nearing completion. Charlotte E. Moore is continuing her Selected Tables of Atomic Spectra (energy levels and multiplet tables), having recently completed the tables for neutral oxygen. Publication of a Bibliography on Atomic Energy Levels and Spectra (July 1971 through June 1975) is planned during 1976.

6. Compilations and bibliographies on atomic spectral data.

7. CODATA Bulletin 14, 112-115 (1975).

8. Spectroscopic data on punched cards and magnetic tapes (7 track BCD mode, 800 bpi, even parity). Bibliographic files on punched paper tapes (Dura typewriter) and magnetic tapes.

9. We will answer specific inquiries. Address to Dr. Lucy Hagan.

10. We have access to a UNIVAC 1108 Computer. Three to four persons work in the Center.

1. Data Center on Atomic Line Shapes and Shifts.

2. National Bureau of Standards.

3. National Bureau of Standards, Rm. A267, Bldg. 221, Washington, D.C. 20234, U.S.A.

4. Dr. W. L. Wiese.

5. The two main objectives of the center are: (1) the collection and cataloging of all literature relevant to the broadening and shift of atomic spectral lines; and (2) the preparation and publishing of bibliographies and critical reviews of various topics in atomic line broadening.

6. Bibliography on Atomic Line Shapes and Shifts:
   NBS Special Publication 366 (1972)
   NBS Special Publication 366,Supplement 1, (1974)
   NBS Special Publication 366, Supplement 2, (1975)
   Critical reviews:
   J. Phys. Chem. Ref. Data (in press) (experimental Stark broadening parameters for non-hydrogenic spectral lines of neutral atoms)
   J. Phys. Chem. Ref. Data (in press) (experimental Stark broadening parameters for non-hydrogenic spectral lines of ionized atoms).

7. Bulletin American Astronomical Society, No. 1, first issue each year, 1970-1975 (for example Vol. 4, No. 1, p. 137-139 (1972).

8. Bibliographic information stored on punched cards and magnetic tape (for internal use only).

9. Data and references available upon request by phoning (301) 921-3374 or by writing to the address given above. Bibliographies may be purchased from U.S. Government Printing Office, Washington, D.C. 20402. Reprints of J. Phys. Chem. Ref. Data publication may be purchased from Subscription Service Department, American Chemical Society, 1155 Sixteenth Street, NW, Washington, D.C. 20056.

10. Four people working in data center (1 full time, 3 part time).

1. Data Center on Atomic Transition Probabilities.

2. National Bureau of Standards.

3. National Bureau of Standards, Rm. A267, Bldg. 221, Washington, D.C. 20234, U.S.A.

4. Dr. W.L. Wiese.

5. To collect and catalog all relevant literature, to extract and analyze the numerical data, and to prepare and publish bibliographies and tables of "best" values.

6. Bibliography on Atomic Transition Probabilities:
   NBS Special Publication 320 (1970); Supplement 1 (1971); Supplement 2 (1973).
   Critical data compilations:
   NSRDS-NBS 4, Vol. I (1966) (hydrogen through neon)
   NSRDS-NBS 22, Vol. II (1969) (sodium through calcium)
   NBS Technical Note 474 (1969) and Atomic Data 1, 1-17 (1969) (Ba I, II)
   J. Phys. Chem. Ref. Data 2, 85-120 (1973) (forbidden lines of scandium through nickel)
   J. Phys. Chem. Ref. Data 4, 263-352 (1975) (scandium and titanium)
   Critical analyses of systematic trends in atomic oscillator strengths:
   Astrophys. J. Suppl. 23, No. 196, 103 (1971) (helium through magnesium isoelectronic sequences)
   Phys. Rev. A, Feb. 1976 (in press) (spectral series of lithium isoelectronic sequence); data tables to be published in J. Phys. Chem. Ref. Data.

7. Bulletin American Astronomical Society, No. 1, first issue each year, 1970-1975 (for example Vol. 4, No. 1, p. 137-139 (1972).

8. Information is not automated at present.

9. Data and references available by phoning (301)921-3374 or by writing to us. Bibliographies and NBS compilations may be purchased from U.S. Government Printing Office, Washington, D.C. 20402. Reprints of J. Phys. Chem. Ref. Data publications may be purchased from: Subscription Service Department, American Chemical Society, 1155 Sixteenth Street, NW, Washington, D.C. 20056.

10. Four people working in data center (1 full time, 3 part time).

1. Nautical Almanac Office.

2. U.S. Naval Observatory.

3. Nautical Almanac Office, U.S. Naval Observatory, Washington, D.C. 20390, USA.

4. Dr. P. K. Seidelmann.

5. The data center was established to provide data upon request in maching readable form, primarily in America. The center specializes in ephemerides and astrometric star catalogs, which are the fields of specialization of the personnel of the office. Additionally, the center does serve as a distribution method for other astronomers who do not wish, or have the facilities, to provide copies of their machine readable data.

6. U.S. Naval Observatory Circular No. 146 (a new circular is issued when it appears necessary).

7. Annual Reports of U.S. Naval Observatory in Bulletin of the American Astronomical Society.

8. Data is stored and provided on punched cards or magnetic tapes (either 7 track, 556 or 800 bpi, or 9 track, 800 or 1600 bpi).

9. The data is available on an exchange basis, three new tapes, or cards, for each requested tape, or card.

10. This data center was established in conjunction and cooperation with Her Majesty's Nautical Almanac Office and the Astronomisches Rechen - Institut.

1. Computing Laboratory of the Pulkovo Observatory.

2. Main Observatory of the U.S.S.R. Academy of Sciences (Pulkovo)

3. Pulkovo Observatory, 196140 Leningrad M-140, Pulkovo, U.S.S.R.

4. Dr. D.D. Polozhentsev.

5. Processing of the astronomical data, mostly in the field of meridian astronomy and solar activity.

6. None.

7. Paper for IAU Colloquium No. 35 (1976).

8. We store data on punched cards and magnetic tapes (9 tracks, 800 bits per inch), on the main results of astrometric observ. and star catalogues.

9. Through interchange.

10. See the paper for IAU Colloquium No. 35.

1. Institut de l'Astronomie théorique de l'Acad. Sci. URSS.
2.
3. 10, quai de Koutouzoff - Leningrad 192187 - USSR.
4. V. A. Broumberg, V. K. Abalakine, V. A. Shor.
5.
6. Astronomitcheskiĭ Ejegodnik SSSR; Efemeridy malykh planet - every year.
   Algoritmy Nebesnoĭ Mekhaniki - 6-8 issues per year.
7. -
8. Hand written cards, punched cards.
9. Interchange, loan.
10.

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1. The Minor Planets, Comets and Satellites Department.

2. The Institute of the Theoretical Astronomy of the USSR Academy of Sciences.

3. Institute of the Theoretical Astronomy, Naberezhnaja Kutuzova 10, 192187 Leningrad, USSR.

4. Dr. V.A. Shor.

5. The Department of Minor Planets, Comets and Satellites is engaged in the following kinds of activities: a) the observations of minor planets and comets using 16" double astrograph of the Crimean Astrophysical Observatory; b) the improvement of the orbital elements, the computation and publication of opposition ephemerides of all catalogued (numbered) planets; c) the researches on spatial and dynamical structure of the asteroid belt; d) the improvement of star positions from minor planet observations; e) the computations of the definitive orbits of comets, the investigations of the evolution of comet orbits caused by planet perturbations and nongravitational effects; f) the studies of the motion of some natural satellites.

   The Ephemeris volume annually issued by the Department since 1947 contains: a) orbital elements of all numbered planets, their mean opposition magnitudes B(a,0) and absolute magnitudes B (1,0); b) dates of the oppositions; c) opposition ephemerides comprising 70 days; d) extended ephemerides of bright planets (B (a,0) $\leq 11^{m}.5$) covering 200 days; e) extended ephemerides of sume unusual planets having some specific features such as approaches to the Earth, the great eccentricity, inclination; f) the information on the insufficiently observed planets.

6. The Ephemerides of Minor Planets, published annually.

7. The activities of the Center are systematically reflected in the triennial reports of Commission 20 in the Transactions of the IAU.

8. The information is stored on punched cards and magnetic tapes in the binary-decimal code used for BESM-4 electronic computer.

9. The data files may be available through interchange.

10. The Ephemerides of Minor Planets are prepared in collaboration with the Minor Planet Center (Cincinnati Observatory) and the Astronomical Observatory of Latvian State University.

1. Astronomical Council of the USSR Academy of Sciences.

2. Sternberg State Astronomical Institute of Moscow University.

3. 109017, Moscow 17, ul. Pyatnitskaya 48, USSR.

4. Prof. Dr. B.V. Kukarkin.

5. The work on the collection, storage, analysis and distribution of data on variable cosmic objects is carried out by the Astronomical Council of the USSR Academy of Sciences, together with the Sternberg State Astronomical Institute of Moscow University, since 1946 on behalf of the International Astronomical Union. Here is a brief account of this work.
1. Compilation of a full set of cards on published variable star studies as well as those sent to us in the form of letters and preprints. During recent years the work was extended by inclusion of pulsars, X-ray sources, non-stable quasars and galactic nuclei. Our work is not restricted to collecting information; it is mainly devoted to thorough critical analysis of all data. Most important data are included in the Catalogue only after careful evaluation of all the information. These data are systematically put on punched cards and magnetic tapes.
2. The General Catalogue of Variable Stars is usually published once a decade (the latest, third, edition was published in 1969-71).
3. During the intervals between the publication of the General Catalogue, several Supplements to it are published. For instance the Third Supplement to the latest edition will be published by summer 1976.
4. Besides this special reference books are published from time to time: catalogues of suspected variables, lists of variable stars arranged in the order of right ascensions etc.
5. Each year or two, we compile name-lists of variable stars recently discovered or investigated. Twenty lists were published since 1946.
6. By now (1976) the cards contain data on more than 40,000 objects.
7. The General Catalogue and Supplements contain the following data: equatorial and galactic co-ordinates, references to the main study of the star and to the paper containing the finding chart, type of variability, limits of variations, elements of variations, spectral types. Numerous remarks contain more special data.
8. The work on improving the classification of variable stars and other non-stable celestial objects is continuously under way.

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6. The General Catalogue of Variable Stars, 3rd edition 1969-71, three volumes. The Supplements to the Catalogue (three issues 1971-76). The bulletin "Variable Stars" (13 Numbers 1971-75 and 9 Supplements 1971-75).

7. See Sky and Telescope 40, 355 (1970).

8. Detailed information about all variable stars on hand written cards. The information selected for the Catalogue, on punched cards and magnetic tapes.

9. In 1976. Not ready yet.

10. Three persons work all the time. Eight persons take part in the work from time to time as experts, if necessary.

1. Astronomical Council of the USSR Academy of Sciences.

2. Sternberg State Astronomical Institute of Moscow University.

3. 109017, Moscow 17, ul. Pyatnitskaya 48, USSR.

4. Prof. Dr. B.V. Kukarkin.

5. Since 1959 the work on the collection and analysis of data on globular clusters of our Galaxy and (during recent years) of the Magellanic Clouds and the Andromeda Nebula (M31) is carried out at the Astronomical Council of the USSR Academy of Sciences and the Sternberg State Astronomical Institute of Moscow University. The main objective of our work is to undertake a careful analysis of all the information and to put diverse and heterogeneous data on a unique system. In 1974 the book "Globular Star Clusters" and the catalogue of 129 globular clusters were published. The second enlarged edition of the book and the catalogue is in preparation (it is planned to be in print in 1978). We collect permanently information based on the account of all available new data. The cards contain the following information: equatorial and galactic co-ordinates, integrated V-magnitudes, colour indices B-V, U-B and V-I, colour excesses E(B-V), information on intermediate- and narrow-band photometry, various parameters of colour-magnitude diagrams, spectral classes, metal abundances, numbers of red giant and horizontal branch stars, numerical characteristics of stellar concentration in the clusters, tidal and core radii, flattening, variable stars (numbers according to types), properties of variable stars (periods etc.), presence of anomalous stars, X-ray sources etc., radial velocities and proper motions, apparent and true distance moduli, data on the brightest stars of the giant branch, integrated absolute V-magnitudes, number of HI atoms in the direction of globular clusters, and additional information.

   Apart from the data on 129 globular clusters which we consider to be undoubtedly globular, we also analysed data on some clusters which are not proven to be globular.

6. The book "Globular Star Clusters", Moscow 1974. "General Catalogue of Globular Clusters of Our Galaxy,"Moscow 1974.

7. -

8. On hand written cards.

9. We are ready to send information in written form.

(continued)

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(continued)

10. Two persons work all the time. Six persons take part in the analysis of the information. We constantly have links to many persons, observatories and institutions.

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1. Department of Applied Mathematics and Computational Techniques.

2. Astronomical Council of the Academy of Sciences of the USSR.

3. Moscow 109017, Piatnitskaya, 48, USSR.

4. Prof. A.G. Massevitch.

5. The main objectives and used data files:

1. Automatic reduction of satellite frames. The whole complex of programs for obtaining positions and moments of observation for satellites is based on the SAO star catalogue stored on magnetic tape. Our variant of the catalogue contains α_{1950}, δ_{1950}, μ_α, μ_δ, M_V, Sp for each star with number N SAO. An economical code packing method is used.

Now this catalogue and the complex are adjusted for ES-computer system.

A system of storing in files on magnetic tape of satellite data is prepared.

2. Ephemeris service for satellite observing stations.

3. Astrophysical problems:
   - A complex of programs in the field of stellar structure and stellar evolution
   - A complex of programs for analysis of the spectra of magnetic stars
   - Stellar statistics programs.

6. Nautchnye informatsyi N 30, 34 (nonperiodically).

7. -

8. punched cards ГОСТ - 6198,
magnetic tapes 35 mm width.

9. Our data on punched cards are available through interchange, as are printed catalogues of α, δ, τ for satellites.

10. We have a computer M-222 (M-20 type):
rate - $3 \cdot 10^4$ op/sec., main storage - 16 kwords (one word - 45 digits). We have an access to a BESM-6 computer too:
rate - 10^6 op/sec., main storage - 32 kwords.

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1. Department of Astrophysics.

2. Astronomical Council of the USSR Academy of Sciences.

3. 109017, Moscow 17, Pyatnitskaya 48, USSR.

4. Dr. O.B. Dluzhnevskaya.

5. Open clusters

1. Work on the analysis of published data on open clusters has started at the Astronomical Council of the USSR Academy of Science about three years ago. From the published data for about a thousand open clusters were chosen only those having UBV-photometric data for all cluster members. The membership of stars in those clusters was redetermined by both UBV-photometry data and proper motions or radial velocities in order to obtain homogeneous data allowing thorough statistical investigations of the ages and evolutionary status of the cluster and its integral parameters.

2. Several computer programs have been evaluated using results of stellar models computations for massive stars by B. Paczynski [1], I. Iben [2] and V. Varshavsky and A. Tutukov [3] ($16 \geq M/M_{\odot} \geq 0.8$) at different evolutionary stages. Those programs allow estimation of masses and ages of individual cluster members together with the errors of these estimations and also the corresponding probabilities for each pair of values (if for certain stars the theory allows several values). Some statistical characteristics, like the luminosity function, the mass function, integral colours, integral luminosity and others have been determined for each cluster.

3. Now our catalog includes data for 65 open clusters (about 7500 cluster members) and contains the following information:

For each cluster:

NGC or IC number
References
color excess
distance modulus
remarks
H-R-diagram in the M_V - $(B-V)_o$ - plane
H-R-diagram in the lgTe - lgL/L_o - plane
number of member stars
mass function
luminosity function

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distribution of members with age
mean age
integrated color
integrated magnitude (B-V)
integrated magnitude V
integrated mass from all member stars

For each star of the cluster:
number
color indices: V, B-V
(Te - effective temperature)
(L - luminosity)
estimated mass - m } several values, if the position of the
estimated age - t } star in the H-R diagram corresponds to
probability - w } several evolutionary tracks

4. There exist also determinations of values m, t and w for stars of the Woolley catalog [4] brighter than $M_V \leqslant 7^m$ and having $\frac{\Delta\pi}{\pi} \leqslant 15\%$ (for about 400 stars).

5. All these data are kept in the computer's memory and can be delivered on punched cards or taped lists of data.

References

1. Paczynski B., Acta Astr., 20, 43 (1970).
2. Iben I., Ap. J., 141, 993 (1965); 142, 1447 (1965); 143, 483 (1966); 143, 505 (1967); 143, 516 (1967); 147, 624 (1967); 147, 650 (1967).
3. Varshavsky V., Tutukov A., Nauch. Inf. Moscow 23, 47 (1972); 26, 35 (1973).
4. Woolley R., Epps E.A., Penston M.J., Pocock S.B., R. Obs. Ann., No. 5 (1970).

6. Nautshnye informatsii of the Astronomical council of the USSR Ac. of Sci., Moscow (Russian with English abstracts) No. 21, p. 58, 68, 1972, No. 31, p. 113, 1974.

7. -

8. Punched cards, taped lists of data.

9. Our data on punched cards or taped lists are available through interchange.

10. We use the computer M-222. Two persons work on this particular subject. The group is linked to the Computing Center of the Astronomical Council in Zvenigorod.

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