

FROM EARLY DIRECTORIES TO CURRENT YELLOW-PAGE SERVICES

A. HECK
Observatoire Astronomique
11, rue de l'Université
F-67000 Strasbourg, France
heck@astro.u-strasbg.fr

Abstract. This chapter¹ reviews major astronomical directories of the 20th century as well as the corresponding online yellow-page services. Some of the online resources were already operational before the advent of the World-Wide Web which they used subsequently with a diversification of the services offered. While mere collections of commented URLs might lose their utility because of the availability on the web of increasingly better search engines, these facilities do not make obsolete well-targeted, value-added, authenticated, homogeneously presented and continually updated resources (such as the *Star*s Family* and the *StarPages* ones). Additional comments are offered on the rewarding schemes for such activities as well as on copyright protection issues.

1. Introduction

It might be difficult to believe it today, but astronomical directories were already available at the beginning of the 20th century. A new generation appeared in the late seventies and another one with the World-Wide Web (WWW) in the early nineties. These resources included sometimes not only typical data on astronomy-related organizations, but also entries of general interest. These, in turn, reflected how diverse astronomy had become and how diverse too were (and still are) the fields connected to our activities.

With the apparition of networks, resources were put on line, even before the advent of the WWW, and were of course transferred onto the web

¹Reprinted from *Information Handling in Astronomy - Historical Vistas*, Kluwer Acad. Publ., Dordrecht (2003) 183-205.

when it became operational. Typical WWW-centered yellow-page services became quickly available, but their utility is questioned today with the excellent efficiency of search engines.

This paper will review major astronomy-related directories and information resources, first on paper, then electronic, in the course of the 20th century. It will conclude with a discussion on the future of such resources and on copyright protection issues.

2. First Directories

The first astronomical directory of last century has been produced at the Royal Observatory of Belgium (ROB) by P. Stroobant *et al.* (1907) under the title “*Les observatoires astronomiques et les astronomes*”².

In the foreword of the book, P. Lecointe, Scientific Director of ROB’s Astronomical Service, tells the genesis of that compilation. Back in 1902, a series of internal lectures by ROB scientists had been launched in order to foster studies in common and to homogenize as much as possible research activities carried out at ROB. To remain up to date with the latest astronomical investigations, a group of people (that took the name of *Comité de bibliographie et d’études astronomiques*³) started compiling journals as well as publications of observatories and learned societies. They built up a bibliographical catalogue with the purpose to complement, whenever needed, the *Astronomische Jahresbericht* and the *International Catalogue of Scientific Literature (Astronomy)*.

The compilation by Stroobant *et al.* (1907) was one of the first by-products of that work. Lecointe stressed the practical and most useful character of the work “expressing remarkable cooperation spirit and scientific solidarity”.

The presentation of each entry in French is literary in the sense that each type of data is fully described. For an observatory, geographical coordinates are given with the reference of the source, as well as a list of personnel (with the corresponding titles and positions), a few historical notes and a description of the instruments and activities. The observatories are listed alphabetically on the location name. The compilation includes a few private facilities.

Astronomical societies are also listed with details on their foundation, aims, activities, publications and constitution of the board. In addition, a few journals are mentioned with indications on their foundation, editors, publication frequencies and prices as well as on their contents and volume status. Finally, indices of names of locations are given together with a few

²(The) Astronomical Observatories and (the) Astronomers.

³Committee of Bibliography and Astronomical Studies.

pages where societies and journals are sorted by countries. The compilation included also a map showing the distribution of institutions at that time. It has been reproduced here in Fig. 1.

A second edition (Stroobant *et al.* 1931) and a supplement (Stroobant *et al.* 1936) appeared much later with the blessing of the International Astronomical Union (IAU). At its 1952 General Assembly in Rome, the IAU expressed the wish to see the compilation published again. This was done by F. Rigaux in 1959 with a supplement two years later (Rigaux 1959 & 1961). Those directories were again published in French.

From an IAU Commission 5 report (Pecker 1979), it did not seem that further updates or development of the compilations carried out at ORB were intended.

3. A New Generation

3.1. IDAAS, IDPAI, AND THEIR MERGING

We were led to compile astronomical directories quite differently from Stroobant and his collaborators.

After putting together an astronomical photographic atlas (Heck & Manfroid 1977), we needed to make sure that the publisher had all necessary information to sell our masterpiece to the astronomical community and possibly well beyond. We then started gathering lists of essentially amateur organizations around the world. They were indeed the prime target for marketing the volume. Lists of journals were also set up for taking advantage of the reviewing system.

It was subsequently realized that such lists had their own intrinsic interest. They would improve or make easier national and international contacts in amateur astronomy. They would also provide professional astronomers with addresses of groups they could approach for *e.g.* complementary observations. They had also a historical value since they were providing snapshots of the amateur world in those years.

Thus came to light the 1978, 1979, 1981, 1982 and 1984 versions of the IDAAS directory under its original title "*International Directory of Amateur Astronomical Societies*". A few specific computer printouts were also produced at request between the 1978 and 1979 editions. Later on, IDAAS' meaning was changed to "*International Directory of Astronomical Associations and Societies*" since more and more mixed amateur-professional societies were included and the word *amateur* was not anymore quite appropriate in the title. Three more editions (1986, 1988 and 1990) were produced.

Along the years, an increasing number of professional institutions showed an interest in the successive IDAAS editions. Therefore a list of

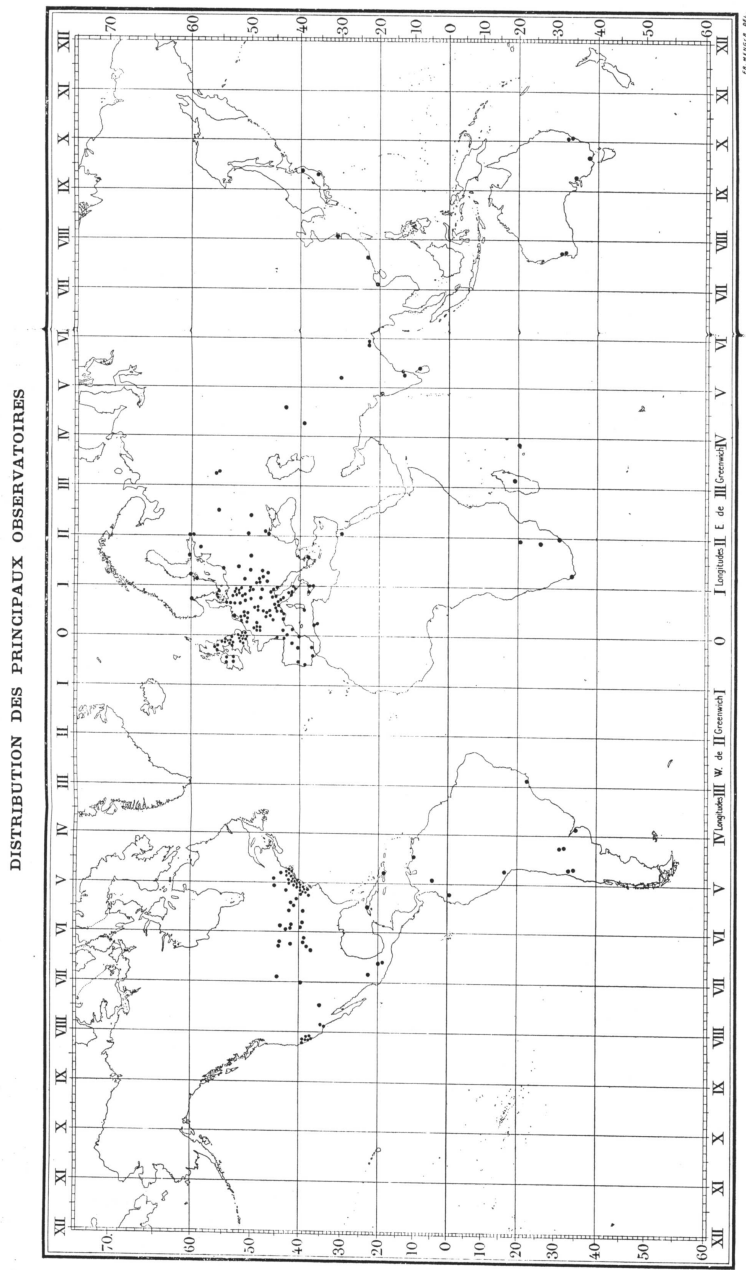


Figure 1. World Distribution of the Main Observatories after Stroobant *et al.* (1907).

institutions was also compiled for advertising IDAAS and, since that list was now existing, why not to publish it too? Hence came to light the other directory IDPAI, standing for “*International Directory of Professional astronomical Institutions*”. Three editions have been produced: 1987, 1989 and 1990.

From the start, these directories received an enthusiastic welcome and, along the years, numerous letters of support encouraged us to continue the work and to broaden the scope of the compilations. Therefore the last editions were bearing the subtitle “*together with items of general interest*”.

As the overlap between the two directories grew larger, it was decided to merge them, for the year 1991, into a single one entitled “*Astronomy, Space Sciences and Related Organizations of the World*” (*ASpScROW*).

Before going on with the history, it is probably appropriate to say now a few words on the contents of those directories.

3.2. CONTENTS

Those directories were gathering together all practical data available on associations, societies, scientific committees, agencies, companies, institutions, observatories, universities, etc., more generally organizations, involved in astronomy and related space sciences.

Many other entries were also included such as academies, advisory and expert committees, bibliographical services, data and documentation centers, dealers, distributors, funding agencies and organizations, journals, manufacturers, meteorological services, museums, norms and standards offices, planetariums, private consultants, public observatories, publishers, software producers and distributors, and so on.

Other fields such as aeronautics, aeronomy, astronautics, atmospheric sciences, chemistry, communications, computer sciences, data processing, education, electronics, energetics, engineering, environment, geodesy, geophysics, information handling, management, mathematics, meteorology, optics, physics, remote sensing, and so on, were also covered when justified.

The information was given in an uncoded way for easy and direct use. For each entry, all practical data available were listed: city, postal and electronic-mail addresses; URLs; telephone and telefax numbers; foundation years; numbers of members or staff; main activities; titles, frequencies, ISS-Numbers and circulations of periodicals produced; names and geographical coordinates of observing sites; names of planetariums; awards, prizes or distinctions granted; and so on. US FTS numbers were also included in the first versions. Electronic and web addresses were introduced later on (and telex numbers were removed).

The entries were listed alphabetically in each country. At the end of the volumes, an exhaustive index gave a breakdown not only by different designations and acronyms, but also by location and major terms in names. Subindices of academies, awards, bibliographical services, data centers, dealers and distributors, funding organizations, IAU-adhering organizations, ISS-Numbers, journals, manufacturers, meteorological offices, observatories, planetariums, publishers, software producers, etc., were also provided as well as statistics on the contents (numbers of entries per country, memberships, years of foundation) and a list of telephone, telefax and telex national codes.

Table 1 gives a brief description of the successive IDAAS, IDPAI and ASpScROW editions⁴. From 1986 onwards, the directories were distributed as Special Publications of Strasbourg astronomical Data Center (CDS). The main language of publication was English (the first editions had bilingual forewords) while the data were at some stage collected in six languages (English, French, Spanish, German, Italian, Portuguese⁵), than reduced to two (English and French) for simple practical reasons.

A list of acronyms was also included in the 1990 editions of IDAAS and IDPAI, but it had become so voluminous that it became more appropriate to provide it as a separate, nevertheless complementary, publication as we shall see in the following section.

4. The Star*s Family and the StarPages

4.1. THE FIRST STAR*S

Things changed dramatically at the beginning of the 1990s. Networks were all over, e-mail was well into its invasion, information flow was in an ever higher gear. There was an increasing demand, from both individuals and organizations, for the kind of societal data we were providing – a demand for a dynamic usage that would be satisfied by providing online access to the data.

Everything had also to go faster too, from the collection-verification-update of data to their shaping and their provision online. From an annual (or so) exercise during the previous fifteen years, it became a continuous, increasingly time-consuming process with an ever heavier pressure.

Through its European Space Information System (ESIS) group, the European Space Agency (ESA) became the first institution to make our data on organizations accessible on line as a database called *StarWays* (Heck *et al.* 1992). The European Southern Observatory (ESO) would follow with

⁴See also <http://vizier.u-strasbg.fr/~heck/ahdir.htm> for full references on all those directories. The first ones were produced with the collaboration of J. Manfroid.

⁵And occasionally in Chinese and in Russian ...

TABLE 1. Statistics from Successive Editions of the Directories

Directory	Number of countries	Number of entries	Number of pages
IDAAS 1978	27	≈600	112
IDAAS 1979	56	>1200	290
IDAAS 1981	51	>1100	304
IDAAS 1982	54	>1200	308
IDAAS 1984	56	>1200	282
IDAAS 1986	58	>1100	270
IDAAS 1988	64	>1700	522
IDAAS 1990	90	>3200	724
IDPAI 1987	68	>1500	280
IDPAI 1989	80	>2700	498
IDPAI 1990	90	>3500	666
ASpScROW 1991 (two volumes)	95	≈5200	1192

the online databases *StarGates* (Albrecht & Heck 1993, 1994b) for organizations and *StarWords* (Albrecht & Heck 1993, 1994a) for the list – by now a dictionary – of acronyms and abbreviations mentioned in the previous section.

The *Star*s Family* was born. This was announced in the CDS Information Bulletin (Heck 1992) where the new names were introduced for the paper versions:

- *StarGuides* for the directory of organizations (see also Heck 1993a);
- *StarBriefs* for the dictionary of abbreviations, acronyms, etc. (see also Heck 1993b).

Two more products were also announced:

- *StarLabels*: sets of mailing stickers bearing addresses, essentially delivered at production cost to publishers, manufacturers, and conference organizers;
- *StarSets*: subsets of data occasionally provided under some conditions of requirements and usage (see in Sect. 7.2 the discussion regarding the protection of data).

Tables 2 and 3 give a description of the successive editions of *StarGuides* and *StarBriefs*. All of them were distributed by CDS, except the 2001 ones published by Kluwer Academic Publishers⁶. Decreasing numbers of pages

⁶See for instance the web pages <http://vizier.u-strasbg.fr/~heck/ahdir.htm> and <http://vizier.u-strasbg.fr/~heck/ahcata.htm> for full references on the successive editions of *StarGuides* and *StarBriefs* respectively.

indicate transitions to more compacted printing.

TABLE 2. Statistics from Successive Editions of the Directory *StarGuides*

Year of publication	Number of countries	Number of entries	Number of pages
1993	96	≈5200	1184
1994	96	≈5200	888
1995	97	≈5300	822
1996	97	≈5500	924
1997	98	≈5800	964
1998	100	≈6100	1030
1999	101	≈6100	1132
2000	101	≈6200	1148
2001	100	≈6200	1238

TABLE 3. Statistics from Successive Editions of the Dictionary *StarBriefs*

Year of publication	Number of entries	Number of pages
1992	≈50,000	808
1993	>60,000	812
1994	≈70,000	824
1995	≈80,000	750
1996	≈100,000	912
2000	≈140,000	808
2001	>140,000	822

4.2. THE STARPAGES

The World-Wide Web (see *e.g.* Berners-Lee *et al.* 1992 & 1994) knocked at our door with an immediate success: astronomy users and servers were, by the end of 1993, the largest group on the web (Hardin 1993).

CDS in turn decided to make available, through its WWW server, the resources it was distributing on paper (Heck *et al.* 1994), giving birth to the *StarPages*, the web members of the *Star*s Family*:

- the directory of organizations *StarGuides* had its online counterpart named *StarWorlds* ⁷;

⁷<http://vizier.u-strasbg.fr/starworlds.html>

- the dictionary of acronyms, abbreviations, etc., *StarBriefs* had its online counterpart named *StarBits*⁸.

As astronomers and related scientists started to develop personal homepages on the web, a third database, gathering together the corresponding URLs⁹, was set up and made available through the CDS WWW server: *StarHeads*¹⁰ (Heck 1995). That database is purely web-oriented, while the other resources such as *StarGuides* and *StarWorlds* offer much more, as explained above, with an information fully mastered. The data retrieved from *StarHeads* are essentially no more than pointers towards personal homepages maintained by the individual themselves or by the institutional webmasters. The quality of those individual homepages might be very unequal.

When the WWW became operational, many individuals had not realized the enormous visibility those homepages were going to have professionally: real windows on people and on their activities. Students and young scientists – quick to jump on those new “gimmicks” – were not unfrequently filling in their pages with jokes, personal matters, when not simply rubbish of dubious quality often without astronomical interest. Another problem had to be faced quickly too: the volatility of URLs and the difficulty to maintain a valuable compilation of such links. There were two main sources for volatility:

- people moving (especially true for students and young scientists);
- server names were changed frequently and URLs were redefined as webmasters were becoming more “professional” – a typical maturing phase.

A few rules were quickly set up for keeping up *StarHeads*’ standards:

- entries would be restricted to professional astronomers with a PhD and above;
- homepages would be included only after being checked, authenticated, and sometimes refereed; occasionally advices would be given for improvement;
- tips would be issued for setting up professionally useful pages;
- a procedure, including systematic scanning of the database, would be set up for checking periodically that the links were alive; if necessary, new links would be researched and entered into the database;
- individuals would systematically be informed of their page’s inclusion.

Such efforts were rewarded. For instance, ADS¹¹ (see *e.g.* Eichhorn *et al.* 2003) decided to point towards *StarHeads*. Requests are continually coming in from individuals for inclusion or for updating the links. As statistics reveal it, that database is in heavy usage.

⁸<http://vizier.u-strasbg.fr/starbits.html>

⁹Unified Resource Locators – the electronic addresses of web pages.

¹⁰<http://vizier.u-strasbg.fr/starheads.html>

¹¹<http://adsabs.harvard.edu/>

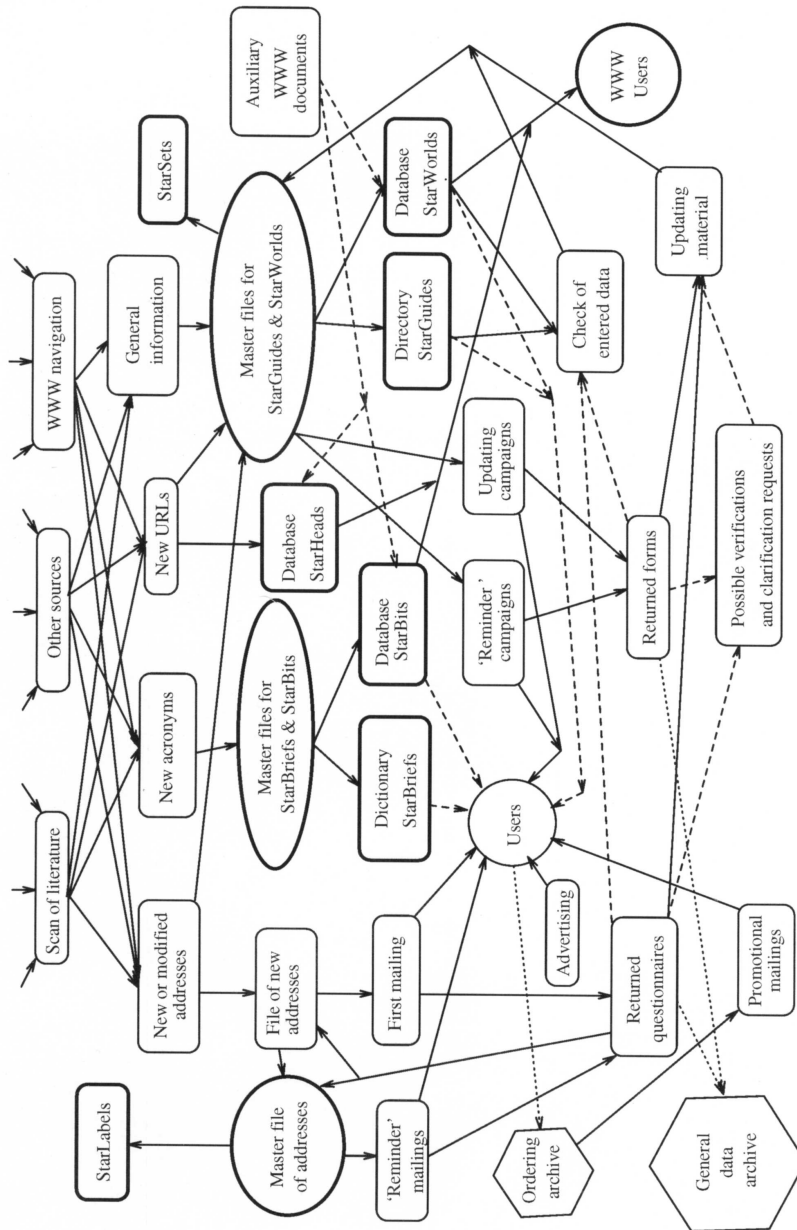


Figure 2. General working scheme for the Star*s Family and the StarPages.

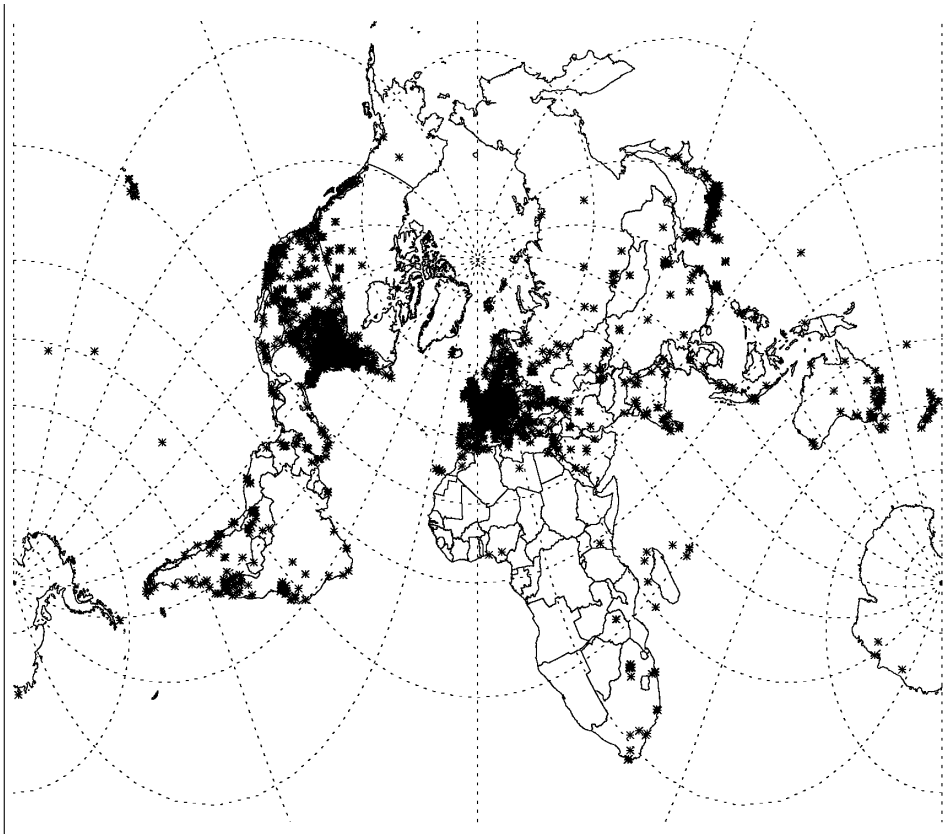


Figure 3. Planet 'Astronomy': World (Heck 2000a).

4.3. CURRENT SITUATION

The *Star*s Family* resources offer features such as a quarter-of-century experience in compilations, a resulting excellent exhaustivity of entries (including also many organizations not yet on the WWW), an homogeneous coverage and presentation of all practical data, as well as a permanent updating and quality checking scheme (see Fig. 2) including authentication of data originators, and so on.

The *StarPages* are currently giving access to the largest amount of WWW links (more than 12,000) available in a set of astronomy/space resources and to a unique astronomy/space-oriented dictionary of acronyms and abbreviations.

The online directory *StarWorlds* of astronomy, space and broadly related organizations of the world gathers currently together about 6,500 entries from 100 countries, offering more than 6,500 WWW links.

The database *StarHeads* of personal web pages of essentially astronomers and space scientists includes currently about 6,000 entries and is also pointed at by services such as the NASA Astrophysics Data System (ADS – Eichhorn *et al.* 2003).

The dictionary *StarBits* of abbreviations, acronyms, contractions, and symbols in astronomy, space sciences, and related fields offers currently explanations for about 200,000 entries.

Updated paper versions are in preparation.

The *Star*s Family* bottomline is to provide services for the benefit of a better communication within the world-wide astronomical community, and between it and the society at large, resolutely putting the emphasis on the quality, on the homogeneity and on the exhaustivity of the information delivered.

Working relationships have been established with various organizations such as (by alphabetical order) the Astronomical League (AL), the Committee for the Scientific Investigations of Claims of the Paranormal (CSICOP), the International Astronomical Union (IAU), the International Organization for Standardization (ISO), NASA's Astrophysics Data System (ADS), and the World Meteorological Organization (WMO).

4.4. SOCIOLOGICAL STUDIES FROM THE STAR*S DATA

Geographical distributions, ages and sizes of astronomy-related organizations have been investigated from comprehensive and up-to-date samples extracted from the master files for *StarGuides/StarWorlds* (for a synthesis, see Heck 2000a). Results for professional institutions, associations, planetariums, and public observatories have also been presented, as well as specific distributions for astronomy-related publishers and commercial-software producers.

The highly uneven general pattern displayed by geographical distributions (see Fig. 3-6) is still very much the same as it was at the beginning of the 20th century (Fig. 1), even if the densities are higher – another illustration of the well-known socio-economic effect of self-reinforcement. Other geographical peculiarities (local concentrations, national cultures and policies, electronic astronomy, ...) have been discussed, as well as the uneasy separation between amateur and professional astronomers in associations.

Some events had a clear impact on the rate of foundation of astronomy-related organizations, such as the World Wars I and II, the beginning of space exploration, the landing of man on the Moon, the end of the Cold War, spectacular comets, and so on. However, as detailed in Heck (2000a), not all of them affected in the same way Western Europe and North America, nor the various types of organizations.

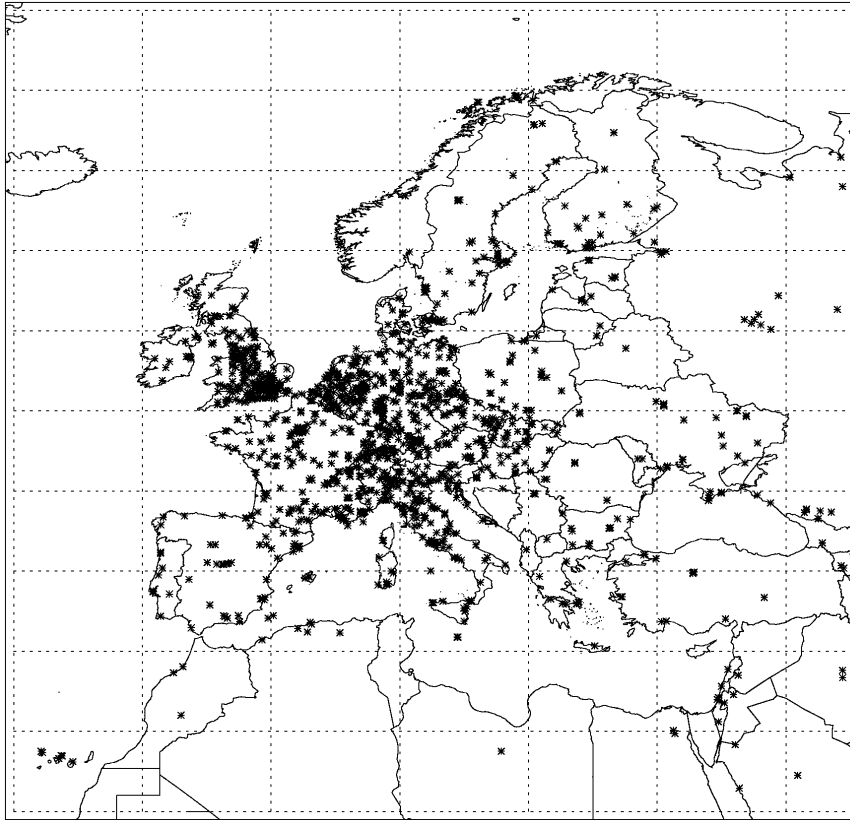


Figure 4. Planet ‘Astronomy’: Western Europe (Heck 2000a).

If the size of the vast majority of astronomy-related organizations is relatively small, there are however some differences between Western Europe and North America. See Heck (2000a) and the references quoted therein for details.

5. Other Directories and Resources

5.1. MANY MORE RESOURCES

There are quite a number of other directories in astronomy and space sciences and it would be impossible to quote all of them, especially because the web has allowed them to multiply countlessly – often in an ephemeral way. Some directories on the web have not been maintained at all since long. We shall therefore restrict the following to a few significant resources, keeping in mind that their updatedness and the degree of details they provide is

quite unequal.

First of all, the *International Astronomical Union (IAU)* is maintaining an online directory¹² of its worldwide professional membership.

National professional associations publish often membership directories. For instance, the members of *American Astronomical Society (AAS)* receive each year a very useful printed directory where the AAS members are listed alphabetically, then grouped per institutions. An electronic version¹³ is also available. This is also the case for the French *Société Française d'Astronomie et d'Astrophysique (SF2A)*¹⁴ that has issued a directory, not only of its members, but of all astronomers and related scientists working in French institutions, as well as of French astronomers working abroad in institutions such as the *European Southern Observatory (ESO)* and the *European Space Agency (ESA)*. An important distinctive feature of that directory is to provide, beyond the usual individual data, a scientific profile for each entry and then an index according to the keywords listed.

Other large national societies make their membership directories available only on paper, sometimes because national law regulates strictly the availability of data (especially electronic ones) on individuals. We would suggest interested parties to check first the web pages of the societies or the organizations, for instance through the online resource *StarWorlds*¹⁵ discussed earlier. If an online membership directory is available, it is generally directly reachable from the main homepage. Otherwise details can be found online for contacting the societies and obtaining a copy of the latest directory on paper.

As a matter of interest, the *Astronomische Gesellschaft (AG)* has published in 1996 an interesting booklet (Klare 1995) listing members with ID pictures plus a few lines on their career and profile.

The US Naval Observatory has also produced a list of active professional observatories (Lukac & Miller 2000) based in part on our own resources: "... StarGuides (and its preceding editions) ... was used extensively ... If one is working with observatories in general, this set should be on the shelf for reference".

The overall availability of e-mail has led to numerous compilations of electronic addresses that people have made available to each other over the networks. The situation in this field is however evolving quite rapidly and many of these lists have become quickly obsolete. Additionally, the nuisance of spamming and unsolicited e-mailing has led people to become more careful in letting their e-address readily available and in distributing

¹²<http://www.iau.org/cgi-iau/iau.mem.cgi>

¹³<https://members.aas.org/directory/directory.cfm>

¹⁴<http://www.cesr.fr/sf2a/>

¹⁵<http://vizier.u-strasbg.fr/starworlds.html>

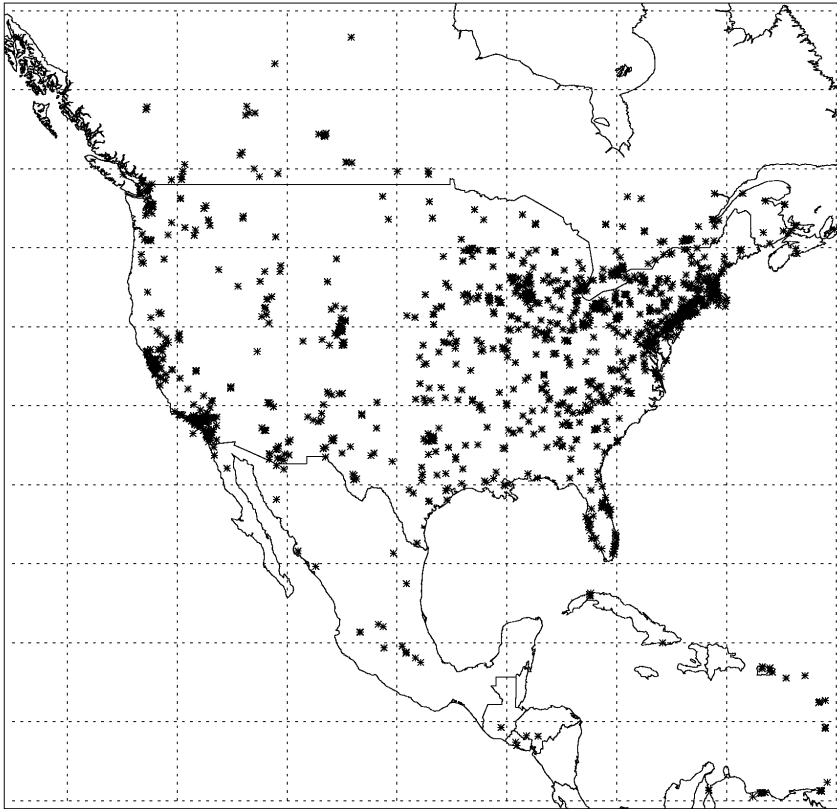


Figure 5. Planet 'Astronomy': North America (Heck 2000a).

lists of e-addresses. The most exhaustive compilation of e-mail addresses of astronomers was compiled by Benn & Martin (*e.g.* 1990).

On the amateur/grand public front, a couple of compilations deserve to be mentioned such as those made available online by *Sky Publishing Corp.*¹⁶ and *Loch Ness Productions*¹⁷.

5.2. ASTROWEB

Among the purely web-oriented resources, *AstroWeb* deserves a special mention.

In the early nineties, people here and there were also collecting URLs (of institutions, of people, of projects, ...) for their own usage, but also for

¹⁶<http://skyandtelescope.com/resources/organizations/>

¹⁷<http://www.lochness.com/lpc/lpc.html>

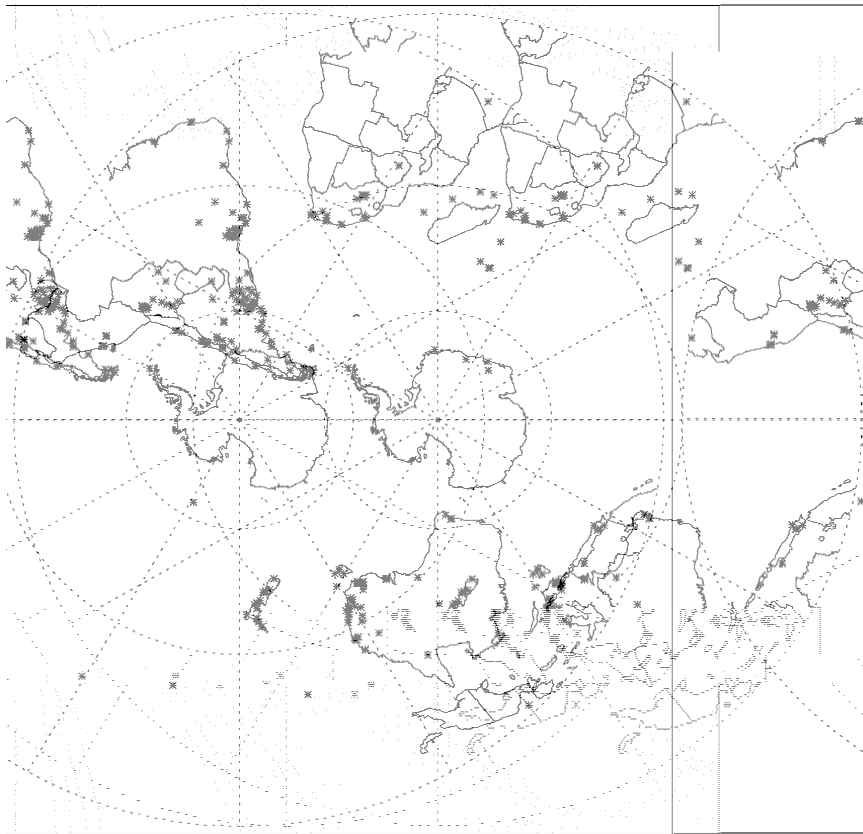


Figure 6. Planet ‘Astronomy’: Southern countries (Heck 2000a).

the benefit of their colleagues. Several of these pioneers¹⁸ joined efforts and set up the *AstroWeb* Consortium (Jackson *et al.* 1994).

Nowadays, if some of the original institutions are *de facto* not contributing anymore to the resource, others are offering mirrors such as the Cambridge Institute of Astronomy and ESA’s Villafranca del Castillo Station (Vilspa). Each of the institutions supports a version of the *AstroWeb* service¹⁹. The separate versions have different styles and contents, but all

¹⁸Originally from Mount Stromlo and Siding Spring Observatories (MSSSO), National Radio Astronomy Observatory (NRAO), Space Telescope – European Coordinating Facility (ST-ECF), European Southern Observatory (ESO), Space Telescope Science Institute (STScI), Strasbourg astronomical Data Center (CDS), Strasbourg Astronomical Observatory.

¹⁹Here are the various URLs/mirrors:

<http://cdsweb.u-strasbg.fr/astroweb/consortium.html>

<http://www.mso.anu.edu.au/astronomy/astroweb/astronomy.html>

<http://fits.cv.nrao.edu/www/astronomy.html>

are computed from the same master database, which is coded in an agreed interchange format.

Each resource record is categorized and many resources have a paragraph describing the resource and containing links to other records. Different presentations of the master listing are available, sorted by category, Internet domain, protocol and name, and name. There is also a searchable version of the merged resource listing, using a WAIS index. The database has been designed to facilitate distributed maintenance.

Specific on-line facilities have been made available for spontaneous contributions. For instance, there are forms by which new resources can be added (*AstroWeb Resource Entry Form*) and existing resources can be edited (*AstroWeb Database Correction Report Form*).

At the time of writing, *AstroWeb* offers slightly more than 3000 distinct records on the CDS server.

5.3. ASTROWEB VERSUS THE STARPAGES

Although people are not comparing similar things, a question sometimes put to us is whether the *StarPages* are related to *AstroWeb* and/or which resource is best. As explained above, the master files for the *StarPages* largely predate and offer much more, and more diversified, information (admittedly in a less visible way) than *AstroWeb*. The two resources are also structured and operated quite differently.

AstroWeb is basically a list of commented URLs: about 3,000, to be compared with the more than 12,000 URLs offered by the *StarPages* through the resources *StarHeads* (for professional astronomers and related scientists) and *StarWorlds* (for astronomy-related organizations, institutions, associations, companies, and so on). But this latter resource is more than just a list of URLs. As shown in Sect. 3.2, *StarWorlds* is a directory with all practical data systematically compiled, authenticated and verified. It also includes quite a number of organizations not yet on the web.

The fact that, in *AstroWeb*, the material is presented in long lists gives not only a feeling of plenty, but allows a direct visible search through it. In the *StarPages*, the full master files are not made accessible as a protective measure for the individuals listed and against excessive download of material, but also to allow usage of more flexible search engines.

In *StarWorlds*, the material retrieved is presented in an homogeneous way, with all practical information available on the various organizations matching the search (see Sect. 3.2). This is the result of daily maintenance,

<http://www.stsci.edu/net-resources.html>

<http://www.vilspa.esa.es/astroweb/astronomy.html>

http://www.ast.cam.ac.uk/astroweb/yp_astronomy.html

updating campaigns, and inclusion of validated information from signed and documented questionnaires.

In *AstroWeb*, and because of the basically spontaneous on-line submission of URLs by third parties, the level is definitely heterogeneous, not exhaustive, and sometimes questionable. Since they are submitted by the entries themselves, the corresponding presentations are basically self-promoting and thus, in some instances, lack the objectivity desired in a scientific resource.

AstroWeb contains however some URLs (essentially of specific experiments or projects) that cannot naturally fit within the *StarPages*. On the other hand, *StarWorlds* includes full data on a significant amount of entries still without Internet presence and/or web sites. A number of URLs from the *StarPages* were downloaded into *AstroWeb* to help it taking off. More details can be found online²⁰.

6. The Future

How can be seen the future of yellow-page services in astronomy? Nowadays excellent search engines such as **google**²¹ or **AltaVista**²² allow to retrieve quickly and efficiently all kinds of information pieces – as probably everyone has already experienced. A list of URLs are returned with excerpts of the corresponding pages where the queried words or expressions are appearing.

There is however matter for insatisfaction: the search engines' databases are not updated daily and the information retrieved is not always the latest one; or the links retrieved point to dead pages or to pages the contents of which have been modified since the last scan by the search engines' robots (and have become unrelated to the query). In our view however – from intense continual practice of the web – such shortcomings are also frequently resulting from the carelessness of webmasters and page maintainers: the contents of the pages are not adequately updated; forward links are not inserted from old pages towards new ones, and so on.

The search engine performance depends also

- on the way requests have been formulated, as well as
- on the way web pages have been formulated and structured.

Still, it is amazing how much detail can be retrieved through well-targeted requests. Certainly not everything is available on the web and might never be, especially for historical documents, but most dynamical organizations (like many astronomy-related organizations, isn't it?) have

²⁰<http://vizier.u-strasbg.fr/~heck/awsp.htm>

²¹<http://www.google.com/> + national variants.

²²<http://www.altavista.com/> + national variants.

now a web presence that can be detected easily. A decade after the web celebrated birth, its pages have reached a fairly good level of maturity.

Since we astronomers (and our librarians/documentation specialists) have generally become well-trained information providers and consumers, one could wonder about the need to maintain specific lists of URLs (commented or not) since the corresponding pages are easily retrieved through search engines. Such lists of URLs have multiplied since the web's early days – often copying each other. But nowadays they can only stay steps behind the web evolution and the search engines' capabilities.

The situation is different with value-added resources where the critical analysis of the information provided, the authentication of the sources, the homogeneous and systematic presentation, and so on, are part of an irreplaceable maintenance. As Gell-Mann (1997) expressed it: “We hear that, in this dawn of the so-called information age, a great deal of talk about the explosion of information and new methods for its dissemination. It is important to realize, however, that most of what is disseminated is misinformation, badly organized information or irrelevant information.” Hence the need to provide good-quality information, relevant to the matter under consideration, information exactly on target and updated whenever needed.

We thus believe that resources such as the *StarPages* have their slot in the future since those properties are exactly what they are aiming at. The corresponding investment in time, updating expenses, and so on, are worthwhile and justified. Gell-Mann added though: “How can we establish a reward system such that many competing but skillful processors of information, acting as intermediaries, will arise to interpret for us this mass of unorganized, partially false material?”

This is where the whole sociology is still unsatisfactory since, in terms of yellow-page services, *ad hoc* rewarding schemes have still to be formulated and structured (see also the following section).

7. A Couple of Final Comments

7.1. A WAY PAVED BY FRUSTRATION?

What should be said to a young scientist who would like to initiate such a compilation activity? The first thing is that this should be done with the highest quality possible or not at all. The second point would be that this should be a secondary activity with however substantial amount of time available for careful maintenance. The third condition would be that the job be done by the scientist him/herself and not by being delegated to unexperienced clerks or technicians.

All this must sound rather obvious.

Less obvious is probably the fact that this young scientist should not expect much of recognition or credits, in any, nor a boost for the career. Quite the opposite, he/she should have strong shoulders as criticisms will abound. Users generally see the tiny piece of information incorrect or missing, get upset about it, shoot an e-mail without thinking it twice, forgetting about the human at the other side that will get in full face the anger expressed – strengthened by the e-mail effect. There is usually no consideration for the vast amount of correct data and the freshly updated material that remain unnoticed.

Fights can take place between the organizations listed, some of them being unhappy by and requesting modification of the information published on the other ones that they find too flattering. Hence the need for the compiler, on one hand, to use sometimes referees and, on the other hand, to protect his/her back by publishing only authenticated information from signed questionnaires or updating forms²³.

Individuals listed in databases behave sometimes as *prime donne* and surrealistic talks have then to be expected, when not hot debates involving occasionally direct personal insults. Take a strong dosis of patience, diplomacy and psychology, but be ready to be tough and to put things back into their right place when they go too far.

Hackers and undelicate people might play nasty tricks. The compiler might see thousands of hours of careful work being sucked away in a few seconds (see also Sect. 7.2 on copyright protection).

The young compiler might also see magazine people who are not doing properly their homework praising impressive lists built up by automatic procedures and of dubious quality while his/her own meticulous work will be overlooked.

It is indeed much easier to carry out one-time job such as devising automatic procedures and to forget later on about the real nature and the quality of the material dealt with. It is quite a different job to maintain daily that material as exactly and as precisely as possible. To compile a directory of real value is quite a different venture to just reproducing and distributing, with comments of greater or lesser interest, data collected indiscriminately and/or automatically from all available source. If professional file construction techniques are necessary, they cannot spare the extensive background, unrewarding and very careful work which is indispensable for the compilation of a valuable directory. The definition of a very well profiled and adapted questionnaire, the homogenization of the data collected and the maximum reduction of the respondents' biases are all points that must be satisfied.

²³Something not necessary for mere lists of URLs since the contents of the pages pointed at are not the responsibility of the compiler.

Moreover, it is imperative to take into account national differences: standards, conventions, habits, publication and financing channels usually vary from country to country. Finally, it is scarcely necessary to add that everything relating to professional astronomy can only be dealt with by professional astronomers, for evident reasons of competence and better knowledge of the realities of their corporation.

The data provided by the respondents are not always reliable, especially in the case of amateur organizations. Some groups have indeed a tendency to exaggerate their importance. *Ghost* and dead groups have also to be detected. Organizations giving no sign of life for some time (for instance by not answering questionnaires and update requests) have to be rejected as well as those not presenting all guarantees of seriousness. Refer also to the discussion on automation and quality in Heck (2000b).

All in all, considering the difficulties (when not easy criticisms instead of encouragements) to produce a good-quality job in the field, with virtually non-existing rewarding schemes, it should not be too surprising few people dedicate themselves to this type of work or others who started it “throw in the sponge” after a while.

7.2. COPYRIGHT PROTECTION OR ANARCHY?

A series of hacking incidents with one of our databases (*StarBits*) showed how fragile was all that compilation work done over so many years and how little efficient was the support received in spite of the good will of parties involved.

It is obvious that hackers and pirats will always be ahead of electronic security setters, just like in crime (and this is crime, after all). Legal protections (“copyright”) are nice in theory, but what can they prevent in practice? Huge databases with real or potential commercial interests can be downloaded by hackers in a matter of seconds. This is perhaps the most dramatic fragility of the electronic material.

Be also aware that, in some countries, it is enough to alter or to change “significantly” a file, a list or a directory to escape prosecution for infringement of copyright restrictions. Everything is of course in the interpretation a judge will make of the word “significantly”.

The protection of material on paper has a longest history and commercial publishers have well-experienced lawyers to deal with the “copyright” of their products. Still, a directory, including many addresses, attracts unavoidably commercial attention. Our own experience is that most people are respectful of copy restrictions and would get in touch with the right owners whenever necessary. Juicy law suits, especially in the US, have got people think twice before making a wrong step. In Europe, the culture of

copyright is less developed (and the suits are still less juicy). We could however settle appropriately, before reaching the courts, various incidents experienced with undelicate commercial companies.

How can one “catch” wrongdoers? Simply by inserting detectors in the files. All the master files for the *Star*s Family* resources and the *StarPages* in particular are seeded with detectors. A standard user would not notice them, but they very efficiently allow to spot quickly illicit copying of the files or wrong usage of the information they provide. One has of course to be imaginative when devising such detectors. Recipes will not be given here as the *StarPages* are operational resources. Be aware that, in some countries, detectors in files must be declared legally. Of course, they are not made public. This serves only to prove the authenticity of detectors before the courts if needed.

We also monitor carefully the usage of the *StarPages* in real time and, thanks to François Ochsenbein from CDS, automatic processes have been designed to kick out and to deny access to users whose queries are excessive or not “normal” (such as systematic scanning). Still, smart people can manage to go round always stricter securities.

Finally do not believe misbehaviors are the privilege of hackers or of commercial companies only. Scientific institutions can also “easily forget” to give appropriate credits and acknowledgements.

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