

Astronomy resources on the Web

Sites for the amateur and professional astronomer

by Jane Duffy

Astronomy is an earth science that deals with materials and their properties beyond the Earth's atmosphere. This interesting paradox is reflected in the discipline's interweaving of both professional and amateur observations in its research programs. Astronomers have been among the first to deploy the Internet's vast capabilities to facilitate the exchange of information both within their discipline and with those related to it, particularly astrophysics, space science, astronautics, and space exploration. The guide below is a selection of the wide range of freely accessible Internet materials created by and for astronomers.

Metasites

- **Astronomy Net Astroguide.** This guide provides access, through its browsable table of contents, to information about astronomy research, nonprofit organizations, practitioners, software, observatories, equipment, and university research projects. Some evaluation is indicated through a link popularity "star system." A dedicated multilevel search engine is found on this page. *Access:* <http://www.astronomy.net/astroguide/>.

- **AstroWeb: Astronomy and Astrophysics on the Internet.** Maintained by the AstroWeb consortium, this page offers subject organized links to information within such

categories as "Observing Resources," "Data Resources," and "Research Areas of Astronomy." The 3,009 resources provided on this page include the following: history of astronomy, online bibliographies of astronomy materials, lists of international astronomy departments, newsgroups, educational resources, and astronomy libraries. In addition to subject classification, the site also provides a WAIS search engine. *Access:* <http://www.cv.nrao.edu/fits/www/astronomy.html>.

- **High Energy Astrophysics Science Archive Research Center.** Developed at NASA's Goddard Space Flight Center, this index is rich in astronomy resources for general audiences. Image and information links are provided for such broad topics as solar eclipse, Mars, comets and meteors, space exploration, and more. This site also provides access to astronomy magazines, hypermedia textbooks, Ask-A-High-Energy Astronomer service, image and video archives, software references, and other metasites. *Access:* http://heasarc.gsfc.nasa.gov/docs/www_info/webstars.html.



HEASARC
High Energy Astrophysics
Science Archive Research Center

About the author

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Educational resources

- **Astronomy Picture of the Day.** An outreach service provided through the NASA Web site, this page is maintained by Robert Nemiroff and Jerry Bonnell. Containing the largest collection of annotated astronomical images on the Internet, APOD daily offers a different space-related image or photograph with explanatory captions. Also found on this site is an image archive, index, dedicated search engine, calendar, glossary, and related astronomy education links. *Access:* <http://antwrp.gsfc.nasa.gov/apod/astropix.html>.

- **Education Index: Astronomy Resources.** The Education Index is searchable alphabetically by subject and subdivided by educational level. The resources for astronomy are well annotated with direct links to each resource. Subjects range from telescope making sites to a highly interactive tour of the Smithsonian National Air and Space Museum. *Access:* <http://www.educationindex.com/astro/>.

- **Educational Observatory Institute—Astronomical Resources.** A work in progress, the Educational Observatory Institute, created and maintained by Samuel Wormley of Iowa State University, offers educational materials appropriate for K–12 and college-level students. Links are provided to sky charts, catalogs, atlases, sky maps, map indexes, and satellite information as well as to online books, reviews, and bibliographies. *Access:* <http://www.cnde.iastate.edu/staff/swormley/eo/eo.html>.

- **NASA Historical Archive for Manned Missions.** This historical archive offers the reader links to rocket history, the history of astronautics, a chronology of aeronautics and astronautics, and a history of Apollo Launch facilities and operations. Information on manned missions includes Projects Mercury, Gemini, Apollo, Skylab, the Apollo Soyuz Test Project, and the Space Shuttle. The site provides full-text access to key documents in the history of space policy, including the NASA Space Act of 1958. *Access:* <http://www.ksc.nasa.gov/history/history.html>.

- **Royal Observatory Greenwich.** Sponsored by the National Maritime Museum, this

site is rich in education information, including downloadable leaflets, night sky links, online exhibits, and special programs for K–12. International topics fully developed on this site include Tycho's Star Maps, Harrison and the Story of Longitude, and Maritime Greenwich. *Access:* <http://www.rog.nmm.ac.uk/>.

Specialized astronomy Web databases

- **Center for Earth and Planetary Studies.** The Center for Earth and Planetary Studies is part of the Collections and Research Department of the National Air and Space Museum, Smithsonian Institution. In addition to original CEPS research materials for Mars, Venus, Mercury, Earth and its Moon, outreach materials and an extensive image collection are also stored on this site. To enable known item searching of its planetary science, geophysics, and environmental information, a dedicated search engine is also available on this site. *Access:* <http://www.nasm.edu/ceps/>.

- **Chronology of Lunar and Planetary Exploration.** Maintained within the NASA Web site, this page offers a timeline of space exploration from its beginnings with Sputnik 1 in 1957. While chronologically constructed, browsing ahead to specific years through the table of contents is also possible. For each historical entry, links are provided to images, descriptions, launch/orbital data, sponsoring agencies or countries, personnel information, and related resources. *Access:* <http://nssdc.gsfc.nasa.gov/planetary/chrono.html>.

- **Planetary Data System.** This site is an index of information from NASA planetary missions, organized by user level. Information for scientists include data and other PDS documentation; public information offers links to NASA planetary missions as well as to an extensive image library; data producers are given links to archiving software and information; and educators are linked to a growing number of multimedia instructional resources. *Access:* <http://pds.jpl.nasa.gov/>.

Laboratories and preprint sites

- **Los Alamos National Laboratory Preprint Server.** An innovator in scholarly communication, the LANL arXiv makes available e-prints in the area of astrophysics from 1992 to the present. Visitors to the site may browse by year or search by title/author indexes.

Expert search strategies, including subject and Boolean searching, are offered for the easy negotiation of the arXiv search interface. Accessible from the title page as well are chronologically organized information segments classified as "new," "recent," "lastupdate," and "current." *Access:* <http://xxx.lanl.gov/>.

• **Space Telescope Science Institute STEPsheet service.** Created and maintained by the Space Telescope Science Institute Library, this preprint server offers access to both refereed and unrefereed papers from 1980 to the present from the Hubble Space Telescope and other astronomy institutes. The interface allows searching by author, title, institution, publication year and status, as well as by HST proposal number. *Access:* <http://NTweb.stsci.edu/STEPsheet/>.

Research and publication information

• **Astrophysics Data System.** Funded by NASA, the Astrophysics Data System database houses more than 3 million abstracts from journal articles, conference proceedings, doctoral dissertations, and technical reports in the following subject areas: astronomical and solar physics, instrumentation and engineering, and geophysics. Also included are preprints from Los Alamos National Laboratory. This database is searchable by author and title/abstract keywords. ADS scanned articles are accessible through their own browse system. *Access:* <http://www.atnf.csiro.au/pasa/>.

• **Bulletin of the American Astronomical Society.** With available documents arranged chronologically from 1997 to the present, this site is an archive of AAS meeting programs and annual reports of Astronomical Observatories and Departments. Also of academic interest are reports and articles on graduate study in astronomy, citation analysis in the field of astronomy, and other research and education themes. *Access:* <http://www.aas.org/publications/baas/baasindex.html>.

• **Information Bulletin on Variable Stars.** This database of information on variable stars (those that change in brightness) provides access to scanned paper copies of bulletins from the first issue in 1961 to 1994. More recent issues are computer typeset. All information housed here is searchable by IBVS issue number. *Access:* <http://www.konkoly.hu/IBVS/issues.html>.

• **Revised Catalog of MK Spectra Types for the Cooler Stars.** Compiled by Philip Keenan and Gerald Newsom of the Ohio State University Department of Astronomy, this online research tool, classified through the Revised MK system, replaces the print version of the Perkins catalog of standard cooler, i.e., redder or darker, stars later than Spectral type GO. Of interest primarily to the professional astronomer, the catalog and its notes are downloadable from this site in both ASCII and HTML format. *Access:* <http://www.astronomy.ohio-state.edu/MKCool/>.

Professional societies

• **American Association of Variable Star Observers.** Sponsored by a society committed to serve both amateur and professional astronomers since 1911, this Web page offers data request services, alert notices, and "news flashes" about variable stars. Also featured is direct access to observing aids, software, and AAVSO meeting information. In addition to the provision of links to its electronic publications and e-mail discussion forums, this site provides the searcher with online access to its publications and e-mail discussions. *Access:* <http://www.aavso.org/>.

• **American Astronomical Society.** This site offers access to the American Astronomical Society directory as well as other governance documents, meetings announcements and notes, policy statements, projects, and direct links to their journal homepages. Full-text information of selected reports, especially on education issues, may also be found here. *Access:* <http://www.aas.org>.

• **Hubble Space Telescope.** Housed within the NASA Web site, this page offers links to information about the Hubble Space Telescope, including pictures, news releases, and relevant educational materials. The table of contents functions as browsable links to the HST schedule and programming information, pictures by subject, online exhibits, star catalogs, and a data archive. The page also functions as a communications channel for researchers through the provision of fellowship and student programs, proposals, and application information. *Access:* <http://www.stsci.edu/top.html>.

• **International Astronomical Union.** Founded in 1919, the International Astronomical Union has more than 8,300 members from

66 countries and its Web page serves primarily as a communication instrument for these members. Of special interest to the general academic researcher, however, is the IAU List of international astronomy meetings. This list, compiled by librarian Liz Bryson of the Canada-France-Hawaii Telescope Corporation, is a clearinghouse of upcoming astronomy meetings with accompanying association page links, contact information, and abstracts. Registration for automatic updates to the list is also available through this page. Access: <http://www.iau.org/>.

• **Royal Astronomical Society of Canada.** In addition to being the platform for society information, this page is a list of astronomy-related book sites, reference materials, catalogs, images, bibliographies, time information, telescopes and other equipment, asteroid charts, and educational visual resources. While no search engine is provided, the table of contents also functions as a list of direct links to the named sites. The page is also available in French. Access: <http://www.rasc.ca/>.



Historical and biographical resources in astronomy

• **History of Astronomy Resources.** Maintained by Wolfgang R. Dick of Bonn University in Germany, this site features highly organized access to astronomy information by category, e.g., "Persons" and "Archives and Libraries," etc. For academic searching, the online archives are especially useful, providing access to oral history projects, general catalogs, and specific (primarily European) libraries' online resources. Annotations are provided for many selected links, including language notes for non-English resources. "Persons" provides both current and historical biographical information for 1,750 astronomers. Access: http://www.astro.uni-bonn.de/~pbrosche/hist_astr/ha_general.html.

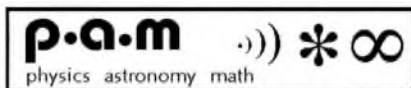
• **Star's Family: The Star Pages.** The Star's Family of Astronomy and Related Resources is maintained by Andre Heck of the Université de Strasbourg, France, and has been operational since 1994. This page provides a directory of more than 5,500 personal Web

pages of astronomers and other space scientists, searchable by name and/or institution. Helpful string search recommendations and keys to abbreviations and acronyms are also found through its title page. Separate links are given for international telephone and fax codes, as well as details, where applicable, for institutions linked through the personal homepage directory. Access: <http://cdsweb.ustrasbg.fr/~heck/sfheads.htm>.

• **Women in Astronomy.** Developed and maintained by the University of Toronto Astronomy and Astrophysics Library, this site offers comprehensive and international coverage of current issues related to women astronomers as well as historical resources, bibliographies, reading lists, photographs, and other images, essays, and biographies. Access: <http://www.astro.utoronto.ca/womenbib.html>.

Discussion groups and communications channels

• **National Radio Astronomy Observatory Newsgroups and Mailing Lists.** Through the outreach arm of the National Radio Astronomy Observatory, this page offers alphabetical lists for more than 50 astronomy-related newsgroups and approximately 20 astronomy mailing lists. Notations are included for many of the entries, which give, where applicable, provenance information, primary and secondary subjects, languages other than English, full-text availability, pertinent dates, and subscription instructions. Access: http://www.cv.nrao.edu/fits/www/yp_newsgroup.html.



• **Special Libraries Association's Physics-Astronomy-Mathematics-Division.** Designed as a tool for the subject librarian, the Web site of the Physics-Astronomy-Mathematics Division of the Special Libraries Association is a handy resource offering links to metasites, directories, databases, catalogs, reference tools, software sites, eprints, organizations, and more. Its frequent annotations, clickable table of contents, and directory of astronomy librarians all add special value to this resource for the information professional. Access: <http://pantheon.yale.edu/~dstern/astro.html>. ■