

**THE ADS SUCCESS STORY**  
**– AN INTERVIEW WITH GÜNTHER EICHHORN**

**Abstract.** In this interview, Günther Eichhorn<sup>1</sup> recalls the history and describes the activities of the “Astrophysics Data System” (ADS<sup>2</sup>) that has become the central facility of bibliographic research in astronomy, from the initial concept of a system that allows access to NASA data, through the first implementation of a proprietary software system, the move to the World Wide Web, to the current implementation of a comprehensive Digital Library with extensive links to other on-line information.

*Editor (Ed.): Dr. Eichhorn, we should probably start with a bit of history to introduce the Astrophysics Data System (ADS)?*

Günther Eichhorn (GE): The decision by NASA to set up an *Astrophysics Data System (ADS)* goes back to 1987-1988. The roots of the current infrastructure were laid in the late 1980’s from a comprehensive community-based review, led by Gael Squibb. The review was spurred by a crisis in the management of NASA’s astrophysics data holdings. Many important data sets gathered in the 1970’s and early 1980’s were not being maintained at a level that would ensure their usability for coming generations<sup>3</sup>.

*Ed.: Then representing the Strasbourg Data Center (CDS), I was myself part of that exercise<sup>4</sup> and I remember especially a seminal and decisive meeting in Annapolis in August 1987.*

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<sup>2</sup><http://adsabs.harvard.edu/>

<sup>3</sup>For more, see for instance Sect. 2 (Historical perspective) of ADCCC (2001).

<sup>4</sup>Cf. the chapter by A. Heck in this volume.

GE: An outcome of the “Squibb report” was to recommend that the archive centers be accessed via a common user interface across networks. This was prior to the development of the World-Wide Web. That idea proved to be several years ahead of its time. The *Astrophysics Data System (ADS)* was thus originally conceived as a distributed system allowing to access, at various data centers, NASA data in the fields of astronomy and astrophysics. The bibliographical part was added later.

*Ed.: This was after you joined yourself the project?*

GE: In 1992, I was hired as Project Scientist, coming from the Space Telescope Science Institute and after a number of positions following a PhD obtained at the University of Heidelberg in 1974.

*Ed.: The first years saw many changes.*

GE: At the very beginning, the software used was a proprietary one (Murray *et al.* 1992). It offered many possibilities (plotting, etc.), but it was a bit cumbersome. Users had to sign in, to be registered. There were export authorizations to be secured. In late 1992, this system was made available both to USA and non-US users. An abstract service was added in 1993 (Kurtz *et al.* 1993) and became quickly popular. By the Summer of 1993, a connection had also been made with the CDS database Simbad allowing queries from object identifiers. This client/server browser had many capabilities that only now become available in modern browsers, but because of sign-up restrictions it never really took off.

*Ed.: I noticed (Kurtz et al. 2000) that the beginnings of the abstract service were dated back to the “Astronomy from Large Databases” conference that we had organized in Garching (Murtagh & Heck 1988). So many things saw light in that year 1993. This was also the time when the first web browser became available.*

GE: The NCSA Mosaic browser was indeed released in 1993. By February 1994, we had an adapted web forms software interfacing both data and abstracts (Eichhorn *et al.* 1995a&b) with about a thousand users within weeks. But later the same year, because of funding restrictions, it was decided to limit our activities to the most used part of the ADS, that is the abstract service.

*Ed.: Another major improvement was the availability of scanned journal articles.*



Figure 1. G. Eichhorn on the wing of a Stearman biplane. (Courtesy G. Eichhorn)

GE: This was initiated at about the same time too. The first full-text images, those of articles from the *Astrophysical Journal Letters*, went on line in December 1994. By the following Summer, the scans were current and complete going back ten years. Today we are scanning on the order of 5000 pages per week with more than three millions pages already scanned.

*Ed.: Let's go on for a while with numbers and statistics.*

GE: We regularly publish them as the figures increase continually. The evolution can be followed in the successive presentations published in the literature (see the bibliographical section). To date (February 2006), some 200 000 users made 4.5 million queries and received some 50 million bibliographic references, 460 000 full-text articles and 6 million abstracts, as well as citation histories, links to data, and links to other data centers, in-

cluding your own database *StarHeads* (Heck 1995). In terms of disk space, we currently use about 500Gb. About 50% of the full-text articles accessed through the ADS were via pointers to electronic journals. If we speak of pages, about 75% of the 2 million pages downloaded were sent directly to a printer, 22% were displayed on a computer screen and 2% were saved into files. Viewing thumbnail images makes up the rest.

*Ed.: What about the geographical coverage?*

GE: Users are evenly distributed between the US, Europe and the rest of the world for roughly one third each.

*Ed.: ADS has also mirror sites throughout the world.*

GE: There are quite a few of them indeed beyond our own operating center at the Harvard-Smithsonian Center for Astrophysics in Cambridge, USA: at Strasbourg astronomical Data Center in France; the European Southern Observatory in Garching, Germany; the National Astronomical Observatory in Tokyo, Japan; the Pontificia Universidad Católica in Santiago de Chile; the University of Nottingham in the United Kingdom; Beijing Astronomical Observatory in PR China; the Inter-University Centre for Astronomy and Astrophysics in Pune, India; the Institute of Astronomy of the Russian Academy of Sciences in Moscow, Russia; the Observatório Nacional in Rio de Janeiro, Brazil; the Korea Astronomy Observatory in Seoul, South Korea; and the latest at the Australian National University in Canberra, Australia..

*Ed.: The sixth volume of the current series “Organizations and Strategies in Astronomy” (OSA 6) included several contributions on science metrics commenting very favorably those based on ADS citation counts.*

GE: Because of the very nearly complete coverage of the astronomical literature and the large number of reference lists in the ADS, we are able to determine fairly complete citations information for a large number of records in the ADS. This allows studies of citation rates for various articles. For instance we found that the citation rate of articles that are published in the arXiv e-print archive is higher than for non-preprinted articles (cf. Kurtz *et al.* 2005c).

*Ed.: What would you say on the theme of “lessons learned” from the ADS venture so far?*

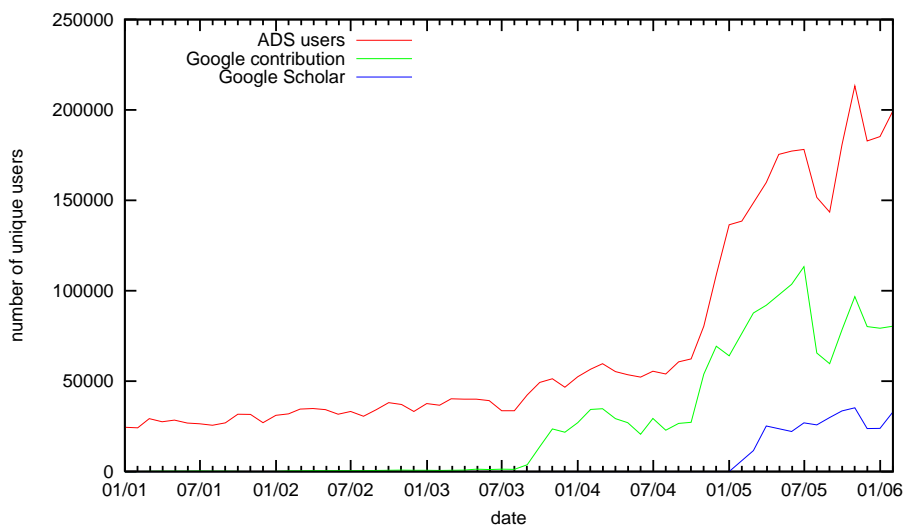


Figure 2. Histogram of ADS usage. (Courtesy ADS)

GE: The main thing is that it is extremely important to establish excellent collaborations with people and to make sure that everyone, including professional societies and publishers, is happy with the work done. The fact that astronomy is a small field without or with little commercial interest probably helped us to get abstracts for free from all publishers, but again one must play nice with everybody, maintaining personal links and good relationships.

*Ed.: Appreciation to ADS was actually shown by recognition and awards, starting to yourself.*

GE: I was awarded the 2001 “Physics, Astronomy and Mathematics Division Award” by the Special Libraries Association while Michael Kurtz received the 2001 “van Biesbroeck Prize” of the American Astronomical Society. Elogious recognitions were expressed not only by the 2002 Visiting Committee of our host here, the Harvard-Smithsonian Center for Astrophysics, but also by the US National Academy of Science in the recommendations for the New Millennium as well as by the United Nations General Assembly through a meeting of its COPUOS branch in 2004 in Beijing.

*Ed. To wrap up this interview, what would you say about the future, for instance on the so-called virtual observatories?*

GE: The ADS is watching the VO efforts. We will be ready to participate once concrete steps are taken. We already have implemented VO-like elements, for instance links from the literature to on-line data.

*Ed.: On electronic journals?*

GE: The ADS includes any published material, whether on-line or paper. We do not publish ourselves. We fully support electronic publishing and will link to any on-line literature, whether published by societies, commercial publishers, preprints, or new open archive non-traditional publishers.

*Ed.: Any final comments?*

GE: The ADS is by now an indispensable part of astronomy research. It is currently funded completely by NASA. NASA is very satisfied with the success of the ADS and intends to continue funding it. The ADS is recognized by the societies as well as the commercial publishers as an integral part of the astronomical community. Informal discussions have happened with the astronomical societies about the continuity of a freely available archive of older publications. While there is no written agreement in place, there is a general understanding that the societies will assure continued access to the archive of the scanned older journals.

We plan to continue scanning any literature that is not yet in the ADS (as long as we can get permission from the copyright holder). We will also scan older literature that is out of copyright, or never was copyrighted (like US Government publications, for instance NASA Reports).

We have arrangements with most publishers to receive their abstracts in a timely manner. This will keep the ADS search system up-to-date. Adding new literature is one of the main efforts that takes up a significant part of the ADS resources.

We will continue to follow the rapidly developing technology of the WWW and will implement any new capabilities that are relevant for our users.

In the long term, when the technology has matured, the ADS will probably evolve into a more library oriented project, but this will take at least a decade, maybe more, since the whole publishing system is still very much in flux. This means that currently and in the foreseeable future, the ADS will remain a development and innovation oriented project.

## References

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Figure 3. Part of the ADS team: (back, left to right) Carolyn Stern Grant, Michael J. Kurtz, Elizabeth Bohlen, (front left) Guenther Eichhorn, (front right) Alberto Accomazzi. (Courtesy ADS)

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