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ELECTRONIC PUBLISHING

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Abstract. The plans of journals for electronic publishing are discussed, together with some of the advantages and disadvantages.

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1. INTRODUCTION

There are rapid developments in electronic publishing at present. Many publishers are planning to publish parallel electronic versions of their journals, even though this is largely unexplored ground.

The American Astronomical Society has been publishing a parallel electronic version of the Astrophysical Journal Letters since July 1995. They plan to publish the whole Astrophysical Journal and Supplements from the beginning of 1997. The Letters have been freely available. When the full journal is published in parallel, access will be restricted to scientists working in an Institute which has a normal library subscription for the journal. Institutes will have to provide the IP (Internet Protocol) numbers of their computers. The abstracts will remain freely available.

Elsevier Science has introduced an electronic journal "New Astronomy" which will be free initially.

Some of the physics journals are ahead in their move to electronic publishing. The Institute of Physics in London has all 31 journals available electronically. Les Editions de Physique, the publisher of Astronomy and Astrophysics Supplements, has the four parts of Journal de Physique available electronically since the beginning of 1996.

Acta Crystallographica IV is an interesting journal. It is devoted to X-ray crystallography of biologically interesting crystals such as

viruses. The amount of data which must be stored is considerable. The journal is published only electronically. The author must submit the article with data in a carefully prescribed form. The author may check the form of the paper on the journal server before it is submitted. Submitted papers which do not conform are immediately returned to the author.

Astronomy and Astrophysics is planning to publish parallel versions electronically of the Letters, Main Journal and Supplements. This will start at the beginning of 1997 or 1998. For several years large tables submitted to the Supplement have not been printed, but have been made available electronically at the CDS in Strasbourg. Since the user of large tables requires to have them on his own computer this presents a great advantage. The abstracts of papers published in Astronomy and Astrophysics are also available on the CDS server.

2. ELECTRONIC VERSION OF THE ASTROPHYSICAL JOURNAL LETTERS

The articles are available in three forms: the whole article in one html file, part of the article in an html file and the whole article in a pdf file. Html is the Hypertext markup language which provides links to other files and to other computers so that files can be accessed by clicking with a mouse on the link in the html file. It is these built in connections that make html such a powerful system. The reason for providing part of the article in an html file as well as the whole file is that if the network connections are slow, work is speeded up. Pdf is a development of postscript. A pdf file is often smaller than a postscript file, which has obvious advantages. To read the file, it must be transferred, and then read with the Adobe Acrobat reader. The reader is available freely, but not yet for all systems such as Digital Unix workstations. The Acrobat reader has built in zooms and can drive a printer to give a high quality printed copy of the paper.

The links in the html version refer to papers and data files that have already been published electronically. For references to older papers there is a link to NASA's Astrophysics Data System. ADS is scanning back copies of a number of journals including Astrophysical Journal, Astronomical Journal and Astronomy and Astrophysics. The pages of the journal are stored as images in gif files. The papers

can be read from the screen, but because the pages are stored as images no computer search is possible.

The electronic version of the Astrophysical Journal also includes forward referencing. If a paper is published now which refers back to an earlier paper that was published electronically, then the electronic version of the earlier paper is modified to include a link to the later paper which refers to it. This constitutes a citation index for a paper built into the electronic version of the original paper.

At present the electronic version of the Astrophysical Journal Letters appears about three weeks before the printed version. This difference in time is substantially increased for subscribers outside the North American continent.

3. THE PROBLEMS OF ELECTRONIC PUBLISHING

Some of the advantages of electronic publishing are obvious, but so are some problems. Probably there will be problems that we have not yet thought of.

Electronic publishing in parallel with a paper version will increase costs. Preparing a pdf file of a paper does not involve much extra work, but converting a paper to an html file does involve quite a lot of work, particularly for including the links to other files. Estimates of the extra costs vary, but 15% extra is a typical estimate.

Archiving the electronic version and the future role of libraries are further problems. The American Astronomical Society is prepared to guarantee the existence of the electronic archive. Commercial publishers are typically prepared to guarantee the electronic archive for about two years. Who should archive it? For Astronomy and Astrophysics the solution may be to extend the agreement with CDS in Strasbourg for archiving large tables. Should there be a national electronic archive maintained by the appropriate research council, or by a consortium of university libraries? There are strong reasons for having more than one electronic archive. Duplication avoids the risk of disaster resulting in losing the whole archive. A mirror archive of an electronic journal in your own country will speed up access to the journal through the networks. As was often said at the ICSU conference on electronic publishing, "America disappears in the afternoon".

An alternative form of archiving is to store the electronic journal on a CD-ROM. With the CD-ROMs available at present, one year of Astronomy and Astrophysics with figures could go on about four

CD-ROMS. This would be a very convenient form of archive for a library, and even for an individual. The cost price of transferring the electronic journal to a CD-ROM is small, the cost of sending it by post is very small compared with posting a year's paper journal. The volume of storage required is very much smaller than for the paper journal. But libraries would have to invest in juke-box robots for serving their customers remotely who are working from their own computer terminal. Some people argue that this type of archive that does not make use of the interactive links of an electronic journal will not be attractive, and that, finally, only archiving of an electronic journal on a server will be accepted. A final problem of an electronic archive is the necessity of updating the archive to new technical standards. The large magnetic tapes that were standard storage for computer results ten years ago cannot even be read now in many departments. Who has a record player now capable of playing an old long playing record?

If everybody suddenly starts reading electronic journals through the networks, then the increase in traffic will make what are sometimes already very slow connections even slower. But often the only way to argue for an improvement in the infrastructure in a country is to show that the infrastructure is already insufficient. In some countries the users of the networks already have to pay for it. The cost can be very high. Less developed countries do not have the same network access that the richer countries have. Will this increase the gulf with these countries even more? It is important to pay attention to the special problems of these countries and to help them in a positive way as much as possible. But we should not slow down the development of electronic publishing because of the problems of less developed countries. Developments which increase the gulf between the two sorts of countries provide a lead and stimulus to the governments of those countries to rectify the situation. That will not occur if worldwide development is slowed down because the developing countries cannot take immediate advantage of it.

4. THE FUTURE OF ELECTRONIC PUBLISHING

What the future will bring in electronic publishing, we will have to wait and see. It is clear that for some time yet the electronic journal will be published side by side with the paper journal. Will that continue? I believe that economic pressure will lead to a purely electronic journal in many cases. A year's Astronomy and Astrophysics

cost DM 3471 in 1996. In addition, libraries outside Germany have to pay DM 315 for postage. It consists of 35 issues weighting about 1 kilogram each. How many pages of that copy are read? The cost of a journal is increased by having a parallel electronic version. The costs can be significantly reduced by abolishing the paper journal.

Perhaps the most exciting developments in electronic publishing will be in what you can do in an electronic publication that you cannot do in a paper journal. Color prints in a paper journal are prohibitively expensive, but in an electronic journal it costs nothing extra. For the presentation of computer simulations a video is often needed. That is impossible in a paper journal but perfectly easy in an electronic journal. One can also add an audio component to the journal. This is a development that has not yet begun.