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Carol Tenopir
University of Tennessee - Knoxville

Donald W. King
University of Pittsburgh

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ELECTRONIC JOURNAL USE: A GLIMPSE INTO THE FUTURE WITH INFORMATION FROM THE PAST AND PRESENT

Carol Tenopir, University of Tennessee, ctenopir@utk.edu

Donald W. King, University of Pittsburgh, dwking@pitt.edu

Not All E-Journals Are the Same

The question is no longer *if* scholarly journals will become available in electronic form, but rather *when*, in what form, and whether the electronic version can replace the print version. Of the approximately 250,000 periodicals listed in the 2002 edition of *Ulrich's Periodical Directory* (ulrichsweb.com), approximately 15,000 are active, refereed scholarly journals. Of these 15,000, approximately 12,000 are available to some degree in some electronic format. The July 2002 issue of *Fulltext Sources Online* includes over 17,000 entries for electronic serials. Electronic versions vary considerably, however.

Some e-journals are complete replacements for print, including an entire journal and all, or more, of any extant print alternative versions. Complete e-journals often provide browse capabilities and tables of contents and are typically available directly from a primary journal publisher. Other so-called e-journals are just databases of separate articles extracted from print or electronic versions of the complete journal. Databases of separate articles may be available from either the primary publisher or an aggregator. They typically emphasize searching over browsing and mix articles from many different journals.

Readers today can also choose to get separate articles from e-print servers, such as the Los Alamos/Cornell arXiv.org service or the Department of Energy, Office of Scientific and Technical Information PrePrint Network (<http://www.osti.gov/preprints/>). Such services provide access to separate articles that may be pre-prints of articles that will be submitted to peer-reviewed journals, post-prints after publication, or papers that will never be submitted to traditional journals. Separate electronic articles may also be accessed from an author's Web site or institutional repositories.

Even within a complete journal model, there are many variations in e-journals. They may be mere replicas of a print version, with papers presented in PDF format for handy printing. Alternatively, they may provide a new e-design with added functionality, color graphics, motion files, and links to datasets. Browsing and searching may be offered or only one or the other. The availability of back issues also varies considerably. The e-journals system from the American Astronomical Society (AAS) is an example of an advanced electronic journals system, with added functions, links to other articles and to datasets, and extensive backfiles.

Not All Readers Are the Same

Previous studies of scientists' reading habits have found that scientists in all work fields read and value peer-reviewed journal articles, but there are considerable differences in the amount that they read and whether they prefer print or electronic sources.¹ Physicists, for example, are high end users of e-print services and read more articles per year on average than engineers but fewer than chemists. Medical faculty with Ph.D. degrees prefer electronic sources on the average more often than medical faculty with M.D. degrees.² Scientists who work in academia generally read more than those in corporations or government laboratories.³

It is difficult to know whether it is the nature of the way work is conducted in a specific scientific field or the availability of electronic alternatives that results in higher reliance on electronic journals, e-print servers, or databases of articles (or if the availability of electronic alternatives happens due to the way work is done in a specific field). Many use electronic versions regularly and are gaining experiences of what works and what does not. Specific features of electronic journals, such as the ability to link to related data, search full texts, or just get quick desktop access to print out a PDF version, are variously mentioned as advantages of electronic journals.⁴

At this time of transition and multiple alternatives, it is difficult to predict the future reading patterns for all work fields, but we may be able to glimpse journal use in the future by comparing reading patterns over time and in different circumstances. This chapter compares three groups to see how scientists have used journals in the past, how they use them in the present, and how they might use them in the future. The three groups are described by their level of experience with e-journals and e-journal alternatives:

1. **Early:** scientists and social scientists in all work fields in both university and non-university settings surveyed from 1990 to 1993. This is a pre-Web world, with reading almost totally in print journals.
2. **Evolving:** scientists and social scientists in all work fields in both university and non-university settings surveyed from 2000 to 2002. These readers have both print and some electronic journals available to them, with approximately 35% of total readings in electronic journals or articles.
3. **Advanced:** astronomers and astrophysicists in both university and non-university settings surveyed in 2001 and 2002. These readers have their major journals available in an electronic system that was designed specifically for them, as well as e-prints in a subset of arXiv.org called astro-ph.

Data Over Time

The data reported here were collected in consistent surveys administered to various groups of scientists over time. Questions covered scholarly journal reading and use and demographics. Scholarly journal reading and use were measured in two ways. First each respondent was asked how many scholarly articles he or she had read in the past month. Scholarly articles were defined to include “those found in journal issues, author web sites, or separate copies such as preprints, reprints and other electronic or paper copies.” Reading was defined as “going beyond the table of contents, title, and abstract to the body of the article.”

Second, we asked respondents to focus on the specific article read most recently to uncover more details about this reading. The critical incident technique emphasizes an incident rather than opinion by asking users to identify a specific incident they experienced and that had a significant effect on the outcome.⁵

Source of Articles Read

Astronomers, our “advanced” group, identify the articles they read in many ways, and they obtain them from a variety of sources. With the mature astronomy system available,

astronomers rely on electronic sources much more than other scientists surveyed by us. In fact, nearly four-fifths of their readings are from electronic sources, compared with just over one-third of readings by other scientists. The reason for this is undoubtedly the advanced astronomy system and several years' experience by astronomers using it. The sources of articles read by the three groups are summarized in Table 1.

Table 1. Sources of Articles Read (By Electronic Journals Experience)

Source of Article Read	Level of Experience (%)		
	Early 1990–1993	Evolving 2000	Advanced 2001
Personal subscription	46.3	36.5	15.2
Print	[100.0]	[68.2]	[54.6]
Electronic	[0.0]	[32.0]	[45.4]
Library subscription	40.6	48.1	49.0
Print	[100.0]	[86.9]	[12.5]
Electronic	[0.0]	[23.1]	[85.9]
A print subscription located in a shared department	[0.0]	[0.0]	[1.6]
Separate copy			
Pre-print	0.2	1.5	18.5
Archive (ADS)	0.0	0.0	10.2
Colleague provided	9.2	9.7	4.5
ILL/document delivery	3.6	3.4	0.6
Author Web site	0.0	0.4	0.8
Other	0.1	0.4	1.2
Total	100	100	100

Not only do astronomers rely more than other scientists on electronic sources, the type of source is substantially different. Astronomers read less from personal subscriptions, partially reflecting the fact that they subscribe to fewer journals. Over half of the readings by astronomers came from non-subscription sources, compared to about one-fifth of readings with other scientists and prior to electronic sources. The difference with astronomers is probably due to the fact that they can rely heavily on the electronic Astrophysics Data Service (ADS) archive (26% of readings), electronic pre-prints such as astro-ph (19% of readings), and, to a lesser degree, authors' Web sites (1% of readings). Astrophysics Data Service (ADS) from NASA is the indexing and abstracting database used most by astronomers. It is available free online directly from NASA and has full text of all the core literature in astronomy. Astro-ph is a subset of the arXiv.org pre-print server.

Browsing or Searching

Readers may browse electronic or print issues, although they often photocopy or print out copies for subsequent reading. Other scientists deliberately search indexing and abstracting databases or articles which, when identified, must be located and obtained before they can be read. The articles are sometimes photocopied or printed out. Still others identify articles through citations in publications, someone told them about the articles, or they were identified in some other way. Here again the article must be located and obtained unless an author or colleague provided a copy of it. Table 2 shows how each group learned about the articles needed.

**Table 2. Where and How Scientists Got the Articles They Read
(By Electronic Journals Experience)**

Method of Learning About Article	Level of Experience (%)		
	Early 1990–1993	Evolving 2000	Advanced 2001
Browsing	57.6	45.0	20.6
Print	[100.0]	[65.8]	[45.2]
Electronic	[0.0]	[34.2]	[54.8]
Online Search	8.5	14.0	39.0
Other			
Colleagues	15.5	22.1	21.1
Citations	5.6	13.3	16.0
Other	12.8	5.6	3.3
Total	100	100	100

Astronomers identify fewer of the articles they need through browsing than other scientists do. It may be that scientists shift away from traditional browsing as electronic access to secondary databases and to full text becomes greater. The fact that scientists receive fewer personal subscriptions now than in the past may also contribute to this phenomenon.

Over half of readings from online searches by astronomers involve scientific indexing/abstracting databases. Other scientists depend even more on traditional A&I databases, while astronomers rely more on pre-print or e-print services such as arXiv.org or astro-ph. Once a desired article has been identified by online search, it must be located and obtained. For astronomers most of these readings come from electronic sources.

Relying on colleagues has always been a preferred information source, and astronomers are no exception. Over half of these readings are made from articles that another person (e.g., a colleague) told the astronomers about (57% of the other readings). Astronomers appear to rely much more on citations found in articles because of the astronomy system linkages and access to e-prints (e.g., astro-ph). In fact, about 15% of the readings from the other identifiable means are from e-prints.

There is substantial difference in the usefulness and value of the ways in which journal articles are identified. For example, the principal purpose for which articles are read varies depending on whether an article is found through browsing, online searching, or some other means. Browsing is done more often for conducting background research or current awareness and keeping up with the literature and less often for support of primary research and writing.

Astronomers are less likely to use library collections than other scientists.⁶ For a period of over 20 years (1977 to the late 1990s) the proportion of reading from library sources rose steadily as a result of a decline in average personal subscriptions per scientist, from about 5.8 in 1977 to about 2.4 in the late 1990s. The jury is out as to whether the trend is reversing and, if so, whether the reason is due to an increased use of electronic sources of journals. The readings from library-provided articles, however, tend to be more useful and valuable. For example, a higher proportion of these readings are for primary research and writing and less for current awareness or keeping up with literature, although the level of importance to the purposes of reading is similar. Most of the reading from library journals in the advanced groups is from electronic versions.

Age of Articles Read

In the past, articles older than five years accounted for about 12% of readings. These older articles were obtained mostly from libraries and were identified most often through online searches and citations in other publications. They also tended to be more useful and valuable than recently published articles because the recently published articles tend to be read for current awareness or keeping up with the literature. Fortunately, most of the core astronomy journals have been retroactively input into an electronic database.

The distribution of the age of articles read is shown in Table 3 for readings observed over time. Remarkably, the distributions of age are similar over time.

**Table 3. Age of Articles Read by Scientists
(By Electronic Journals Experience)**

Age of Articles Read	Level of Experience (%)			
	None		Intermediate/ Evolving	
	1960	1990–1993	2000	Advanced 2001
1 yr.	61.5	65.2	68.8	63.8
2 yrs.	13.3	14.5	10.2	9.9
3 yrs.	2.6	2.6	5.2	5.5
4–5 yrs.	8.4	5.7	5.4	7.8
6–10 yrs.	10.2	4.2	5.2	5.7
11–15 yrs.	1.7	2.6	1.7	2.8
> 15 yrs.	2.3	5.1	3.5	4.5
Total	100.0	100.0	100.0	100.0

Conclusion

When compared to other scientific disciplines, astronomers are on the high end of use of electronic journals and e-print services. Nearly 80% of their readings come from electronic alternatives. Some of the explanations for this may be predictors of adoption of electronic alternatives in other disciplines. Astronomers, like other scientists, continue to invest a large amount of their time in reading articles and place a high level of importance on journal articles. They select access means that are convenient and rely on libraries to subsidize electronic and print access. They use a wide variety of formats and means to get access to materials that are essential to their work in teaching, service, and research.

Notes

1. R. Kling and G. McKim, "Not Just a Matter of Time: Field Differences and the Shaping of Electronic Media in Supporting Scientific Communication," *Journal of the American Society for Information Science* 51 (2000): 1306–20.
2. C. Tenopir, D. W. King, and A. Bush. (forthcoming). *How Medical Faculty Use Print and Electronic Journals*.
3. C. Tenopir and D. W. King, *Towards Electronic Journals: Realities for Scientists, Librarians, and Publishers* (Washington, D.C.: Special Libraries Association, 2000).
4. Ibid.
5. J-M. Griffiths and D. W. King, *A Manual on the Evaluation of Information Centers and Services*. Prepared for NATO, AGARD, April 1991 (Available from the American Institute of Aeronautics and Astronautics, Technical Information Service, 555 West 57th St., Suite 1200, New York, NY 10019).
6. Ibid.

Bibliography

Boyce, P., and H. Dalterio "Electronic Publishing of Scientific Journals." *Physics Today* 49, no. 42 [Online]. Available: <http://www.aas.org/~pboyce/epubs/pt-art.htm>. (Accessed June 18, 2002).

King, D. W., and C. Tenopir. "Using and Reading Scholarly Literature." In *Annual Review of Information Science And Technology (ARIST)*, edited by M. Williams, vol. 34, 423–77. Medford, NJ: Information Today, Inc., 1999.

Tenopir, C., and D. W. King. "Electronic Journals and User Behaviour." *Learned Publishing*, 15 (October 2002): 259–65.

Tenopir, C., et al. "Scientists' Use of Journals: Differences (and Similarities) Between Print and Electronic." *Proceedings of the Online Meeting, New York, May 2001*, 469–81. New York: 22nd National Online Meeting.