

Value and Quality Measures for Physics Journals

Dana L. Roth
Caltech 1-32
Pasadena, CA 91125
dzrlib@library.caltech.edu

I have been concerned for some time that the American Physical Society, as well as other learned society publishers, such as the American Mathematical Society and the Institute of Physics, appear to be overly reliant on the "obvious" higher value and quality of their journals, in general, compared with their commercial counterparts.

While this higher value and quality are generally a "given" for readers, authors, and science librarians, it is not often immediately obvious to many library and university administrators responsible for serial/journal budget decisions. As a result, commercial publishers are able to successfully promote the purchase of multi-year journal packages, without providing evaluation criteria subscribers should be using to determine relative value and quality.

This raises a very fundamental question: Is it reasonable for librarians to indiscriminately complain about increasing subscription prices, if they previously failed to demand objective evaluation criteria for their subscription expenditures?

Economists have pointed out that librarians can, indeed, be their own worst enemy. If librarians purchase journal subscriptions on the basis of "more is better", it should be obvious that publishers, particularly commercial publishers, will establish title bundling as an appropriate model, and include as many journal titles as possible.(1)

In this regard, perhaps it is time for librarians to work with both faculty and administrators to determine the value and quality of the journals specific to their community and establish a library

funded value & quality-based commons. This commons would include both subscribed titles and non-subscribed titles for which the library would subsidize acquisition of articles. In this way, the primary library users would become active participants in value and quality decisions. If a given journal's articles are not part of a library funded quality-based commons, the individual user would then decide whether or not to obtain the article. Many publishers offer the option of online credit card purchasing, so that in lieu of finding the article on the author's web site, having users pay these fees, should generate more appreciation for library-funded material.

Establishing a library-funded journal commons would require comparative analysis of both value and quality. Comparative value is based on easily determined cost-per-page, cost-per-article, cost-per-character or cost-per-local-use data. Quality, which at first glance would appear to be subjective, can be quantified in several ways, using ISI Impact Factors(2) -- a figure widely recognized as one measure of a journal's quality. Increasingly, ISI Impact Factors are being used by authors in deciding where to publish, by administrators in making tenure and research-funding decisions, and should be used by librarians in making collection-management decisions.

Henry Barschall (3a) introduced the concept of cost-effectiveness, a measure that combines both value and quality. Barschall's method has been refined (3b) to produce both a [cost/page] value measure, and a [cost/page/ISI Impact Factor] cost-effectiveness measure. Table 1 shows that Physical Review-B (APS) has a 2004 cost/article of \$1.33 and a cost-effectiveness of 0.43, with commercial journals ranging from \$7.30 to \$28.42/article and have cost-effectiveness measures from 4.42 to 8.99.

One way to look at the cost-effectiveness measure is to compare it with the unit pricing seen on grocery store shelves. If this analysis is valid, Physical Review-B is clearly between 10 and 20 times more cost-effective than its commercial counterparts; or, in terms of the grocery store analogy,

Physical Review-B has a cost-effectiveness of 43 cents/unit compared to \$4.42 to almost \$9/unit for its commercial counterparts.

Another interesting metric is Market Influence, which is the product of the number of articles published in a given year multiplied by the journal's ISI Impact Factor for that year. It gives another measure of cost-effectiveness. Table 2 gives the Market Influence data for Physical Review-B and its commercial counterparts. Physical Review-B with a Market Influence of over 15K, a subscription cost of less than \$7K and a cost/MI of \$0.43 stands in stark contrast to the combined data for the other 5 titles which have a total Market Influence of little over 4K, a total subscription cost of nearly \$27K, and a cost/MI of over \$6.

Because of the exploding increase in submissions, it should be obvious that high-value/high-quality journals published by all the learned societies will require steady increases in subscription prices for the foreseeable future. In this regard, it is essential for libraries to follow Ken Frazier's advice (4) and avoid or exit multi-year, non-cancellable commitments to commercial publishers' packages. Following his advice will allow libraries faced with level budgets or with reductions to ensure uninterrupted subscriptions to learned society journals, which are the essential core of a library's journal collection.

1a. A.S. Edlin and D.C. Rubinfeld. The Bundling of Academic Journals. *American Economic Review*. 95(2):441-446, May 2005.

1b. M. McCabe. Academic Journal Pricing and Market Power: A Portfolio Approach.

<http://www.prism.gatech.edu/~mm284/JournPub.PDF>

(accessed 5/8/06)

2. The ISI Impact Factor.

<http://scientific.thomson.com/free/essays/journalcitationreports/impactfactor>

(accessed 5/3/06)

3a. H.H. Barschall, "The Cost-Effectiveness of Physics Journals,"

Physics Today 41(7):56-59, July 1988.

<http://barschall.stanford.edu/articles/pt8807.pdf> (accessed 5/3/06)

3b. D.L. Roth, " Cost/page and cost/page/impact factor data for selected mathematics journals.

<http://resolver.caltech.edu/CaltechLIB:dzrCPA05> (accessed 5/3/06)

4. K. Frazier, The Librarians' Dilemma: Contemplating the Costs of the "Big Deal". D-Lib Magazine, 2001, 7(3).

<http://www.dlib.org//dlib/march01/frazier/03frazier.html>

Accessed 5/8/06.

Table 1. 2004 Cost/article, ISI Impact Factor and Cost-effectiveness data.

	Cost/article	ISI IF	C/a/IF
Phys. Rev.-B	\$1.33	3.08	0.43
Thin Solid Films	\$7.30	1.65	4.42
Eur. Phys. J. - B	\$11.42	1.43	7.99
J. Mech. Phys. Solids	\$28.42	3.44	8.26
Phys. Status Solidi-B	\$8.64	0.98	8.82
Mat. Sci. Eng.-B	\$8.27	0.92	8.99

Table 2. 2004 Market Influence data.

	Articles	ISI IF	MI	cost/MI
Phys. Rev.-B	4964	3.1	15388	\$0.43
Thin Solid Films	1403	1.65	2315	\$4.42
Eur. Phys. J. - B	398	1.4	557	\$8.29
J. Mech. Phys. Sol.	112	3.4	381	\$8.35
Mat. Sci. Eng.-B	466	0.92	429	\$8.99
Phys. Status Sol.-B	557	0.98	546	\$9.00

Total	2936		4228	\$6.34