

Value and Quality Measures for Chemistry Research Journals

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I have been concerned for some time that ACS Publications, as well as other learned society publishers, such as the American Physical Society and the Royal Society of Chemistry, 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 chemistry 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 that gives numerical values similar to the unit pricing seen on grocery store shelves. In Table 1, for example, Inorganic Chemistry (ACS) has a 2004 cost/page of \$0.26 and a c/p/IF of 0.09. Inorganica Chimica Acta (Elsevier) has a 2004 cost/page of \$1.96 and a c/p/IF of 1.41. Clearly, Inorganic Chemistry has 7.5 times the value and is 16 times as cost-effective; or, in terms of the grocery store analogy, a cost-effectiveness of 9 cents/unit vs \$1.41/unit for Inorganica Chimia Acta.

Another value/quality measure is the concept of Market Influence, an interesting combination of Market Share and ISI Impact Factors. A publisher's Market Share is a comparative measure of the number of its own journals, articles, etc. Some Market Share examples from the 2004 ISI Journal Citation Index (4a) are shown in Table 2:

1. In ISI's "Chemistry, Multidisciplinary" category, the ACS published ~10% of the journals (4b), which included ~25% of all articles.

While Market Share is interesting in terms of gross output, it does not give any indication of value or quality.

Market Influence is defined as the product of multiplying the number of articles published in a journal in a given year by that journal's ISI Impact Factor for that year. Thus, among all the journals listed in the ISI Chemistry, Multidisciplinary category:

1. In 2004, ACS journals, again, with only about 10% of the titles & 25% of the articles, had a market influence of nearly 50%.

Thus, the average ACS article in this category had three times the impact of the average other article.

2. In 2004, J. Am. Chem. Soc. alone has nearly one third of the total Market Influence for this category.

These calculations are fairly easy to do. In Table 3, for example, *Inorganica Chimica Acta* had about 1/4 Market Influence of Inorganic Chemistry, but its cost/MI was nearly 14 times greater. In addition, Wiley-VCH's Chemical Journal Package had roughly the same market influence as JACS but its cost/MI was over 5 times greater.

In addition to these results, as shown in Table 4, in 2004 ACS journals also ranked very low in cost/article. ACS research journals ranged from \$0.80 to \$3.80, which compares very favorably to Elsevier Academic Press (\$4.36 to \$10.26), Elsevier Pergamon Press (\$2.85-\$16.42), Springer (\$6.42-\$10.69), Wiley Society (\$3.04-\$5.75) and Wiley (\$10.17-\$40.41). This data is taken from the University of Wisconsin's Journal Value Project.

(6)

Thus, because of the exploding rise in the number of submissions, it should be increasingly obvious that high-value/high-quality journals published by 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 (7) and

avoid or exit multi-year, non-cancelable commitments to most commercial publishers' packages. Following his advice will allow libraries faced with budget stasis or budget 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)

4a. ISI Journal Citation Reports.

<http://scientific.thomson.com/products/jcr/> (accessed 5/3/06)

4b. ACS journals in ISI's Chemistry, Multidisciplinary category are: *Accts. Chem. Res.*, *Bioconjugate Chem.*, *Chem. Eng. News*, *Chem. Res. Toxicol.*, *Chem. Rev.*, *Cryst. Growth Design*, *J. Am. Chem. Soc.*, *J. Chem. Educ.*, *J. Chem. Eng. Data*, *J. Chem. Info. Comp. Sci.*, *J. Combin. Chem.*, *Nano Lett.*

5. The Core ISI Chemistry categories are: Chemistry, Analytical, ... Applied, ... Inorganic & Nuclear, ... Medicinal, ... Multidisciplinary, ... Organic, ... Physical.

6. Journal Value Project. University of Wisconsin-Madison.

<http://www.wendt.wisc.edu/projects/jvp/welcome.do>

Accessed 5/8/06.

7. 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/page and
cost/page/ISI Impact Factor data.

	c/p	c/p/IF
Inorg. Chem.	\$0.26	0.09
Inorg. Chim. Acta	\$1.96	1.41
	$\$1.96/\$0.26 = 7.5$	$1.41/0.09 = 16$

Table 2. 2004 JCR Category Data

"Chemistry, Multidisciplinary"

Accts. Chem. Res., Bioconjugate Chem.,
Chem. Eng. News, Chem. Res. Toxicol.,
Chem. Rev., Cryst. Growth Design,
J. Am. Chem. Soc., J. Chem. Educ.,
J. Chem. Eng. Data,
J. Chem. Info. Comp. Sci.,
J. Combin. Chem., Nano Lett.

These 12 ACS titles had a:

Market Share = 10% of the journals, 25%
of the articles.

Market Influence ~ 50%.

JACS (alone) Market Influence ~ 33%

Table 3. Cost/Market Influence

	MI	cost/MI
Inorg. Chem.	3954	\$0.65
Inorg. Chim. Acta	913	\$8.98

$$913/3954=0.23 \quad \$8.98/\$0.65=13.8$$

Wiley-VCH Chemical Journal Package

(Adv. Synth. Catal., Angew. Chem. Int. Ed., Chem. Eur. J., ChemBioChem, ChemPhysChem, Eur. J. Inorg. Chem., Eur. J. Org. Chem.)

JACS	21857	\$0.15
Wiley-VCH CJP	19601	\$0.80

$$19601/21857=1.1 \quad \$0.80/\$0.15=5.3$$

Table 4. 2004 Chemistry Cost/Article Data

ACS research journals = \$0.80 to \$3.80

Elsevier Academic Press = \$4.36 to \$10.26

Elsevier Pergamon Press = \$2.85 to \$16.42

Springer = \$6.42-\$10.69

Wiley VCH = \$3.04-\$5.75

Wiley = \$10.17 - \$40.41