The Impact Factor, Eigenfactor, & Altmetrics:
From Theory to Analysis

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What we'll discuss

- Bibliometrics
- Altmetrics
- Application
- Tools for the Future

Bibliometrics

THE KNOWN

Alan Pritchard first coined the term “bibliometrics”

Bibliometrics

The use of statistical methods in the analysis of a body of literature to reveal the historical development of subject fields and patterns of authorship, publication, and use. Formerly called statistical bibliography. (from The ALA Glossary of Library and Information Science, 1983)
Year introduced: 1990

PubMed search builder options

Subheadings:

☐ history ☐ methods

☐ Restrict to MeSH Major Topic.

☐ Do not include MeSH terms found below this term in the MeSH hierarchy.

Tree Number(s): L01.178.682.099.325, L01.453.183.291

Entry Terms:

- Bibliometric Analysis
- Bibliographies, Statistical
- Statistical Bibliography
- Bibliography, Statistical
- Analysis, Bibliometric
- Analyses, Bibliometric
- Bibliometric Analyses
- Statistical Bibliographies

Previous Indexing:

- Bibliography (1966-1989)

All MeSH Categories

"In the early 1960s Irving H. Sher and [Eugene Garfield] created the journal impact factor to help select journals for the Science Citation Index…[Garfield] expected that it would be used constructively while recognizing that in the wrong hands it might be abused."

(Garfield 1999)

Eugene Garfield (1955) first mentioned the concepts of Science Citation Index and Impact Factor in *Science*

- Impact Factor (IF) = *"a measure of the frequency with which an 'average article' in a journal has been cited in a particular year or period"* wokinfo.com/essays/impact-factor/

2005 IF of a journal =

$$\frac{\text{2005 cites to articles published in 2003-04}}{\text{number of articles published in 2003-04}}$$

- *"The journal impact factor is a good predictor of the quality of journals as measured by citations to primary research articles. It is, however, a poor indicator of citations to specific papers or of the future performance of individual researchers."*

(*Nature Materials* 2013)

Impact Factor

ISI Web of Knowledge℠

Journal Citation Reports®

THOMSON REUTERS

PROS

- One of the oldest quantified metrics
- 2-year & 5-year citation windows
- Many journals advertise their IF
- Widely used & recognized

Impact Factor

nature International weekly journal of science

Home | News & Comment | Research | Careers & Jobs | Current Issue | Archive | Audio

Archive > Volume 500 > Issue 7464 > News > Article

NATURE | NEWS

Brazilian citation scheme outed

Thomson Reuters suspends journals from its rankings for 'citation stacking'.

Richard Van Noorden

27 August 2013

CONS

- Citations need context
  - Unidentifiable + or – citations
  - Self-citations
  - Review articles are favored
- Metric for journals not authors
- Time varying IF ↑↓
- Limited to JCR

"For the few scientists who earn a Nobel Prize, the impact…of their research is unquestionable. For the rest of us, how does one quantify the cumulative impact…of an individual's scientific research output?"

(Hirsch 2005)

An index to quantify an individual's scientific research output

J. E. Hirsch*

Department of Physics, University of California at San Diego, La Jolla, CA 92093-0319

Communicated by Manuel Cardona, Max Planck Institute for Solid State Research, Stuttgart, Germany, September 1, 2005 (received August 15, 2005)

I propose the index *h*, defined as the number of papers with citation number ≥*h*, as a useful index to characterize the scientific output of a researcher.

(*i*) Total number of papers (N_p). Advan
ductivity. Disadvantage: does not mea
impact of papers.

h-index developed by a physicist (Hirsch 2005)

h-index shows the broad impact of an individual's work

Ex. Dr. Kim's h-index = 12
12 of his articles have been cited at least 12 times each

h-index

PRO

- Considers the impacts of both journals and authors

CONS

- Unidentifiable + or – citations
- h-index increases with age so comparing productivity of younger researchers is problematic
- Calculated in Web of Science but need comprehensive citation report of all author's publications

Dr. Bergstrom and his colleagues "have developed a way to use the network structure of citations to improve on simple citation counts in measuring the scientific influence of academic publications."

(Bergstrom 2007)

eigenFACTOR.org®

RANKING AND MAPPING SCIENTIFIC KNOWLEDGE

Eigenfactor developed by Dr. West and Dr. Bergstrom at Univ. of Washington

- *"Eigenfactor scores are scaled so that the sum of the Eigenfactor scores of all journals listed in Thomson's Journal Citation Reports (JCR) is 100."*

eigenfactor.org

Eigenfactor

PROS

- Weighted metric with different weights for journals
- Excludes self-citations
- 5-year citation window

CONS

- Limited to journals in Journal Citation Reports
- Journals assigned to a single subject category (Jacso 2012)

Altmetrics

THE NEW

reading

recommending

What are

Altmetrics

altmetrics, anyway?

saving

discussing

Altmetrics measure…

- How far and wide content travels through the scholarly* web
- Web-driven social scholarly interactions
  - Twitter
  - Facebook
  - Blogging
  - Bookmarking

** It's not just scholars who are engaging: clinicians, practitioners, and the general public are reading and sharing, too!*

Altmetrics vs. Article-Level Metrics

- Related, but not interchangeable
- Article-Level Metrics present picture of an article's true impact via data points
  - PLoS
  - Scopus
  - Nature
  - Highwire
- Altmetrics track other types of output in addition to articles, including datasets, presentations, and software

ImpactStory.

Sign up

Carl Boettiger

56 products expand all

add products | refresh metrics | download

Tweet

article

Treebase: an R package for discovery, access and manipulation of online phylogenies
(2012) Boettiger, Temple Lang *Methods in Ecology and Evolution*
highly saved | highly discussed

rfishbase: exploring, manipulating and visualizing FishBase data from R.
(2012) Boettiger, Lang, Wainwright *Journal of Fish Biology*
highly discussed | cited | saved | saved

Fluctuation domains in adaptive evolution
(2010) Boettiger, Dushoff, Weitz *Theoretical Population Biology*
highly saved | discussed | saved

Modeling stabilizing selection: Expanding the Ornstein-Uhlenbeck model of adaptive evolution
(2012) *Evolution*
highly saved | cited | discussed

Early warning signals and the prosecutor's fallacy

Overview: Plum Metrics

Plum is building the next generation of research metrics for scholarly research.

Metrics are captured and correlated at the group / collection level (e.g., lab, department, museum, journal, etc.)

We categorize metrics into 5 separate types: Usage, Captures, Mentions, Social Media, and Citations. Examples of each type are:

- **Usage** - Downloads, views, book holdings, ILL, document delivery
- **Captures** - Favorites, bookmarks, saves, readers, groups, watchers
- **Mentions** - blog posts, news stories, Wikipedia articles, comments, reviews
- **Social media** - Tweets, +1's, likes, shares, ratings
- **Citations** - PubMed, Scopus, patents

We gather metrics around what we call artifacts. Artifacts are more than just the journal articles that a researcher authors. Artifacts are any research output that is available online. We gather metrics about:

- articles
- blog posts
- book chapters
- books
- cases
- clinical trials
- conference papers
- datasets

Current List of Metrics

Below is a listing of the current type of metrics that Plum supports, and samples of providers where we harvest the data from. This list is growing fast / stay tuned.

Metrics as of July 28, 2013

Type	Metric	Example Source(s)	Description
Usage	Abstract Views	dSpace, ePrints, PLoS	The number of times the abstract of an article has been viewed
Usage	Clicks	bit.ly, Facebook	The number of clicks of a URL
Usage	Collaborators	GitHub	The number of collaborators of an artifact
Usage	Downloads	Dryad, Figshare, Slideshare, Github	The number of times an artifact has been downloaded
Usage	Figure Views	figshare, PLoS	The number of times the figure of an article has been viewed
Usage	Full Text Views	PLoS	The number of times the full text of an article has been viewed
Usage	Holdings	WorldCat	The number of libraries that hold the book artifact
Usage	HTML Views	PLoS	The number of times the html of an article has been viewed
Usage	PDF Views	dSpace, ePrints, PLoS	The number of times the PDF of an article has been viewed

Altmetric What do we do? Products Who are we for? Plans and pricing About Blog Sign in

What Does Altmetric Do?

Discover what do we do and how.

Our products

Altmetric Explorer

A powerful and intuitive web application that helps you see all of the attention surrounding your papers.

Altmetric Bookmarklet

A simple browser tool that lets you instantly get article level metrics for any recent paper, for free.

Altmetric API

An application programming interface that enables you to enrich your pages with article level metrics data.

Altmetric Badges

Ready-to-use embeddable badges for your article pages that let you showcase impact in a beautiful way.

OPEN ACCESS PEER-REVIEWED

RESEARCH ARTICLE

2,090	3	6	1
VIEWS	CITATIONS	SAVES	SHARE

Identification of New Differentially Methylated Genes That Have Potential Functional Consequences in Prostate Cancer

Jin W. Kim, Seong-Tae Kim, Aubrey R. Turner, Tracey Young, Shelly Smith, Wennuan Liu, Johan Lindberg, Lars Egevad, Henrik Grönberg, William B. Isaacs, Jianfeng Xu

Viewed

Total Article Views

2,090

	HTML Page Views	PDF Downloads	XML Downloads	Totals
PLOS	1,170	337	29	1,502
PMC	379	213	n.a.	588
Totals	1,551	550	29	2,090

32.88% of article views led to PDF downloads

BETA

Compare average usage for articles published in 2012 in the subject area:

Anatomy and physiology | Show reference set

*Although we update our data on a daily basis, there may be a 48-hour delay before the most recent numbers are available. PMC data is posted on a monthly basis and will be made available once received.

Cited

SCOPUS	CrossRef	PMC	ISI Web of Science	Google Scholar
3	4	3	3	Search

Saved

Subject Areas

- DNA methylation
- Prostate gland
- Promoter regions
- Prostate cancer
- Methylation
- Treatment guidelines
- Gene expression
- DNA sequence anal...

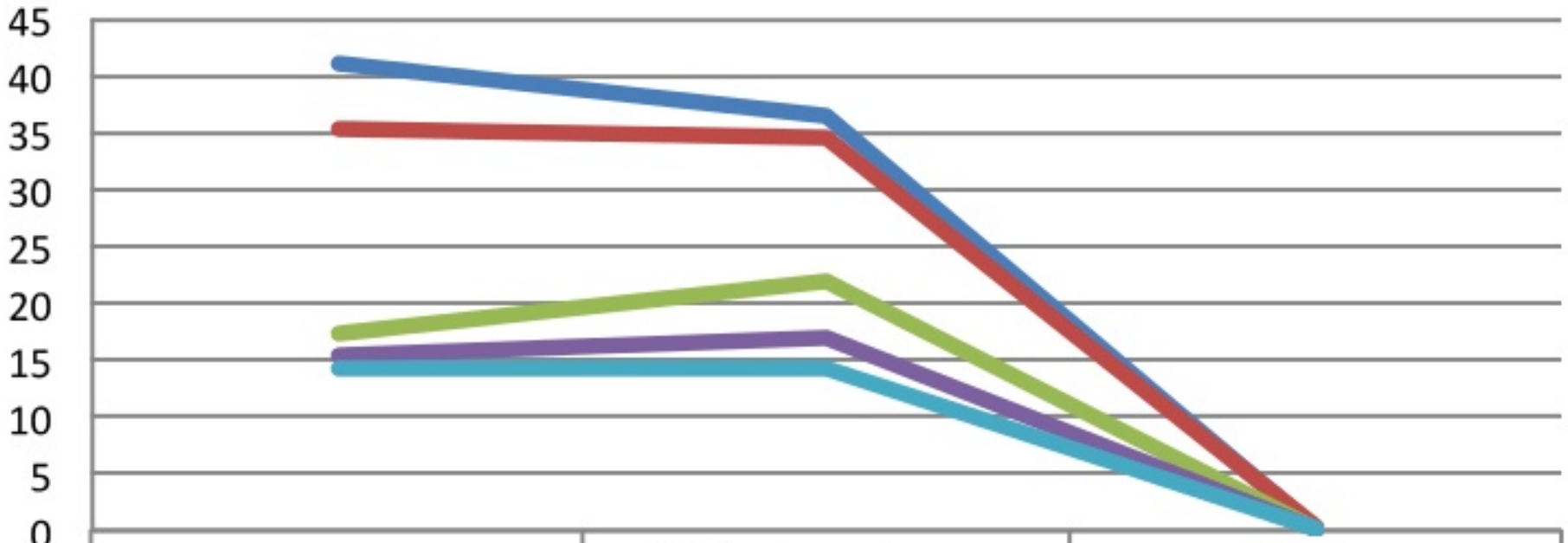
So what's the verdict?

PROS	CONS
■ Content-level, not container-level	■ New and emerging
■ Immediacy	■ Gaming still possible
■ Social sharing	■ Context is critical
■ Incorporates traditional metric measures, too	

Application

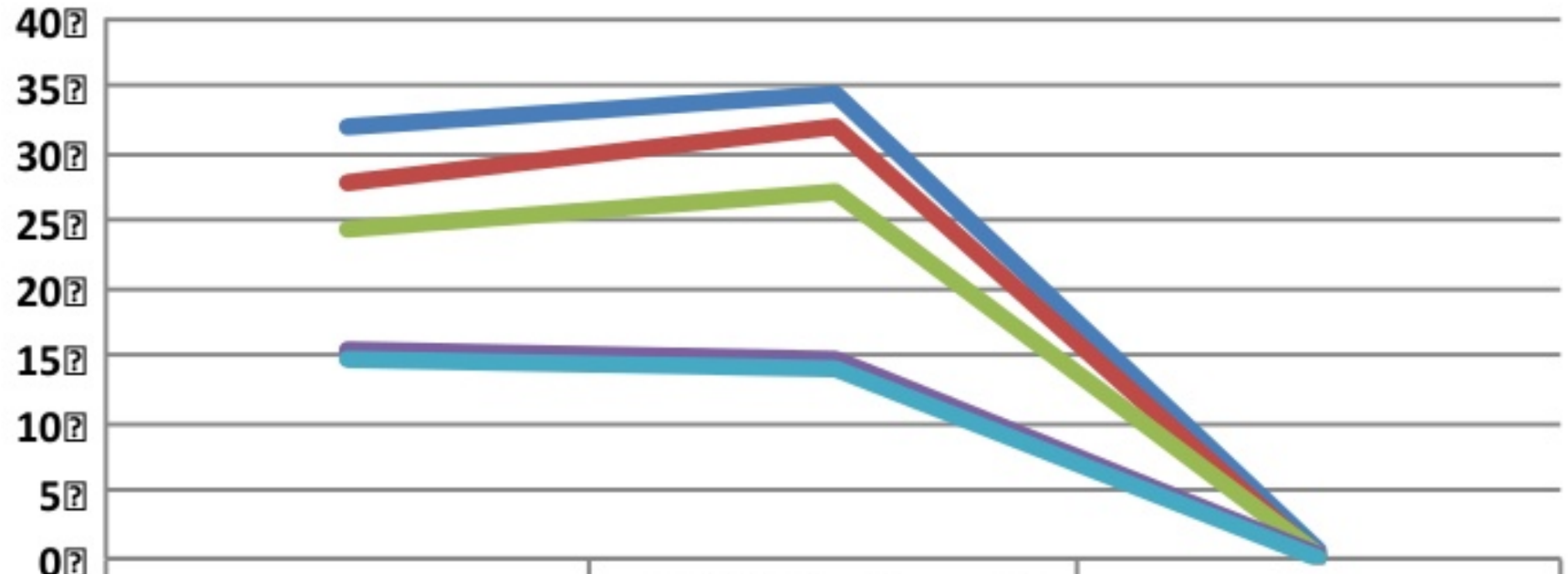
INFORMATION LITERACY AND RESEARCH

Figure 1. Genetics & Heredity Journals



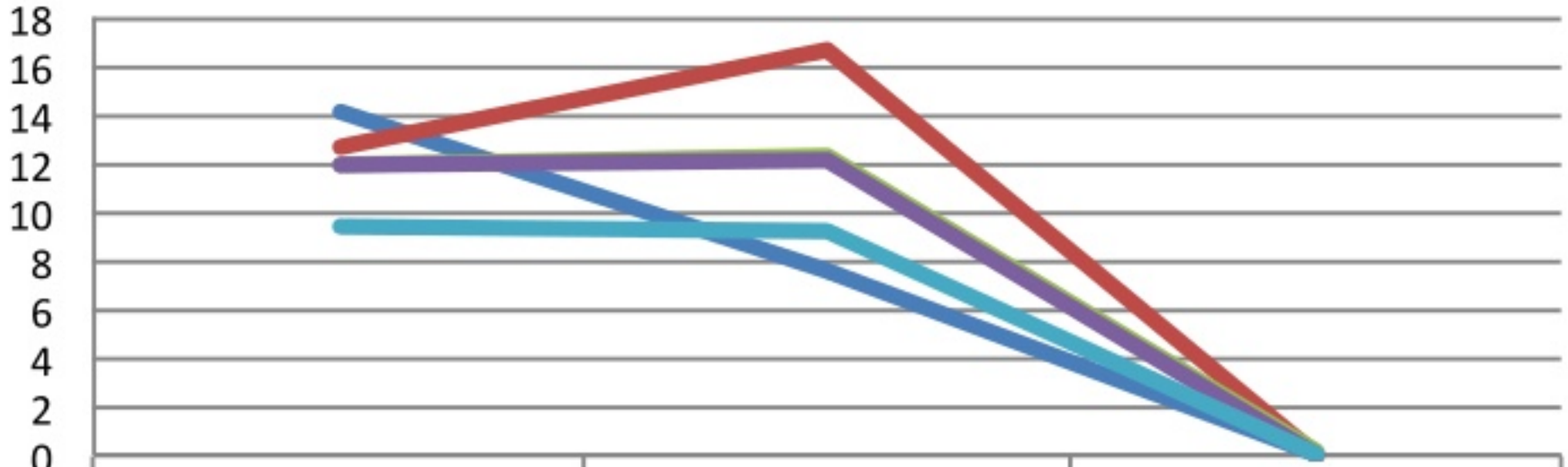
	2012 Impact Factor	2012 5-Year Impact Factor	Eigenfactor
Nature Reviews Genetics	41.063	36.4	0.124
Nature Genetics	35.209	34.52	0.308
Annual Review of Genetics	17.436	21.789	0.023
Trends in Ecology & Evolution	15.389	17.112	0.052
Genome Research	14.397	14.104	0.172

Figure 2. Biochemistry & Molecular Biology Journals



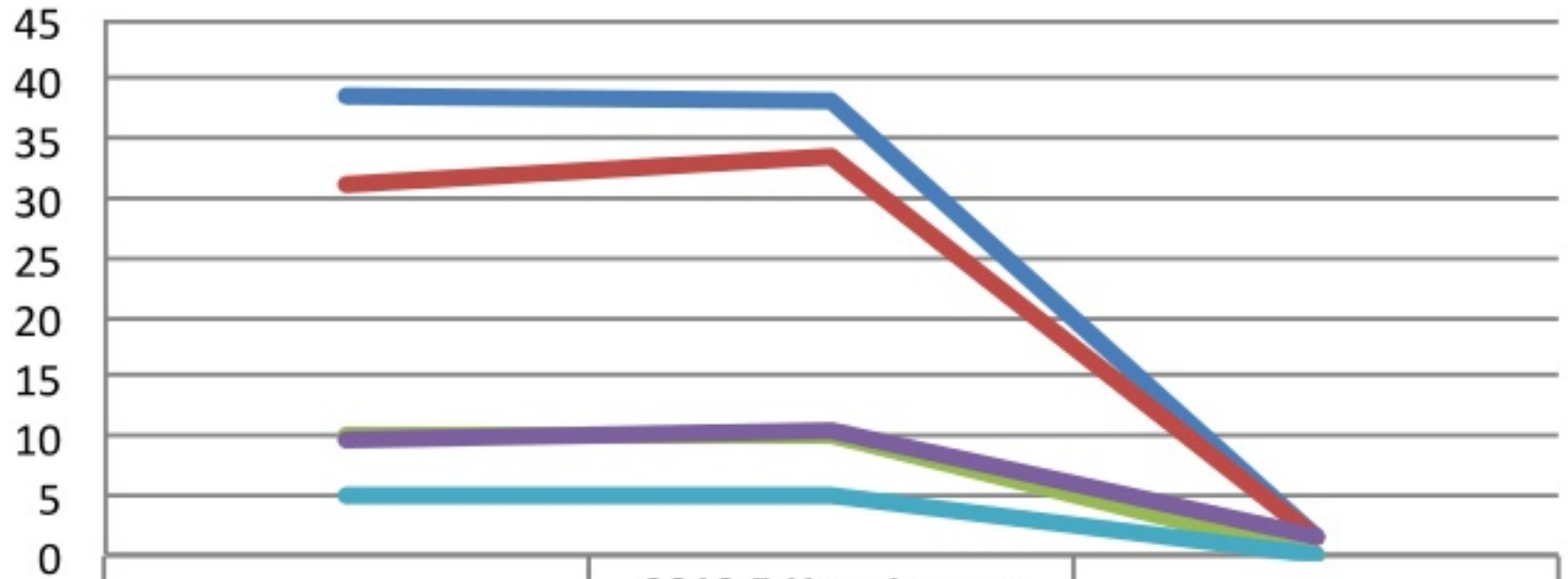
	2012 Impact Factor	2012 5-Year Impact Factor	Eigenfactor
Cell	31.957	34.366	0.585
Annual Review of Biochemistry	27.681	31.964	0.051
Nature Medicine	24.302	27.139	0.164
Molecular Cell	15.28	14.902	0.228
Molecular Psychiatry	14.897	13.985	0.042

Figure 3. Biophysics Journals



	2012 Impact Factor	2012 5-Year Impact Factor	Eigenfactor
Acta Crystallographica Section D-Biological Crystallography	14.103	7.54	0.048
Annual Review of Biophysics	12.63	16.591	0.014
Nature Structural & Molecular Biology	11.902	12.307	0.123
Quarterly Reviews of Biophysics	11.875	12.163	0.006
Current Opinion in Chemical Biology	9.471	9.256	0.026

Figure 4. Multidisciplinary Sciences Journals



	2012 Impact Factor	2012 5-Year Impact Factor	Eigenfactor
Nature	38.597	38.159	1.565
Science	31.027	33.587	1.353
Nature Communications	10.015	10.02	0.059
Proceedings of the National Academy of Sciences of the USA	9.737	10.583	1.546
Journal of the Royal Society Interface	4.907	5.165	0.027

Assessing “impact”

- Tenure & Promotion
  - Expectations
  - Tenure-track vs. tenured
- New models & modes of scholarship
  - Digital Humanities
- San Francisco Declaration on Research Assessment (DORA)

Tools for the Future

THE ALTMETRICS “GRAB-BAG”

Data sharing tools

Citation & collaboration tools

zotero

MENDELEY

FACULTY of 1000

citeulike

Social sharing tools

Academia.edu
share research

ResearchGate

slideshare

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Questions?

Thank you!

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