What we’ll discuss

- Bibliometrics
- Altmetrics
- Application
- Tools for the Future
Bibliometrics
THE KNOWN
Alan Pritchard first coined the term “bibliometrics”
“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”  

  2005 IF of a journal =

  2005 cites to articles published in 2003-04  
  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

**PROS**

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

CONS

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

Brazilian citation scheme outed
Thomson Reuters suspends journals from its rankings for ‘citation stacking’.

Richard Van Noorden
27 August 2013
“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 f August 15, 2005)

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

(ii) Total number of papers ($N_p$). Advantage: does not measure impact of papers.

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 developed by a physicist (Hirsch 2005)
Pros:
- 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 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
What is the difference between the Eigenfactor Score and the Article Influence Score?

- **Eigenfactor Score**
  - Measures a journal’s importance to the research community
  - If a journal doubles in size while the quality of articles remains the same, the Eigenfactor Score would double

- **Article Influence Score**
  - Average influence per article of papers in a journal
  - Calculated from Eigenfactor Score
  - Comparable to Impact Factor
**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
What are altmetrics, anyway?
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
Carl Boettiger

56 products expand all

article


rfishbase: exploring, manipulating and visualizing FishBase data from R. (2012) Boettiger, Lang, Wainwright Journal of Fish Biology


Early warning signals and the prosecutor's fallacy (2012)
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, watchlists
- 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.

<table>
<thead>
<tr>
<th>Type</th>
<th>Metric</th>
<th>Example Source(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usage</td>
<td>Abstract Views</td>
<td>dSpace, ePrints, PLoS</td>
<td>The number of times the abstract of an article has been viewed</td>
</tr>
<tr>
<td>Usage</td>
<td>Clicks</td>
<td>bit.ly, Facebook</td>
<td>The number of clicks of a URL</td>
</tr>
<tr>
<td>Usage</td>
<td>Collaborators</td>
<td>GitHub</td>
<td>The number of collaborators of an artifact</td>
</tr>
<tr>
<td>Usage</td>
<td>Downloads</td>
<td>Dryad, Figshare, Slideshare, Github</td>
<td>The number of times an artifact has been downloaded</td>
</tr>
<tr>
<td>Usage</td>
<td>Figure Views</td>
<td>figshare, PLoS</td>
<td>The number of times the figure of an article has been viewed</td>
</tr>
<tr>
<td>Usage</td>
<td>Full Text Views</td>
<td>PLoS</td>
<td>The number of times the full text of an article has been viewed</td>
</tr>
<tr>
<td>Usage</td>
<td>Holdings</td>
<td>WorldCat</td>
<td>The number of libraries that hold the book artifact</td>
</tr>
<tr>
<td>Usage</td>
<td>HTML Views</td>
<td>PLoS</td>
<td>The number of times the html of an article has been viewed</td>
</tr>
<tr>
<td>Usage</td>
<td>PDF Views</td>
<td>dSpace, ePrints, PLoS</td>
<td>The number of times the PDF of an article has been viewed</td>
</tr>
</tbody>
</table>
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.
Identification of New Differentially Methylated Genes That Have Potential Functional Consequences in Prostate Cancer


2,090 views
3 citations
6 saves
1 share

Viewed

Total Article Views

2,090

Oct 31, 2012 (publication date) through Oct 15, 2012

PLOS 1,170
PMC 375
Totals 1,551

32.83% of article views led to PDF downloads

Cited

SCOPUS 3
CrossRef 4
PMCID 3
PM 3
Google Scholar 3

Saved
So what's the verdict?

<table>
<thead>
<tr>
<th>PROS</th>
<th>CONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content-level, not container-level</td>
<td>New and emerging</td>
</tr>
<tr>
<td>Immediacy</td>
<td>Gaming still possible</td>
</tr>
<tr>
<td>Social sharing</td>
<td>Context is critical</td>
</tr>
<tr>
<td>Incorporates traditional metric measures, too</td>
<td></td>
</tr>
</tbody>
</table>
Application
INFORMATION LITERACY AND RESEARCH
Bibliometrics Ranges

- **2-year Impact Factor**
  - Science ≤ 153.459
  - Social Science ≤ 18.571

- **5-year Impact Factor**
  - Science ≤ 88.550
  - Social Science ≤ 26.624

- **Article Influence Score**
  - Science ≤ 32.565
  - Social Science ≤ 12.870

- **Eigenfactor Score**
  - Science ≤ 1.565
  - Social Science ≤ 0.100
Figure 1. Genetics & Heredity Journals

<table>
<thead>
<tr>
<th></th>
<th>2012 Impact Factor</th>
<th>2012 5-Year Impact Factor</th>
<th>Article Influence Score</th>
<th>Eigenfactor Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature Reviews Genetics</td>
<td>41.063</td>
<td>36.4</td>
<td>18.7</td>
<td>0.124</td>
</tr>
<tr>
<td>Nature Genetics</td>
<td>35.209</td>
<td>34.52</td>
<td>17.402</td>
<td>0.308</td>
</tr>
<tr>
<td>Annual Review of Genetics</td>
<td>17.436</td>
<td>21.789</td>
<td>11.447</td>
<td>0.023</td>
</tr>
<tr>
<td>Trends in Ecology &amp; Evolution</td>
<td>15.389</td>
<td>17.112</td>
<td>7.274</td>
<td>0.052</td>
</tr>
<tr>
<td>Genome Research</td>
<td>14.397</td>
<td>14.104</td>
<td>7.473</td>
<td>0.172</td>
</tr>
</tbody>
</table>
### Figure 2. Biochemistry & Molecular Biology Journals

<table>
<thead>
<tr>
<th></th>
<th>2012 Impact Factor</th>
<th>2012 5-Year Impact Factor</th>
<th>Article Influence Score</th>
<th>Eigenfactor Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell</td>
<td>31.957</td>
<td>34.366</td>
<td>19.272</td>
<td>0.585</td>
</tr>
<tr>
<td>Annual Review of Biochemistry</td>
<td>27.681</td>
<td>31.964</td>
<td>17.412</td>
<td>0.051</td>
</tr>
<tr>
<td>Nature Medicine</td>
<td>24.302</td>
<td>27.139</td>
<td>12.39</td>
<td>0.164</td>
</tr>
<tr>
<td>Molecular Cell</td>
<td>15.28</td>
<td>14.902</td>
<td>8.708</td>
<td>0.228</td>
</tr>
<tr>
<td>Molecular Psychiatry</td>
<td>14.897</td>
<td>13.985</td>
<td>5.06</td>
<td>0.042</td>
</tr>
</tbody>
</table>
### Figure 3. Biophysics Journals

<table>
<thead>
<tr>
<th></th>
<th>2012 Impact Factor</th>
<th>2012 5-Year Impact Factor</th>
<th>Article Influence Score</th>
<th>Eigenfactor Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acta Crystallographica Section D-Biological Crystallography</td>
<td>14.103</td>
<td>7.54</td>
<td>3.751</td>
<td>0.048</td>
</tr>
<tr>
<td>Annual Review of Biophysics</td>
<td>12.63</td>
<td>16.591</td>
<td>8.953</td>
<td>0.014</td>
</tr>
<tr>
<td>Nature Structural &amp; Molecular Biology</td>
<td>11.902</td>
<td>12.307</td>
<td>7.588</td>
<td>0.123</td>
</tr>
<tr>
<td>Quarterly Reviews of Biophysics</td>
<td>11.875</td>
<td>12.163</td>
<td>7.111</td>
<td>0.006</td>
</tr>
<tr>
<td>Current Opinion in Chemical Biology</td>
<td>9.471</td>
<td>9.256</td>
<td>3.238</td>
<td>0.026</td>
</tr>
</tbody>
</table>
Figure 4. Multidisciplinary Sciences Journals

<table>
<thead>
<tr>
<th>Journal</th>
<th>2012 Impact Factor</th>
<th>2012 5-Year Impact Factor</th>
<th>Article Influence Score</th>
<th>Eigenfactor Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature</td>
<td>38.597</td>
<td>38.159</td>
<td>20.801</td>
<td>1.565</td>
</tr>
<tr>
<td>Science</td>
<td>31.027</td>
<td>33.587</td>
<td>17.697</td>
<td>1.353</td>
</tr>
<tr>
<td>Nature Communications</td>
<td>10.015</td>
<td>10.02</td>
<td>5.611</td>
<td>0.059</td>
</tr>
<tr>
<td>Proceedings of the National Academy of Sciences of the USA</td>
<td>9.737</td>
<td>10.583</td>
<td>4.879</td>
<td>1.546</td>
</tr>
<tr>
<td>Journal of the Royal Society Interface</td>
<td>4.907</td>
<td>5.165</td>
<td>1.947</td>
<td>0.027</td>
</tr>
</tbody>
</table>
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
- ResearchGate
- slideshare


References - Altmetrics

- Altmetric.com
- Altmetrics.org
- DORA – am.ascb.org/dora
- ImpactStory.org
- Plumanalytics.com
Questions?
Thank you!

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