Corso di dottorato in Scienze Farmacologiche
Information literacy in Pharmacological Sciences 2017

Scientific communication and research evaluation

Bibliometrics and Bibliometric Indicators

Roberta Sato

Mercoledì 24 maggio

Index

- Metric terms in Information Science – definitions
- What is Bibliometrics?
- Why use Bibliometrics?
- Journal and Author Ranking Tools: Impact Factor, H-index
- Alternative metrics

What is Bibliometrics?

The branch of library science concerned with the application of mathematical and statistical analysis to bibliography; the statistical analysis of books, articles, or other media of communication

http://www.oxforddictionaries.com/definition/english/bibliometrics

That is…data about publications, or citation frequency

Scientometrics is the branch of information science concerned with the application of bibliometrics to the study of the spread of scientific ideas; the bibliometric analysis of science

See definition in Oxford English Dictionary http://digbig.com/5bhbtn

Why use Bibliometrics?

You can use Bibliometrics to answer to questions such as:

- What are the best journals in the field of my discipline?
- Who is citing my articles? How many times have I been cited?
- How do I know this article is important?
- In which journal should I publish?

Why use Bibliometrics?

Bibliometrics can be used to:

- ✓ Determine the most influential journals in a research area
- ✓ Track the impact of a published research
- ✓ Support applications for promotion and grant funding

Evaluation of scientific research

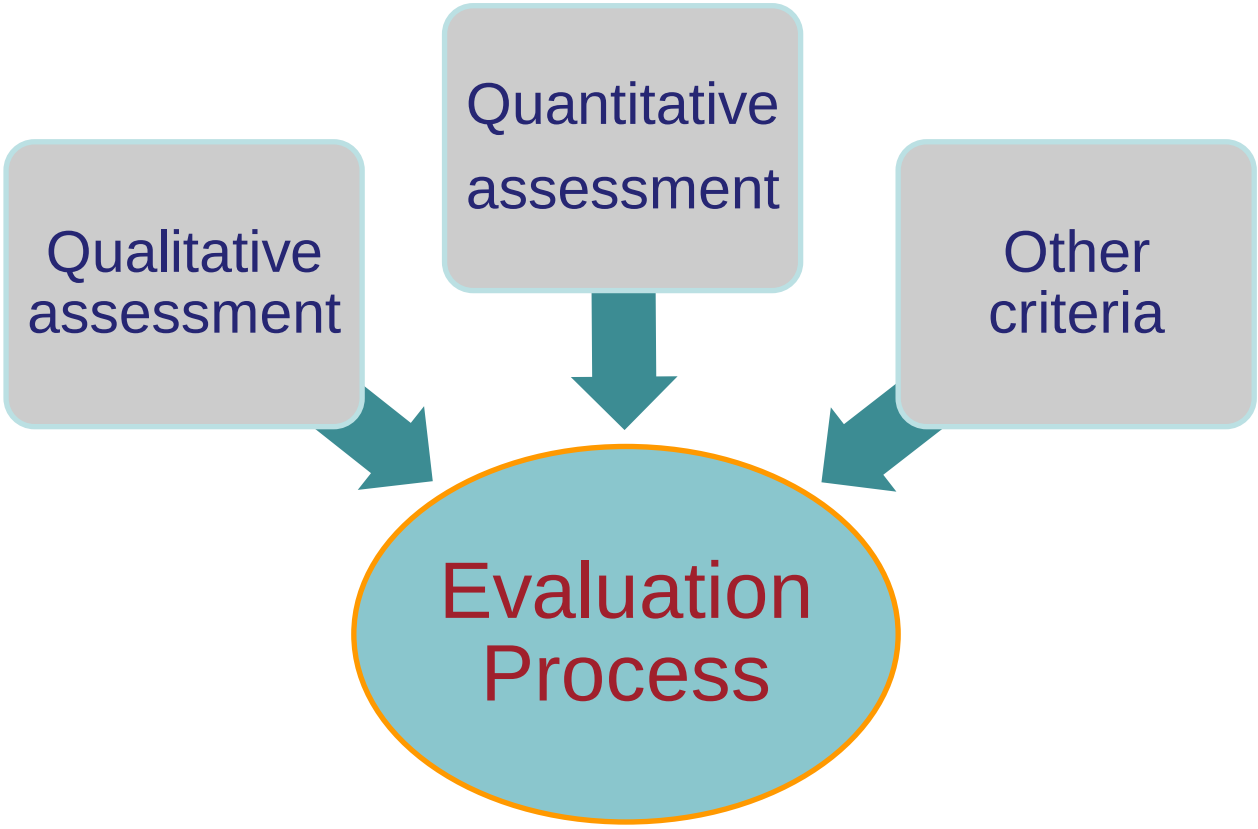
The analysis approach is conducted at multiple levels:

Single researcher (recruitment, promotion, grant awarding career)

Research groups (same department, faculty, university, research organization, nation)

Scientific journals

Research evaluation



Evaluation of scientific research

- *Qualitative assessment*: Review by colleague-scientists, "peers"(*peer reviewing or informed peer reviewers*)
- *Quantitative assessment*: analysis of bibliographic citations (Bibliometric indicators)
- *Other criteria:* congress participation as invited speaker, patents, software etc.

Evaluation of scientific research – Peer Review

A system to assess the *quality of scientific research* before it is published, varying across journals and research fields

- SINGLE-BLIND PEER REVIEW
- DOUBLE-BLIND PEER REVIEW
- OPEN PEER REVIEW
- TRIPLE BLIND PEER REVIEW

PEER REVIEW. The nuts and bolts. A guide for early career researchers
http://senseaboutscience.org/activities/peer-review-the-nuts-and-bolts/

New projects: next generation science journals

ScienceMatters

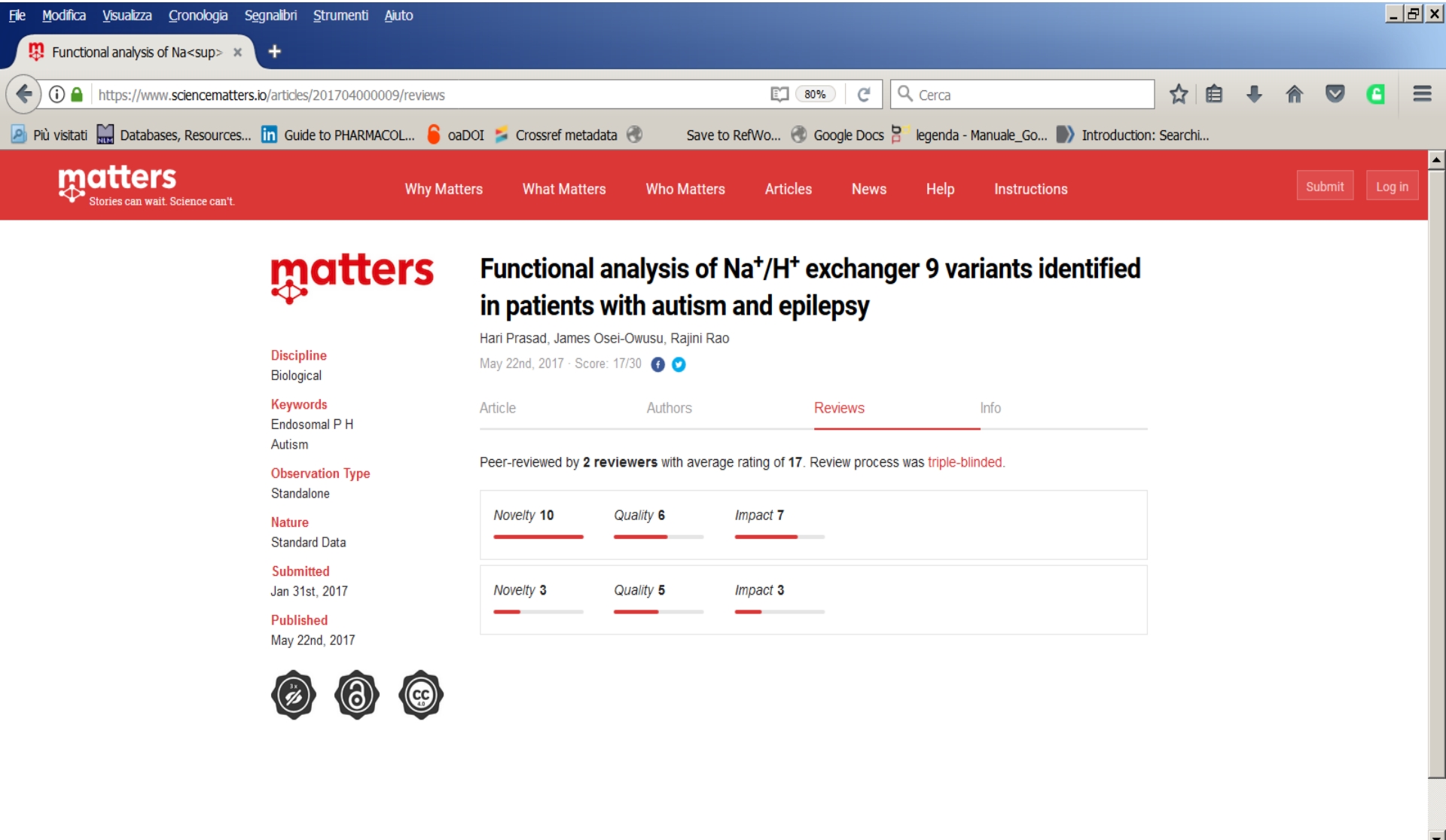
https://www.sciencematters.io/

a publishing platform where scientists can submit single, robust results for relatively quick peer review (triple-blind peer review)

New journal Matters: https://sciencematters.io/what-is-matters?

http://retractionwatch.com/2016/06/27/publishing-needs-more-science-fewer-stories-qa-with-founders-of-sciencematters/

https://www.sciencematters.io/articles/201704000009



Evaluation of scientific research

The listing of references in publications is a convention among scientists for giving credit or recognition to the value of previous works.

Assuming that scientists cite the work that they have found useful in pursuing their own research, the number of citations received by a publication is seen as a quantitative measure of the resonance and impact that this publication has created in the scientific community.

Citations analysis – Limits (1)

Factors that compromise the correlation between citations and the quality of research

Time

Citations are symmetrically but not uniformly distributed over time

Size of the research community

Number of scholars working in the same research field

Editorial practice in the discipline

Number of coauthors, editorial strategy (articles or books), prevailing language, average citation «life» of publications in the research field

Citation ethics

Manipulation through strategic quoting

Publisher's prestige

Positive correlation between visibility and number of citations

Citations analysis – Limits (2)

Nature of the research contribution

Reviews and research proposing *new methodologies* are more cited

Errors in the bibliography

Technical difficulties managing citation databases

Difficulty to eliminate homonymies, multiple surnames/names and spelling symbols (e.g. apostrophe, dash and subscripts)

Atypical meaning of the citation

e.g. «negative» citation

Sleeping beauties or «Mendel's syndrome» papers

Underestimation of an original scientific publication

Abatemarco Antonio and Dell'Anno Roberto. A Bibliometric Evaluation of the Research Outputs of Italian Economists. Economia Politica 2013, issue 1, 97-126

http://www.rivisteweb.it/download/article/10.1428/73102

Citations cannot represent «the» measure of the value/utility of a research product, but is «a» good indicator of the impact of a research output, within a precise interval of time

Evaluation should balance quantitative and qualitative information

Bibliometrics should complement peer review

Bibliometrics tools

The most well-known bibliometrics tools are:

- Ranking tools typically applied to journals (**JCR journal impact factor**, **SCOPUS SNIP**, **SCImago SJR**, etc.)
- **H-index or Hirsch index**, typically applied to authors

Bibliometrics tools

Databases that measure journal impact:

- **Journal Citation Report (Thomson Reuters)**
- **Scopus**

Databases (most used) for citation searching:

- **Web of Science (Thomson Reuters)**
- **Scopus**
- **Google Scholar****

** Google Scholar records are linked to citing articles from WoS Core Collection (for Web of Science subscribers only)

Journal Ranking Tools

- There are many tools used for journal rankings
- Each tool uses different metrics to rank journals
- Each tool has different journal coverage
- Journal metrics should only be compared accross the same discipline or subdiscipline

At present, none of the journal ranking tools adeguately categorise multidisciplinary journals

Impact Factor (JIF)

The *Journal Citation Reports (JCR)* °° database is a subscription product that calculates and publishes the annual impact factors for journals

https://jcr.incites.thomsonreuters.com/

°° *University of Padova has access to JCR back to 1997 (IF back to 1997)*

The **Impact factor (JIF),** proposed in 1963 by Eugene Garfield (ISI-Thomson), is a ratio between citations and recent citable items published

Garfield E. The History and Meaning of the Journal Impact Factor. *JAMA.* 2006;295(1):90-93 doi:10.1001/jama.295.1.90

What is a Journal Impact Factor?

The impact factor of a journal is the average number of citations received in a year by articles published in a journal in the previous 2 years, e.g. a journal's JIF for the year 2015 :

$$\frac{\text{Year 2015 citations to 2014+2013 articles}}{\text{Total no. of articles* published in 2014+2013}} = \text{JIF}$$

* **research papers, research notes, reviews** (not included: editorials, letters, comments etc.)

JIF - SOME CRITICISMS (1)

- There are many journals ** not included in the *Thomson Reuters* citation indexes (no Impact Factor)
- Some subject areas accept and assimilate new research rapidly, e.g., biotechnology versus pure mathematics research (introduced 5-Year Impact Factor)
- Journal Impact factors cannot assess the quality of individual articles in a journal
- A small percentage of articles from a small subset of journals are highly cited. This small percentage accounts for a large proportion of the total citations

**The Thomson Reuters Journal Selection Process: http://wokinfo.com/essays/journal-selection-process/

JIF - SOME CRITICISMS (2)

- Non-English language journals are less accessible to researchers worldwide and therefore may be cited less

- Review articles and review journals may be cited more frequently than items which contain new concepts or research

- Editorials, letters, new items and meeting abstracts are usually not included in article counts

- Sudden changes in a journal's size can affect the impact factor

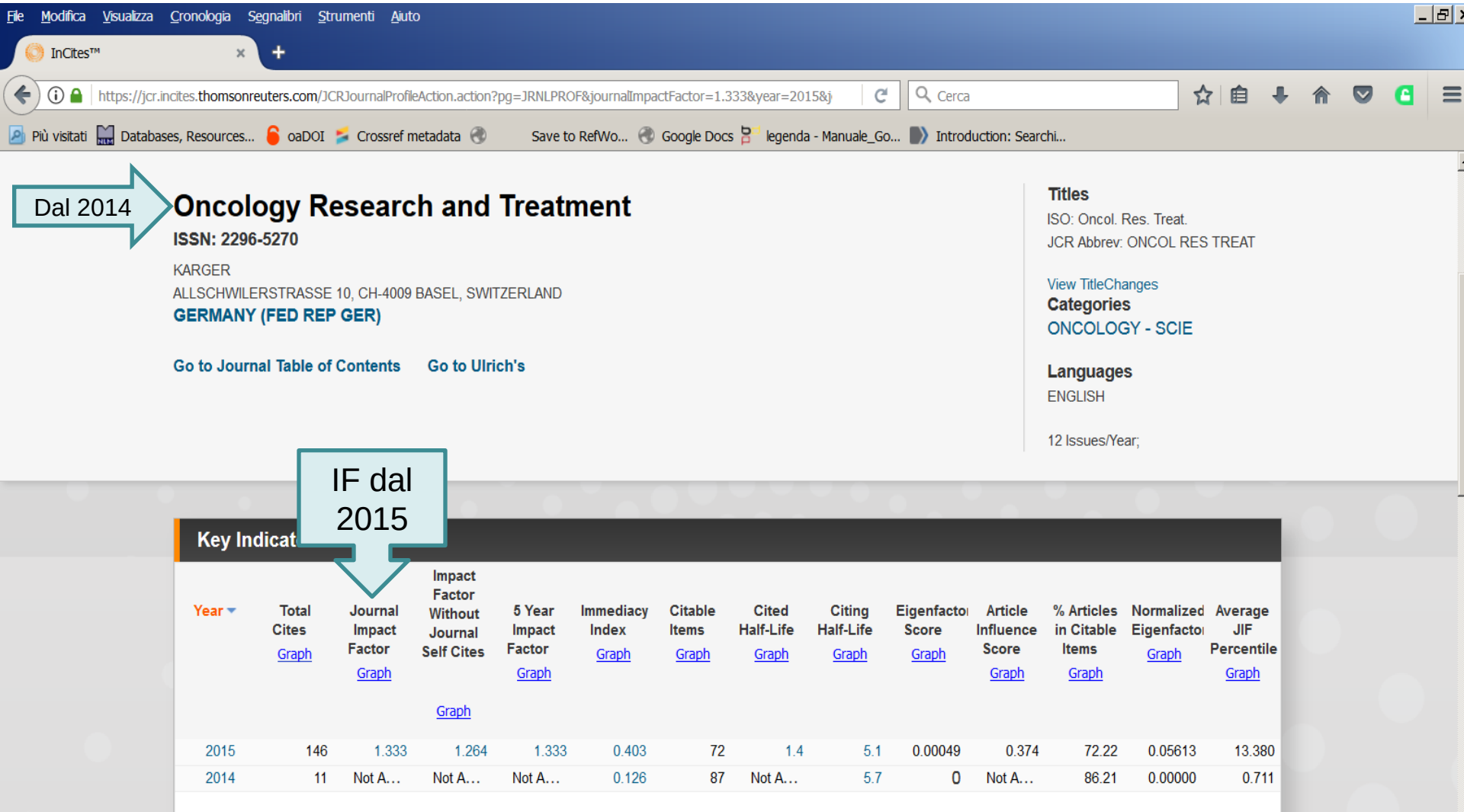
- Title changes effect the impact factor. JCR does not unify the old and new titles for minor title change and if the title position in alphabetic order does not change

JCR – Title change

Journal web site: http://www.karger.com?issn=2296-5262

ONKOLOGIE	changed to	ONCOL RES TREAT	2013
ONCOL RES TREAT	changed from	ONKOLOGIE	2014

JCR 2015 – New title "Oncology Research Treatment" (2014-)



In addition to the IF, the Journal Citation Reports provides other performance indicators: the 5-year journal IF, the Immediacy index, the Eigenfactor Score (EF) and the Author Influence Score

5-Year Journal Impact Factor

IF is calculated on a 5-year citation window. By using a larger citation window than the traditional IF, the 5-year journal IF is more appropriate to evaluate theoretical fields with a more “durable” literature

Immediacy index

This index is calculated by taking the number of times that articles published in a given journal are cited by others and then dividing this number by the number of articles published in that journal in that same year. It is a useful indicator to identify journals publishing in emerging areas of research.

Eigenfactor Score (EF) and Author Influence Score (AI)

The Eigenfactor.org came out of the Metrics Eigenfactor Project, a bibliometric research project conducted by Professor Carl Bergstrom* and his laboratory at University of Washington

- Eigenfactors and Article Influence scores are published in the Thomson Reuters *Journal Citation Report* (***from 2007***) each June and are posted freely on the *Eigenfactor* website (http://www.eigenfactor.org) after a six-month embargo
- *Eigenfactor ranking system* accounts for difference in prestige among citing journals, such that *citations from most prestigious journals are valued highly*
- Like the Impact Factor, the Eigenfactor Score and Article Influence Score are based on the citation network of journals indexed by Thomson Reuters
- Eigenfactor metrics take into account dissertation and newspaper citations too

*Bergstrom C. Eigenfactor measuring the value and prestige of scholarly journals *May 2007 College & Research Libraries News vol. 68 no. 5, 314-316 http://crln.acrl.org/content/68/5/314.full.pdf+html*

Eigenfactor Score (EF)

The **Eigenfactor Score (EF)** measures the number of times articles from the journal published in the past 5 years have been cited in the JCR year

- Counts citations to journals in both the sciences and social sciences
- Assigns a greater weight to those citations coming from influential journals
- Is a measure of the *prestige and impact of a scientific journal*
- *Eliminates self-citations*: every reference from one article in a journal to another article from the same journal is discounted

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

New 2015 - Thomson Reuters began publishing a *Normalized Eigenfactor*, which expresses the Eigenfactor as a *multiplicative* value rather than a percent.

Article Influence Score

The *Article Influence Score* determines the average influence of a journal's articles over the first 5 years after publication.

The Article Influence Score calculates/measures the relative importance of the journal on a per-article basis.

$$\text{Article Influence Score} = \frac{0.01 * \text{Eigenfactor score}}{X}$$

X= *5-year Journal Article Count divided by the 5-year Article Count from All Journals*

The mean Article Influence Score for each article is 1.00.

Article Influence Score=34.642 means that the average article in that journal has thirty-four times the influence of the mean journal in the JCR.

Other Journal Ranking Tools

SCOPUS SNIP (Scopus citations data)

http://www.scopus.com/

Free Scopus journal metrics: http://www.journalmetrics.com

Freely available Tools (for journal or citations impact)

SCImago SJR (free, Scopus citations data)
http://www.scimagojr.com/index.php

Google Scholar Metrics (Journals) (free, publications 2010-2014)
http://scholar.google.com/intl/en/scholar/metrics.html

Google Scholar + Harzing's Publish or Perish (PoP)
http://www.harzing.com/

Esempi di ricerca in JCR

Prospetto riviste più citate, analizzare in particolare:
CA – A cancer journal for clinicians
(Lancet)
Cerco la categoria: PHARMACOLOGY AND PHARMACY
E poi la rivista: DRUGS OF THE FUTURE
Qual'è il suo IF e come si posiziona rispetto a quelle della categoria (quartile?)
Cercare poi: Nature Drug Discovery

Esempio di Ricerca in WoS (linking a JCR e Google Scholar)
Artemisinin safety in children

Google Scholar Metrics
http://scholar.google.com/intl/en/scholar/metrics.html

Scholar Metrics currently cover articles *published between 2011 and 2015 (both inclusive)*

The metrics are based on citations from *all articles* that were *indexed in Google Scholar as June, 2016*

The h5-index for Google Scholar Top 100 publications was calculated for only those articles that were published in the last 5 complete calendar years
http://scholar.google.it/citations?view_op=top_venues&hl=en

Google Scholar Metrics – h5-index

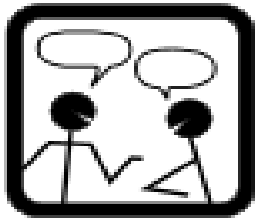
The **h-index** of a publication is the largest number h such that at least h articles in that publication were cited at least h times each.

For example, a publication with five articles cited by, respectively, 17, 9, 6, 3, and 2, has the h-index=3

Rank	Articles	Citations
1	Article 1	17
2	Article 2	9
3	Article 3	6
4	Article 4	3
5	Article 5	2

Every researcher is a communicator

Within academia



Within society

New perspectives of impact

Academic Impact

Traditional metrics

+

Social Impact

Alternative metrics «Altmetrics»

Altmetrics – what are?

- "alternative metrics"
- new way of measuring different, non-traditional forms of impact, potentially of non-traditional outputs
- "alternatives to only using citations", not "alternatives to citations"
- complementary to traditional citation-based analysis

Altmetrics: a manifesto http://altmetrics.org/manifesto/ (issued in 2010)

Altmetrics about: http://altmetrics.org/about

Euan Adie. Beyond traditional impact: what can altmetrics do for you?
http://lgdata.s3-website-us-east-1.amazonaws.com/docs/999/964800/Oxford_-_Altmetric_com.pdf

NISO Altmetrics Recommended Practice
http://www.niso.org/apps/group_public/download.php/17091/NISO%20RP-25-2016%20Outputs%20of%20the%20NISO%20Alternative%20Assessment%20Project.pdf (Sept 2016)

Altmetrics incorporate data from a wide range of sources: databases (Scopus and PubMed), social networks (Facebook, Twitter), social bookmarking tools (Delicious, CiteUlike), blogs, research data repositories (Dryad, Figshare, Slideshare), reference management systems (Mendeley, Zotero) etc.

Article-level metrics (ALMs)

Article-level metrics are applied to scientific papers:

- *count* the number of mentions, views, downloads, saved and discussed activities
- *record* the various *social media* sites and *web sources* where these activities come from*;*
- *track the geographical areas* where interest comes from, and the *category of readers* who tweet, discussed or save an article

Altmetrics tools - The most used are

Altmetric.com http://www.altmetric.com/

Altmetric.com is used by Scopus and PLOS, on social media sites like Twitter and Facebook, science blogs, news sites and reference managers like Mendeley. Big publishers joined Altmetric.com: Springer, Nature Publishing Group, Wiley, BiomedCentral, Highwire etc.

ImpactStory https://impactstory.org/

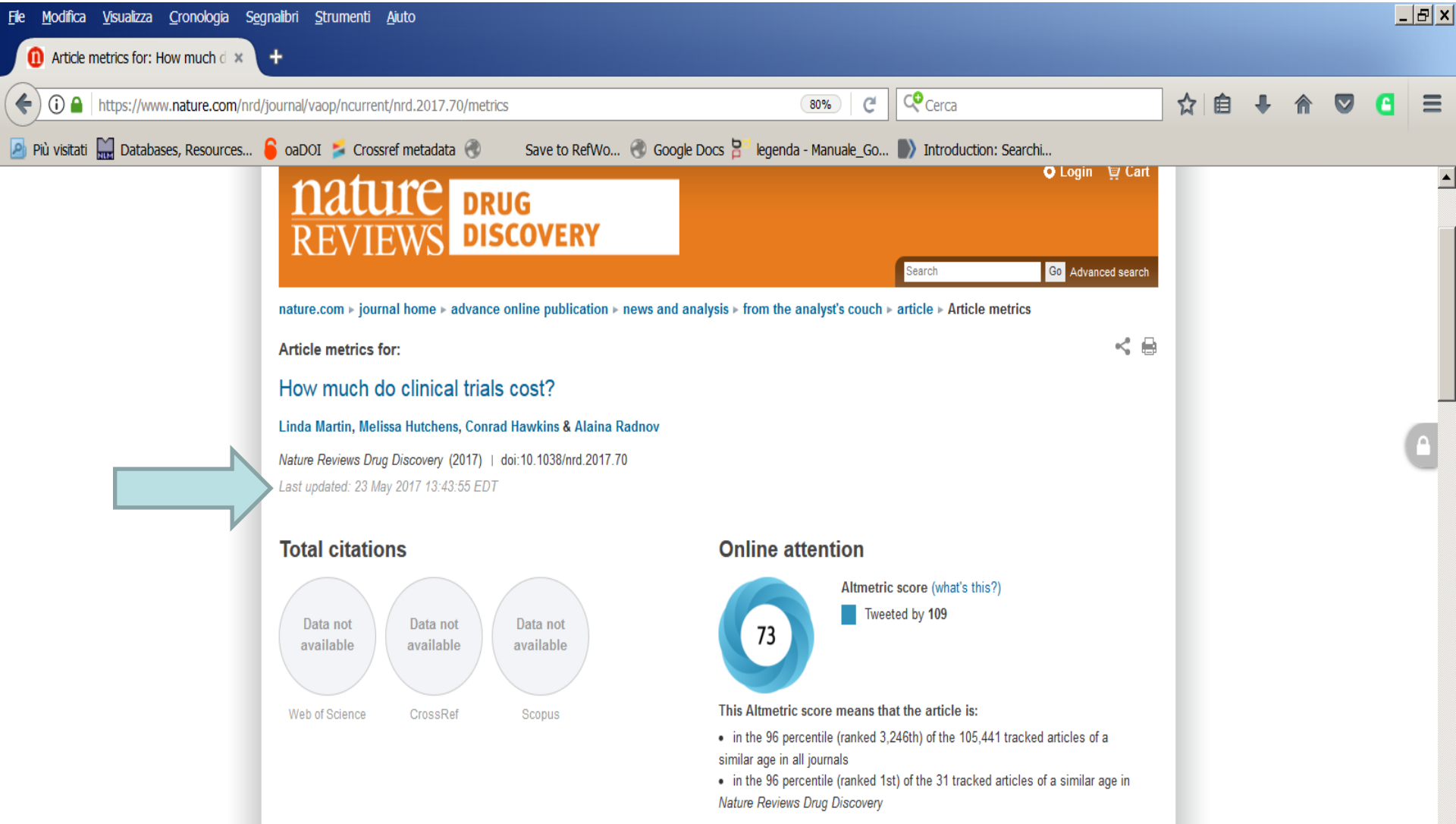
Free, open source web application collecting data from a variety of sources related to a broad set of resources including preprint, datasets, presentation slides etc. It allows users to create a personal profile and track the web impact of their work (academic and/or public)

PlumX https://plu.mx

Compares impact not only of individual reseachers but of research centers, departments and institutions too

http://altmetrics.org/tools/
Special issue on alternative metrics. Research Trends Issue 37 June 2014
http://www.researchtrends.com/issue-37-june-2014/a-brief-history-of-altmetrics/

https://www.nature.com/nrd/journal/vaop/ncurrent/nrd.2017.70/metrics



Altmetrics metrics

PROS

- Immediacy
- Coverage of different types of research output
- Impact on the general public (not only scholarly community)
- Harvesting of more reliable data

CONS

- Immediacy and quality of research evaluation
- Social media and usage statistics vulnerability to manipulation
- Lack of standardization across different metrics
- Obsolescence of data

Barbaro A., D. Gentili, C. Rebuffi. Altmetrics as new indicators of scientific impact. Journal of EAHIL 2014, vo. 10(1), 3-6.
NISO Alternatives Assessment Metrics (Altmetrics) Initiative
http://www.niso.org/topics/tl/altmetrics_initiative
NISO Altmetrics Standards Project White Paper
http://www.niso.org/apps/group_public/download.php/13295/niso_altmetrics_white_paper_draft_v4.pdf

Bibliografia

Bibliometria ed indicatori bibliometrici

De_Bellis, Nicola 1969- Introduzione alla bibliometria dalla teoria alla pratica Nicola De Bellis Roma : Associazione italiana biblioteche, 2014

Hicks, D., Wouters, P., Waltman, L., de Rijcke, S., and Rafols, I. (2015) 'Bibliometrics: The Leiden Manifesto for research metrics.' *Nature.* 520, 429-431.
www.nature.com/news/bibliometrics-the-leiden-manifesto-for-research-metrics-1.17351

Wilsdon, J., et al. (2015). *The Metric Tide: Report of the Independent Review of the Role of Metrics in Research Assessment and Management.*
DOI: 10.13140/RG.2.1.4929.1363

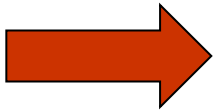
Wouters, P. et al. (2015). *The Metric Tide: Literature Review (Supplementary Report I to the Independent Review of the Role of Metrics in Research Assessment and Management)*. HEFCE. DOI: 10.13140/RG.2.1.5066.3520

Responsible Metrics https://responsiblemetrics.org/ (Accessed July 2015)

Editoria scientifica

Larivière V, Haustein S, Mongeon P (2015) The Oligopoly of Academic Publishers in the Digital Era. PLoS ONE 10(6): e0127502. doi:10.1371/journal.pone.0127502
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0127502

Blobaum, Paul M., "Blobaum's Checklist for Review of Journal Quality for Submission of Scholarly Manuscripts" (2013). *Faculty Research and Creative Activity.* Paper 27.
http://opus.govst.edu/faculty/27



For more information:

SBA – Indicatori bibliometrici

http://bibliotecadigitale.cab.unipd.it/collezioni_navigazione/cartella-servizi/per-chi-pubblica-1/indicatori-bibliometrici