Measuring the Quality of Science

A look at citation analysis tools to evaluate research impact
Citation Analysis

- Counting the number of times a paper, researcher, journal is cited by others.
- **Assumes that influential authors and important works are cited more often than others.**
## Sources of Citation Data

<table>
<thead>
<tr>
<th>Source</th>
<th>Strengths</th>
<th>Weaknesses</th>
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</table>
| **Web of Science**  
(part of the Web of Knowledge, WoK, suite of resources) | - Advanced citation searching and analysis features  
- Citation data available from 1900 to date  
- Broad coverage of high impact journals  
- Additional citation data is available in WoK by searching All Databases | - Conference papers, books, book chapters, dissertations excluded*  
- Limited coverage of non-English language titles  

*conference proceedings are available but may not currently be part of your library’s subscription |
| **Scopus**        | - Advanced citation searching and analysis features  
- Better coverage of Social Science titles  
- Includes conference proceedings | - Books, book chapters, dissertations excluded  
- Citation data for papers published from 1996 onwards only |
| **Google Scholar** | - Free  
- Covers non-English language titles  
- Covers all types of publications including books and conference papers | - No quality control, lots of errors in data  
- Does not cover all journals  
- Covers non-scholarly content  
- Coverage un-even across disciplines  
- Difficult to deal with name variants |

Source: [http://www.ndlr.ie/myri/](http://www.ndlr.ie/myri/)
Scopus & Web of Science coverage comparison

- Scopus: from 1996 only i.e. width rather than depth
- Coverage of Google Scholar ???

Source: JISC [http://adat.crl.edu](http://adat.crl.edu)
Journal Impact: Journal Impact Factors (JIF)

- Created by Eugene Garfield and Irving H. Sher in the early 1960s to help select journals for the Science Citation Index (association-of-ideas index)
- The Journal Impact Factor is the average number of times articles from the journal published in the past two years have been cited
- Allows comparison of journals independent of journal size
- Updated every year and published in the Journal Citation Reports (Thomson Reuters)
  [http://isiknowledge.com/jcr](http://isiknowledge.com/jcr)
- Use it to find influential journals for reading or potential publication

"Eugene Garfield" by the Chemical Heritage Foundation used under CC-BY
Calculation of Journal Impact Factors

Where can I find Journal Impact Factors?

WEB OF SCIENCE™

Search Web of Science™ Core Collection
Exercise

What is the 2014 journal impact factor for the journal Ambio?

Which journal has the highest JIF in the category Toxicology in 2014?
Don’t compare JIFs across disciplines

Mean journal impact factor (2012)

Source: Thomson Reuters Journal Citation Reports
Don’t compare JIFs across disciplines

Source: http://www.slideshare.net/gradschoolmediazoo/bytes3-impact-factors
Don’t judge an article by its cover

- Skewed distribution of citations
- the most cited 15% of the articles account for 50% of the citations

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2126010/
Don’t judge an article by its cover

Acta Crystallographica Section A
Journal impact factor
Metrics for Researchers: *h*-index

- Proposed by Jorge E. Hirsch in 2005:
- An author’s number of articles (h) that have received at least h citations
- A researcher with an h-index of 10 has published 10 articles that have each been cited at least 10 times

- It combines a measure of productivity (# publications) and impact (# citations) into a single number.

How do I find my $h$-index?

- **Calculate it manually:**
  1. Create a list of all your publications and the number of times each publication has been cited.
  2. Sort your papers in descending order by number citations.
  3. Look down through the list to find all papers where the number of citations is $\geq$ the rank for a given paper.
     -> # paper = $h$-index

- **Automatically calculated in Citation Indices:**
  - Web of Science
  - Scopus
  - Google Scholar

<table>
<thead>
<tr>
<th>Rank</th>
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<td>Paper A</td>
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<tr>
<td>2</td>
<td>Paper B</td>
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<td>3</td>
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<td>8</td>
<td>Paper H</td>
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Scientist A: $h$-index = 5

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<tr>
<td>5</td>
<td>Paper E</td>
<td>1</td>
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</table>

Scientist B: $h$-index = 3
**h-index in Web of Science**

1. Go to Web of Science (via Quicklinks on [www.lib4ri.ch](http://isiknowledge.com/wos))
2. Select Web of Science Core Collection
3. Enter the name of the author and select Author from the drop-down menu
4. Click on Search
5. Click on Create Citation Report on the right hand corner of the results page, the h-index is on the right of the screen
h-index in Web of Science
$h$-index in Web of Science
**h-index in Scopus**

1. Go to **Scopus** (via Quicklinks on [www.lib4ri.ch](http://www.scopus.com/))
2. Click on the **Author search** tab
3. Enter the name of the author in the search box & click **Search**
4. On author search results page, **click the name of the author** whose publishing output you want to evaluate.
5. On the author’s profile page, you will find the h-index listed
$h$-index in **Scopus**

To determine which author names should be grouped together under a single identifier number, the Scopus Author Identifier uses an algorithm that matches author names based on their affiliation, address, subject area, source title, dates of publication, citations, and co-authors. Documents with insufficient data may not be matched, this can lead to more than one entry in the results list for the same author. By default, only details pages matched to more than one document in Scopus are shown in search results. About Scopus Author Identifier
$h$-index in **Scopus**

**Scopus**

Uehlinger, Urs R S  
Eidgenössische Technische Hochschule Zurich, Institute of Integrative Biology, Zurich, Switzerland  
Author ID: 7003743290

Documents: 72  
Citations: 2228 total citations by 1551 documents  
$h$-Index: 30

Co-authors: 116  
Subject area: Agricultural and Biological Sciences, Environmental Science  
View More

72 Documents  
Cited by 1551 documents since 1996  
116 co-authors

72 documents  View in search results format

Export all  Add all to my list  Set document alert  Set document feed
$h$-index in Google Scholar

Quick & Easy if author has created a user profile on Google Scholar:

1. Search for author name
2. Click on user profile (if available)
$h$-index in Google Scholar

User profiles for "U Uehlinger"

- Urs Uehlinger
  - Senior scientist (retired since 2007), Dept. Aquatic Ecology, Eawag, Duebendorf, ...
  - Verified email at eawag.ch
  - Cited by 3536

Understanding natural patterns and processes in river corridors as the basis for effective river restoration
- Jy Ward, K. Tocher, U. Uehlinger, ... - Rivers: Research &... 2001 - Wiley Online Library
  - Abstract: Running water ecology is a young science, the conceptual foundations of which were derived largely from research conducted in Europe and North America. However, virtually all European river corridors were substantially regulated well before the science ...
  - Cited by 240 Related articles All 4 versions Cite Save

Morbidity of sentinel lymph node biopsy (SLN) alone versus SLN and completion axillary lymph node dissection after breast cancer surgery: a prospective study
  - From the Department of Surgery, University Hospital Basel, Basel; Division of Gynecology, University Hospital Bern, Bern; Bethanien Clinic, Zürich; Department of Obstetrics and Gynecology, Kantonsspital Aarau, Aarau; Division of Gynecology, University Hospital ...
  - Cited by 211 Related articles All 9 versions Cite Save More

Flow extremes and benthic organic matter shape the metabolism of a headwater Mediterranean stream
- V. Acosta, A. Gorgi, I. Mufioz, URS. Uehlinger, ... - Freshwater... 2004 - Wiley Online Library
  - Flow may have a strong impact on the metabolism of medium sized rivers (Young & Huryn, 1996; Uehlinger, 2000), while in low order streams the relevance of flow for the dynamics of benthic organic matter (BOM) accumulation may be affected by local climate, topography and ...
  - Cited by 99 Related articles All 5 versions Cite Save

Contribution of the hyporheic zone to ecosystem metabolism in a prealpine gravel-bed river
  - Cited by 104 Related articles Cite Save

Response of benthic invertebrates to natural versus experimental disturbance in a Swiss prealpine river
- C. Matthaes, URS. Uehlinger, A. Frutiger - Freshwater Biology, 1997 - Wiley Online Library
  - Pala 1. fbl. 1997 No. 2, 61–77 Response of benthic
$h$-index in Google Scholar

Urs Uehlinger
Senior scientist (retired since 2007), Dept. Aquatic Ecology, Eawag, Dübendorf, Switzerland
Stream ecology (ecosystem metabolism)
Verified email at eawag.ch - Homepage

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<tr>
<td>Understanding natural patterns and processes in river corridors as the basis for effective river restoration</td>
<td>250</td>
<td>2001</td>
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<tr>
<td>JV Ward, K Tochmor, U Uehlinger, F Malard</td>
<td></td>
<td></td>
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<tr>
<td>Regulated Rivers. Research &amp; Management 17 (4-5), 311-323</td>
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<td>Physico-chemical characterization of channel types in a glacial floodplain ecosystem (Val Roseg, Switzerland)</td>
<td>119</td>
<td>1997</td>
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<td>K Tochmor, F Malard, P Burgherr, CT Robinson, U Uehlinger, R Zahn, ...</td>
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<td>Archiv für Hydrobiologie 140 (4), 433-463</td>
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<td>Spatial and temporal variability of the periphyton biomass in a prealpine river (Necker, Switzerland)</td>
<td>119</td>
<td>1991</td>
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<td>U Uehlinger</td>
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<td>Arch. Hydrobiol. 123 (2), 219-237</td>
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<td>MW Naegeli, U Uehlinger</td>
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<td>Journal of the North American Benthological Society, 794-804</td>
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<td>Flow extremes and benthic organic matter shape the metabolism of a headwater Mediterranean stream</td>
<td>106</td>
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<td>V Aruna, A Giorgi, I Muñoz, URS Uehlinger, S Sabater</td>
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<td>Freshwater Biology 49 (7), 960-971</td>
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<td>Response of benthic invertebrates to natural versus experimental disturbance in a Swiss prealpine river</td>
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<td>K Tochmor, U Uehlinger, CT Robinson</td>
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<td>Academic Press</td>
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h-index in Google Scholar

Author has no user profile on Google Scholar?

- Use Publish or Perish (POP) program: http://www.harzing.com/pop.htm
- A free software program that retrieves and analyzes academic citations. It uses Google Scholar to obtain the raw citations, then analyzes these and presents many metrics including the h-index
Exercise

- Find the h-index for Christa P. H. Mulder (currently at University of Alaska Fairbanks) in Web of Science, Scopus & Google Scholar!
Some Limitations & Caveats

- Academic disciplines differ in the average number of references per paper and the average number of papers published by each author. *Don’t compare your h-index with someone working in a different field!*

- The length of the academic career will impact the number of papers published and the amount of time papers have had to be cited. *Don’t compare your h-index with that of an older or younger colleague!*

‘Obviously a single number can never give more than a rough approximation to an individual’s multifaceted profile, and many other factors should be considered in combination in evaluating an individual.’

[Jorge E. Hirsch]
Thank you for your attention!

Questions?

Jochen Bihn
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