Scholarly Metrics

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Learning Objectives

Be able to interpret some standard citation metrics with caution and know where to find them

Explore three major sources of citation data including Web of Science (JCR), Scopus and Google Scholar

Identify best practices on broadening your scholarly impact

h-index

- J. E. Hirsch, 2005
- # of papers (*h*) published that have each been cited at least *h* times.
- Can be applied to any level of aggregation such as author, institution and journal, etc.

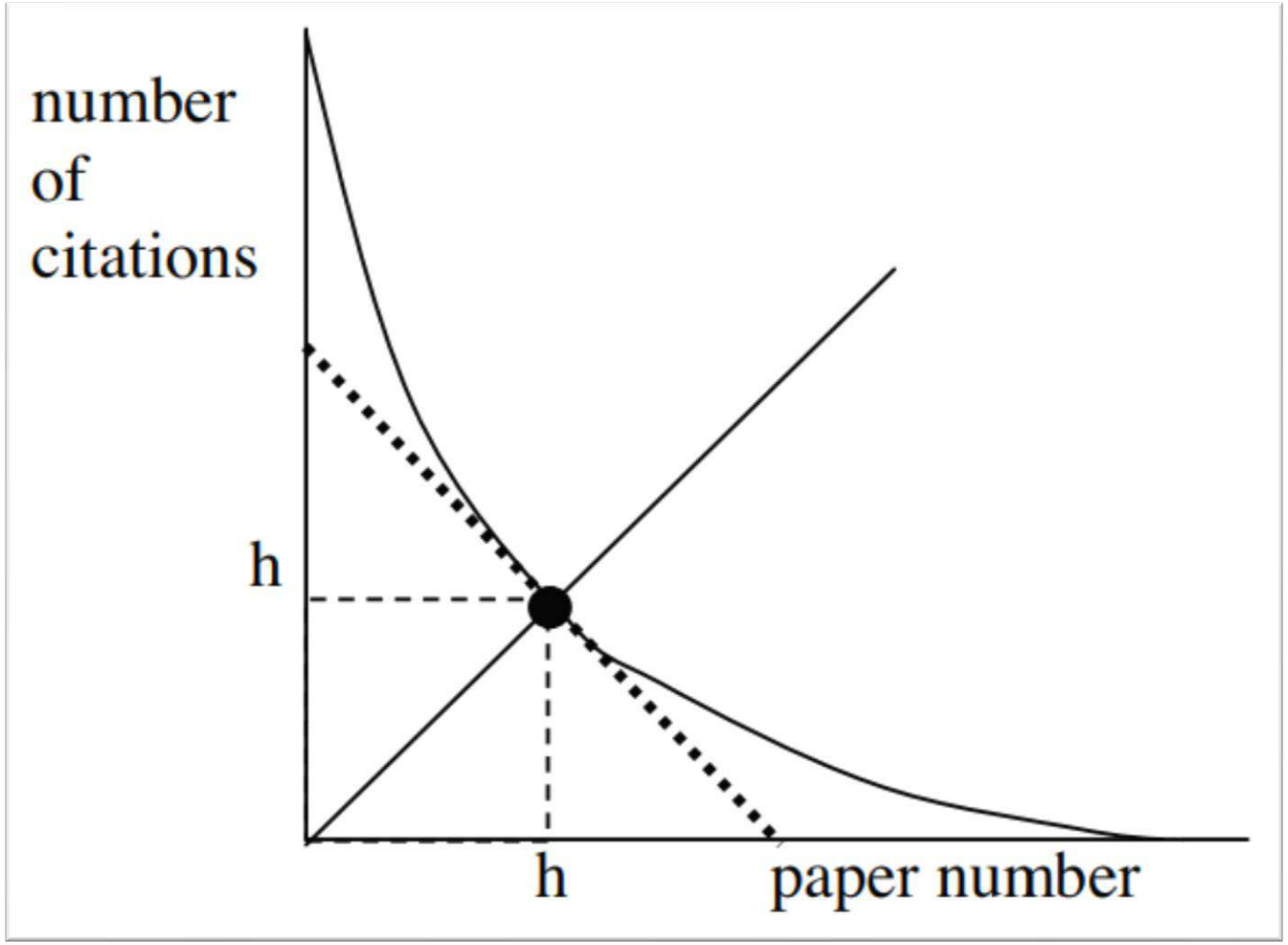


Image from Hirsch, J. E. “An Index to Quantify an Individual’s Scientific Research Output.” Proceedings of the National Academy of Sciences 102.46 (2005): 16569–16572. http://web.cs.ucla.edu/~palsberg/hirsch05.pdf

h-index (Cont'd)

An author has 8 papers that have been cited 34, 29, 20, 15, 7, 6, 5 and 4 times. What is the author's h-index?

Paper #	# of Citations	
1	34	
2	29	
3	20	
4	15	
5	7	
6	6	**= h-index**
7	5	
8	4	

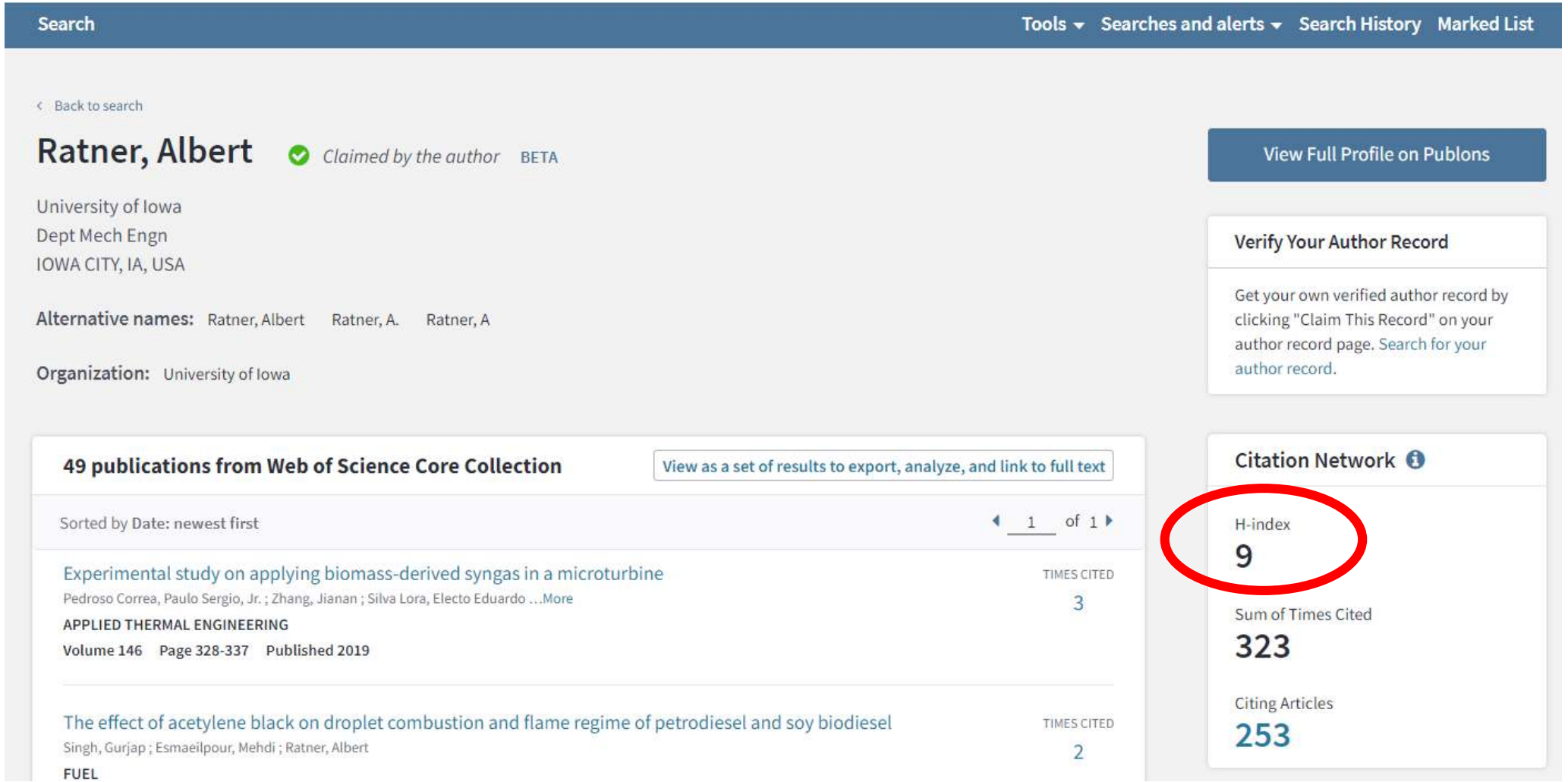
Example from https://subjectguides.uwaterloo.ca/calculate-academic-footprint/YourHIndex

h-index Issues

- Is not influenced by citation counts of papers that have been cited at least *h* times
- Distinctive. Its value can only increase, never decrease, over time.
- Advantage senior researchers but disadvantage early-career researchers

	John's h-index = 10	Sara's h-index = 5
Paper #	# of Citations	# of Citations
1	34	62
2	28	50
3	25	40
4	23	32
5	20	5
6	17	4
7	16	3
8	14	2
9	13	1
10	10	1

Finding Your h-index in Web of Science



Finding Your h-index in Scopus

Author details

Print Email

Ratner, Albert

View potential author matches

Author ID: 35579345900

http://orcid.org/0000-0002-9281-3185

Affiliation(s):

University of Iowa, Iowa City, United States View more

Other name formats: Ratner, A.

Subject area: Engineering, Energy, Chemical Engineering, Chemistry, Environmental Science, Agricultural and Biological Sciences, Physics and Astronomy, Earth and Planetary Sciences, Medicine, Materials Science, Mathematics, Computer Science

Profile actions

Edit author profile

Connect to ORCID

Alerts

Set citation alert

Set document alert

AR Albert Ratner

69 Documents

View Mendeley profile

Documents by author

69

Analyze author output

Total citations

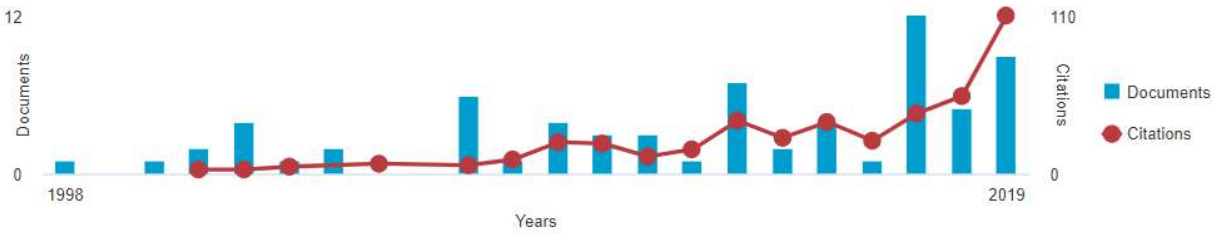
439 by 354 documents

View citation overview

h-index: 11

View *h*-graph

Document and citation trends:



Google Scholar

Albert Ratner

FOLLOW

Associate Professor, University of Iowa
Verified email at uiowa.edu - Homepage

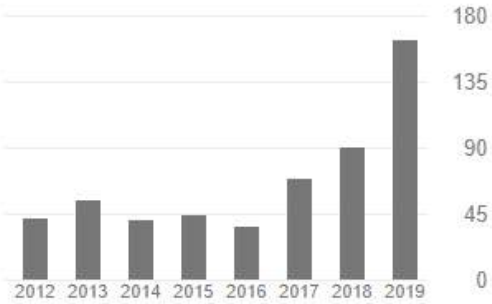
Combustion Instability Biomass Gasification and C... Droplet Behavior in Alternat... and High Speed and La

GET MY OWN PROFILE

TITLE	CITED BY	YEAR
Experimental investigation of water emulsion fuel stability G Singh, E Lopes, N Hentges, A Ratner arXiv preprint arXiv:1911.05106		2019
Effect of polymeric additives on ignition, combustion and flame characteristics and soot deposits of crude oil droplets G Singh, M Esmaeilpour, A Ratner arXiv preprint arXiv:1911.00392		2019
Rotary valve G Singh, A Ratner US Patent App. 16/312,689		2019

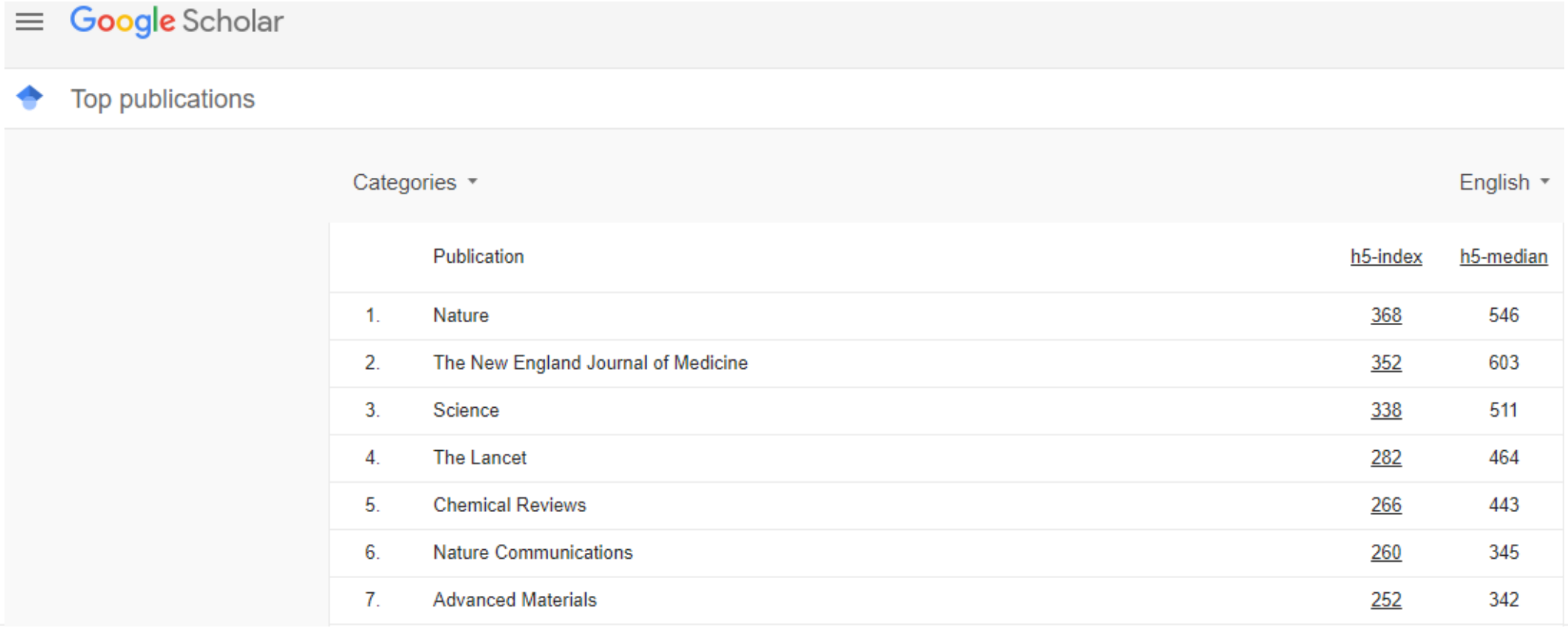
Cited by VIEW ALL

	All	Since 2014
Citations	676	449
h-index	13	12
i10-index	17	14



Finding h-index in Google Scholar

- i10-index: # of papers with at least 10 citations. Simple and straightforward to calculate. Only used in Google Scholar
- Why an individual's h-index is different in Web of Science (9), Scopus (11) and Google Scholar (13)?



	Publication	h5-index	h5-median
1.	Nature	368	546
2.	The New England Journal of Medicine	352	603
3.	Science	338	511
4.	The Lancet	282	464
5.	Chemical Reviews	266	443
6.	Nature Communications	260	345
7.	Advanced Materials	252	342

h5-index
h5-median

- h5-index: # of papers (*h*) published in the report year and the preceding four years that have been cited at least *h* times.
- h5-median: median # of citations in the report year and the proceeding four years to those papers that have each been cited at least *h* time.

Definitions from https://scholar.google.com/intl/en/scholar/metrics.html#metrics

Journal Impact Factor

- Average # of times the papers published in a journal over a two-year period (the two years prior to the report year) were cited during the report year.
- e.g., IEEE Access

Journal Impact Factor Calculation

$$\text{2018 Journal Impact Factor} = \frac{12{,}838}{3{,}133} = 4.098$$

How is Journal Impact Factor Calculated?

$$\text{JIF} = \frac{\text{Citations in 2018 to items published in } \mathbf{2016\ (4{,}529) + 2017\ (8{,}309)}}{\text{Number of citable items in } \mathbf{2016\ (808) + 2017\ (2{,}325)}} = \frac{12{,}838}{3{,}133}$$

Finding Journal Impact Factor in Web of Science

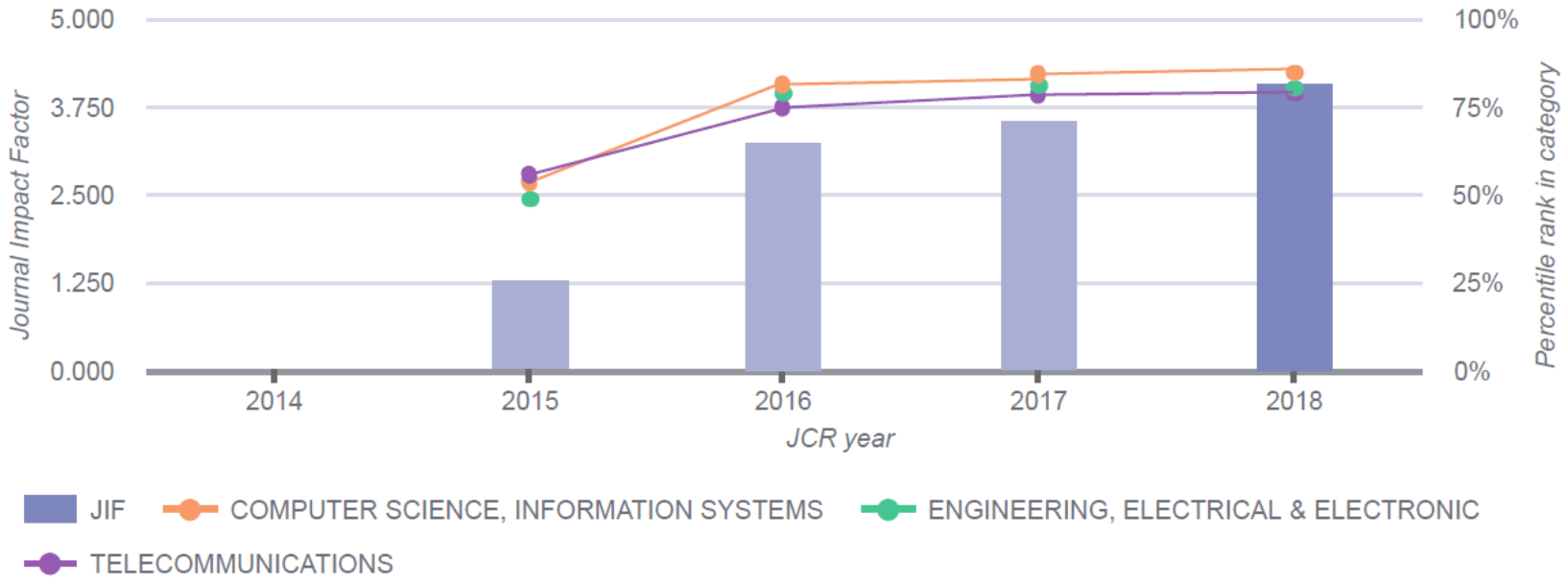
InCites Journal Citation Reports

Clarivate Analytics

2018 Journal Impact Factor & percentile rank in category for: IEEE Access

4.098

2018 Journal Impact Factor



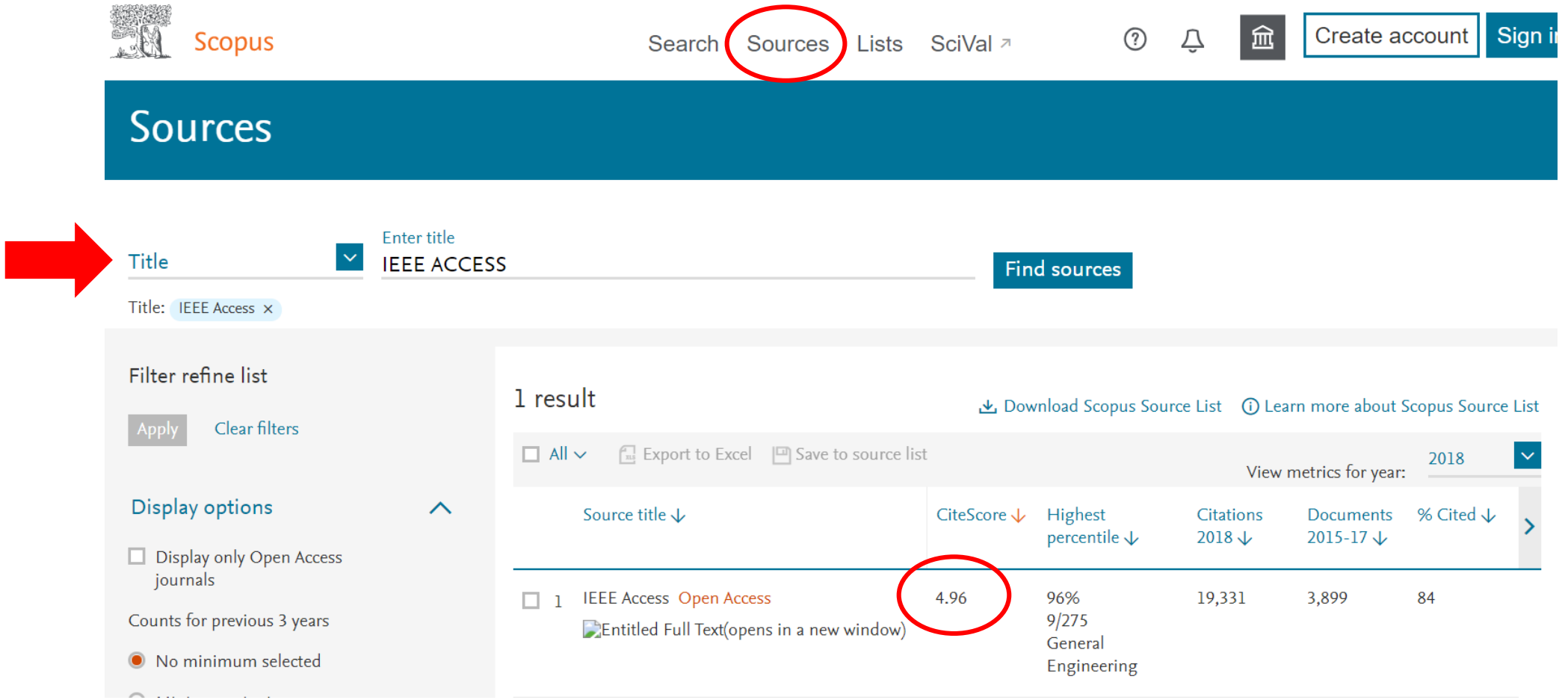
CiteScore

- Like *Impact Factor*, but based on three years' data
- Average # of times the papers published in a journal over a three-year period (the three years prior to the report year) were cited during the report year.
- e.g., IEEE Access

$$4.96 = \frac{\text{Citation Count 2018}}{\text{Documents 2015 - 2017}} = \frac{19{,}331 \text{ Citations}}{3{,}899 \text{ Documents}}$$

Image from https://journalmetrics.scopus.com/index.php/Faqs

Finding CiteScore in Scopus



Putting Citations in Context

Fields/Disciplines: Citation rates vary by discipline.

Time: Citations grow over time at different rates

Document Types: Articles, Reviews, Conference Papers etc.

Source Normalized Impact Per Paper (SNIP)

- Developed by Henk Moed in 2009 and revised in 2012
- Impact Per Paper (IPP): calculated as the # of citations given in the present year to publications in the past three years divided by the total # of publications in the past three years. (Similar to *CiteScore*)
- Normalized in order to correct for differences in citation practices between subject fields

$$\boldsymbol{SNIP} = \frac{\textit{Impact Per Paper (IPP)}}{\textit{Relative Database Citation Potential (RDCP)}}$$

Definition from https://www.journalindicators.com/methodology

SNIP (Cont'd)

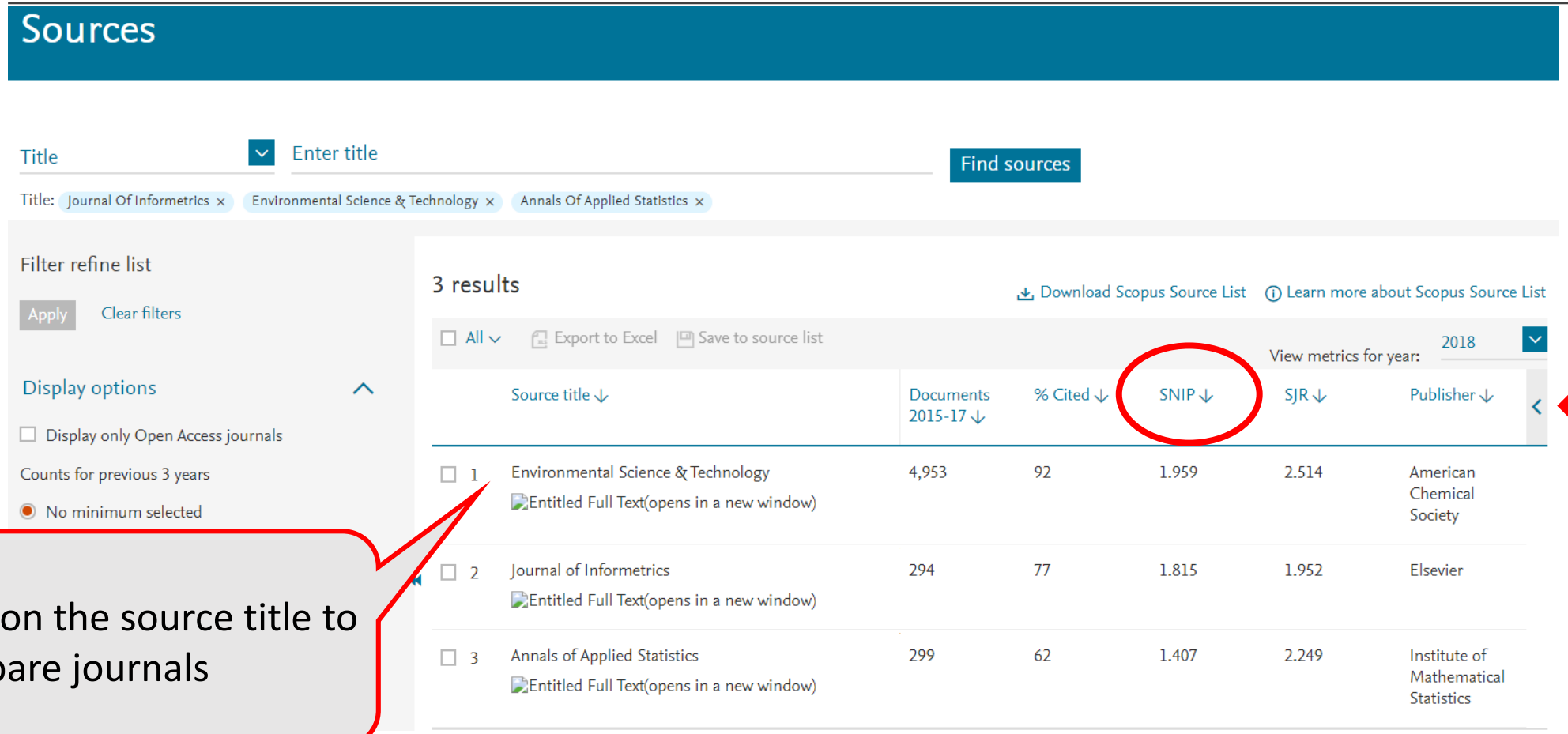
$$\boldsymbol{RDCP(Relative\ Database\ Citation\ Potential)} = \frac{Database\ Citation\ Potential\ (DCP)}{Median\ DCP}$$

- Database Citation Potential (DCP): average # of citations to the publications in the subject field of the journal, counting three proceeding years.
- Example: If a journal published 10 papers in 2008-2010 and these papers were cited 120 times in 2011, DCP is 6 and median DCP is 3, what is the journal's SNIP?

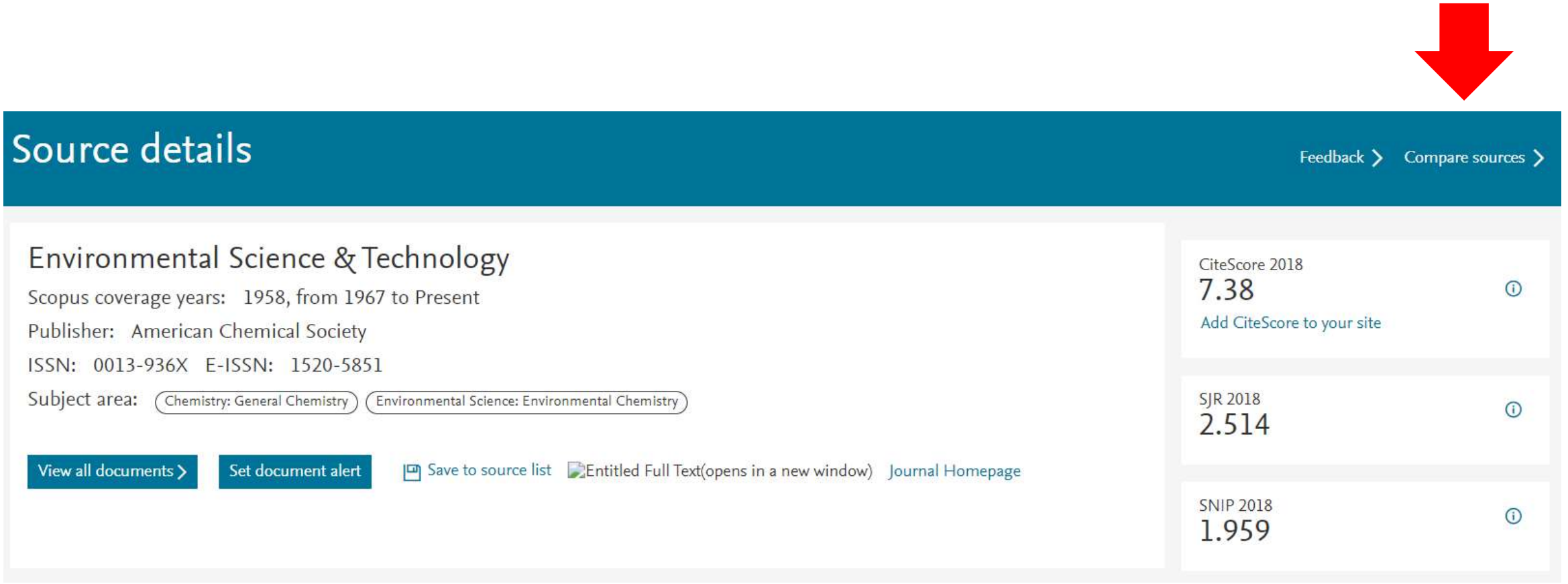
$$RDCP = \frac{DCP}{Median\ DCP} = \frac{6}{3} = 2$$

$$SNIP = \frac{Impact\ Per\ Paper\ (IPP)}{Relative\ Database\ Citation\ Potential\ (RDCP)} = \frac{120/10}{2} = 6$$

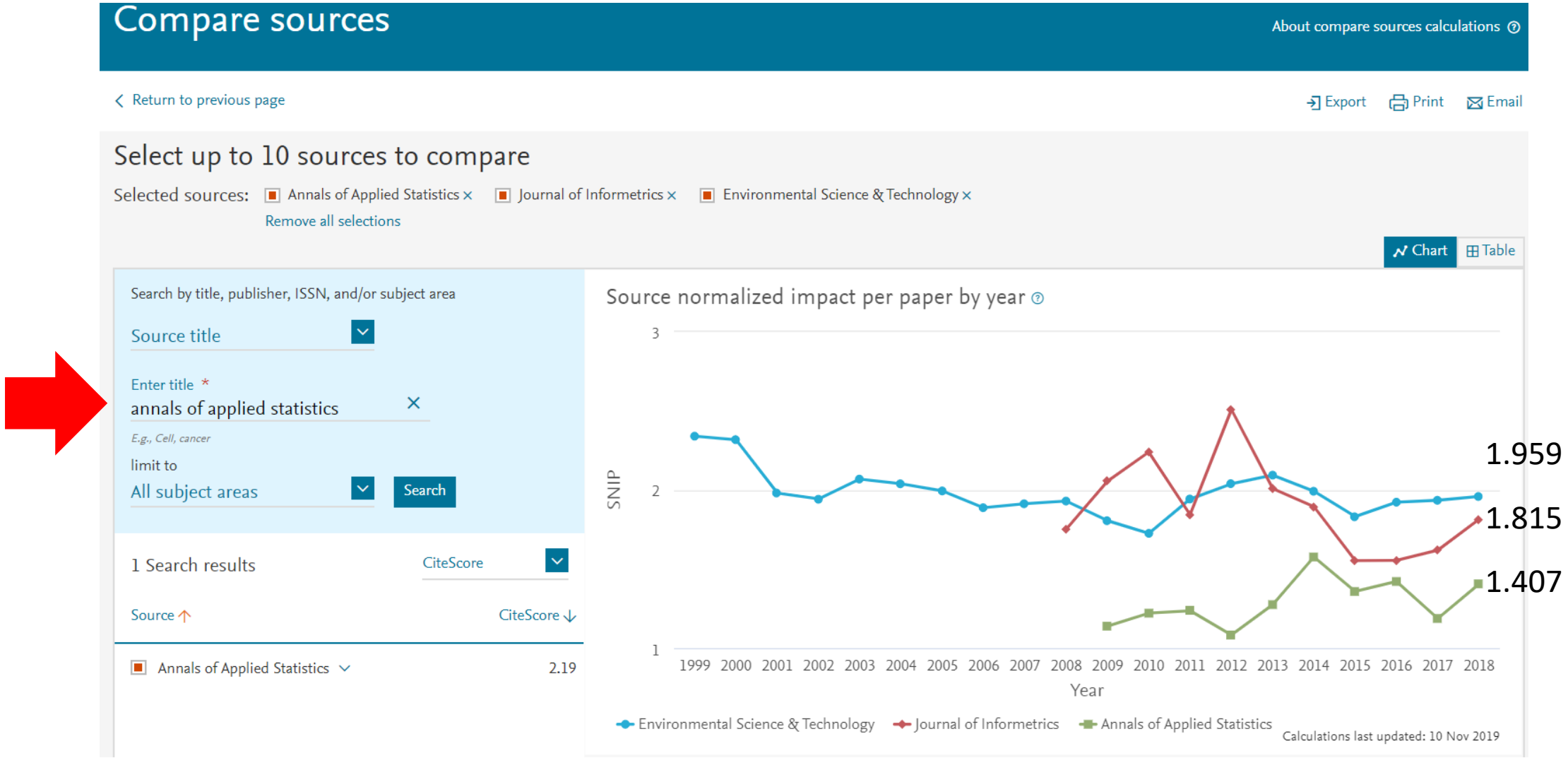
Finding SNIP in Scopus



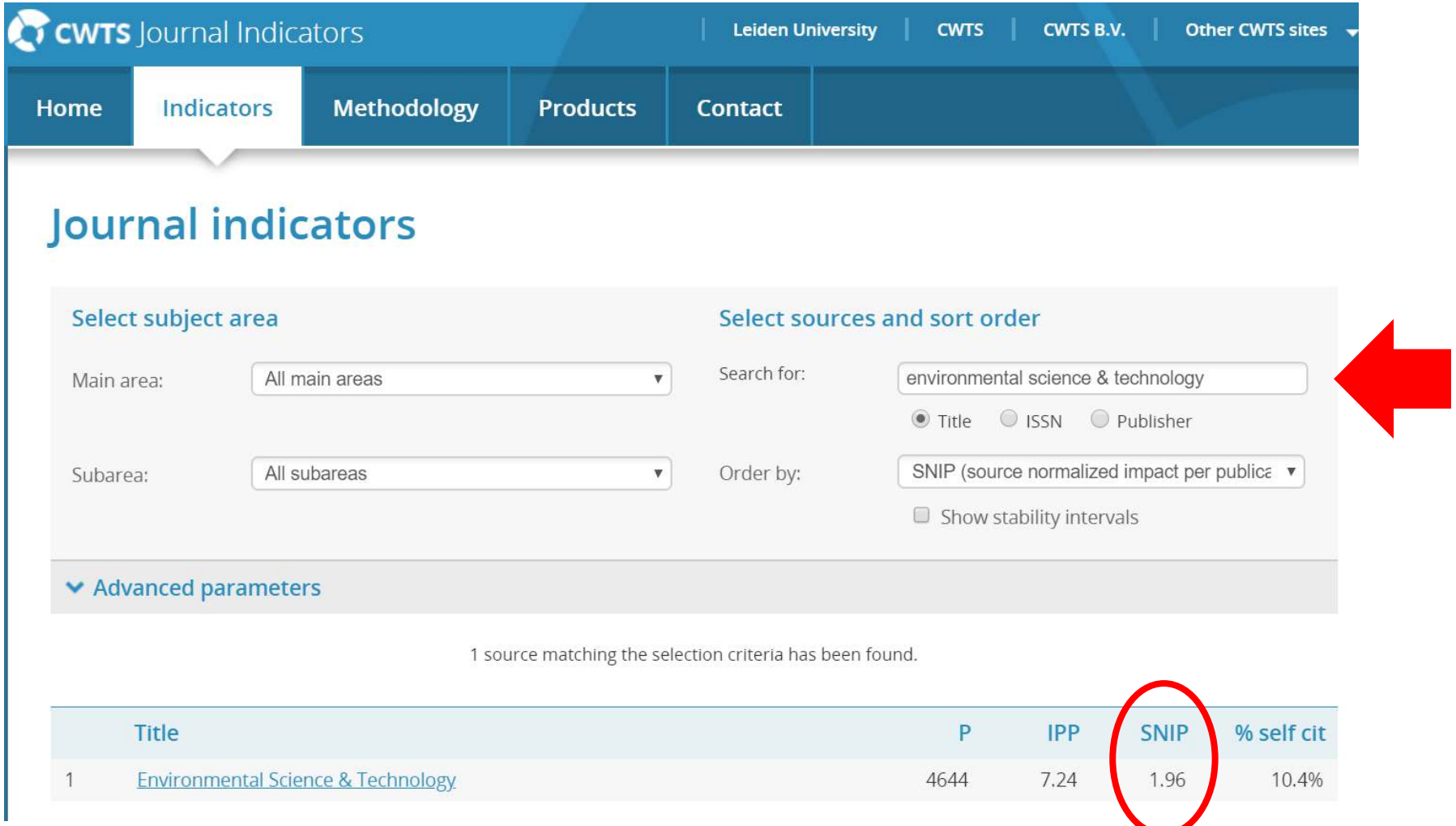
Comparing Journals in Scopus



Comparing Journals in Scopus (Cont'd)



Finding SNIP in CWTS Journal Indicators



https://www.journalindicators.com/indicators

Category Normalized Citation Impact (CNCI)

- *CNCI* is the citation impact (citations per paper) normalized for subject area, year of publication and document type.

$$\boldsymbol{CNCI} = \frac{\textit{Actual Citations}}{\textit{Category Expected Citations}}$$

- Example: A Plant Sciences paper published in 2014 has been cited 46 times.
  Is that good, bad or average performance? (hint: an expected citation rate for the paper is 2.32)

$$\boldsymbol{CNCI} = \frac{46}{2.32} = 19.82$$

Definition from http://clarivate.libguides.com/incites_ba/understanding-indicators

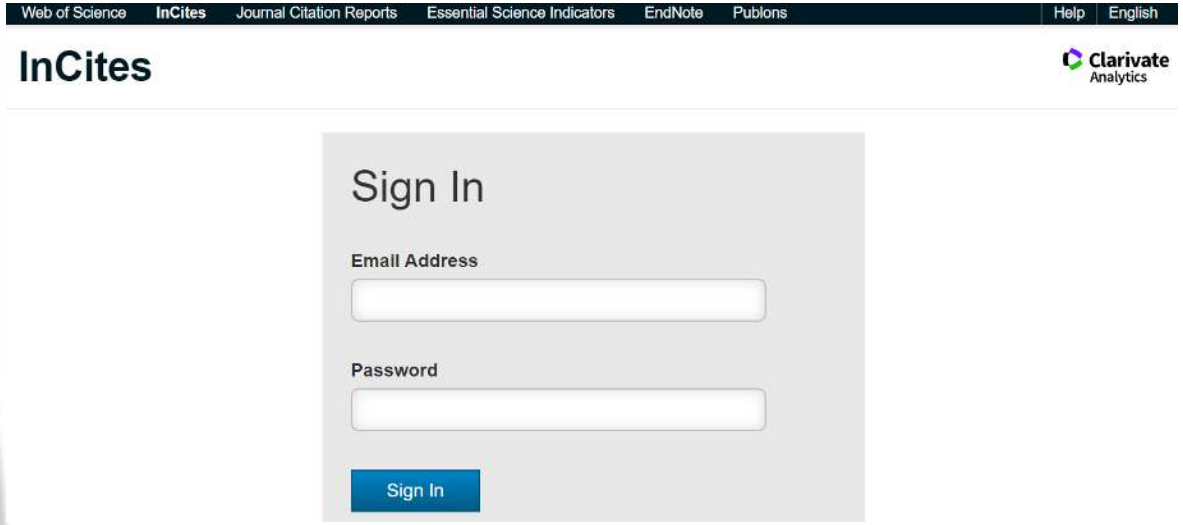
Category Normalized Citation Impact (CNCI)

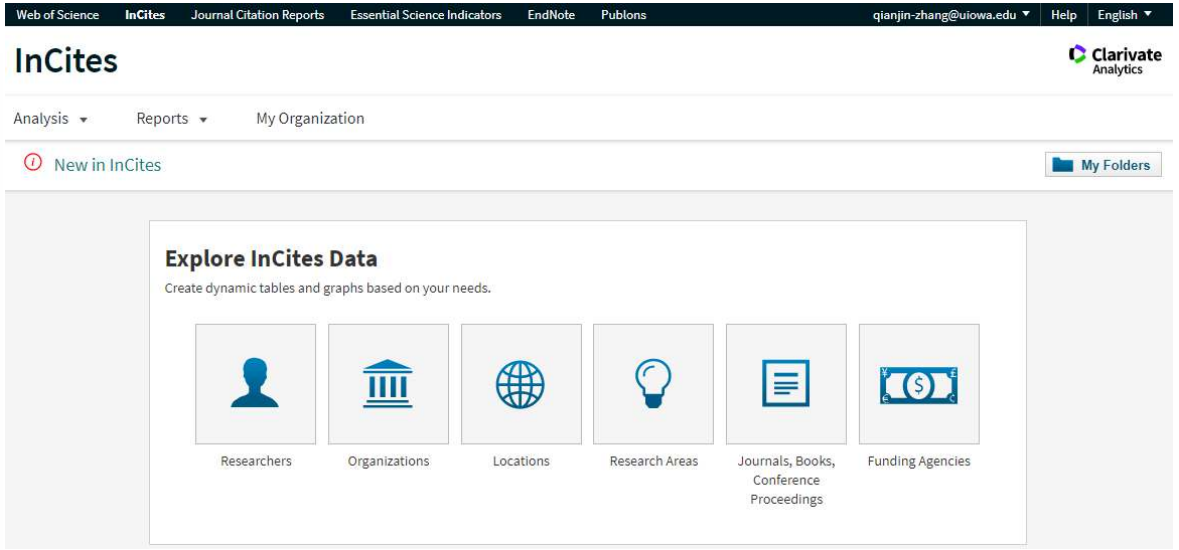
- When a paper belongs to multiple subject categories, the *CNCI* value is calculated with harmonic mean of all **Category Expected Citations** this paper belongs to.
- When calculating a set of papers (the collected works of an individual, institution or country/region), the *CNCI* value is the average of all the papers in the set.

Source from http://help.prod-incites.com/inCites2Live/indicatorsGroup/aboutHandbook/usingCitationIndicatorsWisely/normalizedCitationImpact.html

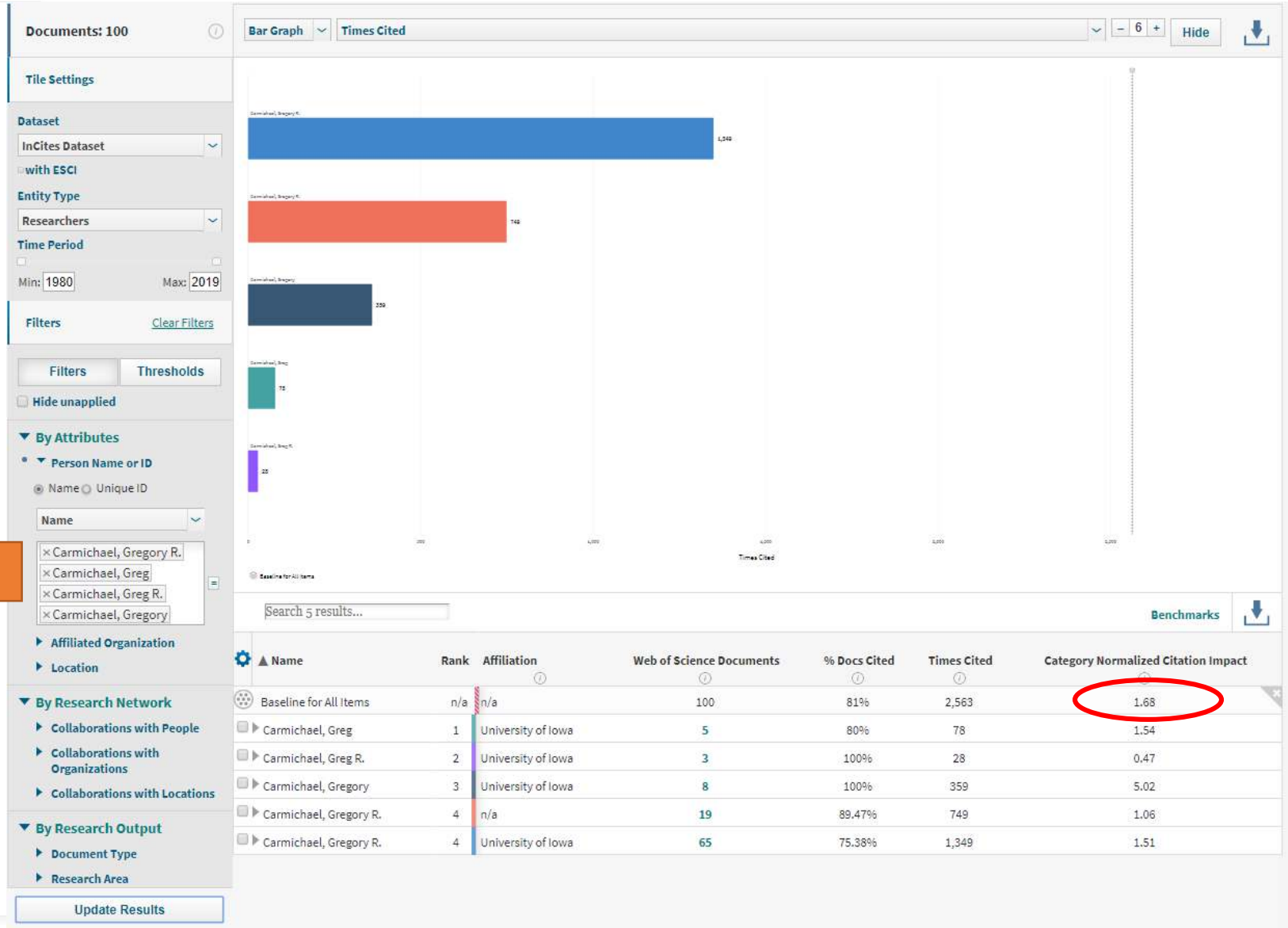
Finding CNCI in InCites

- InCites Benchmarking & Analytics is a citation-based evaluation tool.
- Registration and sign in are required.
- If you are already registered for *Web of Science*, *ResearcherID* or *EndNote*, use the same username and password.





Finding Your CNCI



How U.S. News Calculated the Best Global Universities Rankings?

Education > Best Global Universities > Rankings

Best Global Universities Rankings

These institutions from the U.S. and more than 80 other countries have been ranked based on 13 indicators that measure their academic research performance and their global and regional reputations. Students can use these rankings to explore the higher education options that exist beyond their own countries' borders and to compare key aspects of schools' research missions. These are the world's top 1,500 universities.

See the methodology »

BEST GLOBAL UNIVERSITIES U.S.News 2020

Clarivate Analytics

RANKING INDICATOR	WEIGHT
Global research reputation	12.5%
Regional research reputation	12.5%
Publications	10%
Books	2.5%
Conferences	2.5%
Normalized citation impact	10%
Total citations	7.5%
Number of publications that are among the 10% most cited	12.5%
Percentage of total publications that are among the 10% most cited	10%
International collaboration – relative to country	5%
International collaboration	5%
Number of highly cited papers that are among the top 1% most cited in their respective field	5%
Percentage of total publications that are among the top 1% most highly cited papers	5%

Screenshots from https://www.usnews.com/education/best-global-universities

Known Issues with Using CNCI

- A single highly cited paper may inflate the *CNCI* values given a small set of papers.
- Very highly cited papers can have an unduly large influence on the *CNCI* value given a large sets of papers (e.g., collected works of an institution).
- If the baseline values for current year is very low, the *CNCI* values for current year can fluctuate more than expected.
- Other indicators
  - % Documents in Top 1%
  - % Documents in Top 10%
  - Average Percentile

Source from http://help.prod-incites.com/inCites2Live/indicatorsGroup/aboutHandbook/usingCitationIndicatorsWisely/normalizedCitationImpact.html

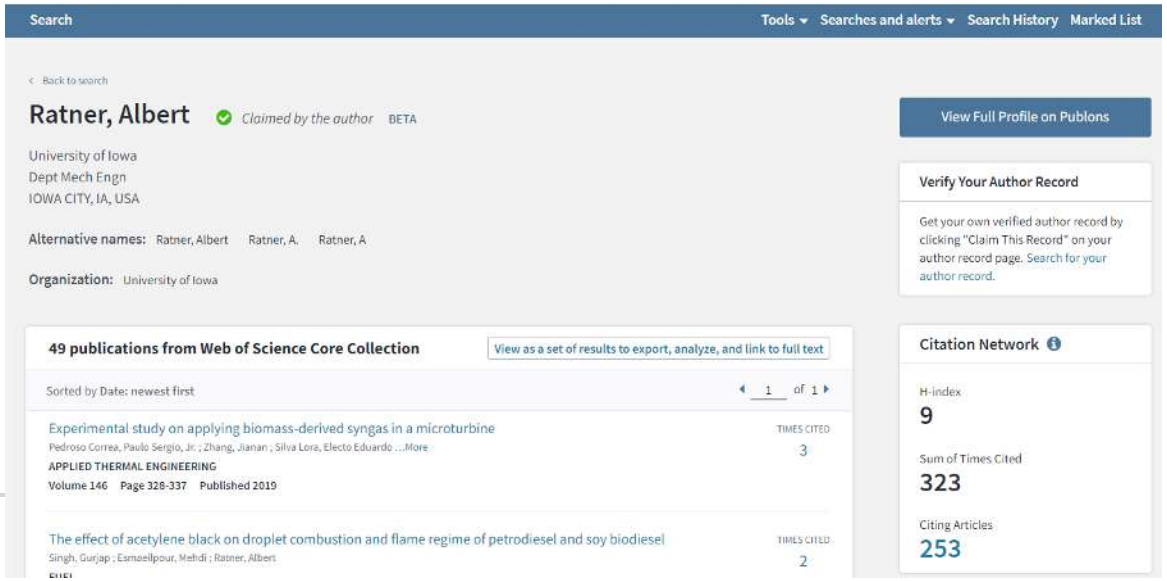
Putting It Together…

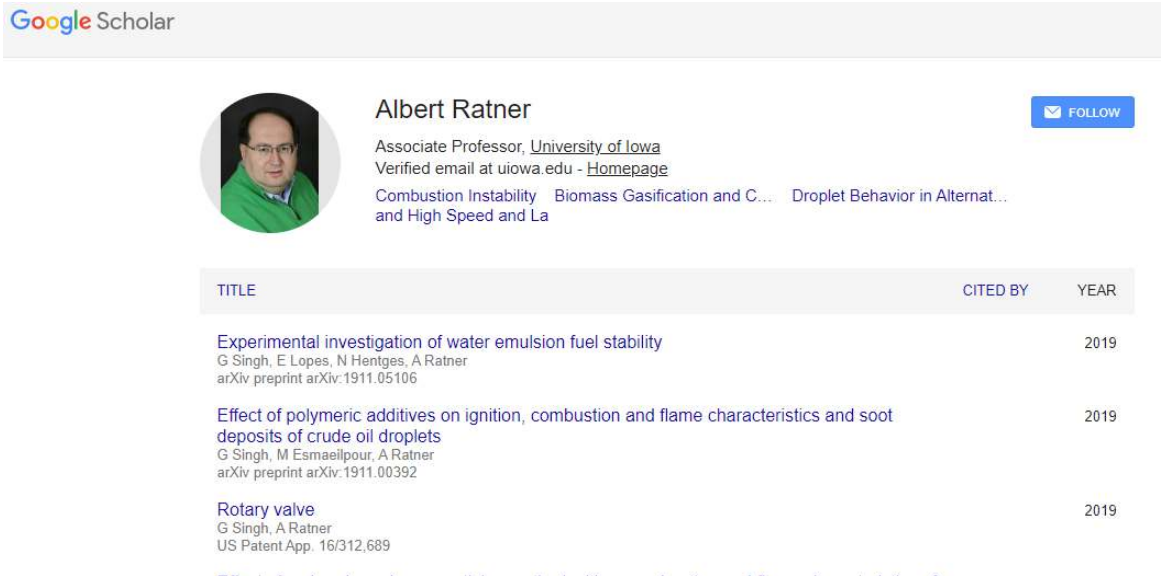
Normalization assumes that the various fields simply differ in their average citation impact or in the rate at which citations accrue, not in author's reasons for citing or in the inherent meaning of a citation.

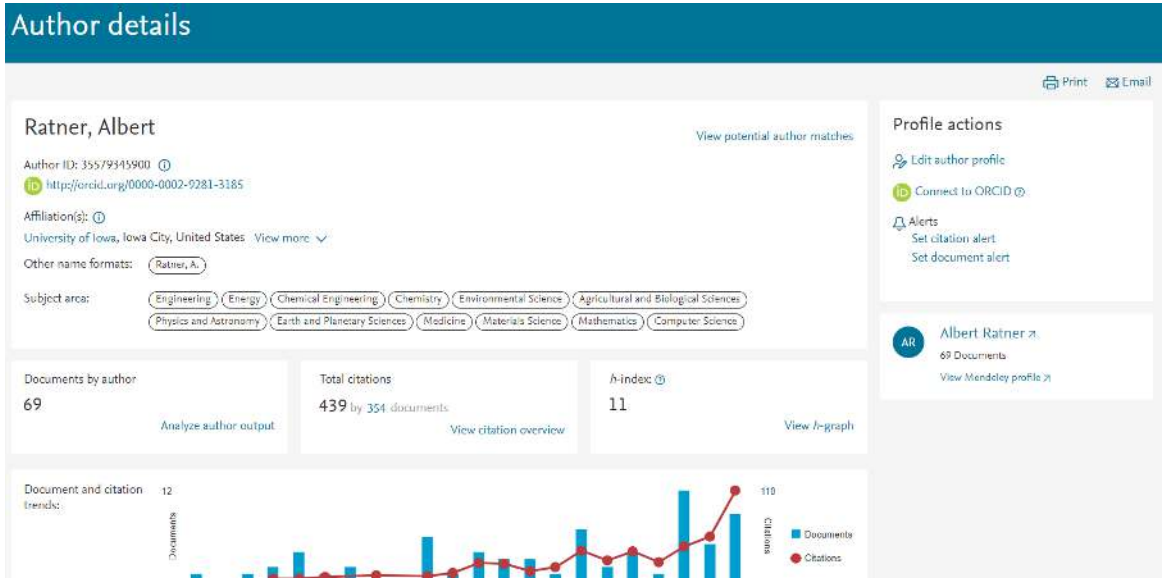
Normalization is intended to control for differences in citation rates among fields. But do these field-normalization citation metrics really eliminate disciplinary differences in impact?

Consider complementary citation impact indictors such as average percentile, % documents in top 1% and % documents in top 10% when comparing the relative influence of journals within their disciplines

Why an individual's h-index is different in Web of Science, Scopus and Google Scholar?







Coverage of Data Sources

Web of Science: more complete coverage of the natural and social sciences than the humanities. 13,100 journals in Core Collection (20,556 if include *Emerging Sources Citation Index*). Conference proceedings and book data are also available.

Scopus: 22,800 journals along with selected book series and conference proceedings. Natural and social sciences are represented well but is weaker in its coverage of arts and humanities.

Google Scholar: the broadest coverage. Data for approximately 87% of all the English-language scholarly documents available on the web: journal articles, preprints, conference papers, theses, research reports, and other items.

Broadening Your Scholarly Impact

Researcher Profiles

- Author disambiguation: ORCID, ResearcherID, Scopus Author ID
- University author profile page
- Author profiles: Web of Science, Scopus, Google Scholar
- Researcher Communities: Academia, ResearchGate
- Personal sites and social media: LinkedIn, blog

Altmetrics Tools

- Altmetrics
- PlumX
- ImpactStory

References

- Walters, W. (2017). Citation-based journal rankings: Key questions, metrics, and data sources. *IEEE Access, 5*, 22036-22053.
- Journal Impact Factor. Understanding Journal Citation Reports Metrics. https://clarivate.libguides.com/jcr/basics
- CiteScore. https://journalmetrics.scopus.com/index.php/Faqs
- How are CiteScore metrics used in Scopus? https://service.elsevier.com/app/answers/detail/a_id/14880/supporthub/scopus/
- How is SNIP (Source Normalized Impact per Paper) used in Scopus? https://service.elsevier.com/app/answers/detail/a_id/14884/supporthub/scopus/related/1/

References (Cont'd)

- SNIP - CWTS Journal Indicators. https://www.journalindicators.com/methodology
- Category Normalized Citation Impact (CNCI). http://clarivate.libguides.com/incites_ba/understanding-indicators
- Eigenfactor (EF), EFn, Article Influence Score (AI). http://www.eigenfactor.org/about.php
- SCImago Journal rank (SJR). https://www.scimagojr.com/
- Relative Citation Ratio (RCR). https://nexus.od.nih.gov/all/2016/09/08/nih-rcr/
- iCite https://icite.od.nih.gov