# Impact factor and citation index of Publication

# The man who started it all! Eugene Garfield



# The article that got the ball rolling:

#### Citation Indexes for Science

A New Dimension in Documentation through Association of Ideas

Eugene Garfield

"The uncritical citation of disputed data by a writer, whether it be deliberate or not, is a serious matter. Of course, knowingly propagandizing unsubstantiated claims is particularly abhorrent, but just as many naive students may be swayed by unfounded assertions presented by a writer who is unaware of the criticisms. Buried in scholarly journals, critical notes are increasingly likely to be overlooked with the passage of time, while the studies to which they pertain, having been reported more widely, are apt to be rediscovered." (1)

In this paper I propose a bibliographic system for science literature that can eliminate the uncritical citation of fraudulent, incomplete, or obsolete data by making it possible for the conscientious scholar to be aware of criticisms of earlier papers. It is too much to expect a research worker to spend an inordinate amount of time searching for the bibliographic descendants of antecedent papers. It would not be avecaging to day

approach to subject control of the literature of science. By virtue of its different construction, it tends to bring together material that would never be collated by the usual subject indexing. It is best described as an association-of-ideas index, and it gives the reader as much leeway as he requires. Suggestiveness through association-of-ideas is offered by conventional subject indexes but only within the limits of a particular subject heading.

If one considers the book as the macro unit of thought and the periodical article the micro unit of thought, then the citation index in some respects deals in the submicro or molecular unit of thought. It is here that most indexes are inadequate, because the scientist is quite often concerned with a particular idea rather than with a complete concept. "Thought" indexes can be extremely useful if they are properly conceived and developed.

In the literature-searching process, indexes play only a small, although significant, part. Those who seek comprehensive ease. Classified indexes are also dependent upon a subject analysis of individual articles and, at best, offer us better consistency of indexing rather than greater specificity or multiplicity in the subject approach. Similarly, terminology is important, but even an ideal standardization of terminology and nomenclature will not solve the problem of subject analysis.

What seems to be needed, then, in addition to better and more comprehensive indexes, alphabetical and classified, are new types of bibliographic tools that can help to span the gap between the subject approach of those who create documents—that is, authors—and the subject approach of the scientist who seeks information.

Since 1873 the legal profession has been provided with an invaluable research tool known as Shepard's Citations, published by Shepard's Citations, Inc., Colorado Springs, Colo. (2). A citation index is published for court cases in the 48 states as well as for cases in Federal courts. Briefly, the Shepard citation system is a listing of individual American court cases, each case being followed by a complete history, written in a simple code. Under each case is given a record of the publications that have referred to the case, the other court decisions that have affected the case, and any other references that may be of value to the lawyer. This type of listing is particularly important to the lawyer, because, in law, much is based on precedent.

Citation indexes depend on a simple system of coding entries, one that requires minimum space and facilitates the

# Why is this different?

Based on law indexing (Shepard's Citations)
 1873

Subject indexes to scientific literature were in existence

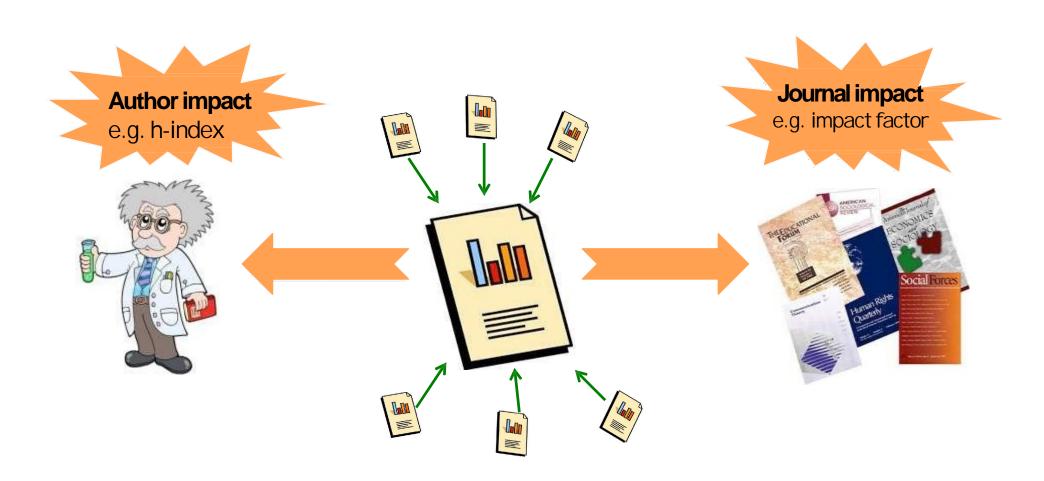
 Garfield suggests that each article is given a code and all works that cited that article would be linked to the original article.

# Citation Analysis

- Citation analysis provides the ability to track the work of authors, the influence of papers and the trajectory of research ideasby examining citation counts in key research databases and online sources
- A citation count refers to the number of times one paper has been cited or referenced in the work of another



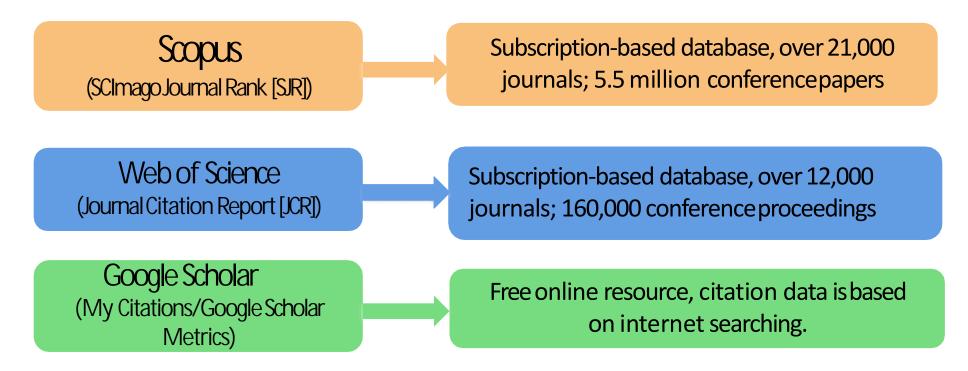
### It All Starts With A Citation...



#### Which Tools To Use?

- There are three key databases/online resources that are used as sources of citation data
- Due to their differing coverage citation counts will also differ.

<sup>\*</sup>There is no one source that will index all scholarly publications, therefore it is important to search all three available sources



# Journal Impact Factor Formula

The number of times articles published in (2 years) were cited by indexed journals

Total number of citable items (2 years)

# In Simpler Terms

The impact factor is a measure reflecting the average number of citations to articles published in science and social science journals.

# Journal Impact Factor

Journal of Hypothetical Examples

100

Citing references appearing in 2010, to articles published in Journal in 2009 and 2008

200

Total number of articles in Journal published in 2009 and 2008

0.50

JIF

### Other Methods

- H Index (or H factor)
- i10 index

#### What is a H-index?

- An index that quantifies both the actual scientific productivity and the apparent scientific impact of a scientist
- A scholar with an index of 40 means that the scholar has published 40 papers each of which has been cited by others at least 40 times

Source: Wikipedia

#### h-Index

- h-index developed in 2005 by Jorge Hirsch, University of California in San Diego
- Attempts to quantify productivity and apparent scientific impact of a scientist.

"A scientist has index h if h of his/her Np papers have at least h citations each, and the other (Np – h) papers have no more than h citations each".

- For example, an h-index of 20 means that the researcher has
   20 papers each of which has been cited 20 or more times
- Calculated by Scopus, WoS, Google Scholar, but only for those papers within the database



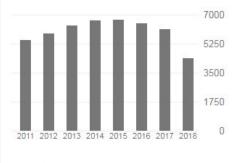
C. N. R. Rao
Professor of Chemistry
Verified email at jncasr.ac.in
Materials Chemistry Solid State Chemistry

✓ FOLLOW

#### GET MY OWN PROFILE

Cited by VIEW ALL

All	Since 2015
102818	36806
145	86
1209	588
	102818 145



Co-authors



TITLE	CITED BY	YEAR
Graphene: the new two-dimensional nanomaterial CNR Rao, AK Sood, KS Subrahmanyam, A Govindaraj Angewandte Chemie International Edition 48 (42), 7752-7777	3133	2009
Chemical applications of infrared spectroscopy CNR Rao Academic Press,	2136	1963
Metal carboxylates with open architectures CNR Rao, S Natarajan, R Vaidhyanathan Angewandte Chemie International Edition 43 (12), 1466-1496	1911	2004
MoS2 and WS2 analogues of graphene HSS Ramakrishna Matte, A Gomathi, AK Manna, DJ Late, R Datta, Angewandte Chemie International Edition 49 (24), 4059-4062	1258	2010
Synthesis, structure, and properties of boron-and nitrogen-doped graphene LS Panchakarla, KS Subrahmanyam, SK Saha, A Govindaraj, Advanced Materials 21 (46), 4726-4730	1253	2009

h-index is the largest number h such that h publications have at least h citations. The second column has the "recent" version of this metric which is the largest number h such that h publications have at least h new citations in the last 5 years

i10-index is the number of publications with at least 10 citations. The second column has the "recent" version of this metric which is the number of publications that have received at least 10 new citations in the last 5 years



#### T. Medhat Edit

Lecturer of Computer Science, Kafrelsheikh University Edit

Augmented Reality - Decision Making - Information Systems - Neural

Networks - Rough Sets Edit

Verified email at eng.kfs.edu.eg Edit

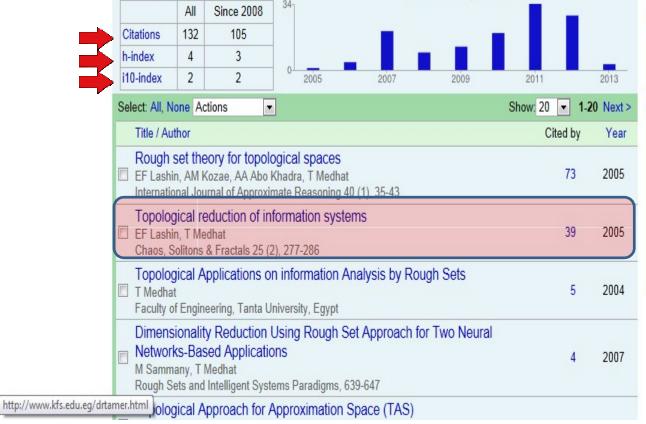
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Citation indices

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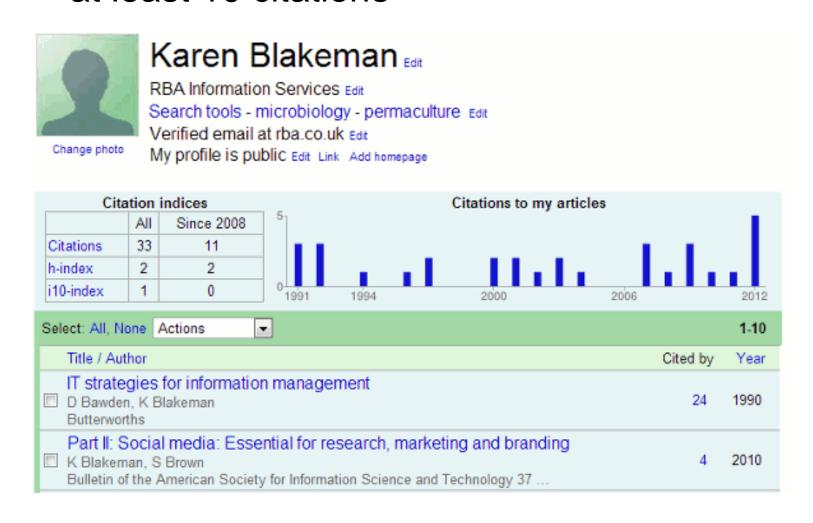
View all co-authors

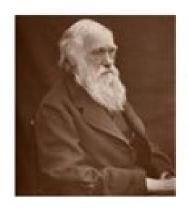
Abd Almonem M Kozae Taher Sharshar	
View all co-authors	
Name	
Email	

#### i10 Index

#### • i10 Index

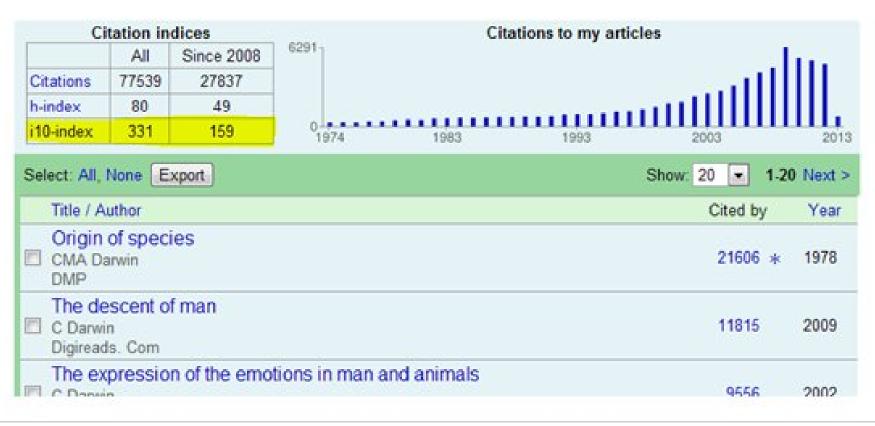
i10-index is the number of publications with at least 10 citations

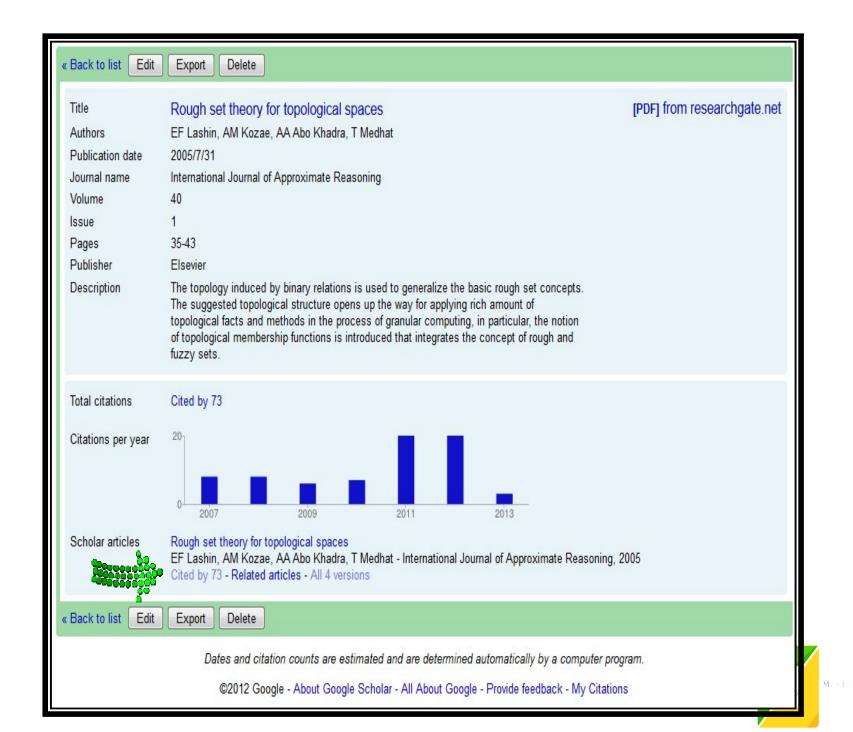


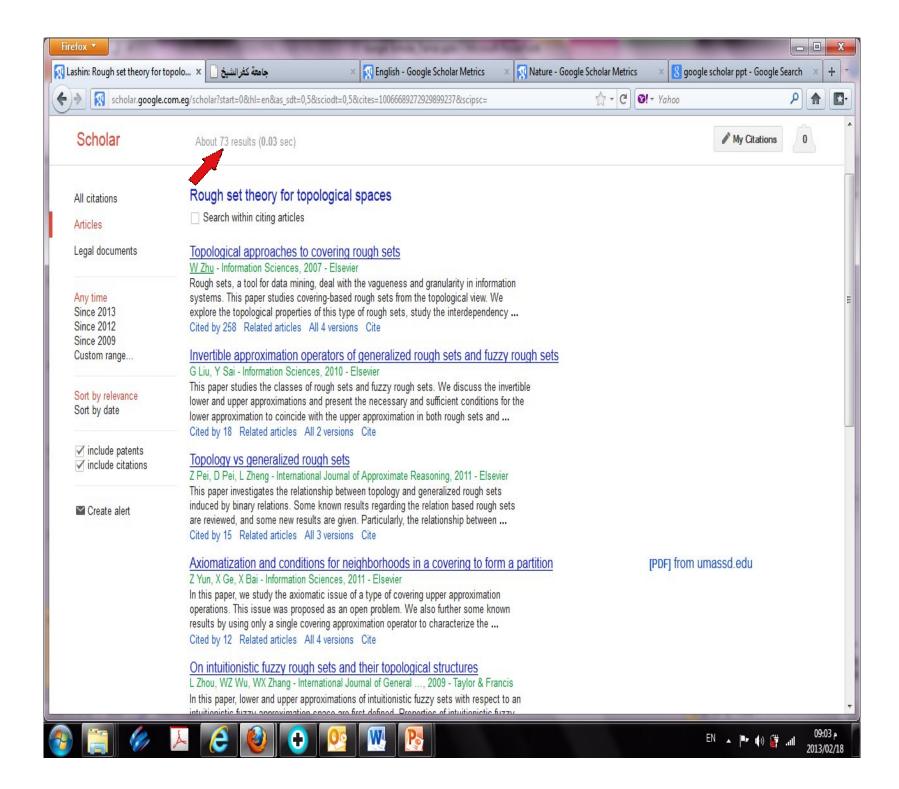


#### Charles Robert Darwin

naturalist (1809-1882)
life sciences - evolution - biogeography - speciation - natural selection
Verified email at unr.edu.ar
Homepage







#### g-index

The g-index is a cumulative index, suggested by Leo Egghe quoted here from (Wikipedia 2014d):

Given a set of articles ranked in decreasing order of the number of citations that they received, the g-index is the (unique) largest number such that the top g articles received (together) at least g<sup>2</sup> citations.

The g-index should be evaluated according to the method in the box and can be written as

### g-index

The g-index should be evaluated according to the method in the box and can be written as

$$g^2 \le \sum_{i \le g} c_i$$

Transformed it can be seen that g is compared with the average of the first g papers:

$$g \le \frac{1}{g} \sum_{i \le g} c_i$$

#### g-index for Professor X

The top g articles received (altogether) at least g squared citations.

Document no. (g)	Citation count	Square of g	Total no. of citations
Document 1	50 cites	1	50
Document 2	18 cites	4	50+18 = 68
Document 3	11 cites	9	68+11 = 79
Document 4	7 cites	16	79+7 = 86
Document 5	4 cites	25	86+4 = 90
Document 6	3 cites	36	90+3 = 93
Document 7	1 cites	49	93+1=94
Document 8	1 cites	64	94+1=95
Document 9	1 cites	81	95+1=96
Document 10	1 cites	100	96+1=97

# Journal Citation Reports JCR

- JCR distills citation trend data for 10,000+ journals from more than 25 million cited references indexed by Thomson Reuters every year
- Science Edition and Social Sciences Edition released annually
- Science Edition covers 7,200+ journals in 171 subject categories
- Social Sciences Edition covers 2,100+ journals in 55 subject categories

### When we talk about impact...

#### 4 levels

Level 1: Article-level impact

Level 2: Journal-level impact

Level 3: Author-level impact

Level 4: Institutional impact

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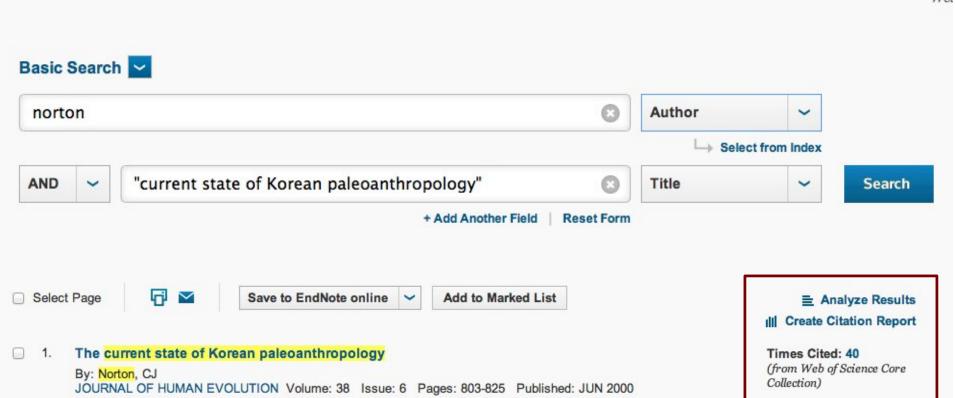
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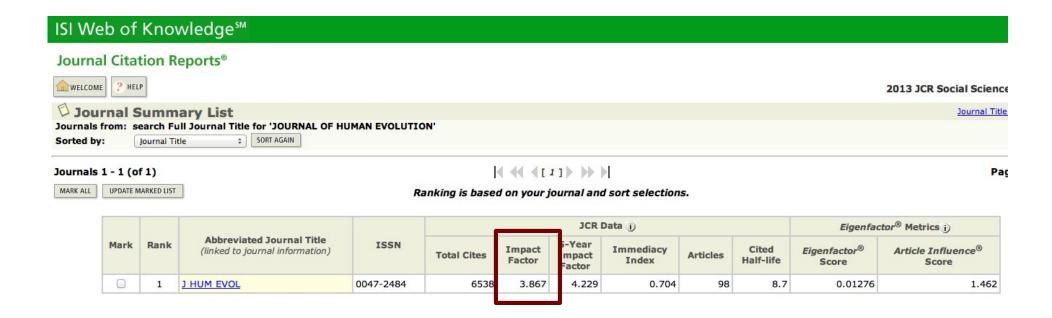


Add to Marked List

# Journal-level impact

Main Metrics:	Available:	Access:
Journal Impact Factor (JIF)	Journal Citation Reports (JCR) Thomson Reuters	AUS Subscription
SCImago Journal Ranking (SJR)	SCImago website	Free
Source Normalized XX (SNIP)	SCOPUS - Elsevier	Subscription
H5-index	Google Scholar Metrics	Free

# Journal Citation Reports



Norton, C.J. (2000). The current state of Korean paleoanthropology. Journal of Human Evolution, 38(6), 803-825.

1 - 50 of 560 << First | < Previous | Next > | L

#### SCImago Journal & Country

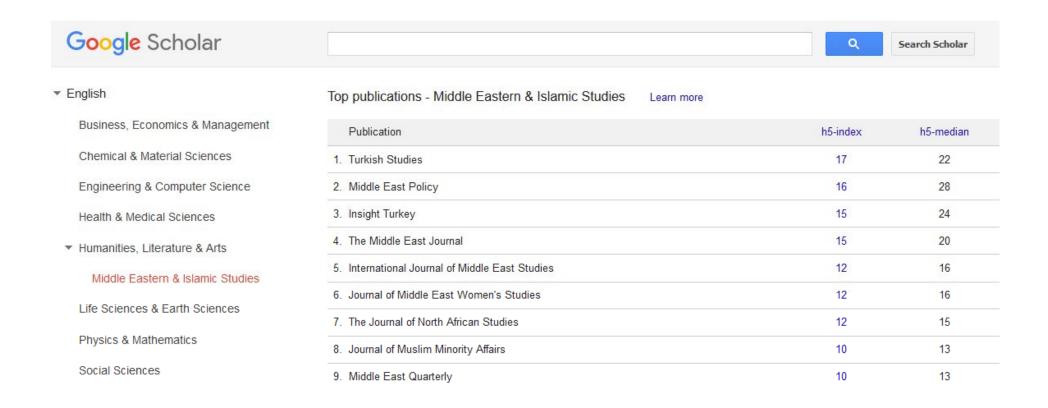
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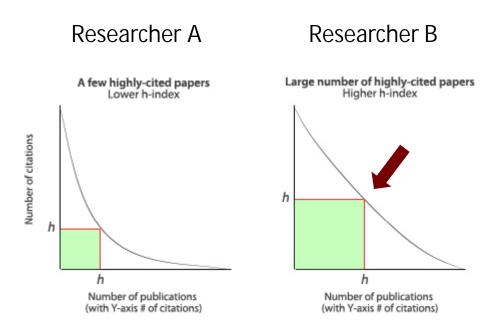
	Title	Туре		SJR	H index	Total Docs. (2013)	Total Docs. (3years)	Total Refs.	Total Cites (3years)	Citable Docs. (3years)	Cites / Doc. (2years)	Ref. / Doc.
1	Computational Linguistics	j	Q1	3,083	64	32	84	1.961	329	82	4,36	61,28
2	Journal of Cognitive Neuroscience	j	Q1	3,058	160	170	737	9.721	4.183	732	5,10	57,18
3	Artificial Intelligence	j	Q1	2,858	107	76	200	3.874	909	196	4,53	50,97
4	Cognition	j	Q1	2,572	132	182	490	8.763	2.169	479	3,82	48,15
5	Communication Research	j	Q1	2,310	65	35	108	2.099	354	108	2,64	59,97
6	Studies in Second	i	Q1	2.175	29	26	59	1.633	158	59	2.28	62.81



H5-index of 15 means that the journal has published 15 articles in the last 5 years that have 15 or more citations each.

h5-median for a publication is the median number of citations for the articles that make up its h5-index

#### The h-index



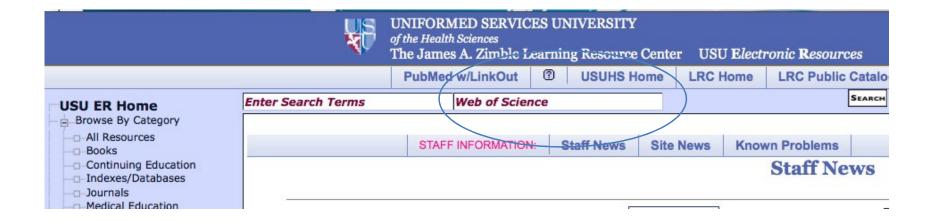
Two researchers with <u>the same number</u> of publications

Researcher B has a higher number of cited papers than researcher A

Researcher B's h-index will be higher than researcher A.

The h-index relies on citations to your papers, not the journals h-index is most useful for comparison within disciplines.

# First log in to ER and find Web of Science



# Access JCR from the Web of Knowledge

Analytical Tools:

Journal Citation Reports®

Journal performance metrics offer a systematic, objective means to critically evaluate the world's leading journals

- Delivers quantifiable statistical information based on citation data
- Helps determine a publication's impact and influence in the global research community
- Includes journal and category data

#### Essential Science Indicators<sup>SM</sup>

In-depth analytical tool offering data for ranking scientists, institutions, countries, and journals.

- Explore science performance statistics and science trends data, based on journal article publication counts and citation data
- Determine research output and impact in specific fields of research
- Evaluate potential employees, collaborators, reviewers, and peers

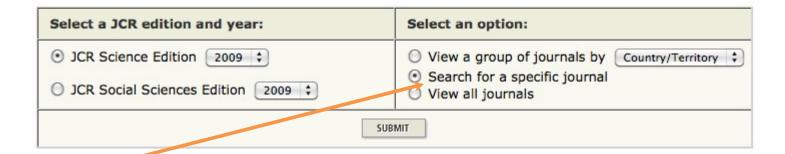
#### Scenario I

(We all have our dreams!)

 You have written an article and would like to have the most visibility possible. You have a choice between publishing in Science and Nature.

 Which should you choose, based on Impact Factor?

### Search for individual journals

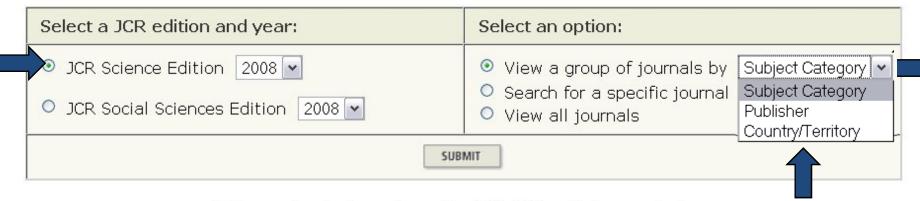


Mark						JCR	Data (j)			Eigenfac	ctor <sup>TM</sup> Metrics j
	k Rank	Abbreviated Journal Title (linked to journal information)	ISSN	Total Cites	Impact Factor	5-Year Impact Factor	Immediacy Index	Articles	Cited Half-life	Eigenfactor <sup>TM</sup> Score	Article Influence <sup>TM</sup> Score
✓	1	NATURE	0028-0836	483039	34.480	32.906	8.209	866	8.9	1.74605	18.062

HPDATE MARKED LIST

Mark	Rank	Abbreviated Journal Title (linked to journal information)		JCR Data ()				Eigenfactor <sup>™</sup> Metrics j			
			ISSN	2009 Total Cites	Impact Factor	5-Year Impact Factor	Immediacy Index	2009 Items	Cited Half-life	Eigenfactor <sup>TM</sup> Score	Article Influence <sup>TM</sup> Score
✓	1	NATURE	0028-0836	483039	34.480	32.906	8.209	866	8.9	1.74605	18.062
✓	2	SCIENCE	0036-8075	444643	29.747	31.052	6.531	897	8.8	1.52308	16.580

# **Subject Categories**



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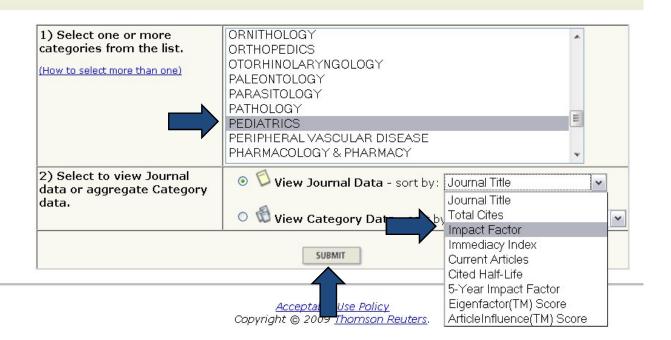
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## View Journal data

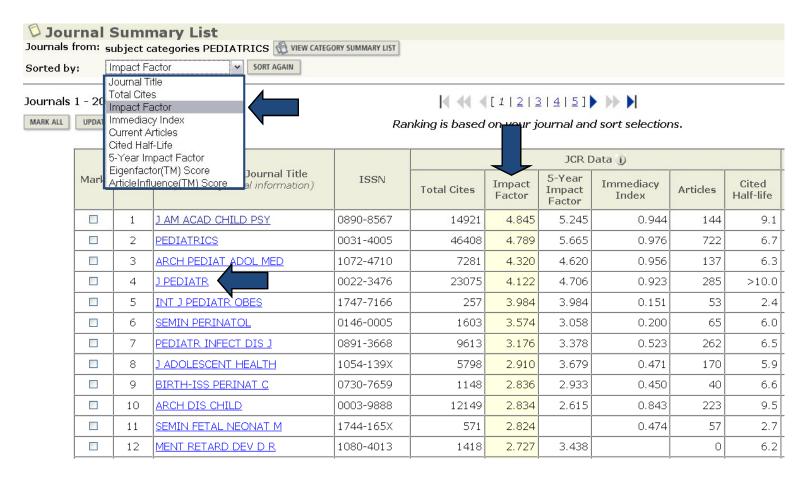
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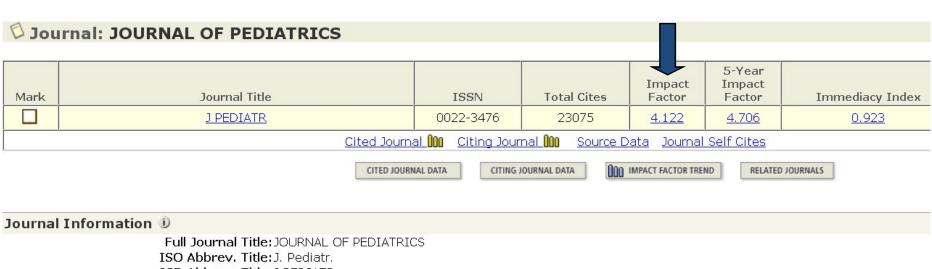
#### **Subject Category Selection**



# Sort journals in the category



# Full Record Page



JCR Abbrev. Title: J PEDIATR

ISSN: 0022-3476

Issues/Year:12

Language: ENGLISH

Journal Country/Territory: UNITED STATES

Publisher: MOSBY-ELSEVIER

Publisher Address: 360 PARK AVENUE SOUTH, NEW YORK, NY 10010-1710

Subject Categories: PEDIATRICS SCOPE NOTE

VIEW JOURNAL SUMMARY LIST

VIEW CATEGORY DATA

Journal Rank in Categories: JOURNAL RANKING

## Journal Rank in categories

Mark	Journal Title	ISSN	Total Cites	Impact Factor	5-Year Impact Factor	
	BIRTH-ISS PERINAT C	0730-7659	1148	2.836	2.933	
	Cited Journal 1000 Citing Journal 1000 Source Data Journal  CITED JOURNAL DATA CITING JOURNAL DATA 1000 IMPACT FACTOR TRE					
ournal I	Information ①					
	Full Journal Title: BIRTH-ISSUES IN PERINATAL  ISO Abbrev. Title: Birth-Issue Perinat. Care  JCR Abbrev. Title: BIRTH-ISS PERINAT C	L CARE				

ISSN: 0730-7659

Issues/Year: 4

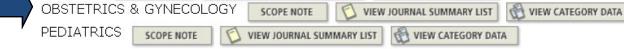
Language: ENGLISH

Journal Country/Territory: UNITED STATES

Publisher: WILEY-BLACKWELL PUBLISHING, INC

Publisher Address: COMMERCE PLACE, 350 MAIN ST, MALDEN 02148, MA,

Subject Categories: NURSING SCOPE NOTE VIEW JOURNAL SUMMARY LIST W VIEW CATEGORY DATA



Journal Rank in Categories: JOURNAL RANKING



# Journal Rank in categories



## Rank in Category: BIRTH-ISSUES IN PERINATAL CARE

## Journal Ranking 1

For 2008, the journal BIRTH-ISSUES IN PERINATAL CARE has an Impact Factor of 2.836.

This table shows the ranking of this journal in its subject categories based on Impact Factor.

Category Name	Total Journals in Category		
NURSING	60	1	Q1
OBSTETRICS & GYNECOLOGY	61	13	Q1
PEDIATRICS	86	9	Q1







## Journal self citation

To provide one the ability to easily compare self-citation rates among journals particularly as this influences Impact factor calculations.

#### Journal Self Cites i

The tables show the contribution of the journal's self cites to its impact factor. This information is also represented in the cited journal graph.

Total Cites	12149
Cites to Years Used in Impact Factor Calculation	1352
Impact Factor	2.834

Self Cites	444 (3% of 12149)
Self Cites to Years Used in Impact Factor Calculation	117 (8% of 1352)
Impact Factor without Self Cites	2.589

# Category Impact Data

## Journal: JOURNAL OF PEDIATRICS

Mark	Journal Title	ISSN	Total Cites	Impact Factor	
	<u>J PEDIATR</u>	0022-3476	23075	4.122	
Cited Journal Ma Citing Journal Ma Source Date Journal					

CITED JOURNAL DATA

CITING JOURNAL DATA

MAN IMPACT FACTOR TREM

#### Journal Information 1

Full Journal Title: JOURNAL OF PEDIATRICS

ISO Abbrev. Title: J. Pediatr. JCR Abbrev. Title: J PEDIATR

ISSN: 0022-3476

Issues/Year:12

Language: ENGLISH

Journal Country/Territory: UNITED STATES

Publisher: MOSBY-ELSEVIER

Publisher Address: 360 PARK AVENUE SOUTH, NEW YORK, NY 10010-1710

Subject Categories: PEDIATRICS

SCOPE NOTE

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Journal Rank in Categories: A JOURNAL RANKING

# Category Data – Median and Aggregate Impact Factors

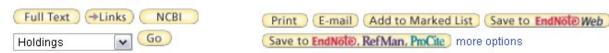


- The Median Impact Factor for the subject category of Pediatrics is 1.252
- The Aggregate Impact Factor for Pediatrics is 1.932

#### 

## Access to JCR from the Web of Science

## Practice Variations in the Treatment of Febrile Infants Among Pediatric **Emergency Physicians**



Author(s): Goldman RD (Goldman, Ran D.)1,4,5, Scolnik D (Scolnik, Dennis)6, Chauvin-Kimoff L (Chauvin-Kimoff, Laurel)<sup>7,8</sup>, Farion KJ (Farion, Ken J.)<sup>9,10</sup>, Ali S (Ali, Samina)<sup>13,12</sup>, Lynch T (Lynch, Tim)<sup>14,15</sup>, Gouin S (Gouin, Serge)<sup>11</sup>, Osmond MH (Osmond, Martin H.)9,10, Johnson DW (Johnson, David W.)2,3, Klassen TP (Klassen, Terry P.)13,12

Group Author(s): Fever Infants Grp Res Pediat Emerg

Source: PEDIATRICS Volume: 124 Issue: 2 **Pages:** 439-445 Published: AUG 2009

Times Cited: 1 References: 29 Citation Map

Abstract: OBJECTIVES: The objectives of this study were to characterize variations in treatment decisions for young febrile infants in pediatric emergency departments across Canada and to document the extent of practice variations among pediatric emergency department practitioners.

METHODS: This was a prospective, concurrent, cohort study of consecutive infants up to 90 days of age who presented to 6 pediatric emergency departments in Canada with fever (rectal temperature of >= 38.0 degrees C). We recorded information in the emergency department and contacted the families by telephone to confirm the final disposition.

RESULTS: A total of 257 infants were recruited over 2 to 4 months. Patients were similar across carters in terms of formation triage and durations of fever also were similar among centers. In one center, significantly make children arrived with cough; in another center, fewer parents reported sick contacts at home. Rates of blo significantly different across sites, but rates of lumbar puncture, respiratory virus testing, and chest radiography were ports) different. A total of 55% of infants received antibiotics, and significant practice variations in the numbers and types of antibiotics used were documented.

#### Cited by: 1

This article has been cited 1 times (from Web of Science).

Hampers LC Practice Variation With Febrile Infants: Delight in

Disorder? PEDIATRICS 124 2 783-785 AUG

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#### References: 29

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# Impact Factor Trend Graph



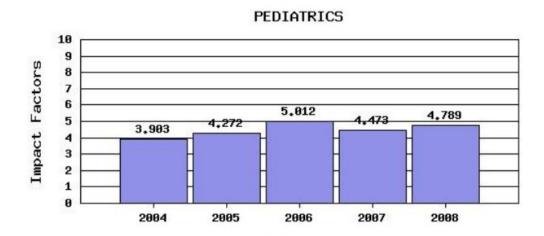




2008 JCR Science Editi

Impact Factor Trand Graph: PEDIATRICS

Click on the "Return to Journal utton to view the full journal information.



#### \*Impact Factor -- see below

The journal impact factor is a particular year. The impact fa others in the same field. For Journal" button.

- Entry point into JCR from Web of Science
- •Indicates the Journal's Impact Factor over the latest five years

NOTE: Title changes and coverage changes may result in no impact factor for one or more years in the above graph.

# Limitations of the Impact Factor

- Self-citations
- Many times editors insist that authors cite works in that journal
- Some disciplines tend to cite more than others
- Journals change their names thus affecting impact factor for approximately two years
- Does not take into account negative citations

## Example

Paper 1: Author A, Author B

Paper 2: Author B, Author C, Author D

Paper 3: Author A, Author E

Paper 4: Author A, Author C

Aa/P = 9/4 = 2.25 authors per paper

Author A: 3 papers

Author B: 2 papers

Author C: 2 papers

Author D: 1 paper

Author E: 1 paper

Pa papers / A authors = Pa/A = 9/5 = 1.8 papers per author

Number of all references in all papers in all journal issues: Ref

Another interesting measure is the number of references per paper: Ref/P

The higher Aa/P and Ref/P the higher will be the total number of citations C. All authors will share the news and distribute their new paper that will make citations more likely. If it is custom to put many references in a paper chances are higher that also the own paper will be cited more often.

