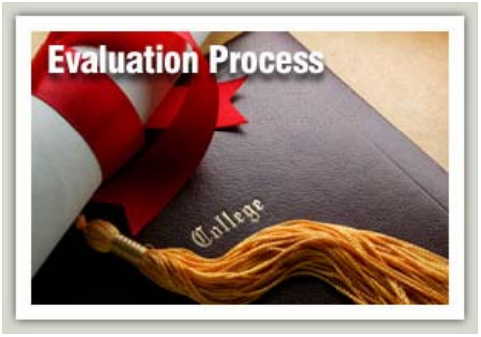

Evaluación de la Producción Científica: Revistas Científicas, Investigadores e Instituciones

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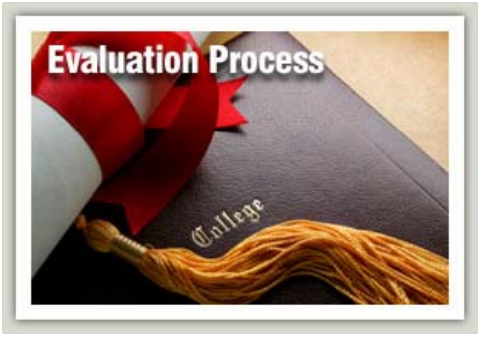
Grupo de investigación SCI²S

http://sci2s.ugr.es



Scientific Production Evaluation.
Scientometrics and Bibliometrics

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DECSAI
Universidad de Granada

Scientometrics

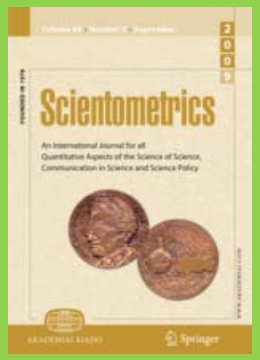
The science of measuring the "quality" of science.

Bibliometrics is the practical tool for making the "quality analysis", thorough the scientific publications analysis.

Computer Sciences

Information Science & Library Science

SCIENTROMETRICS



JOURNAL OF THE AMERICAN SOCIETY FOR INFORMATION SCIENCE AND TECHNOLOGY

Scientometrics and Bibliometrics: Scientific Production Evaluation

- Introduction
- Journal Analysis: Some indices
- H-index: A debate on the most popular index
- Universities ranking indices
- Spanish Univeristies analysis
- Final Comments

Scientometrics and Bibliometrics: Scientific Production Evaluation

Introduction

Journal Analysis: Some indices

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Universities ranking indices

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Final Comments

Scientometrics: the science of measuring the "quality" of science. **Historical appointment.**

Modern scientometrics is mostly based on the work of Derek J. de Solla Price and Eugene Garfield.

Eugene GARFIELD (1955): *Citation Index for Science: a new dimension in Documentation through association of Ideas*. *Science*, v. 122.

Antikythera mechanism,
an ancient Greek clockwork calculator

Derek J. Price, Little Science, Big Science (New York, 1963)

Derek J. de Solla Price (1965). Networks of Scientific Papers. *Science*, 149(3683): 510-515,

Scientometrics: **the science of measuring the "quality" of science.**

"***Bibliometrics*** ***can be defined as the*** **performance analysis of science and technology performance. It utilizes quantitative analysis and science mapping to describe patterns of publication within a given field or body of literature".**

Basic for these analyses is the scientific communication between scientists through (mainly) journal publications.

Key concepts in bibliometrics are *output* and *impact*, as measured through publications and citations.

By large scale quantification, citations indicate influence or (inter)national visibility of scientific activity.

Scientometrics: the science of measuring the "quality" of science.

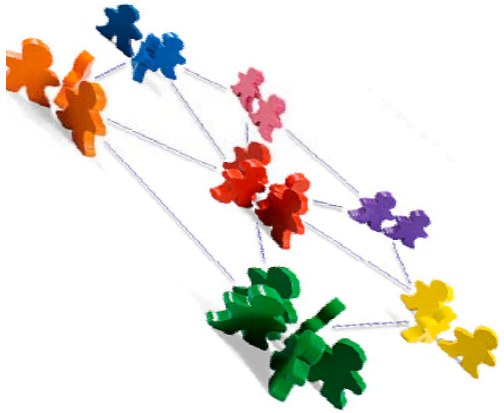
"_Bibliometrics_ _can be defined as the_ performance analysis of science and technology performance. It utilizes quantitative analysis and science mapping to describe patterns of publication within a given field or body of literature".

Important starting point in bibliometrics: scientists express, through citations in their scientific publications, a certain degree of influence of others on their own work.

The ‘building blocks’ of an organization

- University

- Laboratories / research groups



- Researchers (in these laboratories)

- Scientific publications

Measuring the performance of:

- Researchers
- Journals
- Research groups
- Universities / institutions
- Countries

Databases

Web of Science

- Approximately 9,000 journals going back to 1955
- Books in series and an unknown number of conf. proceedings, including LNCS, LNAI, LNM
- Since 1963, formerly produced by ISI

Scopus

- 15,000 journals going back to 1996 for citations
- 500 conference proceedings
- Launched by Elsevier in 2004

Scholar Google

- Journals, conferences proceedings, …
- unclear coverage
- Launched in 2004

Measuring and metrics: Some examples

Journal Impact Factor: Measure of the frequency with which the "average article" in a journal has been cited in a given period of time.

Measuring the Level of Non-Citation: Uses the level of non-citation of articles within a journal as a measure of quality.

PageRank Algorithm: (used in web-metrics (Google)) Used to provide greater weight to citations from journals that have high impact than citations from lower-impact journals.

H-index: impact of individual scientists rather than journals: measuring the number of an individual scientist's impact and citation record.

Scientometrics and Bibliometrics: Scientific Production Evaluation

Introduction

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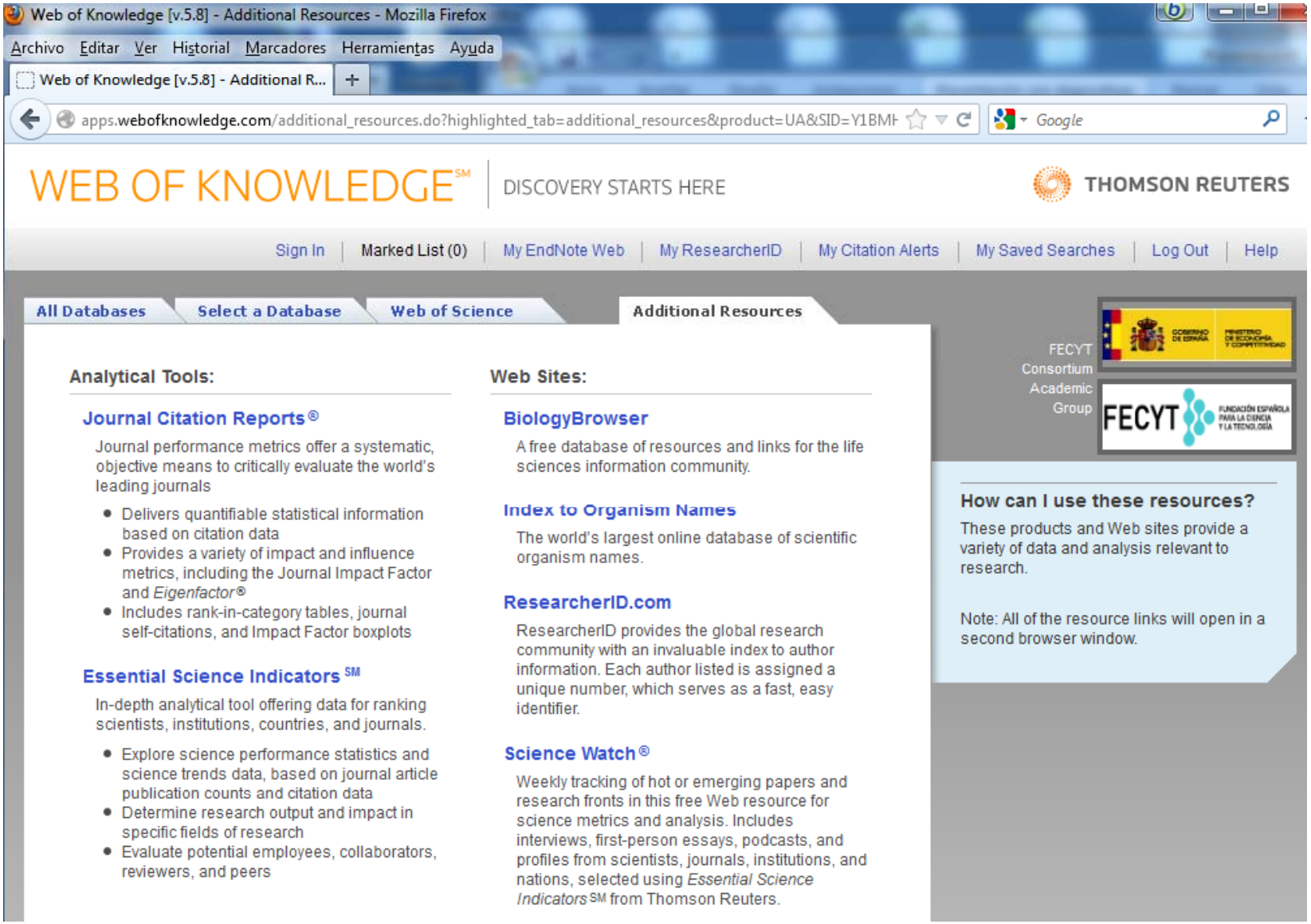
Journal Analysis: Some indices



Bibliometría/Cienciometría

Journal Citation Reports

ISI Web of Knowledge℠

Journal Citation Reports®

Y su indicador estrella el Factor de Impacto

Select a JCR edition and year:	Select an option:
JCR Science Edition 2012	View a group of journals by Subject Category
JCR Social Sciences Edition 2012	Search for a specific journal
	View all journals
SUBMIT	

Citation Analysis as a Tool in Journal Evaluation

Journals can be ranked by frequency and impact of citations for science policy studies.

Eugene Garfield

Also see: Citation frequency and citation impact -- and the role they play in journal selection for Current Contents and other ISI services.

(NOTE: The article reprinted here was referenced in the essay which begins on page 409 in Volume 1. Its inadvertent omission was discovered too late to include it at its proper location, immediately following the essay.)

Early Approaches: the Impact Factor

Eugene Garfield (Science, 1972) described the Impact Factor (IF) for journals:

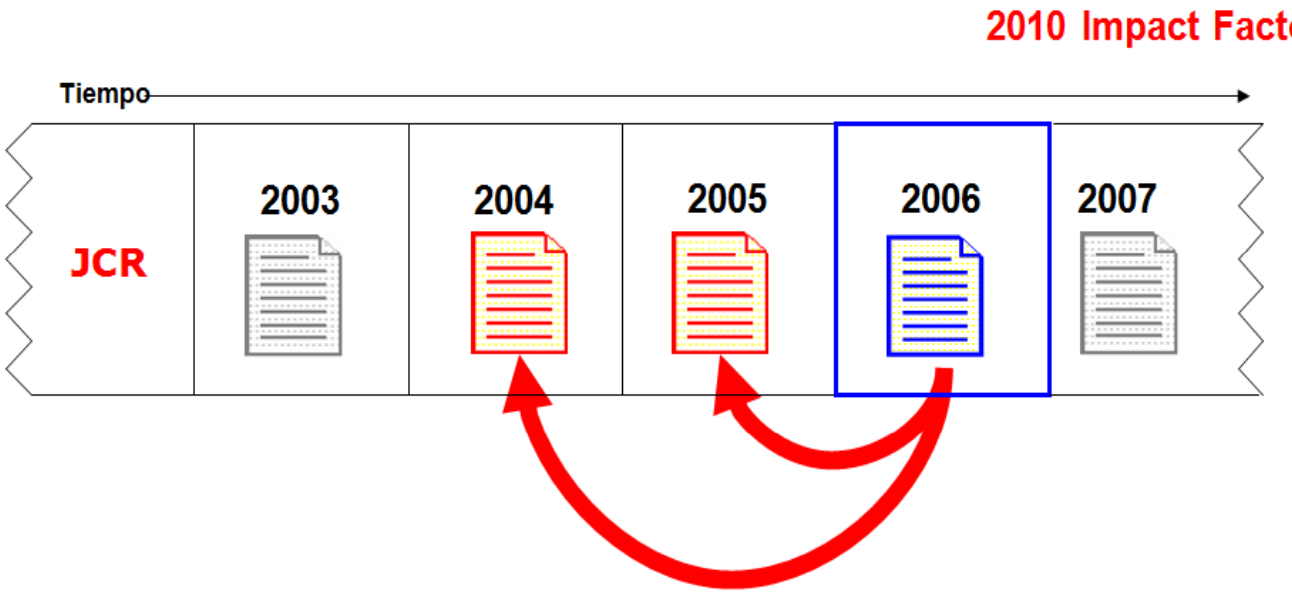
Impact factor for Journal X, 2009

- **A = # citations in all ISI articles during 2009 to papers published in X during 2007–2008**
- **B = # of articles published in X during 2007–2008**
- **Impact Factor = A/B**

The IF is computed from data gathered by Thomson Reuters (antiguo Institute for Scientific Information (ISI)), which publishes the Science Citation Index

THOMSON REUTERS

Early Approaches: the Impact Factor



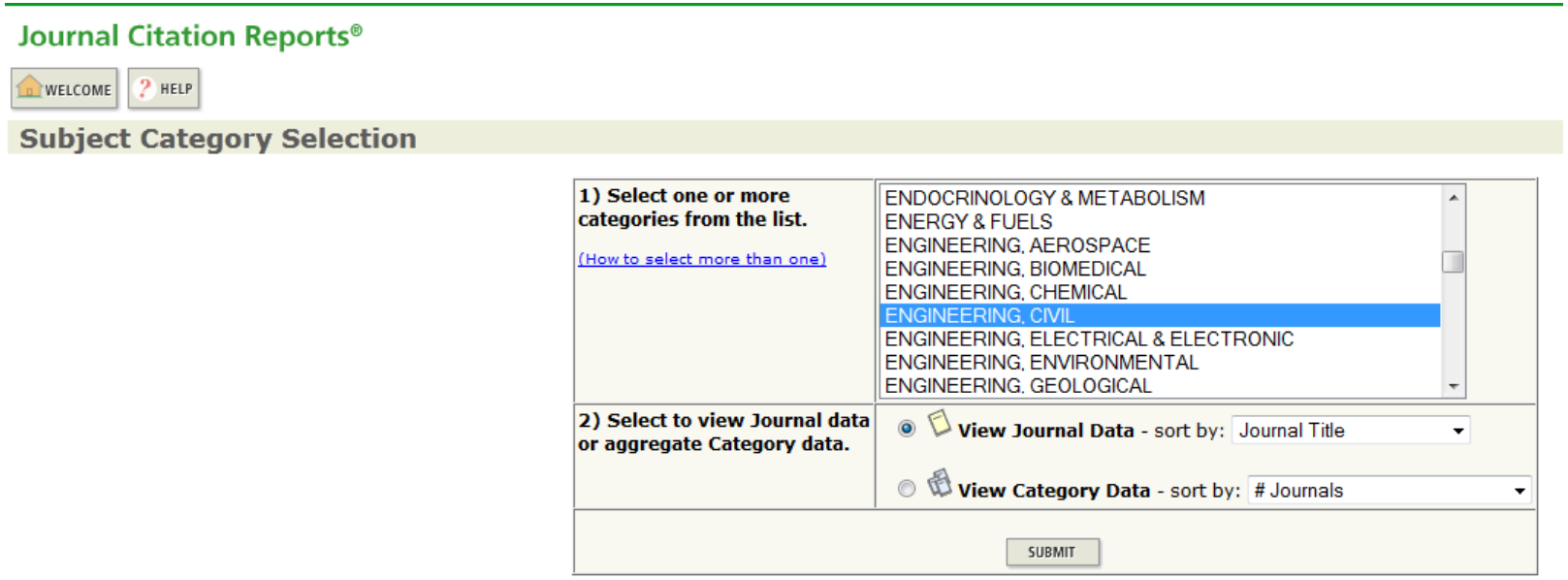
Número de citas recibidas en 2006 por los trabajos publicados en 2004 y 2005

Número de trabajos publicados en 2004 y 2005

Impact Factor = A/B

Bibliometría/Cienciometría

Journal Citation Reports



Bibliometría/Cienciometría

Journal Citation Reports

Journal Summary List

Journal Title

Journals from: subject categories ENGINEERING, CIVIL VIEW CATEGORY SUMMARY LIST

Sorted by: Impact Factor SORT AGAIN

Journals 1 - 20 (of 122) [1 | 2 | 3 | 4 | 5 | 6 | 7] Pa

MARK ALL UPDATE MARKED LIST

Ranking is based on your journal and sort selections.

Mark	Rank	Abbreviated Journal Title (linked to journal information)	ISSN	JCR Data						*Eigenfactor*® Metrics	
				Total Cites	Impact Factor	5-Year Impact Factor	Immediacy Index	Articles	Cited Half-life	*Eigenfactor*® Score	*Article Influence*® Score
☐	1	COMPUT-AIDED CIV INF	1093-9687	1315	4.460	3.326	0.623	53	5.0	0.00266	0.689
☐	2	J HAZARD MATER	0304-3894	46368	3.925	4.679	0.480	997	3.9	0.13651	1.015
☐	3	IEEE T INTELL TRANSP	1524-9050	2203	3.064	3.263	0.354	164	4.5	0.00510	0.699
☐	4	J HYDROL	0022-1694	25961	2.964	3.654	0.489	644	8.3	0.04608	1.134
☐	5	TRANSPORT RES B-METH	0191-2615	4064	2.944	3.520	0.347	101	9.4	0.00953	1.487
☐	6	STRUCT INFRASTRUCT E	1573-2479	644	2.805	2.470	0.200	85	2.9	0.00171	0.455
☐	7	ENERG BUILDINGS	0378-7788	7891	2.679	3.254	0.242	516	5.5	0.01650	0.742
☐	8	BUILD ENVIRON	0360-1323	7021	2.430	2.699	0.660	312	5.4	0.01907	0.736
☐	9	TRANSPORT RES E-LOG	1366-5545	1751	2.272	2.764	0.419	86	5.1	0.00692	1.077
☐	10	WATER RESOUR MANAG	0920-4741	3076	2.259	2.530	0.388	245	3.9	0.00829	0.556
☐	11	COAST ENG	0378-3839	3234	2.239	2.553	0.683	101	7.9	0.00714	0.923
☐	12	J CIV ENG MANAG	1392-3730	511	2.016		0.216	88	2.9	0.00121	
☐	13	STOCH ENV RES RISK A	1436-3240	1154	1.961	1.888	0.325	83	3.8	0.00366	0.522
☐	14	J HYDRO-ENVIRON RES	1570-6443	261	1.899	1.961	0.379	29	2.8	0.00180	0.810
☐	15	EARTHQ ENG STRUCT D	0098-8847	4249	1.898	2.168	0.260	131	>10.0	0.00867	1.042
☐	16	STRUCT SAF	0167-4730	1338	1.840	2.382	0.241	29	9.8	0.00417	1.250
☐	17	AUTOMAT CONSTR	0926-5805	1692	1.820	2.038	0.181	160	4.9	0.00388	0.449
☐	18	ENG STRUCT	0141-0296	6732	1.713	1.990	0.216	403	6.1	0.02229	0.782
☐	19	J WATER RES PL-ASCE	0733-9496	2185	1.709	1.757	0.101	69	9.6	0.00268	0.510
☐	20	TRANSPORTATION	0049-4488	1358	1.657	2.131	0.344	64	8.6	0.00328	0.850

Bibliometría/Cienciometría

Journal Citation Reports

Journal: COMPUTER-AIDED CIVIL AND INFRASTRUCTURE ENGINEERING

Mark	Journal Title	ISSN	Total Cites	Impact Factor	5-Year Impact Factor	Immediac
☐	COMPUT-AIDED CIV INF	1093-9687	1315	4.460	3.326	0.6

Cited Journal | Citing Journal | Source Data | Journal Self Cites

CITED JOURNAL DATA | CITING JOURNAL DATA | IMPACT FACTOR TREND | RELATED JOURNALS

Journal Information

Full Journal Title: COMPUTER-AIDED CIVIL AND INFRASTRUCTURE ENGINEERING
ISO Abbrev. Title: Comput.-Aided Civil Infrastruct. Eng.
JCR Abbrev. Title: COMPUT-AIDED CIV INF
ISSN: 1093-9687
Issues/Year: 10
Language: ENGLISH
Journal Country/Territory: UNITED STATES
Publisher: WILEY-BLACKWELL
Publisher Address: 111 RIVER ST, HOBOKEN 07030-5774, NJ,
Subject Categories: COMPUTER SCIENCE, INTERDISCIPLINARY APPLICATIONS SCOPE NOTE | VIEW JOURNAL SUMMARY LIST | VIEW CATEGORY DATA
CONSTRUCTION & BUILDING TECHNOLOGY SCOPE NOTE | VIEW JOURNAL SUMMARY LIST | VIEW CATEGORY DATA
ENGINEERING, CIVIL SCOPE NOTE | VIEW JOURNAL SUMMARY LIST | VIEW CATEGORY DATA
TRANSPORTATION SCIENCE & TECHNOLOGY SCOPE NOTE | VIEW JOURNAL SUMMARY LIST | VIEW CATEGORY DATA

Journal Rank in Categories: JOURNAL RANKING

Journal Impact Factor

Cites in 2012 to items published in: 2011 =173 2010 =215 Sum: 388
Number of items published in: 2011 =43 2010 =44 Sum: 87

Calculation: Cites to recent items 388 = **4.460**
Number of recent items 87

Bibliometría/Cienciometría

Journal Citation Reports

Web of Science®

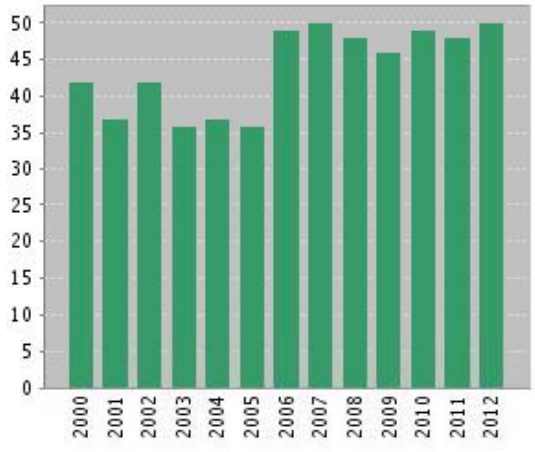
<< Back to previous page

Citation Report SO=(COMPUT-AIDED CIV INF)

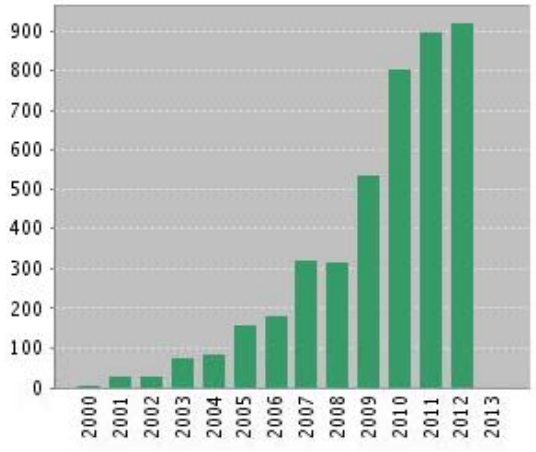
Timespan=All Years. Databases=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH.

This report reflects citations to source items indexed within Web of Science. Perform a Cited Reference Search to include citations to items not indexed within Web of Science.

Published Items in Each Year



Citations in Each Year



Results found:	**570**
Sum of the Times Cited [?]:	**4370**
Sum of Times Cited without self-citations [?]:	**3105**
Citing Articles[?]:	**2551**
Citing Articles without self-citations [?]:	**2340**
Average Citations per Item [?]:	**7.67**
h-index [?]:	**28**

Results: **570** Page 1 of 57 Go Sort by: Times Cited -- highest to lowest

Impact Factor is Heavily Criticized …

Few articles make the difference:

Philip Campbell – Editor-in-Chief of the journal Nature – concerned about IF's crudeness (ESEP, 2008):

> **The value of Nature's impact factor for 2004 was 32.2**
>
> **When he analyzed the citations of individual Nature papers over the relevant period (i.e., citations in 2004 of papers published in 2002 to 2003), he found that 89% of the impact factor was generated by just 25% of the papers!**

A journal can adopt editorial policies that increase its impact factor.

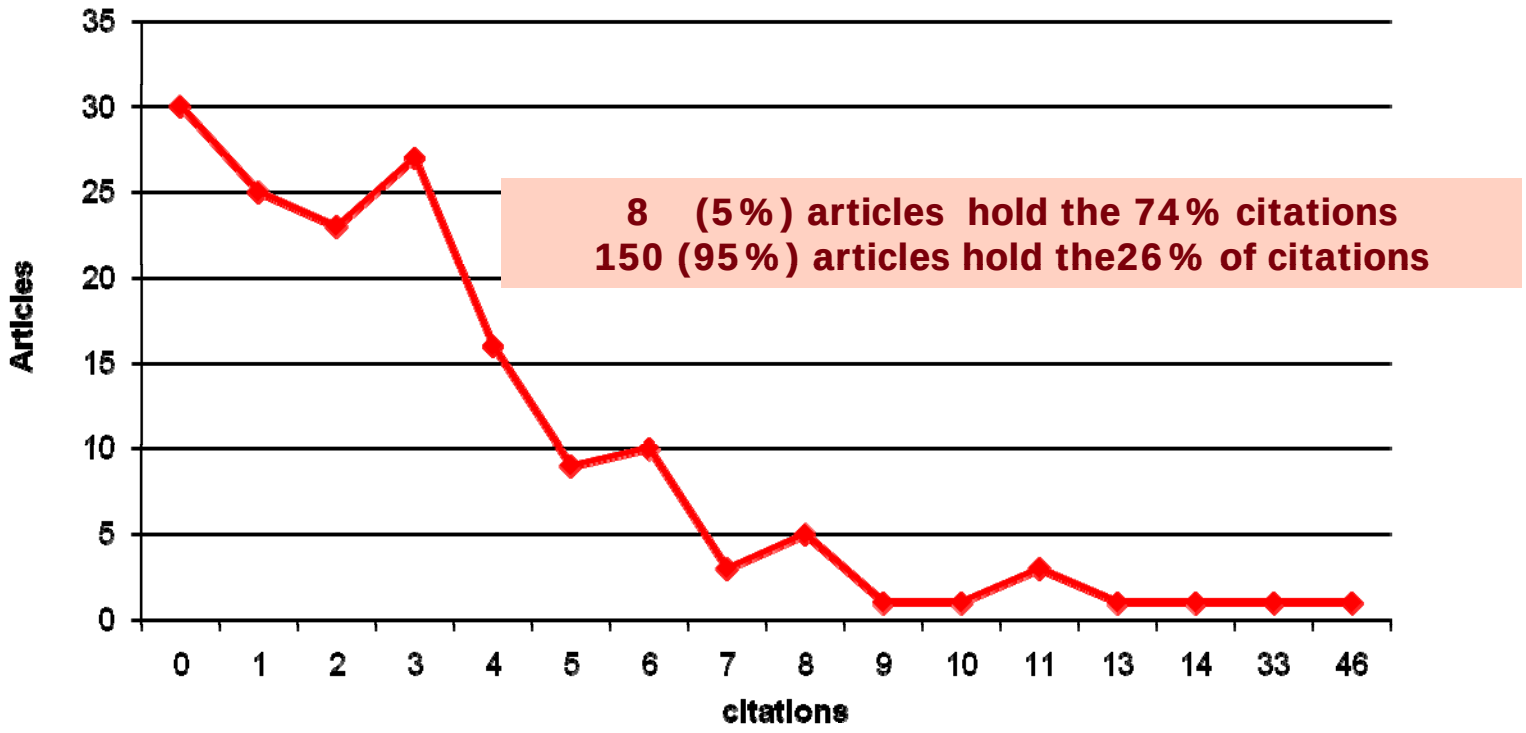
A critical analysis: M. Rossner, H. Van Epps, E. Hill.
Show me the data. The Journal of Cell Biology 179:6, December 17, 2007, 1091-1092.

"My question is: Are we making an impact?"

Warning

- The impact factor is an average value.
- The citation distribution is clearly asymmetric
- The impact factor associated to an article is not equivalent to the journal IF.

Example: Journal citations in 2007
International Journal of Nursing Studies



8 (5%) articles hold the 74% citations
150 (95%) articles hold the26% of citations

New proposals

SNIP: Source normalized impact per paper (Scopus) average of citations along 3 years divided by the relative database citation potential per area.

PageRank based algorithms

Eigen factor: (5 years window, without self-citation) (ISI)

SJR index: (3 years window, average by the number of documents) (Grupo SCImago, SCOPUS))

Article influence score: influence of Eigen factor per paper (similar to IF and SJR associated to papers average) (ISI)

Recent studies based on h-index

(Braun, T. Glaenzel W, Schubert A., 2005, A hirsch-type index for journals, The Scientist, 19:8)

Analysis of correlations:

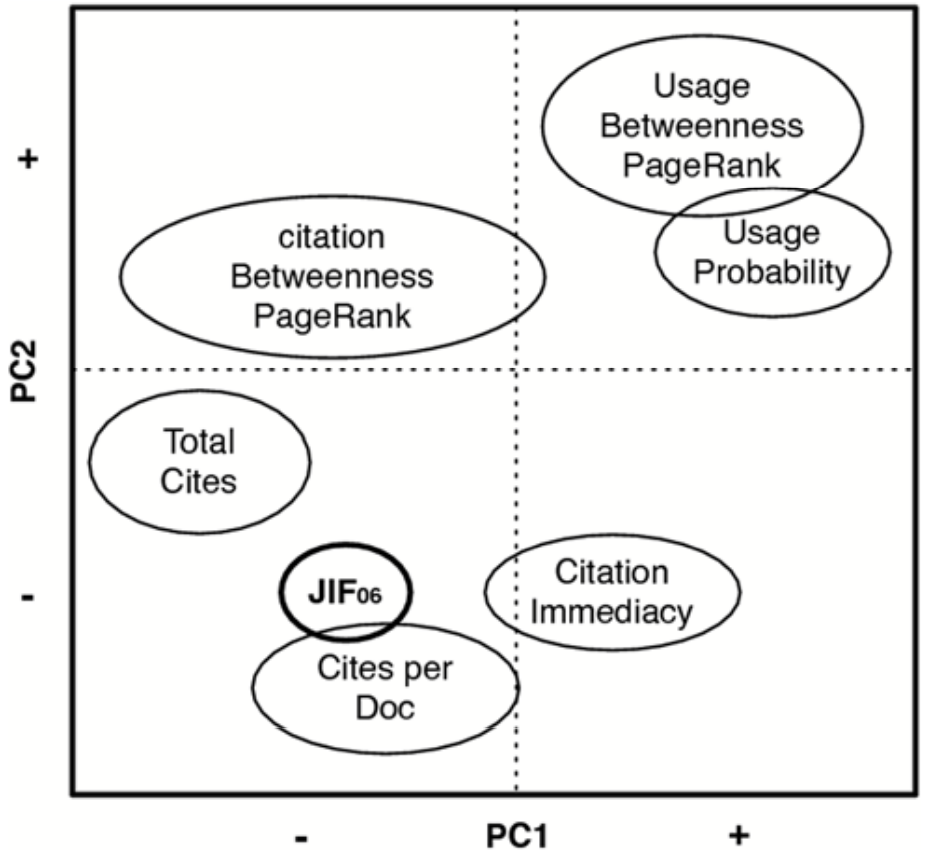
D. Torres-Salinas, E. Jiménez-contreras. Introducción y estudio comparativo de los nuevos indicadores de citación sobre revistas científicas en Journal Citation Reports y Scopus. El Profesional de la Información, v. 19, n. 2, marzo-abril 2010, 201-207.

New proposals and Studies

Analysis of correlations:
D. Torres-Salinas, E. Jiménez-contreras. Introducción y estudio comparativo de los nuevos indicadores de citación sobre revistas científicas en Journal Citation Reports y Scopus. El Profesional de la Información, v. 19, n. 2, marzo-abril 2010, 201-207.

Analysis of 39 Scientific Impact Measures, usage and citation measures.
PC1: Rapid vs Delayed
PC2: Popularity vs Prestige

J. Bollen, H. Van de Sompel, A. Hagberg, R. Chute.
A principal component analysis of 39 scientific impact measures. PLoS ONE (www.plosone.org), June 2009, 4:6, e6022



Scientometrics and Bibliometrics: Scientific Production Evaluation

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The h-index

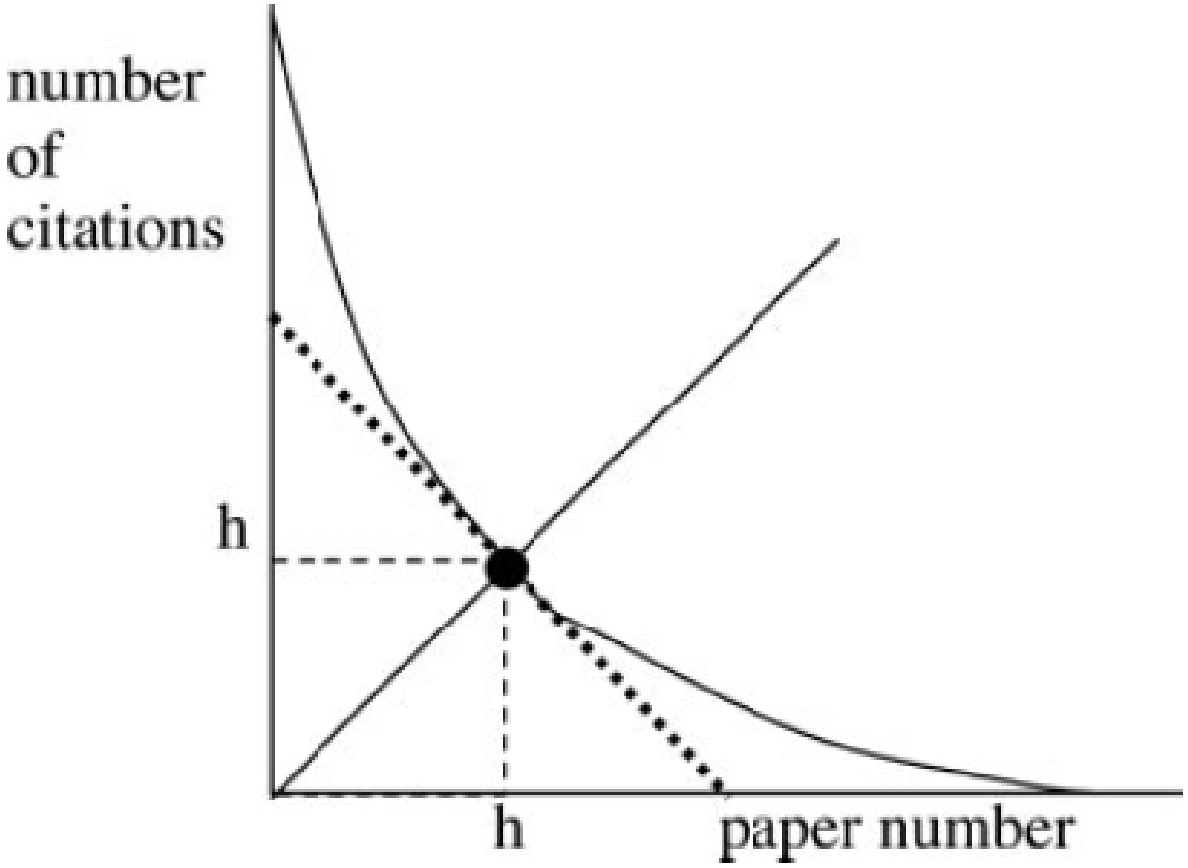
The h index was suggested by Jorge E. Hirsch, a physicist at UCSD, as a tool for determining theoretical physicists' relative quality and is sometimes called the *Hirsch index* or *Hirsch number*.

Hirsch, J. E. (2005). "An index to quantify an individual's scientific research output". *PNAS* 102 (46): 16569–16572. doi:10.1073/pnas.0507655102

"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."

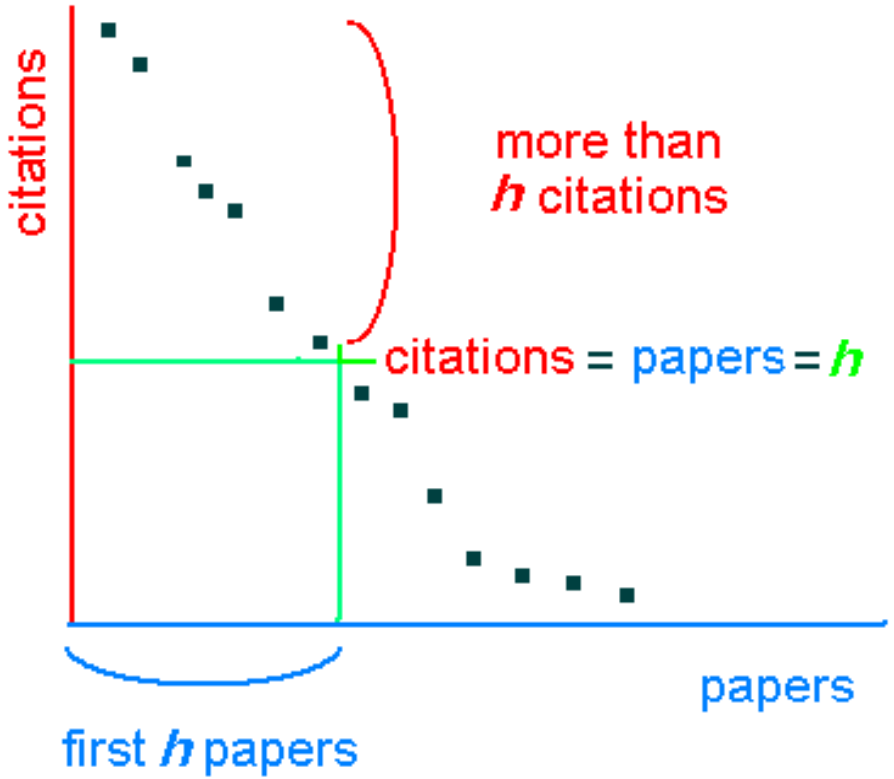
It aims to measure the cumulative impact of a researcher's output by looking at the amount of citation his/her work has received.

The h-index graphical ilustration



The intersection of the 45° line with the curve gives h

The h-index



Quantifies both the actual scientific **productivity** and the apparent scientific **impact** of a scientist

1	2	3	4	5	6	7	8	9	10	11
49	23	15	14	6	3	1	1	0	0	0

The h-index

It has attracted immense interest from scientists because of its claimed objectivity in ranking scientific achievement.

Advantages:

- **The *h*-index was intended to address the main disadvantages of other bibliometrics indicators, such as total number of papers or total number of citations.**

  The total number of papers does not account for the quality of scientific publications, whilst the total number of citations can be disproportionately affected by participation in a single publication of major influence.

- **The *h*-index is intended to quantify both the actual scientific productivity and the apparent scientific impact of a scientist.**

- **As you increase your *h*-index number, it becomes harder to increase it further.**

The h-index

Criticism:

- It is affected by limitations in citation data bases
- It does not account for the age of the articles and the age of citations
- It is a growing function over time
- Does not show scientist's inactivity or retirement
- Scientists with short scientific life are out of competition
- It does not account for the number of authors of a paper
- Self citations. Although this could easily be eliminated.
- Cross field comparison. Currently biologists have much higher h-indexes than physicists, simply because there are more scientists in that field. Moreover, citation patterns greatly vary from field to field.
- It does not account for confounding factors
  - practice of "gratuitous authorship"
  - the favorable citation bias associated with review articles

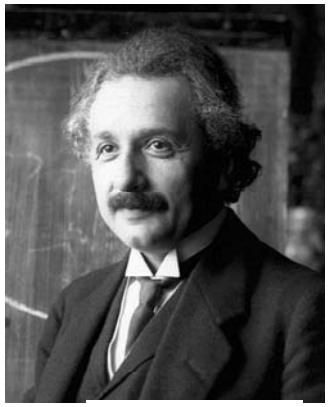
The h-index

Criticism:

- **The *h*-index is bounded by the total number of publications.**

  This means that scientists with a short career are at an inherent disadvantage, regardless of the importance of their discoveries.

For example, Évariste Galois' *h*-index is 2, and will remain so forever. Had Albert Einstein died in early 1906, his *h*-index would be stuck at 4 or 5.



The **Annus Mirabilis papers** (from Latin *annus mīrābilis*, "extraordinary year") are the papers of Albert Einstein published in the *Annalen der Physik* scientific journal in 1905. These four articles contributed substantially to the foundation of modern physics and changed views on space, time, and matter. The *Annus Mirabilis* is often called the "Miracle Year".

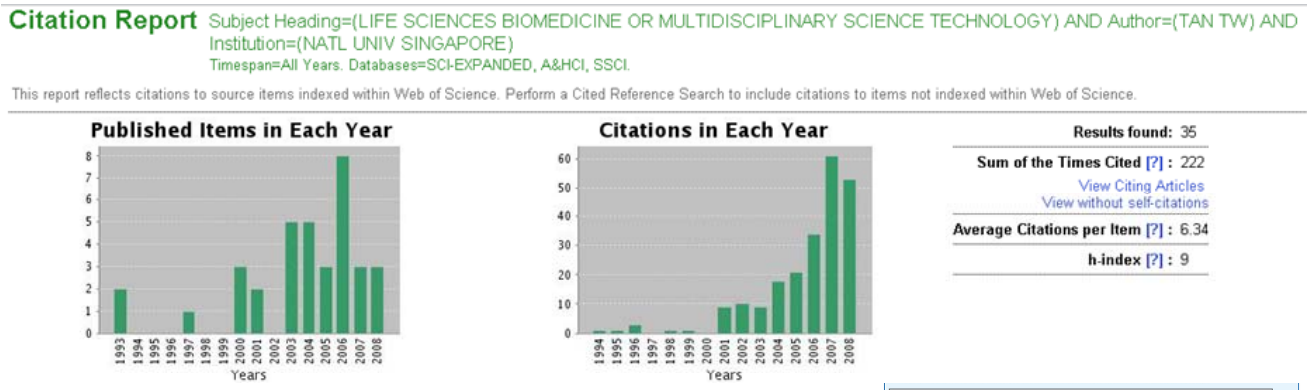
The h-index

Widely used, at the present and available in different tools:

ISI Web of Science

Scopus

Scholar google



Specific websites:

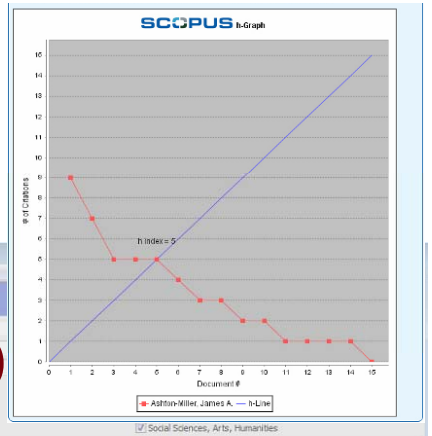
A long list of chemists with high h-index values

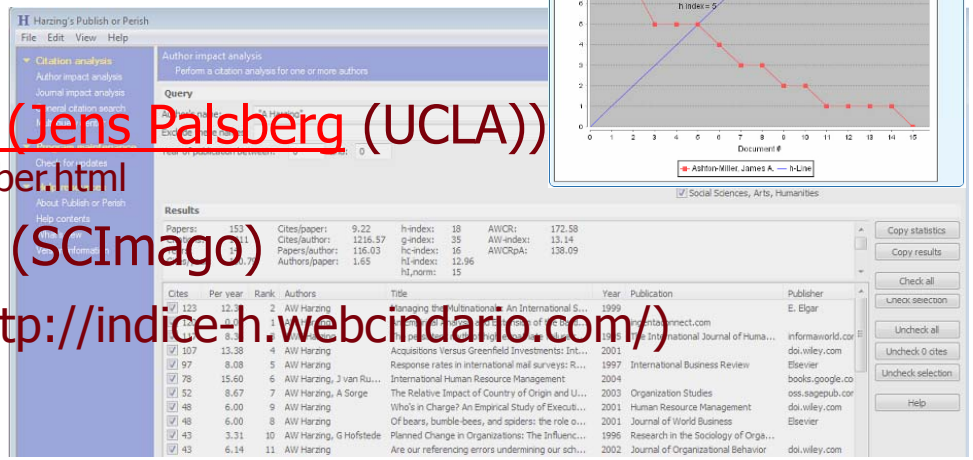
The H-index for economists

The H-index for computer science (Jens Palsberg (UCLA))
http://www.cs.ucla.edu/~palsberg/h-number.html

H-index for Journals and Countries (SCImago)

H-index for spanish researchers (http://indice-h.webcindario.com/)



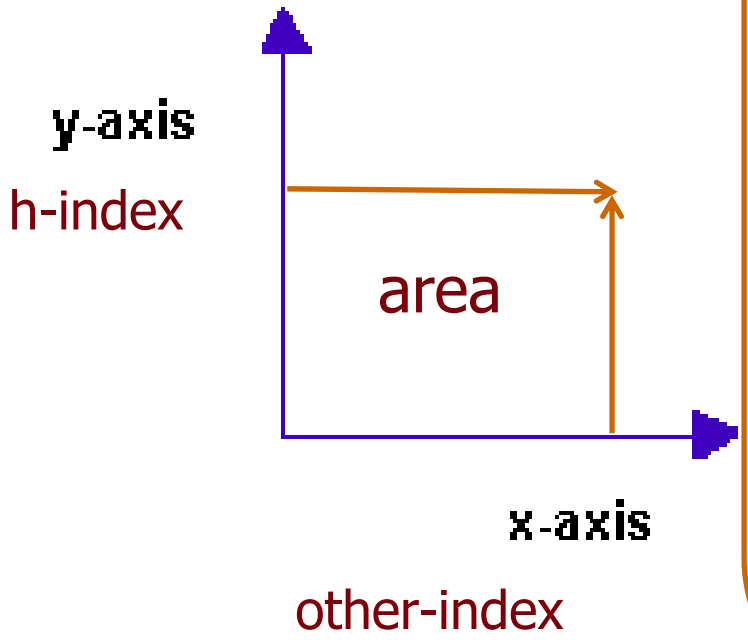


The h-index extensions

New indices based on h-index: Bidimensional indices

Multidimensional descriptors?
Lutz Bornmann, Swiss Federal Institute of Technology Zurich (ETH Zurich), JASIST 2008
Ramón Carbó-Dorca, Institut de Química Computacional, Girona), JMC, 2010

Proposals



Alonso S, Cabrerizo FJ, Herrera-Viedma E, Herrera F (2010) hg-index: A new index to characterize the scientific output of researchers based on the h- and g- indices. Scientometrics 82(2):391-400

$$hg = \sqrt{h \cdot g}$$

Cabrerizo FJ, Alonso S, Herrera-Viedma E, Herrera F (2009) q^2-Index: Quantitative and Qualitative Evaluation Based on the Number and Impact of Papers in the Hirsch Core. Journal of Informetrics 4(1):23-28

$$q^2 = \sqrt{h \cdot m}$$

Jin BH, Liang LM, Rousseau R, Egghe L (2007) The R- and AR-indices: Complementing the h-index. Chinese Science Bulletin 52(6):855-863.

$$R = \sqrt{\sum_{j=1}^{h} cit_j}$$

Standarization of the h-index for comparing scientific that work in different scientific fields

Iglesias JE, Pecharromán C (2007) Scaling the h-index for different scientific ISI fields. Scientometrics 73:(3):303-320, doi: 10.1007/s11192-007-1805-x

Table 2. Normalization factor for the ISI Fields of Science, relative to the field "Physics". To put *h*-indices of different fields in a common scale, multiply by f_i, the tabulated value. The first column gives f_i values calculated from a power-law Zipf plot (for comparison of authors having different number of papers, see text). The remaining columns give correction factors computed under the assumption that the citation distribution function is a stretched exponential, for comparison of authors having a similar number of published papers

		Stretched Exponential			
ISI Fields	Power Law	100 papers	200 papers	500 papers	1000 papers
Agricultural Sciences	1.27	1.20	1.24	1.30	1.35
Biology & Biochemistry	0.60	0.77	0.73	0.68	0.64
Chemistry	0.92	0.95	0.94	0.93	0.92
Clinical Medicine	0.76	0.86	0.83	0.80	0.77
Computer Science	1.75	1.97	–	–	–
Economics & Business	1.32	1.23	1.28	1.36	1.42
Engineering	1.70	1.79	–	–	–
Environment/Ecology	0.88	0.93	0.92	0.90	0.88
Geosciences	0.88	0.93	0.91	0.89	0.88
Immunology	0.52	0.73	0.68	0.63	0.58
Materials Science	1.36	1.29	1.35	1.44	–
Mathematics	1.83	–	–	–	–
Microbiology	0.63	0.79	0.75	0.71	0.67
Molecular Biology&Genetics	0.44	0.68	0.64	0.57	0.53
Neuroscience&Behavior	0.56	0.75	0.71	0.66	0.62
Pharmacology&Toxicology	0.84	0.90	0.89	0.86	0.85
Physics	1.00	1.00	1.00	1.00	1.00
Plant & Animal Science	1.08	1.05	1.06	1.07	1.08
Psychiatry/Psychology	0.88	0.93	0.91	0.90	0.88
Social Sciences, general	1.60	1.58	1.72	–	–
Space Science	0.74	0.85	0.82	0.79	0.76

Example.
Biology: 20 -> 12
CS: 7 -> 12
Physics: 12

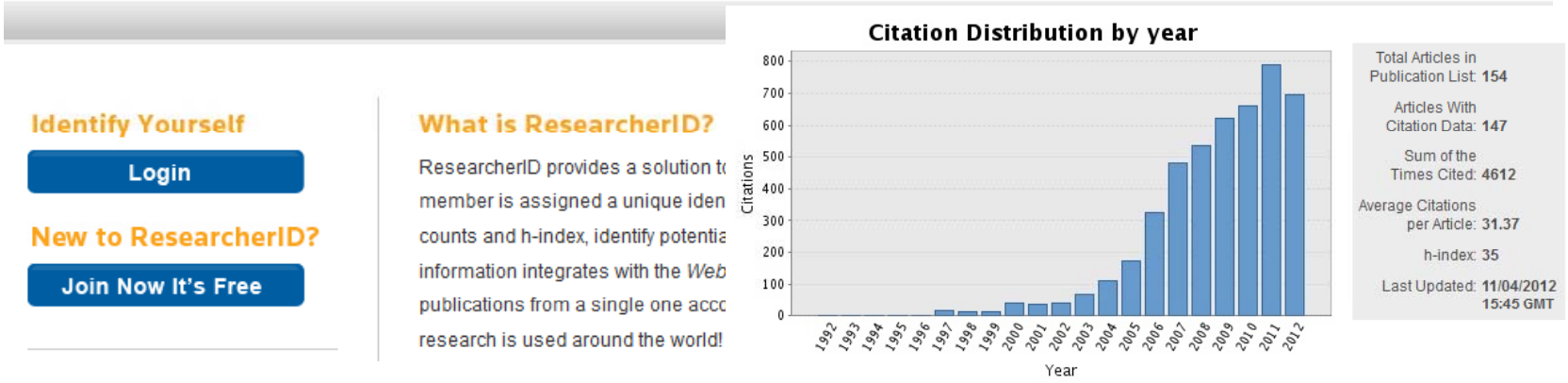
Two tools to obtain the h-index in two databases Web of Sciences and Scholar Google

Incluyen un identificador personal

RESEARCHERID

http://www.researcherid.com

THOMSON REUTERS

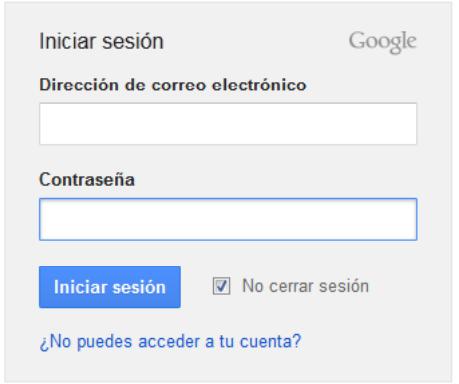


Google académico

Google http://scholar.google.com/citations

CREAR CUENTA

	Total	Desde 2007
Citas	6852	3555
Índice h	38	29
Índice i10	88	58



More extensions to the h-index …

Can be extended to measure the performance of:

- **Journals**
- **Research groups**
- **Universities/institutions**
- **Countries**

Example: the h-index of a specific department equals h if

h of the N_p faculty members have a value of h as h-index, and

the rest (N_p−h) faculty members have no more than h value as h-index

More extensions to the h-index …

A review

New indices based on h-index, computation, analysis, …

http://sci2s.ugr.es/hindex/

S. Alonso, F.J. Cabrerizo, E. Herrera-Viedma, F. Herrera,
h-index: A Review Focused in its Variants, Computation and Standardization for Different Scientific Fields.
Journal of Informetrics 3:4 (2009) 273-289, doi:10.1016/j.joi.2009.04.001

Scientometrics and Bibliometrics: Scientific Production Evaluation

Introduction

Journal Analysis: Some indices

H-index: A debate on the most popular index

Universities ranking indices

Spanish Univeristies analysis

Final Comments

Various academic rankings

ARWU or Shanghai Ranking

http://www.shanghairanking.com/

NTU Ranking (National Taiwan University)

Previous: HEEACT (Higher Education Evaluation & Accreditation Council of Taiwan)

http://nturanking.lis.ntu.edu.tw/

***The QS* World University Rankings™**

http://www.topuniversities.com/university-rankings

Times Higher Education World University Rankings

http://www.timeshighereducation.co.uk/world-university-rankings/

SCIMAGO Institutions Rankings

http://www.scimagoir.com/

CWTS University Ranking (Leiden ranking)

http://www.leidenranking.com/

Ranking ISI de Universidades

http://rankinguniversidades.es/

Composition of Shanghai ranking

ARWU-2013 Top 500: http://www.shanghairanking.com/

Ranking Methodology

10%: Quality of Education: Nobel prizes and fields medals by alumni

20%: Quality of Faculty: Nobel prizes and field medals by staff

20%: Quality of Faculty: Highly cited staff in 21 disciplines

20% Research Output: Articles published in Nature & Science

20%: Research Output: Articles published in citation indexes

10%: Per capita performance on those indicators

Domingo Docampo. Reproducibility of the Shanghai academic ranking of world universities results,
Scientometrics February 2013, Volume 94, Issue 2, pp 567-587

ARWU-2013 Top 500: http://www.shanghairanking.com/

World Rank	Institution*	Country /Region	National Rank	Total Score	Score on PUB
1	Harvard University		1	100	100
2	Stanford University		2	72.6	69.4
3	University of California, Berkeley		3	71.3	68.1
4	Massachusetts Institute of Technology (MIT)		4	71.1	60.1
5	University of Cambridge		1	69.6	66.2
6	California Institute of Technology		5	62.9	45.2
7	Princeton University		6	61.9	44
8	Columbia University		7	59.8	68
9	University of Chicago		8	57.1	49.8
10	University of Oxford		2	55.9	69.9
11	Yale University		9	55.4	62.4
12	University of California, Los Angeles		10	52.9	71.2
13	Cornell University		11	50	55.2
14	University of California, San Diego		12	49.9	63.4
15	University of Pennsylvania		13	49.6	66.7
16	University of Washington		14	48.3	70.8
17	The Johns Hopkins University		15	46.9	68.8
18	University of California, San Francisco		16	46.2	59.3
19	University of Wisconsin - Madison		17	44.9	63.3
20	Swiss Federal Institute of Technology Zurich		1	43.5	54.7
21	The University of Tokyo		1	43	72.2
21	University College London		3	43	67.5
23	University of Michigan - Ann Arbor		18	42.6	75.7

Academic Ranking of World Universities
ACADEMIC RANKING OF WORLD UNIVERSITIES
SINCE 2003

ARWU-2013 Top 500: http://www.shanghairanking.com/

Academic Ranking of World Universities 2013

Spain

Country Rank	Institution	World Rank
1-4	Autonomous University of Barcelona	201-300
1-4	Autonomous University of Madrid	201-300
1-4	Complutense University of Madrid	201-300
1-4	University of Barcelona	201-300
5-8	Polytechnic University of Valencia	301-400
5-8	University of Granada	301-400
5-8	University of Pompeu Fabra	301-400
5-8	University of Valencia	301-400
9-10	University of the Basque Country	401-500
9-10	University of Zaragoza	401-500

ARWU-2013 Top 500: http://www.shanghairanking.com/

ARWU	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Institutional Ranking	401-500	404-502	401-500	401-500	403-510	402-503	402-501	401-500	401-500	401-500	301-400

Composition of Shanghai ranking

ARWU Top 200: http://www.shanghairanking.com/

Ranking Methodology - Subject fields

10%: Quality of Education: Nobel prizes, fields medals and Turing awards by alumni since 1951

15%: Quality of Faculty: Nobel prizes, fields medals and Turing awards by staff since 1951

25%: Quality of Faculty: Highly cited staff in 21 disciplines

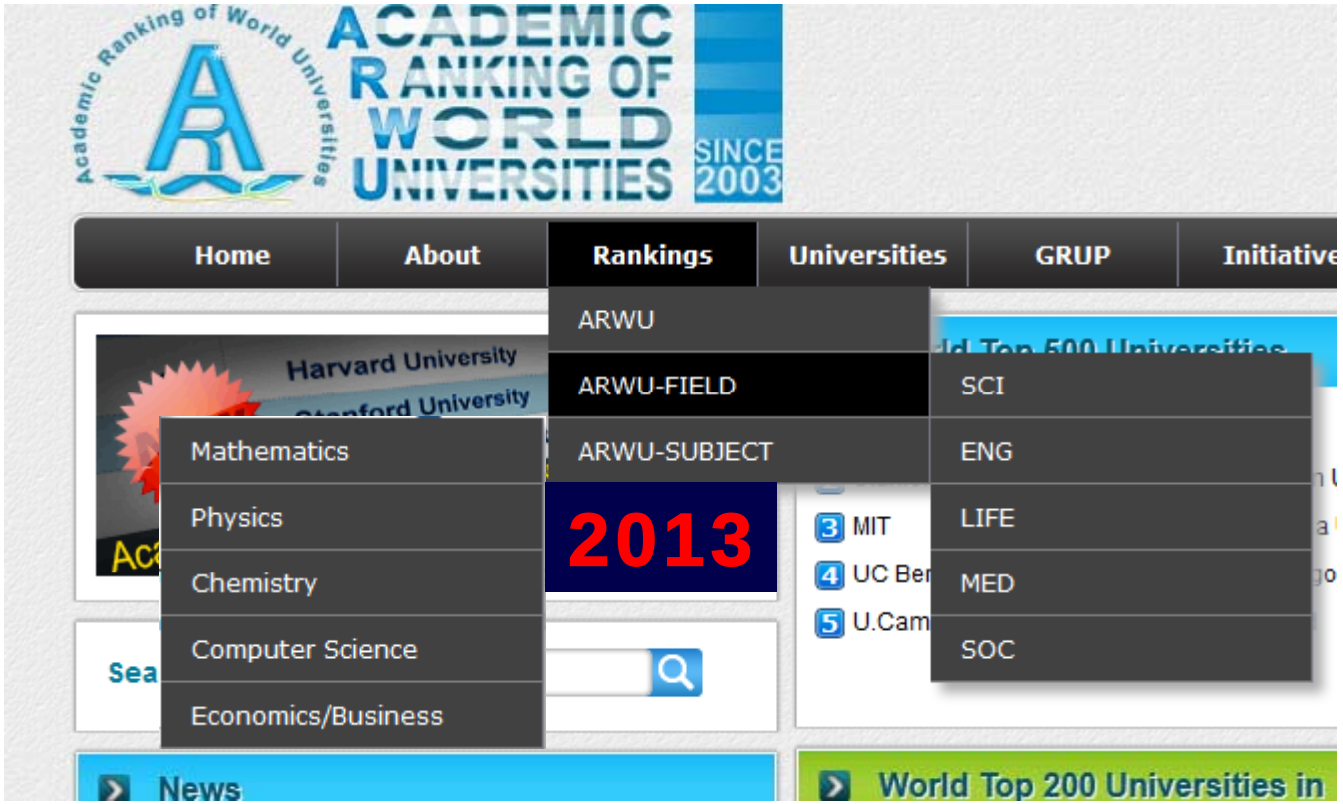
25%: Research Output: Articles published in citation indexes in the area (last two years, 2007-2008)

25%: Research Output: Percentage of articles published in Top 20% journals JCR-2008 in the area

For each indicator, the highest scoring institution is assigned a score of 100, and other institutions are calculated as a percentage of the top score.

Composition of Shanghai ranking

http://www.shanghairanking.com/



ARWU-2013 Top 500: http://www.shanghairanking.com/

2013 University of Granada

Performance in Academic Ranking of World Universities by Broad Subject Fields							
Broad Subject Fields	2007	2008	2009	2010	2011	2012	2013
Natural Sciences and Mathematics (SCI)	/	/	/	/	/	/	/
Engineering/Technology and Computer Sciences (ENG)	/	/	/	/	/	/	151-200
Life and Agriculture Sciences (LIFE)	/	/	/	/	/	/	/
Clinical Medicine and Pharmacy (MED)	/	/	/	/	/	/	/
Social Sciences (SOC)	/	/	/	/	/	/	/

Performance in Academic Ranking of World Universities by Subject Fields					
Subject Fields	2009	2010	2011	2012	2013
Mathematics	/	/	/	101-150	101-150
Physics	/	/	/	/	/
Chemistry	/	/	/	/	/
Computer Science	/	/	/	101-150	76-100
Economics/Business	/	/	/	/	/

NTU Ranking (Taiwan ranking)

http://nturanking.lis.ntu.edu.tw/Default.aspx

TOP UNIVERSITIES

1. Harvard University
2. Johns Hopkins University
3. Stanford University
4. University of Washington - Seattle
5. University of California - Los Angeles
6. University of California - Berkeley
7. University of Michigan - Ann Arbor
8. University of Toronto
9. University of Oxford
10. Massachusetts Institute of Technology
11. Columbia University
12. University of Pennsylvania
13. University of California - San Diego
14. University of Cambridge
15. University of California - San Francisco
16. University of London - University College London
17. Duke University
17. The University of Tokyo
19. Yale University
20. Imperial College London

(More...)

RANK BY FIELD

- Agriculture
- Clinical Medicine
- Engineering
- Life Sciences
- Natural Sciences
- Social Sciences

RANK BY SUBJECT

- Agricultural Sciences
- Chemical Engineering
- Chemistry
- Civil Engineering
- Computer Science
- Environment/Ecology
- Electrical Engineering
- Geoscience
- Materials Science
- Mathematics
- Mechanical Engineering
- Pharmacology & Toxicology
- Physics
- Plant & Animal Science

NTU Ranking (Taiwan ranking)

Indicators (back to top)

http://nturanking.lis.ntu.edu.tw/Default.aspx

The 2013 performance measures are composed of eight indicators. The indicators together represent three different criteria of scientific paper performance: research productivity, research impact, and research excellence. Table 1 lists the indicators and shows the respective weightings for each indicator.

Table 1 The Criteria, Indicators, and Their Respective Weightings Used for the Overall Performance Based Ranking

Criteria	2013 Overall Performance Indicators	Weighting	
Research productivity	The number of articles of the last 11 years* (2002-2012)	10%	25%
	The number of articles of the current year (2012)	15%	
Research impact	The number of citations of the last 11 years* (2002-2012)	15%	35%
	The number of citations of the last 2 years (2011-2012)	10%	
	The average number of citations of the last 11 years* (2002-2012)	10%	
Research excellence	The h-index of the last 2 years (2011-2012)	10%	40%
	The number of Highly Cited Papers (2002-2012)	15%	
	The number of articles of the current year in high-impact journals (2011-2012)	15%	

*Note: Part of the data derived in this study is extracted from ESI databse, which includes data from the previous 11 years. Thus, the timeframe for long-term indicator in this study is 11 year.

NTU Ranking (Taiwan ranking)

2013 - Overall Ranking : Top Universities in Spain

http://nturanking.lis.ntu.edu.tw/Default.aspx

Show 25 per page *It is available to click title buttons for arranging the criteria in order.

World Rank	Country Rank	University	Total Score hide	Ref. Rank (normalized by number of faculty)
89	1	University of Barcelona	60.8	104
169	2	Autonomous University of Barcelona	54.8	203
214	3	Autonomous University of Madrid	53.0	241
224	4	University of Valencia	52.4	264
259	5	Complutense University of Madrid	50.9	370
267	6	University of Granada	50.7	322
369	7	University of Oviedo	48.2	381
378	8	University of Santiago de Compostela	47.9	394
392	9	University of Zaragoza	47.7	466
421	10	University of the Basque Country	47.1	-
434	11	Universidad de Sevilla	47.0	-
446	12	Polytechnic University of Valencia	46.8	-
463	13	Universitat Pompeu Fabra	46.6	-
479	14	Universidad de Cantabria	46.4	-

NTU Ranking (Taiwan ranking)

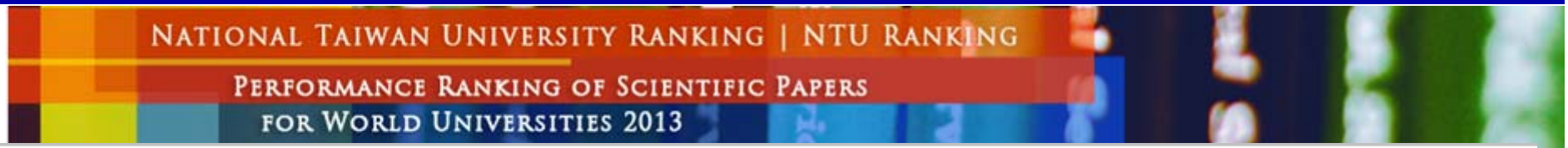
2013 - Civil Engineering

Rank By Continent/Country

Show 25 per page *It is available to click title buttons for arranging the criteria in order.

World Rank	University	Total Score details
1	University of California- Berkeley	90.6
2	Swiss Federal Institute of Technology - Zurich	84.6
3	Tsinghua University	84.3
4	Hong Kong Polytechnic University	82.8
5	Delft University of Technology	82.1
6	Technical University of Denmark	78.6
7	Georgia Institute of Technology	76.1
8	University of Toronto	75.9
9	Tongji University	74.9
10	Zhejiang University	74.2
10	Stanford University	74.2
12	Texas A&M University- College Station	73.4
13	University of Queensland	72.2
14	Dalian University of Technology	70.5
15	University of Illinois- Urbana-Champaign	70.3
16	National Taiwan University	69.9
17	National University of Singapore	69.7
18	The University of Texas- Austin	69.4
19	Imperial College London	69.2
20	Nanyang Technological University	68.0

NTU Ranking (Taiwan ranking)



2013 - Civil Engineering : **Top Universities in Spain**

Back To Civil Engineering

Show 25 per page *It is available to click title buttons for arranging the criteria in order.

World Rank	Country Rank	University	Total Score hide
47	1	Polytechnic University of Catalonia	62.9
79	2	University of Barcelona	57.1
116	3	University of Girona	54.5
139	4	Autonomous University of Barcelona	53.3
183	5	Polytechnic University of Valencia	51.6
195	6	University of Granada	51.2
195	6	Universidad de Sevilla	51.2
195	6	University of Santiago de Compostela	51.2
230	9	Universidad de Cantabria	49.6
234	10	Complutense University of Madrid	49.4
234	10	Universidad Politecnica de Madrid	49.4
234	10	University of Castilla-La Mancha	49.4
288	13	Autonomous University of Madrid	47.9

Rankings I-UGR de Universidades Españolas según Campos y Disciplinas Científicas

Rankings I-UGR de Universidades Españolas según Campos y Disciplinas Científicas (4ª Ed. 2013)

inicio
equipo
método
prensa
papers
Shanghai

EC3metrics

Campos

Ciencias Agrarias
2008-2012
Enviar

Disciplinas

Actividad física y Deporte
2008-2012
Enviar

Consultar el perfil de una universidad

Comparación entre universidades

English Version (PDF)

Documento con resumen de posiciones 2013 (PDF)

Se presenta la 4ª edición (Mayo 2013) de los "Rankings I-UGR de Universidades Españolas según Campos y Disciplinas Científicas" Nota. Se trata de un ranking de las universidades españolas públicas y privadas basado en la investigación publicada en las revistas internacionales de mayor impacto y visibilidad. Este ranking se diferencia de otros en cuatro aspectos fundamentales:

- Se organiza por campos (12) y por disciplinas científicas (37), cuyo número se ha incrementado en esta edición. De esta forma no se presenta por grandes ramas de conocimiento que diluyen los distintos perfiles de investigación que exhiben las universidades, de manera que pueda captarse mejor en qué especialidades son más activas e influyentes.
- Propone un método de ordenación que sintetiza 6 indicadores bibliométricos de producción e impacto que miden los aspectos cualitativos y cuantitativos de la producción científica de las universidades.
- Emplea como fuente de información las bases de datos de Thomson-Reuters (antiguo ISI) Web of Science y Journal Citation Reports. Dichos productos son una selección de las mejores revistas a nivel mundial y son una referencia básica de las agencias de evaluación del rendimiento investigador a nivel internacional y nacional (CNEAI, ANECA).
- Se utilizan series temporales amplias: un periodo de diez años (2003-2012) y un periodo de cinco años (2008-2012). Se intenta con ello dotar de estabilidad a los resultados y detectar posibles cambios en la actividad científica.

POWERED BY THOMSON REUTERS

Anteriormente llamado

A new ranking of Spanish Universities ¿why?

1. We propose a new measure (IFQ^{2}A-INDEX) that synthesizes 6 bibliometric indicators measuring qualitative and quantitative aspects of the scientific production of Spanish universities.

2. Actually don´t exist any ranking product in Spain that uses exclusively Thomson Reuters products. We use Web of Science and Journal Citation Reports, these products are a selection of the best scientific journals worldwide and basic reference database for evaluation agencies in Spain as CNEAI or ANECA.

3. Most rankings do not take into account the specialization of the universities or analyzed disciplines too broad so that in this new ranking we provide the results in 12 different scientific fields.

I-UGR Rankings of the Spanish universities by scientific fields: The IFQ^{2}A - Index

A new ranking of Spanish Universities ¿why?

1. We present a ranking of public and private Spanish universities **based on research** published in scientific with international visibility. Therefore reflect universities with the best research performance don't reflect others aspect as teaching.

2. Its main objective is to discover the strengths and weaknesses of the Spanish university research system in different **scientific fields**.

3. Results are presented in **two different time frames**: a ten-year period (2002-2011) and a period of five years (2007-2011).

4. We called this new product as "**Rankings I-UGR de las Universidades Españolas según Campos y Disciplinas Científicas**" (previous "**Rankings ISI**")

I-UGR Rankings of the Spanish universities by scientific fields: The IFQ^{2}A - Index

Definition of IFQ²A-INDEX

The indicator designed to rank the institutions is called the IFQ²A-index:

Institutional Field Quantitative-Qualitative Analysis Index

The IFQ²A-index can be formally defined as a bidimensional bibliometric measure to compare and rank the scientific productions and their impact of different institutions in a given field. This indicator considered two dimensions:

- **QuaNtitative Institution-Field index (QNIF)**
- **QuaLitative Institution-Field index (QLIF)**

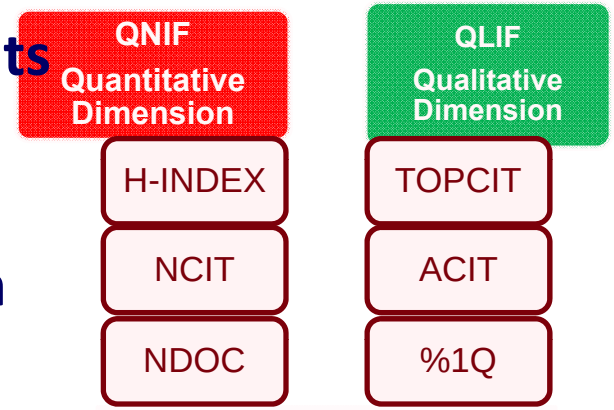
I-UGR Rankings of the Spanish universities by scientific fields: The IFQ²A - Index

Indicators

We have used six bibliometric measures to compute the two partial indices QNIF (Quantitative Dimension) and QLIF (Qualitative Dimension)

- **NDOC**: Number of citable items (article, review, procedings, letters) indexed in Journal Citation Journals.
- **NCIT**: Number of citations received by all citable documents
- **H-INDEX**: h-index, as proposed by Hirsch

- **TOPCIT**: Ratio of highly cited documents
- **ACIT**: Average number of citations received by all citable documents
- **%1Q**: Ratio of documents published in journals in the top JCR quartile



Correlation

Both QNIF and QLIF correlate strongly with the indicators that compose them (which shows they manage to synthesize the information of three indicators each); but the correlation between them (QNIF against QLIF) is extremely low, proving they are independent and thus the IFQ2A-index is a truly bidimensional measure.

Correlation analysis of the Quantitative Dimension and Qualitative Dimension with the rest of the indicators

		NDOC	*NCIT*	*H*	*1Q*	*ACIT*	*TCIT*	*QNIF*	*QLIF*
QuaNtitative Institution-Field index	QNIF	*0,959*	*0,972*	*0,923*	0,099	0,414	0,394	1,000	0,367
QuaNtitative Institution-Field index	QLIF	0,133	0,440	0,582	*0,836*	*0,863*	*0,914*	0,367	1,000

I-UGR Rankings of the Spanish universities by scientific fields: The IFQ²A - Index

Final computation

Thus once the indicators have been selected and defined all the indicators use in quantitative and qualitative dimensions are subsequently normalized in setting the highest value to 1, and the rest proportionally. QNIF (Quantitative Dimension) and QLIF (Qualitative Dimension) are respectively calculated as:

$$QNIF = \sqrt[3]{DOC\ X\ NCIT\ X\ H}$$

$$QLIF = \sqrt[3]{1Q\ X\ ACIT\ X\ TCIT}$$

We can define an index that aggregates the two previous ones as a hypervolume measure (the surface area associated to both indices, the area under the position in the map)

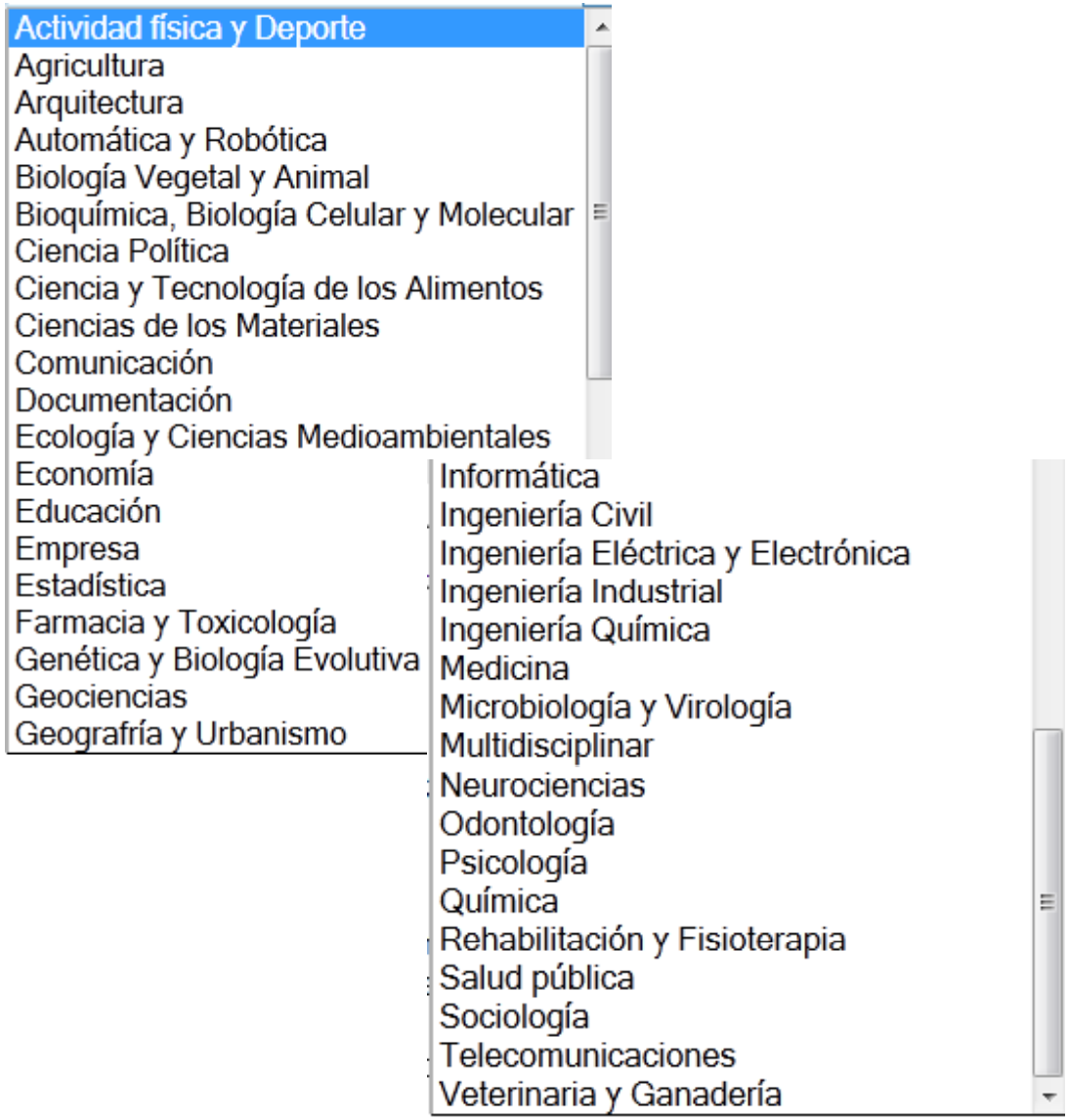
$$IFQ^2A = QNIF\ X\ QNIF$$

ISI Rankings of the Spanish universities by scientific fields: The IFQ²A - Index

Scientific Fields

First: we stablished 12 scientific fields

- **Mathematics**
- **Physics**
- **Chemistry**
- **Biological Sciences**
- **Clinical Medicine, Pharmacy & Pharmacology**
- **Earth & Enviromental Sciences**
- **Agricultural Sciences**
- **Engineering**
- **Information & Communication Technologies**
- **Economics**
- **Psychology & Education**
- **Others Social Sciences**



Scientific Fields

Second: The *Journal Citation Reports (JCR)* categories (228) and therefore its journals were assigned to each of the 12 scientific fields. Example:

JCR Categories
OPERATIONS RESEARCH & MANAGEMENT SCIENCE
MATHEMATICAL & COMPUTATIONAL BIOLOGY
STATISTICS & PROBABILITY
MATHEMATICS, INTERDISCIPLINARY APPLICATIONS
MATHEMATICS, APPLIED
MATHEMATICS

→ MATHEMATHICS

Física: PHYSICS, MULTIDISCIPLINARY; THERMODYNAMICS; MECHANICS; PHYSICS, NUCLEAR; PHYSICS, PARTICLES & FIELDS; PHYSICS, MATHEMATICAL; PHYSICS, CONDENSED MATTER; PHYSICS, APPLIED; OPTICS; ASTRONOMY & ASTROPHYSICS; PHYSICS, ATOMIC, MOLECULAR & CHEMICAL; SPECTROSCOPY; PHYSICS, FLUIDS & PLASMAS; ACOUSTICS

rankings I-UGR

POWERED BY THOMSON REUTERS

Anteriormente llamado rankings ISI

Website: http://www.rankinguniversidades.es/

Ingeniería Civil / 2008-2012

Ver indicadores

Nota Metodológica

Ingeniería Civil | 2008-2012 | Enviar

Universidad	Dimensión Cuantitativa DCUAN	Dimensión Cualitativa DCUAL	Puntuación Final IFQ²A-index	Ranking	Tendencia
Politècnica de Catalunya	0.977	0.451	**0.441**	**1**	
Girona	0.426	0.948	**0.403**	**2**	
Sevilla	0.476	0.629	**0.299**	**3**	
Vigo	0.404	0.708	**0.286**	**4**	
Cantabria	0.528	0.533	**0.282**	**5**	
Granada	0.533	0.467	**0.249**	**6**	
Politècnica de València	0.669	0.344	**0.230**	**7**	
Castilla la Mancha	0.441	0.472	**0.208**	**8**	
Autónoma de Barcelona	0.303	0.656	**0.199**	**9**	
Politécnica de Madrid	0.592	0.302	**0.179**	**10**	
Barcelona	0.303	0.585	**0.177**	**11**	
Santiago de Compostela	0.245	0.666	**0.164**	**12**	

rankings I-UGR

POWERED BY THOMSON REUTERS

Anteriormente llamado rankings ISI

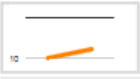
Website: http://www.rankinguniversidades.es/

Ingeniería Civil / 2003-2012

Ver indicadores

Nota Metodológica

Ingeniería Civil | 2008-2012 | Enviar

Universidad	Dimensión Cuantitativa DCUAN	Dimensión Cualitativa DCUAL	Puntuación Final IFQ^{2}A-index	Ranking	Tendencia
Politècnica de Catalunya	1.000	0.434	**0.434**	**1**	
Extremadura	0.313	1.000	**0.313**	**2**	
Girona	0.339	0.802	**0.272**	**3**	
Cantabria	0.488	0.500	**0.244**	**4**	
Politècnica de València	0.649	0.349	**0.226**	**5**	
Barcelona	0.313	0.723	**0.226**	**6**	
Vigo	0.354	0.583	**0.206**	**7**	
Autónoma de Barcelona	0.277	0.655	**0.182**	**8**	
Castilla la Mancha	0.402	0.425	**0.171**	**9**	
Sevilla	0.357	0.475	**0.170**	**10**	
Politécnica de Madrid	0.585	0.281	**0.164**	**11**	
Oviedo	0.324	0.507	**0.164**	**12**	

rankings I-UGR

POWERED BY THOMSON REUTERS

Anteriormente llamado rankings ISI

Website: http://www.rankinguniversidades.es/

Team and Publication analyzing the Ranking

D. Torres-Salinas, J G Moreno-Torres, E. Delgado-López-Cózar, F. Herrera, **A methodology for Institution-Field ranking based on a bidimensional analysis: the IFQ2A index**. *Scientometrics 88:3 (2011) 771-786*.

D. Torres-Salinas, E. Delgado-López-Cózar, J G Moreno-Torres, F. Herrera, **Rankings ISI de las universidades españolas según campos científicos: Descripción y resultados**. *El Profesional de la Información 20:1 (2011) 111-122*.

D. Torres-Salinas, J G Moreno-Torres, E. Delgado-López-Cózar, N. Robinson-García, F. Herrera, **Rankings ISI de las universidades españolas según campos y disciplinas científicas: Descripción y resultados**. *El Profesional de la Información 20:6 (2011) 701-709*.

El profesional de la información

Scientometrics and Bibliometrics: Scientific Production Evaluation

Introduction

Journal Analysis: Some indices

H-index: A debate on the most popular index

Universities ranking indices

Spanish Univeristies analysis

Final Comments

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- **Measuring and assessing academic performance is now a fact of scientific life.**

- **Bibliometrics provides useful metrics but, of course, existing metrics have known flaws.**

Final Comments

Scientometrics: **the science of measuring the "quality" of science. Current discussion.**

"*Bibliometrics can be defined as the* quantitative analysis of science and technology performance. It utilizes quantitative analysis and statistics to describe patterns of publication within a given field or body of literature".

Discussed Flaws

Prof Loet Leydesdorff
University of Amsterdam

SciTopics
Research summaries by experts

http://www.scitopics.com/measuring_research_output_with_science_technology_indicators.html
Measuring Research Output with Science & Technology Indicators

"The measurement of research output and the ranking of universities has become an industry in itself. Ranking, however, is based on reducing the complexity to a single number. The weighting of different dimensions remains a problem."

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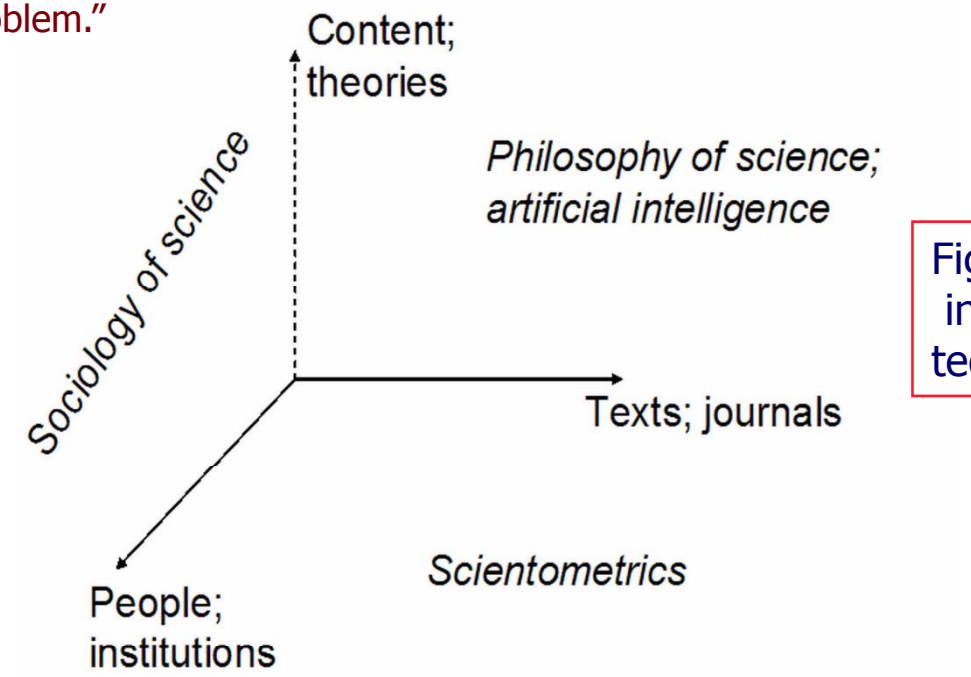

Figure 1: Different perspectives in the study of science and technology.

Alonso Rodríguez-Navarro (UPM, E.T.S.I. Agrónomos)
Sound Research, Unimportant Discoveries: Research, Universities, and Formal Evaluation of Research in Spain
JASIST 60(9) 2009 1845-1858

- **Journal publications**
- **Patents**
- **Innovation**

Google patents beta

Final Comments

- **Measuring and assessing academic performance is now a fact of scientific life.**
- **Bibliometrics provides useful metrics but, of course, existing metrics have known flaws.**

A goal: Getting creative/innovative

Julia Lane,
Let's make science metrics more scientific
Nature **464**, 488-489 (25 March 2010)
Julia Lane is the director of the Science of Science & Innovation Policy programme, National Science Foundation

"…Knowledge creation is a complex process, so perhaps **alternative measures of creativity and productivity should be included in scientific metrics,** such as the filing of patents, the creation of prototypes and even the production of YouTube videos. Many of these are more up-to-date measures of activity than citations. Knowledge transmission differs from field to field ..."

Evaluación de la Producción Científica: Revistas Científicas, Investigadores e Instituciones