

Štandardné ukazovatele pre hodnotenie výkonu vo vede a ich používanie

Igor Podlubný

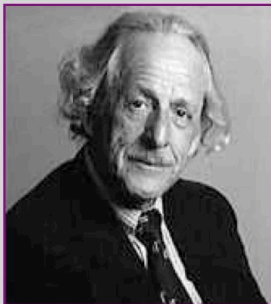
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**60 years of
Citation Analysis**

10 years of H-index

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60 years of Citation Analysis

"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..."

Eugene Garfield,
Citation Indexes for Science,
Science 121, 108 (1955)

Citation analysis is a tool

- doing your own research – “stand on the shoulders of giants”
- information search and retrieval
- modeling of the historical development of science and technology
- qualitative and quantitative evaluation of scientists, publications and scientific institutions

L. Egghe, R. Rousseau, INTRODUCTION TO INFORMETRICS: Quantitative Methods in Library, Documentation and Information Science. Elsevier, 1990.

Most frequently used indicators

Main (classical) indicators

- Number of papers
- Number of citations
- Co-authorship
- Average number of citations per paper

New indicators

- H-index (J. Hirsch)
- m-quotient (J. Hirsch)
- G-index (L. Egghe)

10 years of H-index

An index to quantify an individual's scientific research output

J. E. Hirsch

*Department of Physics, University of California, San Diego
La Jolla, CA 92093-0319*

I propose the index h , defined as the number of papers with citation number higher or equal to h , as a useful index to characterize the scientific output of a researcher.

ment, award of grants, etc.

The publication record of an individual and the citation record are clearly data that contain useful information. That information includes the number (N_p) of papers published over n years, the number of citations (N_c^j) for each paper (j), the journals where the papers were published and their impact parameter, etc. This is a large amount of information that will be evaluated with different criteria by different people. Here I would like to propose a single number, the " h -index", as a particularly simple and useful way to characterize the scientific output of a researcher.

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

The research reported here concentrated on physicists.



Calculating h-index: Google Scholar

1
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Tomas Skovranek
 Assistant Professor of Process Control, BERG Faculty, Technical University of Kosice, Slovakia
 Fractional-order differential equations, Applied mathematics, Control theory, Mathematical modeling
 Verified email at tuka.sk

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Citation indices	All	Since 2010
Citations	324	307
h-index	7	6
i10-index	4	4

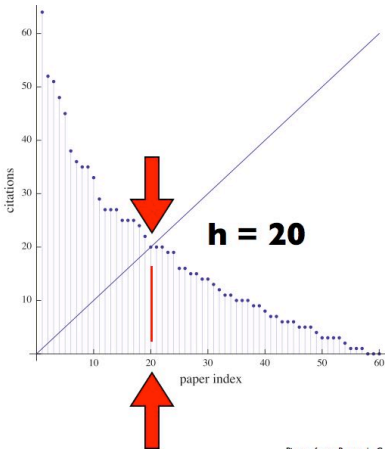


Co-authors [View all...](#)

Igor Podlubny
 Ivo Petras
 YangQuan Chen
 Dominik Sierociuk
 Jen Tepek
 Bohdan Datsko

Title	Cited by	Year
Matrix approach to discrete fractional calculus II: Partial fractional differential equations I Podlubny, A Chechkin, T Skovranek, YQ Chen, BMV Jara Journal of Computational Physics 228 (8), 3137-3153	172	2009
Modelling heat transfer in heterogeneous media using fractional calculus D Sierociuk, A Ostrowski, G Sarwas, I Petras, I Podlubny, T Skovranek Philosophical Transactions of the Royal Society of London A: Mathematical ...	42	2013
Modeling of the national economies in state-space: A fractional calculus approach T Skovranek, I Podlubny, I Petras Economic Modelling 29 (4), 1322-1327	26	2012
Matrix approach to discrete fractional calculus III: non-equidistant grids, variable step length and distributed orders I Podlubny, T Skovranek, BMV Jara, I Petras, V Verbitsky, YQ Chen Philosophical Transactions of the Royal Society of London A: Mathematical ...	20	2013
Supplier selection based on multi-criteria AHP method M Hudymakova, M Benkova, J Pocsova, T Skovranek Acta Montanistica Slovaca 15 (3), 249	9	2010
Matrix approach to discretization of ODEs and PDEs of arbitrary real order I Podlubny, T Skovranek, BMV Jara Matlab Central file exchange 22071	8	2008
Shadows on the Wall: Geometric Interpretation of Fractional Integration I Podlubny, V Despotovic, T Skovranek, BH McNaughton AMC 10, 12	7	2007
Matrix approach to discretization of fractional derivatives and to solution of fractional differential equations and their systems I Podlubny, T Skovranek, BMV Jara Emerging Technologies & Factory Automation, 2009. ETFA 2009. IEEE Conference ...	5	2009
Fitting of experimental data using Mittag-Leffler function		

Calculating h-index



- **h-index:**
combines an assessment of both quantity (number of papers) and quality (impact, or citations to these papers)
- **m-quotient ($m = \text{hindex} / \text{YearsOfCareer}$):**
accounting for varying lengths of academic careers
- **g-index:**
accounting for highly-cited papers: g-index is the (unique) largest number such that the top g articles received (together) at least g^2 citations
- **contemporary h-index (e.g., Google's 5-year h-index):**
accounting for active versus inactive researchers;
adds an age-related weighting to each cited article,
giving less weight to older articles
- **average number of citations per meaningful paper (CPMP):**
meaningful papers are those that define the h-index
(Podlubny & Kassayova, 2006; also known as A-index)



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Welcome to Harzing.com

Welcome to Harzing.com, [Anne-Wil Harzing's](#) website.

Anne-Wil is Professor of International Management at [Middlesex University](#), London. She is also affiliated with [ESCP Europe business school](#).

She previously was Professor in International Management and Associate Dean Research at the University of Melbourne, Australia, and before that held various [academic appointments](#) at universities in the United Kingdom and the Netherlands.

She [publishes extensively](#) on topics in International Management, Cross-cultural Management, Language, and research evaluation.

Anne-Wil also maintains the popular [Journal Quality List](#) and the [Publish or Perish software](#) program.

About this web site

This [website](#) provides information, [online papers](#) and [resources](#) about Anne-Wil's areas of research. It also presents resources to assist with [academic publishing](#) and the assessment of [research](#) and [journal quality](#), as well as software to conduct [citation analysis](#). This web site has been online since 1999.

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Year	Citations	h-index
2015	1	1
2014	1	1
2013	1	1
2012	1	1
2011	1	1
2010	1	1
2009	1	1
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2007	1	1
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Chapter 1: Introduction to citation analysis > 1.4 Citation metrics > 1.4.5 Individual h-index (3 variations)

1.4.5 Individual h-index (3 variations)

Hirsch (2005) indicates that there will be large differences in typical h-values in different fields. Academic disciplines differ in the average number of references per paper and the average number of papers published by each academic. As a general rule of thumb h-indices are much higher in the Natural Sciences than in the Social Sciences and Humanities, although there is a large variability even within these fields.

Podlubny (Podlubny, 2005 and Podlubny and Kassayova, 2006) showed that for nine broadly defined disciplines the average ratio of total citations to the number of citations in mathematics varied considerably (Mathematics: 1, Engineering/technology: 5, Biology: 8, Earth/space sciences: 9, Social/behavioral sciences: 13, Chemistry: 15, Physics: 19, Biomedical Research: 78, Clinical Medicine: 78).

Similarly, Iglesias & Pecharroman (2006) calculated the average number of citations/paper in the 21 different ISI fields and used this to design a normalization factor. Unfortunately, the discipline areas used in neither studies map closely enough onto the categories used by Google Scholar to use these normalization factors in Publish or Perish. However, they do show that comparisons of bibliometric data across fields are generally inappropriate.

Part of the differences between disciplines are caused by the fact that academics in the Natural Sciences typically publish more (and often shorter) articles and also publish with a large number of co-authors, while academics in the Social Sciences and Humanities typically published fewer (and longer) articles (or books) and publish with fewer co-authors.



A-index



Citation Analysis

This guide covers resources for citation analysis.

Last Updated: Aug 27, 2014 | URL: [http://libguides.usd.edu/citation-analysis](#)

Terms and Definitions

Indexes

h-index

The h-index, or Hirsch index, measures the impact of a particular scientist rather than a journal. It is defined as the highest number of publications of a scientist that received h or more citations each while the other publications have not more than h citations each (Schreiber, 2008a). The h-index is included in Web of Science. For example, a scholar with an h-index of 5 had published 5 papers, each of which has been cited by others at least 5 times.

g-index

Proposed by Egghe in 2006 to overcome a bias against highly cited papers inherent in the h-index. The g-index is the "highest number of papers of a scientist that received g or more citations, on average" (Schreiber, 2008a).

A and R indexes

The A and R indexes are meant to be used with h and are not stand-alone indexes. The A-index is the average number of citations per "meaningful paper" (Podlubny & Kassayova, 2006). The R-index clarifies the relationship to the h-index formally (Schreiber, 2008a).

Citation Analysis

Sources for Journal Rankings

For an overview on the topic, see the [Introduction](#) under the Journal Rankings tab.

A and R Indexes

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[Eigenfactor.org](#)

A free and searchable database, Eigenfactor covers the natural and social sciences and "also lists newspaper, PhD theses, popular magazines and more." The Eigenfactor is now included in [Journal Citation Reports](#). It continues to be listed here for use on its own.

Research Impact, Citation Analysis & Altimetrics

This guide provides information on assessing the impact of research and HSL resources available for citation analysis.

Terms and Definitions

Overview

Citation Analysis Tools & Instructions

Journal Rankings

Altimetrics

Terms and Definitions

The Indexes

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Citation Analysis & Altimetrics

Information on assessing the impact of research available for citation analysis.

A Instructions

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URL: <http://www.researcherid.com/rid/B-1393-2009>
Subject: Automation & Control Systems; Engineering; Mathematics
Keywords: fractional calculus; fractional control; chaos - dynamical systems
ORCID: <http://orcid.org/0000-0002-9250-6986>

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Sub-org/Dept: Faculty of BERG
Role: Faculty

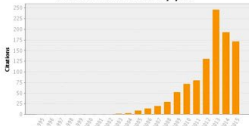
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View Publications
Citation Metrics >

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My Publications: Citation Metrics

This graph shows the number of times the articles on the publication list have been cited in each of the last 20 years.
Note: Only articles from Web of Science Core Collection with citation data are included in the calculations. [More information about these data.](#)

Citation Distribution by year

Year	Citations
1995	0
1996	0
1997	0
1998	0
1999	0
2000	0
2001	0
2002	0
2003	0
2004	0
2005	5
2006	10
2007	15
2008	25
2009	40
2010	65
2011	80
2012	125
2013	235
2014	195
2015	170

Total Articles in Publication List: 56
Articles With Citation Data: 56
Sum of the Times Cited: 1037
Average Citations per Article: 18.52
h-index: 14
Last Updated: 11/08/2015 09:19 GMT

Recent addition: Google Scholar Citations



Ivo Petras

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Professor of Automation, BERG Faculty, Technical University of Kosice, Slovakia
Fractional Calculus, Control Theory, Automation, Applied Mathematics, Chaos Theory
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Title	1-20	Cited by	Year
Analogue realizations of fractional-order controllers			
I Podlubny, I Petras, BM Vinagre, P O'Leary, L Dorcak Nonlinear dynamics 29 (1), 281-296		444	2002
Fractional order systems: modeling and control applications			
R Caponetto, G Dongola, L Fortuna, I Petras World Scientific Pub Co Inc		348	2010
Fractional-order nonlinear systems: modeling, analysis and simulation			
I Petras Springer		336	2011
Fractional order control-a tutorial			
YQ Chen, I Petrás, D Xue American Control Conference, 2009. ACC'09., 1397-1411		265	2009
Two direct Tustin discretization methods for fractional-order differentiator/integrator			
BM Vinagre, YQ Chen, I Petrás Journal of the Franklin Institute 340 (5), 349-362		177	2003
The fractional-order controllers: Methods for their synthesis and application			
I Petras Journal of Electrical Engineering 50 (9-10), 284-288		166	1999

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Citation indices	All	Since 2010
Citations	3550	2865
h-index	27	23
i10-index	50	45



Co-authors View all...

Lubomir Dorcak
Igor Podlubny
Blas M Vinagre
YangQuan Chen
Jan Terpak
Paul O'Leary
Tomas Skovranek
Dominik Sierociuk
Emmanuel A. Gonzalez
Jihad H Asad
Riccardo Caponetto

**Tell me
who is your co-author...**

Collaboration distance: **Erdős number (EN)**

The main idea: top quality people collaborate
with people of similar or close quality

- **Paul Erdős** (assigned **EN=0**):
- **511** direct collaborators (assigned **EN=1**)
- around **8200** people who have collaborated with those 511 (assigned **EN=2**)
- etc.

Example: my EN is 3

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MR Erdos Number = 3

Igor Podlubny	coauthored with	Hari Mohan Srivastava	MR1771455 (2001b:33008)
Hari Mohan Srivastava	coauthored with	Joel Lee Brenner	MR0374522 (51 #10722)
Joel Lee Brenner	coauthored with	Paul Erdős ¹	MR0902513 (88j:20006)

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MR Erdos Number = 2

Stanislav Jendroš	coauthored with	Zsolt Tuza	MR1392730 (97c:05088)
Zsolt Tuza	coauthored with	Paul Erdős ¹	MR1007715 (90f:05077)

MR Erdos Number = 2

Lev Bukovský	coauthored with	Zdeněk Hedrlín	MR0191933 (33 #160)
Zdeněk Hedrlín	coauthored with	Paul Erdős ¹	MR0313119 (47 #1674)

MR Erdos Number = 2

Zuzana Bukovská	coauthored with	Tibor Šalát	MR1120367 (92k:26016)
Tibor Šalát	coauthored with	Paul Erdős ¹	MR1635220 (99e:11013)

MR Erdos Number = 2

Ján Borsík	coauthored with	Tibor Šalát	MR1251035 (94m:26006)
Tibor Šalát	coauthored with	Paul Erdős ¹	MR1635220 (99e:11013)

MR Erdos Number = 2

Michal Tkáč	coauthored with	Zsolt Tuza	MR1392730 (97c:05088)
Zsolt Tuza	coauthored with	Paul Erdős ¹	MR1007715 (90f:05077)

MR Erdos Number = 2

Jozef Doboš	coauthored with	Tibor Šalát	MR0686978 (84a:54003)
Tibor Šalát	coauthored with	Paul Erdős ¹	MR1635220 (99e:11013)

MR Erdos Number = 2

Roman Soták	coauthored with	Zsolt Tuza	MR1674880 (99j:05055)
Zsolt Tuza	coauthored with	Paul Erdős ¹	MR1007715 (90f:05077)

MR Erdos Number = 2

Mirko Horňák	coauthored with	Zsolt Tuza	MR2337566 (2008f:05153)
Zsolt Tuza	coauthored with	Paul Erdős ¹	MR1007715 (90f:05077)

MR Erdos Number = 2

Tomáš Madaras	coauthored with	Zsolt Tuza	MR1674880 (99j:05055)
Zsolt Tuza	coauthored with	Paul Erdős ¹	MR1007715 (90f:05077)

MR Erdos Number = 2

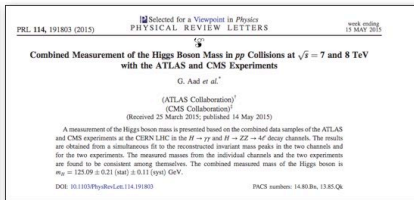
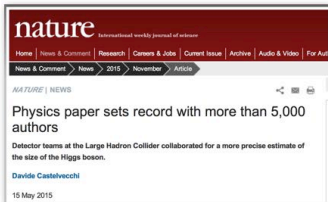
Peter Mihók	coauthored with	Stefan Andrus Burr	MR1768301 (2001f:05096)
Stefan Andrus Burr	coauthored with	Paul Erdős ¹	MR0371701 (51 #7918)

MR Erdos Number = 2

Gabriel Semanišin	coauthored with	Michael S. Jacobson	MR1768301 (2001f:05096)
Michael S. Jacobson	coauthored with	Paul Erdős ¹	MR0932108 (89b:05122)

at least 11 people
with EN= 2

Incorrect approach to authorship



text: **9** pages,
list of authors: **24** pages

characters: **27529**
number of authors: **5154**
characters/author: **5.3**

$$\frac{1}{5154} = 0,000194024059 \approx 0,00$$



podľa CREPC.SK

“bosonic author share”

“bozónový autorský podiel”

Citation counts

in different fields of science

hlásam, že študovať matematiku bez fyziky je nerozumné. Azda to raz prejde, lebo v posledných rokoch o tom (a podobných veciach) začínajú písať hŕfne aj americkí matematici. No a my predsa potrebujeme vzor (aby sme si z neho vybrali vždy to najmenej vhodné),“ povedal na margo svojich kurzov S. Schwarz.

Motívom č. 2 je akademik Schwarz ako vedec, autor šiestich monografií a 103 pôvodných prác s ohlasom 700 citácií. Podľa dlhodobých štatistík Eugena Garfielda je to ekvivalent 1500 citácií vo fyzike a 3000 citácií v biológii. V matematike sa totiž tvorí ťažšie. A všetko si možno overiť. Štefan Schwarz bol jedným zo zakladateľov teórie pologrúp vo svetovom meradle a významne prispel do teórie konečných polí, ktoré dnes hrajú fundamentálnu úlohu v teórii šifrovania. Prispel aj k teórii čísel a ako jeden z prvých študoval stochastické a boolovské matice.

Príklad č. 3: Štefanovi Schwarzovi do konca jeho dní. „Aj keby som chcel, nevedel by som inak, že aj teraz sedím denne 6 – 7 hodín „okolo“ matematiky.

Wrong!

THE TOP 50 RESEARCHERS RANKED BY CITATIONS TO THEIR SCIENTIFIC ARTICLES DURING 1965-78

NAME	FIELD	CITATIONS 1965-78
1. GOOD R.A.	Immunology	17,679
2. SCHALLY A.V.*	Endocrinology	15,340
3. BRAUNWALD E.	Cardiology	13,483
4. WEBER K.	Biochemistry	13,427
5. FUXE K.G.	Cell Biology	13,319
6. SNYDER S.H.	Pharmacology	13,149
7. POPEL J.A.	Chemistry	12,714
8. AXELROD J.A.*	Pharmacology	12,425
9. DELUCA H.F.	Biochemistry	12,090
10. KARNOVSKY M.J.	Cell Biology	11,427
11. LEVY R.I.	Cardiology	10,784
12. CURTRECASAS P.	Biochemistry	10,543
13. OSBORN M.	Cell Biology	10,376
14. KLEIN G.	Immunology	10,347
15. SUTHERLAND E.W.*	Pharmacology	10,297
16. BOYSE E.A.	Immunology	10,159
17. VANE J.R.*	Pharmacology	9,971
18. FUDENBERG H.H.	Immunology	9,602
19. FREDRICKSON D.S.	Genetics	9,499
20. COTTON F.A.	Inorganic Chem.	9,346

**“Citation
superstars”**

(*The Scientist*, Vol:4, #4, p. 22, February 19, 1990)

~Twenty Years of Citation Superstars~

☐ continued from

ScienceWatch
September/October 2003

"Citation
superstars"

Most-Cited Researchers, 1983-2002					
Rank	Name	Affiliation	Field	Papers	Citations
1	Bert Vogelstein	HHMI/Johns Hopkins	Molecular Biology & Genetics	361	106,401
2	Salvador Montecado	U. College London	Pharmacology	541	68,686
3	Solomon H. Snyder	Johns Hopkins U.	Pharmacology	625	63,106
4	Charles A. Dinarello	U. Colorado	Immunology	862	62,365
5	Pierre Chambon	U. Strasbourg	Molecular Biology & Genetics	686	61,884
6	Robert C. Gallo	U. Maryland	Immunology	930	61,303
7	David Baltimore	Caltech	Molecular Biology & Genetics	386	59,519
8	Tadamitsu Kishimoto	Osaka U.	Molecular Biology & Genetics	1,406	58,621
9	Axel Ullrich	MPI Biochem.	Molecular Biology & Genetics	525	58,395
10	Ronald M. Evans	HHMI, Salk Institute	Molecular Biology & Genetics	442	57,630
11	Timothy A. Springer	Ctr. Blood Res.	Immunology	438	54,737
12	Michael Kastrup	UC San Diego	Molecular Biology & Genetics	311	54,390
13	Anthony S. Fauci	NIH/D	Immunology	781	53,932
14	Joseph Schlessinger (see also)	Yale U.	Molecular Biology & Genetics	420	53,894

28	Thomas K. Strazielle	U. Pittsburgh	Clinical Medicine	1,844	42,499
29	Michael B. Sporn	Dartmouth Med. Sch.	Biology & Biochemistry	329	41,952
30	Charles H. Hennekens	U. Miami	Medicine	731	41,758
31	Mans G. Caron	HHMI, Duke U.	Biology & Biochemistry	510	41,119
32	Robert J. Tjian	HHMI, UC Berkeley	Molecular Biology & Genetics	206	40,902
33	Yasutami Nishizuka	Kobe U.	Biology & Biochemistry	196	40,880
34	David V. Goeddel	Tularik, Inc.	Molecular Biology & Genetics	177	40,862
35	Michael S. Brown	U. Texas SW Med Ctr.	Molecular Biology & Genetics	480	40,545
36	Joseph L. Goldstein	U. Texas SW Med Ctr.	Molecular Biology & Genetics	426	40,020
37	Ad Bax	NIDDKD	Chemistry	308	39,875
38	Richard M.J. Palmer	Alzyme	Biology & Biochemistry	99	39,759
39	Joan Massagué	HHMI, Mem. Sloan Kef.	Molecular Biology & Genetics	250	39,280
40	Peter J. Barnes	Imperial Coll.	Pharmacology	1,311	38,823
41	Erkki Ruoslahti	Burnham Inst.	Molecular Biology & Genetics	268	38,367
42	Michael J. Berridge	Babraham Inst.	Biology & Biochemistry	191	38,305
43	Stanley J. Korsmeyer	HHMI, Dana-Farber Cancer Inst.	Molecular Biology & Genetics	287	38,455
44	Niall G. Copeland	NCI	Molecular Biology & Genetics	696	38,032
45	Robert A. Weinberg	MIT	Molecular Biology & Genetics	274	38,000
46	Michael G. Rosenfield	HHMI, UC San Diego	Molecular Biology & Genetics	324	37,806
47	Nancy A. Jenkins	NCI	Molecular Biology & Genetics	691	37,146
48	Thomas Hökfelt	Karolinska Institute	Neuroscience	775	37,123
49	Anita B. Roberts	NCI	Molecular Biology & Genetics	344	36,397
50	Judah Folkman	Harvard U.	Clinical Medicine	305	36,209

SOURCE: Thompson ISI [Bio. of Science](#)

10 years of the “Law of the Constant Ratio”

*Jointly published by Akadémiai Kiadó, Budapest
and Springer, Dordrecht*

*Scientometrics,
Vol. 64, No. 1 (2005) 95–99*

Short communication

Comparison of scientific impact expressed by the number of citations in different fields of science

IGOR PODLUBNY

The data

In a recent publication of the National Science Foundation the distribution of scientific citations of the U.S. scientific and engineering articles across wide fields of science in 1992, 1994, 1996, 1997, 1999, and 2001 was published (see Ref. 1, Chapter 5, Table 5-27 on page 5-50). The sources for the data appearing in that table were the Science Citation Index (SCI) and the Social Sciences Citation Index (SSCI).

Law of the constant ratio

Short communication

Comparison of scientific impact expressed by the number of citations in different fields of science

JÓR PÓDLUBNY

Field	Priemerný pomer citácií za uvedené roky	1992		1994		1996		1997		1999		2001	
		počet	pomer	počet	pomer	počet	pomer	počet	pomer	počet	pomer	počet	pomer
Clinical medicine	78	475793	69	516665	78	554332	80	574859	90	584330	78	589762	76
Biomedical research	78	460148	67	518304	78	562361	81	572122	89	594596	79	568328	73
Biology	8	52535	8	57825	9	58649	8	58130	9	56981	8	57899	7
Chemistry	15	88010	13	96827	15	105960	15	105762	16	110927	15	109703	14
Physics	19	137922	20	141653	21	138417	20	131958	21	125968	17	120593	15
Earth/space sciences	9	55086	5	58818	9	71230	10	73507	11	83053	11	82614	11
Engineering/technology	5	32680	5	35189	5	33664	5	32958	5	34001	5	36809	5
Mathematics	1	6858	1	6631	1	6961	1	6418	1	7520	1	7794	1
Social/behavioral sciences	13	80282	12	84353	13	93032	13	93187	15	99481	13	104793	13

The data

In a recent publication of the National Science Foundation the distribution of scientific citations of the U.S. scientific and engineering articles across wide fields of science in 1992, 1994, 1996, 1997, 1999, and 2001 was published (see Ref. 1, Chapter 5, Table 5-27 on page 5-50). The sources for the data appearing in that table were the Science Citation Index (SCI) and the Social Sciences Citation Index (SSCI).

Law of the constant ratio

**Towards a better list of citation superstars:
compiling a multidisciplinary list of highly cited
researchers**

Igor Podlubny and Katarina Kassayova

Law of the constant ratio

**Towards a better list of citation superstars:
compiling a multidisciplinary list of highly cited
researchers**

Igor Podlubny and Katarina Kassayova

Highly cited researchers

Table 1. Mapping of the ESI fields to NSF fields

ESI field	Broad field according to NSF 2004 report	Average ratio of the total citation number to the total number of citations in mathematics	Average ratio of citations of 10 highly cited scientists in the field to the average number of citations of 10 highly cited mathematicians
Agriculture	Biology	8	5
Biology and biochemistry	Biomedical research	78	37
Chemistry	Chemistry	15	10
Clinical medicine	Clinical medicine	78	37
Computer science	Engineering and technology	5	3
Economics and business	Social/behavioral sciences	13	9
Engineering	Engineering and technology	5	3
Environment and ecology	Earth and space sciences	9	6
Geo sciences	Earth and space sciences	9	6
Immunology	Clinical medicine	78	37
Material science	Engineering and technology	5	3
Mathematics	Mathematics	1	1
Microbiology	Biomedical research	78	37
Molecular biology and genetics	Biomedical research	78	37
Multidisciplinary	Engineering and technology	5	3
Neuroscience and behavior science	Clinical medicine	78	37
Pharmacology and toxicology	Clinical medicine	78	37
Physics	Physics	19	12
Plant and animal sciences	Biology	8	5
Psychiatry and psychology	Clinical medicine	78	37
Social sciences	Social/behavioral sciences	13	9
Space sciences	Earth and space sciences	9	6

Appendix. Multidisciplinary list of 200 most frequently cited researchers

	Name	Normalized citations	Field	Rating in the field	Papers	Citations (total)	Citations per paper
1	INOUE, A	2,495	Materials science	1	655	8,315	12.69
2	FILIPPENKO, A V	1,799	Space science	1	211	10,795	51.16
3	FRENK, C S	1,506	Space science	2	123	9,036	73.46
4	SCHNEIDER, D P	1,352	Space science	3	218	8,112	37.21
5	WHITESIDES, G M	1,340	Chemistry	1	267	13,399	50.18
6	ELLIS, R S	1,328	Space science	4	127	7,961	62.69
7	RAFFERTY, A E	1,322	Mathematics	1	31	1,322	42.65
8	NAKAMURA, K	1,292	Physics	1	549	16,359	29.80
9	GRUBBS, R H	1,286	Chemistry	2	169	12,853	76.05
10	LANGDON, T G	1,260	Materials science	2	199	4,201	21.11
11	FABIAN, A C	1,251	Space science	5	286	7,505	26.24
12	WHITE, S D M	1,245	Space science	6	109	7,466	68.5
13	TOKURA, Y	1,238	Physics	2	509	15,666	30.78
14	STUCKY, G D	1,221	Materials science	3	86	4,072	47.35
15	KOBAYASHI, T	1,181	Physics	3	1,000	14,945	14.95
16	NAKAMURA, T	1,149	Materials science	4	457	3,831	8.38
17	DONOHU, D L	1,137	Mathematics	2	19	1,137	59.84
18	STODDART, J F	1,133	Chemistry	3	292	11,331	38.8
19	KOBAYASHI, S	1,109	Chemistry	4	679	11,080	16.32
20	YORK, D G	1,101	Space science	7	174	6,804	37.95
21	JOHNSTONE, I M	1,074	Mathematics	3	14	1,074	76.71
22	KASS, R E	1,072	Mathematics	4	12	1,072	89.33
23	MATYJASZEWSKI, K	1,053	Chemistry	5	278	10,536	37.90
24	GUNN, J E	1,047	Space science	8	114	6,284	55.12
25	XIA, Y N	1,046	Materials science	5	70	3,484	49.77
26	HECKMAN, T M	1,034	Space science	9	151	6,202	41.07
27	JONES, J D G	1,019	Plant & animal science	1	76	5,432	71.47
28	FUKUGITA, M	1,014	Space science	10	113	6,081	53.81
29	STRAUSS, M A	1,005	Space science	11	133	6,031	45.35
30	HONSCHEID, K	1,002	Physics	4	306	12,690	41.47
31	HORITA, Z	992	Materials science	6	127	3,307	26.04
32	WANG, J	990	Chemistry	6	1,075	9,897	9.21
33	VANMONTAGU, M	987	Plant & animal science	2	162	5,263	26.92
34	COUCH, W J	983	Space science	12	91	5,892	64.75
35	WILLIAMS, D J	975	Chemistry	7	571	9,744	17.06
36	IVEZIC, Z	968	Space science	13	132	5,803	43.96
37	WANG, J	941	Engineering	1	606	3,134	5.17
38	BRINKMANN, J	930	Space science	14	186	5,577	29.98
39	RHEINGOLD, A L	926	Chemistry	8	732	9,261	12.65
40	TAKAHASHI, T	918	Physics	5	807	11,630	14.41
41	VANPARADIJS, J	915	Space science	15	171	5,491	32.11
42	HALL, P	905	Mathematics	5	162	905	5.59
43	KULKARNI, S R	891	Space science	16	169	5,348	31.64
44	RUBIN, D B	889	Mathematics	6	27	889	32.93
45	WHITESIDES, G M	885	Materials science	7	73	2,951	40.42
46	GRAB, C	881	Physics	6	124	11,156	89.97
47	STEIDEL, C C	879	Space science	17	66	5,270	77.50
48	COLE, S	876	Space science	18	80	5,258	65.72
49	TANAKA, K	867	Chemistry	9	1,055	8,676	8.22
50	NEMOTO, M	866	Materials science	8	82	2,883	35.16

The resulting multidisciplinary list of the top 200 highly cited researchers is given in the Appendix to this article. One can see that among the top 10 researchers there are five leaders in their particular fields (namely, in Material science, Space science, Chemistry, Mathematics and Physics); among the top 50 there are leaders in seven fields (add Plant and animal science, and Engineering), and among the top 100 there are leaders in 10 different fields (add Geosciences, Environment/ecology, and Clinical medicine). It could not be so if one used only absolute numbers of citations, as in Schafer (2003). In addition, we would like to mention that all 22 leaders in their fields are present in the first 1,500 lines of the compiled list.

2006: First multidisciplinary list of Highly Cited Researchers

Appendix. Multidisciplinary list of 200 most frequently cited researchers

Name	Normalized citations	Field	Ranking in the field	Papers	Citations (2006)	Citations per paper
1. INSUL, A.	2,485	Materials science	1	855	8,215	12.89
2. FLYNN, A. V.	1,799	Space science	2	271	17,715	65.36
3. FRANK, C. E.	1,658	Space science	3	123	16,018	130.25
4. POLYMER, S. P.	1,592	Space science	4	278	8,112	29.17
5. BENTLEY, G. M.	1,345	Chemistry	7	247	13,346	53.98
6. BARTON, A. E.	1,332	Space science	5	127	7,947	62.58
7. SULLIVAN, R.	1,322	Mathematics	1	31	1,322	42.65
8. GALLAGHER, R. H.	1,276	Chemistry	2	159	12,853	80.83
9. LARSON, T. G.	1,265	Materials science	2	189	4,251	22.49
10. FABIAN, A. J.	1,251	Space science	5	240	7,515	31.31
11. TONURA, T.	1,228	Physics	2	559	15,458	27.65
12. STUCK, C. S.	1,221	Materials science	3	181	8,874	49.03
13. KOBAYASHI, T.	1,181	Physics	3	1,030	14,945	14.50
14. NAGARATH, T.	1,155	Chemistry	2	457	3,857	8.43
15. DONOFRIO, D. L.	1,137	Mathematics	2	19	1,137	59.84
16. STEIGER, J. F.	1,135	Chemistry	4	252	11,201	44.45
17. KOBAYASHI, S.	1,139	Chemistry	4	579	11,050	19.09
18. YOSHI, S.	1,131	Space science	6	142	8,854	62.35
19. JOHNSON, J. M.	1,074	Mathematics	2	14	1,074	76.71
20. KELL, C.	1,057	Mathematics	3	12	1,057	88.08
21. WATKINS, D. B.	1,053	Chemistry	5	276	10,530	38.15
22. KIM, J. H.	1,047	Space science	8	114	8,244	72.32
23. XIA, Y. N.	1,040	Materials science	5	76	3,491	46.07
24. HOSKINS, J. W.	1,024	Space science	9	151	8,225	54.47
25. JONES, J. O. S.	1,019	Plant & animal science	7	76	5,432	71.47
26. FUKUDA, M.	1,016	Space science	10	113	8,281	73.69
27. DRAKE, M. A.	1,000	Space science	11	123	8,231	66.95
28. HOSKINS, E. R.	1,000	Physics	4	366	12,660	34.59
29. HODGE, J.	992	Materials science	6	127	3,337	26.28
30. BANG, J.	990	Chemistry	6	1,075	9,937	9.25
31. VERMA, R. N.	987	Plant & animal science	7	142	3,255	22.92
32. COLLIER, W. J.	983	Space science	12	97	5,832	60.12
33. BELLARD, G. J.	975	Chemistry	7	571	8,744	15.30
34. VOGEL, J.	962	Space science	13	132	5,863	44.41
35. BANG, J.	961	Engineering	1	636	3,134	4.93
36. BANG, J.	960	Space science	14	106	5,177	48.84
37. HANSEN, R. L.	959	Chemistry	8	732	3,817	5.21
38. GARDNER, T.	958	Physics	5	861	5,183	6.02
39. VERMA, R. N.	955	Space science	15	111	5,837	52.58
40. HILL, A.	953	Mathematics	3	90	9,055	100.61
41. KILGUS, S. R.	951	Space science	16	165	5,345	32.40
42. POLK, C. S.	950	Mathematics	4	27	9,500	353.70
43. BENTLEY, G. M.	945	Materials science	7	73	2,847	38.99
44. GIBB, C.	940	Physics	6	264	11,152	42.25
45. FREED, C. G.	939	Space science	17	66	5,215	79.02
46. COLE, J. L.	938	Space science	18	66	5,244	79.45
47. TAMURA, K.	937	Chemistry	9	1,000	9,519	9.52
48. NEUSTADT, M.	936	Materials science	8	62	2,863	46.18

The resulting multidisciplinary list of the top 200 highly cited researchers is given in the Appendix to this article. One can see that among the top 10 researchers there are five leaders in their particular fields (namely, in Material science, Space science, Chemistry, Mathematics and Physics); among the top 50 there are leaders in seven fields (add Plant and animal science, and Engineering), and among the top 100 there are leaders in 10 different fields (add Geosciences, Environment/ecology, and Clinical medicine). It could not be so if one used only absolute numbers of citations, as in Schafer (2003). In addition, we would like to mention that all 22 leaders in their fields are present in the first 1,500 lines of the compiled list.

Paper counts

in different fields of science

Equivalent numbers of papers



The Law of the Constant Ratio

The use of publication and citation databases, namely Web of Science

162).

Based on the same source of data (<http://www.nsf.gov/statistics/seind04/>), we extend the law of the constant ratio to the number of articles, too. Namely, one article in mathematics corresponds to three articles in earth and space science; to four articles in engineering and technology, in biology, and in chemistry; to five articles in physics; to nine articles in social and behavioral sciences; to ten articles in biomedical research; and to eighteen articles in clinical medicine.

This means that quantitative com-

Mathematics	1	
Earth and space sciences	3	
Biology	4	
Engineering and technology	4	
Chemistry	4	
Physics	5	
Social and behavioral sciences	9	
Biomedicine	10	
Clinical medicine	18	

Evaluating journals

Main indicators for journals

- **Impact factor (IF)**
(average number of times articles from the journal published in the past 2 years have been cited)
- **5-year impact factor**
- **Rank in the research field**
- **Immediacy index**
(average number of times an article is cited in the year it is published)
- **Cited half-life**
(median age of the articles that were cited in the JCR year)

Impact factor

- **A** : number of times articles published in 2008 and 2009 were cited by Thomson Reuters Scientific indexed journals during 2010
- **B** : total number of "citable items" published by that journal in 2008 and 2009. ("Citable items" are usually articles, reviews, proceedings, or notes; not editorials or Letters-to-the-Editor.)

2010 impact factor = **A/B**

E. Garfield: The Impact Factor and Using It Correctly.
Der Unfallchirurg, 48(2) p. 413, June 1998.
(Letters to the Editor) – English translation



“The source of much anxiety about Journal Impact Factors comes from their **misuse in evaluating individuals, e.g. during the Habilitation process.**

In many countries in Europe, I have found that in order to shortcut the work of looking up actual (real) citation counts for investigators the journal impact factor is used as a surrogate to estimate the count.

I have always warned against this use. There is **wide variation from article to article within a single journal** as has been widely documented by Per O. Seglen of Norway and others.”

REMEMBER:

Journal's "Impact Factor" (IF) is the indicator of its commercial success, and not the indicator of its quality!

- applies only to journals, not individual articles or individual scientists
- British RAE panels are obliged to assess the quality of the content of individual articles, not the reputation of the journal in which they are published
- Australian Research Council created the "ERA 2010 List" based on expert evaluation of journals quality, and not on impact factor

Who knows IJNSNS?

Maybe this helps?

International Journal of Nonlinear
Sciences and Numerical Simulation

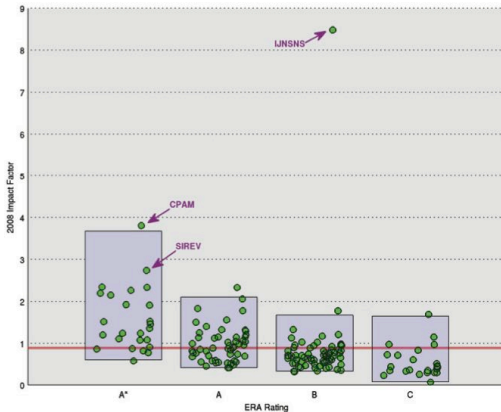
JCR 2008,
Mathematics, Applied

Mark	Rank	Abbreviated Journal Title (linked to journal information)	ISSN		
				Total Cites	Impact Factor
☐	1	INT J NONLIN SCI NUM	1565-1339	1978	8.479
☐	2	COMMUN PUR APPL MATH	0010-3640	5522	3.806
☐	3	SIAM REV	0036-1445	3881	2.739
☐	17	INT J ROBUST NONLIN	1049-8923	1456	1.560
☐	18	SIAM J OPTIMIZ	1052-6234	2652	1.525
☐	19	SIAM J CONTROL OPTIM	0363-0129	4356	1.517
☐	36	SIAM J SCI COMPUT	1064-8275	5403	1.157
☐	37	SIAM J MATH ANAL	0036-1410	3169	1.153
☐	38	SIAM J NUMER ANAL	0036-1429	6593	1.152
☐	49	J COMPUT APPL MATH	0377-0427	4861	1.048
☐	50	J MATH ANAL APPL	0022-247X	13068	1.046



ERA 2010 Journal List

Excellence in Research for Australia assessment



Detecting h -index manipulation through self-citation analysis

Christoph Bartneck · Servaas Kokkelmans

Forensic scientometrics?

90

C. Bartneck, S. Kokkelmans

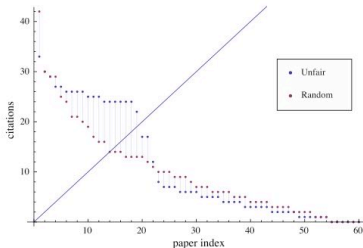


Fig. 4 Citation profile $c_{60,i}$ over paper index i of an author in the unfair and in the random condition with $\theta = 3$, career length $T = 20$, mean citation rate $\frac{y}{x} = \frac{3}{2}$ with $v = 3$ and $\alpha = 2$, and for a total number of published papers of $p = \theta \times T = 60$

Conclusions

- 1. Quality of a scientific paper is defined by its content, and not by the method and place of its publication**

Old example: Évariste Galois
Recent example: Grigori Perelman

Nature – retractions

EDITORIAL

Nature Medicine **9**, 1093 (2003)
doi:10.1038/nm0903-1093

The long road to retraction

In the current issue of *Nature Medicine*, we are publishing the retraction of a paper by Kugler et al., titled "Regression of human metastatic renal cell carcinoma after vaccination with tumor cell-dendritic cell hybrids."

A painful remedy

Nature **468**, 6 (04 November 2010) | doi:10.1038/468006b
Published online 03 November 2010 | Corrected online **18 November 2010**

This year, *Nature* has published four retractions, an unusually large number. In 2009 we published one. Throughout the past decade, we have averaged about two per year, compared with about one per year in the 1990s, excluding the pulse of retractions of papers co-authored by Schön.

Retraction

Nature **452**, 120 (6 March 2008) | doi:10.1038/nature06819

Genetic tracing reveals a stereotyped sensory map in the olfactory cortex

Zhihua Zou, Lisa F. Horowitz, Jean-Pierre Montmayeur, Scott Snapper & Linda B. Buck

Nature **414**, 173–179 (2001)

Linda Buck was a
Nobel Prize winner

Highly cited Harvard stem cell scientist retracts Nature paper

with 12 comments

[Amy Wagers](#), an up and coming stem cell researcher at Harvard who made a name for herself as a postdoc early by questioning the work of others, has retracted a January 2010 paper she co-authored in *Nature*. According to [the retraction](#):

“

Three of the authors (J.L.S., F.S.K. and A.J.W.) wish to retract this Article after a re-examination of the publication raised serious concerns with some of the reported data.



nature article retracted

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Not-so-deep impact!

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Editorial

Nature **435**, 1003-1004 (23 June 2005) | doi:10.1038/4351003b; Published online 22 June 2005

Not-so-deep impact

Research assessment rests too heavily on the inflated status of the impact factor. [▲ Top](#)

“...we have analysed the citations of individual papers in Nature and found that 89% of last year's figure was generated by just 25% of our papers.”

“The great majority of our papers received fewer than 20 citations.”

“... impact factors don't tell us as much as some people may think about the respective quality of the science that journals are publishing.”

“None of this would really matter very much, were it not for the unhealthy reliance on impact factors by administrators and researchers' employers worldwide to assess the scientific quality of nations and institutions, and often even to judge individuals.”

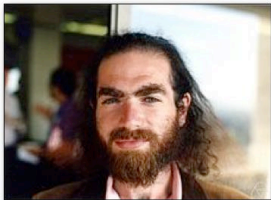
Conclusions

2. Quantitative measure of quality of a scientific paper: the number of its relevant citations

Currently available tools for collecting citations for citation analysis:

- Web of Science
- Scopus
- Google Scholar

Grigori (Grisha) Perelman



(photo: wikipedia)

- proved the Poincaré conjecture
- rejected the Fields Medal (2006)
- rejected the Clay Millennium Prize (2010) – \$1,000,000



Ricci flow with surgery on three-manifolds

Grisha Perelman

(Submitted on 10 Mar 2003)

This is a technical paper, which is a continuation of [math.DG/0211159](#). Here we construct Ricci flow with surgery on three-manifolds, verify most of the assertions, made in section 2 of [math.DG/0211159](#). The only exceptions are (1) the statement that manifolds with a local lower bound on sectional curvature are geodesically bounded, which is deferred to a separate paper, since the proof here uses the Ricci flow, and (2) the claim on the lower bound on the length of maximal horns and the smoothness of solutions.

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(NOT journal papers!)**



The entropy formula for the Ricci flow and its geometric applications

Grisha Perelman

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Finite extinction time for the solutions to the Ricci flow on certain three-manifolds

Grisha Perelman

(Submitted on 17 Jul 2003)

Let M be a closed oriented three-manifold, whose prime decomposition contains no aspherical factors. We show that for any initial Riemannian metric on M the solution to the Ricci flow with surgery, defined in our previous paper [math.DG/0303109](#), becomes extinct in finite time. The proof uses a version of the minimal disk argument from 1999 paper by Richard Hamilton, and a regularization of the curve shortening flow, worked out by Altschuler and Grayson.

Comments: 7 pages

Subjects: Differential Geometry (math.DG)

MSC classes: 53C

Cite as: [arXiv:math/0307245v1 \[math.DG\]](#)

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valid in all dimensions as an entropy for a certain are given. In particular, (1) metrics modulo isic orbits (that is, other is forming in finite time, 3) Ricci flow can not quickly ne, no matter what related to Richard strization conjecture for etic proof of this conjecture, lower curvature bound.

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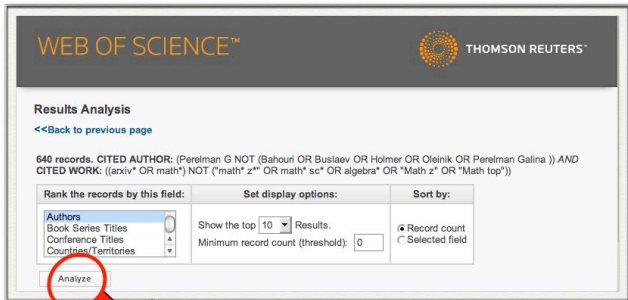
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☐	PERELMAN G	ARXIV0303109					3
☐	PERELMAN G	ARXIV0307245					1
☐	PERELMAN G	ARXIV7ATHDG0211159					1
☐	PERELMAN G	ARXIVARXIVMATH021115					1
☐	PERELMAN G	ARXIVD60211159	2002				1
☐	PERELMAN G	ARXIVD60303109					1
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☐	PERELMAN G	ARXIVMATH DG0211159					1
☐	PERELMAN G	ARXIVMATH0211159					18
☐	PERELMAN G	ARXIVMATH0211159	2002				10
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☐	PERELMAN G	ARXIVMATH0211159V1	2002				5
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☐	PERELMAN G	ARXIVMATH021159	2003				1
☐	PERELMAN G	ARXIVMATH021159V1	2002				1
☐	PERELMAN G	ARXIVMATH03031019	2003				1
☐	PERELMAN G	ARXIVMATH0303109					9
☐	PERELMAN G	ARXIVMATH0303109	2003				10
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Real impact of G. Perelman's pre-prints



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625 authors
from **378** research institutions
from **43** countries
in **217** journals
from **39** subject areas

Conclusions

3. Take the word “indicators” seriously – an indicator says that there *might* be something, not that there *is* something

Quantitative analysis should be complemented by expert judgements or recommendations

Conclusions

- 4. Multidisciplinary comparisons and rankings are possible based on the “law of the constant ratio”**



Radko Mesiar

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Uncertainty modelling, aggregation

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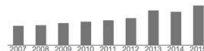
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Monotone measures and universal integrals in a uniform framework for the scientific impact assessment problem

Marek Gagolewski^{a,b,*}, Radko Mesiar^{c,d}



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Aggregating different paper quality measures with a generalized h-index

Marek Gagolewski^{a,b,*}, Radko Mesiar^{c,d}

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