Web of Science: мировая практика применения индекса цитирования при проведении научных исследований

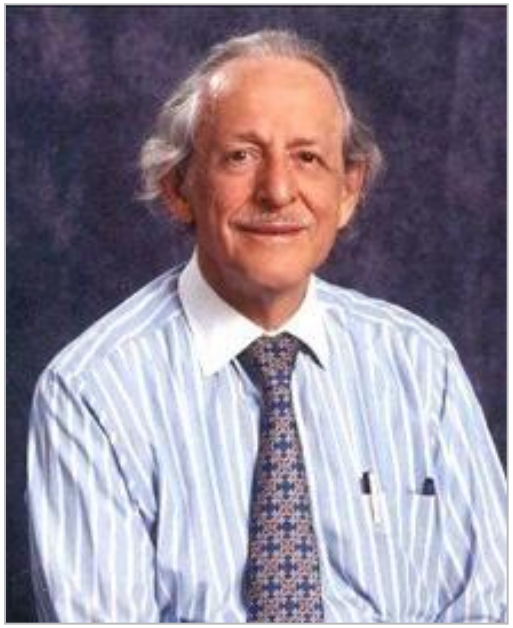
Павел Касьянов,
Региональный представитель

THOMSON REUTERS

Ноябрь 2009

История ISI

- Идея индекса цитирования впервые предложена Ю. Гарфилдом в 1955м году
- ISI приобретён Thomson в 1992м году
- В настоящий момент – часть Thomson Reuters



Thomson Reuters

- Создана 17го апреля 2008г. в результате слияния Thomson Corporation и Reuters Group PLC.
- *“Thomson Reuters is the world’s leading source of intelligent information for businesses and professionals”*
- Более 50,000 сотрудников
- Представительства в 93х странах мира

Более 3,500+ клиентов *Web of Science* в 100 странах

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Как проводится оценка результатов научной деятельности?

- Комбинация различных методологий и подходов, например:
  - Количество и объём полученных грантов
  - Количество наград (например, Нобелевских премий)
  - Peer evaluation
  - **Подсчёт публикационной активности**
  - **Подсчёт объёма цитирования**
- Peer Evaluation - Дорого, субъективно, существенные временные затраты
- Ни один из этих показателей не работает идеально сам по себе, всегда есть «частные случаи» и необходима экспертная оценка для правильной интерпретации результатов

Растущий интерес к применению библиометрических методов

- Страны с существенным научным потенциалом активно используют библиометрические показатели при оценке результатов научной деятельности
- Сегодня во многих странах существуют целые команды аналитиков. Они подготавливают библиометрические отчёты, часто называемые «science indicators studies»
- Практически в 100% случаев, исследования проводятся на основе данных Thomson Reuters.

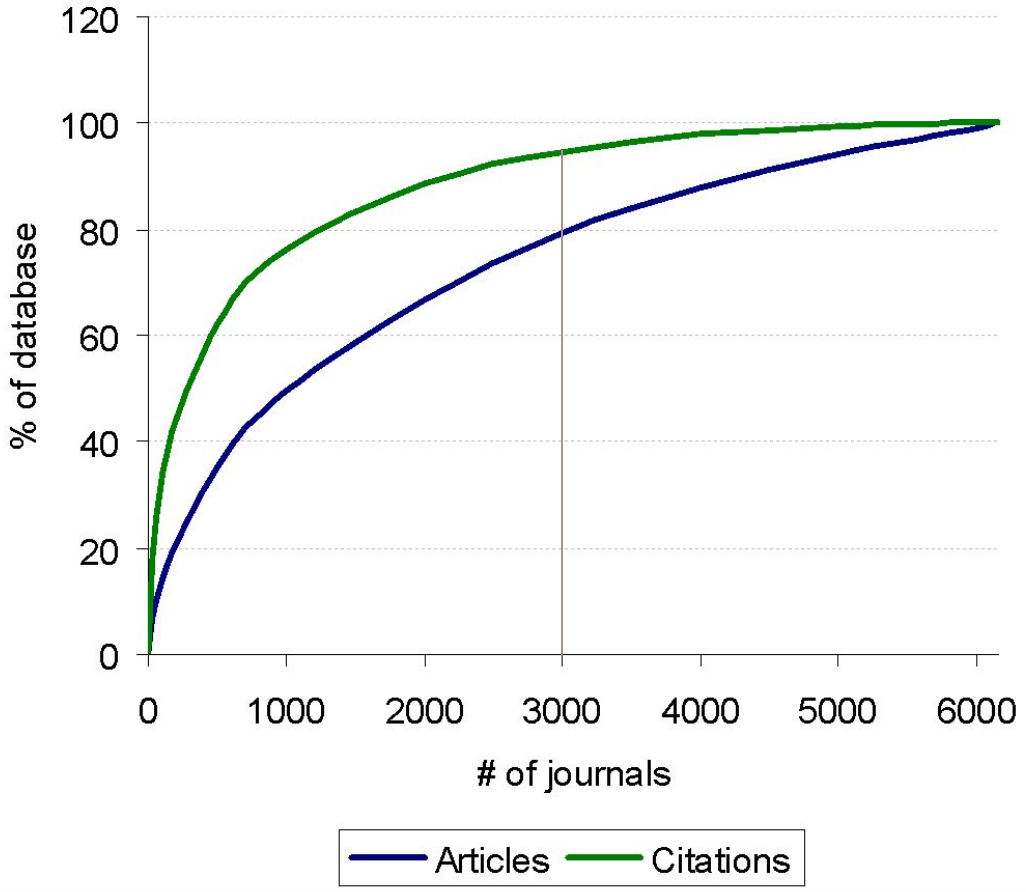
Некоторые правительственные органы, использующие наши данные

- США: National Institutes of Health
- США: National Science Foundation (с 1974)
- Великобритяния: Office of Science & Technology; Higher Education Funding Council
- Евросоюз: DGXII (Research Directorate)
- Австралия: Академия Наук, правительственная лаборатория CSIRO
- Канада: NSERC, FRSQ (Quebec), Alberta Research Council
- Франция: Министерство Науки, OST - Париж, CNRS
- Германия: Общество Макса Планка, правительственные лаборатории, DKFZ, MDC
- Япония: Национальный институт Информатики, Министерство Образования, Министерство Экономики, Торговли и Промышленности
- Китай: Академия Наук

Политика отбора журналов в Web of Science

- Для чего мы отбираем журналы?

Относительно небольшая группа журналов публикует абсолютное большинство *значимых научных результатов*



Всего 3000 журналов покрывает 80% статей…

…но, что ещё более важно – 92% того, что цитируется

В 7,621 журнале опубликовано 814,967 статей, получивших 20,834,641 ссылок

4% журналов (300) публикуют **30% статей** (239,206)

4% журналов (300) получают **51% ссылок** (10,681,596)

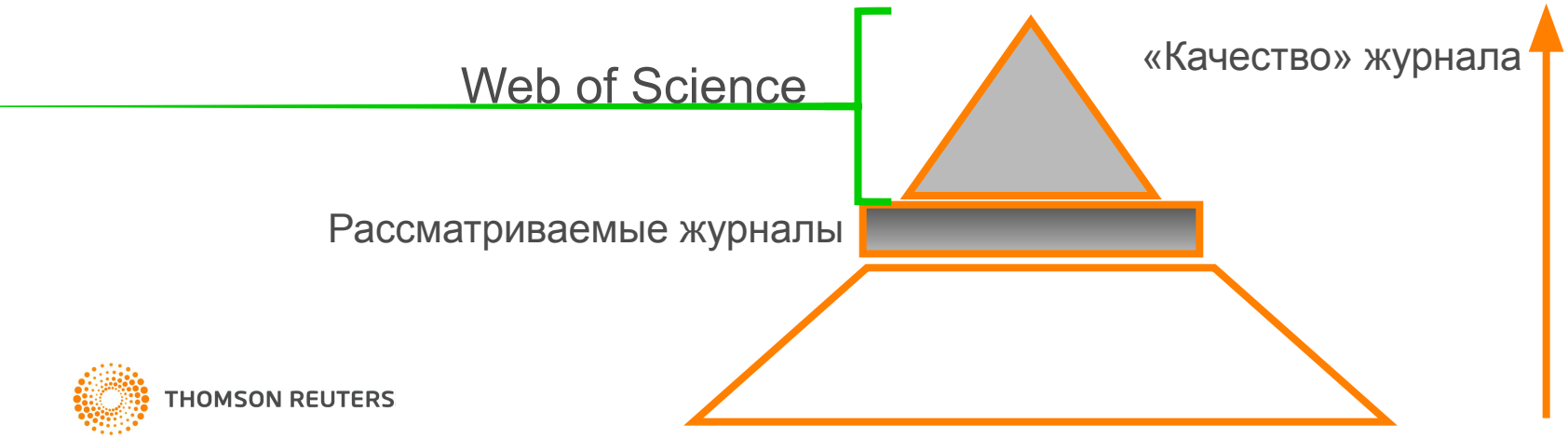
Полезность и качество цитирования

- Для чего?
  - Ссылка на источник
  - Идентификация методологии
  - Предоставление читателю возможности ознакомиться с дополнительной информацией
  - Подтверждение данных
  - Исправление информации
  - Критика/комментарии к чьей-то работе или точке зрения
- Цитирование является индикатором полезности и авторитетности статьи и её влияния на научное сообщество; оно является показателем, по которому можно сравнить результаты исследования учёных

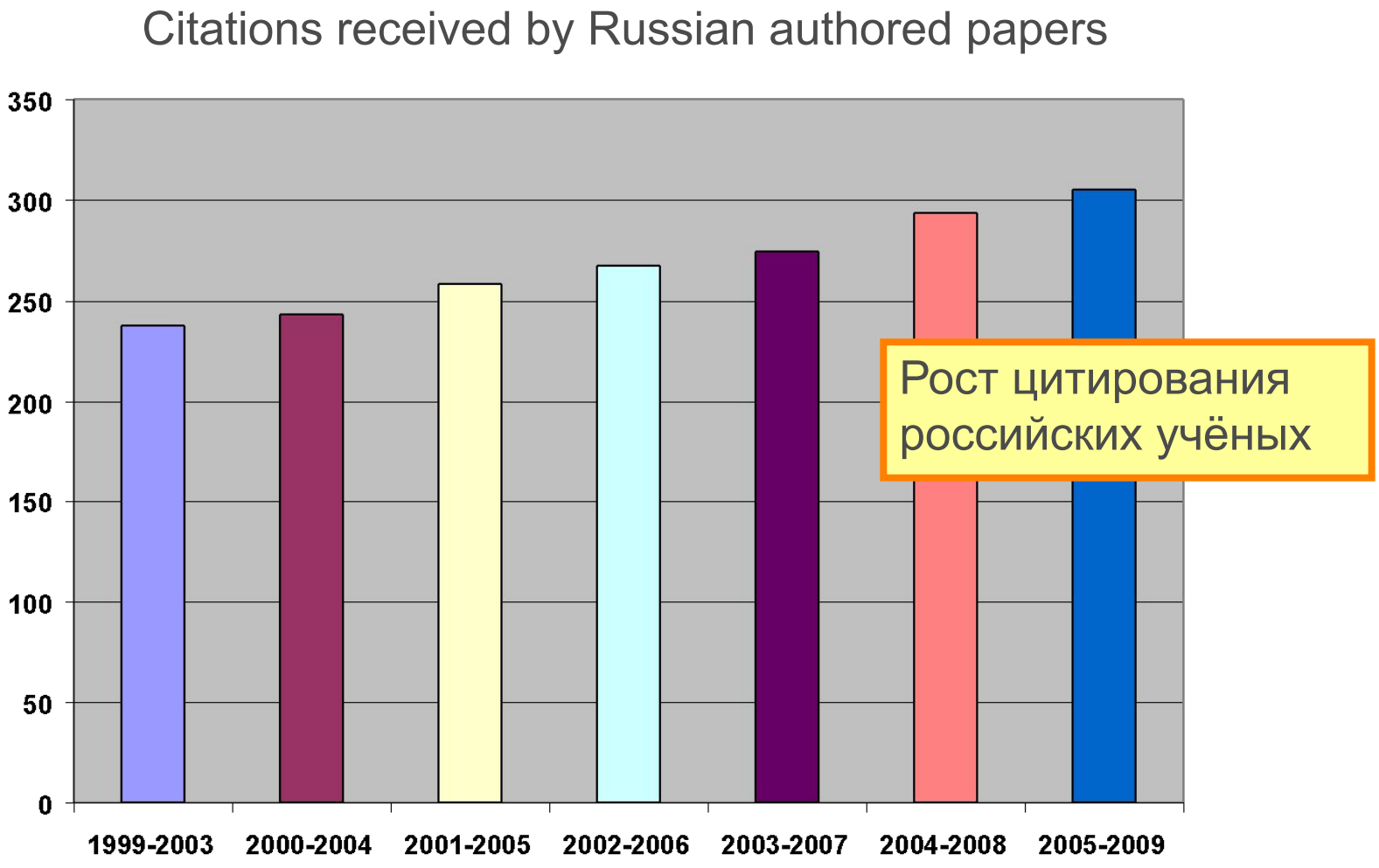
"When to Cite", E. Garfield, Library Quarterly, v66, p449-458, 1996

Политика отбора журналов в Web of Science

- Ежегодно рассматривается ~2000 журналов
  - 10-12% принимается
- Эксперты Thomson Reuters
  - Профессионалы информационного бизнеса
  - Библиотекари
  - Эксперты в конкретной предметной области



Оценка результатов исследований на национальном уровне



Россия - №20 по цитированию в мире по всем областям и №34 – по психологии

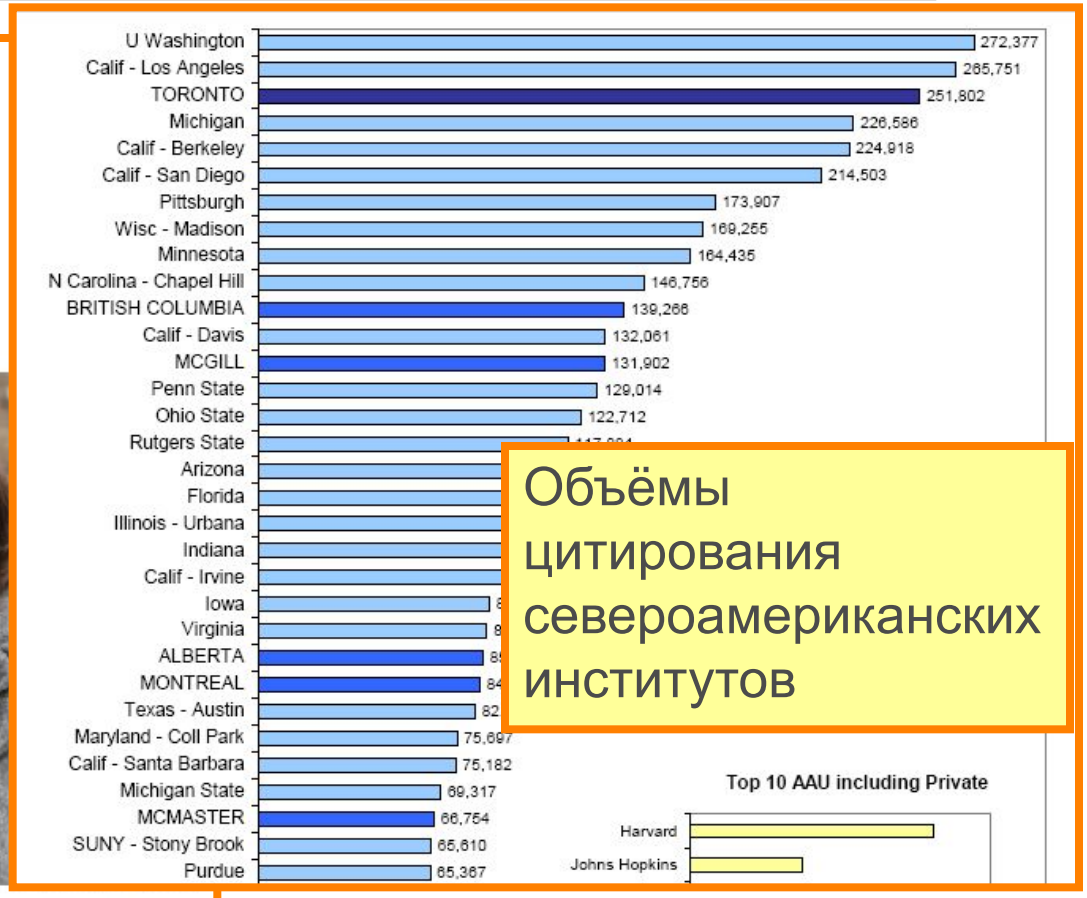
	View		Country/Territory	Papers	Citations	Citations Per Paper
21			DENMARK	1,411	14,700	10.42
22			AUSTRIA	1,420	11,844	8.34
23			IRELAND	1,029	8,348	8.11
24			BRAZIL	1,546	8,226	5.32
25			SOUTH KOREA	1,021	7,238	7.09
26			TAIWAN	1,325	7,162	5.41
27			SOUTH AFRICA	1,263	6,783	5.37
28			TURKEY	1,569	6,671	4.25
29			GREECE	901	4,815	5.34
30			HUNGARY	436	4,811	11.03
31			INDIA	646	4,601	7.12
32			POLAND	519	3,411	6.57
33			MEXICO	1,084	3,381	3.12
34			RUSSIA	1,311	3,185	2.43

Оценка исследований на уровне института

UNIVERSITY OF TORONTO

PERFORMANCE INDICATORS FOR GOVERNANCE, 2008

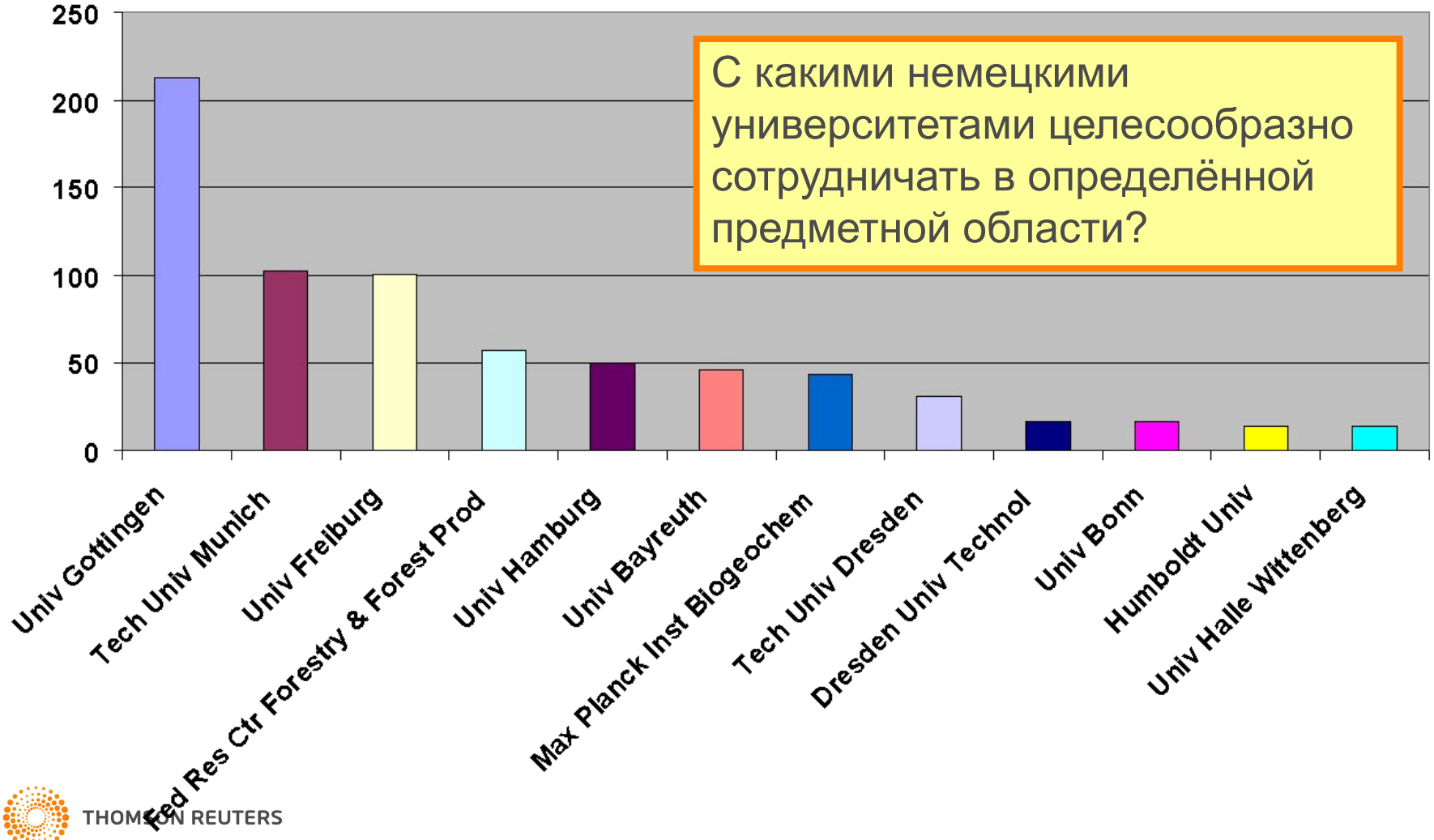
A SUMMARY



Объёмы цитирования североамериканских институтов

Источник: Thomson Reuters
U.S. and Canadian University Science Indicators

Оценка на уровне предметной области

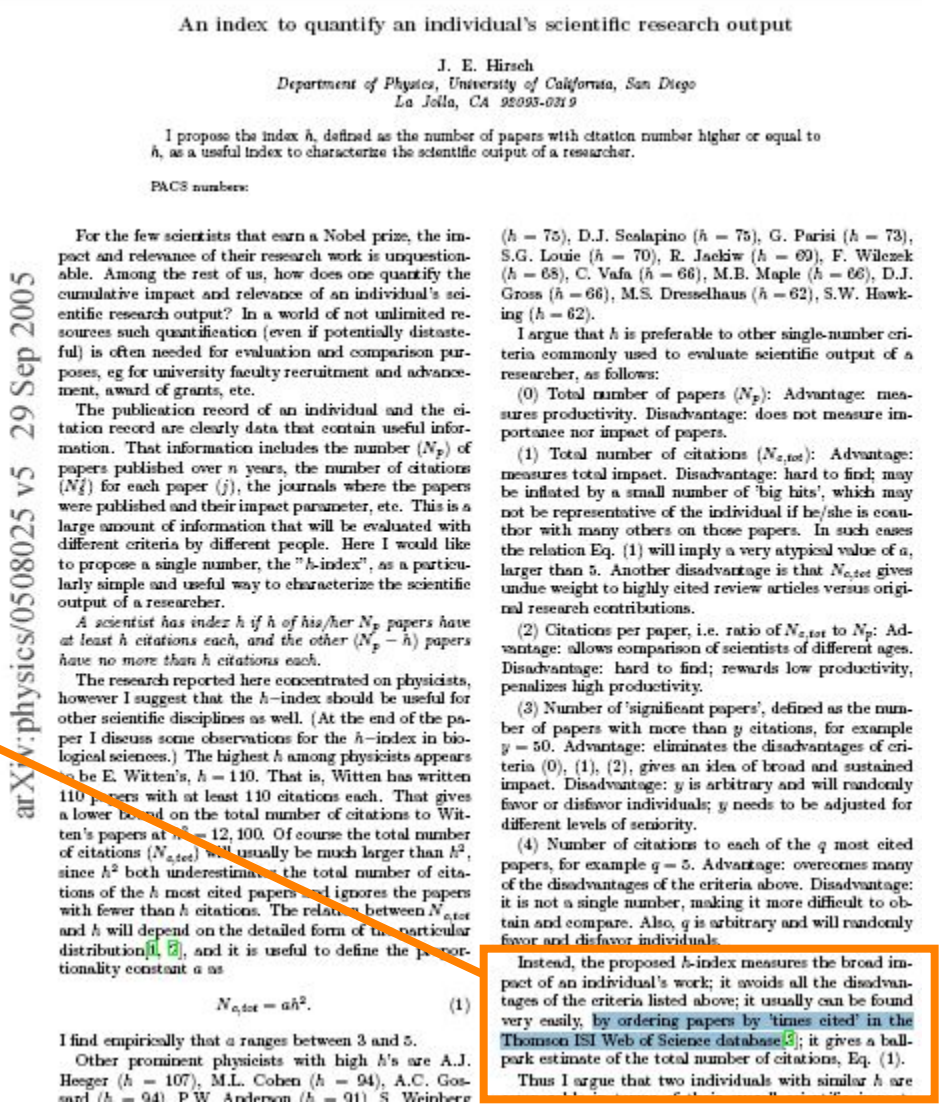


Различные вопросы – различные показатели

Объект оценки	Необходимые данные	Оцениваемая выборка
Производительность	Количество публикаций	Автор, группа, организация
Общее влияние	Объём цитирования	Автор, группа, организация
	Индекс Хирша	Автор, группа, организация
Непрямое влияние	Объём цитирования "второго поколения"	Автор, группа, организация
Эффективность	Средний объём цитирования на статью	Автор, группа, организация
	Соотношение процитированных/непроцитированных работ	Автор, группа, организация
	Импакт-фактор	Журнал
Относительный импакт	Среднее цитирование в предметной области	Автор, группа, организация
	Ожидаемое цитирование в журнале	Автор, группа, организация
	Перцентили: статей, средние, относительные	Автор, группа, организация
Специализация	Показатели коллаборации	Автор, группа, организация
	Индекс Дисциплинарности	Автор, группа, организация
Трендовый анализ	Временные ряды	Автор, группа, организация

Эффективность – индекс Хирша

"…can be found very easily by ordering the papers by 'times cited' in the Thomson ISI
Web of Science database."



An index to quantify an individual's scientific research output

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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.

PACS numbers:

For the few scientists that earn a Nobel prize, the impact and relevance of their research work is unquestionable. Among the rest of us, how does one quantify the cumulative impact and relevance of an individual's scientific research output? In a world of not unlimited resources such quantification (even if potentially distasteful) is often needed for evaluation and comparison purposes, eg for university faculty recruitment and advancement, 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_j^c) 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, however I suggest that the h−index should be useful for other scientific disciplines as well. (At the end of the paper I discuss some observations for the h−index in biological sciences.) The highest h among physicists appears to be E. Witten's, $h = 110$. That is, Witten has written 110 papers with at least 110 citations each. That gives a lower bound on the total number of citations to Witten's papers at $h^2 = 12,100$. Of course the total number of citations ($N_{c,tot}$) will usually be much larger than h^2, since h^2 both underestimates the total number of citations of the h most cited papers and ignores the papers with fewer than h citations. The relation between $N_{c,tot}$ and h will depend on the detailed form of the particular distribution[1, 2], and it is useful to define the proportionality constant a as

$$N_{c,tot} = a h^2. \qquad (1)$$

I find empirically that a ranges between 3 and 5.

Other prominent physicists with high h's are A.J. Heeger ($h = 107$), M.L. Cohen ($h = 94$), A.C. Gossard ($h = 94$), P.W. Anderson ($h = 91$), S. Weinberg ($h = 75$), D.J. Scalapino ($h = 75$), G. Parisi ($h = 73$), S.G. Louie ($h = 70$), R. Jackiw ($h = 69$), F. Wilczek ($h = 68$), C. Vafa ($h = 66$), M.B. Maple ($h = 66$), D.J. Gross ($h = 66$), M.S. Dresselhaus ($h = 62$), S.W. Hawking ($h = 62$).

I argue that h is preferable to other single-number criteria commonly used to evaluate scientific output of a researcher, as follows:

(0) Total number of papers (N_p): Advantage: measures productivity. Disadvantage: does not measure importance nor impact of papers.

(1) Total number of citations ($N_{c,tot}$): Advantage: measures total impact. Disadvantage: hard to find; may be inflated by a small number of 'big hits', which may not be representative of the individual if he/she is coauthor with many others on those papers. In such cases the relation Eq. (1) will imply a very atypical value of a, larger than 5. Another disadvantage is that $N_{c,tot}$ gives undue weight to highly cited review articles versus original research contributions.

(2) Citations per paper, i.e. ratio of $N_{c,tot}$ to N_p: Advantage: allows comparison of scientists of different ages. Disadvantage: hard to find; rewards low productivity, penalizes high productivity.

(3) Number of 'significant papers', defined as the number of papers with more than y citations, for example $y = 50$. Advantage: eliminates the disadvantages of criteria (0), (1), (2), gives an idea of broad and sustained impact. Disadvantage: y is arbitrary and will randomly favor or disfavor individuals; y needs to be adjusted for different levels of seniority.

(4) Number of citations to each of the q most cited papers, for example $q = 5$. Advantage: overcomes many of the disadvantages of the criteria above. Disadvantage: it is not a single number, making it more difficult to obtain and compare. Also, q is arbitrary and will randomly favor and disfavor individuals.

Instead, the proposed h-index measures the broad impact of an individual's work; it avoids all the disadvantages of the criteria listed above; it usually can be found very easily, by ordering papers by 'times cited' in the Thomson ISI Web of Science database[3]; it gives a ballpark estimate of the total number of citations, Eq. (1).

Thus I argue that two individuals with similar h are

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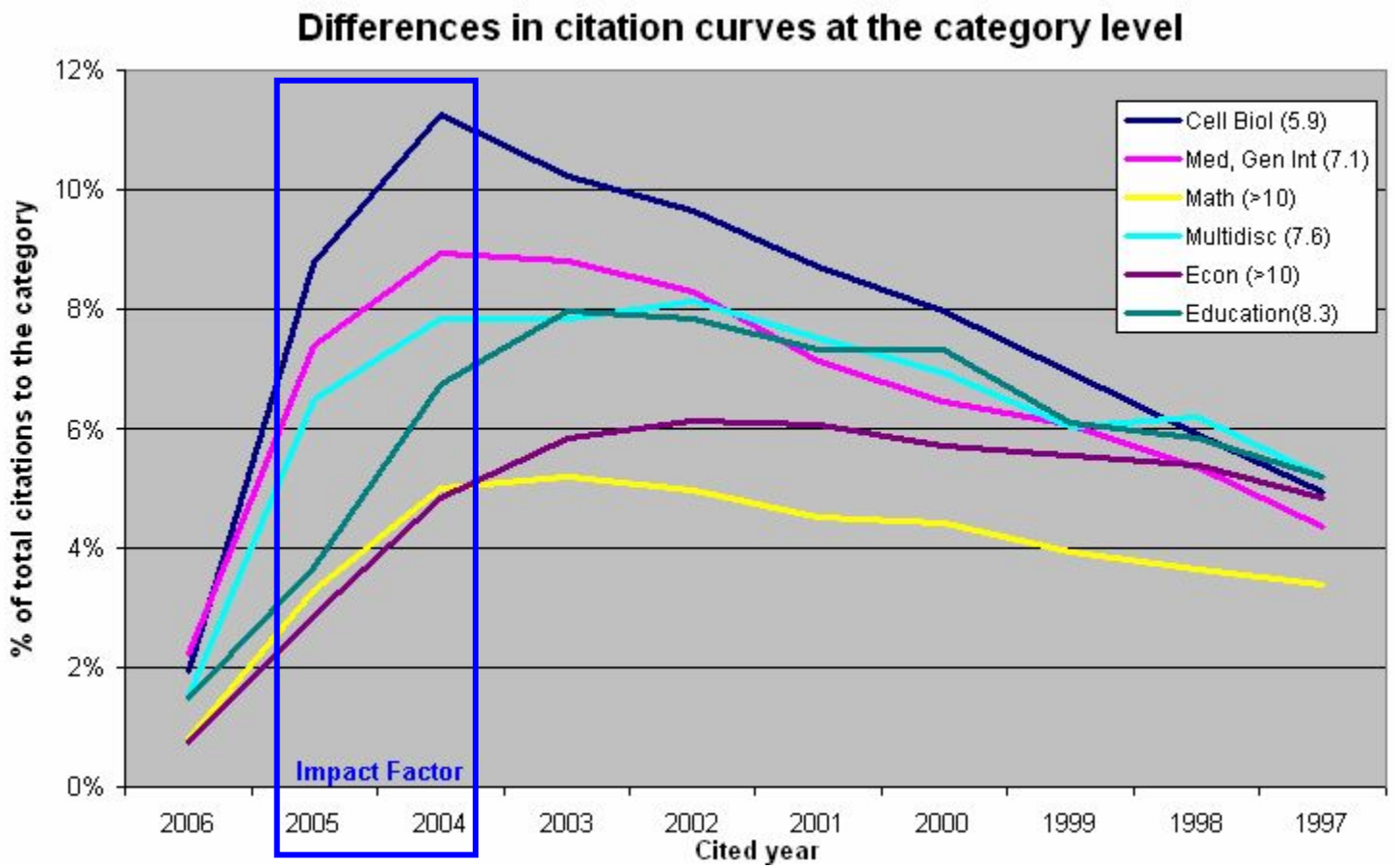
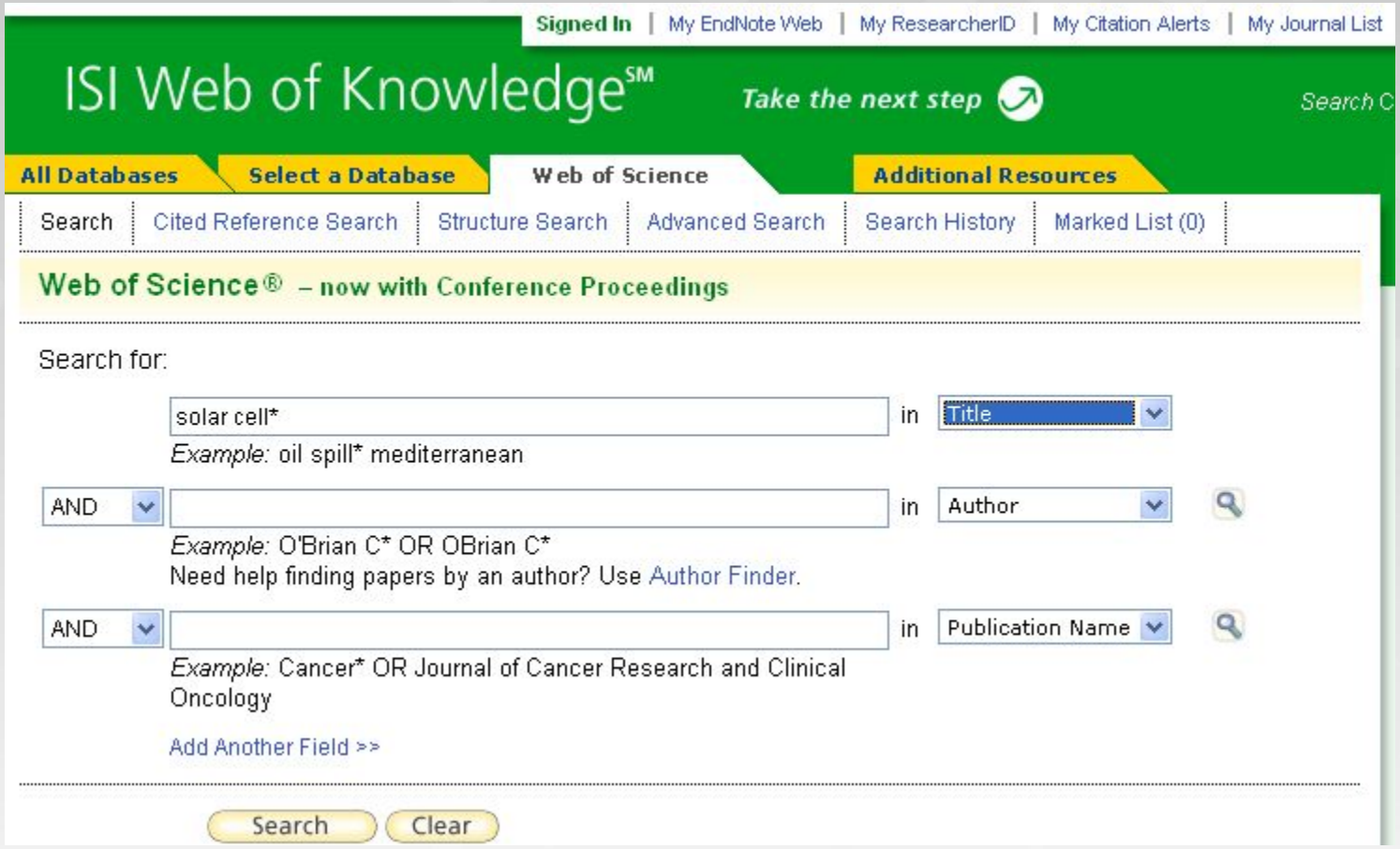
Жизненный цикл цитирования статьи



Web of Science – реферативная база данных по научным публикациям



- Поиск по ключевым словам, автору или университету
- Анализ цитирования

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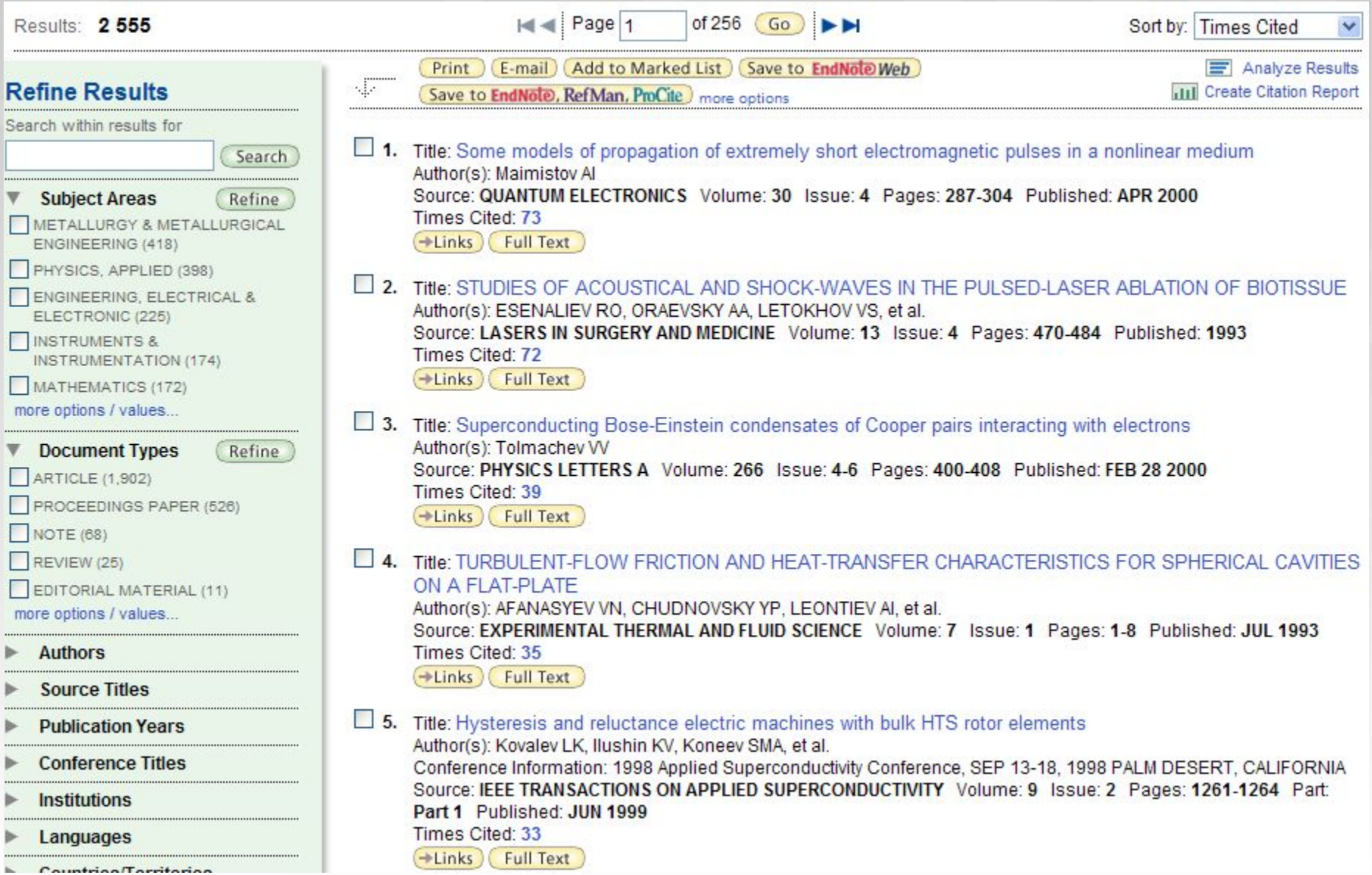
Web of Science – поиск по организации – МГТУ им. Баумана



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Search

Subject Areas Refine

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- PHYSICS, APPLIED (398)
- ENGINEERING, ELECTRICAL & ELECTRONIC (225)
- INSTRUMENTS & INSTRUMENTATION (174)
- MATHEMATICS (172)

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Document Types Refine

- ARTICLE (1,902)
- PROCEEDINGS PAPER (526)
- NOTE (68)
- REVIEW (25)
- EDITORIAL MATERIAL (11)

more options / values...

Authors

Source Titles

Publication Years

Conference Titles

Institutions

Languages

Countries/Territories

1. Title: Some models of propagation of extremely short electromagnetic pulses in a nonlinear medium
Author(s): Maimistov AI
Source: **QUANTUM ELECTRONICS** Volume: **30** Issue: **4** Pages: **287-304** Published: **APR 2000**
Times Cited: 73
Links | Full Text

2. Title: STUDIES OF ACOUSTICAL AND SHOCK-WAVES IN THE PULSED-LASER ABLATION OF BIOTISSUE
Author(s): ESENALIEV RO, ORAEVSKY AA, LETOKHOV VS, et al.
Source: **LASERS IN SURGERY AND MEDICINE** Volume: **13** Issue: **4** Pages: **470-484** Published: **1993**
Times Cited: 72
Links | Full Text

3. Title: Superconducting Bose-Einstein condensates of Cooper pairs interacting with electrons
Author(s): Tolmachev VV
Source: **PHYSICS LETTERS A** Volume: **266** Issue: **4-6** Pages: **400-408** Published: **FEB 28 2000**
Times Cited: 39
Links | Full Text

4. Title: TURBULENT-FLOW FRICTION AND HEAT-TRANSFER CHARACTERISTICS FOR SPHERICAL CAVITIES ON A FLAT-PLATE
Author(s): AFANASYEV VN, CHUDNOVSKY YP, LEONTIEV AI, et al.
Source: **EXPERIMENTAL THERMAL AND FLUID SCIENCE** Volume: **7** Issue: **1** Pages: **1-8** Published: **JUL 1993**
Times Cited: 35
Links | Full Text

5. Title: Hysteresis and reluctance electric machines with bulk HTS rotor elements
Author(s): Kovalev LK, Ilushin KV, Koneev SMA, et al.
Conference Information: 1998 Applied Superconductivity Conference, SEP 13-18, 1998 PALM DESERT, CALIFORNIA
Source: **IEEE TRANSACTIONS ON APPLIED SUPERCONDUCTIVITY** Volume: **9** Issue: **2** Pages: **1261-1264** Part: **Part 1** Published: **JUN 1999**
Times Cited: 33
Links | Full Text

Web of Science – панель Refine Results

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- По конференции
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- И т.д.

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Web of Science – реферативная информация по статье

X-ray spectra of fast ions generated from clusters by ultrashort laser pulses

Full Text | Links | Holdings | Go | Print | E-mail | Add to Marked List | Save to EndNote Web | Save to EndNote, RefMan, ProCite | more options

Author(s): Magunov AI, Faenov AY, Skobelev IY, Pikuz TA, Dobosz S, Schmidt M, Perdrix M, Meynadier P, Gobert O, Normand D, Stenz C, Bagnoud V, Blasco F, Roche JR, Salin F, Sharkov BY

Source: LASER AND PARTICLE BEAMS **Volume:** 21 **Issue:** 1 **Pages:** 73-79 **Published:** MAR 2003

Times Cited: 24 **References:** 15 Citation Map

Abstract: The high precision X-ray spectroscopy studies of plasma created from the CO2 clusters in gas jet targets by the ultrashort laser pulses (35 and 60 A duration) were performed at the intensities I-L similar to 10(17)-10(18) W cm(-2). The spectral line shape of the H-like and He-like oxygen ions gains an asymmetry with increasing the laser pulse intensity. Theoretical modeling of the line shape shows that the asymmetry can be explained by absorption of the Doppler-shifted line radiation from the essential fraction of ions (over 10(-3)) with energies above 1 MeV due to photoionization of inner shells of carbon ions. The results obtained demonstrate measurement capabilities of the X-ray spectral measurements of multicharged ions accelerated during the interaction with a laser radiation.

Document Type: Article

Language: English

Author Keywords: acceleration of ions; laser-produced plasma; x-ray spectroscopy

KeyWords Plus: ATOMIC CLUSTERS; PLASMAS; EXPLOSION; EMISSION

Reprint Address: Magunov, AI (reprint author), Russian Acad Sci, Theory Dept, Inst Gen Phys, Vavilov St 38, Moscow 119991, Russia

Addresses:
1. Russian Acad Sci, Theory Dept, Inst Gen Phys, Moscow 119991, Russia
2. All Russian Inst Phys Tech & Radiotech Measuremen, Multicharged Ions Spectra Data Ctr, Moscow, Russia
3. NE Bauman Moscow State Tech Univ, Moscow, Russia
4. CEA, CE Saclay, DSM, DRECAM,SPAM, Gif Sur Yvette, France
5. Univ Bordeaux, Ctr Lasers Instenses & Applicat, Talence, France
6. Inst Expt Theoret Phys, Moscow, Russia

Publisher: CAMBRIDGE UNIV PRESS, 40 WEST 20TH ST, NEW YORK, NY 10011-4211 USA

Subject Category: Physics, Applied

Cited by: 24

This article has been cited 24 times (from Web of Science).

Faenov AY, Pikuz TA, Pikuz SA, et al. Ionography of Submicron Foils and Nanostructures Using Ion Flow Generated in FS-Laser Cluster Plasma CONTRIBUTIONS TO PLASMA PHYSICS 49 7-8 Sp. Iss. SI 507-516 SEP 2009

Faenov AY, Pikuz TA, Fukuda Y, et al. Femtosecond-Laser-Driven Cluster-Based Plasma Source for High-Resolution Ionography LASER-DRIVEN RELATIVISTIC PLASMAS APPLIED TO SCIENCE, INDUSTRY AND MEDICINE 1153 343-355 2009

Makarov GN The spectroscopy of clusters by intense pulses of VUV radiation from free electron lasers PHYSICS-USPEKHI 52 5 461-486 MAY 2009

[view all 24 citing articles]

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Related Records:

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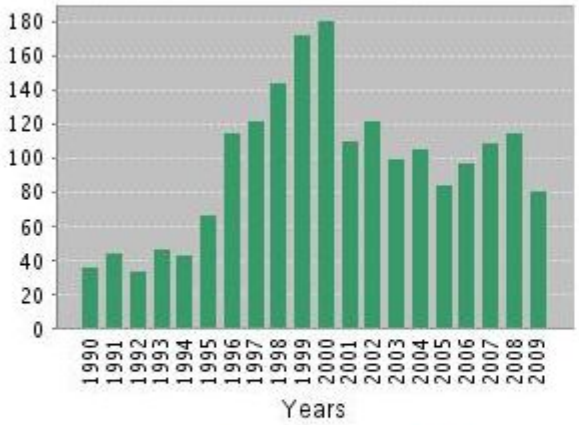
Web of Science – citation report – МГТУ им. Баумана

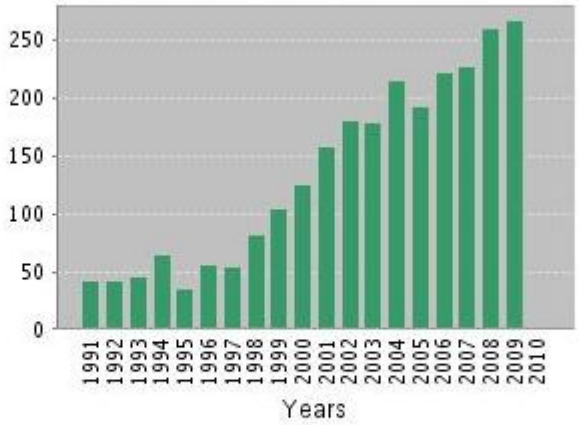
This report reflects citations to source items indexed within Web of Science. Perform a Cited Reference Search to include citations to items not indexed within Web of Science.

Published Items in Each Year



The latest 20 years are displayed.
View a graph with all years.

Citations in Each Year



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Results found: 2,555

Sum of the Times Cited [?] : 2,933

View Citing Articles
View without self-citations

Average Citations per Item [?] : 1.15

h-index [?] : 18

Results: **2 555**

Page 1 of 256 Go

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Web of Science – citation report - МГТУ – 3 популярных журнала

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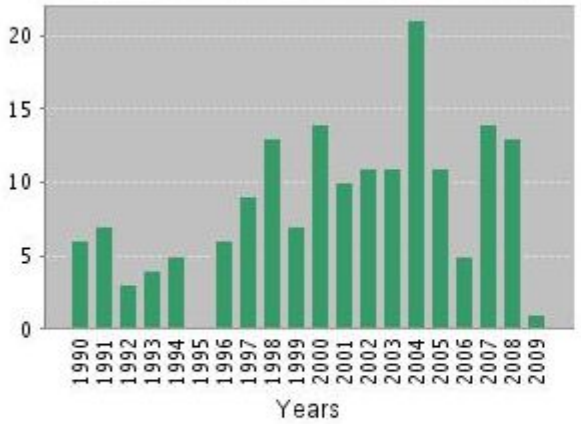
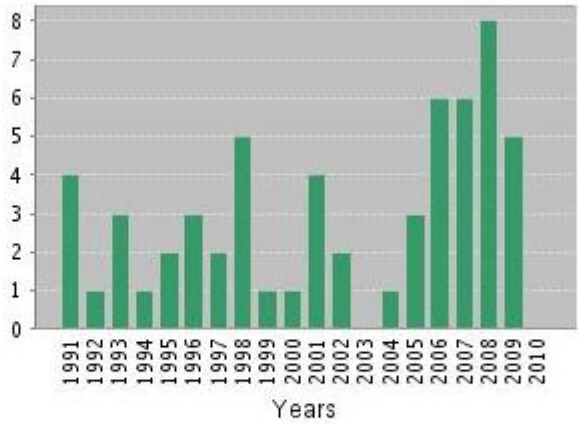
Published Items in Each Year



The latest 20 years are displayed.
View a graph with all years.

Citations in Each Year



The latest 20 years are displayed.
View a graph with all years.

Results found: 381

Sum of the Times Cited [?] : 70

View Citing Articles
View without self-citations

Average Citations per Item [?] : 0.18

h-index [?] : 3

Results: **381**

Page 1 of 39 Go

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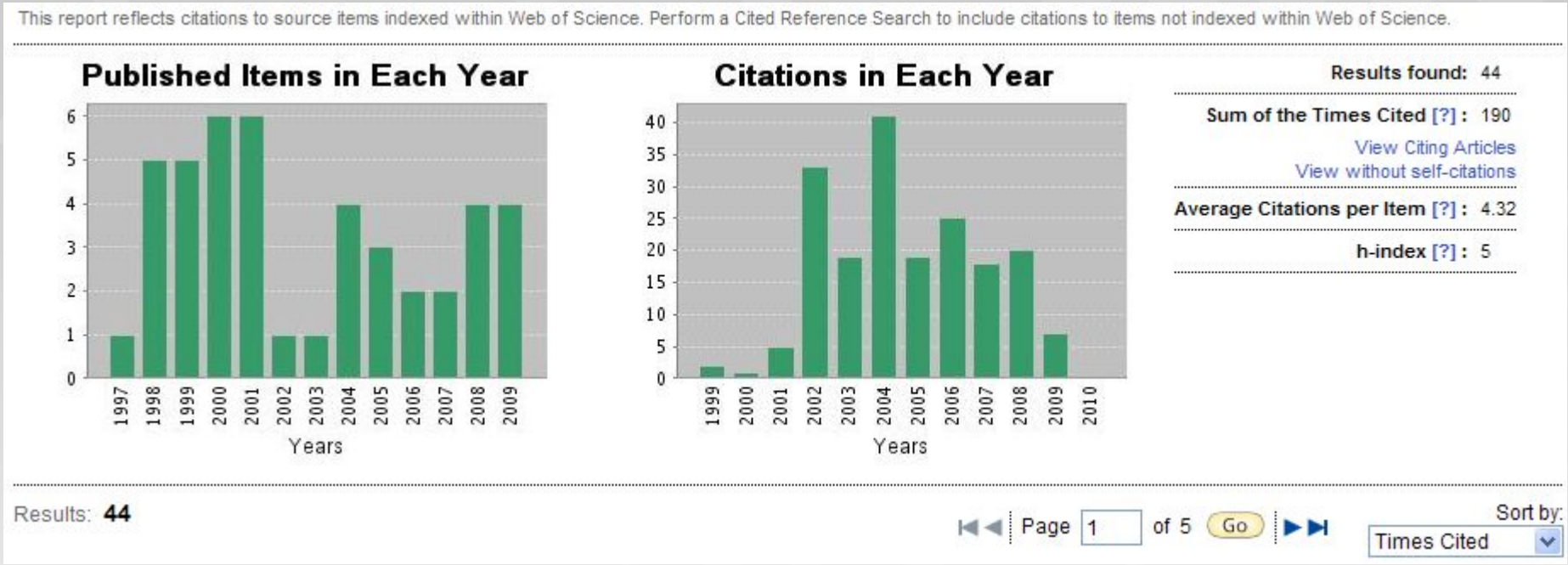
Web of Science – citation report - МГТУ – журнал «Quantum Electronics»



Отношение Average Citations per item: 4.32 / 0.18=**24.0**

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Journal Citation Reports

- импакт-фактор – показатель, рассчитываемый эксклюзивно в JCR
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Rank	Abbreviated Journal Title *(linked to journal information)*	ISSN	JCR		
			Total Cites	Impact Factor	5-Year Impact Factor
1	IEEE T PATTERN ANAL	0162-8828	24674	5.960	7.981
2	IEEE T IND ELECTRON	0278-0046	9014	5.468	4.665
3	PROG QUANT ELECTRON	0079-6727	634	4.750	5.909
4	PROG ELECTROMAGN RES	1559-8985	3346	4.735	
5	P IEEE	0018-9219	17993	4.613	6.824
6	IEEE J SEL AREA COMM	0733-8716	13838	4.249	5.615
7	IEEE T MED IMAGING	0278-0062	10426	4.004	5.544
8	IEEE T INFORM THEORY	0018-9448	29333	3.793	5.434
9	IEEE SIGNAL PROC MAG	1053-5888	3040	3.758	6.157
10	IEEE T NEURAL NETWOR	1045-9227	9883	3.726	4.144

Категория: Engineering, Electrical and Electronic

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Journal Citation Reports – сопоставляем результаты

Rank	Abbreviated Journal Title (linked to journal information)	ISSN	JCR Data						Eigenfactor™ Metrics	
			2008 Total Cites	Impact Factor	5-Year Impact Factor	Immediacy Index	2008 Items	Cited Half-life	Eigenfactor™ Score	Article Influence™ Score
1	QUANTUM ELECTRON+	1063-7818	2273	0.835	0.757	0.154	169	9.6	0.00442	0.198
2	HIGH TEMP+	0018-151X	767	0.469	0.434	0.055	127	9.6	0.00151	0.118
3	MET SCI HEAT TREAT+	0026-0673	271	0.157	0.174	0.026	77	>10.0	0.00110	0.098

Отношение импакт-факторов: 0.835 / 0.157 = **5.31**

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Цикл научных исследований

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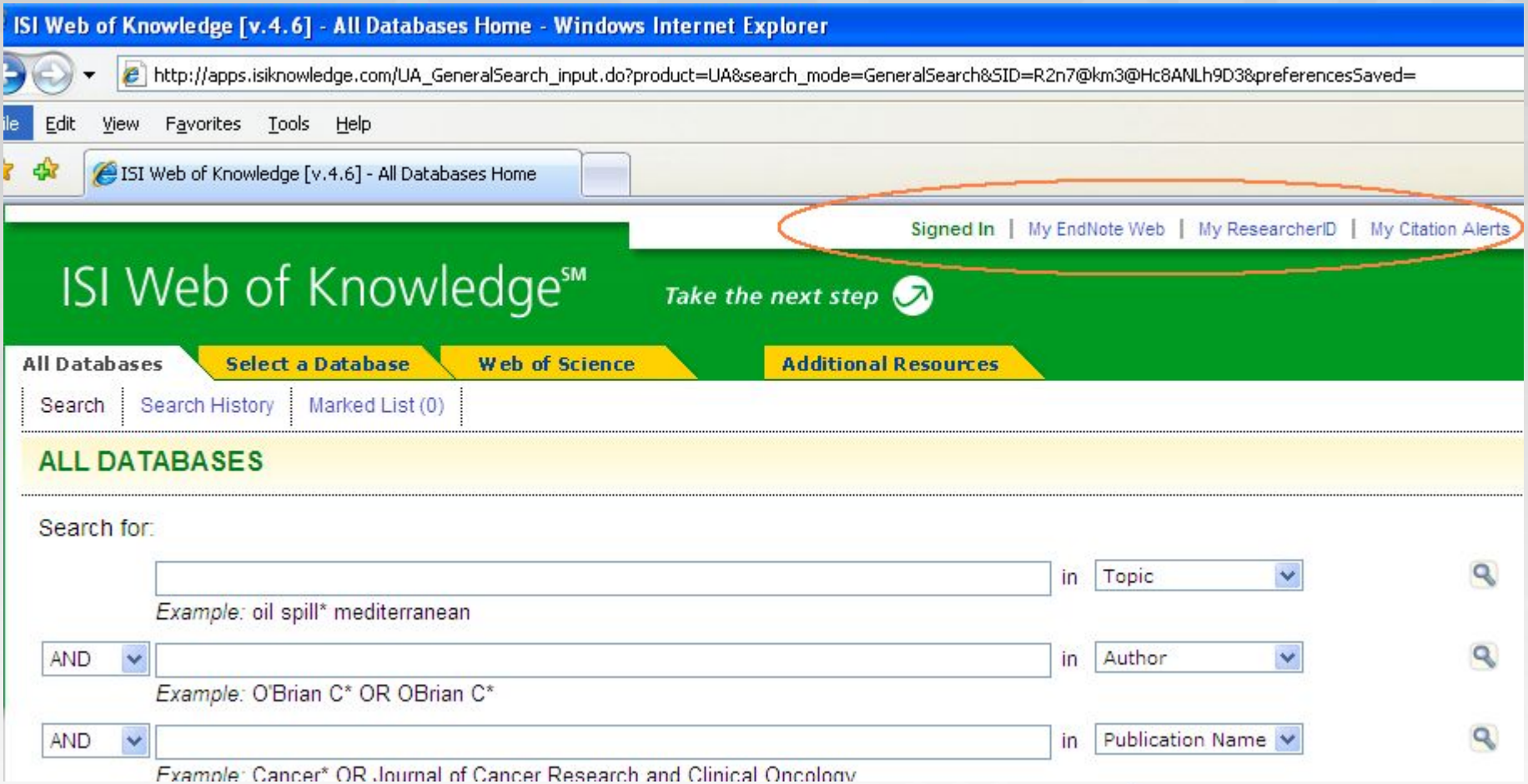

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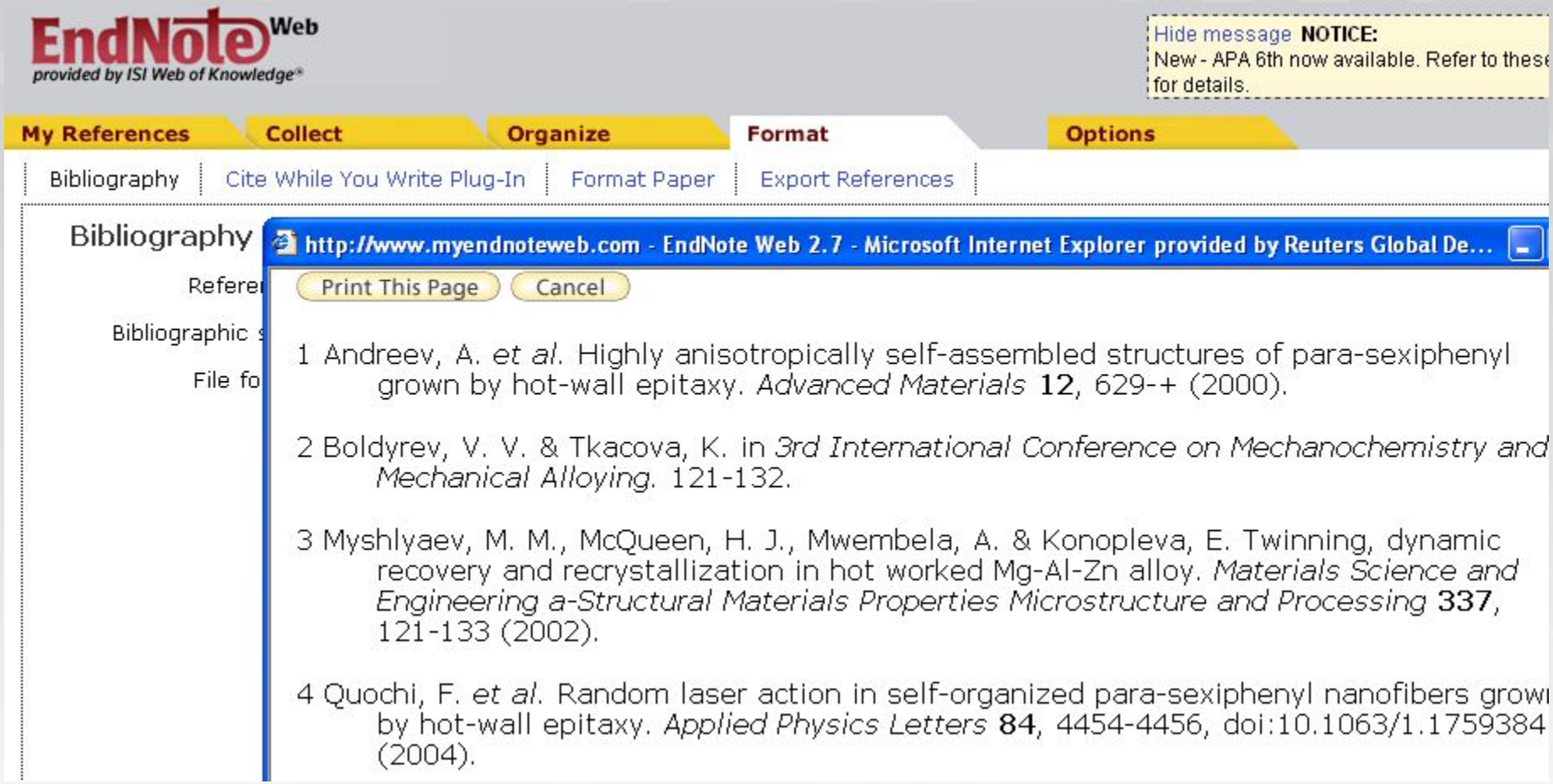

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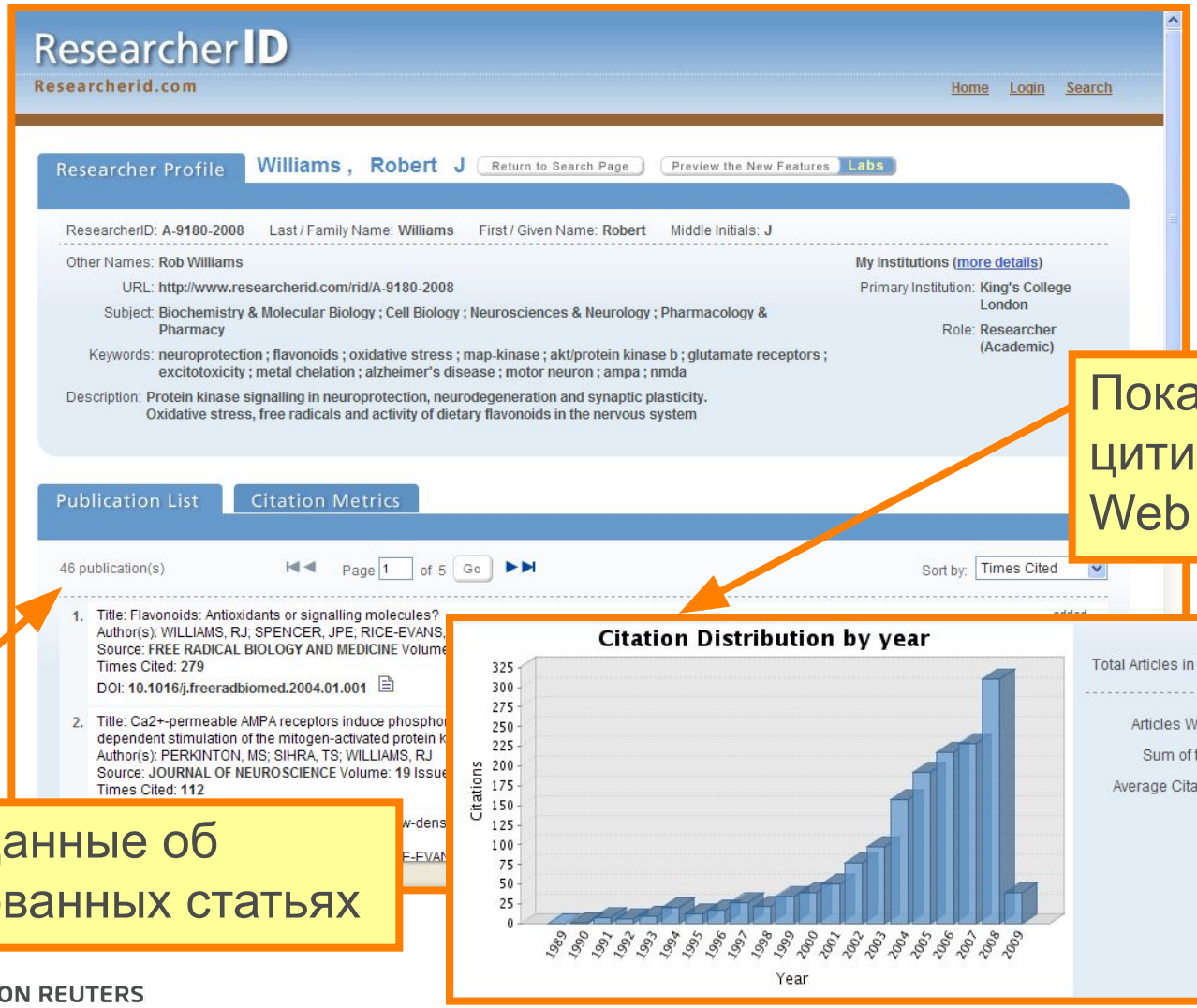

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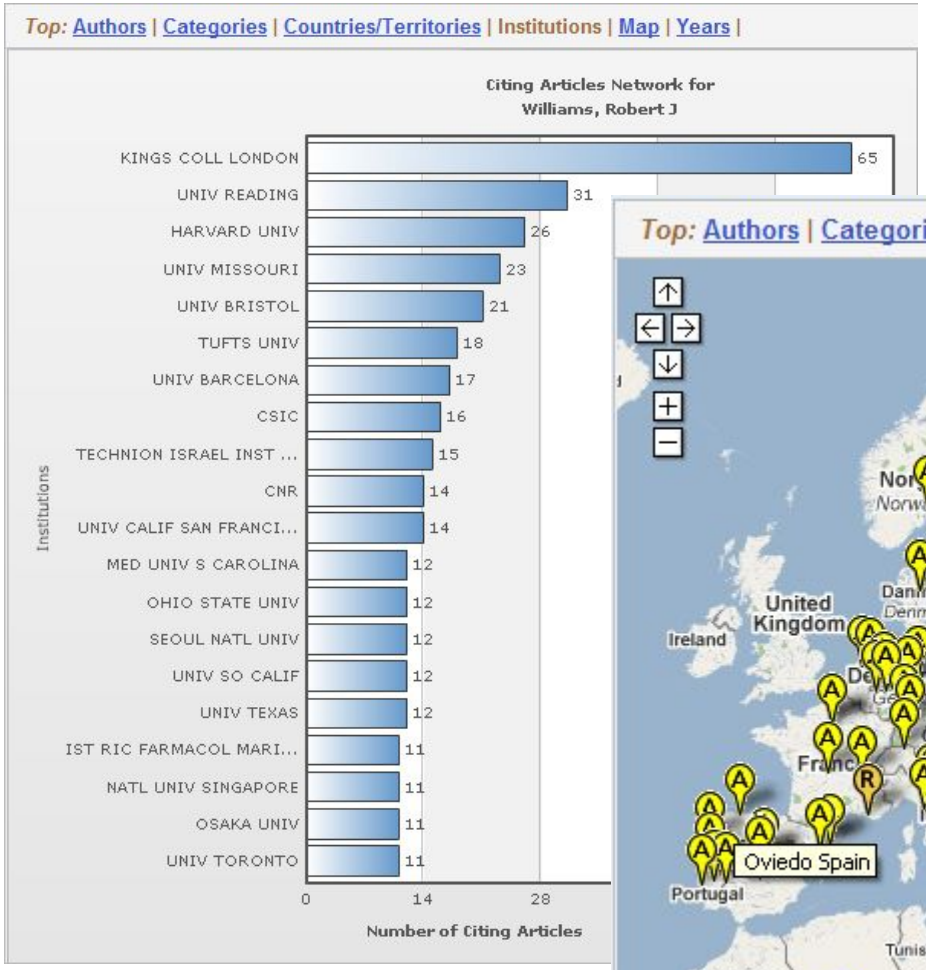

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