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Vol. 122, Issue 3159, pp. 108-111
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Citation Indexes for Science

A New Dimension in Documentation
through Association of Ideas

Eugene Garfield

"The uncritical citation of disputed data by a writer, whether it be deliberate or not, is a serious matter. Of course, knowledge transcends individual unscrupulous approach to subject control of ture of science. By virtue of i construction, it tends to brin material that would never be .

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Gläserne Forschung

- Zitatanalysen mit Fachdatenbanken

Life-Cycle Wissenschaftliche Kommunikation



Wo finden Sie Fachdatenbanken?

The screenshot shows the TUHH library website. The header includes the TUHH logo and 'Universitätsbibliothek DE | EN'. A navigation bar contains 'Universitätsbibliothek', 'Aktuelles', 'Ausleihen', 'Finden', and 'Lernen & Arbeiten'. The 'Finden' menu is open, listing options like 'tub.find – Katalog', 'Datenbanken', 'Fachinformation', 'Fachreferat', 'GBV Kataloge', 'Hamburger Bibliotheken', 'Normen', 'Patente', 'Schiffbau-Dokumentation', and 'Zeitschriften'. The 'Datenbanken' option is highlighted in green, and a sub-menu item 'Datenbank-Infosystem (DBIS)' is visible. Below the menu is a 'tub.find' search box with a search button and radio buttons for 'Bücher' and 'Artikel'.

...im Datenbank-
Informationssystem (DBIS)

The screenshot shows the 'Datenbanken' page. It features a search bar, a navigation bar with 'Publizieren', and a list of database categories: 'Top-Datenbanken | Fachliste | Freie Datenbanken | Nationallizenzen | Shibboleth'. A search input field contains 'Datenbank finden'. The 'Fachgebiet: Energie, Umweltschutz, Kerntechnik' is displayed, along with a 'Liste nach Datenbanktypen sortieren' button. The 'Zugriffsbedingungen' section lists access types: 'Online-Datenbank mit Zugang ausschließlich im Intranet der TU Hamburg', 'Frei im Web', and 'Deutschlandweit frei zugänglich (DFG-geförderte Nationallizenz)'. A list of 'TOP-Datenbanken (8)' includes 'WTI Frankfurt', 'Umwelt-Online', 'WEKA Business Portal', 'Web of Science Core Collection', 'Merkblätter gefährliche Arbeitsstoffe online', 'IEEE Xplore / Electronic Library Online (IEL)', 'DWA-Regelwerk online', and 'LIVIVO - Das Suchportal für Lebenswissenschaften'. The 'Gesamtangebot (55)' section lists 'AIAA Meeting Papers and Journals Archive', 'BranchenIndex', 'Cooperative Patent Classification', and 'Daten / Umweltbundesamt'.

<https://www.tub.tuhh.de/>

Zugang zu den von der TUHH
lizenzierten Fachdatenbanken nur
im TUHH-Intranet!

Datenbank der Datenbanken

Web of Science

Clarivate Analytics

Search My Tools Searches and alerts Search History Marked List

Select a database Web of Science Core Collection Learn More

See how we've improved Analyze Results, Cited Reference Search, and more!

Basic Search Cited Reference Search Advanced Search + More

Hamburg University of Technology Organization-Enhanced Search

Finds papers from organizations with identified name variants.
Select available organizations from the Index.

Click here for tips to improve your search.

+ Add Another Field | Reset Form

- **Web of Science:** interdisziplinäre Datenbank mit mehr als 20.000 ausgewerteten Zeitschriften, inkl. Natur-und Ingenieurwissenschaften

(Zugang nur im TUHH-Intranet)

... haben in den Jahren 2015 bis 2017 am meisten publiziert?

Web of Science

Search

Results: ...
(from Web of Science Core Collection)

You searched for: ORGANIZATION-ENHANCED:
(Hamburg University of Technology) ...[More](#)

[Create Alert](#)

Refine Results

Search within results for...

Filter results by:

- Highly Cited in Field (11)
- Hot Papers in Field (2)
- Open Access (301)
- Associated Data (2)

[Refine](#)

Publication Years

- 2017 (516)
- 2016 (508)
- 2015 (518)

[more options / values...](#)

[Refine](#)

Authors [Refine](#)

The first 100 Authors (by re

- JACOB AF (50)
- WERNER H (46)
- HEINRICH S (45)
- SMIRNOVA I (41)
- SCHULTE K (40)
- ZENG AP (39)
- SCHNEIDER GA (38)
- SCHUSTER C (38)
- MORLOCK MM (36)
- BARGMANN S (33)
- KNOPP T (32)
- GRABE J (31)
- HERSTATT C (31)
- LIESE A (30)
- EHLERS S (27)
- EICH M (26)
- FIEDLER B (25)
- WEISSMULLER J (25)
- JANSSEN R (23)
- EMMELMANN C (22)
- HUBER G (22)
- KRAUSE D (22)
- FIEG G (21)
- PETROV AY (21)
- ABDEL-MAKSOD M (20)

... meine eigenen Artikel zitiert?

The screenshot shows the Web of Science interface with search results for the author 'antranikian g*'. The results are sorted by Date. A red arrow points to the 'Create Citation Report' button for the first result.

Web of Science | InCites | Journal Citation Reports | Essential Science Indicators | EndNote | Publons | Sign In | Help | English

Web of Science | Clarivate Analytics

Search | My Tools | Searches and Alerts | Search History | Marked List

Results: 185 (from Web of Science Core Collection)

Select articles grouped for author name: antranikian g*

You searched for: AUTHOR: (antranikian, g*) ...More

Create Alert

Refine Results

Search within results for...

Filter results by:

- Open Access (52)
- Associated Data (10)

Refine

Sort by: **Date** | Times Cited | Usage Count | Relevance | More

Page 1 of 19

Select Page | 5K | Save to EndNote online | Add to Marked List

Create Citation Report

Analyze Results

Times Cited: 0 (from Web of Science Core Collection)

Usage Count

1. **Towards a sustainable biobased industry - Highlighting the impact of extremophiles**

By: Krueger, Anna; Schaefers, Christian; Schroeder, Carola; et al.
NEW BIOTECHNOLOGY Volume: 40 Pages: 144-153 Part: A Published: JAN 25 2018

VOLLTEXT@TUHH | Full Text from Publisher | View Abstract

2. **Diversity of bacteria and archaea from two shallow marine hydrothermal vents from Vulcano Island**

By: Antranikian, Garabed; Suleiman, Marcel; Schaefers, Christian; et al.
EXTREMOPHILES Volume: 21 Issue: 4 Pages: 733-742 Published: JUL 2017

Full Text from Publisher | View Abstract

3. **Complete genome sequence of Thermus brockianus GE-1 reveals key enzymes of xylan/xylose metabolism**

By: Schaefers, Christian; Blank, Saskia; Wiebusch, Sigrid; et al.
STANDARDS IN GENOMIC SCIENCES Volume: 12 Article Number: 22 Published: FEB 3 2017

VOLLTEXT@TUHH | Free Full Text from Publisher | View Abstract

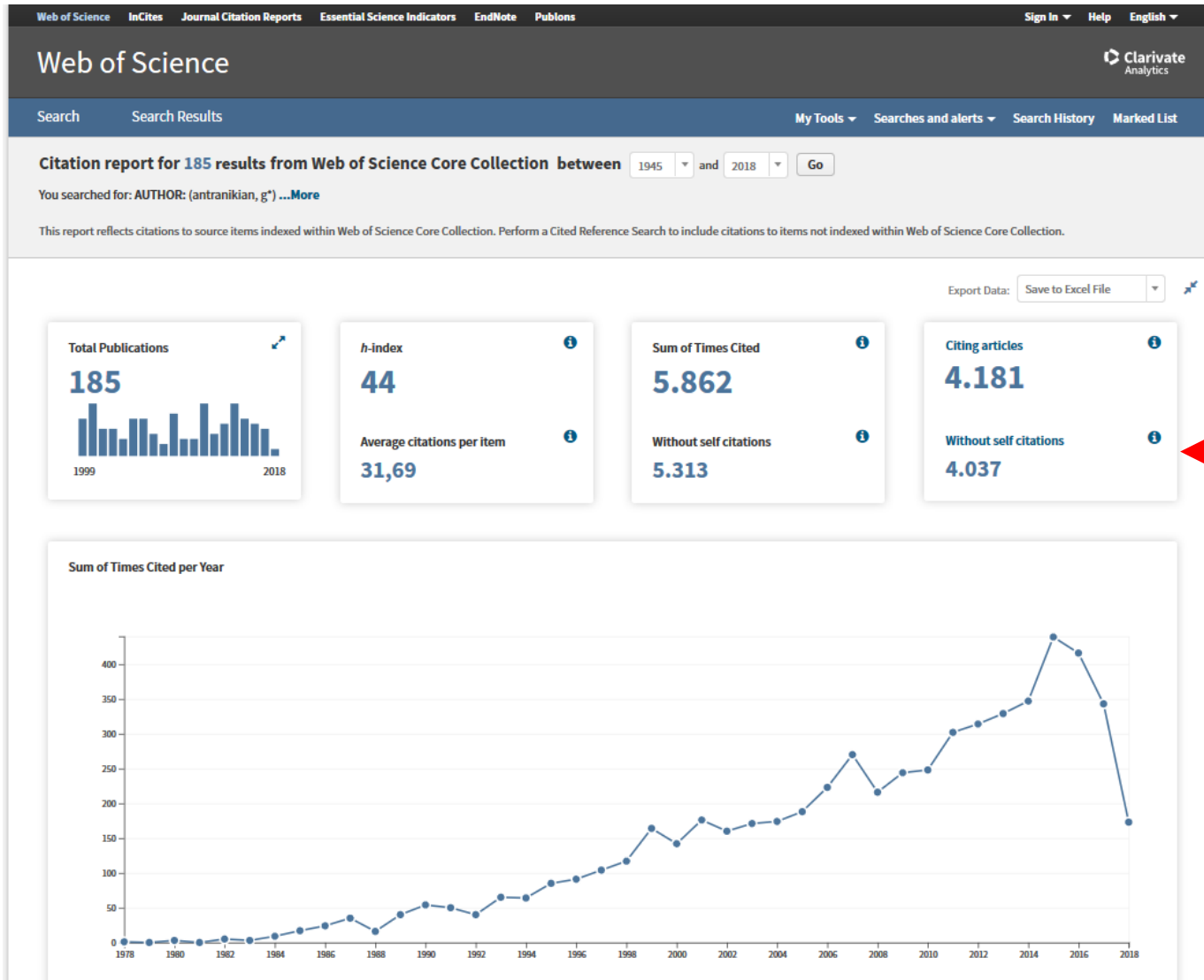
Times Cited: 3 (from Web of Science Core Collection)

Usage Count

Times Cited: 0 (from Web of Science Core Collection)

Usage Count

Citation Report



		2014	2015	2016	2017	2018	Total	Average Citations per Year
Use the checkboxes to remove individual items from this Citation Report								
or restrict to items published between 1945 and 2018 <input type="button" value="Go"/>								
<input type="checkbox"/>	1. Xylanolytic enzymes from fungi and bacteria By: Sunna, A; Antranikian, G CRITICAL REVIEWS IN BIOTECHNOLOGY Volume: 17 Issue: 1 Pages: 39-67 Published: 1997	347	439	416	343	173	5862	142.98
<input type="checkbox"/>	2. Extremophiles as a source of novel enzymes for industrial application By: Niehaus, F; Bertoldo, C; Kahler, M; et al. APPLIED MICROBIOLOGY AND BIOTECHNOLOGY Volume: 51 Issue: 6 Pages: 711-729 Published: JUN 1999	26	16	15	11	10	354	16.09
<input type="checkbox"/>	3. Enzymatic production of cyclodextrins By: Biber, A; Antranikian, G; Heinzle, E APPLIED MICROBIOLOGY AND BIOTECHNOLOGY Volume: 59 Issue: 6 Pages: 609-617 Published: SEP 2002	15	25	10	18	10	329	16.45
<input type="checkbox"/>	4. Genome sequence of <i>Picrophilus torridus</i> and its implications for life around pH 0 By: Fütterer, O; Angelov, A; Liesegang, H; et al. PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA Volume: 101 Issue: 24 Pages: 9091-9096 Published: JUN 15 2004	11	11	14	16	1	159	9.35
<input type="checkbox"/>	5. Keratin degradation by <i>Fervidobacterium pennavorans</i>, a novel thermophilic anaerobic species of the order Thermotogales By: Friedrich, AB; Antranikian, G APPLIED AND ENVIRONMENTAL MICROBIOLOGY Volume: 62 Issue: 8 Pages: 2875-2882 Published: AUG 1996	5	9	15	8	4	150	10.00
<input type="checkbox"/>	6. Starch-hydrolyzing enzymes from thermophilic archaea and bacteria By: Bertoldo, C; Antranikian, G CURRENT OPINION IN CHEMICAL BIOLOGY Volume: 6 Issue: 2 Pages: 151-160 Published: APR 2002	4	11	7	8	6	124	5.39
<input type="checkbox"/>	7. Industrial relevance of thermophilic Archaea By: Egorova, K; Antranikian, G CURRENT OPINION IN MICROBIOLOGY Volume: 8 Issue: 6 Pages: 649-655 Published: DEC 2005	11	15	9	9	3	121	7.12
		17	12	11	7	1	120	8.57

Use the checkboxes to remove individual items from this Citation Report

or restrict to items published between and

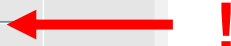
	2014	2015	2016	2017	2018	Total	Average Citations per Year
<input type="checkbox"/> 41. Cloning, sequencing, and characterization of thermoalkalstable type I pullulanase from Anaerobranca gottschalkii By: Bertoldo, C; Armbrecht, M; Becker, F; et al. APPLIED AND ENVIRONMENTAL MICROBIOLOGY Volume: 70 Issue: 6 Pages: 3407-3416 Published: JUN 2004	6	10	4	3	1	46	3.07
<input type="checkbox"/> 42. Thermococcus guaymasensis sp. nov. and Thermococcus aggregans sp. nov., two novel thermophilic archaea isolated from the Guaymas Basin hydrothermal vent site By: Canganella, F; Jones, WJ; Gambacorta, A; et al. INTERNATIONAL JOURNAL OF SYSTEMATIC BACTERIOLOGY Volume: 48 Pages: 1181-1185 Part: 4 Published: OCT 1998	4	3	0	0	0	45	2.14
<input type="checkbox"/> 43. Extremely thermostable esterases from the thermoacidophilic euryarchaeon Picrophilus torridus By: Hess, Matthias; Katzer, Moritz; Antranikian, Garabed EXTREMOPHILES Volume: 12 Issue: 3 Pages: 351-364 Published: MAY 2008	5	4	8	1	2	44	2.59
<input type="checkbox"/> 44. Novel thermoactive glucoamylases from the thermoacidophilic Archaea Thermoplasma acidophilum, Picrophilus torridus and Picrophilus oshimae By: Serour, E; Antranikian, G ANTONIE VAN LEEUWENHOEK INTERNATIONAL JOURNAL OF GENERAL AND MOLECULAR MICROBIOLOGY Volume: 81 Issue: 1-4 Pages: 73-83 Published: 2002	4	2	2	2	1	44	2.59
<input type="checkbox"/> 45. Identification of Bacillus kaustophilus, Bacillus thermocatenuatus and Bacillus strain HSR as members of Bacillus thermoleovorans By: Sunna, A; Tokajian, S; Burghardt, J; et al. SYSTEMATIC AND APPLIED MICROBIOLOGY Volume: 20 Issue: 2 Pages: 232-237 Published: JUN 1997	1	0	1	1	0	44	2.00

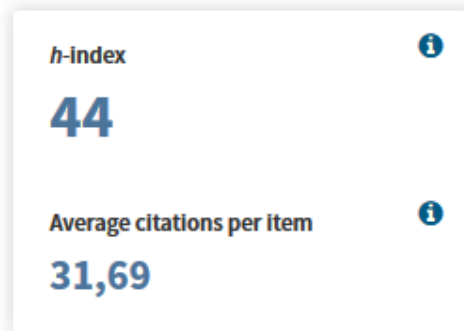
h-index

44

Average citations per item

31,69





Ein h-index von 44 für Prof. Antranikian besagt,

dass von allen seinen Artikeln in einer bestimmten Datenbasis (hier: Web of Science) 44 Artikel von Prof. Antranikian mehr als 44 mal zitiert wurden.

Andere Datenbasis, anderer h-index

Scopus

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Author details

The Scopus Author Identifier assigns a unique number to groups of documents written by the same author via an algorithm that matches authorship based on a certain criteria. If a document cannot be confidently matched with an author identifier, in this case, you may see more than one entry for the same author.

Antranikian, Garabed

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h-index: 🔗
45

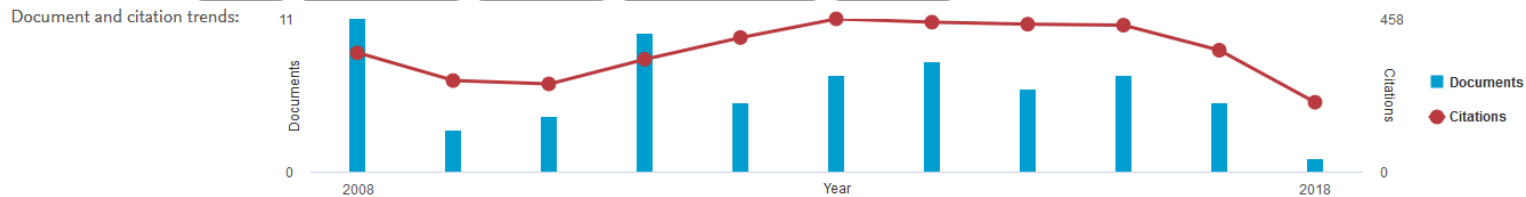
View potential author matches

Technische Universität Hamburg-Harburg, Institute of Technical Microbiology,
Hamburg, Germany

Author ID: 7005144112 🔗

Other name formats: ANTRANIKIAN, Garabed Antranikian, Garo Antranikian, G.

Subject area: Biochemistry, Genetics and Molecular Biology Immunology and Microbiology Chemical Engineering Chemistry Environmental Science Medicine Agricultural and Biological Sciences
Engineering Physics and Astronomy Computer Science Earth and Planetary Sciences Multidisciplinary



Documents by author
182

Total citations
6418 by 4572 documents

Neu im Intranet der TUHH: Scopus

Scopus

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Search

("particulate matter" OR particulates) and ("solid fuel*" or wood) and (combust* or stove*) and ("air pol

Article title, Abstract, Keywords



E.g., "Cognitive architectures" AND robots

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Affiliation name

Hamburg

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Search Q

- Universität **Hamburg** – Hamburg, Germany
- Universitätsklinikum **Hamburg**-Eppendorf und Medizinische Fakultät – Hamburg, Germany
- Deutsche Elektronen-Synchrotron – Hamburg, Germany
- Technische Universität **Hamburg**-Harburg – Hamburg, Germany
- Deutsches Zentrum für Herz-Kreislauf-Forschung e. V. – Berlin, Germany

About S

Customer Service

Affiliation details - Technische Universität Hamburg-Harburg

Technische Universität Hamburg-Harburg

Schwarzenbergstr. 95, Hamburg
Hamburg, Germany
Affiliation ID: 60010338

Other name formats: [Hamburg University Of Technology](#) [Technische Universität Hamburg-harburg](#) [Technical University Hamburg-harburg](#) [Tu Hamburg-harburg](#) [Hamburg University Of Technology \(tuhh\)](#)
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Documents, affiliation only
10,363

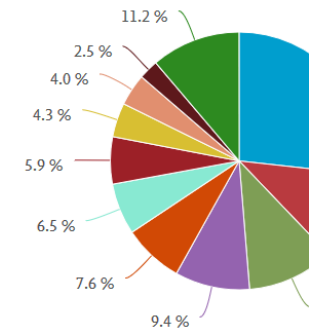
Authors
3,096

Documents by subject area Collaborating affiliations Documents by source

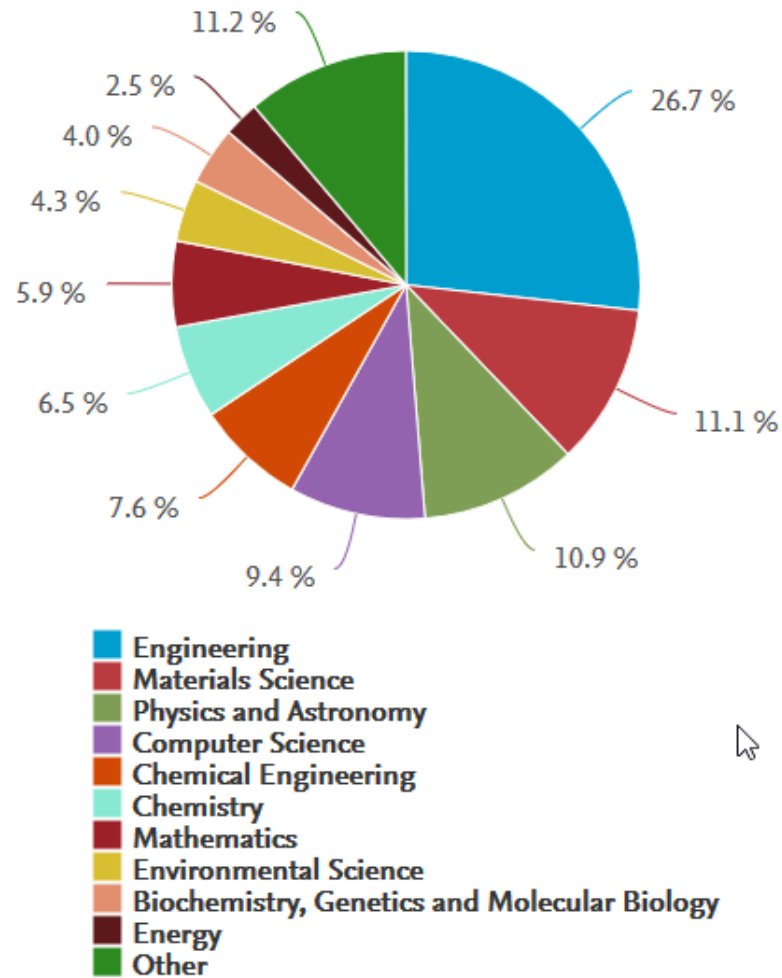
Sort by: Document count (high-low) ▾

Technische Universität Hamburg-Harburg

Engineering	5094	Social Sciences	252
Materials Science	2117	Agricultural and Biological Sciences	201
Physics and Astronomy	2069	Decision Sciences	109
Computer Science	1787	Economics, Econometrics and Finance	94
Chemical Engineering	1440	Health Professions	37
Chemistry	1230	Pharmacology, Toxicology and Pharmaceutics	33
Mathematics	1127	Multidisciplinary	31
Environmental Science	816	Arts and Humanities	22
Biochemistrv. Genetics and Molecular Biologv	762	Dentistrv	11



Technische Universität Hamburg-Harburg



	Web of Science	Scopus
Inhalt	Zeitschriftenaufsätze, Konferenzbeiträge, Bücher	
Produzent	Clarivate Analytics	Elsevier
Zeitraum	1945- (TUHH)	Teilweise ab 19. Jahrhundert
Abdeckung	Weltweit, US-amerikanische Orientierung	Weltweit, europäische Orientierung

Gemeinsamkeiten

- multidisziplinär
- Zitationsanalysen möglich
- Open Access Aufsätze ermittelbar
- Kosten pro Jahr im deutlich 5-stelligen Bereich
 - Normalisierte Affiliation-Suche
- Differenzierte Recherchemöglichkeiten

Auch nach:

- Vergleich von Web of Science und Scopus im Hinblick auf den Informationsbedarf an der TU Chemnitz. Martin Bauschmann, Carolin Ahnert. 2016/17. <https://pdfs.semanticscholar.org/presentation/fd88/5d4818d45c907dc9fc67e4915b0b8b0cf405.pdf>

- Schwerpunkt eher Natur- und Ingenieurwissenschaften als Sozial- und Geisteswissenschaften
- zeitlich tief erschlossen (ab 1945)
- an der TUHH seit Jahren eingeführt

Auch nach:

- Vergleich von Web of Science und Scopus im Hinblick auf den Informationsbedarf an der TU Chemnitz. Martin Bauschmann, Carolin Ahnert. 2016/17. <https://pdfs.semanticscholar.org/presentation/fd88/5d4818d45c907dc9fc67e4915b0b8b0cf405.pdf>

- Ingenieurwissenschaften mit europäischem Fokus berücksichtigt
- Deutsche Verlage berücksichtigt
- Umfang tendenziell größer
- Differenzierte Personensuche

Auch nach:

- Vergleich von Web of Science und Scopus im Hinblick auf den Informationsbedarf an der TU Chemnitz. Martin Bauschmann, Carolin Ahnert. 2016/17. <https://pdfs.semanticscholar.org/presentation/fd88/5d4818d45c907dc9fc67e4915b0b8b0cf405.pdf>

Und was bedeutet eigentlich der Impact Factor?

Berechnung (z.B. für 2016)

$$\text{IF (2016)} = \frac{A}{B}$$

- A = Anzahl aller Zitierungen einer Zeitschrift in den ausgewerteten Zeitschriften einer bestimmten Datenbank (z.B. Web of Science oder Scopus) für die Jahre 2014 und 2015
- B = Zahl der Artikel der Zeitschrift, die 2014 und 2015 publiziert wurden (und von der Datenbank erfasst wurden!)

Ein IF von 7 für eine Zeitschrift im Jahr 2016 bedeutet, dass jeder Artikel dieser Zeitschrift aus den Jahren 2014 und 2015 durchschnittlich 7 mal in 2016 zitiert wurde.

Der Impact Factor (IF) oder genauer Journal Impact Factor (JIF) hat nicht unbedingt etwas mit der wissenschaftlichen Qualität einer Zeitschrift zu tun! Impact-Faktor von Review-Zeitschriften ist tendenziell hoch!?

Und: Impact-Faktoren haben nichts mit der Beurteilung von wissenschaftlichen Publikationsleistungen eines Wissenschaftlers zu tun.

JIF und Quartile (Web of Science)

The screenshot displays the Web of Science search results page. The search criteria are 'TOPIC: (modified phase field crystal equation)'. The results are sorted by 'Publication Date -- newest to oldest'. The first result is 'COMPUTER METHODS IN APPLIED MECHANICS AND ENGINEERING' by Elsevier Science SA. A detailed report for this journal is shown, including its Impact Factor (3.949 in 2016, 3.957 5-year average) and its ranking in three categories: Engineering, Multidisciplinary (5 of 85, Q1), Mathematics, Interdisciplinary Applications (3 of 100, Q1), and Mechanics (6 of 133, Q1). The report also lists the publisher, ISSN, and research domain.

Results: 147
(from Web of Science Core Collection)

You searched for: TOPIC: (modified phase field crystal equation) ...More

Sort by: Publication Date -- newest to oldest

1. **COMPUTER METHODS IN APPLIED MECHANICS AND ENGINEERING**

Impact Factor
3.949 3.957
2016 5 year

JCR® Category	Rank in Category	Quartile in Category
ENGINEERING, MULTIDISCIPLINARY	5 of 85	Q1
MATHEMATICS, INTERDISCIPLINARY APPLICATIONS	3 of 100	Q1
MECHANICS	6 of 133	Q1

Data from the 2016 edition of Journal Citation Reports

Publisher
ELSEVIER SCIENCE SA, PO BOX 564, 1001 LAUSANNE, SWITZERLAND

ISSN: 0045-7825
eISSN: 1879-2138

Research Domain
Engineering
Mathematics
Mechanics

Quartile (Q1 – Q4) – St(Schw)ellenwert (Lagemaß) der innerhalb einer Subject Category gerankten Zeitschriften
Q1 = Zeitschrift liegt im 1. Viertel der Liste der nach dem JIF gerankten Zeitschriften

Web of Science Core Collection

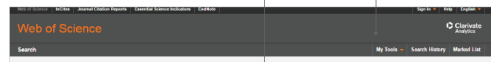
Quick Reference Guide

What is *Web of Science Core Collection*?

Search over 66 million records from the top journals, conference proceedings, and books in the sciences, social sciences, and arts and humanities to find the high quality research most relevant to your area of interest. Using linked cited references, explore the subject connections between articles that are established by the expert researchers working in your field.

Basic search

Use the drop-down to search another content set on the Web of Science.



Select Your Search Field

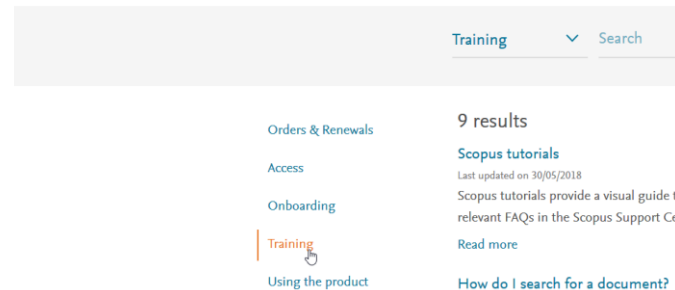
Use the drop down to select your search field. Search by Topic, Author, Publication Name, Funding Agency, Organization-Enhanced, Author Identifier Number or PubMed ID.

Use "My Tools" to move to your Saved Searches, EndNote online account, or ResearcherID.

ELSEVIER

Scopus: Access and use Support Center

Support Center > Scopus: Access and use Support Center > Training



Web of Science „Quick Reference Guide“ und „Handbook“)

<http://clarivate.libguides.com/webofscienceplatform/woscc>

Web of Science deutsche Schnellanleitung

http://wokinfo.com/media/pdf/wos-corecoll_qrc_de.pdf

Scopus: Access and use Support Center

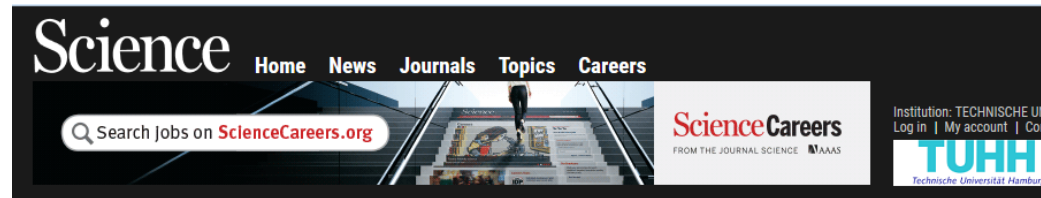
<https://service.elsevier.com/app/home/supporthub/scopus/>

Erste Infos zum Thema Zitatanalyse

The screenshot shows the TUHH library website. At the top left is the TUHH logo. In the center, it says 'Universitätsbibliothek' with 'DE | EN' below it. To the right is a search bar with a magnifying glass icon and the text 'Suchen'. Further right is the 'tub.' logo. Below this is a dark navigation bar with the following items: 'Universitätsbibliothek', 'Aktuelles', 'Ausleihen', 'Finden', 'Lernen & Arbeiten', and 'Publizieren'. The main content area has a heading 'Zitatanalyse' followed by a paragraph: 'Zitatanalysen, sogenannte bibliometrische Methoden, erlauben die quantitative Bewertung der Bedeutung von Zeitschriften (über den Impakt-Faktor) sowie die Publikationsbewertung von Personen und Institutionen. Diese spielen bei der Bewertung von Forschungsleistungen angesichts knapper Finanzressourcen eine immer größere Rolle.' Below this are two columns of links: 'Web of Science' (with a sub-description: 'Datenbank des Institute of Scientific Information (ISI, heute zu Thomson)') and 'Google Scholar' (with a sub-description: 'Google-Angebot für die wissenschaftliche Recherche, das auch...'). On the right side, there is a vertical list of links: 'Publizieren', 'Forschungsdaten', 'Hochschulschriften', 'Literaturverwaltung', 'Open Access', 'ORCID iD', 'tub.dok: Open Access', and 'Urheberrecht'.

<https://www.tub.tuhh.de/publizieren/zitatanalyse/>

Und ein wenig Geschichte



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Citation Indexes for Science: A New Dimension in Documentation through Association of Ideas

+ See all authors and affiliations

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Photograph of Eugene Garfield, recipient of the 2007 Richard J. Bolte Sr. Award, at Heritage Day, May 9, 2007, at the Chemical Heritage Foundation (CHF).

https://commons.wikimedia.org/wiki/File:Eugene_Garfield_H_D2007_Richard_J._Bolte_Sr._Award.TIF

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Citation Indexes for Science

A New Dimension in Documentation
through Association of Ideas

Eugene Garfield

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

In this paper I propose a bibliographic system for science literature that can eliminate the uncritical citation of fraudulent, incomplete, or obsolete data by making it possible for the conscientious scholar to be aware of criticisms of earlier papers. It is too much to expect a research worker to spend an inordinate

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

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

In the literature-searching process, in-

case. Classified indexes are also dependent upon a subject analysis of individual articles and, at best, offer us better consistency of indexing rather than greater specificity or multiplicity in the subject approach. Similarly, terminology is important, but even an ideal standardization of terminology and nomenclature will not solve the problem of subject analysis.

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

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

Citation indexes depend on a simple

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