Clarivate™

回到未来

科技文献数据发展历程与科睿唯安实践

王炜
科睿唯安大客户部总经理
2021年5月，西安

科睿唯安是什么？

Web of Science

InCites

publons

InCites Essential Science Indicators

InCites Journal Citation Reports

ScholarOne™

EndNote

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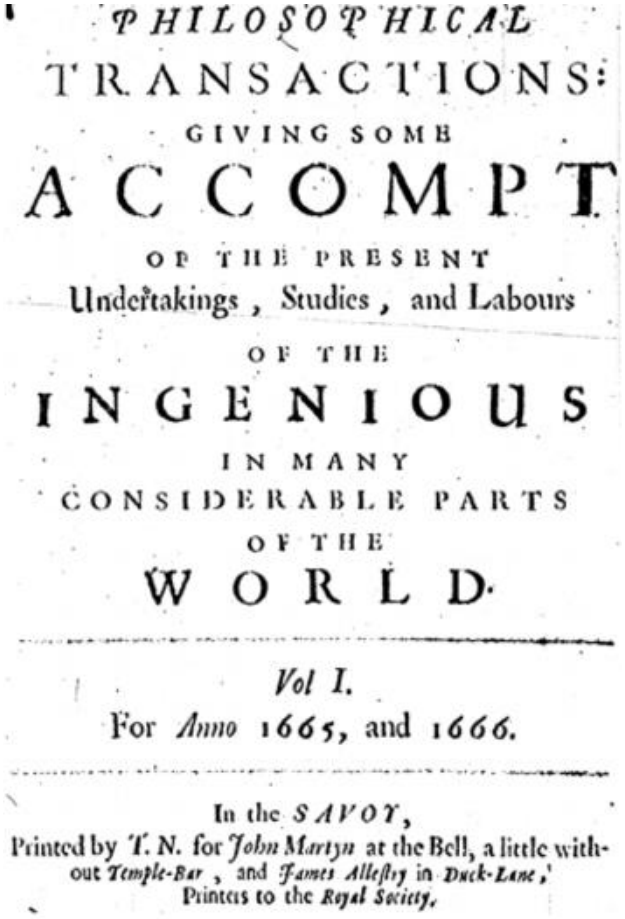
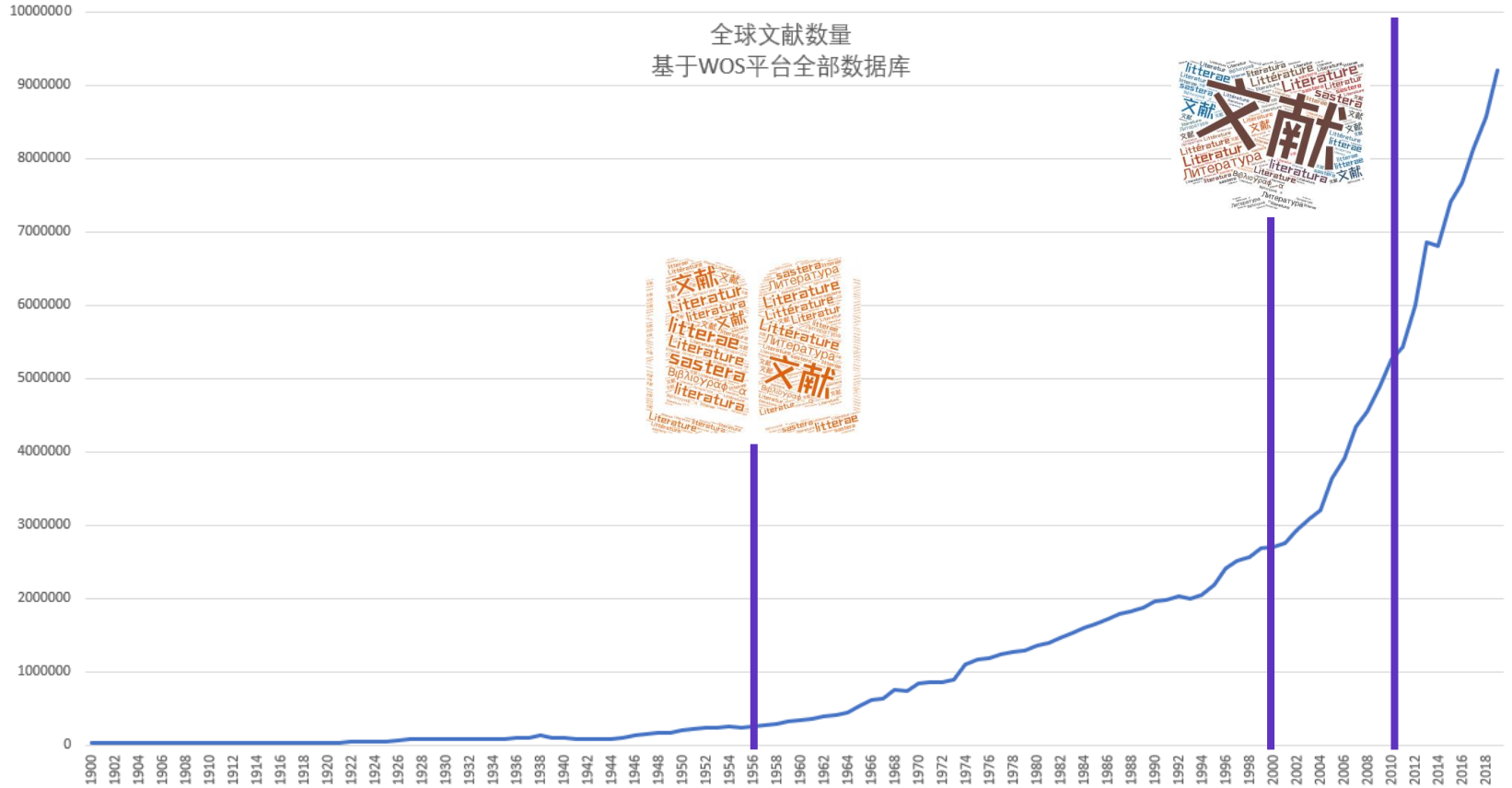
科技文献——科睿唯安的基石



PHILOSOPHICAL
TRANSACTIONS:
GIVING SOME
ACCOMPT
OF THE PRESENT
Undertakings, Studies, and Labours
OF THE
INGENIOUS
IN MANY
CONSIDERABLE PARTS
OF THE
WORLD.

Vol I.
For Anno 1665, and 1666.

In the SAVOY,
Printed by T. N. for John Martyn at the Bell, a little without Temple-Bar, and James Allestry in Duck-Lane,
Printers to the Royal Society.



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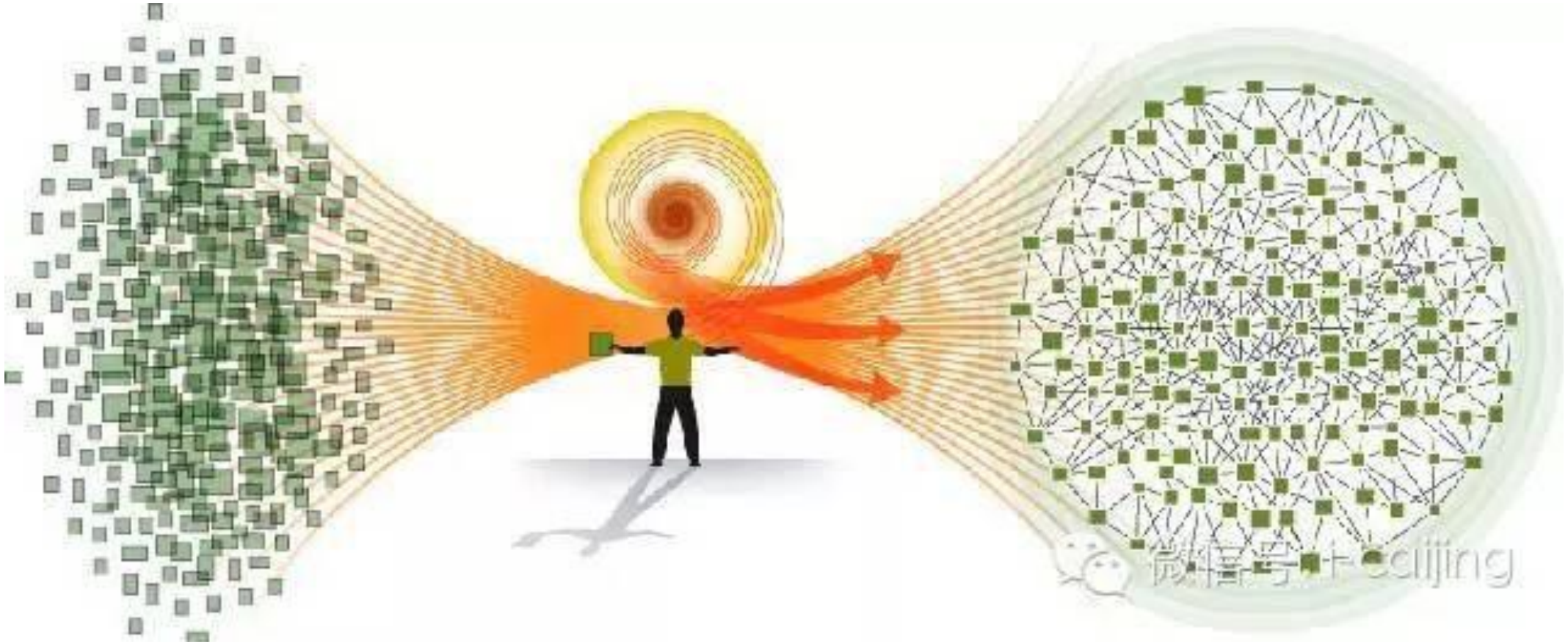
科睿唯安——用文献连接未来与过去



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提纲

源自学术，服务学术——纸质时代与科技文献数据

信息技术，指标演进——信息技术与评价发展

不忘初心，回到未来——社交媒体与人工智能

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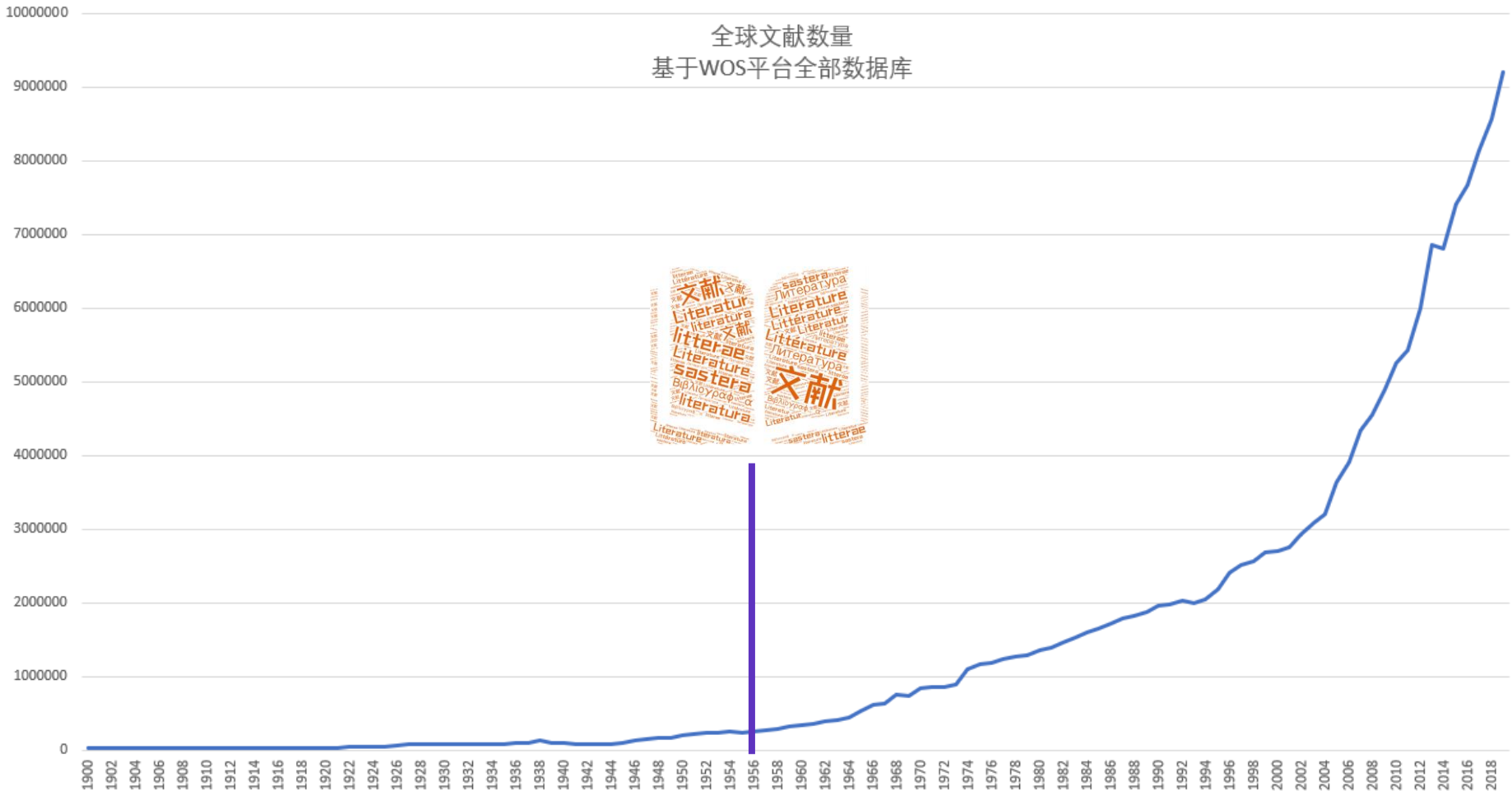
源自学术，服务学术

科技文献数据的发展



从小众间的交流载体转变为全球的学术信息传播平台。

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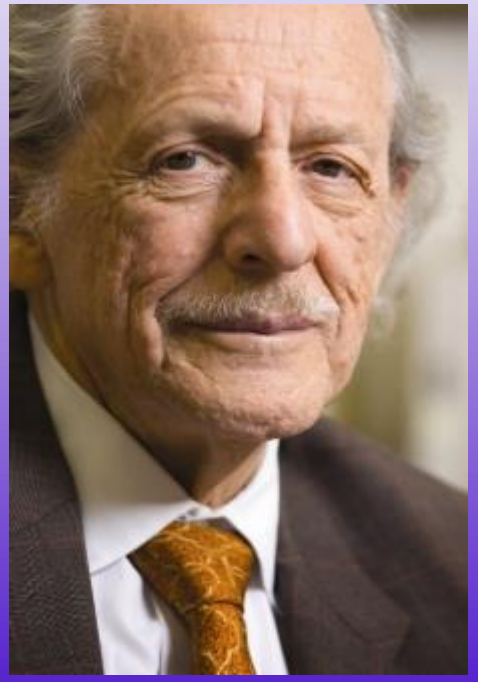
科技文献的发展

Citation Index的诞生

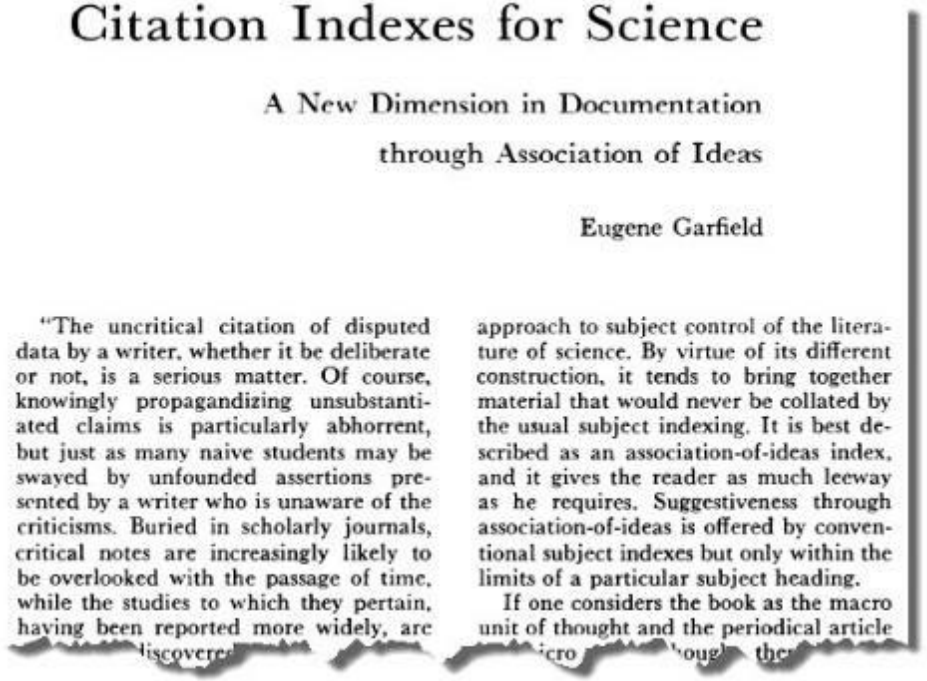
- 1955年，“引文索引”第一次作为一个学术概念被提出



Dr. Eugene Garfield
（1925-2017）

Founder & Chairman Emeritus
ISI, Thomson Scientific

Garfield, Eugene. “Citation Indexes for Science.” Science, vol. 122, no. 3159, 1955, pp. 108–111. JSTOR,



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

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If one considers the book as the macro unit of thought and the periodical article

CI — CITATION INDEX

Dr. Garfield认为：将一篇文献作为检索字段从而跟踪一个Idea的发展过程及学科之间的交叉渗透的关系。

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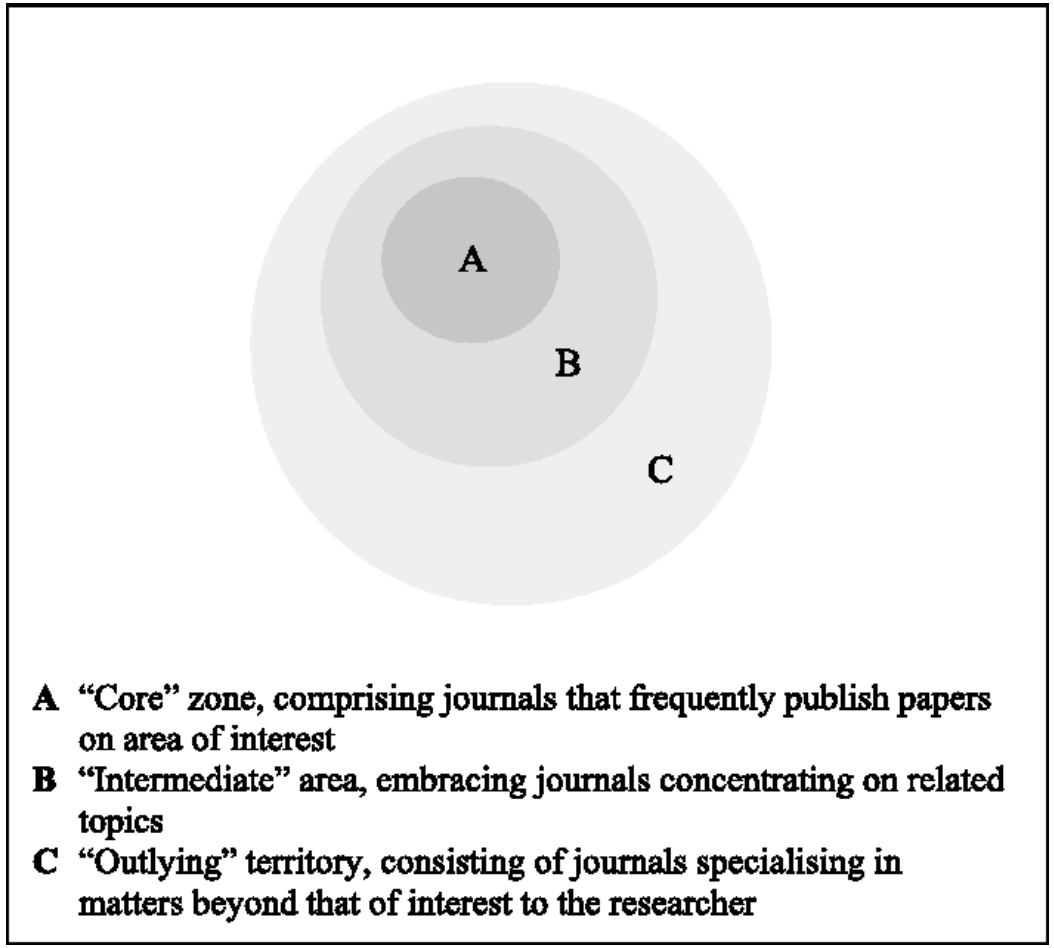
科技文献数据的发展

Citation Index的诞生

- Bradford’s Law奠定了选刊的理论基础
- 选刊成为了SCI的先导及核心工作

影响力最高的期刊集中在少数区间



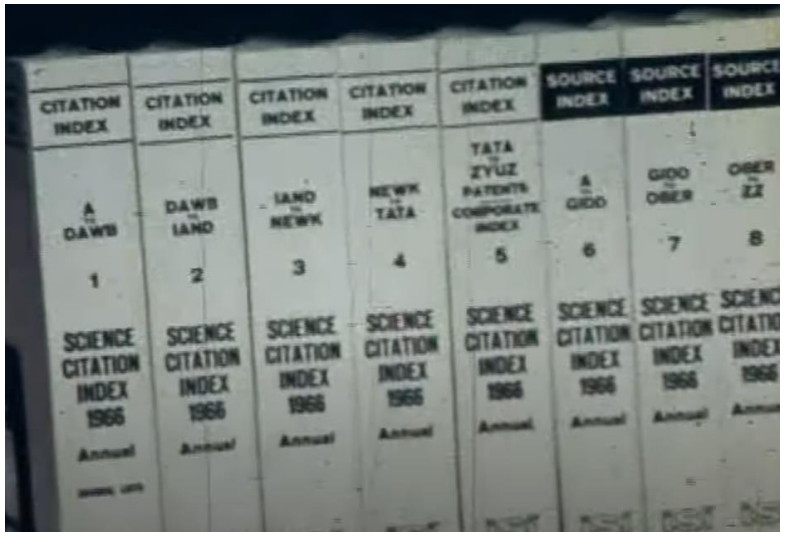
Bradford, Samuel C., Sources of Information on Specific Subjects, Engineering: An Illustrated Weekly Journal (London), 137, 1934 (26 January), pp. 85–86.

科技文献数据的发展

Citation Index的诞生

- 加菲尔德博士创立ISI
- 在Citation Index概念的基础上SCI诞生
- Citation Index改变了科学家使用文献的方式
- 科技成果转移转化

The Institute for Scientific Information™ (ISI, 1960)



1973
Social Sciences Citation Index

1964
Science Citation Index

1978
Arts and Humanities Citation Index

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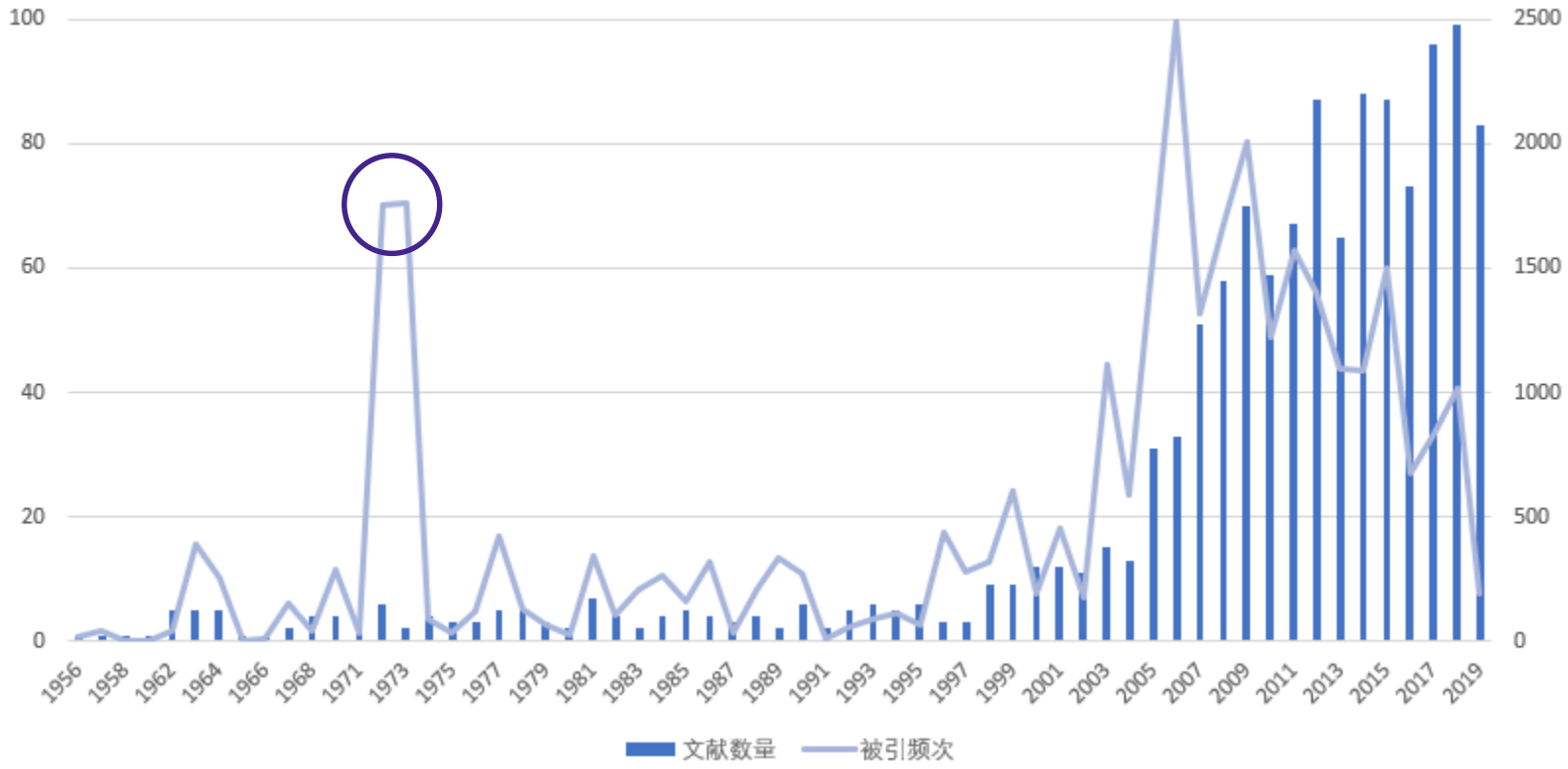
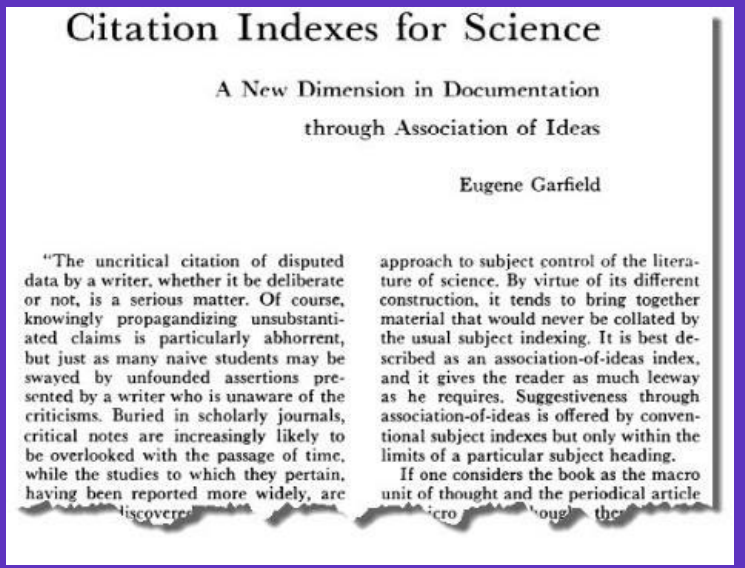
科技文献数据的发展



Citation Index研究的后续发展



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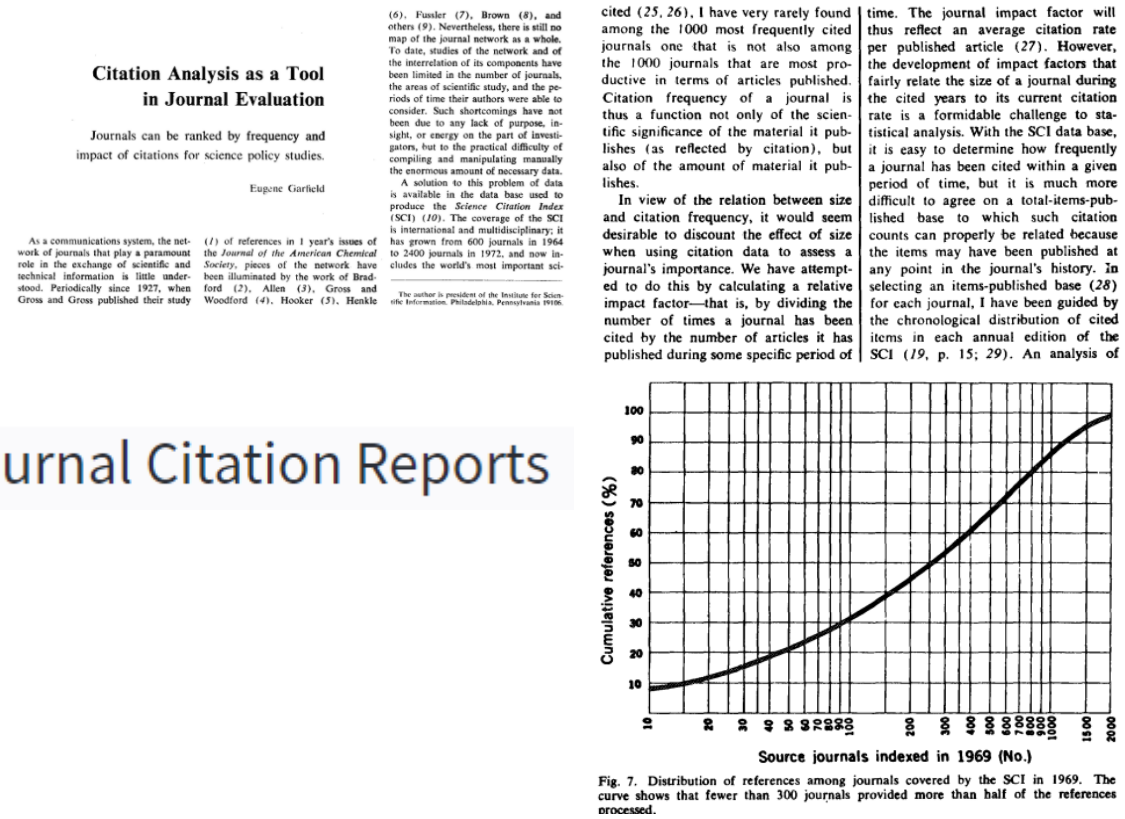
科技文献数据的发展

指标——双刃剑

Garfield, Eugene. “Citation Analysis as a Tool in Journal Evaluation.” Science, vol. 178, no. 4060, 1972, pp. 471–479.



Citation Analysis as a Tool in Journal Evaluation

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

Eugene Garfield

As a communications system, the network of journals that play a paramount role in the exchange of scientific and technical information is little understood. Periodically since 1927, when Gross and Gross published their study (*1*) of references in 1 year's issues of the *Journal of the American Chemical Society*, pieces of the network have been illuminated by the work of Bradford (*2*), Allen (*3*), Gross and Woodford (*4*), Hooker (*5*), Henkle (*6*), Fussler (*7*), Brown (*8*), and others (*9*). Nevertheless, there is still no map of the journal network as a whole. To date, studies of the network and of the interrelation of its components have been limited in the number of journals, the areas of scientific study, and the periods of time their authors were able to consider. Such shortcomings have not been due to any lack of purpose, insight, or energy on the part of investigators, but to the practical difficulty of compiling and manipulating manually the enormous amount of necessary data.

A solution to this problem of data is available in the data base used to produce the *Science Citation Index* (SCI) (*10*). The coverage of the SCI is international and multidisciplinary; it has grown from 600 journals in 1964 to 2400 journals in 1972, and now includes the world's most important scientific information. Philadelphia, Pennsylvania 19106.

cited (*25, 26*), I have very rarely found among the 1000 most frequently cited journals one that is not also among the 1000 journals that are most productive in terms of articles published. Citation frequency of a journal is thus a function not only of the scientific significance of the material it publishes (as reflected by citation), but also of the amount of material it publishes.

In view of the relation between size and citation frequency, it would seem desirable to discount the effect of size when using citation data to assess a journal's importance. We have attempted to do this by calculating a relative impact factor—that is, by dividing the number of times a journal has been cited by the number of articles it has published during some specific period of time. The journal impact factor will thus reflect an average citation rate per published article (*27*). However, the development of impact factors that fairly relate the size of a journal during the cited years to its current citation rate is a formidable challenge to statistical analysis. With the SCI data base, it is easy to determine how frequently a journal has been cited within a given period of time, but it is much more difficult to agree on a total-items-published base to which such citation counts can properly be related because the items may have been published at any point in the journal's history. In selecting an items-published base (*28*) for each journal, I have been guided by the chronological distribution of cited items in each annual edition of the SCI (*19*, p. 15; *29*). An analysis of

Fig. 7. Distribution of references among journals covered by the SCI in 1969. The curve shows that fewer than 300 journals provided more than half of the references processed.

Journal Citation Reports

- 1972年，加菲尔德进一步提出：引文分析可以用作期刊分析。
- 文献计量学界的“爱因斯坦”创造了如原子弹能量般的Journal Impact Factor。
- 1975年JCR诞生。

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科技文献数据的发展

指标——双刃剑

期刊影响因子诞生之初，主要是为了帮助图书馆在有限资金的条件下合理购买最符合其需求的学术文献，进行馆藏的管理。但随着其运用的扩展，逐渐被用于科研评估中。

——科睿唯安首席科学家岳卫平博士

COMMENT OBITUARY

Eugene Garfield

(1925–2017)

Inventor of the Science Citation Index.

"I think you're making history, Gene!" So said Nobel laureate and molecular biologist Joshua Lederberg to his friend Eugene Garfield in 1962. They were building the Science Citation Index (SCI), now the Clarivate Analytics Web of Science, with long-sought grants from US funding agencies. Today, we cannot imagine research without indexes that reveal how articles are cited. Garfield enabled an entire field: scientometrics, the quantitative study of science and technology.

Garfield died on 26 February. We met in 1992, when I was writing a history of the index. That was a few months before he sold the Institute for Scientific Information (ISI), the company he had founded (initially named Documation) in 1956 in Philadelphia, Pennsylvania, to Thomson Reuters. He stayed on as chairman emeritus, a bomb of energy, still coming up with ideas for applying citation indexes.

Garfield also launched *The Scientist* — a monthly magazine for life scientists — together with indexes in the social sciences and humanities, and services that alert researchers to new relevant publications. The ISI's flagship product was *Current Contents*, which compiles the tables of contents for recent scientific journals. He built a host of services to summarize, filter, index and classify articles. His tools allowed scientists to learn how publications were used in later research and to find related ones — an ability now so crucial that it is hard to imagine that it had to be invented. Garfield was also a prolific letter-writer; he developed his best ideas in communication with scientists, scholars, policymakers and technical experts. This correspondence and his more than 1,000 published essays are gold mines for historians.

Garfield was born on 16 September 1925 into a family of second-generation Jewish immigrants living in New York City's East Bronx. He and his sisters were raised by their mother and her family, a mix of left-wing labour activists and entrepreneurs. Garfield picked up traits from both.

In 1949, he graduated from Columbia University in New York as a chemistry major.

In 1951, he landed a job at the Welch Medical Library at Johns Hopkins University in Baltimore, Maryland, where almost all information services of the National Library of Medicine were born. He explored new ways to deal with the exploding medical literature, which was outpacing the capacity of human indexing, and developed machine methods for searching and cataloguing using punch cards.

In 1953, the library organized what it billed as the First Symposium on Machine Methods in Scientific Documentation. This introduced Garfield to Shepard's Citations, a system for legal citations invented in 1873 that tracked how US court cases cited earlier ones. It was a radical departure from subject indexing, which then dominated thinking in science.

Garfield contacted William Adair, a former vice-president at Shepard's who had expertise in citation indexing, to see whether computers could be applied to the problem. So began a mutual education — Garfield learnt about citation indexing and taught Adair about the scientific literature. While working, Garfield did a master's degree in library and information science at Columbia University in 1954, and obtained a PhD in structural linguistics at the University of Pennsylvania in Philadelphia, at conferences, making prototype indexes and sending proposal after proposal to the US Patent Office, the National Science Foundation and the National Institutes of Health. Funding finally became available after 1957, when the launch of the Soviet Union's Sputnik satellite unleashed panic in the United States about the information crisis in science. Funders wanted ways to evaluate their effectiveness. Lederberg and Garfield joined forces to build an automated citation index across science.

Nonetheless, for many years, the SCI made a loss, supported by profits from *Current Contents* and other ISI services. Neither scientists nor librarians saw much use for these expensive books (a ten-year set could cost US$25,000) with their long lists of code in small print. The exception was the community of historians and sociologists of science. For example, Derek de Solla Price, a science historian at Yale University in New Haven, Connecticut, and sociologist Robert Merton at Columbia University immediately saw the SCI as an instrument for analysing the dynamics and structure of science, and each developed theories about citations in research.

Since the early 1970s, the SCI's influence has extended. Quantitative analyses of output and citations have been used to evaluate funding programmes, research groups, individuals and nations. This use increased markedly after the Journal Impact Factor was marketed in the SCI *Journal Citation Reports* starting in 1975 (the impact factor had been computed for selected journals in the SCI from the early 1960s). Garfield came to see the impact fac-tor as a mixed blessing, "like nuclear energy". Although he felt that citation indexing and the impact factor could be remedies for the limitations of peer review, he was uncomfortable with their misuse as performance indicators.

Garfield was fascinated by art. The former ISI building, designed by architects Denise Scott Brown and Robert Venturi, housed an impressive collection, including striking murals by Huichol artists from Mexico.

Garfield's enthusiasm was not the bookkeeper's but the visionary's. He saw in his creations a better science for society and the ideal of a unified body of knowledge

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- JIF的初衷是为了图书馆馆员的馆藏建设。
- 配合SCI帮助研究人员选择期刊。
- 影响因子开始被滥用。

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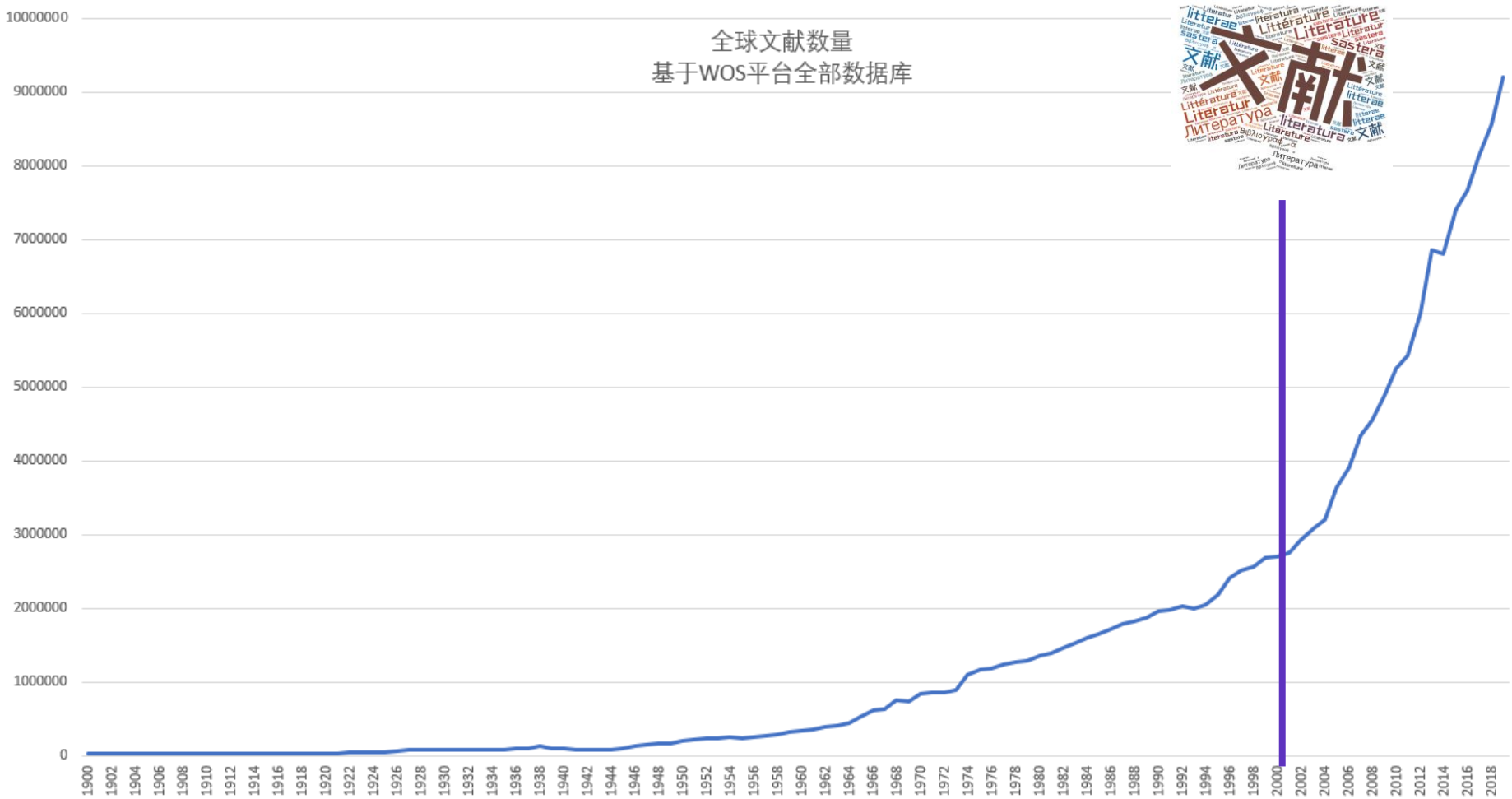
信息技术，指标演进

科技文献数据的发展



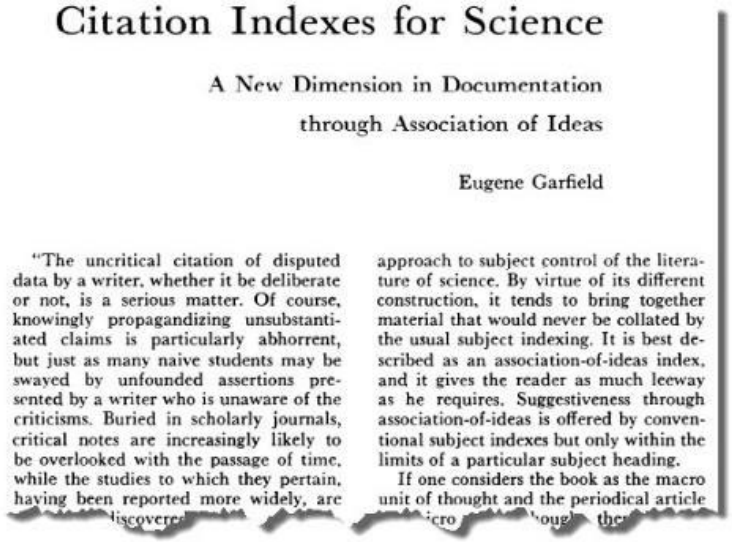
互联网的出现极度增大了全球期刊数量，以及期刊传播速度。

科技文献进入了信息爆炸时代

Clarivate™

科技文献数据的发展

——Citation Index研究的后续发展



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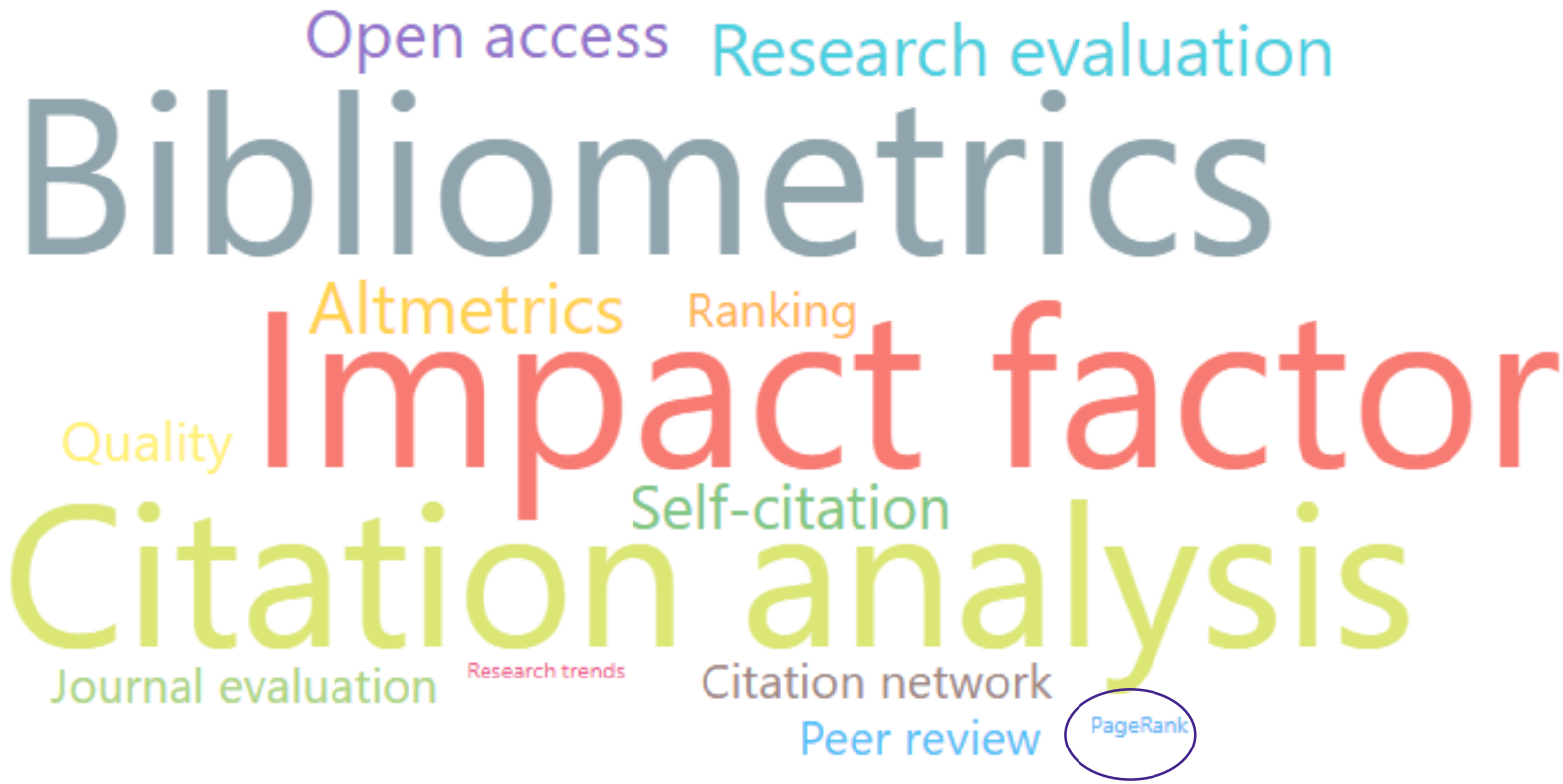

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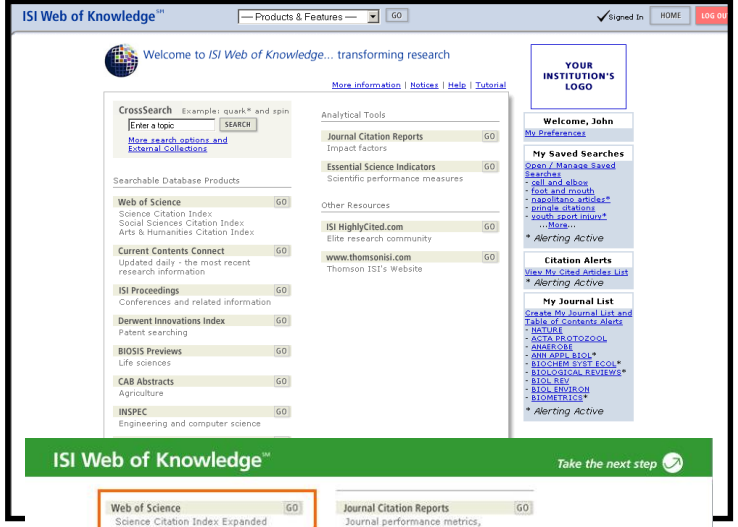
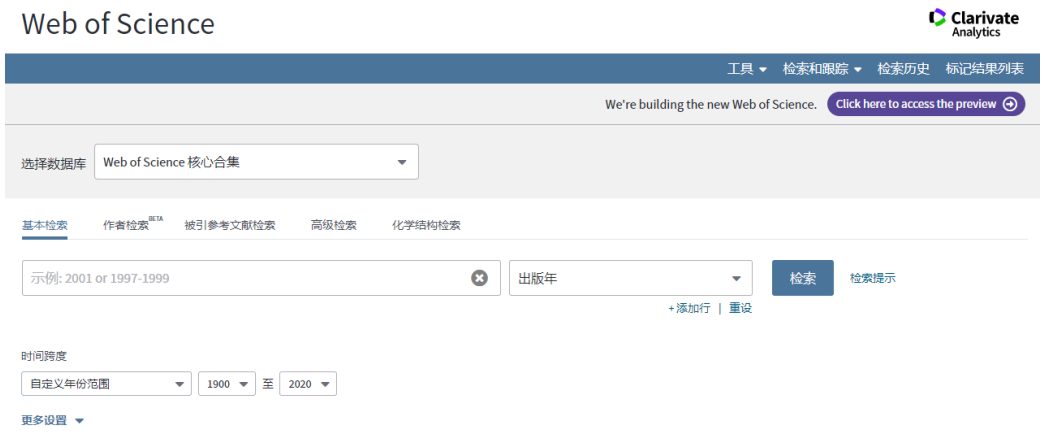
信息技术的发展

更快、更多、更好

- 1997年Citation Index正式推出互联网版本，Web of Science诞生
- 50年的index经验保证了数据的完整性和延续性
- 选刊机制被完整地保留了下来





Clarivate™

信息技术的发展

更快、更多、更好

- 多语种的citation index加入
- 更多文献类型的加入
- 更多优质期刊的加入

中国科学引文数据库℠

Egyptian Knowledge Bank
بنك المعرفة المصرى

KCI - 한국어 학술지 데이터베이스

Russian Science Citation Index

SciELO Citation Index

- CPCI-会议录引文索引
- BKCI-图书引文索引
- DII-德温特专利引文索引
- DCI-研究数据引文索引

Emerging Science Citation Index

全学科的新兴领域的7800+种学术期刊

WOS核心合集一共有20000+本期刊

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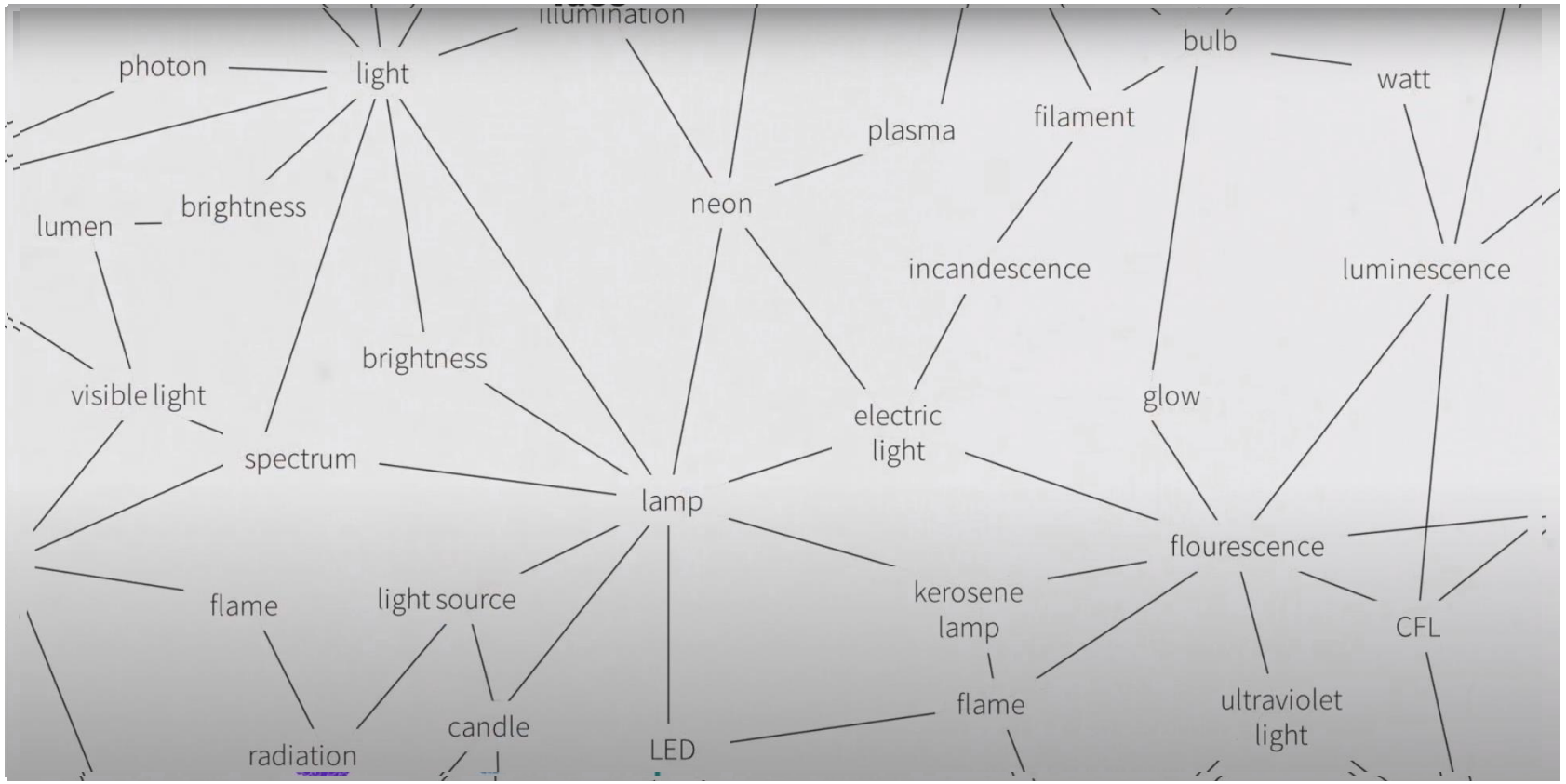
指标的演进

网络赋能文献计量新视野



- 更大量和完整的数据可以被分析
- 文献体量的急速增加加剧了对科研评价与分析的需求
- 传统指标的适用范围发生变化

Clarivate™

指标的演进

科研分析的新视角

Highly Cited Paper

InCites Essential Science Indicators

发表论文的绝对数量

问题：
发表1000篇的机构就一定优于发表900篇的吗？

发表论文的被引次数

问题：
被引用100次的文章就一定优于被引90次的吗？

考虑到学科和出版年代差异后的比较

问题：
当绝对数量差异较大时如何比较？

一系列相对指标的组合

- 文献指标使用的演进
- 分类评价的驱动
- 相对指标的优势
- 标准化利于跨领域比较

Clarivate™

指标的演进

全面指标的使用

第三代InCites平台（2020年）

2008年，科研分平台析InCites推出

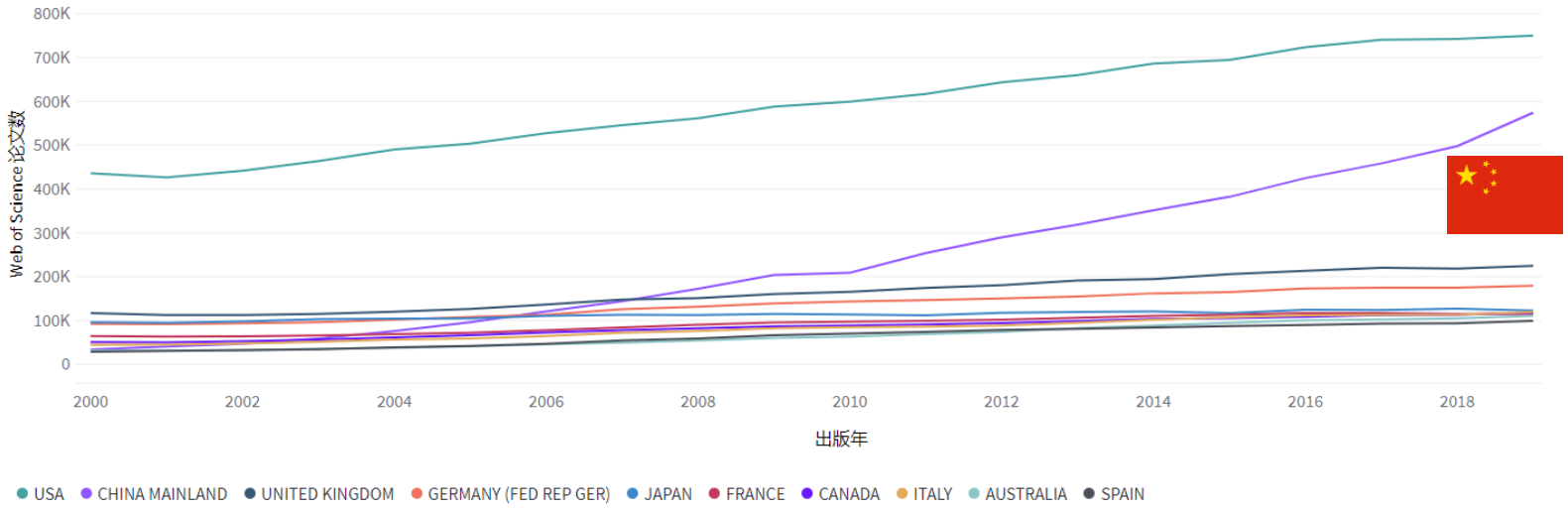
- 集合了更多学科分类
- 更全面和更丰富的相对指标
- 更清晰的机构归并

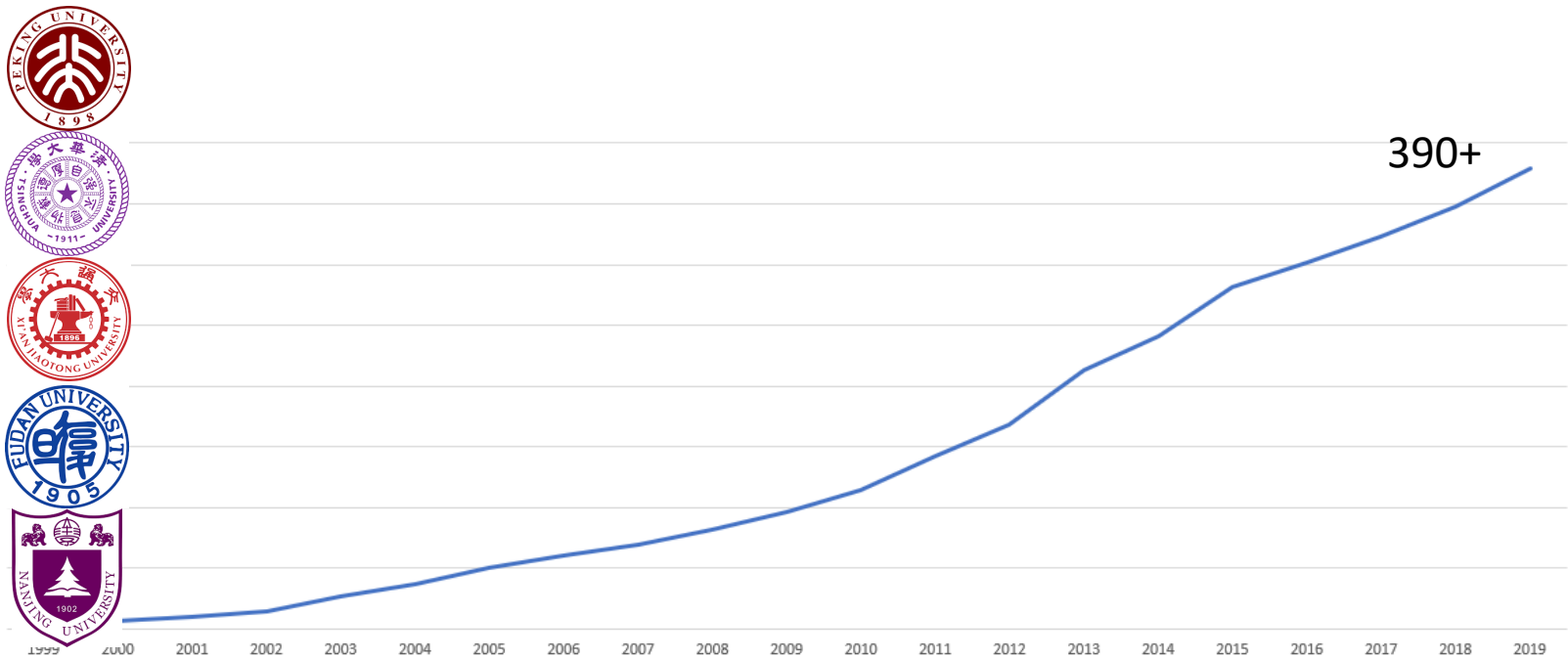
Clarivate™

中国科研发展

全面画像，而非简单指标

- 科研巨人迅速崛起
- 搭上了互联网的高速列车
- 科睿唯安进入中国20年





Clarivate™

中国科研发展

全面画像，而非简单指标

- 古德哈特定律
- 指标的不当使用
- 全面画像的缺失

标　　题：	科技部 教育部 人力资源社会保障部 中科院 工程院关于开展清理“唯论文、唯职称、唯学历、唯奖项”专项行动的通知		
索 引 号：	306-03-2018-084	**发文机构：**	科技部;教育部;人力资源社会保障部;中科院;工程院
成文日期：	2018年10月15日	**发布日期：**	2018年10月23日
发文字号：	国科发政〔2018〕210号	**有 效 性：**	

科技部 教育部 人力资源社会保障部 中科院 工程院关于开展清理“唯论文、唯职称、唯学历、唯奖项”专项行动的通知

国科发政〔2018〕210号

国务院各有关部门和单位、中国科协，各省、自治区、直辖市、计划单列市科技厅（委、局）、教育厅（教委）、人力资源社会保障厅（局）、科协，新疆生产建设兵团科技局、教育局、人力资源社会保障局、科协：

为深入贯彻习近平总书记在两院院士大会、中央财经委员会第二次会议上重要讲话精神，根据《中共中央办公厅 国务院办公厅关于深化项目评审、人才评价、机构评估改革的若干意见》（以下简称《若干意见》）和《国务院关于优化科研管理提升科研绩效若干措施的通知》（国发〔2018〕25号，以下简称《若干措施》）要求，决定开展清理“唯论文、唯职称、唯学历、唯奖项”（以下简称“四唯”）专项行动。有关事项通知如下。

当有关科研人员及其机构的数据被压缩为简单的指标或排名时，信息将会丢失。科学研究并非一维性事务，过程很复杂且不具备同一性。

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中国科研发展

全面画像，而非简单指标

“事实上，每一个被过度简化或误用的指标都有更好的替代选项。通常先进行合适的、可靠的数据分析，然后再通过图形来显示多个互补的维度。通过将数据置于更广泛的背景下，我们能够看到新的特点，了解更多的信息，并提高我们解读科研活动的能力。”

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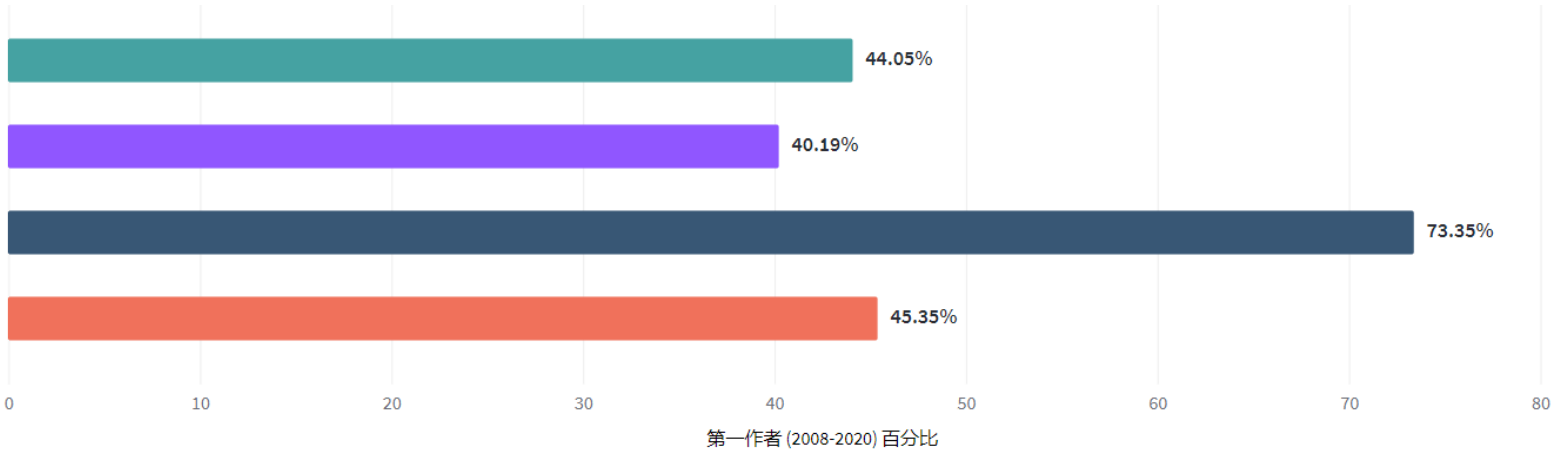
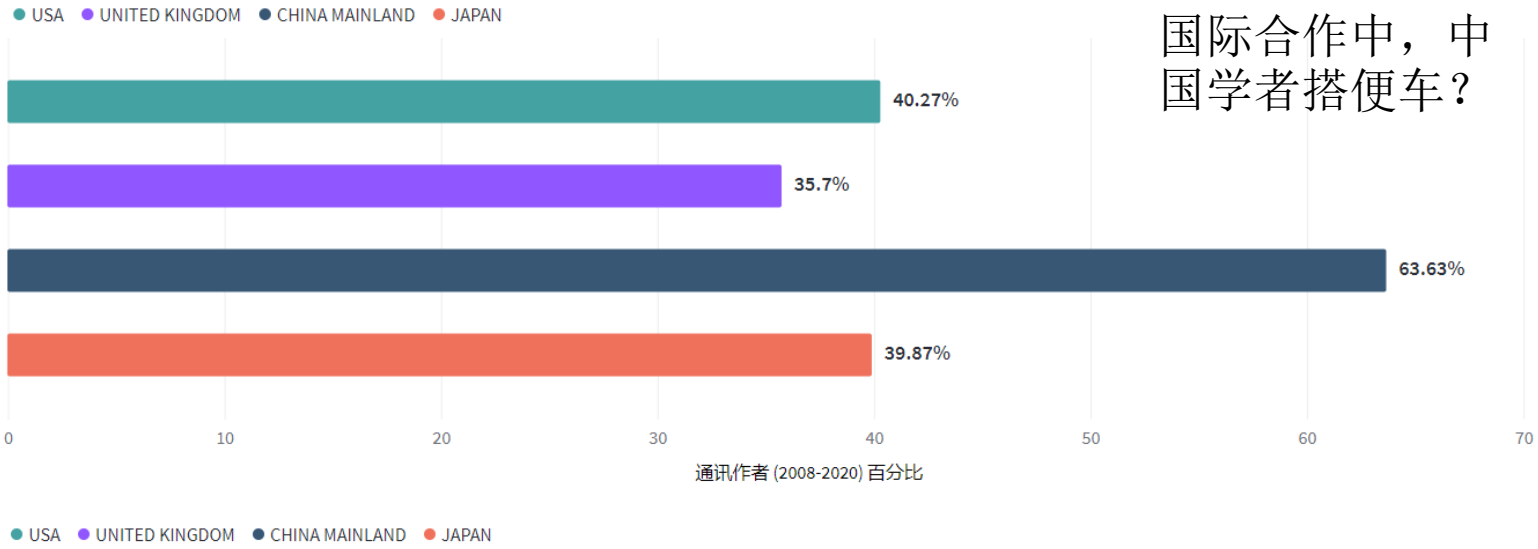
作者顺位：更深入解读科研合作关系

2020年新增指标：第一作者、通讯作者、末位作者





国际合作中，中国学者搭便车？

中国科研发展

全面画像，而非简单指标

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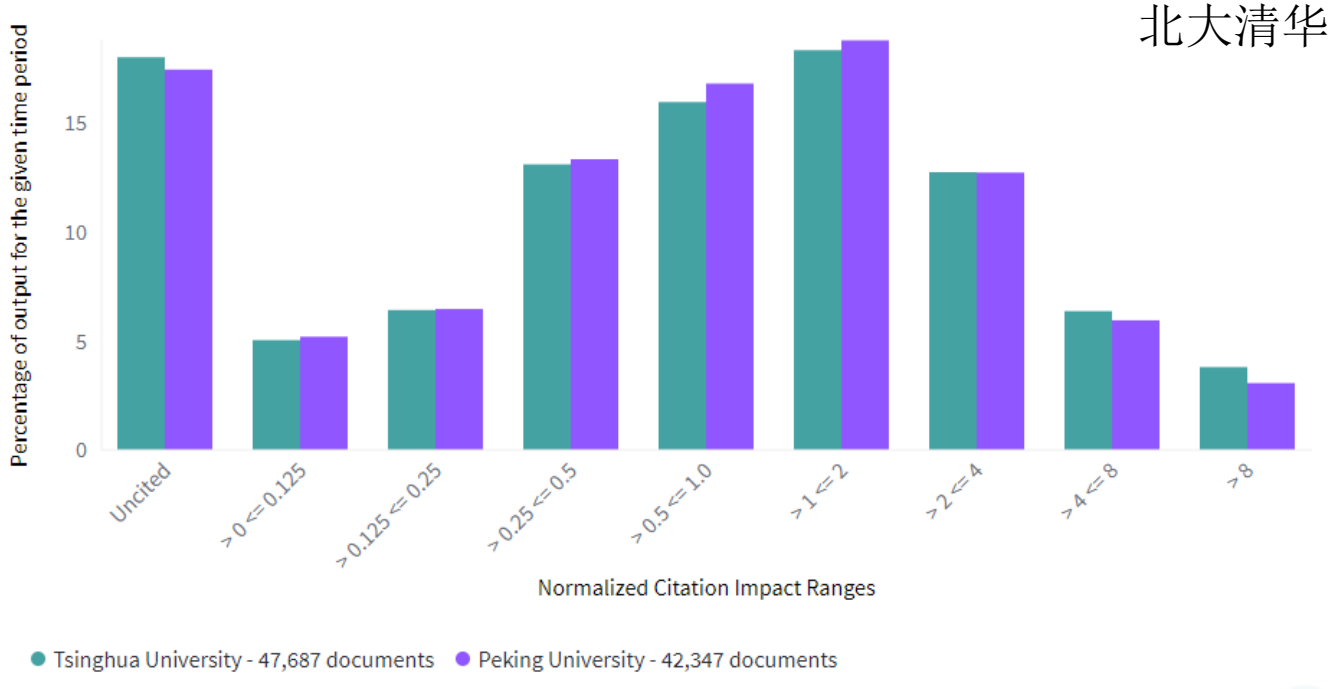
Impact Profile：深入解析单一相对指标背后的故事

2020年新增功能（机构、期刊、地区、人员）

Organization Name	Rank	Web of Science Documents	Times Cited	Category Normalized Citation Impact
Tsinghua University	1	47,687	979,977	1.85
Peking University	2	42,347	843,919	1.63

北大清华，理科对比



中国科研发展

全面画像，而非简单指标

“事实上，每一个被过度简化或误用的指标都有更好的替代选项。通常先进行合适的、可靠的数据分析，然后再通过图形来显示多个互补的维度。通过将数据置于更广泛的背景下，我们能够看到新的特点，了解更多的信息，并提高我们解读科研活动的能力。”

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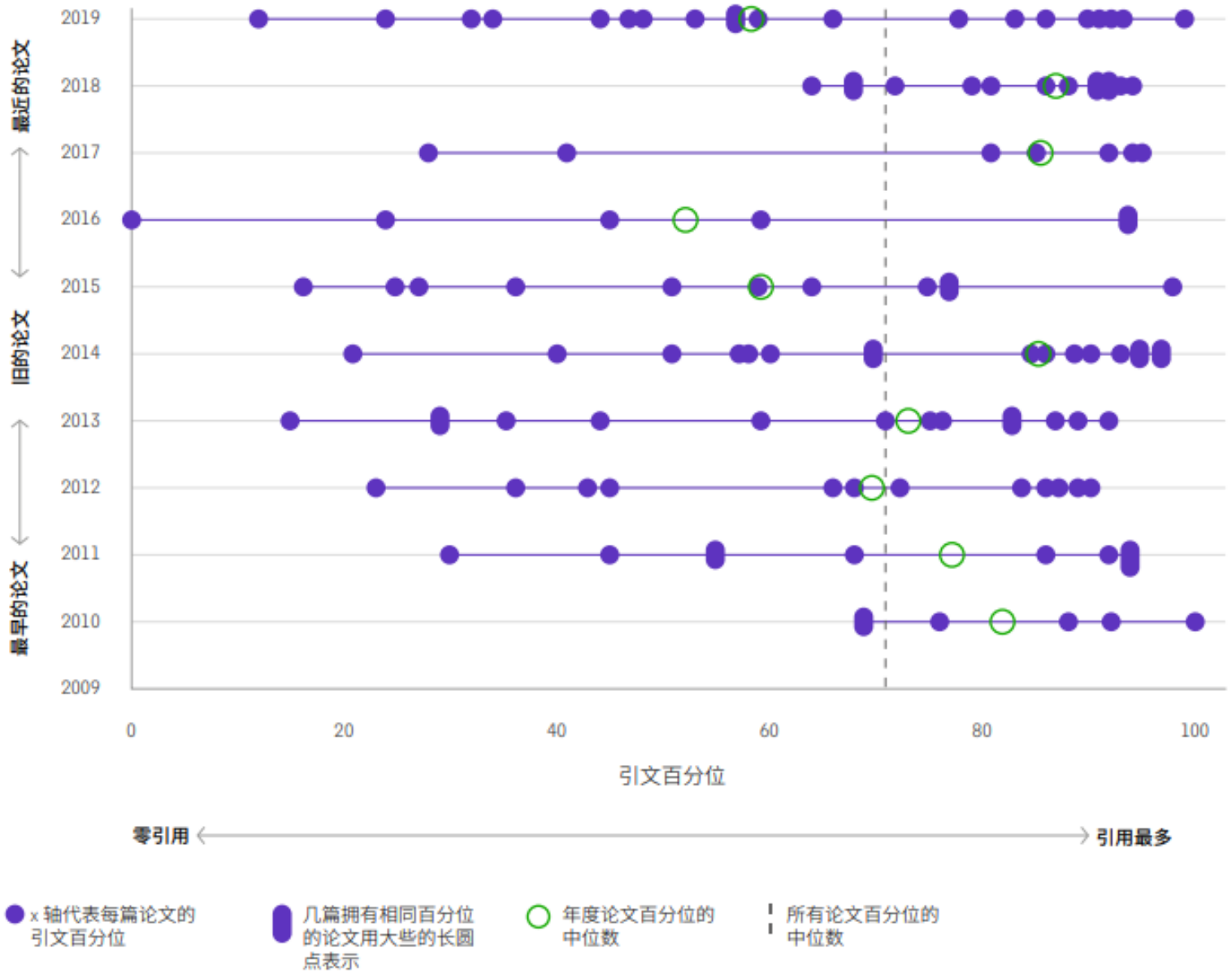
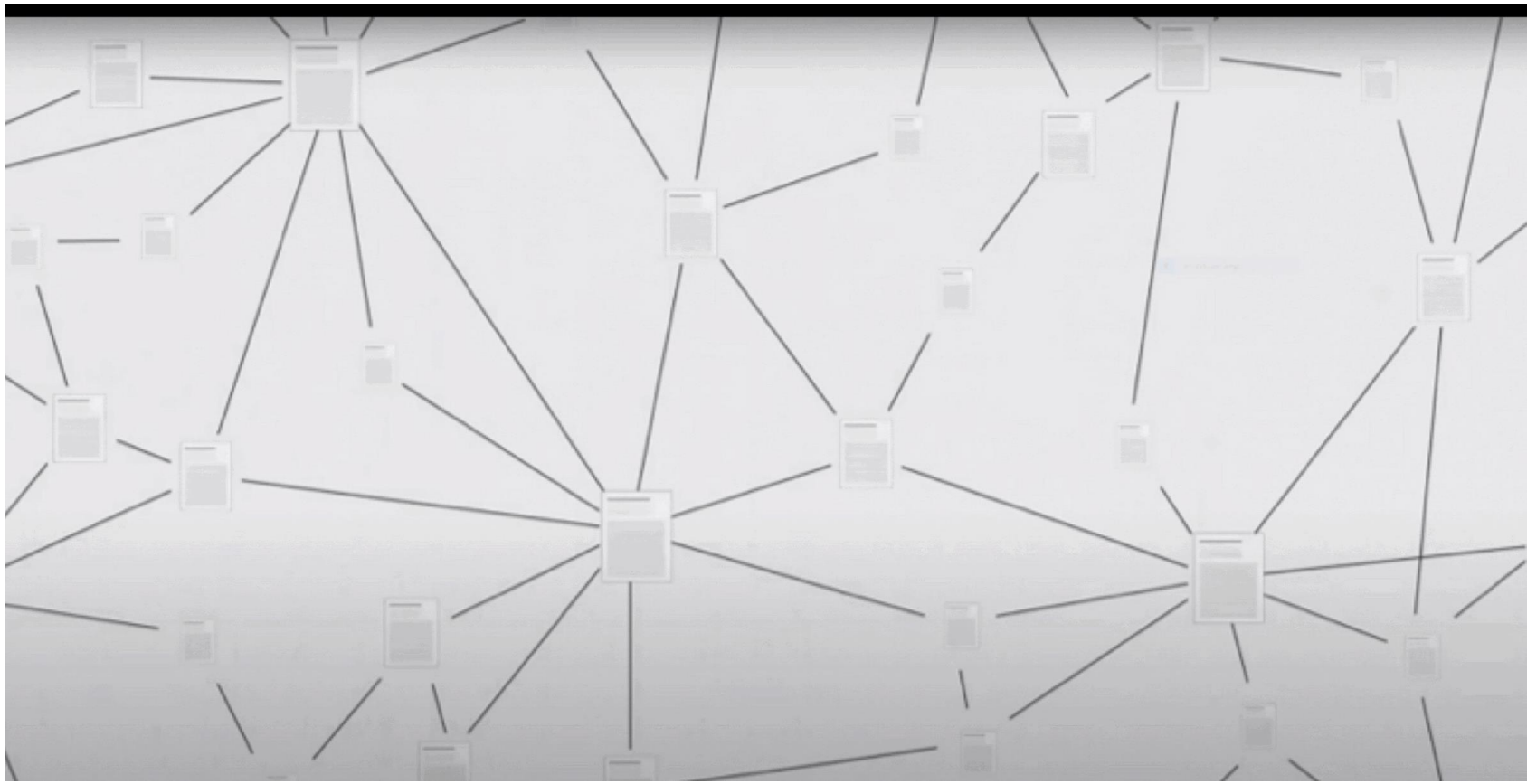
射束图：三维角度全面了解研究人员——新版WOS



信息技术的发展

- 指标得到了不断演进
- 单纯的统计指标已经无法满足需要
- 数据的积累提供了更多的可能



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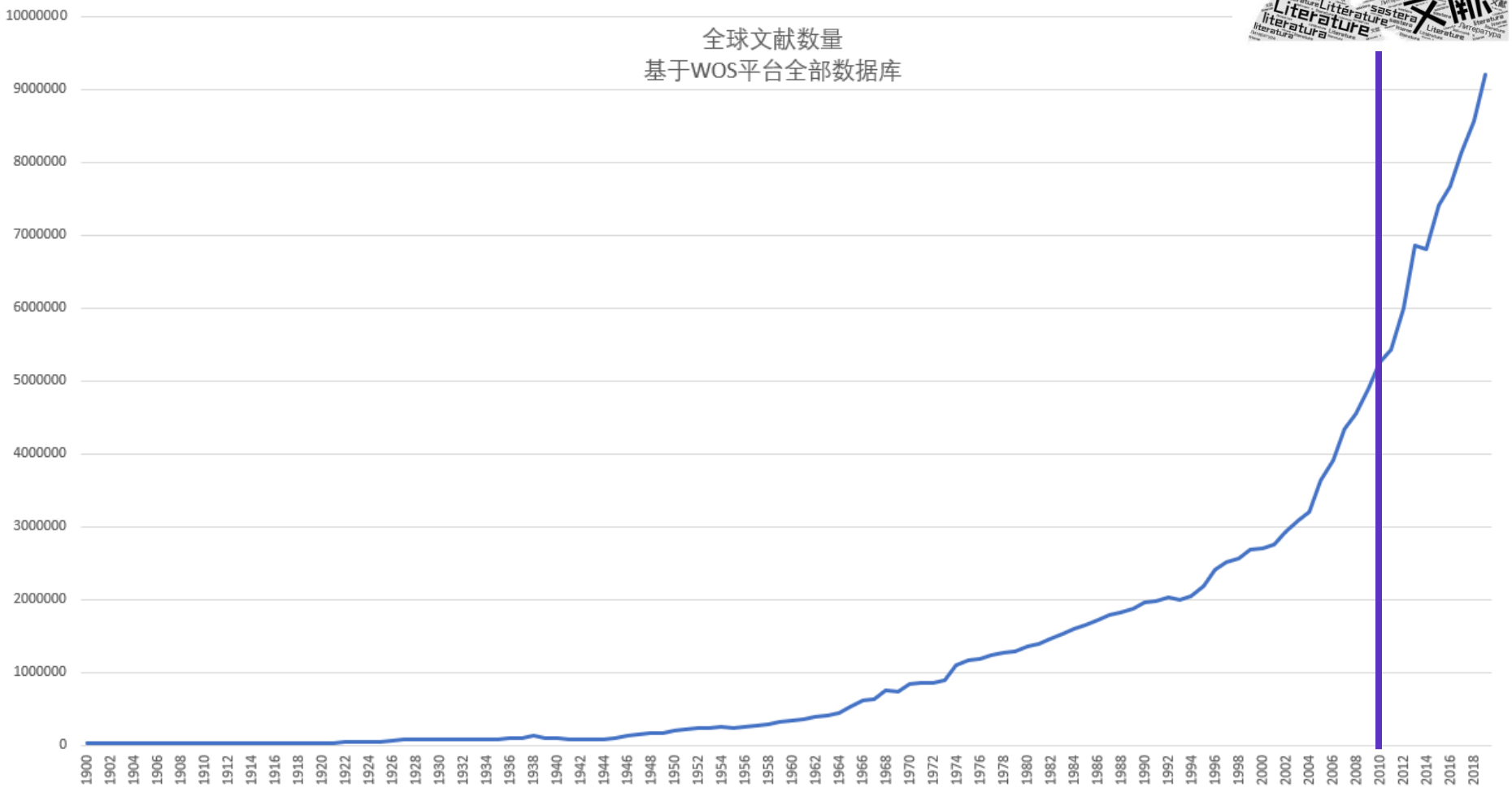
不忘初心，回到未来

科技文献的发展



社交媒体和人工智能的出现。

E时代研究人员行为的改变。

与现实世界更紧密的联系。

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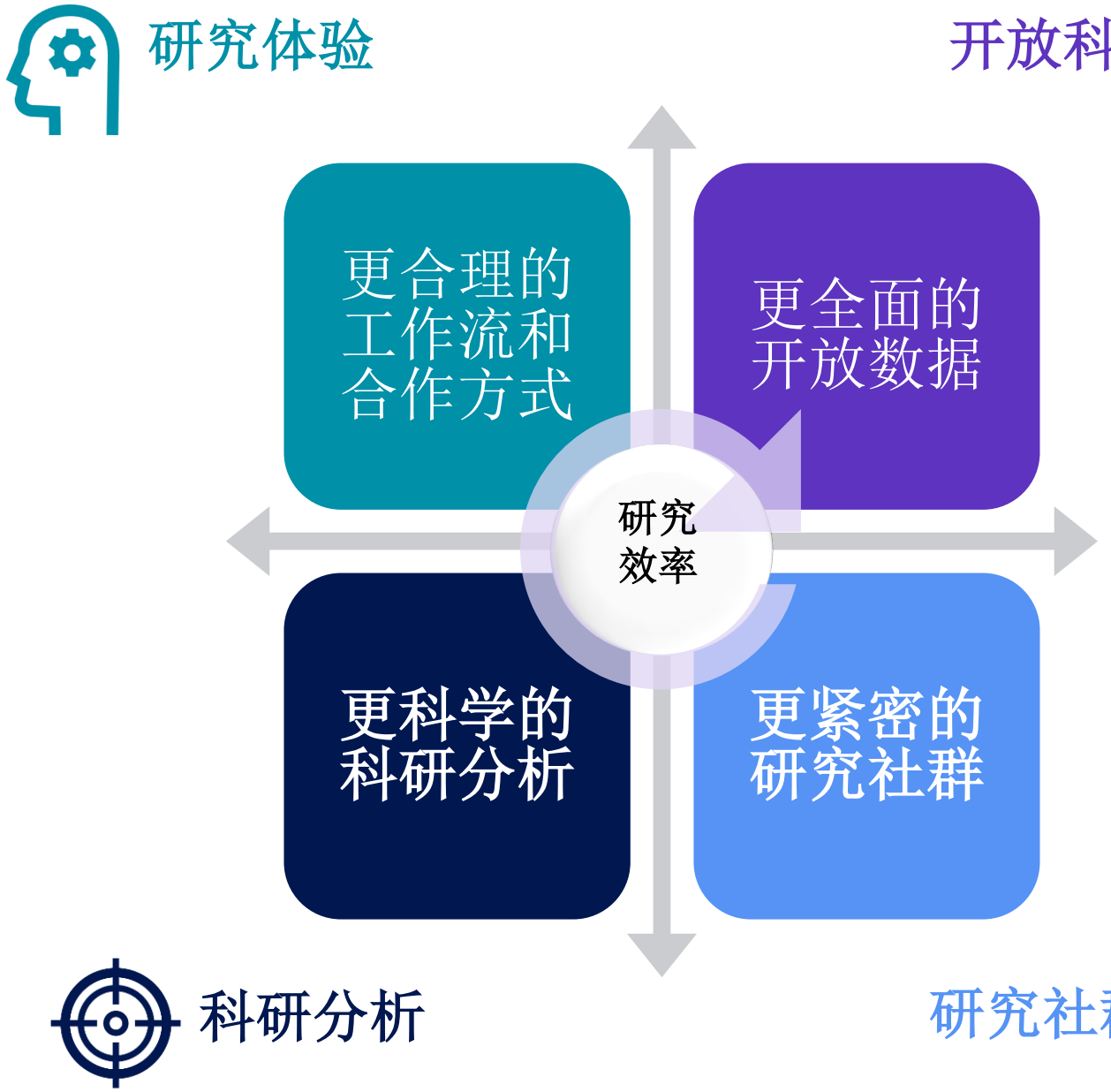
回到未来

新时代的科研需求

- 研究体验
- 开放科学
- 研究社群
- 科研分析



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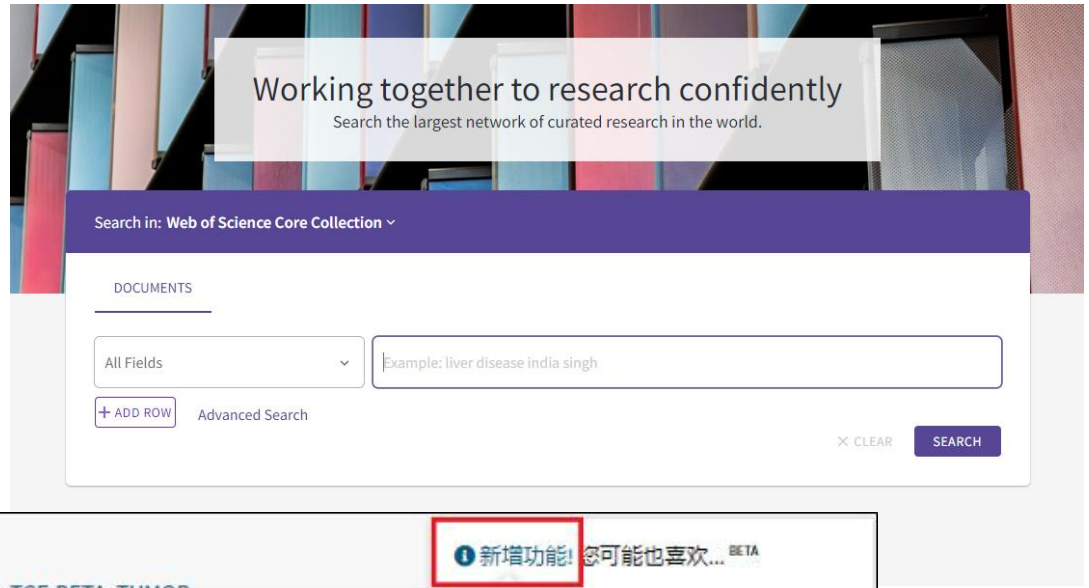
研究体验

新一代Web of Science



- 入口更简单，内容更丰富
- 通过关键词、全球浏览和检索信息，AI可以提供更多相似结果参考
- AI推荐相似作者（即将推出）

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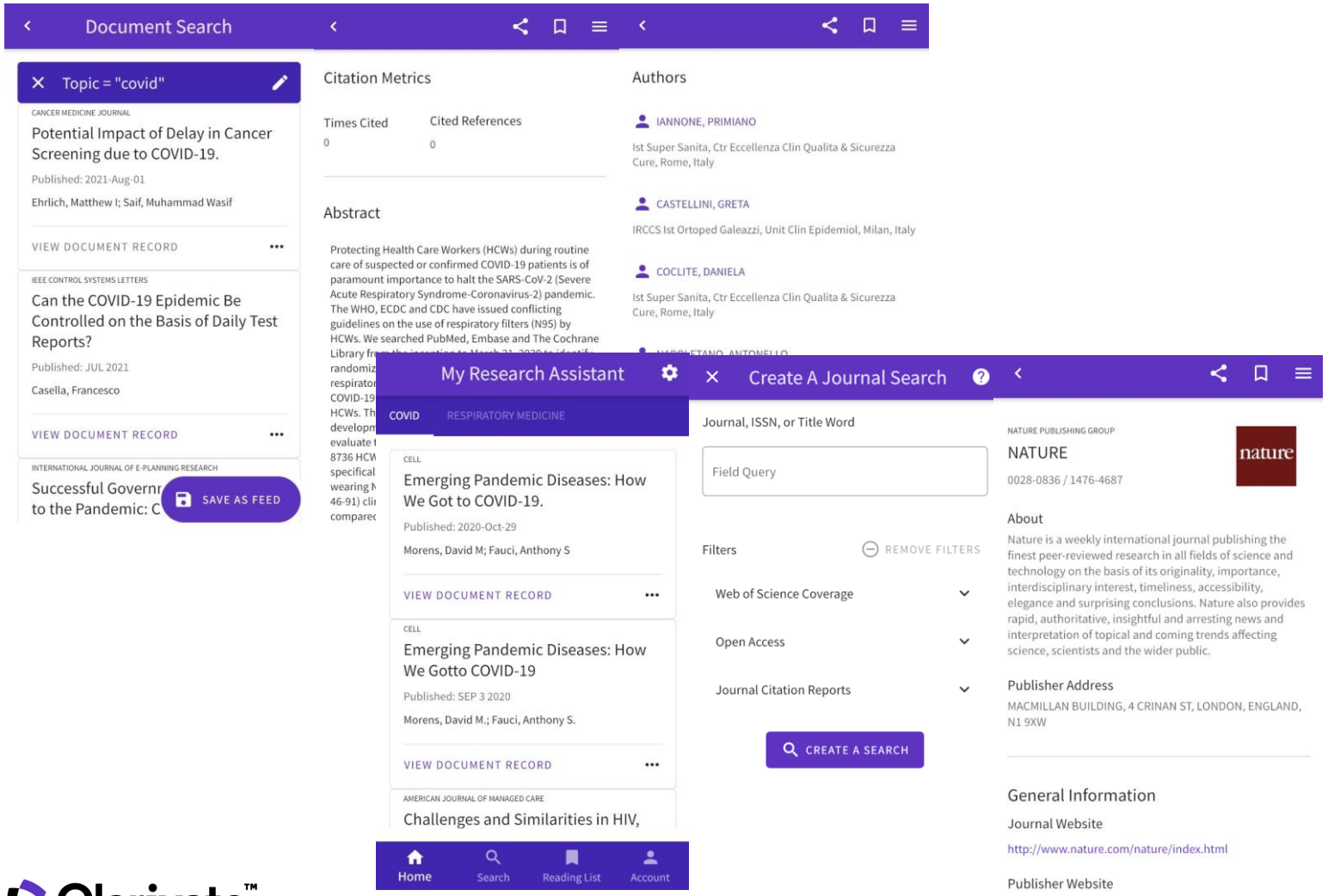
研究体验

科研助手——MyRA



- 更注重研究者的研究流程
- 融管理、追踪、推荐和发现与一体
- 与机构版更好地融合

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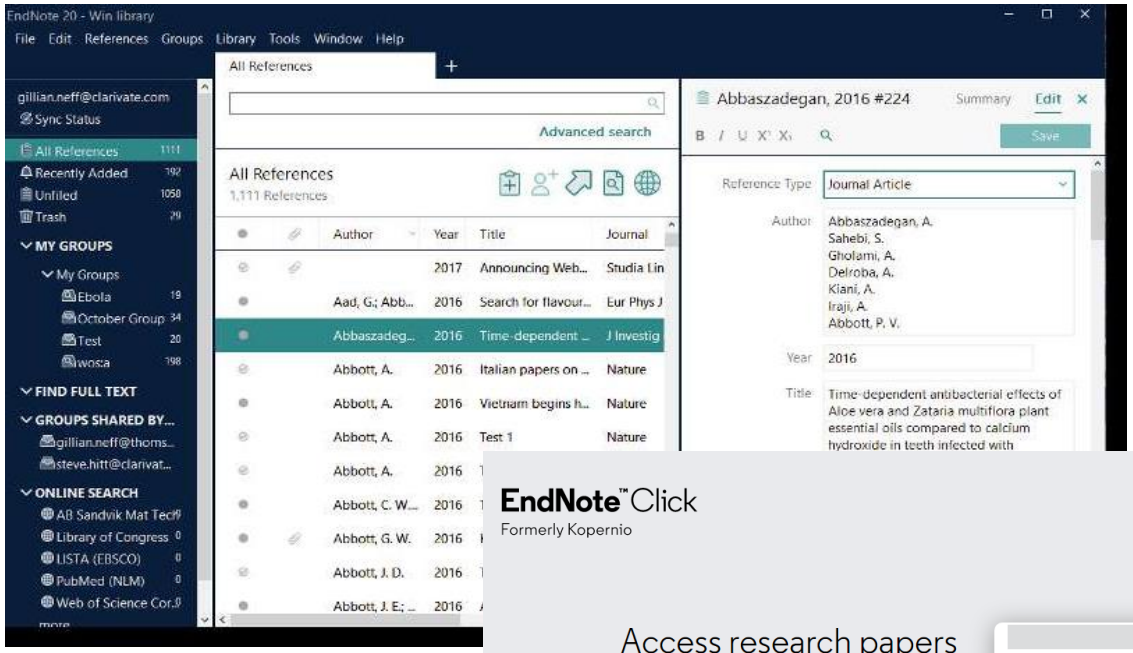
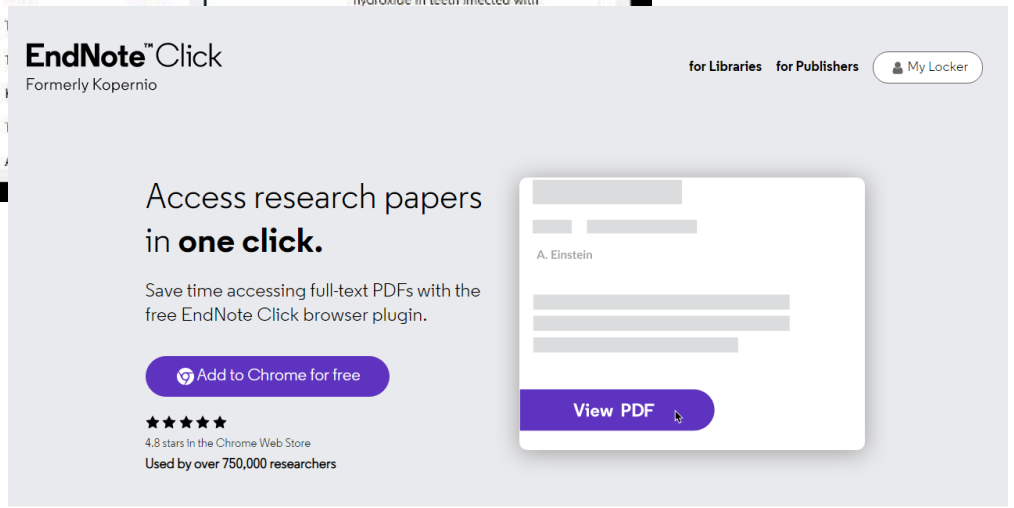
研究体验

文献管理与文献获取的融合





- EndNote与Korpenio整合
- 更注重共享
- 无缝连接

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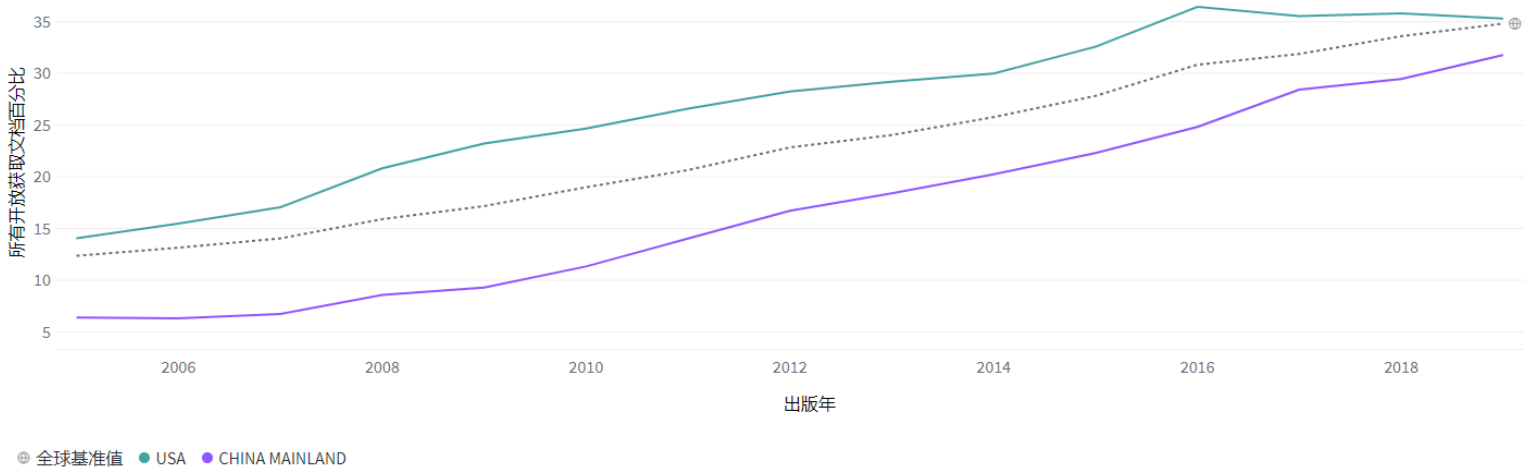
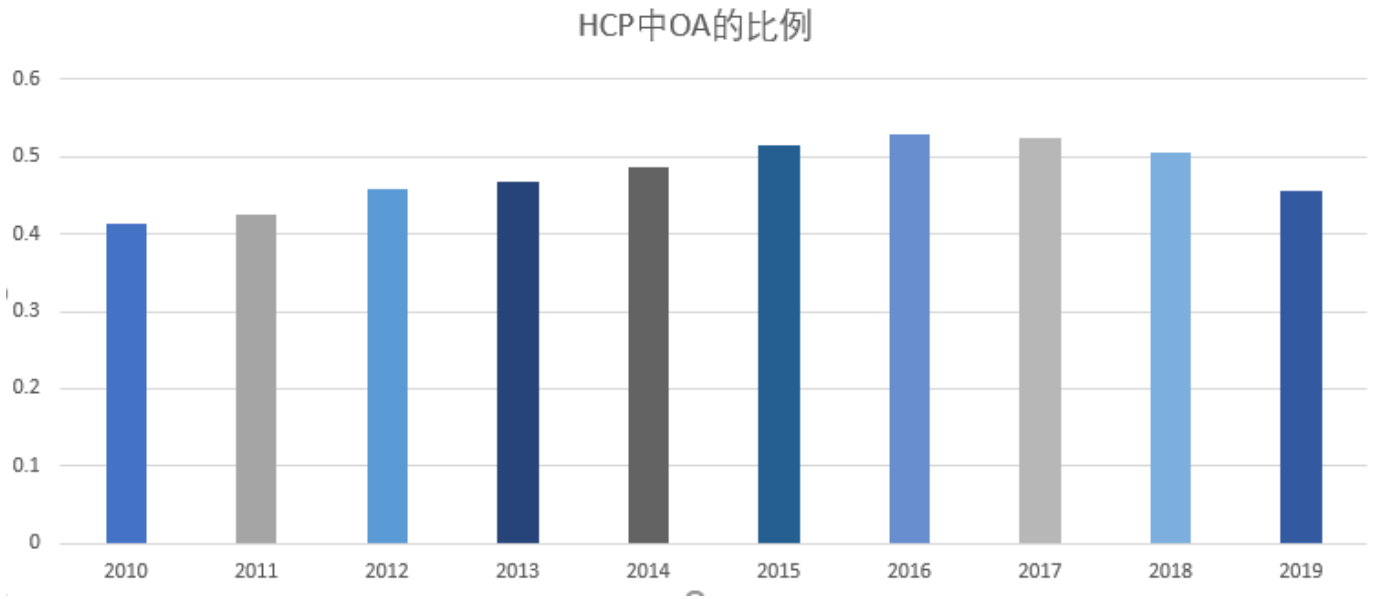
Stop clicking and start reading.

更开放和全面
提升OA比例

- 全面的OA标注
- WOS中30%的文献量是OA资源
- 中国的OA文章也在迅速增长





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更开放和全面
与多源数据的融合

- 最顶尖的专利数据
- 深加工制药与生命科学数据

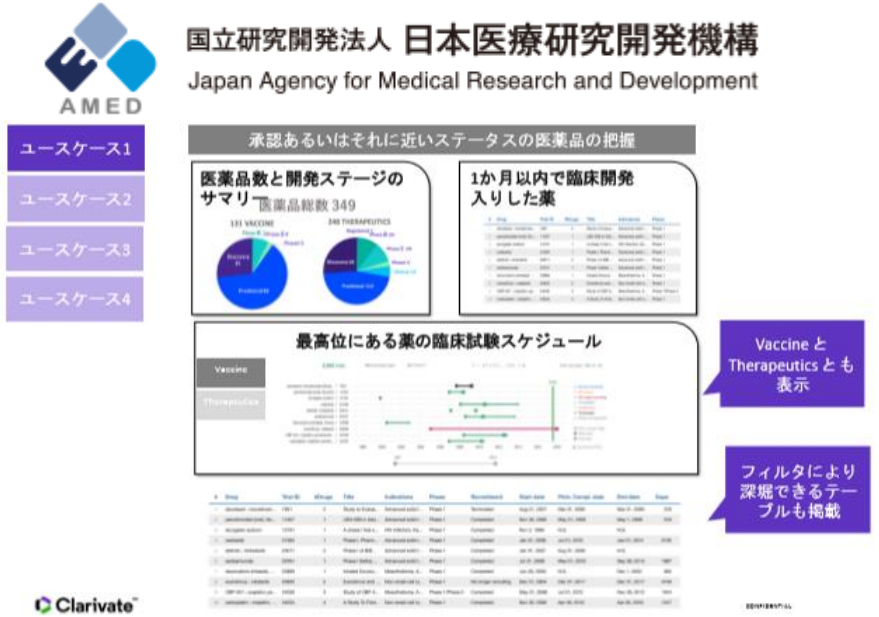
Derwent™

CPA GLOBAL
Part of Clarivate

incoPat | Global Patent Database

Cortellis™

DRG
Part of Clarivate



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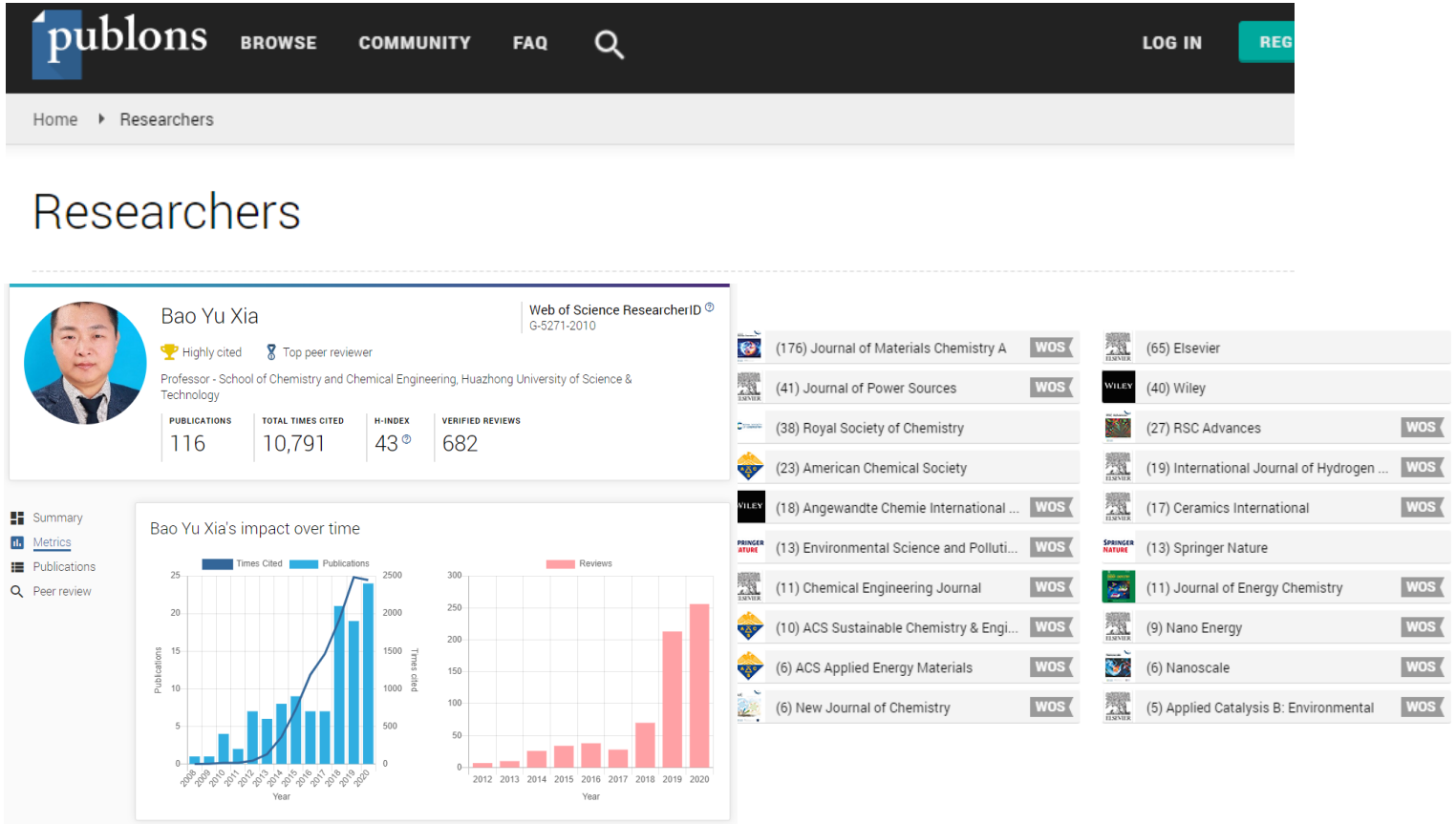
研究社群

社交媒体—同行评议的Linkedin



- Citation依然是学术影响力的重要体现
- 社群联系已经超越引文
- Publons——审稿人的社交媒体，已有200万+注册用户

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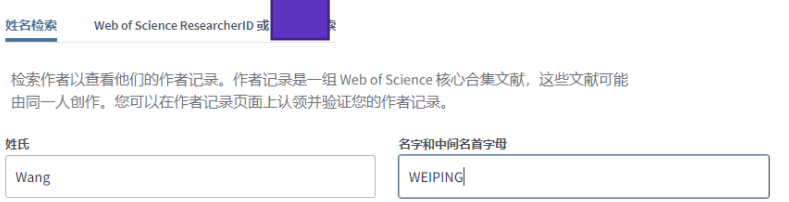
研究社群

AI+社交媒体

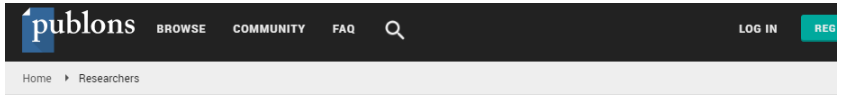
作者
机构
Email

学科
引文网络
作者位置
……



5200万+ Name

2400万 +Author Records



Researchers 200万+

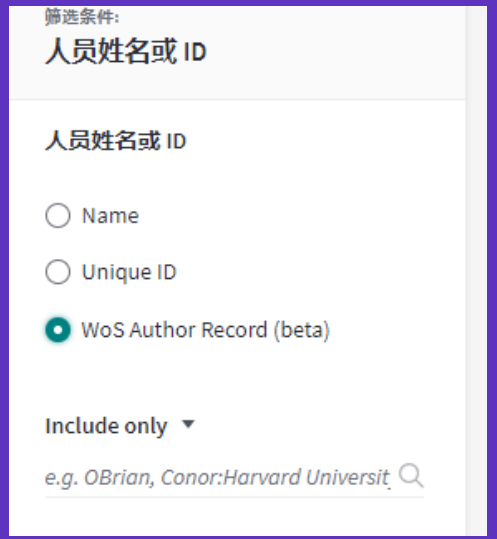
WOS Author Records

&

Publons

经过清洗数据的喂养

AI识别愈加成熟



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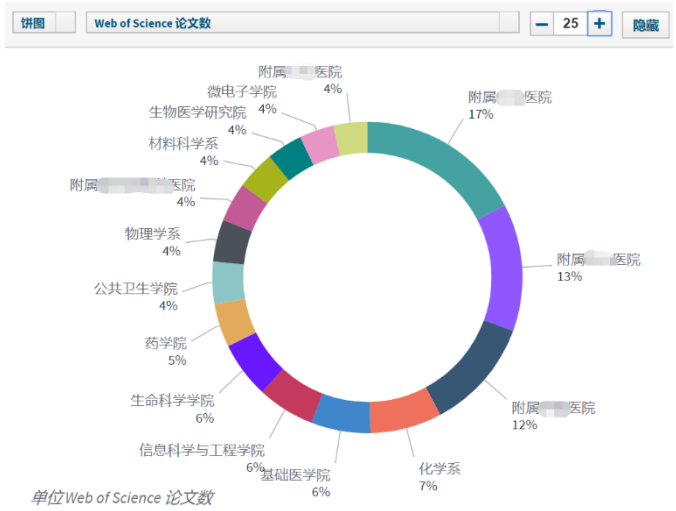
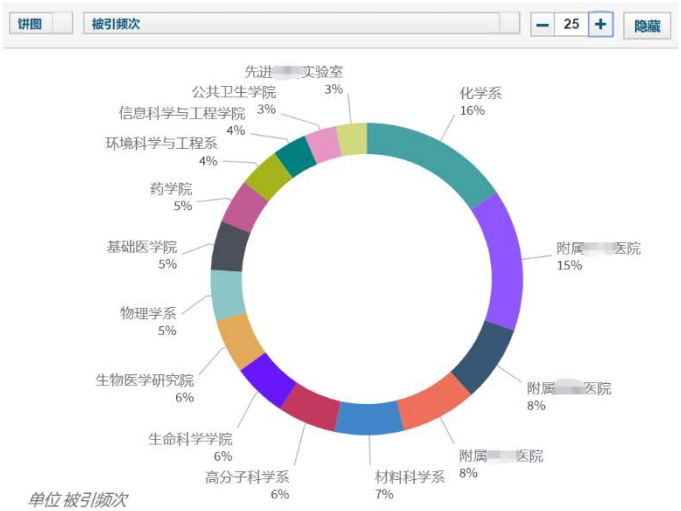
研究社群

内循环





Name	Rank	Affiliation	▼ Web of Science Documents	Times Cited	Category Normalized Citation Impact	% Documents in Q1 Journals	% Documents in Top 10%	% Highly Cited Papers	H-Index	% International Collaborations
周,	1	附属 医院	99	674	2.26	55.32%	31.31%	4.04%	14	16.16%
周,	1	附属 医院	99	674	2.26	55.32%	31.31%	4.04%	14	16.16%
樊,	3	附属 医院	95	769	2.44	70.21%	32.63%	5.26%	15	20%
叶,	4	附属 医院	91	299	2.52	32.35%	15.38%	2.2%	8	34.07%
张,	5	微电子学院	86	543	1.46	60.38%	15.12%	2.33%	12	19.77%
虞,	6	附属 医院	77	289	1.41	48.65%	12.99%	2.6%	9	5.19%
夏,	7	化学系	72	1,013	2.75	93.75%	41.67%	9.72%	17	22.22%
阚,	8	公共卫生学院	68	625	3.33	91.43%	36.76%	2.94%	13	60.29%
陈,	9	附属 医院	66	187	1.59	43.9%	19.7%	0%	7	33.33%
金	10	生命科学学院	64	286	2.21	63.33%	25%	1.56%	10	59.38%

InCites My Organization

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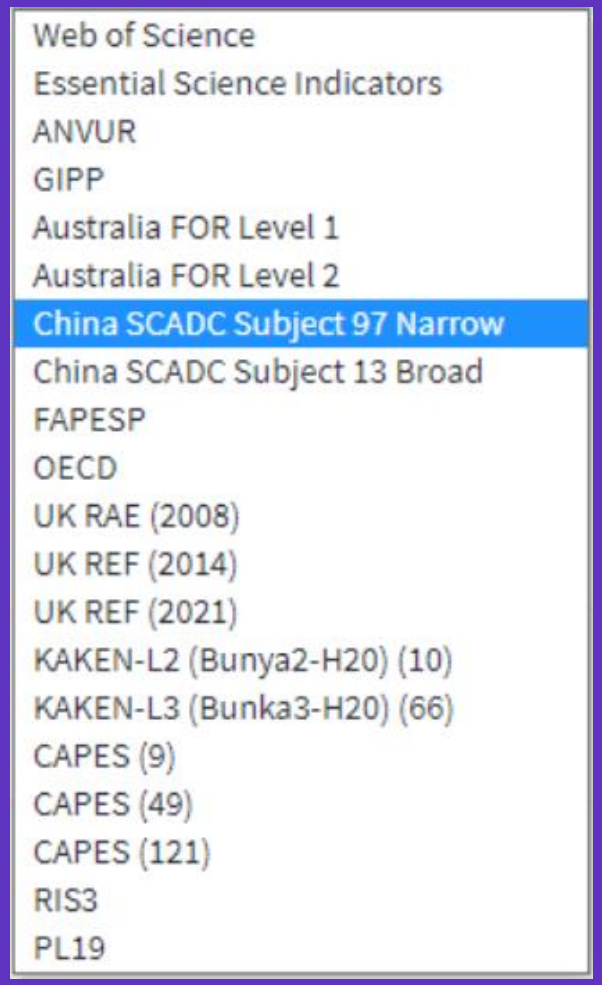
科研分析——分类的演进

源自学科，超越学科



- 科学探索：Web of Science 分类，264
- 科研分析：ESI, 22个领域
- 国际标准：OECD， 42个学科分类
- 宏观分类：GIPP，6大分类
- 地区分类：**中国（97个学科分类，到期刊级别）**

- *最佳的分类系统与应用的场景和目标息息相关*
- *每一个相对指标应该都与分类相关联*

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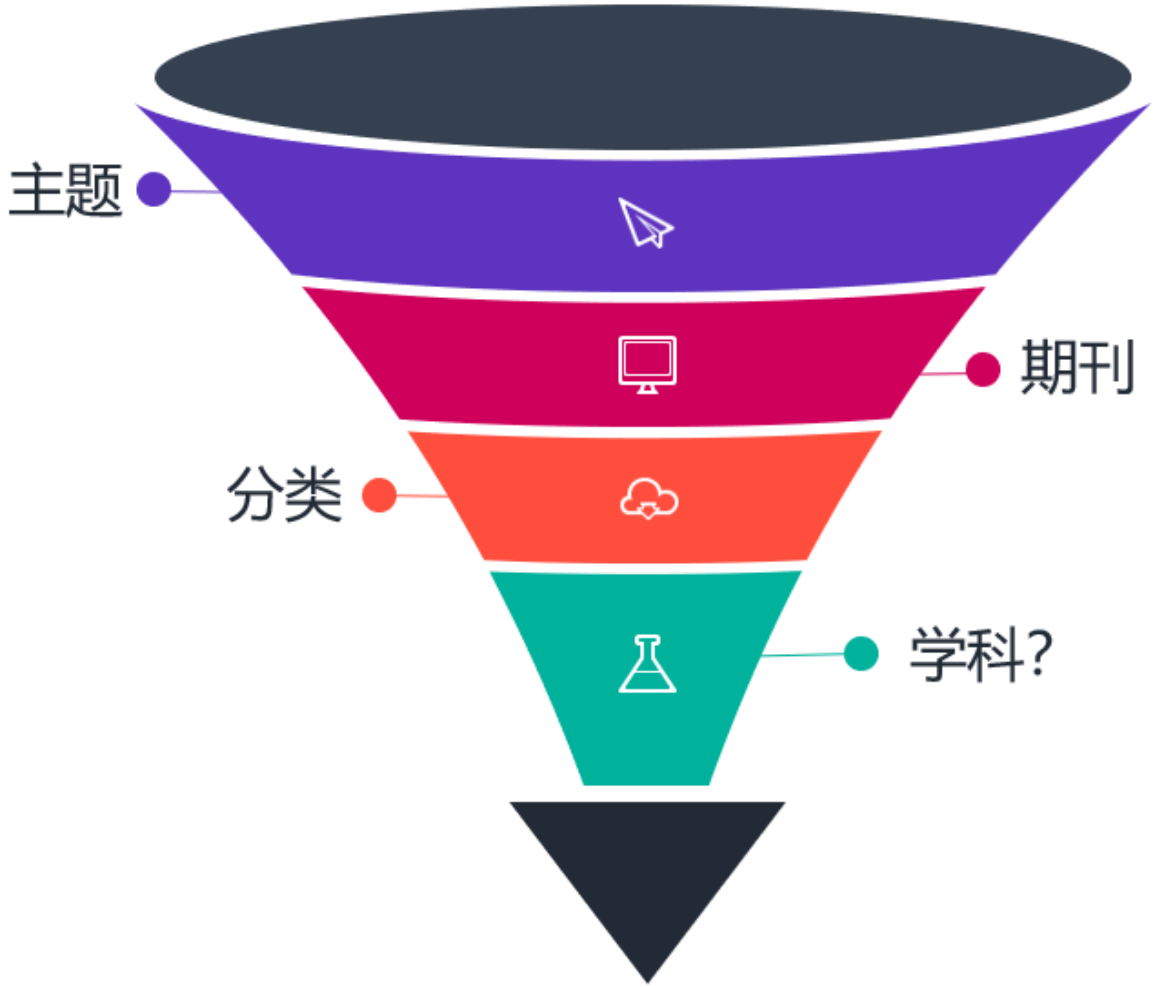
科研分析——分类的演进

源自学科，超越学科

- 期刊定义分类
- 指导下的信息检索分类
- 算法分类



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科研分析——分类的演进

源自学科，超越学科

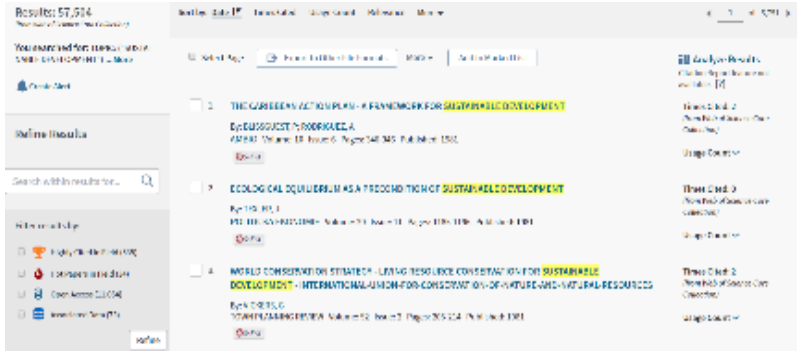
- 期刊定义分类

➢ 引文分析和专家判断相结合

➢ 充分但不精确

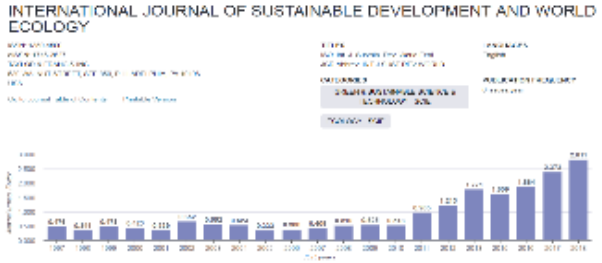
第一篇关于可持续发展的文章（1981）

“Sustainable Development” in WoS



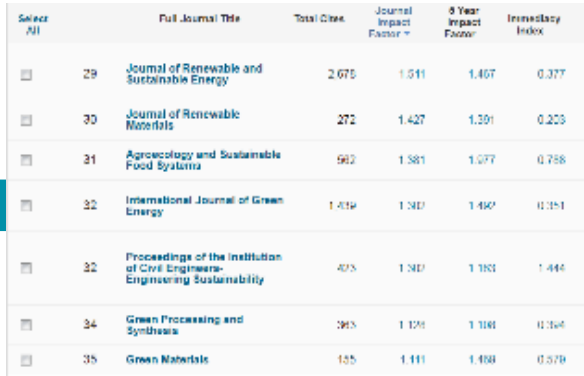
第一本“可持续发展”的期刊（1997）

“Sustainable Development” in JCR



“可持续发展”学科(2015)

GREEN & SUSTAINABLE SCIENCE & TECHNOLOGY



可持续发展的研究?

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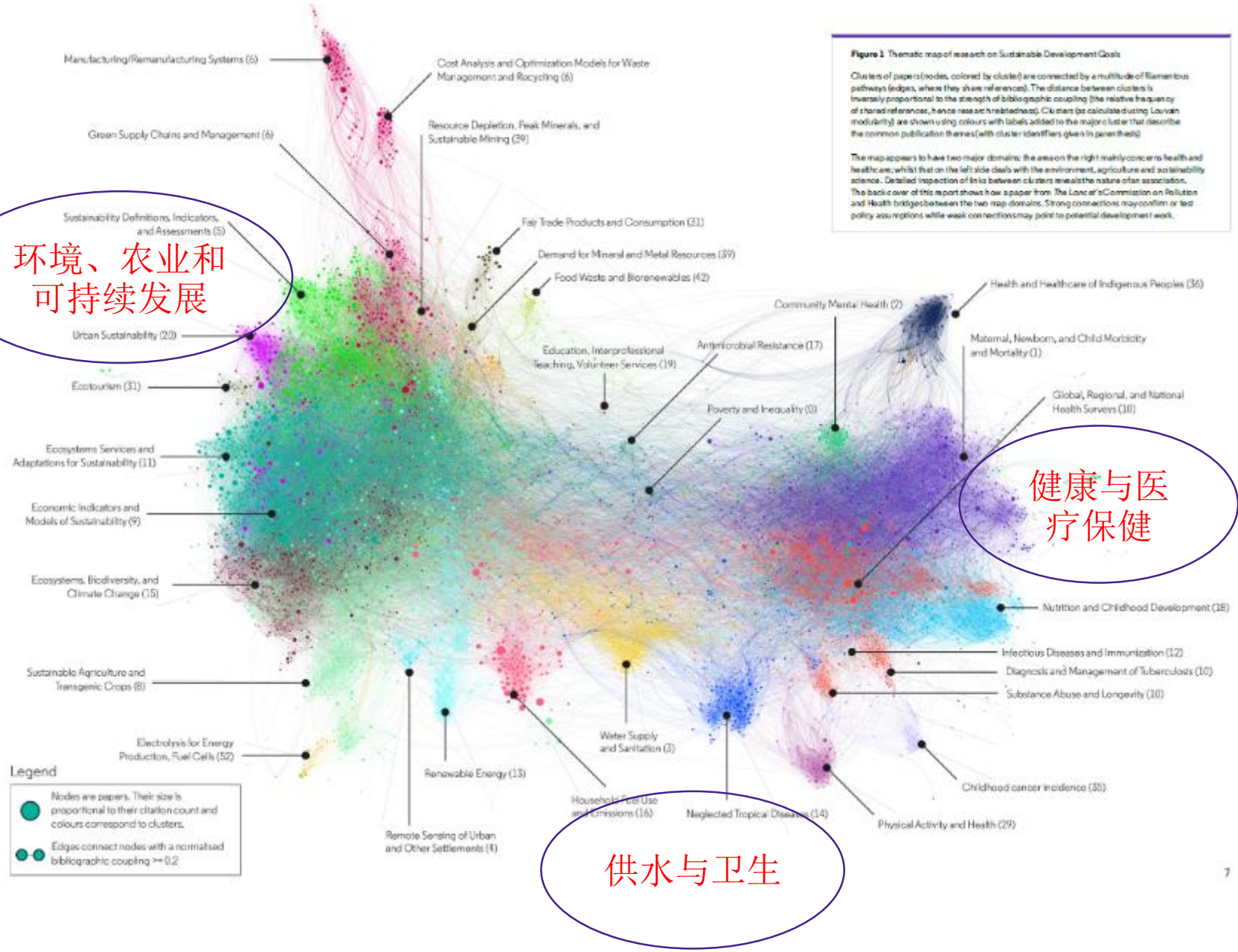
科研分析——分类的演进

源自学科，超越学科

- 指导下的信息检索分类

➢ 需要主题方面的专业知识

➢ 一次性的，可重复性较差



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科研分析——分类的演进

源自学科，超越学科

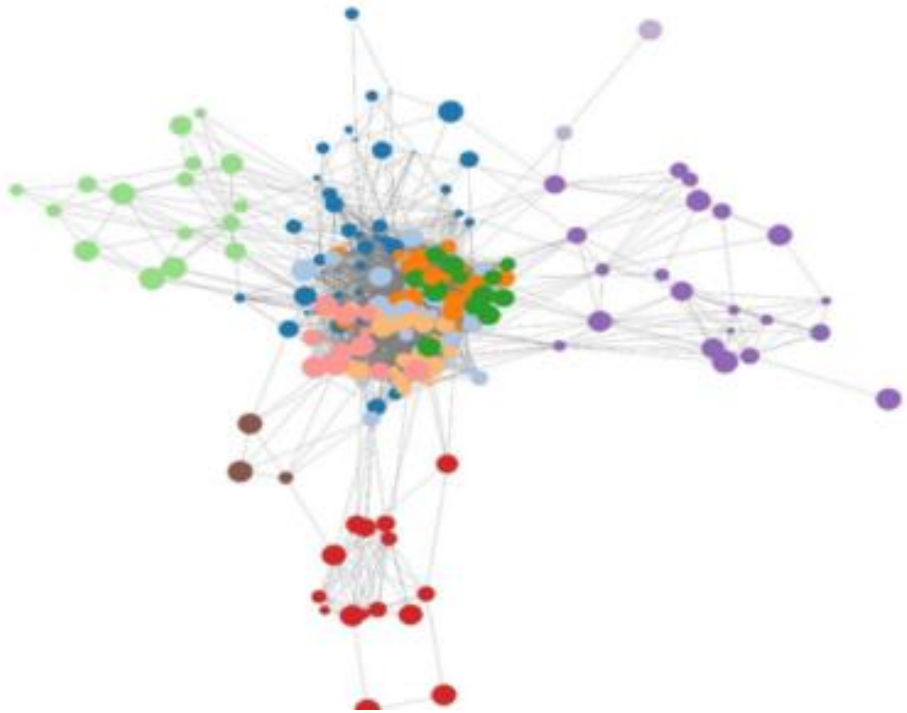
- 算法分类

➢ 更准确地表述微聚类或专业方向

➢ 增强内容的同质性

➢ 改进引文规范化

CWTS
Meaningful metrics



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科研分析——分类的演进

源自学科，超越学科

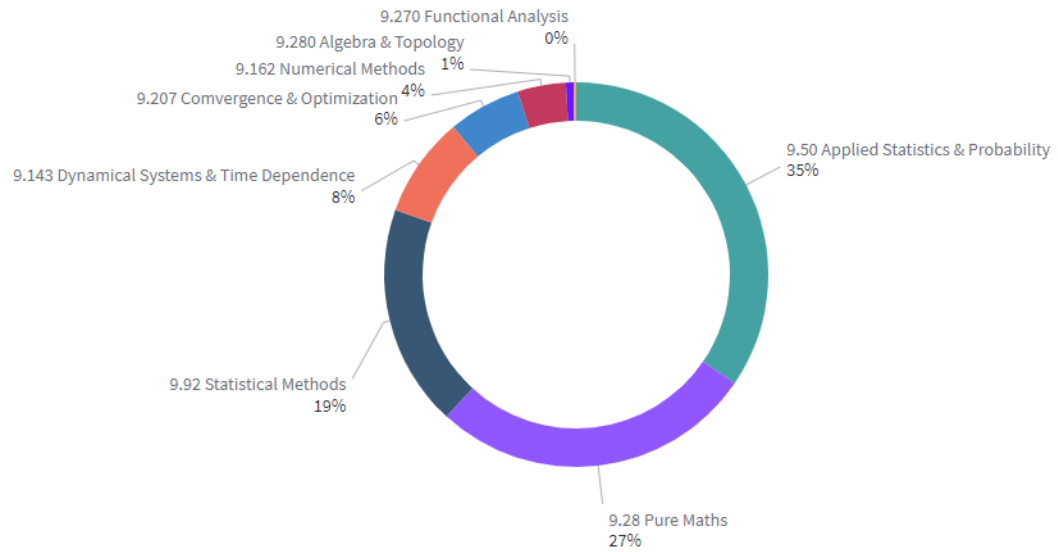
- 算法分类

➢ 更准确地表述微聚类或专业方向

➢ 增强内容的同质性

➢ 改进引文规范化

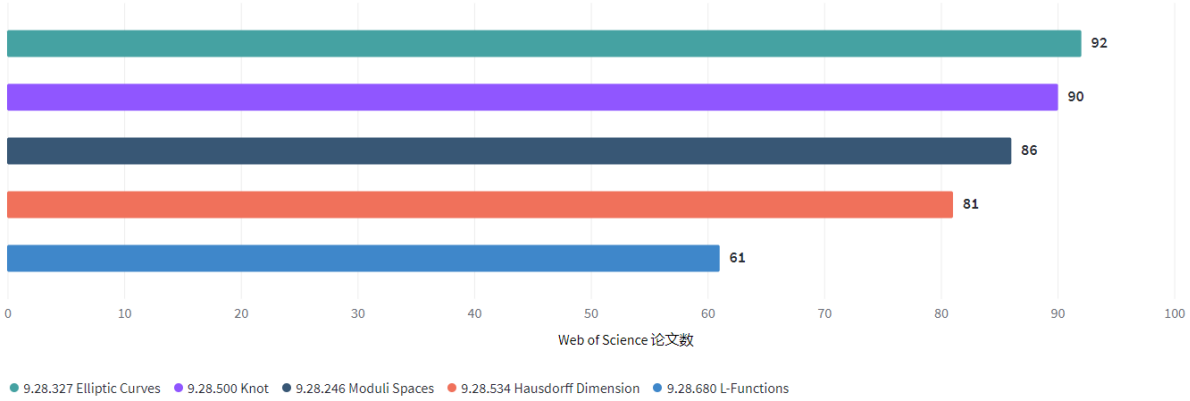
北大数学学科中观构成



北大Pure Maths微观Top 5 topics

Area		Rank	Web of Science Documents	Times Cited	Category Normalized Citation Impact	% Documents in Q1 Journals
Moduli Spaces	模空间	1	55	159	1.29	50.98%
Hausdorff Dimension	豪斯多夫维数	1	55	117	0.97	69.09%
Finite Group	有限群	3	49	72	1.06	8.16%
Knot	纽结	4	37	83	0.9	40.54%
Elliptic Curves	椭圆曲线	5	27	71	1.4	38.46%

四大顶刊 Top 5 topics



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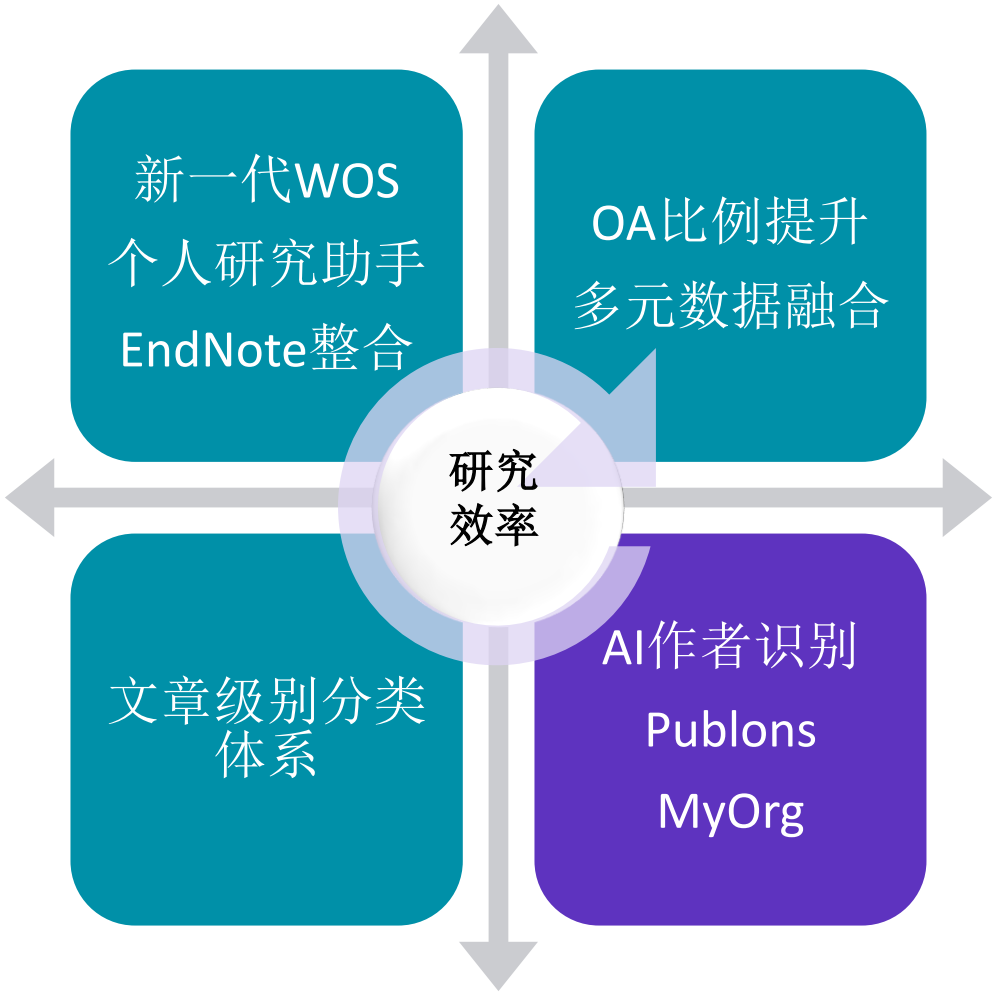
研究影响——分类的演进

源自学科，超越学科

- 研究体验
- 开放科学
- 研究社群
- 科研分析



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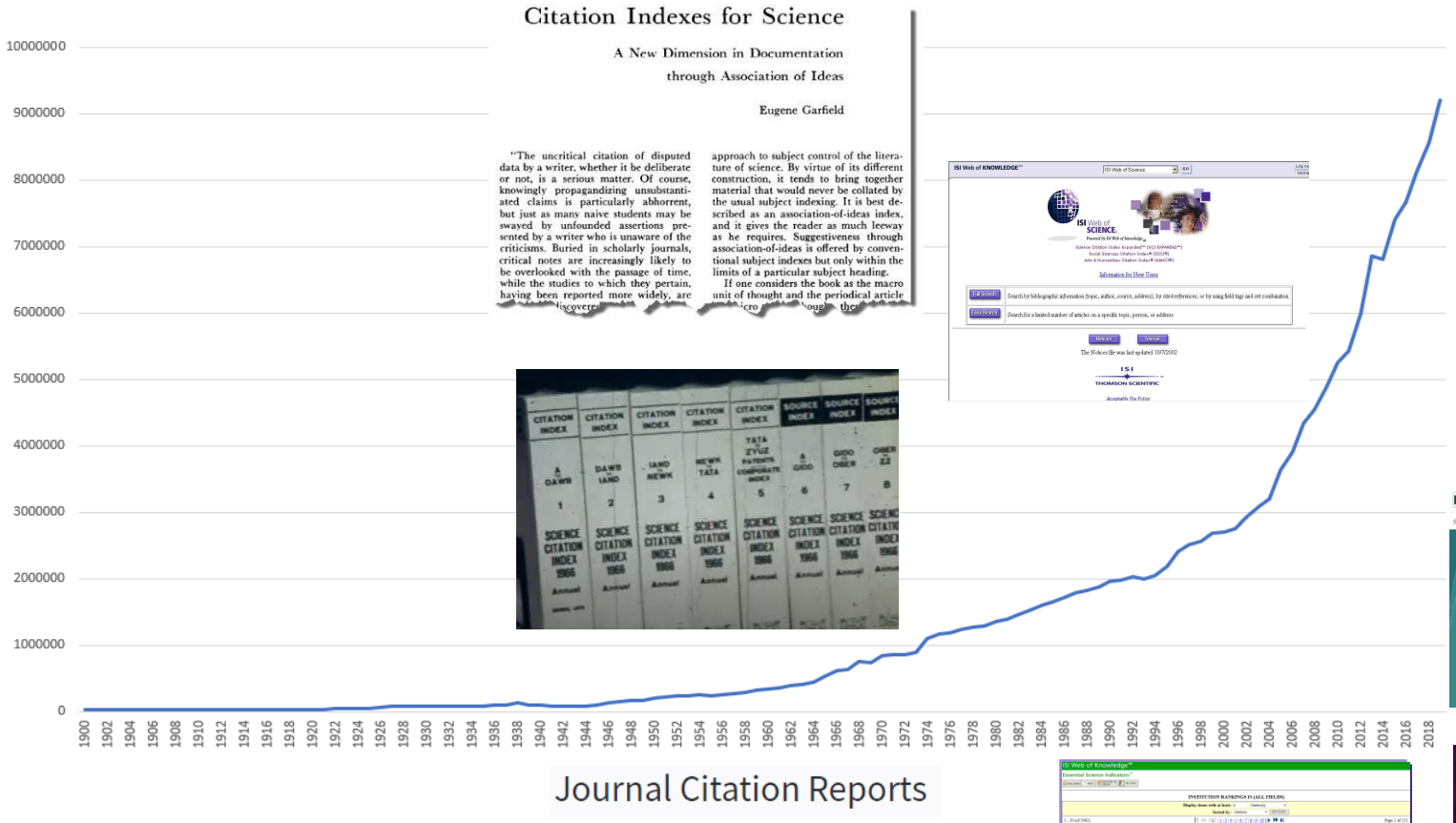
源自学术，服务学术——文献数据发展

信息技术，指标演进——评价发展与中国20年

不忘初心，回到未来——社交媒体与人工智能

科睿唯安——源自文献，超越文献



Citation Indexes for Science

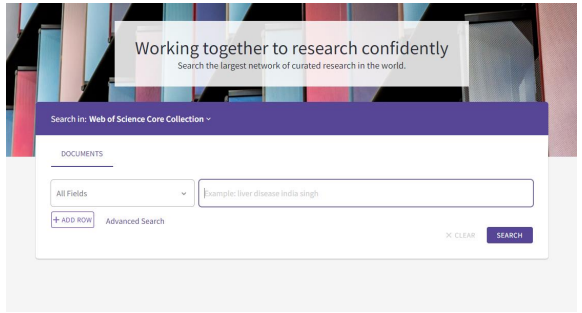
A New Dimension in Documentation through Association of Ideas

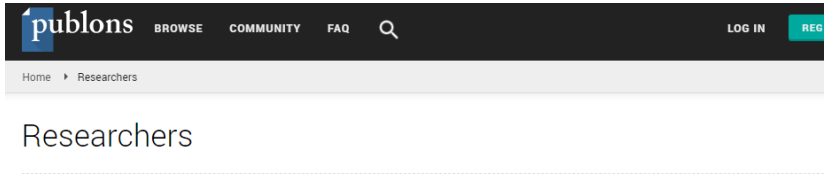
Eugene Garfield

"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

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





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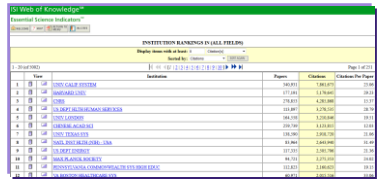

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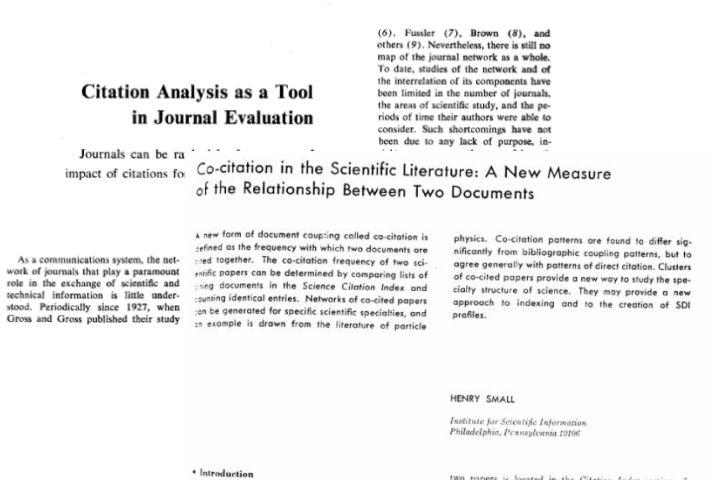


Citation Analysis as a Tool in Journal Evaluation

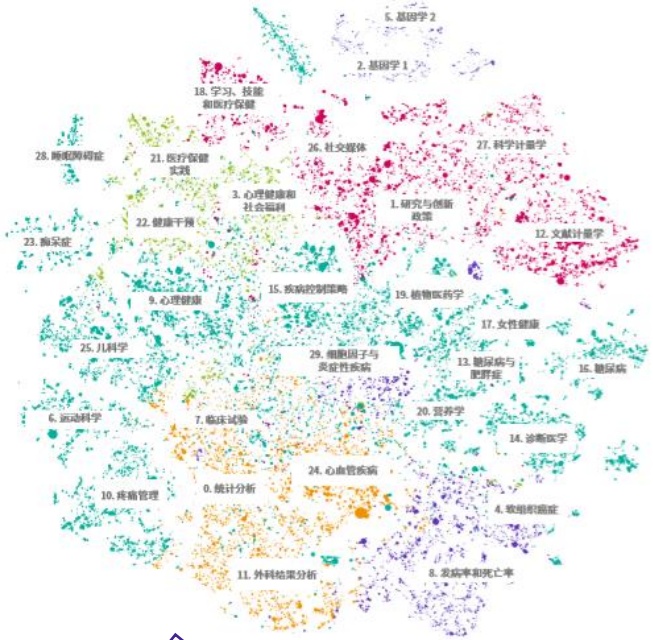
Co-citation in the Scientific Literature: A New Measure of the Relationship Between Two Documents

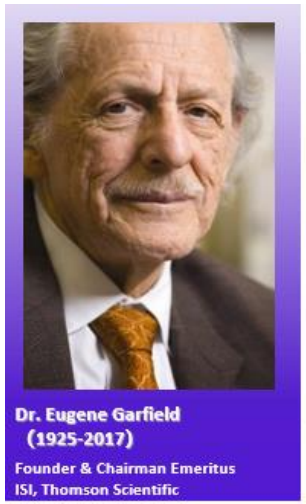
HENRY SMALL

Institute for Scientific Information
Philadelphia, Pennsylvania 19106

分析指标的完善

文献数据的深度理解





Dr. Eugene Garfield
(1925-2017)
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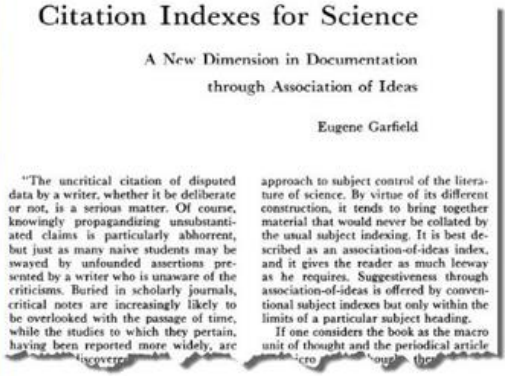
ISI, Thomson Scientific



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A New Dimension in Documentation through Association of Ideas

Eugene Garfield

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