

Systematic Serendipity: Finding the Undiscovered Answers to Science Questions

presented by

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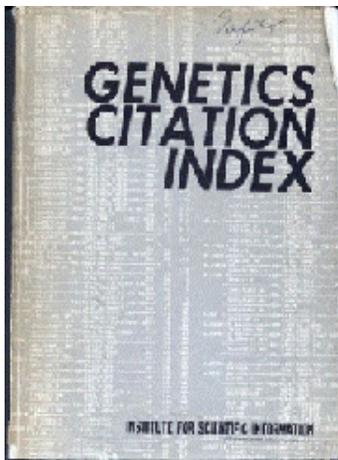
Home Page: <http://eugenegarfield.org>

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University of Arizona Health Sciences Center, Tucson

When the 1961 *Science Citation Index* was first published in 1964, *Chemical & Engineering News* asked Dr. Julian Smith to review the initial five-volume set.ⁱ These volumes were the culmination of an experimental project supported by the National Institutes of Health called the *Genetics Citation Index*.

The *Genetics Citation Index* was distributed to 1,000 geneticists and contained several different indexes including a 15-year cumulative citation index to the *American Journal of Human Genetics*, a five-year index to a group of 35 genetics journals, and a selective one-year multi-disciplinary citation index based on 600 journals, published in 1961.ⁱⁱ

When the *GCI* project was almost done in 1963, we asked the National Science Foundation to publish and distribute the complete 1961 *Science Citation Index*. Since neither the traditional indexing and abstracting services nor NSF would consider publishing it, the Institute for Scientific Information made the decision to do so and more importantly, to continue publication on a quarterly and annual basis. The first quarterly issue appeared in May 1964. Since then an untold number of scientists have been making use of the *SCI* to retrieve information and to conduct statistical, bibliometric, and sociometric studies. After 40 years, I still can't take for granted that any audience I address is familiar with it. Here in a nutshell is a brief tutorial.



HOW TO DO A SEARCH

Starting point for most searches in the **SCI** is a specific work. □ For example: suppose you are interested in the subject of Urey's article: "Lifelike Forms in Meteorites."

Lifelike Forms in Meteorites

Are fossils present in carbonaceous meteorites? The evidence is suggestive but as yet inconclusive.

Harold C. Urey

At a meeting held 1 May 1962 at the New York Academy of Sciences, a group of reports was presented dealing with the 1700 particles per milligram claimed by the Fordham group, in contradiction to reports mentioning any early skepticism in regard to the whole matter and suggestion that additional experiments with hydrocarbons extracted from meteorites be made by spectroscopic methods, to supplement the mass spectrographic analyses. In New York, October 1961, Nagy had shown chemical and mineralogical data pointing to the possibility that there

H. C. Urey, *Science* **137**, 623-626 (1962)

In the **SCI**, this subject is identified by the specific citation:

UREY HC-----62-SCIENCE----- 137 623

To find where a specific paper, book, thesis or technical note, etc. has been cited in a current journal article, look in the **Citation Index** section of the **SCI** under the specific citation.

CITED AUTHOR	CITING PUBLICATION	CITING YEAR	VOL	PAGE
UREY HC	SCIENCE	62	137	623
MUELLER G	NATURE	205	1200	
MUELLER G	NATURE	205	1201	
MUELLER G	NATURE	205	1202	
MUELLER G	NATURE	205	1203	
MUELLER G	NATURE	205	1204	
MUELLER G	NATURE	205	1205	
MUELLER G	NATURE	205	1206	
MUELLER G	NATURE	205	1207	
MUELLER G	NATURE	205	1208	
MUELLER G	NATURE	205	1209	
MUELLER G	NATURE	205	1210	
MUELLER G	NATURE	205	1211	
MUELLER G	NATURE	205	1212	
MUELLER G	NATURE	205	1213	
MUELLER G	NATURE	205	1214	
MUELLER G	NATURE	205	1215	
MUELLER G	NATURE	205	1216	
MUELLER G	NATURE	205	1217	
MUELLER G	NATURE	205	1218	
MUELLER G	NATURE	205	1219	
MUELLER G	NATURE	205	1220	
MUELLER G	NATURE	205	1221	
MUELLER G	NATURE	205	1222	
MUELLER G	NATURE	205	1223	
MUELLER G	NATURE	205	1224	
MUELLER G	NATURE	205	1225	
MUELLER G	NATURE	205	1226	
MUELLER G	NATURE	205	1227	
MUELLER G	NATURE	205	1228	
MUELLER G	NATURE	205	1229	
MUELLER G	NATURE	205	1230	
MUELLER G	NATURE	205	1231	
MUELLER G	NATURE	205	1232	
MUELLER G	NATURE	205	1233	
MUELLER G	NATURE	205	1234	
MUELLER G	NATURE	205	1235	
MUELLER G	NATURE	205	1236	
MUELLER G	NATURE	205	1237	
MUELLER G	NATURE	205	1238	
MUELLER G	NATURE	205	1239	
MUELLER G	NATURE	205	1240	
MUELLER G	NATURE	205	1241	
MUELLER G	NATURE	205	1242	
MUELLER G	NATURE	205	1243	
MUELLER G	NATURE	205	1244	
MUELLER G	NATURE	205	1245	
MUELLER G	NATURE	205	1246	
MUELLER G	NATURE	205	1247	
MUELLER G	NATURE	205	1248	
MUELLER G	NATURE	205	1249	
MUELLER G	NATURE	205	1250	

CITATION INDEX SECTION

Any article cited during the period indexed is listed alphabetically under the first author's name. Each cited work by that author is arranged chronologically and indicated by a dashed line. ■ Beneath the cited item, you will find the list of current citing articles. In this instance, the 1962 article by H. C. Urey in *Science* **137**, 623 was cited, in 1965, by G. Mueller, *Nature* **205**, 1200. ■ Each citing item, other than journal articles, is characterized by a code indicating whether it is a review article, letter, correction, book review, meeting proceedings, editorial, etc. In this example "L" is the code for "letter."

To find the articles and other items published by a specific organization, look in the **Corporate Index** under the organization's name.

ORGANIZATION	YEAR	VOL	PAGE
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1200
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1201
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1202
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1203
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1204
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1205
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1206
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1207
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1208
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1209
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1210
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1211
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1212
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1213
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1214
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1215
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1216
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1217
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1218
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1219
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1220
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1221
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1222
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1223
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1224
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1225
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1226
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1227
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1228
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1229
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1230
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1231
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1232
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1233
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1234
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1235
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1236
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1237
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1238
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1239
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1240
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1241
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1242
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1243
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1244
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1245
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1246
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1247
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1248
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1249
UNIVERSITY OF LONDON, BIRKBECK COLLEGE	1965	205	1250

CORPORATE INDEX SECTION

To find the full titles, co-authors and bibliographic data for the citing works or works attributed to an organization, look in the **Source Index** under the first author's name.

AUTHOR	TITLE	JOURNAL	YEAR	VOL	PAGE
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1200
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1201
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1202
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1203
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1204
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1205
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1206
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1207
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1208
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1209
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1210
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1211
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1212
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1213
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1214
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1215
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1216
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1217
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1218
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1219
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1220
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1221
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1222
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1223
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1224
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1225
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1226
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1227
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1228
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1229
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1230
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1231
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1232
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1233
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1234
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1235
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1236
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1237
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1238
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1239
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1240
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1241
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1242
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1243
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1244
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1245
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1246
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1247
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1248
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1249
MUELLER G	CLAUDE G. MUELLER ET AL.	NATURE	1965	205	1250

SOURCE INDEX WITH TITLES

All the current articles published in the period indexed are listed alphabetically by author. ■ The full title, as in the Mueller article above, is given. All co-authors, journal, page, volume, year and the number of references it cites are given. Each item is coded, e.g. "C" for "correction," "B" for "book review," "L" for "letter," "M" for "meeting," etc. ■ The **SCI Source Index** is essentially a calendar year author index covering all the journal items processed by the closing date for the current year. ■ All journal issues available for any given year are included in the latest **SCI Annual**. ■ The **SCI Source Index** can also be used independently of the **Citation Index**. ■ While the **Citation Index** is a subject index, the **Source Index** is the comprehensive author index of science. All co-authors are cross-referenced.

CORPORATE INDEX SECTION

Under each organization you will find the citations for all items attributed to that organization which were published during the period indexed. ■ In this example, the 1965 article by Mueller is listed under University of London, Birkbeck College, with other articles attributed to that institution.

HOW TO DO A SEARCH -- HAROLD UREY

The **SCI** system consists of several separate but interrelated indexes organized by author, key word, etc. However, the unique feature which inspired its name -- the *Citation Index* -- permits the user to determine where a particular journal article, book, or patent, has been cited.

From that simple linking relationship -- cited and citing works -- significant capabilities have evolved. A simple mathematical representation of the scientific literature is to say it is a topological map of about 100,000,000 nodes linked together by about two billion vertices.

Slide 2 illustrates by example how a paper by Harold Urey in *Science* about "Lifelike Forms in Meteorites" has been cited by G. Mueller et al. in *Nature*.

TOPOLOGICAL MAP OF CITING AND CITED PAPERS

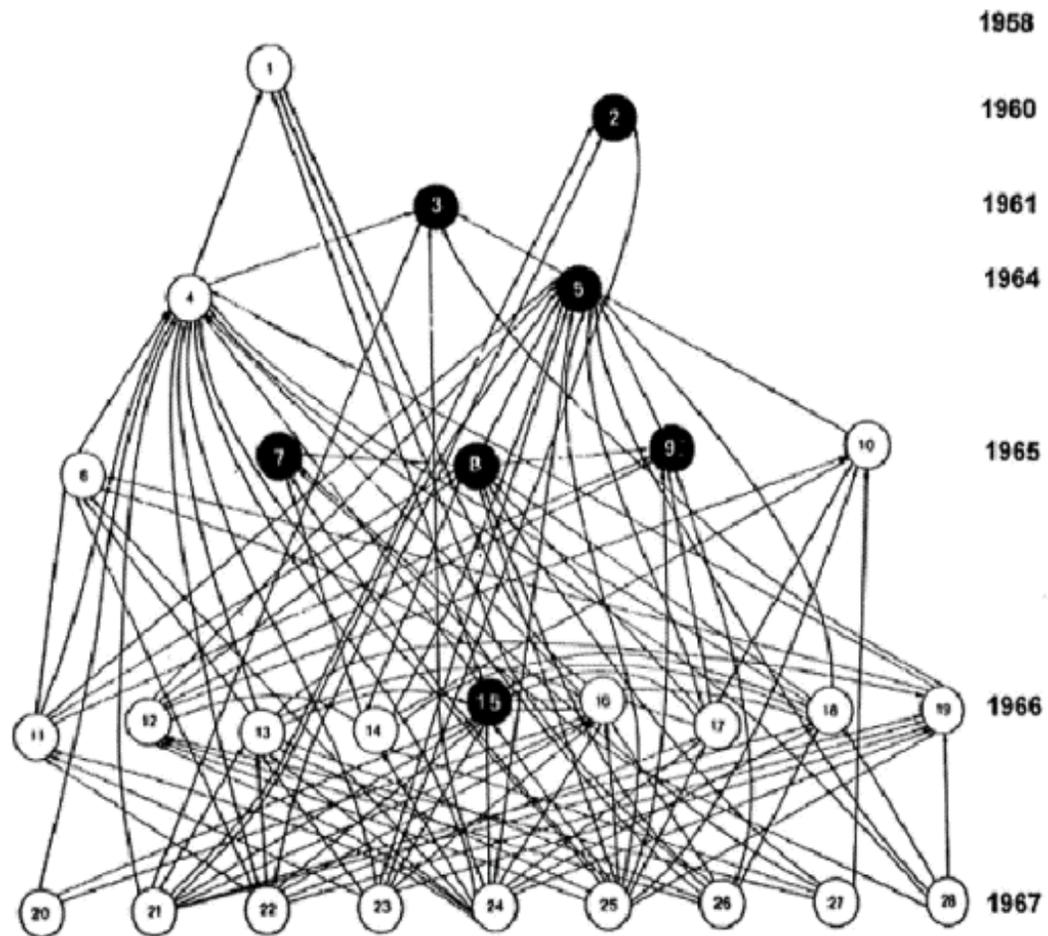


Figure 3 : TOPOLOGICAL MAP OF CITING AND CITED PAPERS

Slide 3 illustrates the topological mapping of 26 papers in genetics that have been linked by various citations.

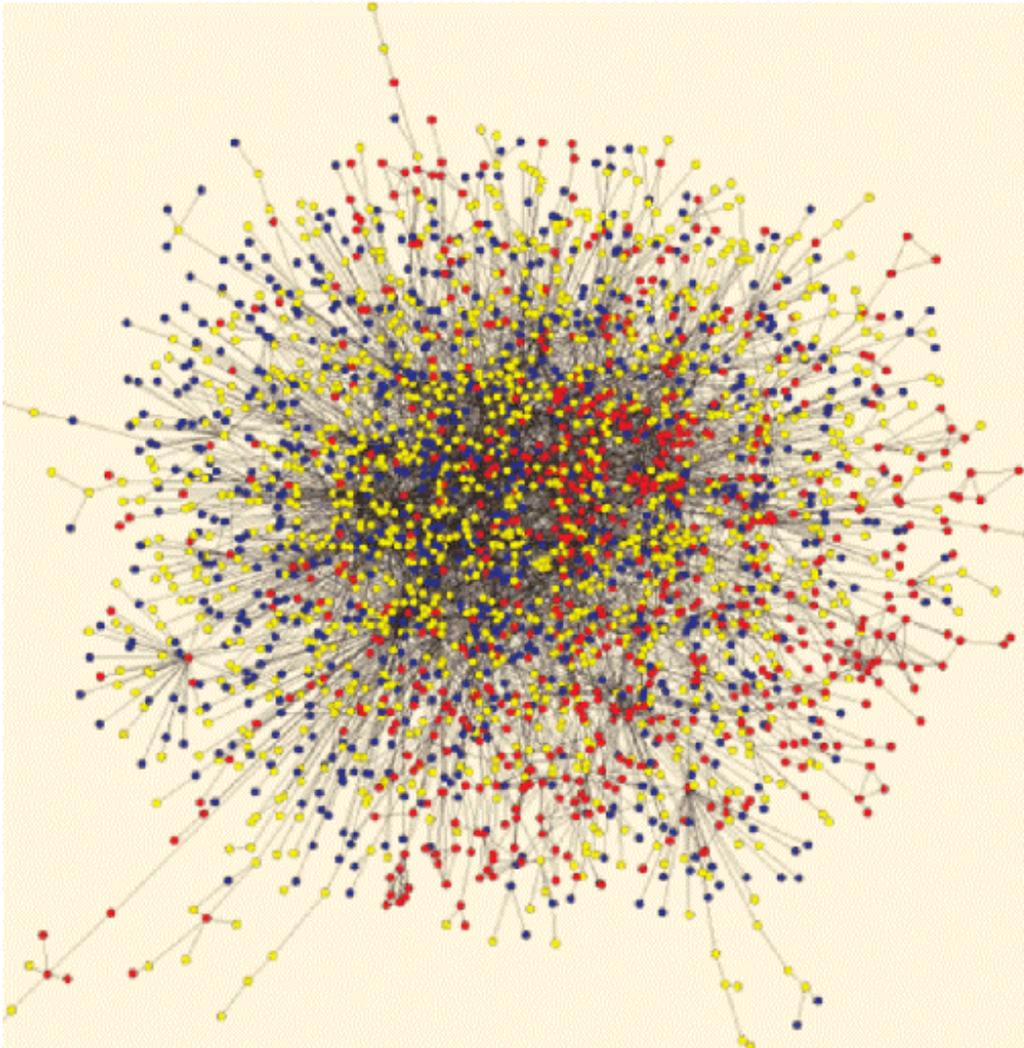
Slide 4: MAPPING THE *C. ELEGANS* INTERACTOME

This topological map was recently distributed with the June 21st edition of *The Scientist*.

URL of article: http://www.the-scientist.com/yr2004/jun/feature_040621.html

MAPPING THE *C. ELEGANS* INTERACTOME

http://www.the-scientist.com/yr2004/jun/feature_040621.html



Slide 5: “SYSTEMATIC SERENDIPITY,” BY JULIAN F. SMITH.
Chemical and Engineering News 42(35): 55-56 (1964)

**“Systematic Serendipity”
Science Citation Index:
An International
Interdisciplinary Index to
the Literature of Science.
Vol. 1 of five volumes. xxx
+ 496 pages. Institute for
Scientific Information, 325
Chestnut Street,
Philadelphia, PA 19106. 5
volumes, \$700. Reviewed
by Dr. Julian F. Smith.**

**“Perish such a self-
contradictory concept as
systematic serendipity, but
actually the index has
introduced system into
serendipic browsing for
the first time. Like lemon
in tea, it flavors the
resources of a reference
library.”**

Back in 1964, an experienced literature searcher, Julian Smith very perceptively understood how a *Citation Index* could aid retrieval and dissemination of information.ⁱⁱⁱ In particular, he appreciated that this feature would lead to unexpected connections between citing and cited documents. In a traditional key word search one does not know exactly what will be retrieved but the result is not entirely surprising, that is unexpected, since the documents retrieved contain that key word. On the other hand, when you examine a list of papers that have cited a target article or book, the citing papers may or may not contain the same key words as the target. And due to the multi-disciplinary nature of the *SCI*'s coverage, one often encounters completely surprising unexpected papers. That explains the origin of the oxymoron “Systematic Serendipity” which Smith used to describe the citation-based search.

SLIDE 6: MERTON'S QUOTE AND *OED* DEFINITION OF SERENDIPITY.

Robert K. Merton defined serendipity as:

“the discovery, by chance or sagacity, of valid results which were not sought for.”

Oxford English Dictionary's Definition of Serendipity:

The faculty of making happy and unexpected discoveries by accident. Also, the fact or an instance of such a discovery.

Formerly rare, this word and its derivatives have had wide currency in the 20th century.

1754 H. WALPOLE Let. to Mann 28 Jan., This discovery, indeed, is almost of that kind which I call Serendipity. 1880 E. SOLLY Index Titles of Honour Pref. 5 The inquirer was at fault, and it was not till some weeks later, when by the aid of Serendipity, as Horace Walpole called it that is, looking for one thing and finding another that the explanation was accidentally found. 1926 E. MEYNELL Life of Francis Thompson xiii. 221 To the Serendipity Shop the venture of a friend in Westbourne Grove he would often go. 1955 Sci. Amer. Apr. 92/1 Our story has as its critical episode one of those coincidences that show how discovery often depends on chance, or rather on what has been called 'serendipity' the chance observation falling on a receptive eye. 1971 S. E. MORISON European Discovery Amer.: Northern Voy. i. 3 Columbus and Cabot..(by the greatest serendipity of history) discovered America instead of reaching the Indies. 1980 TWA Ambassador Oct. 47/2 It becomes a glum bureaucracy, instead of the serendipity of 30 people putting out a magazine.

Hence serendipitist.

1939 JOYCE Finnegans Wake 191 You..semisemitic serendipitist, you (thanks, I think that describes you) Europasianised Afferyank! 1968 Punch 13 Nov. 684/1 There are the financial serendipitists, the men blessed monetarily by a fortunate law.

It is of interest to mention Professor Robert K. Merton, the eminent sociologist of science,^{iv} who served on the Advisory Board of the *SCI* during a 40-year period until his recent death. I recommend his recent and posthumously published book, *Travels and Adventures of Serendipity*.^v Dr. Merton defined serendipity as “the discovery, by chance or sagacity, of valid results which were not sought for.”^{vi} The *Oxford English Dictionary* defines it somewhat differently as “the faculty of making happy and unexpected discoveries by accident,” and properly refers to its first occurrence, indeed invention, by Horace Walpole in 1754. It has been my personal experience that these unexpected serendipitous discoveries have proven most enlightening for users of the *Science Citation Index*.

In 1966, I defined the phenomenon of information retrieval as a dichotomy which includes both information recovery and information discovery. Traditional searches involve information recovery.^{vii} Citation-based searching leads to information discovery. Traditional information experts normally want precision in searching. They prefer not to deal with the unexpected. They measure precision and recall when studying relevance. But relevance, like beauty, is in the eye of the beholder. In spite of numerous large-scale studies of information systems designed to measure precision recall and relevance, especially the work of Cyril Cleverdon,^{viii} it is remarkable that there has never been a comparable study of citation-based retrieval. Relevance has a different meaning in the context of a citation-based search. Only the user can decide what is relevant. There is no *a priori* way to measure that!

What does all of this have to do with medical ignorance? If I understand the purpose of this conference, one hopes to demonstrate new mechanisms and technologies to overcome the inherent shortcomings of tradition-based knowledge seeking and searching which I consider a metaphor about education. Ignorance occurs when one relies upon *a priori* conceptions of relevance, that is, knowledge. Openness to the new and unexpected is in fact a key factor in overcoming ignorance. Professor Witte enticed me to participate in this conference by invoking Robert K. Merton's name not only because he was my mentor, but also because he published a highly relevant work in 1987 on specified ignorance.^{ix}

SLIDE 7: DEFINITION OF SPECIFIED IGNORANCE AND URL FOR MERTON HISTCITE COLLECTION.

Robert K. Merton's Definition of Specified Ignorance:

“The express recognition of what is not yet known but needs to be known in order to lay down the foundation for still more knowledge”

[*HistCite* file on the work of Robert K. Merton
<http://garfield.library.upenn.edu/histcomp/index-merton.html>]

He defined specified ignorance as “the express recognition of what is not yet known but needs to be known in order to lay down the foundation for still more knowledge.” The citational impact of that paper and a dozen of Merton’s classic books and papers can be seen at the website I recently created at <http://garfield.library.upenn.edu/histcomp/index-merton.html> .

These *HistCite* databases are derivatives of the *Science*, *Social Sciences*, and *Arts and Humanities Citation Indexes*, as stored on the *Web of Science*.

Based on my premise that most of you have never used the *SCI* or *SSCI* in its printed, CD-ROM, or on-line web formats, here is the absurdly brief tutorial I promised earlier.

In the next few slides, I have illustrated the use of *SCI* to conduct both a quasi-traditional keyword search of a topic as well as a less traditional citation-based search to find information on the topic of medical ignorance.

Let me explain what I mean by quasi-traditional. In the *SCI*, one can indeed do an ordinary title word search. By now title word searching has become traditional in Medline and elsewhere. But when we first used this natural language approach in *Current Contents* weekly indexes, and later in the *SCI*, it was pooh-poohed by traditionalists. Controlled vocabulary was considered obligatory. Searching so-called natural language was allegedly fraught with dangers. In the intervening 40 years that bugaboo is now mainly forgotten.^x

But in *Current Contents*, we were dealing with the current literature where new terminology cropped up almost daily. And further, we did not suggest that searching titles was comprehensive but rather that it was sufficient as a starting point of further searching. To search current literature one needs current terminology.

Slide 8:

To poke fun at traditionalists, I often use a quote from Humpty Dumpty in Lewis Carrol’s *Through the Looking Glass*:

'When I use a word,' Humpty Dumpty said, in a rather scornful tone, 'it means just what I choose it to mean, neither more nor less.'

'The question is,' said Alice, 'whether you *can* make words mean so many different things.'

SLIDE 8: HUMPTY DUMPTY SYNDROME



From my experience at the Welch Medical Library Project, I knew that the expert indexers at *Index Medicus* were very adept at assigning subject headings. After several years in the development of *SCI*, while relying on natural language searching, we recognized the benefits of human-based indexing, by augmenting our subject search capability by including author supplied descriptors or subject headings. These are now commonplace, but it took many years for the practice to be adopted by scientific and medical journals.

We also recognized from the earliest days of *SCI*'s development that key cited references were in fact symbols for the subject matter they represented.^{xi} Further, the titles of the documents cited in each paper contain a trove of useful descriptive information that can explicate the subject matter discussed in the paper. By assembling and massaging the 25 or so titles of the references cited in a current paper, we were able to create "key words plus."^{xii} As an essentially automatic procedure *KeyWords Plus* is used quite effectively to augment title words, author-supplied keywords, or other journal-supplied descriptors. This type of indexing is called "derivative indexing" and it has been successfully used with Medical Subject Headings.^{xiii} Hence my use of the term quasi-traditional.

SLIDE 9: RESULTS OF TITLE SEARCH ON “MEDICAL IGNORANCE.”

TITLE SEARCH IN *WEB OF SCIENCE*

TI=(**m** **medical** **ignorance**)

DocType=All document types; Language=All languages; Database(s)=SCI-EXPANDED, SSCI, A&HCI; Timespan=1945-2004

Use the checkboxes to add individual articles to the Marked List. Be sure to click *SUBMIT MARKS* button before leaving page.

- BIRLEY HDL
[Continuing Medical Ignorance: Modern Myths In The Management Of Genital Warts](#)
INT J STD AIDS 12 (2): 71-74 FEB 2001

- KERWIN A
[None Too Solid - Medical Ignorance](#)
KNOWLEDGE 15 (2): 166-185 DEC 1993

- WITTE MH, WITTE CL, WAY DL
[Medical Ignorance, AIDS Kaposi's-Sarcoma Complex, and the Lymphatic-System](#)
WESTERN J MED 153 (1): 17-23 JUL 1990

- WITTE MH, KERWIN A, WITTE CL, et al.
[A Curriculum on Medical Ignorance](#)
MED EDUC 23 (1): 24-29 JAN 1989

- WITTE MH, KERWIN A, WITTE CL
[Seminars, Clinics, and Laboratories on Medical Ignorance](#)
J MED EDUC 63 (10): 793-795 OCT 1988

- LEFANU J
[The Encyclopedia of Medical Ignorance - Exploring the Frontiers of Medical Knowledge - Duncan,R, Westonsmith,M](#)
NEW YORK TIMES BK R (MAY): 33-33 1985

- WEATHERALL DJ
[The Encyclopedia of Medical Ignorance - Exploring the Frontiers of Medical Knowledge - Duncan,R, Westonsmith,M](#)
NATURE 310 (5974): 257-257 1984

- NORTON A
[The Encyclopedia of Medical Ignorance - Exploring the Frontiers of Medical Knowledge - Duncan,R, Westonsmith,M](#)
LANCET 1 (8382): 884-884 1984

9 documents matched your query of the 33,629,275 in the data limits you selected

To find literature on the topic of “Medical Ignorance,” I used the key word approach. In this next slide, I have conducted a “general search” in the *SCI* on the *Web of Science*. In Slide 9, we see that there were 9 papers which included the term “medical ignorance” in their titles. Among these are a few papers by Professor Witte. This is a traditional title-based search.

SLIDE 10: RESULTS FOR EXPANDED SEARCH ON “MEDICAL IGNORANCE IN TITLES, OR ABSTRACTS, OR KEY WORDS, OR KEYWORDS PLUS.

EXPANDED TITLE, KEYWORD, ABSTRACT SEARCH

TS=(**medical ignorance**)

DocType=All document types; Language=All languages; Database(s)=SCI-EXPANDED, SSCI, A&HCI; Timespan=1945-2006

Use the checkboxes to add individual articles to the Marked List. Be sure to click **SUBMIT MARKS** button before leaving page.

- SABO SY, CHIRDAN LB**
[Small Bowel and Mesenteric Injury Following Traditional Treatment and Self-inflicted Trauma to Inguinal Hernia](#)
E AFR MED J 76 (9): 533-534 SEP 1999

- WITTE MH, WITTE CL**
[Epilogue: What We Don't Know About Cancer](#)
ANTICANCER RES 19 (6A): 4919-4933 NOV-DEC 1999

- EIS D**
[Clinical Ecology - An Unproved Approach in the Context of Environmental Medicine](#)
ZBL HYG UMWELTMED 202 (2-4): 291-330 AUG 1999

- KERWIN A**
[None Too Solid - Medical Ignorance](#)
KNOWLEDGE 15 (2): 166-185 DEC 1993

- WITTE MH, WITTE CL, WAY DL**
[Medical Ignorance, AIDS Kaposi-Sarcoma Complex, and the Lymphatic System](#)
WESTERN J MED 153 (1): 17-23 JUL 1990

- WITTE MH, KERWIN A, WITTE CL, et al.**
[A Curriculum on Medical Ignorance](#)
MED EDUC 23 (1): 24-29 JAN 1989

- WITTE MH, KERWIN A, WITTE CL**
[Seminars, Clinics, and Laboratories on Medical Ignorance](#)
J MED EDUC 63 (10): 793-795 OCT 1988

- LEFANU J**
[The Encyclopedia of Medical Ignorance - Exploring the Frontiers of Medical Knowledge - Duncan, R, Weston-Smith, M](#)
NEW YORK TIMES BK R (MAY): 33-33 1985

- WEATHERALL DJ**
[The Encyclopedia of Medical Ignorance - Exploring the Frontiers of Medical Knowledge - Duncan, R, Weston-Smith, M](#)
NATURE 310 (5974): 257-257 1984

12 documents matched your query of the 33,629,275 in the data limits you selected.

In Slide 10, we see the impact of expanding the search to include papers containing “medical ignorance” not only in their titles, but also in key words, or keywords plus, or abstracts. Hence, a quasi-traditional search. This produced 12 papers. By doing this, we have increased recall but lowered precision.

SLIDE 11: PAPERS WITH MEDICAL “AND” IGNORANCE IN THEIR TITLES ONLY.

TITLE SEARCH: "MEDICAL AND IGNORANCE"

TI=(medical and ignorance)

DocType=All document types; Language=All languages; Database(s)=SCI-EXPANDED, SSCI, A&HCI; Timespan=1945-2004

Use the checkboxes to add individual articles to the Marked List. Be sure to click SUBMIT MARKS button before leaving page.

- KERWINA**
[None Too Solid - Medical Ignorance](#)
KNOWLEDGE 15 (2): 166-185 DEC 1993

- WITTE CL, KERWINA, WITTE MH**
[On The Importance of Ignorance in Medical-Practice and Education](#)
INTERDISCIPL SCI REV 16 (4): 295-298 DEC 1991

- WITTE MH, WITTE CL, WAY DL**
[Medical Ignorance, AIDs Kaposi-Sarcoma Complex, and the Lymphatic-System](#)
WESTERNJ MED 153 (1): 17-23 JUL 1990

- WITTE MH, KERWINA, WITTE CL, et al.**
[A Curriculum on Medical Ignorance](#)
MED EDUC 23 (1): 24-29 JAN 1989

- WITTE MH, KERWINA, WITTE CL**
[Seminars, Clinics, and Laboratories on Medical Ignorance](#)
J MED EDUC 63 (10): 793-795 OCT 1988

- MATHESON NW**
[Consensus and Penalties for Ignorance in the Medical Sciences - Implications for Information-Transfer - Britain, Jm](#)
LIBR QUART 57 (2): 235-237 APR 1987

- LEFANUJ**
[The Encyclopedia of Medical Ignorance - Exploring the Frontiers of Medical Knowledge - Duncan, R, Westonsmith, M](#)
NEW YORK TIMES BK R (MAY): 33-33 1985

- WEATHERALL DJ**
[The Encyclopedia of Medical Ignorance - Exploring the Frontiers of Medical Knowledge - Duncan, R, Westonsmith, M](#)
NATURE 310 (5974): 257-257 1984

- NORTON A**
[The Encyclopedia of Medical Ignorance - Exploring the Frontiers of Medical Knowledge - Duncan, R, Westonsmith, M](#)
LANCET 1 (8382): 884-884 1984

13 documents matched your query of the 33,629,275 in the data limits you selected

Similarly, we could expand the simple title search to look for papers that contain both terms "medical" and "ignorance." That combination produces one more title.

SLIDE 12: PAPERS WITH MEDICAL “AND” IGNORANCE IN THEIR TITLES, ABSTRACTS

Similarly, expanding the search to include all key words and the full text of abstracts, produces 141 Papers, most of which in fact are quite distant from medical ignorance.

EXPANDED TITLE, KEYWORD, ABSTRACT SEARCH

TS=(medical and ignorance)

DocType=All document types; Language=All languages; Database(s)=SCI-EXPANDED, SSCI, AdHOC; Timespan=1945-2004

Use the checkboxes to add individual articles to the Marked List. Be sure to click SUBMIT MARKS button before leaving page.

- WEISS L, MCCOY K, KLUGER M ET AL.
[Access to and use of health care: Perceptions and experiences among people who use heroin and cocaine](#)
ADDICT RES THEORY 12 (2): 155-165 APR 2004

- JULIAND G
[Translation of clinical trials into clinical practice](#)
J INTERN MED 255 (3): 309-316 MAR 2004

- HUGO CJ, BOSHOF DEL, TRAUT A, ET AL.
[Community attitudes toward and knowledge of mental illness in South Africa](#)
SOC PSYCH PSYCH EPID 38 (12): 715-719 DEC 2003

- DANDY J
[Public awareness of patient rights, consent forms and advance statements](#)
ASLIB PROC 55 (5-6): 357-366 2003

- CRUMWR, GRIFFIN LD, HILL DLG, ET AL.
[Zen and the art of medical image registration: correspondence, homology, and quality](#)
NEUROIMAGE 20 (3): 1425-1437 NOV 2003

- SILVERMAN PM
[The origins of molecular biology - A pedagogical tool for the professional development of pre-college science teachers](#)
BIOCHEM MOL BIOL EDUC 31 (5): 313-318 SEP-OCT 2003

- HENWOOD F, WYATT S, HART A, ET AL.
['Ignorance is bliss sometimes': constraints on the emergence of the 'informed patient' in the changing landscapes of health information](#)
SOCIOLOG HEALTHCARE 25 (6): 589-607 SEP 2003

- HELDE G, BRODTKORBE, BRATHEN G, ET AL.
[An easily performed group education programme for patients with uncontrolled epilepsy - a pilot study](#)
SEIZURE-EUR J EPILEP 12 (7): 497-501 OCT 2003

- STADELER M, KELTERER D, BAUER A, ET AL.
[Skin disease prevention program in the baking, hotel and catering trades](#)
ALLERGOLOGIE 26 (9): 403-412 SEP 2003

- LIAOLM
[Learning to assist women born with atypical genitalia: journey through ignorance, taboo and dilemma](#)
J REPROD INFANT PSYC 21 (3): 229-238 AUG 2003

141 documents matched your query of the 33,629,275 in the data limits you selected

SLIDE 13: PUBMED SEARCH

For those of you who are more familiar with PubMed or Medline, the same outcome is possible. In Slide 13, you see the result of a PubMed search.

In the previous slides, I illustrated variations on language-based searching. However, once we have identified papers by Dr. Witte and others who have written on this subject, we can quickly augment those results by using the *WOS* feature called “cited reference” searching.

The screenshot shows the PubMed search interface. At the top, there are logos for NCBI, PubMed, and the National Library of Medicine (NLM). Below the logos is a search bar with the text "Search PubMed for #3 and #2" and a "Go" button. There are also links for "Limits", "Preview/Index", "History", "Clipboard", and "Details".

The search results are listed as follows:

- 1: Peralt LA.** [Related Articles, Links](#)
Bi terrorism: an overview.
Semin Perioper Nurs. 2001 Oct;10(4):167-74. Review.
PMID: 15129614 [PubMed - indexed for MEDLINE]
- 2: Shukh Y, Pal SK.** [Related Articles, Links](#)
Complementary and alternative cancer therapies: past, present and the future scenario.
Asian Pac J Cancer Prev. 2004 Jan-Mar;5(1):3-14.
PMID: 15074998 [PubMed - in process]
- 3: Frelick RW.** [Related Articles, Links](#)
SES discrepancies and Delaware cancer death rates.
Del Med J. 2004 Mar;76(3):103-9.
PMID: 15061457 [PubMed - in process]
- 4: Nakano T.** [Related Articles, Links](#)
Status of Japanese radiation oncology.
Radiat Med. 2004 Jan-Feb;22(1):17-9.
PMID: 15053170 [PubMed - in process]
- 5: Bloche MG.** [Related Articles, Links](#)
The invention of health law.
Calif Law Rev. 2003 Mar;91(2):247-322.
PMID: 15046033 [PubMed - indexed for MEDLINE]
- 6: Miller RA.** [Related Articles, Links](#)
'Accelerated aging': a primrose path to insight?
Aging Cell. 2004 Apr;3(2):47-51.
PMID: 15038817 [PubMed - in process]
- 7: Okere-Yeboah M.** [Related Articles, Links](#)
Strangulated external hernias in Kumasi.
West Afr J Med. 2003 Dec;22(4):310-3.
PMID: 15008294 [PubMed - indexed for MEDLINE]
- 8: Ahasan HA, Mamun AA, Kasim SR, Bakar MA, Gazi EA, Bala CS.** [Related Articles, Links](#)
Paralytic complications of puffer fish (tetrodotoxin) poisoning.
Singapore Med J. 2004 Feb;45(2):73-4.
PMID: 14985845 [PubMed - in process]

At the bottom of the page, there is a control bar with a "Summary" dropdown menu, a "Show" button, a "20" dropdown menu, a "Sort" dropdown menu, and a "Text" dropdown menu. Below this bar, it says "Items 1-20 of 496". On the right side, there is a "1" button, "of 25", and a "Next" button.

SLIDE 14: FULL RECORD FOR WITTE, KERWIN, ET AL, "A CURRICULUM ON MEDICAL IGNORANCE," MEDICAL EDUCATION, 23(1):24-29 (JAN, 1989)

Slide 14 shows the full source record for one of the Witte papers that was retrieved in the keyword search. By clicking on "times cited," we find seven additional papers that have cited it.

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General Search Results—Full Record

Article 5 of 13 [FORWARD](#) [NEXT](#) [PREVIOUS](#) [LINKS](#)

[MARK](#)

ISI JOURNAL CITATION reports

A CURRICULUM ON MEDICAL IGNORANCE
WITTE MH, KERWIN A, WITTE CL, SCADRON A
MEDICAL EDUCATION
23 (1): 24-29 JAN 1989

Document type: Article Language: English [Cited References: 16](#) [Times Cited: 7](#) [FULL RECORD](#) [Explanation](#)

Addresses:
WITTE MH, UNIV ARIZONA, COLL MED, DEPT SURG, 1501 N CAMPBELL AVE, TUCSON, AZ 85724
UNIV ARIZONA, COLL MED, DEPT HUMANITIES, TUCSON, AZ 85724

Publisher:
BLACKWELL SCIENCE LTD, OSNEY MEAD, OXFORD, OXON, ENGLAND OX2 0EL

IDS Number:
T2564

ISSN:
0308-0110

Article 5 of 13 [PREVIOUS](#) [NEXT](#) [NEXTIVITY](#)

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SLIDE 15: SEVEN PAPERS CITING WITTE 1989 PAPER.

Slide 15 (below) shows the list of seven papers. Note that we are now in the realm of the unexpected. Nothing in the title of the first paper mentions medical ignorance. It is about medical students' rating of faculty teaching in a multi-instructor setting.



Citing Articles—Summary

[A CURRICULUM ON MEDICAL IGNORANCE](#)

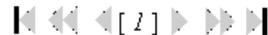
WITTE MH, KERWIN A, WITTE CL, et al.

MEDICAL EDUCATION

23 (1): 24-29 JAN 1989

These documents in the database cite the above article:

Results Page 1 (Articles 1 – 7):



Use the checkboxes to add individual articles to the Marked List. Be sure to click SUBMIT MARKS button before leaving page.

- STRATTON TD, WITZKE DB, JACOB RJ, ET AL.
[Medical students' ratings of faculty teaching in a multi-instructor setting: An examination of monotonic response patterns](#)
ADV HEALTH SCI EDUC 7 (2): 99-116 2002
- WITTE MH, WITTE CL
[Ignorance in infectious diseases: The case of AIDS, Kaposi sarcoma, and lymphology](#)
LYMPHOLOGY 33 (3): 95-121 SEP 2000
- WITTE CL, WITTE MH, KERWIN A
[IGNORANCE AND THE PROCESS OF LEARNING AND DISCOVERY IN MEDICINE](#)
CONTROL CLIN TRIALS 15 (1): 1-4 FEB 1994
- WITTE CL, KERWIN A, WITTE MH
[ON THE IMPORTANCE OF IGNORANCE IN MEDICAL-PRACTICE AND EDUCATION](#)
INTERDISCIPL SCI REV 16 (4): 295-298 DEC 1991
- HEARST E
[PSYCHOLOGY AND NOTHING](#)
AM SCI 79 (5): 432-443 SEP-OCT 1991
- WITTE MH, WITTE CL
[MEDICAL-EDUCATION REFORM](#)
JAMA-J AM MED ASSOC 265 (24): 3245-3246 JUN 26 1991
- WITTE MH, WITTE CL, WAY DL
[MEDICAL IGNORANCE, AIDS KAPOSI-SARCOMA COMPLEX, AND THE LYMPHATIC-SYSTEM](#)
WESTERNJ MED 153 (1): 17-23 JUL 1990

Results Page 1 (Articles 1 – 7):

7 of 33,629,275 documents in the database cite the above article.

Moving down the list, one finds three other papers by Witte, but in the first two the term “ignorance” is used, but it was missed in the title search because the noun “medicine” was used rather than the adjective “medical.” The fifth paper is a paper by E. Hearst on “Psychology and Nothing” in the 1991 *American Scientist*.

SLIDE 16: PAPER BY E. HEARST, “PSYCHOLOGY AND NOTHING,” IN AMERICAN SCIENTIST.

In contrast to the papers by Witte on Medical Ignorance, I would classify this paper as “unexpected.” However, we will see later that it is not completely unrelated I tracked down this paper by locating the author who is right here at the University of Arizona. The subtitle of the paper gives us a small clue to its relevance: “Recognizing and learning from absence, deletion and nonoccurrence are surprisingly difficult. Animals and people, it seems, accentuate the positive.” Then in the penultimate paragraph, the author states: “Scientific training emphasizing disproof rather than confirmation is not as widespread as it probably ought to be. And successful courses of instruction are being developed that stress absence of knowledge (“ignorance”) or examination of past failures, rather than presentation of presumed positive conclusions or outcomes, as their primary educational focus.” He then cites the University of Arizona program on medical ignorance. [Popperian, “resistance to falsification.”]

Well, I hope that this brief tutorial on using *WOS* has illustrated the key point. While using key words is essentially an *a priori* view of the literature, the use of cited reference searching is essentially *a posteriori*. While cited and citing works can be closely connected, they can also seem at first unrelated, even serendipic. And in some cases the only thing that may link two papers is the particular method they cite. While this may be uninteresting to one reader, it is quite beautiful to those interested in the methodology involved.

I could also go on to describe bibliographic coupling which ISI calls “related records.” For example, in Slide 16 by clicking on the related records button you find the following list of related, that is, bibliographically coupled papers.



Citing Articles--Full Record

Article 5 of 7



PSYCHOLOGY AND NOTHING
HEARST E
AMERICAN SCIENTIST
79 (5): 432-443 SEP-OCT 1991

Document
type: Article

Language: English

Cited
References: 28

Times
Cited: 34



Explanation

Key Words Plus:
DELETED DETAILS

Addresses:
HEARST E, INDIANA UNIV, DEPT PSYCHOL, BLOOMINGTON, IN 47405

Publisher:
SIGMA XI-SCI RES SOC, PO BOX 13975, RES TRIANGLE PK, NC 27709

IDS Number:
GJ181

ISSN:
0003-0996

Article 5 of 7



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SLIDE 17: RELATED RECORDS FOR HEARST

These papers are ranked by the number of references that they share in common with the Hearst paper on "Psychology and Nothing." No less than 3,102 papers are related in this way but in the next slide we see the top ten which give some idea of what that topic may be about.

ISI Web of SCIENCE® Powered by ISI Web of Knowledge™

HOME ICLP DATE & DB LIMITS GENERAL SEARCH CITED REF SEARCH STRUCTURE SEARCH COMBINE SEARCHES ADVANCED SEARCH SEARCH RESULTS

Related Records--Summary

The records below are related to this parent record and are sorted by the most shared references:
HEARST E [PSYCHOLOGY AND NOTHING](#)

SUBMIT MARKS MARK PAGE MARK ALL

Results Page 1 (Articles 1 – 10):

« « « [1 | 2 . . » » »

Use the checkboxes to add individual articles to the Marked List. Be sure to click SUBMIT MARKS button before leaving page.

- BRENDL CM, HIGGINS ET, LEMMKM
[Sensitivity To Varying Gains and Losses - The Role of Self-Discrepancies and Event Framing](#)
J PERS SOC PSYCHOL 69 (6): 1028-1051 DEC 1995
- HEARST E, WOLFF WT
[Addition Versus Deletion As a Signal](#)
ANIM LEARN BEHAV 17 (2): 120-133 MAY 1989
- COLDREN JT, HAAF RA
[Asymmetries in Infants' Attention to the Presence or Absence of Features](#)
J GENET PSYCHOL 161 (4): 420-434 DEC 2000
- BRENDL CM, HIGGINS ET
[Principles of Judging Valence: What Makes Events Positive or Negative?](#)
ADV EXP SOC PSYCHOL 28: 95-160 1996
- MILLER JS, MCDUGALL SA, ZOLMAN JF
[The Ontogeny of the Feature-Positive Effect in Young Chicks](#)
ANIM LEARN BEHAV 16 (2): 195-198 MAY 1988
- AGOSTINELLI G, SHERMAN SJ, FAZIO RH, et al.
[Detecting and Identifying Change - Additions Versus Deletions](#)
J EXP PSYCHOL HUMAN 12 (4): 445-454 NOV 1986
- NALLAN GB, SANDERS R, DYKEMAN C, et al.
[Identity Relation Can Serve As the Distinguishing Feature in Feature-Positive and Feature-Negative Learning Research](#)
AM J PSYCHOL 99 (1): 71-79 SPR 1986
- SAVITSKY K, GILOVICH T, BERGER G, ET AL.
[Is Our Absence As conspicuous As we think? Overestimating the Salience and Impact of One's Absence from a Group](#)
J EXP SOC PSYCHOL 39 (4): 386-392 JUL 2003

SLIDE 18: RELATED RECORDS TO WITTE

ISI Web of SCIENCE® Powered by ISI Web of Knowledge™

HOME HELP LIT ADV LISTS SERIAL SLICES DIS DIS SEARCH VIBRATOR SEARCH COVERE SEARCH ADVISOR SEARCH SEARCH RESULTS

Related Records--Summary

The records below are related to this parent record and are sorted by the most shared references:
WITTE MH [A CURRICULUM ON MEDICAL IGNORANCE](#)

MARK MARK PAGE MARK ALL

Results Page 1 (Articles 1 -- 8):

|| << < [1 | 2 . > >> ||

Use the checkboxes to add individual articles to the Marked List. Be sure to click SUBMIT MARKS button before leaving page.

- WITTE MH, KERWIN A, WITTE CL**
[Seminars, Clinics, and Laboratories on Medical Ignorance](#)
J MED EDUC 63 (10): 793-795 OCT 1988
- RYMON R**
[Goal-Directed Diagnosis - A Diagnostic Reasoning Framework for Exploratory-Corrective Domains](#)
ARTIF INTELL 84 (1-2): 257-297 JUL 1996
- VANDERVLEUTEN CPM, NEWBLE DI**
[How Can We Test Clinical Reasoning](#)
LANCET 345 (8956): 1032-1034 APR. 22 1995
- MILLER RA**
[Medical Diagnostic Decision-Support Systems - Past, Present, And Future - A Threaded Bibliography And Brief Commentary](#)
J AM MED INFORM ASSN 1 (1): 8-27 JAN-FEB 1994
- HUDDLE T**
[Basic Science And The Undergraduate Medical Curriculum](#)
PERSPECT BIOL MED 36 (4): 550-564 SUM 1993
- ELSTEIN AS, SHULMAN LS, SPRAFKA SA**
[Medical Problem-Solving - A 10-Year Retrospective](#)
EVAL HEALTH PROF 13 (1): 5-36 MAR 1990
- REAMES HR, DUNSTONE DC**
[Professional Satisfaction Of Physicians](#)
ARCH INTERN MED 149 (9): 1951-1956 SEP 1989
- LADUCA A, ENGEL JD, CHOVAN JD**
[An Exploratory Study Of Physicians Clinical Judgment - An Application Of Social Judgment Theory](#)
EVAL HEALTH PROF 11 (2): 178-200 JUN 1988

1,383 documents in the database are related to parent record. (500 shown)

As a further illustration of related record searching, let's return to Witte's paper in Slide 14 and we find that there are 1,383 papers with connecting links but the top eight are shown in Slide 18. You can be the judge whether these papers are or are not related to "a curriculum on medical ignorance."

We have all heard the term "information overload." That term was used long before the advent of the internet, but the internet has aggravated the problem.

By removing the physical barriers to traditional manual-based searching of databases, the process of current awareness has been made more efficient but we still bump up against the limitation of time for reading. It is not unusual when doing a literature search today to encounter a volume of relevant literature that is impossible to read in its entirety. It is true whether you are using Medline, Google, *SCI*, or any other search engine. The problem, therefore, is how we separate the wheat from the chaff.

As I have indicated earlier, there are two aspects to information retrieval. One is information recovery – the other information discovery. When we first published the *SCI*, we quickly realized that machine readable files could be the basis of a system for selective dissemination of information (SDI).^{xiv} Just one year after we inaugurated the primordial *SCI*, ISI became the first organization to offer a commercial system for the selective dissemination of information (SDI). This took expression in the form of a weekly computer printout that told scholars of current papers that cited their work or the work of colleagues. I have been the beneficiary of this service for almost 40 years. It still amazes me how often I am made aware of papers that I could not have anticipated by the use of key words.

Similarly, Dr. Merton also received thousands of notifications over the years. While a highly-cited scholar, the personal alerting system produced relatively small weekly listings. So in spite of how often he was cited, it was quite feasible for him to scan those weekly lists and decide which papers warranted reprint requests. Today one can increasingly find full texts on the internet or identify the email address of authors. This will become routine as time goes by. You can even obtain this kind of alert service using the Google system. Those of you who use the *Google News Alert* will recognize the similarity between it and the ISI Alert. The *WOS* system I described above also has an alerting feature.

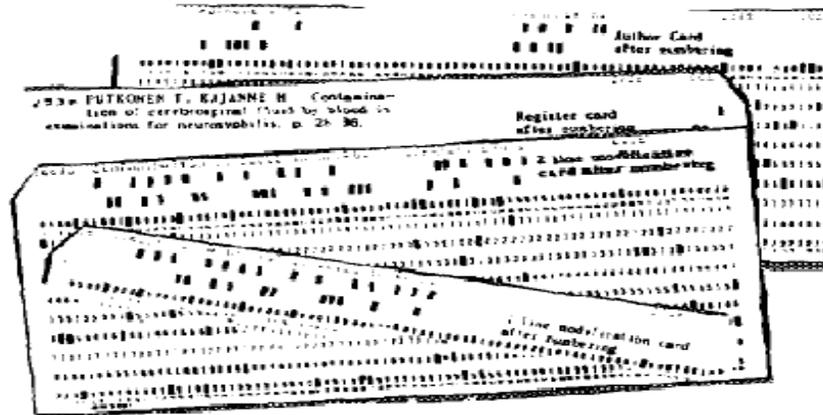
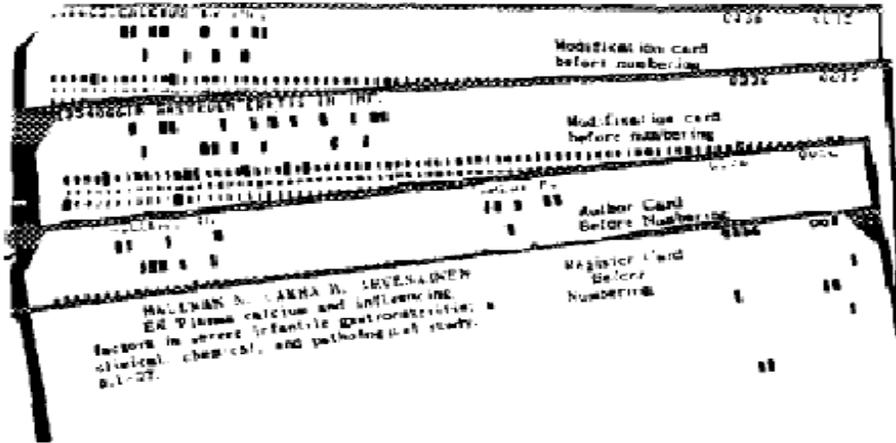
In one form or another, the problem of information overload has been recognized from the earliest days of scientific publishing. After the invention of printing in the 15th Century, scholars were soon complaining that it was impossible to read everything published. And especially from the end of the 19th Century to this day, bibliographers and librarians have proposed alternative solutions. Not the least of these were modern classification systems like the Universal Decimal System (UDC) on which is based on the Dewey Decimal System. However, it was Henry E. Bliss who designed the first classification for science. When I met him in 1954, I was a student at Columbia Library School. He told me that a significant objective of classification is to help the reader see the connections between subject matter. To create his classification system, he read the textbook in every known branch of science over a 40-year period as librarian of CCNY – the City College of the City University of New York, an institution that has produced many scholars of Nobel Class.

Another method showing the connections between topics is implicit in the growing field of visualization. Back in the sixties my colleagues and I described a technique for visualizing topics chronologically. We called them Historiographs. In 1964, we issued a report "The Use of Citation Data in Writing the History of Science."^{xv}

SLIDE 20: PUNCHED CARD

In case you have never seen a punched card, here are some examples.
Since then, we have automated the procedure for creating historiographs.

EXAMPLES OF PUNCHED CARDS



Slide 21:

HistCite Guide

HistCite is a system designed to help selectively identify the significant (most cited) papers retrieved in topical searches of the Web of Science (SCI, SSCI and/or AHC). Once a marked list of papers has been created, the resulting Export file is processed by HistCite to create tables ordered by author, year, or citation frequency as well as historiographs which include a small percentile of the most-cited papers and their citation links.

The COLORED boxes are components of the Historiograph Compilation. Clicking on a box will describe in more detail about the specific component.

For more information on the HistCite™ software, contact [Dr. Eugene Garfield](mailto:Dr.Eugene.Garfield@codex.cis.upenn.edu) at Garfield@codex.cis.upenn.edu

Missing Links?Citation MatrixGraphs

[Glossary](#) [HistCite Guide](#) [About](#)
Wed Jun 16 15:23:55 2004

Topic Search: Peer Review

Nodes: 3173
Authors: 5484, Journals: 1040, Outer References: 34805
Collection span: 1969 - 2004
View: Overview. Sorted by year, source, volume, issue, page.

Page 1: [1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) [8](#) [9](#) [10](#) [11](#)

#	LCR	NCR	Nodes / Authors / Date	LCS	GCS
1	0	0	1 1969 FDA PAPERS 3(9):4-& HAMPSHIR.GD <i>NAS-NRC DRUG EFFICACY STUDY - PEER REVIEW</i>	0	1
2	0	17	2 1969 JOURNAL OF THE AMERICAN DENTAL ASSOCIATION 79(6):1376-& SCHONFEL.HK <i>PEER REVIEW OF QUALITY OF DENTAL CARE</i>	0	8
3	0	2	3 1970 CALIFORNIA MEDICINE 113(2):80-& SCHAFFAR.RW; PARKE.HJ <i>UTILIZATION AND PEER REVIEW - MEDICINES PRIVILEGE AND</i>	0	1

SLIDE 21: HISTCITE GUIDE

The *HistCite* program takes the output of a search on the *ISI Web of Science* (the internet version of the *SCI*) and generates a chronological historiograph of the key literature. Whatever topic is chosen one can simply begin a WOS search with a key term, save a text file of retrieved papers that use that term, and add additional papers that cite them to obtain a group of past and present papers, that are linked to varying degrees.

I would like now to illustrate the *HistCite* system. It has a dual function -- one to help separate the wheat from the chaff in a large collection of papers however they are retrieved by key word or by citation based search, and secondly, to help scholars prepare micro-histories of those topics.

Those of you who are familiar with Google and other search engines may recognize some similarities in what I have described earlier. The connection between citation indexing and googling is well recognized by experts.^{xvi} However, it is also well known that most search engines produce too much information. The challenge is to identify the needle in the haystack.

SLIDE 22: PAPERS FOUND IN WOS - TOPIC SEARCH: IGNORAN* AND MEDIC* - CHRONOLOGICAL FILE

http://garfield.library.upenn.edu/histcomp/medic_ignoran/

Papers found in WoS
Topic Search: ignoran* and medic*

Nodes: 228

[Authors](#): 483, [Journals](#): 179, [Outer References](#): 6842

Collection span: 1961 - 2004

View: Overview. Sorted by year, source, volume, issue, page.

#	LCR	NCR	Nodes / Authors / Date	LCS	GCS
1	0	0	1 1961 JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION 176(9):804-& [Anon] <i>Advanced Medical Ignorance</i>	0	0
2	0	10	2 1962 AMERICAN SOCIOLOGICAL REVIEW 27(4):508-514 LEWIS LS; LOPREATO J <i>Arationality, Ignorance, and Perceived Danger in Medical Practices</i>	0	14
3	0	0	3 1974 SOUTH AFRICAN MEDICAL JOURNAL 48(17):717-718 SMIT PJ <i>Sports Medicine, Ignorance and Sport</i>	0	2
4	0	0	4 1979 AUSTRALIAN AND NEW ZEALAND JOURNAL OF MEDICINE 9(5):629-629 RYAN R <i>Anxious Moments in Nuclear-Medicine - Is Ignorance Bliss</i>	0	0
5	0	6	5 1980 ET CETERA 37(1):5-12 BATES EM <i>The Implications for Semantics of Developments in Medical Technology - The Fatal Consequences of Semantic Ignorance</i>	0	0
6	0	1	6 1984 LANCET 1(8382):884-884 NORTON A <i>The Encyclopedia of Medical Ignorance - Exploring the Frontiers of Medical Knowledge - Duncan,R, Westonsmith,M</i>	0	0
7	0	1	7 1984 NATURE 310(5974):257-257 WEATHERALL DJ <i>The Encyclopedia of Medical Ignorance - Exploring the Frontiers of Medical Knowledge - Duncan,R, Westonsmith,M</i>	0	0
8	0	1	8 1985 NEW YORK TIMES BOOK REVIEW (MAY):33-33 LEFANU J <i>The Encyclopedia of Medical Ignorance - Exploring the Frontiers of Medical Knowledge - Duncan,R, Westonsmith,M</i>	0	0
9	0	16	9 1986 LANGUAGE AND STYLE 19(1):11-20 KELLY LG <i>Medicine, Learned Ignorance, and Style in 17th-Century Translation</i>	0	2
10	0	1	10 1987 LIBRARY QUARTERLY 57(2):235-237 MATHESON NW <i>Consensus and Penalties for Ignorance in the Medical Sciences - Implications for Information-Transfer - Brittain,JM</i>	0	

By clicking on LCS, we obtain the file sorted by Local Citation Score. The Witte paper in *Journal of Medical Education* comes to the top

In the above slide, I have illustrated the format of a *HistCite* collection by searching *WOS* to find papers on “medical ignorance.”

SLIDE 23: LCS

[Missing Links?](#) [Citation Matrix](#)

[Glossary](#) [HistCite Guide](#) [About](#)

Papers found in WoS
Topic Search: ignoran * and medic*

Nodes: 228

Authors: 483, Journals: 179, Outer References: 6842

Collection span: 1961 - 2004

View: Overview. Sorted by LCS.

#	LCS	NCR	Nodes / Authors / Date	LCS	GCS
1	<u>1</u>	16	13 1989 MEDICAL EDUCATION 23(1):24-29 WITTE MH; KERWIN A; WITTE CL; SCADRON A <i>A Curriculum on Medical Ignorance</i>	<u>5</u>	7
2	0	10	11 1988 JOURNAL OF MEDICAL EDUCATION 63(10):793-795 WITTE MH; KERWIN A; WITTE CL <i>Seminars, Clinics, and Laboratories on Medical Ignorance</i>	4	5
3	<u>2</u>	27	15 1990 WESTERN JOURNAL OF MEDICINE 153(1):17-23 WITTE MH; WITTE CL; WAY DL <i>Medical Ignorance, AIDS Kaposi-Sarcoma Complex, and the Lymphatic-System</i>	2	7
4	0	22	101 1996 JOURNAL OF THE ROYAL STATISTICAL SOCIETY SERIES B-METHODOLOGICAL 58(1):3-34 WALLEY P <i>Inferences from Multinomial Data: Learning about a Bag of Marbles</i>	<u>2</u>	32
5	0	32	109 1997 AMERICAN JOURNAL OF HEALTH PROMOTION 12(2):112-122 PELLETIER KR; MARIE A; KRASNER M; HASKELL WL <i>Current Trends in the Integration and Reimbursement of Complementary and Alternative Medicine by Managed Care, Insurance Carriers, and Hospital Providers</i>	<u>2</u>	59
6	0	87	122 1997 SOCIAL SCIENCE & MEDICINE 45(9):1423-1431 LERNER BH <i>From Careless Consumptives To Recalcitrant Patients: The Historical Construction of Noncompliance</i>	<u>1</u>	11
7	0	215	127 1998 BULLETIN OF THE HISTORY OF MEDICINE 72(3):389-433 KAPCHUK TJ <i>Intentional Ignorance: A History of Blind Assessment and Placebo Controls in Medicine</i>	1	29
8	0	6	129 1998 BURNS 24(2):129-133 LIU EH; KHATRI B; SHAKYA YM; RICHARD BM <i>A 3 Year Prospective Audit of Burns Patients Treated at the Western Regional Hospital of Nepal</i>	1	11
9	0	1	164 2000 JOURNAL OF MEDICINE AND PHILOSOPHY 25(1):107-113 TAKALA T; HAYRY M <i>Genetic Ignorance, Moral Obligations and Social Duties</i>	<u>1</u>	7
10	0	33	190 2002 FAMILY PRACTICE 19(1):57-64 KROESEN K; BALDWIN CM; BROOKS AJ; BELL IR <i>US Military Veterans' Perceptions of the Conventional Medical Care System and Their Use of Complementary and Alternative Medicine</i>	<u>1</u>	2

SLIDE 23: LCS

Papers found in WoS
 Topic Search: ignoran* and medic*

Nodes: 228

Authors: 483, Journals: 179, Outer References: 6842

Collection span: 1961 - 2004

View: Overview. Sorted by GCS.

#	LCR	NCR	Nodes / Authors / Date	LCS	GCS
1	0	12	29 1992 BRITISH MEDICAL JOURNAL 304(6822):294-296 BRADLEY CP <i>Uncomfortable Prescribing Decisions - A Critical Incident Study</i>	0	87
2	0	557	74 1995 CALIFORNIALAWREVIEW83(1):1-377 VALDES F <i>Queers, Sissies, Dykes, And Tomboys - Deconstructing the Conflation of Sex, Gender, and Sexual Orientation in Euro-American Law and Society</i>	0	60
3	1	93	125 1998 ANNALS OF INTERNAL MEDICINE 129(7):573-578 LERNER BH; GULICK PM; DUBLER NN <i>Rethinking Nonadherence: Historical Perspectives on Triple-Drug Therapy For HIV Disease</i>	0	60
4	0	29	39 1993 ACADEMIC MEDICINE 68(4):249-254 CHRISTAKIS DA; FEUDTNER C <i>Ethics In a Short White Coat - The Ethical Dilemmas That Medical-Students Confront</i>	0	59
5	0	32	109 1997 AMERICAN JOURNAL OF HEALTH PROMOTION 12(2):112-122 PELLETIER KR; MARIE A; KRASNER M; HASKELL WL <i>Current Trends in the Integration and Reimbursement of Complementary and Alternative Medicine by Managed Care, Insurance Carriers, and Hospital Providers</i>	2	59
6	0	30	41 1993 BRITISH JOURNAL OF GENERAL PRACTICE 43(374):365-370 SINCLAIR HK; BOND CM; TAYLOR RJ <i>Hormone Replacement Therapy - A Study of Womens Knowledge and Attitudes</i>	0	53
7	0	88	19 1991 DRUGS 42(2):228-239 SCHUG SA; MERRY AF; ACLAND RH <i>Treatment Principles for the Use of Opioids in Pain of Nonmalignant Origin</i>	0	51
8	0	0	86 1995 SPINE 20(1):1-9 CHERKIN DC; DEYO RA; WHEELER K; CIOL MA <i>Physician Views about Treating Low-Back-Pain - the Results of A National Survey</i>	0	49
9	0	15	17 1991 ARCHIVES OF GENERAL PSYCHIATRY 48(2):120-123 GORMAN JM; KERTZNER R; TODAK G; GOETZ RR; WILLIAMS JBW; RABKIN J; MEYERBAHLBURG HFL; MAYEUX R; STERN Y; LANGE M; DOBKIN J; SPITZER R; EHRHARDT AA <i>Multidisciplinary Base-Line Assessment of Homosexual Men With and Without Human-Immunodeficiency-Virus Infection .1. Overview of Study Design</i>	0	46
10	0	17	58 1994 JOURNAL OF THE ROYAL SOCIETY OF MEDICINE 87(9):523-525 PERKIN MR; PEARCY RM; FRASER JS <i>A Comparison of the Attitudes Shown by General-Practitioners, Hospital Doctors and Medical-Students Towards Alternative medicine</i>	0	45

SLIDE 24: GCS

http://garfield.library.upenn.edu/histcomp/medic_ignorant/index-tc.html

The file is now sorted by Global Citation Score. The paper by Brady comes to the top.

SLIDE 25: AUTHORS

http://garfield.library.upenn.edu/histcomp/medic_ignorant/list/au-pubs.html

By clicking on Authors, we find the most published authors in the file.

Ranked All-Author list.

Total: 483 Sorted by number of publications (Pubs)

#	NAME	TLCS	TGCS	Pubs
1	PAYS D	0	0	<u>8</u>
2	WITTE CL	11	29	<u>8</u>
3	WITTE MH	11	29	<u>8</u>
4	KERWIN A	9	18	<u>5</u>
5	PELLETIER KR	2	87	<u>3</u>
6	TAKALA T	1	9	<u>3</u>
7	ASTIN JA	0	28	<u>2</u>
8	ERNST E	0	2	<u>2</u>
9	FEUDTNER C	0	89	<u>2</u>
10	GRILLI R	0	46	<u>2</u>
11	HASKELL WL	2	80	<u>2</u>
12	HAYRY M	1	8	<u>2</u>
13	LERNER BH	1	71	<u>2</u>
14	LIBERATI A	0	46	<u>2</u>
15	REES J	0	10	<u>2</u>
16	WALLEY P	2	40	<u>2</u>
17	ACLAND RH	0	51	<u>1</u>
18	ADINMA JIB	0	4	<u>1</u>
19	AKDAS A	0	1	<u>1</u>
20	ALEXANIAN A	0	40	<u>1</u>
21	ALLAM MF	0	0	<u>1</u>
22	AMM M	0	1	<u>1</u>
23	ANDERS K	0	1	<u>1</u>
24	ANDERSEN SE	0	0	<u>1</u>
25	APOLONE G	0	40	<u>1</u>
26	APPEL PW	0	0	<u>1</u>
27	ARNOLD A	0	17	<u>1</u>
28	AVSAROGULLARI L	0	0	<u>1</u>
29	BALDWIN CM	1	2	<u>1</u>
30	BALDWIN HE	0	1	<u>1</u>

SLIDE 25: AUTHORS

http://garfield.library.upenn.edu/histcomp/medic_ignorant/list/au-pubs.html

SLIDE 26: JOURNALS

http://garfield.library.upenn.edu/histcomp/medic_ignorant/list/so-pubs.html

A sort by source journal shows that 8 articles on this topic have appeared in a French journal, followed by 6 in *Social Science and Medicine*.” The rest are widely dispersed in 179 different journals.

Ranked Journal list

Total: 179 View: Overview. Sorted by number of publications (Pubs).

#	Name	TLCS	TGCS	Pubs
1	Sciences et Techniques de L Animal de Laboratoire	0	0	8
2	Social Science & Medicine	1	82	6
3	Journal of Medical Ethics	0	14	4
4	Academic Medicine	0	73	3
5	Annals of Internal Medicine	0	82	3
6	British Journal of General Practice	0	73	3
7	Bulletin de L Academie Nationale De Medecine	0	2	3
8	Burns	1	12	3
9	East African Medical Journal	0	11	3
10	Jama-Journal of the American Medical Association	0	30	3
11	Public Health	0	2	3
12	American Journal of Gastroenterology	0	13	2
13	American Journal of Health Promotion	2	80	2
14	American Journal of Public Health	0	42	2
15	Archives de Pediatrie	0	4	2
16	Artificial Intelligence in Medicine	0	0	2
17	Australian and New Zealand Journal of Psychiatry	0	9	2
18	British Medical Journal	0	87	2
19	Bulletin du Cancer	0	1	2
20	California Law Review	0	63	2
21	Clinical Orthopaedics and Related Research	0	1	2
22	Family Practice	1	20	2
23	Journal of the Royal Society of Medicine	0	46	2
24	Medical Education	5	27	2
25	Pain	0	1	2
26	Schweizerische Medizinische Wochenschrift	0	8	2
27	Social History of Medicine	0	3	2
28	Sociology of Health & Illness	0	1	2
29	Theoretical Medicine and Bioethics	0	2	2
30	Acta Anatomica	0	19	1

SLIDE 27: ARTICLES PUBLISHED IN *SCIENCES ET TECHNIQUES DE L'ANIMAL DE LABORATOIRE*

I was curious as to why this French veterinary journal would be so prominent. It turns out that the entire group of 8 articles is an eight-part series about vascular microsurgery in the rat. The same abstract is repeated in all of the listings. The relevant line is underlined.

SCIENCES ET TECHNIQUES DE L ANIMAL DE LABORATOIRE

1. [60](#) 1994 SCIENCES ET TECHNIQUES DE L ANIMAL DE LABORATOIRE 19(1)5-9
PAYS D *Initiation to the Vascular Micro-Surgery in the Rat - Introduction*
2. [61](#) 1994 SCIENCES ET TECHNIQUES DE L ANIMAL DE LABORATOIRE 19(2)93-110
PAYS D *Initiation to the Vascular Micro-Surgery in the Rat - Introduction*
3. [62](#) 1994 SCIENCES ET TECHNIQUES DE L ANIMAL DE LABORATOIRE 19(3)225-234
PAYS D *Initiation to the Vascular Micro-Surgery in the Rat - Introduction*
4. [63](#) 1994 SCIENCES ET TECHNIQUES DE L ANIMAL DE LABORATOIRE 19(4)275-287
PAYS D *Initiation to the Vascular Micro-Surgery in the Rat - Introduction*
5. [82](#) 1995 SCIENCES ET TECHNIQUES DE L ANIMAL DE LABORATOIRE 20(1)41-57
PAYS D *Initiation to the Vascular Micro-Surgery in the Rat - Introduction*
6. [83](#) 1995 SCIENCES ET TECHNIQUES DE L ANIMAL DE LABORATOIRE 20(1)59-71
PAYS D *Initiation to the Vascular Micro-Surgery in the Rat - Introduction*
7. [84](#) 1995 SCIENCES ET TECHNIQUES DE L ANIMAL DE LABORATOIRE 20(2)121-145
PAYS D *Initiation to the Vascular Micro-Surgery in the Rat - Introduction*
8. [85](#) 1995 SCIENCES ET TECHNIQUES DE L ANIMAL DE LABORATOIRE 20(2)147-172
PAYS D *Initiation to the Vascular Micro-Surgery in the Rat - Introduction*

Abstract

Vascular micro-surgery stands as a specialized technique in the human and veterinarian surgery chapter. Microscope, new instruments and improved methods enabled vascular micro-surgery to exist. In our medical unit, the teaching and the training program of the naive micro-surgeons is developed in 2 steps: a) Initiation at the vascular micro-surgery; b) Improvements in vascular micro-surgery techniques. **One difficulty for the basic training of these beginners lays in their near total ignorance of the animal experimentation;** consequently an appropriate teaching is mandatory. The author will present the summarized teaching given during the first course devoted to the initiation at the vascular micro-surgery in 6 papers: 1. an introductive part, 2. the instrumental means, 3. a reliable and simple anesthetic method in the rat, 4. a surgery and post-surgery methodology, 5. a technical description of vascular anastomoses, 6. a general methodology for anastomoses. The goal, with these papers, is to unveil vascular micro-surgery to those scientists, working on animals and not fully aware of this specialized branch of surgery.

SLIDE 28: ARTICLES PUBLISHED IN *SOCIAL SCIENCE & MEDICINE*

On the other hand, in Slide 28 we see the six papers for *Social Science & Medicine*. Only one of these papers contains the term ignorance in the title while others contain the term only in the abstract. This example illustrates the semantic problems inherent in natural language searches. Nevertheless, the paper, by Maynard has a beautiful quote, “The price of knowledge is high but the cost of ignorance is greater.”

SOCIAL SCIENCE & MEDICINE

1. [28](#) 1991 *SOCIAL SCIENCE & MEDICINE* 33(5):559-568

LUPTON D; DONALDSON C; LLOYD P

Caveat-Emptor or Blissful Ignorance - Patients and the Consumerist Ethos

2. [49](#) 1993 *SOCIAL SCIENCE & MEDICINE* 37(4):473-480

REUBEN R

Women and Malaria - Special Risks and Appropriate Control Strategy

3. [64](#) 1994 *SOCIAL SCIENCE & MEDICINE* 39(10):1433-1445

MAYNARD A

Can Competition Enhance Efficiency in Health-Care - Lessons from the Reform of The Uk-National-Health-Service

4. [122](#) 1997 *SOCIAL SCIENCE & MEDICINE* 45(9):1423-1431

Lerner BH

From Careless Consumptives To Recalcitrant Patients: The Historical Construction of Noncompliance

5. [199](#) 2002 *SOCIAL SCIENCE & MEDICINE* 54(3):445-457

Leask J; Chapman S

'The Cold Hard Facts' Immunisation and Vaccine Preventable Diseases in Australia's Newsprint Media 1993-1998

6. [200](#) 2002 *SOCIAL SCIENCE & MEDICINE* 55(7):1143-1156

Jefferts MD

Concepts of Iron Deficiency Anemia and Public Health Measures in Rural Costa Rica

SLIDE 29: OUTER REFERENCES

http://garfield.library.upenn.edu/histcomp/medic_ignorant/index-tc.html#

The “outer references” is a ranked list of everything else that is cited in the main collection. The papers by Eisenberg, Arrow, and Astin appear at the top. Most of the outer references do not use the term ignorance in their titles. That is why they are not in the main collection. An exception is the reference to Duncan’s *Encyclopedia of Medical Ignorance*. As a book, it would not be a source entry in *WOS*.

To include a more complete sample of relevant papers, we added the top 10 of the outer references to the main collection.

Cited references outside of this network

Total: 6842 (top 100 shown).

Sorted by LCS.

#	LCS	Reference
1	5	EISENBERG DM, 1998, JAMA-J AM MED ASSOC, V280, P1569 WoS
2	4	ARROW KJ, 1963, AM ECON REV, V53, P941 WoS
3	4	ASTIN JA, 1998, JAMA-J AM MED ASSOC, V279, P1548 WoS
4	4	DUNCAN R, 1984, ENCY MED IGNORANCE E WoS
5	3	SUTHERLAND LR, 1994, J CLIN GASTROENTEROL, V19, P194 WoS
6	3	FAWCETT J, 1994, HOLIST NURS PRACT, V8, P36 WoS
7	3	BAAR K, 1995, NAT HLTH, V25, P74 WoS
8	3	LEVI I, 1980, ENTERPRISE KNOWLEDGE WoS
9	3	EICHNA LW, 1983, NEW ENGL J MED, V308, P18 WoS
10	3	MITCHELL S, 1993, AM DEMOGR, V15, P46 WoS
11	3	HACKERMAN N, 1974, SCIENCE, V183, P907 WoS
12	3	COLEMAN LM, 1995, J AM GERIATR SOC, V43, P747 WoS
13	3	RHODES R, 1998, J MED PHILOS, V23, P10 WoS
14	3	PERELSON GH, 1996, FHP J CLIN RES, V5, P32 WoS
15	3	SINGH N, 1996, ARCH INTERN MED, V156, P197 WoS
16	2	KLEIJNEN J, 1991, BRIT MED J, V302, P316 WoS
17	2	KEVLES DJ, 1985, NAME EUGENICS GENETI WoS
18	2	KNICKERBOCKER B, 1996, CHRISTIAN SCI M 0311 WoS
19	2	GOLD H, 1937, JAMA-J AM MED ASSOC, V108, P2173 WoS
20	2	BOTKIN MC, 1993, BAY AREA REP 0107, P17 WoS
21	2	VALDES F, 1994, CREIGHTON L REV, V27, P381 WoS
22	2	MULLER S, 1984, J MED ED 2, V59 WoS
23	2	DOWNER SM, 1994, BRIT MED J, V309, P86 WoS
24	2	WEIS OF, 1983, ANESTH ANALG CURR RE, V62, P70 WoS
25	2	THOMAS EJ, 2000, MED CARE, V38, P261 WoS
26	2	BERGMAN AB, 1963, NEW ENGL J MED, V268, P1334 WoS
27	2	HEPLER CD, 1990, AM J HOSP PHARM, V47, P533 WoS
28	2	TROSTLE JA, 1988, SOC SCI MED, V27, P1299 WoS
29	2	LOPEZ IFH, 1994, HARVARD CIVIL RIGHTS, V29, P1 WoS
30	2	EPSTEIN S, 1996, IMPURE SCI AIDS ACTI WoS

SLIDE 30: OUTER REFERENCES ADDED TO MAIN COLLECTION

In Slide 30, you see that these additional papers are included, but we have not included the many other global papers that cite them. We have also added some additional papers that have cited the work of Witte on medical ignorance.

[Missing Links?](#) [Citation Matrix](#)

[Graphs](#)

[Glossary](#) [HistCite Guide](#) [About](#)

Papers found in WoS Topic Search: ignoran* and medic* and papers citing Witte MH and the following papers added:

EISENBERG DM, 1998, JAMA-J AM MED ASSOC, V280, P1569
 ARROW KJ, 1963, AM ECON REV, V53, P941
 ASTIN JA, 1998, JAMA-J AM MED ASSOC, V279, P1548
 SUTHERLAND LR, 1994, J CLIN GASTROENTEROL, V19, P194
 EICHNA LW, 1983, NEW ENGL J MED, V308, P18
 MITCHELL S, 1993, AM DEMOGR, V15, P46
 COLEMAN LM, 1995, J AM GERIATR SOC, V43, P747
 RHODES R, 1998, J MED PHILOS, V23, P10
 SINGH N, 1996, ARCH INTERNMED, V156, P197

Nodes: 257

[Authors](#): 535, [Journals](#): 191, [Outer References](#): 7656

Collection span: 1961 - 2004

View: Overview. Sorted by year, source, volume, issue, page

#	LCR	NCR	Nodes / Authors / Date	LCS	GCS
1	0	0	1 1961 JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION 176(9):804-804 [Anon] <i>Advanced Medical Ignorance</i>	0	0
2	0	10	2 1962 AMERICAN SOCIOLOGICAL REVIEW 27(4):508-514 LEWIS LS; LOPREATO J <i>Irrationality, Ignorance, and Perceived Danger in Medical Practices</i>	0	14
3	0	28	3 1963 AMERICAN ECONOMIC REVIEW 53(5):941-973 ARROW KJ <i>Uncertainty and the Welfare Economics of Medical-Care</i>	4	753
4	0	0	4 1974 SCIENCE 183(4128):907-907 HACKERMAN <i>Ignorance As Driving Force</i>	0	4
5	0	0	5 1974 SOUTH AFRICAN MEDICAL JOURNAL 48(17):717-718 SMIT RJ <i>Sports Medicine, Ignorance And Sport</i>	0	2
6	0	0	6 1979 AUSTRALIAN AND NEW ZEALAND JOURNAL OF MEDICINE 9(5):629-629 RYAN R <i>Anxious Moments in Nuclear-Medicine - Is Ignorance Bliss</i>	0	0
7	0	6	7 1980 ET CETERA 37(1):5-12 BATES EM <i>The Implications for Semantics of Developments in Medical Technology - The Fatal Consequences of Semantic Ignorance</i>	0	0
8	0	0	8 1983 NEW ENGLAND JOURNAL OF MEDICINE 308(1):18-21 EICHNA LW <i>A Medical-School Curriculum for the 1980s</i>	3	17
9	0	1	9 1984 LANCET 1(8382):884-884 NORTON A <i>The Encyclopedia of Medical Ignorance - Exploring the Frontiers of Medical Knowledge - Duncan,R, Westonsmith,M</i>	0	0

SLIDE 31: FILE SORTED BY LCS SHOWING WITTE 1988 TO 1990

In Slide 31, the file is sorted by local citation score and shows the 1988 to 1990 Witte papers are at the top, followed by Eisenberg in *JAMA*, Arrow in *American Economic Review*, then Sutherland and then Astin.

[Missing Links?](#) [Citation Matrix](#)

[Graphs](#)

[Glossary](#) [HistCite Guide](#) [About](#)

Papers found in WoS Topic Search: ignoran* and medic*
and papers citing Witte MH and the following papers added:

EISENBERG DM, 1998, JAMA-J AM MED ASSOC, V280, P1569
ARROW KJ, 1963, AM ECON REV, V53, P941
ASTIN JA, 1998, JAMA-J AM MED ASSOC, V279, P1548
SUTHERLAND LR, 1994, J CLIN GASTROENTEROL, V19, P194
EICHNA LW, 1983, NEW ENGL J MED, V308, P18
MITCHELL S, 1993, AM DEMOGR, V15, P46
COLEMAN LM, 1995, J AM GERIATR SOC, V43, P747
RHODES R, 1998, J MED PHILOS, V23, P10
SINGHN, 1996, ARCH INTERNMED, V156, P197

Nodes: 257

Authors: 535, Journals: 191, Outer References: 7656

Collection span: 1961 - 2004

View: Overview. Sorted by LCS.

#	LCR	NCR	Nodes / Authors / Date	LCS	GCS
1	2	16	16 1989 MEDICAL EDUCATION 23(1):24-29 WITTE MH; KERWIN A; WITTE CL; SCADRON A <i>A Curriculum on Medical Ignorance</i>	7	7
2	2	27	18 1990 WESTERN JOURNAL OF MEDICINE 153(1):17-23 WITTE MH; WITTE CL; WAY DL <i>Medical Ignorance, AIDS Kaposi-Sarcoma Complex, and the Lymphatic-System</i>	7	7
3	1	10	14 1988 JOURNAL OF MEDICAL EDUCATION 63(10):793-795 WITTE MH; KERWIN A; WITTE CL <i>Seminars, Clinics, and Laboratories on Medical Ignorance</i>	5	5
4	1	29	147 1998 JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION 280(18):1569-1573 EISENBERG DM; DAVIS RB; ETTNER SL; APPEL S; WILKEY S; VAN ROMPAY M; KESSLER RC <i>Trends in Alternative Medicine Use in the United States, 1990-1997 - Results of a Follow-Up National Survey</i>	5	1303
5	0	28	3 1963 AMERICAN ECONOMIC REVIEW 53(5):941-973 ARROW KJ <i>Uncertainty and the Welfare Economics of Medical-Care</i>	4	753
6	0	17	62 1994 JOURNAL OF CLINICAL GASTROENTEROLOGY 19(3):194-197 SUTHERLAND LR; VERHOEF MJ <i>Why Do Patients Seek a 2nd Opinion or Alternative Medicine</i>	4	51
7	2	34	146 1998 JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION 279(19):1548-1553 ASTIN JA <i>Why Patients Use Alternative Medicine - Results of a National Study</i>	4	524
8	0	6	157 1999 ANTICANCER RESEARCH 19(6A):4919-4933 WITTE MH; WITTE CL <i>Epilogue: What We Don't Know About Cancer</i>	4	4
9	2	114	188 2000 LYMPHOLOGY 33(3):95-121 WITTE MH; WITTE CL <i>Ignorance in infectious diseases: The case of AIDS, Kaposi sarcoma, and lymphology</i>	4	4

SLIDE 32: GLOBAL CITATION SORT

In this slide we see the same file sorted by Global Citation Score. Note that Eisenberg, Arrow, and Astin are Citation Classics, by which I mean they have been cited hundreds of times. I have recently posted a file of 4,000 author commentaries on Citation Classics at <http://garfield.library.upenn.edu/classics.html>. These originally appeared in *Current Contents* over a 25-year period.

Time does not permit me to take this particular analysis any further.

[Missing Links?](#) [Citation Matrix](#)

[Graphs](#)

[Glossary](#) [HistCite Guide](#) [About](#)

Papers found in WoS Topic Search: ignoran* and medic*
and papers citing Witte MH and the following papers added:
EISENBERG DM, 1998, JAMA-J AM MED ASSOC, V280, P1569
ARROW KJ, 1963, AM ECON REV, V53, P941
ASTIN JA, 1998, JAMA-J AM MED ASSOC, V279, P1548
SUTHERLAND LR, 1994, J CLIN GASTROENTEROL, V19, P194
EICHNA LW, 1983, NEW ENGL J MED, V308, P18
MITCHELL S, 1993, AM DEMOGR, V15, P46
COLEMAN LM, 1995, J AM GERIATR SOC, V43, P747
RHODES R, 1998, J MED PHILOS, V23, P10
SINGH N, 1996, ARCH INTERN MED, V156, P197

Nodes: 257

Authors: 535, Journals: 191, Outer References: 7656

Collection span: 1961 - 2004

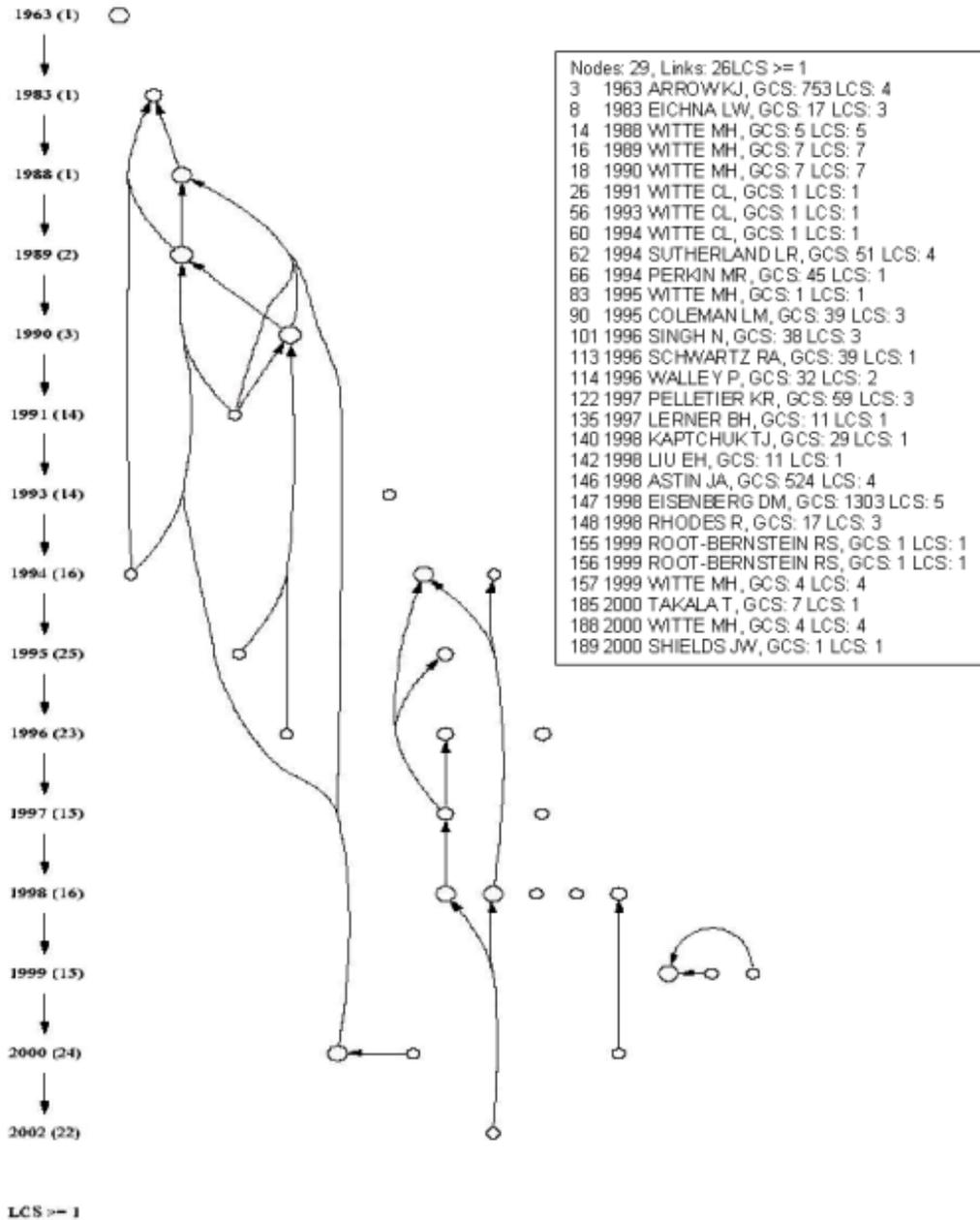
View: Overview. Sorted by GCS.

#	LCR	NCR	Nodes / Authors / Date	LCS	GCS
1	1	29	147 1998 JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION 280(18):1569-1575 EISENBERG DM; DAVIS RB; ETTNER SL; APPEL S; WILKEY S; VAN ROMPAY M; KESSLER RC <i>Trends In Alternative Medicine Use in the United States, 1990-1997 - Results of a Follow-Up National Survey</i>	5	1303
2	0	28	3 1963 AMERICAN ECONOMIC REVIEW 53(5):941-973 ARROW KJ <i>Uncertainty and the Welfare Economics of Medical-Care</i>	4	753
3	2	34	146 1998 JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION 279(19):1548-1553 ASTIN JA <i>Why Patients Use Alternative Medicine - Results of a National Study</i>	4	524
4	0	12	34 1992 BRITISH MEDICAL JOURNAL 304(6822):294-296 BRADLEY CP <i>Uncomfortable Prescribing Decisions - A Critical Incident Study</i>	0	87
5	0	557	82 1995 CALIFORNIA LAW REVIEW 83(1):1-377 VALDES F <i>Queers, Sissies, Dykes, And Tomboys - Deconstructing The Conflation Of Sex, Gender, And Sexual Orientation In Euro-American Law And Society</i>	0	60
6	1	93	138 1998 ANNALS OF INTERNAL MEDICINE 129(7):573-578 LERNER BH; GULICK PM; DUBLER NN <i>Rethinking nonadherence: Historical perspectives on triple-drug therapy for HIV disease</i>	0	60
7	0	29	44 1993 ACADEMIC MEDICINE 68(4):249-254 CHRISTAKIS DA; FEUDTNER C <i>Ethics in a Short White Coat - The Ethical Dilemmas That Medical-Students Confront</i>	0	59
8	3	32	122 1997 AMERICAN JOURNAL OF HEALTH PROMOTION 12(2):112-122 PELLETIER KR; MARIE A; KRASNER M; HASKELL WL <i>Current Trends in the Integration and Reimbursement of Complementary And Alternative Medicine by Managed Care, Insurance Carriers, and Hospital Providers</i>	3	59

SLIDE 33: HISTORIOGRAPH OF MEDICAL IGNORANCE

The detailed analyses we have done so far have demonstrated that the subject of medical ignorance is not a precisely defined subject. There appears to be few papers that clearly epitomize this subject. I also tested the subject “absence of knowledge,” and it produced almost nothing relevant.

HISTORIOGRAPH OF MEDICAL IGNORANCE



Let me close the discussion of *HistCite* by referring to a topic that is rather precisely laid out – the 1953 Watson-Crick paper on the double helix structure of DNA and the controversy concerning its link to the work of Avery-McCleod in 1944. This is discussed in detail in a recent paper I published in an American Library Association journal called *Information Technology and Libraries*.^{xvii}

Now I would briefly like to show you the use of *HistCite* in a truly historical mapping exercise. We are celebrating the 50th anniversary of the Watson-Crick discovery of the Double Helix structure of DNA. That 1953 paper was used to conduct a cited reference of the *SCI*. Since time is short, I am not going to dwell on the details of that search. In the following slides, I simply want to show you the result of mapping the five years from 1953 to 1958.

SLIDE 34: 1953-1958 ARTICLES THAT CITED WATSON-CRICK 1953 PAPER ON “MOLECULAR STRUCTURE OF DNA”

Figure 34 shows the chronological HistCite table for the papers that cite the Watson-Crick, 1953 paper in *Nature*. We have also added a few of the key outer references for Avery and Hershey.

Contrary to claims made in the 50th anniversary issue of *Nature*, this paper was cited over 200 times during the five years following publication. The papers by Avery and Hershey were outer references in the first iteration of this search. In other word, they were highly cited by the papers that cite the Watson-Crick paper. The Avery paper was cited 150 times during the five-year period. Since then it has been cited in about 1400 papers.

Articles from 1953-1958 citing Watson and Crick's 1953 paper, "Molecular Structure of DNA" and selected outer references

Nodes: 210

Sorted by **year, journal, volume, page**.

Page 1: 1

#	Cited nodes	Nodes / Authors	GCS	LCS
1	0	1 1944 JOURNAL OF EXPERIMENTAL MEDICINE 79():137-157 AVERY OT; MACLEON CM; MCCARTY M <i>Studies on the Chemical Nature of the Substance Inducing Transformation of Pneumococcal Types. Induction of Transformation by A Deoxyribonucleic Acid Fraction Isolated from Pneumococcus Type III</i>	331	148
2	0	2 1952 JOURNAL OF GENERAL PHYSIOLOGY 36(1):39-56 HERSHEY AD; CHASE M <i>Independent Functions of Viral Protein and Nucleic Acid in Growth of Bacteriophage</i>	747	23
3	2	3 1953 ACTA CRYSTALLOGRAPHICA 6(8-9):673-677 FRANKLIN RE; GOSLING RG <i>The Structure of Sodium Thyminucleate Fibres . 1. The Influence of Water Content</i>	14	11
4	3	4 1953 ACTA CRYSTALLOGRAPHICA 6(8-9):678-685 FRANKLIN RE; GOSLING RG <i>The Structure of Sodium Thyminucleate Fibres . 2. The Cylindrically Symmetrical Patterson Function</i>	10	8
5	1	5 1953 ARCHIVES OF BIOCHEMISTRY AND BIOPHYSICS 46(1):12-17 SMITH CL <i>The Breakdown of Deoxyribonucleic Acid Under Deuteron and Electron Bombardment</i>	5	1
6	2	6 1953 BIOCHEMICAL JOURNAL 55(5):774-782 WYATT GR; COHEN SS <i>The Bases of the Nucleic Acids of Some Bacterial and Animal Viruses - The Occurrence of 5-Hydroxymethylcytosine</i>	57	8
7	3	7 1953 COLD SPRING HARBOR SYMPOSIA ON QUANTITATIVE BIOLOGY 18():123-131 WATSON JD; CRICK FHC <i>The Structure Of DNA</i>	61	21
8	1	8 1953 COLD SPRING HARBOR SYMPOSIA ON QUANTITATIVE BIOLOGY 18():133-134 WYATT GR <i>The Quantitative Composition Of Deoxypentose Nucleic Acids As Related To The Newly Proposed Structure</i>	9	4
9	2	9 1953 COLD SPRING HARBOR SYMPOSIA ON QUANTITATIVE BIOLOGY 18():171-183 LARK KG; ADAMS MH <i>The Stability Of Phages As A Function Of The Ionic Environment</i>	13	2
10	2	10 1953 COLD SPRING HARBOR SYMPOSIA QUANTITATIVE BIOLOGY 18():255-259 STENT GS <i>Mortality Due To Radioactive Phosphorus As An Index To Bacteriophage Development</i>	8	4

SLIDE 35: TWO GENERATIONS OF CITATIONS TO WATSON-CRICK 1953 PAPER

This *HistCite* file contains 975 papers that either cited Watson-Crick 53 or cited one of the 210 citing papers. Thus, we have two generations of citations.

[Outer References Missing Links?](#) [Journal list](#) [All-Author list](#) [Citation Matrix](#) [Graphs](#) [HistCite Guide](#)

Articles citing Watson and Crick's 1953 paper, "Molecular Structure of DNA", the articles citing them (1953-1958), and selected outer references

Nodes: 975

Sorted by **year, journal, volume, page**.

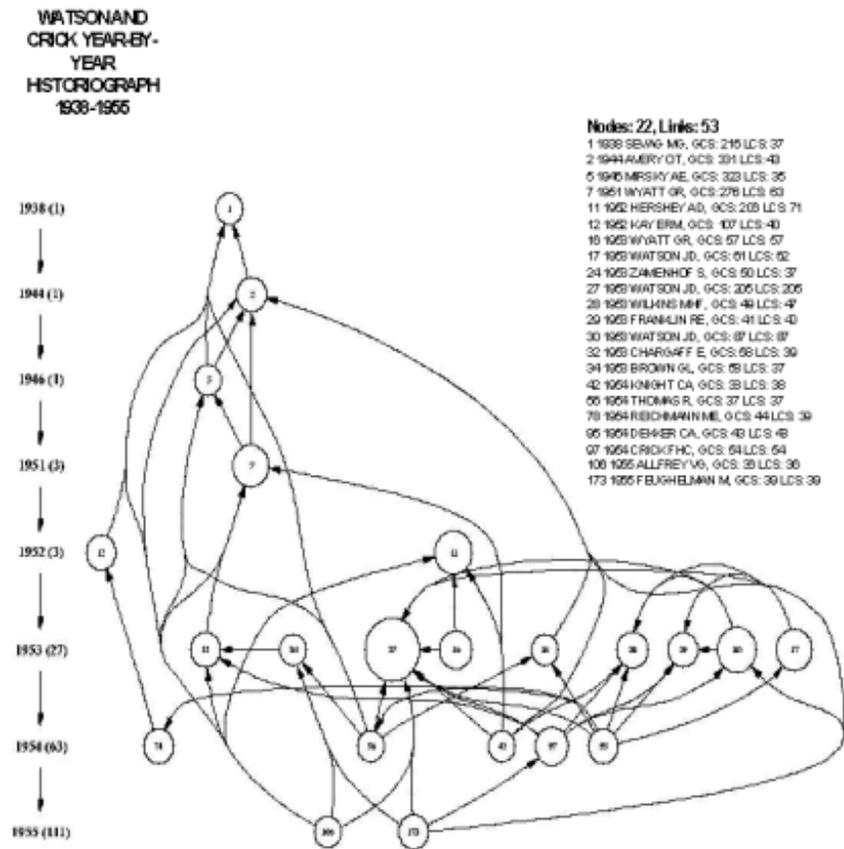
Page 1: 1 2

#	Cited nodes	Nodes / Authors	GCS	LCS
1	0	1 1938 JOURNAL OF BIOLOGICAL CHEMISTRY 124():425- SEVAG MG <i>[unknown]</i>	216	37
2	1	2 1944 JOURNAL OF EXPERIMENTAL MEDICINE 79():137-157 AVERY OT; MACLEON CM; MCCARTY M <i>Studies on the Chemical Nature of the Substance Inducing Transformation of Pseumococcal Types. Induction of Transformation by a Deoxyribonucleic Acid Fraction Isolated from Pneumococcus Type III</i>	331	43
3	0	3 1945 JOURNAL OF BIOLOGICAL CHEMISTRY 161(1):83-89 SCHMIDT G; THANNHAUSER SJ <i>A Method for the Determination of Desoxyribonucleic Acid, Ribonucleic Acid, and Phosphoproteins in Animal Tissues</i>	696	34
4	1	4 1945 JOURNAL OF BIOLOGICAL CHEMISTRY 161(1):293-303 SCHNEIDER WC <i>Phosphorus Compounds in Animal Tissues. 1. Extraction and Estimation of Desoxypentose Nucleic Acid and of Pentose Nucleic Acid</i>	952	30
5	2	5 1946 JOURNAL OF GENERAL PHYSIOLOGY 30(2):117-& MIRSKY AE; POLLISTER AW <i>Chromosin, a Desoxyribose Nucleoprotein Complex of the Cell Nucleus</i>	323	35
6	0	6 1947 JOURNAL OF THE CHEMICAL SOCIETY (SEP):1131-1141 GULLAND JM; JORDAN DO; TAYLOR HFW <i>Deoxypentose Nucleic Acids. 2. Electrometric Titration of the Acidic and the Basic Groups of the Deoxypentose Nucleic Acid of Calf Thymus</i>	70	31
7	3	7 1951 BIOCHEMICAL JOURNAL 48(5):584-590 WYATT GR <i>The Purine and Pyrimidine Composition of Deoxypentose Nucleic Acids</i>	276	63
8	0	8 1951 JOURNAL OF BIOLOGICAL CHEMISTRY 189(2):597-605 MARSHAK A; VOGEL HJ <i>Microdetermination of Purines And Pyrimidines in Biological Materials</i>	136	30
9	0	9 1951 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA 37(4):205-211 PAULING L; COREY RB; BRANSON HR <i>The Structure of Proteins - 2 Hydrogen-Bonded Helical Configurations of the Polypeptide Chain</i>	185	26
10	1	10 1952 BIOCHEMICAL JOURNAL 52(5):558-565 MARKHAM R; SMITH JD <i>The Structure of Ribonucleic Acids. 2. The Smaller Products of Ribonuclease Digestion</i>	104	28

SLIDE 36: WATSON-CRICK YEAR-BY-YEAR HISTORIOGRAPH 1936-1965

In Figure 36, we have the year-by-year map of the 22 most-cited papers in the chained indexed file. Notice that in 1953 there were nine highly-cited papers. And in 1954, there are five. Using the typical reference citation, that is, only author, volume, page, and year, it is not possible to differentiate the month-by-month progression, after the Watson and Crick paper appeared in April, 1953. However, the *HistCite* system can take into account the cover dates of the journals involved if they are included.

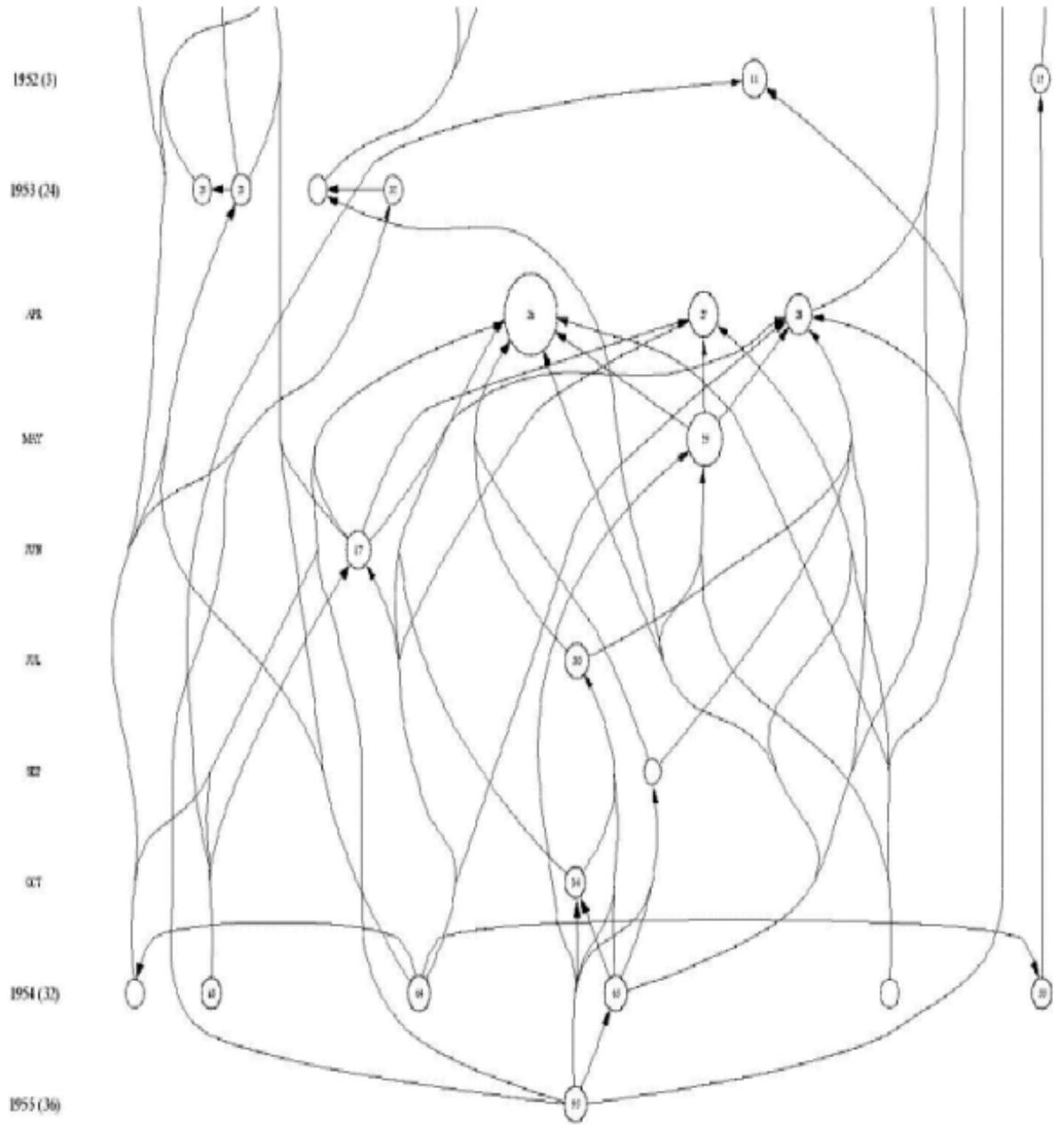
The Watson-Crick paper is #27. Avery 1944 is #2.



SLIDE 37: WATSON-CRICK MONTH BY MONTH 1953

In Figure 37, we see how the historiography changes not just year-to-year but month-by-month. Unfortunately, *WoS* does not contain cover dates until 1985 or there about. So we had to manually insert in the export files the cover dates for the few dozen papers involved in this example

WATSON AND CRICK MONTH-BY-MONTH HISTORIOGRAPH FOR 1953





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www.eugenegarfield.org

<http://garfield.library.upenn.edu/histcomp/>

Medical Ignorance *HistCite* Collection:

<http://garfield.library.upenn.edu/histcomp/index-med-ign.html>

HistCite on: ignoran* and medic*:

http://garfield.library.upenn.edu/histcomp/medic_ignorant/

HistCite on: "ignorant" and medic*" including citing Witte MH:

<http://access.isiproducts.com/sales/>

ISI Web of Knowledge

ISI Web of Science

ISI Essential Science Indicators

ISI Journal Citation Reports

<http://www.isihighlycited.com/>

<http://thescientist.com>

References:

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13. Garfield, E. and Sher. I. "ASCA (Automatic Subject Citation Alert) -- A New Personalized Current Awareness Service for Scientists ," *American Behavioral Scientist*, 10 (5) pgs. 29-32 (1967). Reprinted in *Essays of an Information Scientist*, Volume 6, pgs 514-17. Philadelphia: ISI Press (1984). <http://www.garfield.library.upenn.edu/essays/v6p514y1983.pdf>

14. Garfield, E., Sher I.H. , & Torpie, R, H. "The Use of Citation Data in Writing the History of Science." Philadelphia: The Institute for Scientific Information, Report of research for Air Force Office of Scientific Research under contract F49(638)-1256 (1964). Available: <http://www.garfield.library.upenn.edu/papers/useofcitdatawritinghistofsci.pdf>

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16. Garfield E, Pudovkin AI, Istomin VI, "Mapping the Output of Topical Searches in the *Web of Knowledge* and the case of Watson-Crick," *Information Technology and Libraries*; 22 (4): 183-187 December 2003. Available: <http://garfield.library.upenn.edu/papers/casewatsoncrick2003.pdf>