

Envisioning (Biomedical) Science

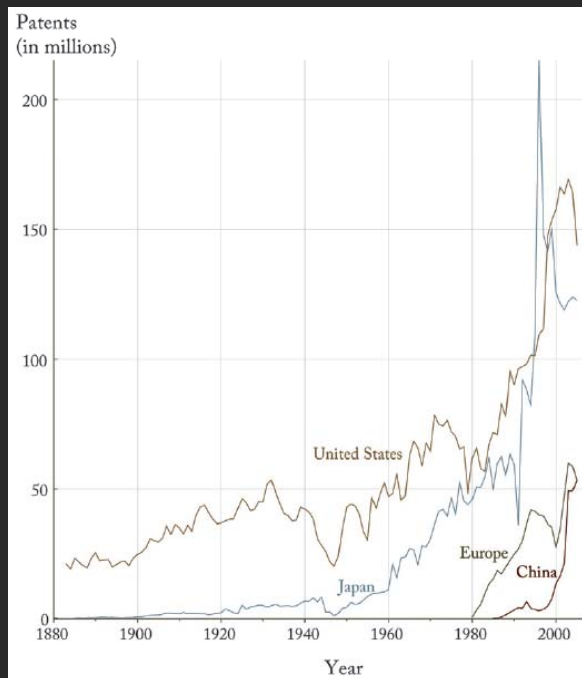
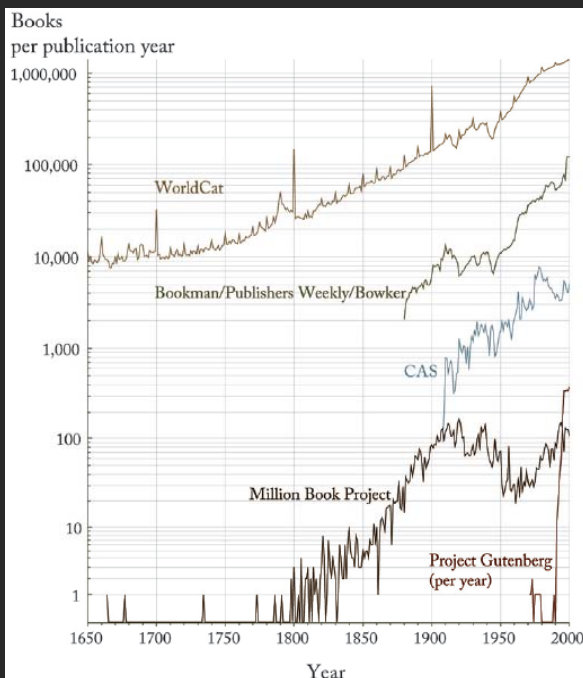
Dr. Katy Börner

Cyberinfrastructure for Network Science Center, Director
Information Visualization Laboratory, Director
School of Library and Information Science
Indiana University, Bloomington, IN
katy@indiana.edu



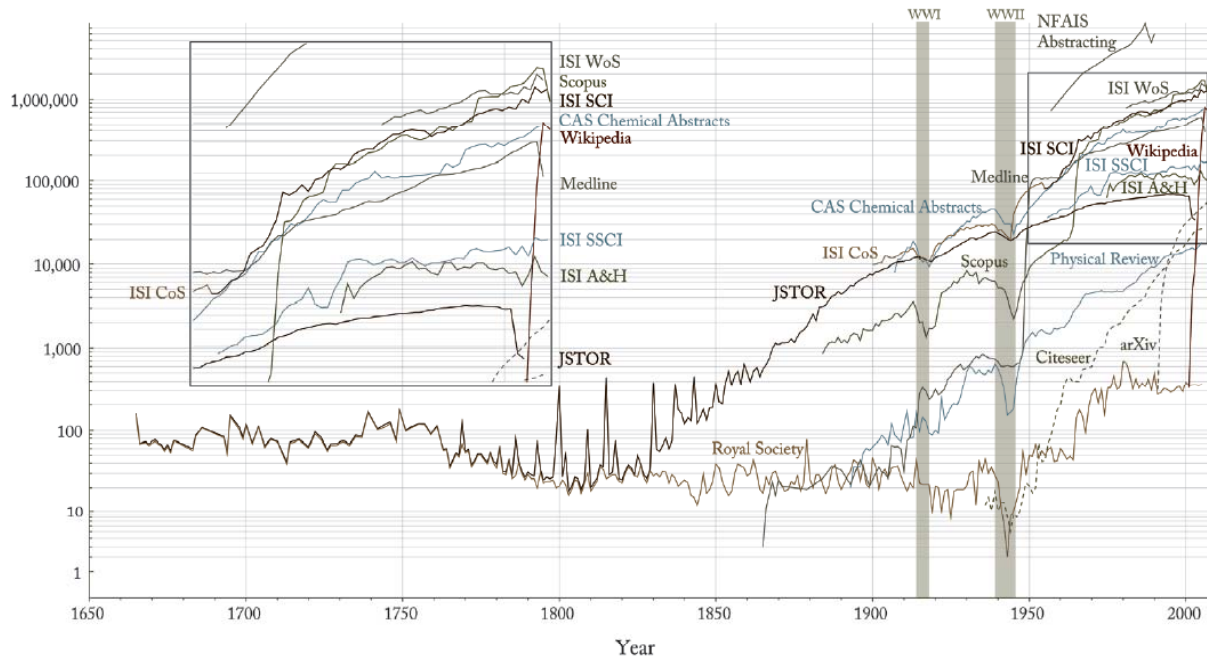
With special thanks to the members at the Cyberinfrastructure for Network Science Center, Mapping Science exhibit map makers and advisory board members, and the VIVO team.

July 22, 2010
NIH Library, Bethesda, MD



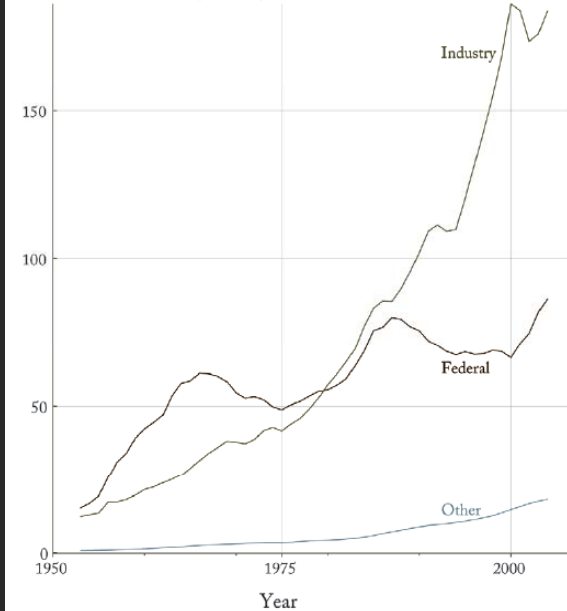
Börner, Katy (2010) *Atlas of Science*. MIT Press. <http://scimaps.org/atlas>

Papers & Wikipedia Entries

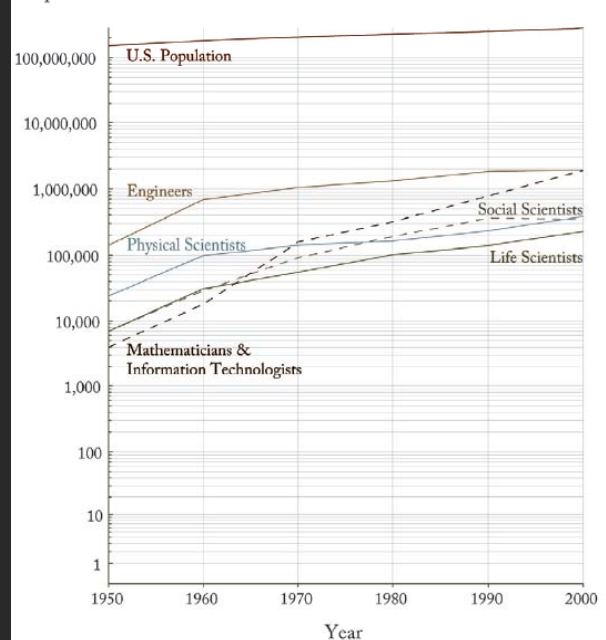


Börner, Katy (2010) *Atlas of Science*. MIT Press. <http://scimaps.org/atlas>

U.S. R&D Expenditures
Constant 2000 dollars (billions)



People



Börner, Katy (2010) *Atlas of Science*. MIT Press. <http://scimaps.org/atlas>

S&T Navigation, Management Tools that Different Stakeholders Want

Funding Agencies

- Need to monitor (long-term) money flow and research developments, identify areas for future development, stimulate new research areas, evaluate funding strategies for different programs, decide on project durations, funding patterns.

Scholars

- Want easy access to research results, relevant funding programs and their success rates, potential collaborators, competitors, related projects/publications (**research push**).

Industry

- Is interested in fast and easy access to major results, experts, etc. Influences the direction of research by entering information on needed technologies (**industry-pull**).

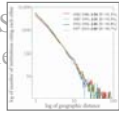
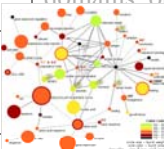


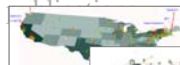
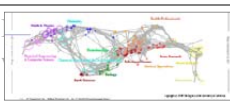
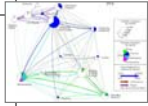
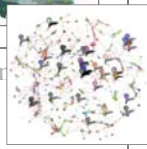


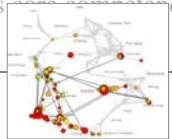
Advantages for Publishers

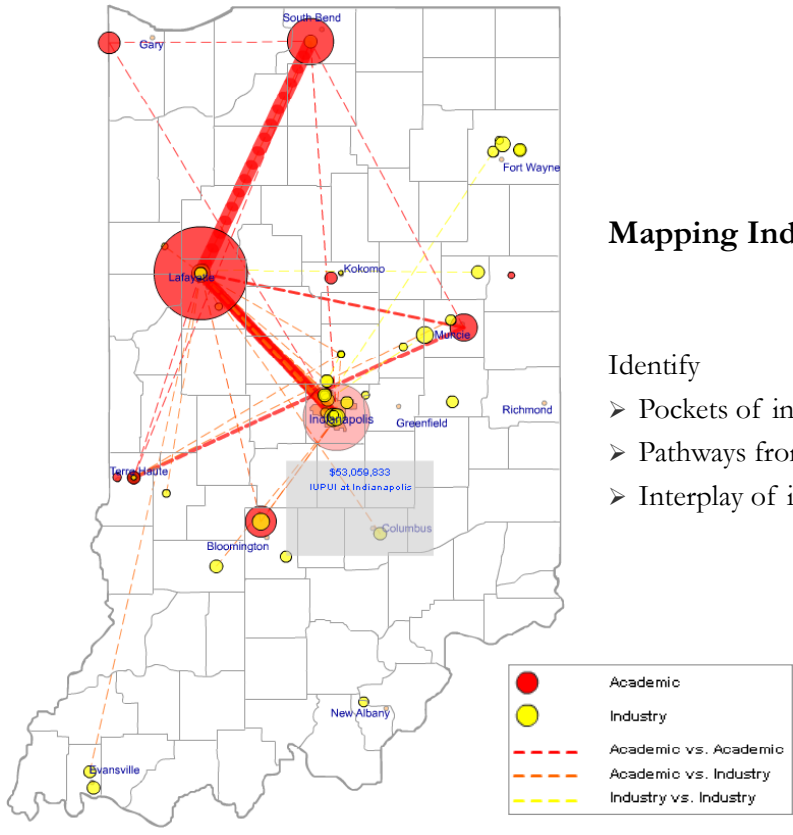
- Need easy to use interfaces to massive amounts of interlinked data. Need to communicate data provenance, quality, and context.

Society

- Needs easy access to scientific knowledge and expertise.

Type of Analysis vs. Level of Analysis

	<i>Micro/Individual</i> (1-100 records)	<i>Meso/Local</i> (101-10,000 records)	<i>Macro/Global</i> (10,000 < records)
Statistical Analysis/Profiling	Individual person and their expertise profiles	Larger labs, centers, universities, research domains or states	All of NSF, SA, all of science 
Temporal Analysis (When)	Funding portfolio of one individual	Topic bursts of PNAS 	113 Years of PNAS Research 
Geospatial Analysis (Where)	Career trajectory of one individual	Mapping a state intellectual landscape 	PNAS 
Topical Analysis (What)		flows in research 	VxOrd/Topic r NIH funding 
Network Analysis (With Whom?)	NSF one 	work of 	NIH's 

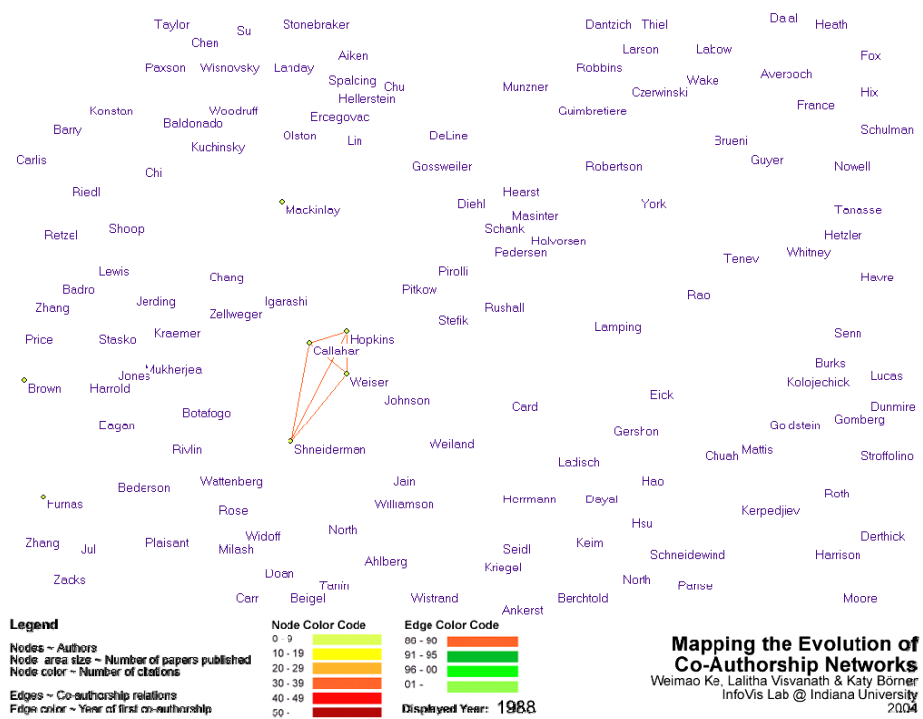


Mapping Indiana's Intellectual Space

- Identify
- Pockets of innovation
 - Pathways from ideas to products
 - Interplay of industry and academia

Mapping the Evolution of Co-Authorship Networks

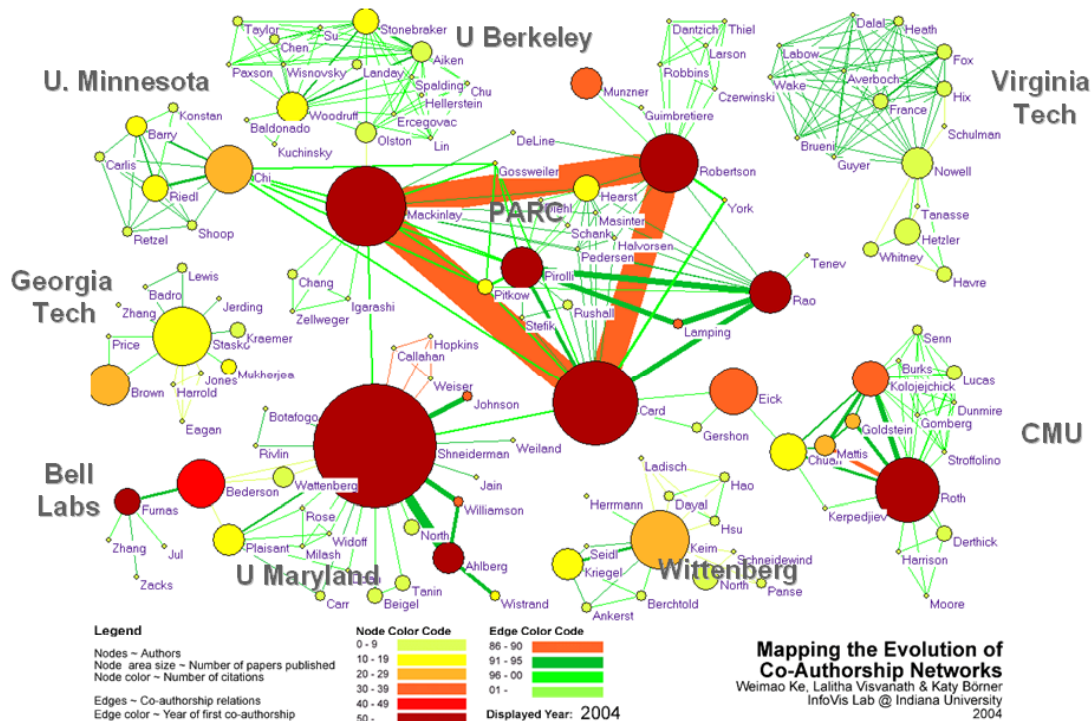
Ke, Visvanath & Börner, (2004) Won 1st prize at the IEEE InfoVis Contest.



Mapping the Evolution of Co-Authorship Networks
 Weimao Ke, Lalitha Visvanath & Katy Börner
 InfoVis Lab @ Indiana University
 2004

Mapping the Evolution of Co-Authorship Networks

Ke, Viswanath & Börner, (2004) Won 1st price at the IEEE InfoVis Contest



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Studying the Emerging Global Brain: Analyzing and Visualizing the Impact of Co-Authorship Teams

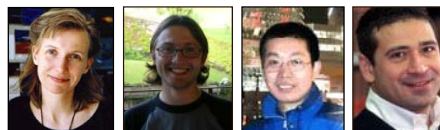
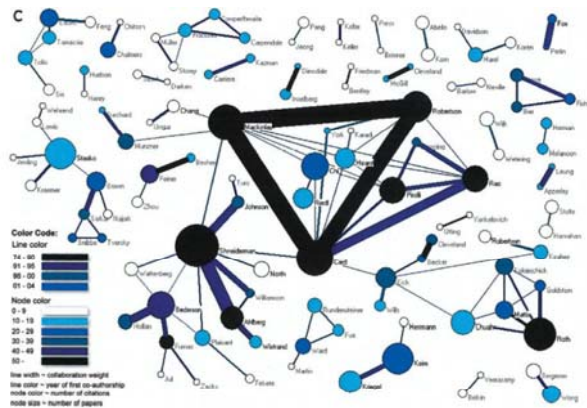
Börner, Dall'Asta, Ke & Vespignani (2005) *Complexity*, 10(4):58-67.

Research question:

- Is science driven by prolific single experts or by high-impact co-authorship teams?

Contributions:

- New approach to allocate citational credit.
- Novel weighted graph representation.
- Visualization of the growth of weighted co-author network.
- Centrality measures to identify author impact.
- Global statistical analysis of paper production and citations in correlation with co-authorship team size over time.
- Local, author-centered entropy measure.

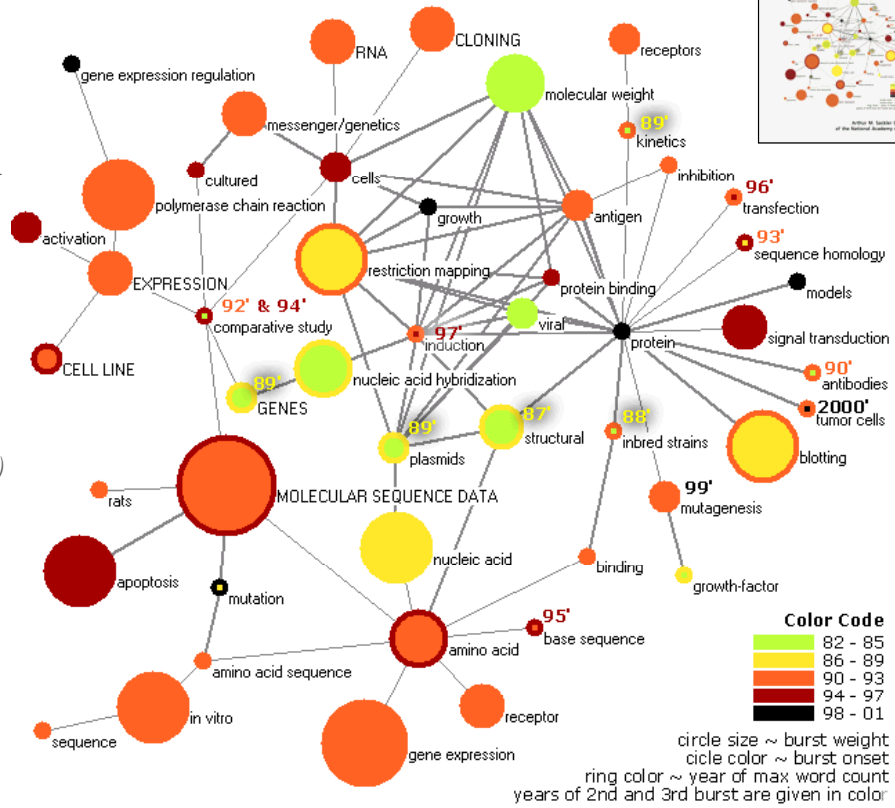


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Mapping Topic Bursts

Co-word space of the top 50 highly frequent and bursty words used in the top 10% most highly cited PNAS publications in 1982-2001.

Mane & Börner. (2004) PNAS, 101(Suppl. 1): 5287-5290.



Spatio-Temporal Information Production and Consumption of Major U.S. Research Institutions

Börner, Katy, Penumarthy, Shashikant, Meiss, Mark and Ke, Weimao. (2006) Mapping the Diffusion of Scholarly Knowledge Among Major U.S. Research Institutions. Scientometrics. 68(3), pp. 415-426.

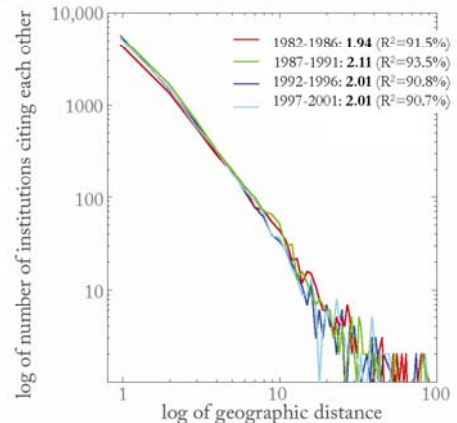
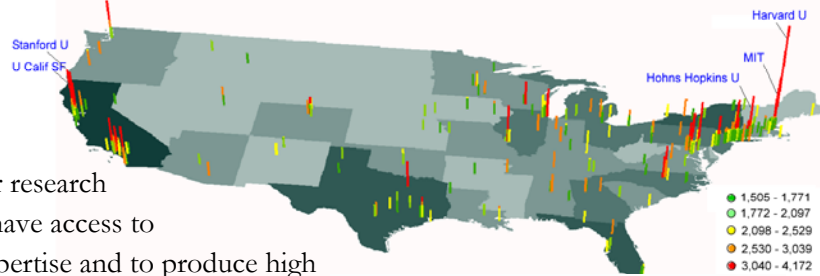


Research questions:

1. Does space still matter in the Internet age?
2. Does one still have to study and work at major research institutions in order to have access to high quality data and expertise and to produce high quality research?
3. Does the Internet lead to more global citation patterns, i.e., more citation links between papers produced at geographically distant research institutions?

Contributions:

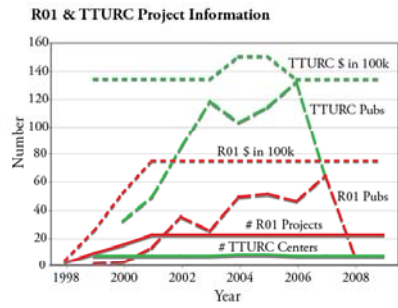
- Answer to Qs 1 + 2 is YES.
- Answer to Qs 3 is NO.
- Novel approach to analyzing the dual role of institutions as information producers and consumers and to study and visualize the diffusion of information among them.



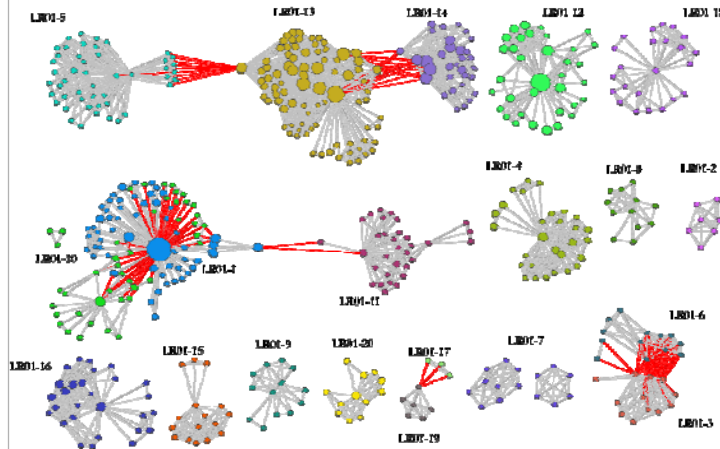
Mapping Transdisciplinary Tobacco Use Research Centers Publications

Compare R01 investigator based funding with TTURC Center awards in terms of number of publications and evolving co-author networks.

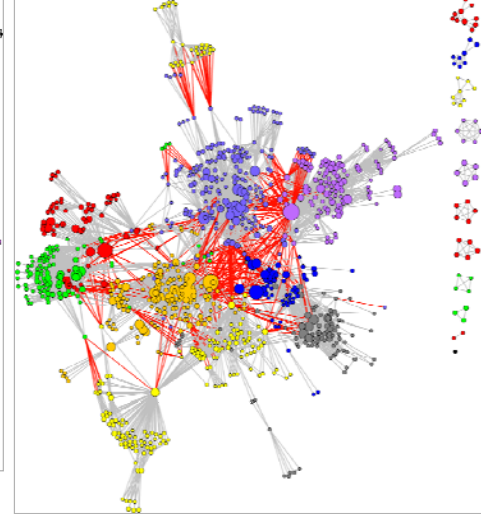
Zoss & Börner, *forthcoming*.



Longitudinal R01 Co-Authorship Network



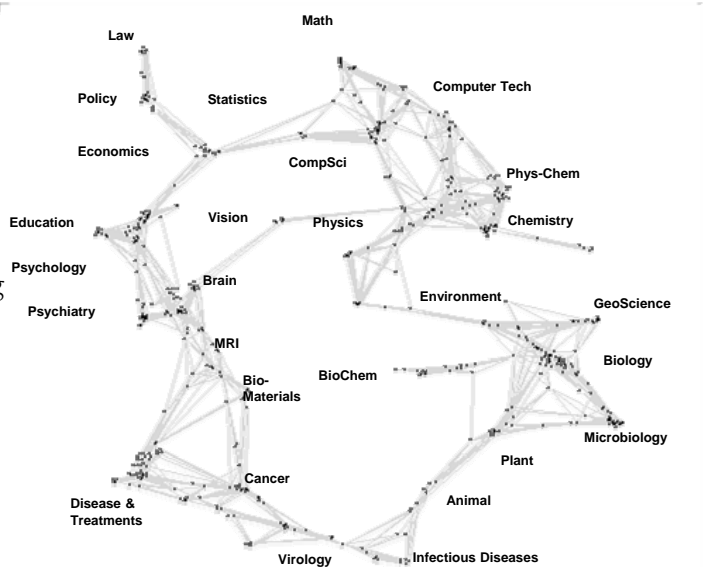
TTURC Co-Authorship Network



2002 Base Map of Science

Kevin W. Boyack, Katy Börner, & Richard Klavans (2007). *Mapping the Structure and Evolution of Chemistry Research*. 11th International Conference on Scientometrics and Informetrics. pp. 112-123.

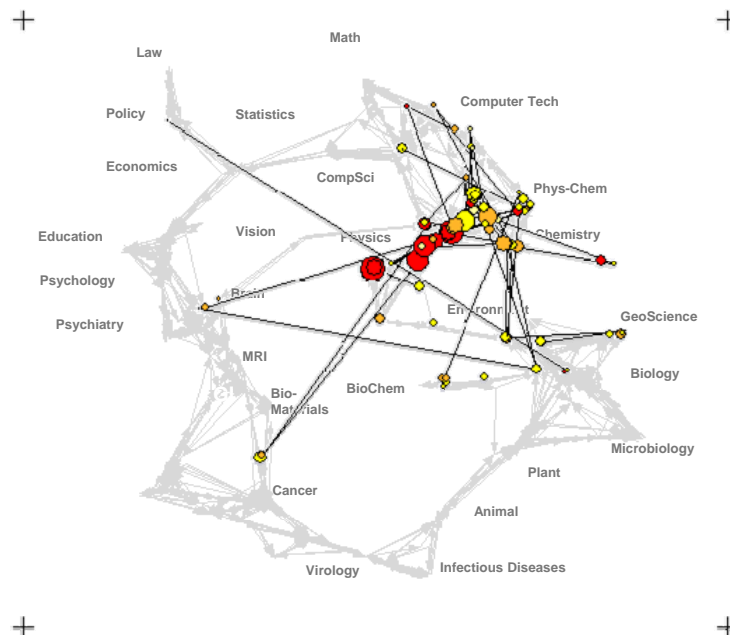
- Uses combined SCI/SSCI from 2002
 - 1.07M papers, 24.5M references, 7,300 journals
 - Bibliographic coupling of papers, aggregated to journals
- Initial ordination and clustering of journals gave 671 clusters
- Coupling counts were reaggregated at the journal cluster level to calculate the
 - (x,y) positions for each journal cluster
 - by association, (x,y) positions for each journal



Science map applications: Identifying core competency

Kevin W. Boyack, Katy Börner, & Richard Klavans (2007).

Funding patterns of the US Department of Energy (DOE)

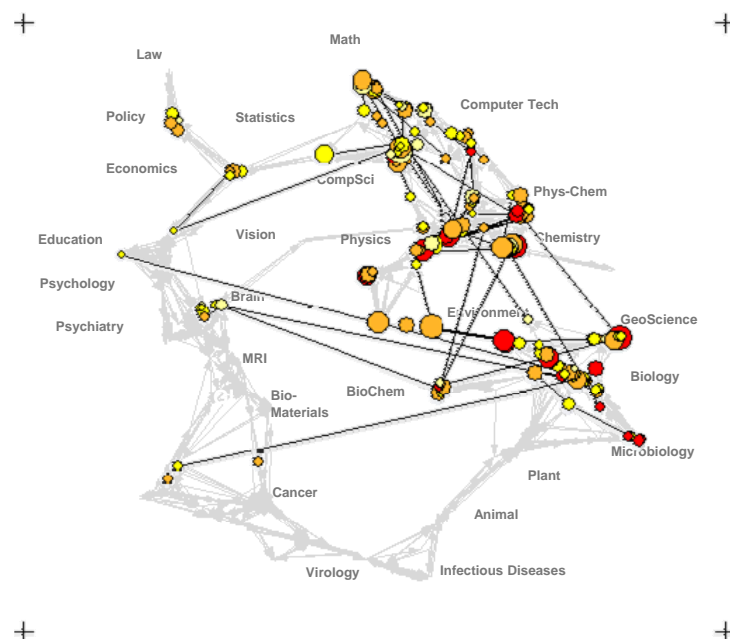


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Science map applications: Identifying core competency

Kevin W. Boyack, Katy Börner, & Richard Klavans (2007).

Funding Patterns of the National Science Foundation (NSF)

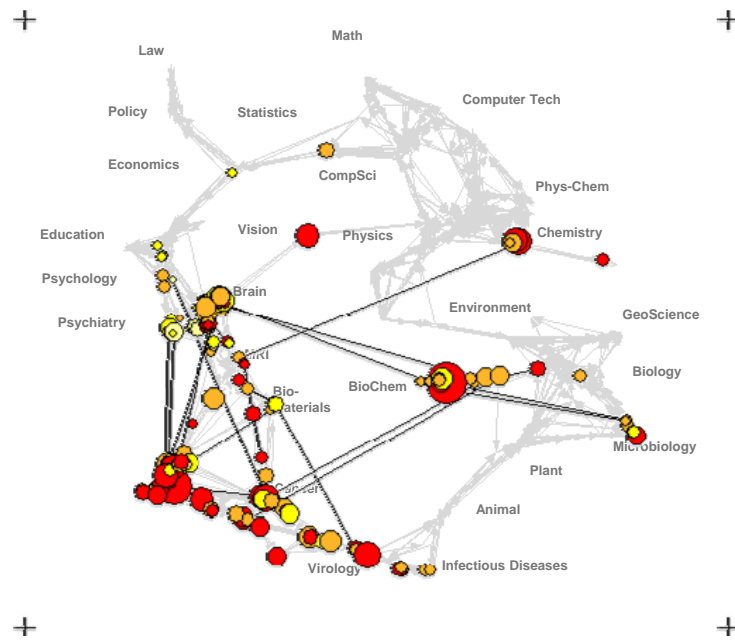


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Science map applications: Identifying core competency

Kevin W. Boyack, Katy Börner, & Richard Klavans (2007).

Funding Patterns of the National Institutes of Health (NIH)

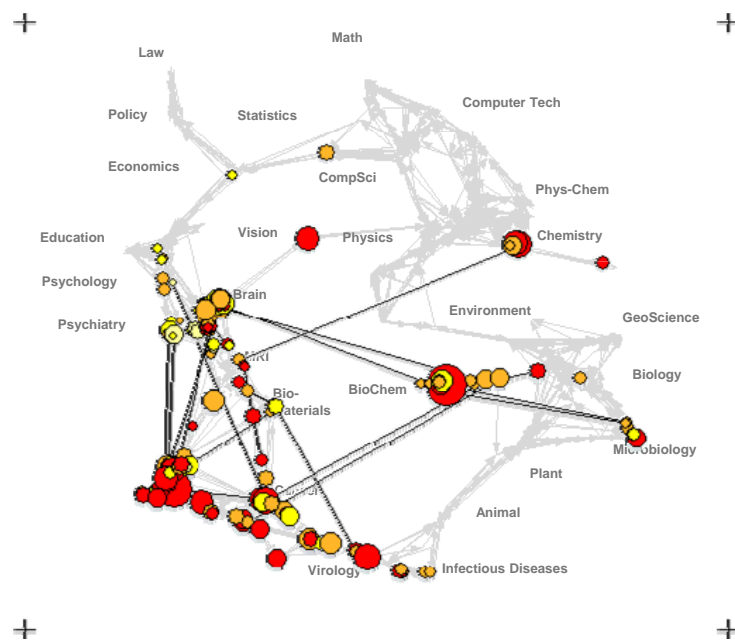


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Funding Patterns of the National Institutes of Health (NIH)

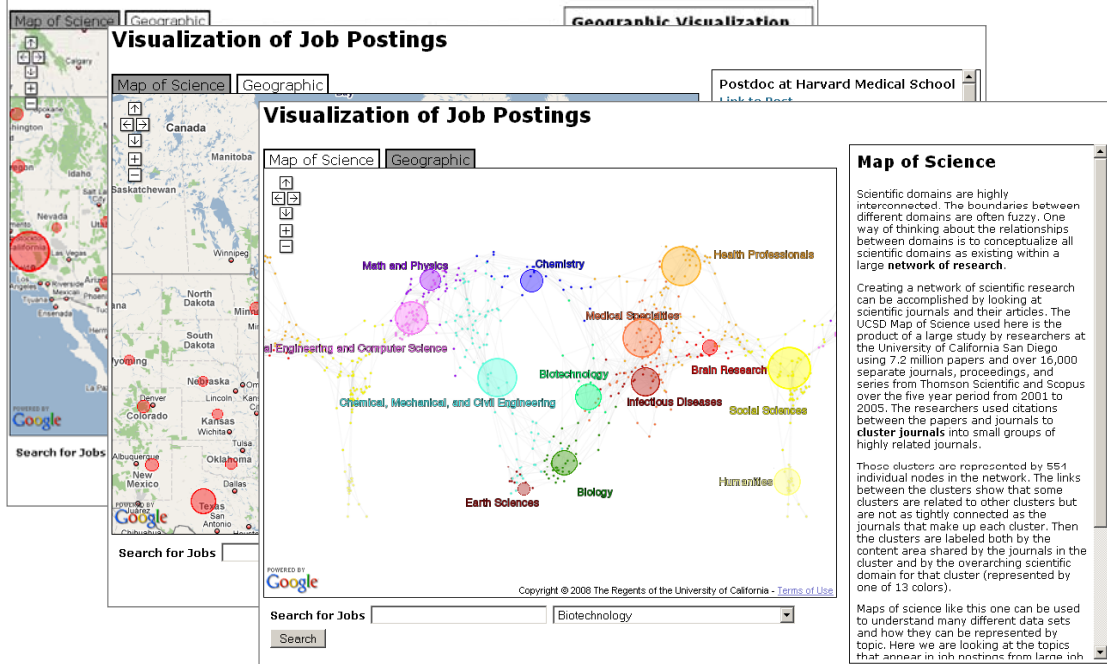


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Where Are the Academic Jobs? Interactive Exploration of Job Advertisements in Geospatial and Topical Space

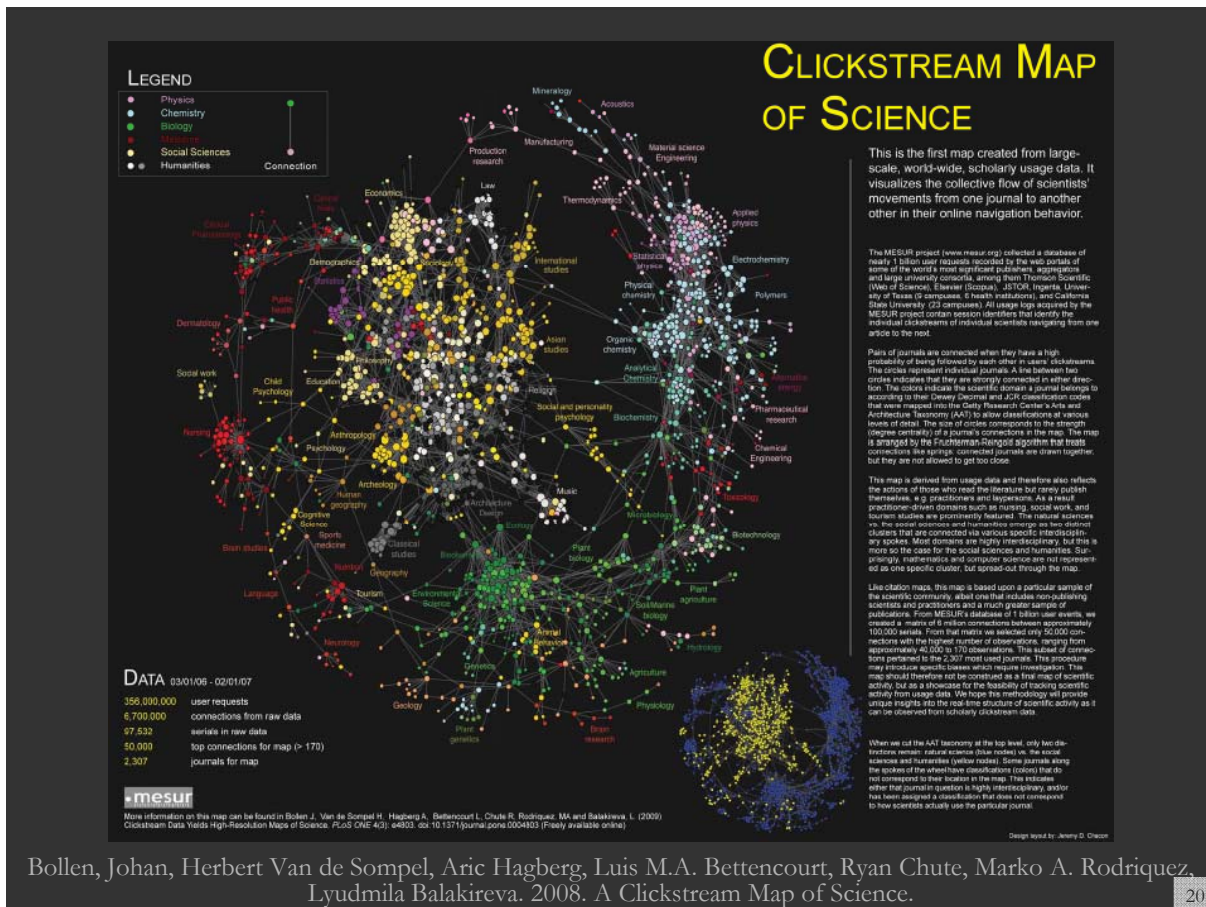
Angela Zoss, Michael Connover, Katy Börner (2010)

Visualization of Job Postings



<http://cns-nd3.slis.indiana.edu/mapjobs/geo>

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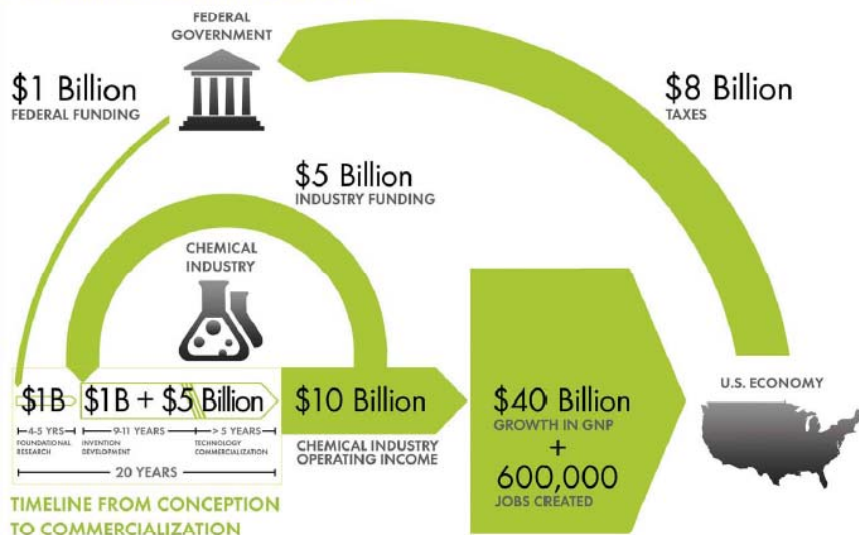
Chemical Research & Development Powers the U.S. Innovation Engine

Macroeconomic Implications of Public and Private R&D Investments in Chemical Sciences

The Council for Chemical Research (CCR)

has provided the U.S. Congress and government policy makers with important results regarding the impact of Federal Research & Development (R&D) investments on U.S. innovation and global competitiveness through its commissioned 5-year two phase study. To take full advantage of typically brief access to policy makers, CCR developed the graphic below as a communication tool that distills the complex data produced by these studies in direct, concise and clear terms.

INVESTMENT IN CHEMICAL SCIENCE R&D



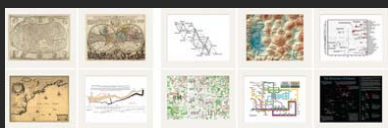
The design shows that an input of \$1B in federal investment, leveraged by \$5B industry investment, brings new technologies to market and results in \$10B of operating income for the chemical industry, \$40B growth in the Gross National Product (GNP) and further impacts the US economy by generating approximately 600,000 jobs, along with a return of \$8B in taxes. Additional details, also reported in the CCR studies, are depicted in the map to the left. This map clearly shows the two R&D investment cycles; the shorter industry investment at the innovation stage to commercialization cycle; and the longer federal investment cycle which begins in basic research and culminates in national economic and job growth along with the increase tax base that in turn is available for investment in basic research.

Council for Chemical Research. 2009. Chemical R&D Powers the U.S. Innovation Engine. Washington, DC. Courtesy of the Council for Chemical Research.

Mapping Science Exhibit – 10 Iterations in 10 years

<http://scimaps.org>

The Power of Maps (2005)



The Power of Reference Systems (2006)



The Power of Forecasts (2007)



Science Maps for Economic Decision Makers (2008)



Science Maps for Science Policy Makers (2009)



Science Maps for Scholars (2010)

Science Maps as Visual Interfaces to Digital Libraries (2011)

Science Maps for Kids (2012)

Science Forecasts (2013)

How to Lie with Science Maps (2014)

Exhibit has been shown in 72 venues on four continents. Currently at
 - NSF, 10th Floor, 4201 Wilson Boulevard, Arlington, VA
 - Marston Science Library, University of Florida, Gainesville, FL
 - Center of Advanced European Studies and Research, Bonn, Germany
 - Science Train, Germany.





Debut of 5th Iteration of Mapping Science Exhibit at MEDIA X was on May 18, 2009 at Wallenberg Hall, Stanford University, <http://mediax.stanford.edu>, <http://scaleindependentthought.typepad.com/photos/scimaps>

Illuminated Diagram Display

W. Bradford Paley, Kevin W. Boyack, Richard Kalvans, and Katy Börner (2007)
Mapping, Illuminating, and Interacting with Science. SIGGRAPH 2007.

Questions:

- Who is doing research on what topic and where?
- What is the 'footprint' of interdisciplinary research fields?
- What impact have scientists?

Contributions:

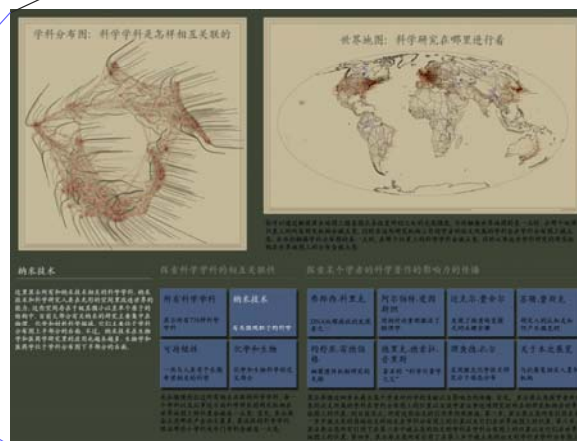
- Interactive, high resolution interface to access and make sense of data about scholarly activity.

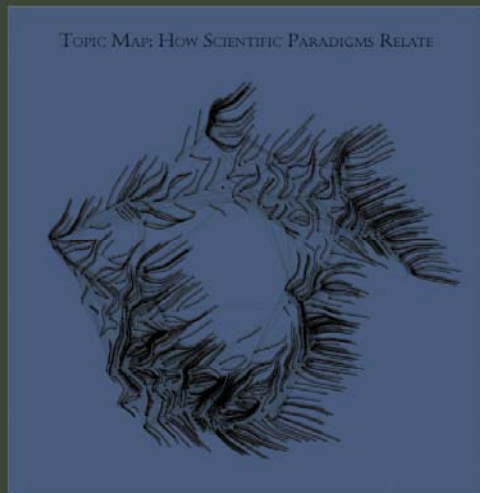


Large-scale, high resolution prints illuminated via projector or screen.



Interactive touch panel.





You may run your finger over each of these maps to control the lighting on the other: touching a place on the world map will light up topics studied in that place; touching a paradigm on the topic map will light up the places that study that topic.

Nanotechnology

This overlay shows the distribution of nanotechnology within the paradigms of science. The majority of current work in nanotechnology takes place in physics, chemistry, and materials science, at the upper right portion of the map. However, an increasing amount of nanotechnology is being applied in the biological and medical sciences, at the lower right.

All Topics <i>Sweep through all 776 scientific paradigms</i>	Nanotechnology <i>Science on the tiny scale of molecules</i>	Francis H. C. CRICK <i>Co-discovered DNA's double helix</i>	Albert EINSTEIN <i>Revitalized physics with Relativity theories</i>	Michael E. FISHER <i>Models critical phase transitions of matter</i>	Susan T. FISKE <i>Connects perception and stereotypes</i>
Sustainability <i>The science behind our long-term hopes</i>	Biology & Chemistry <i>The interface between these two vital fields</i>	Joshua LEDERBERG <i>Pioneer in bacterial genetic mechanisms</i>	Derek J. de Solla PRICE <i>Known as the "Father of Scientometrics"</i>	Richard N. ZARE <i>Uses laser chemistry in molecular dynamics</i>	About this display <i>People & organizations that helped create it</i>

We sweep slowly through adjoining related topics, lighting up the places in the world that study each topic. You may select a subset of the topics that deal with these three interesting subjects by touching it.

A single person's spreading influence is shown as a series of four snapshots. First, we light only topics and places relating to that person's papers—papers that are still highly cited today. The second lights everything that cites that original work. Note that this first-generation impact extends to far more topics than did the original work. The third snapshot lights science that cites the second, and the fourth lights science that cites the third.



Science Maps in "Expedition Zukunft" science train visiting 62 cities in 7 months

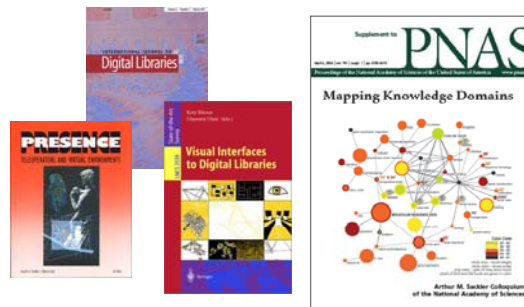
12 coaches, 300 m long

Opening was on April 23rd, 2009 by German Chancellor Merkel

<http://www.expedition-zukunft.de>

Computational Scientometrics References

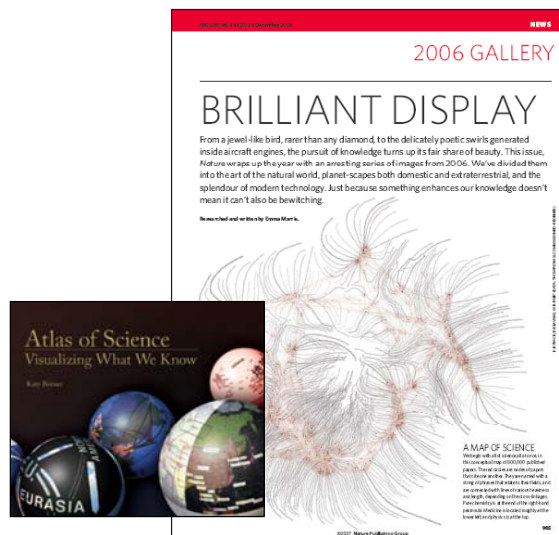
Börner, Katy, Chen, Chaomei, and Boyack, Kevin. (2003). **Visualizing Knowledge Domains**. In Blaise Cronin (Ed.), *ARIST*, Medford, NJ: Information Today, Inc./American Society for Information Science and Technology, Volume 37, Chapter 5, pp. 179-255.
<http://ivl.slis.indiana.edu/km/pub/2003-borner-arist.pdf>



Shiffrin, Richard M. and Börner, Katy (Eds.) (2004). **Mapping Knowledge Domains**. *Proceedings of the National Academy of Sciences of the United States of America*, 101(Suppl_1).
http://www.pnas.org/content/vol101/suppl_1/


Börner, Katy, Sanyal, Soma and Vespignani, Alessandro (2007). **Network Science**. In Blaise Cronin (Ed.), *ARIST*, Information Today, Inc./American Society for Information Science and Technology, Medford, NJ, Volume 41, Chapter 12, pp. 537-607.
<http://ivl.slis.indiana.edu/km/pub/2007-borner-arist.pdf>

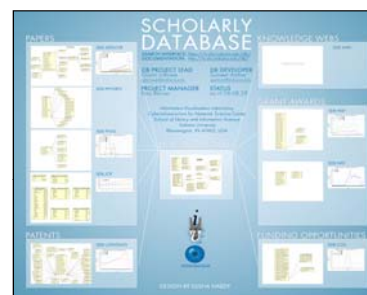
Börner, Katy (2010) *Atlas of Science*. MIT Press.
<http://scimaps.org/atlas>



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Computational Scientometrics Cyberinfrastructures


 **Scholarly Database: 23 million scholarly records**
<http://sdb.slis.indiana.edu>

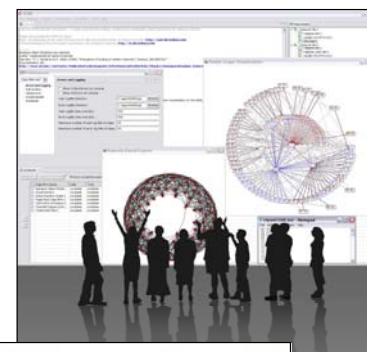


 **VIVO Research Networking**
<http://vivoweb.org>

 **Information Visualization Cyberinfrastructure**
<http://iv.slis.indiana.edu>

 **Network Workbench Tool & Community Wiki**
<http://nwb.slis.indiana.edu>

 **Science of Science (Sci²) Tool and CI Portal**
<http://sci.slis.indiana.edu>



 **Epidemics Cyberinfrastructure**
<http://epic.slis.indiana.edu/>



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Supports federated search of 23 million publication, patent, grant records.
 Results can be downloaded as data dump and (evolving) co-author, paper-citation networks.

SCHOLARLY DATABASE
 Cyberinfrastructure for Network Science Center, SLIS, Indiana University, Bloomington

IU User
 IU users must login using the Central Authentication Service (CAS), the standard IU authentication system. Please click the button below to proceed to the IU login page.

Non-IU User
 Email:
 Password:
 Login

Not Registered Yet?
 Register as an IU User
 Register as a Non IU User

In the News
 Wotfeld, Julia. 2008. *Emerg Theory*. *Nature*, 455, 9: 720-723.

Please Cite As
 La Rosa, Susan, Andrea, Sumesh, Bongson, John, Ha, Weiman and Bömer, Katy. (2007) The Scholarly Database and Its Utility for Scientometric Research. In *Proceedings of the 21th International Conference on Scientometrics and Informetrics*, Madrid, Spain, June 28-27-2007, pp. 497-502.
<http://sdb.slis.indiana.edu/~kay/paper%20sdb.pdf>

Acknowledgements
 The Scholarly Database is funded by the School of Library and Information Science and the Cyberinfrastructure for Network Science center at Indiana University, the National Science Foundation under Grants No. IRI-0338293 and IRI-0518450, and a James B. McDonnell Foundation grant in area Studying Complex Systems.

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

INDIANA UNIVERSITY
 SCHOOL OF LIBRARY AND INFORMATION SCIENCE

James B. McDonnell Foundation

SCHOLARLY DATABASE
 Cyberinfrastructure for Network Science Center, SLIS, Indiana University, Bloomington

Search Edit Profile Admin About Logout

Search
 If multiple terms are entered in a field, they are automatically combined using OR. So, "breast cancer" matches any record with "breast" or "cancer" in that field.
 You can put AND between terms to combine with AND. Thus "breast AND cancer" would only match records that contain both terms.
 Double quotation can be used to match compound terms, e.g. "breast cancer" returns records with the phrase "breast cancer", and not records where "breast" and "cancer" are both present, but not the exact phrase.
 The importance of a particular term in a query can be increased by putting a * and a number after the term. For instance, "breast cancer" *10 would increase the importance of matching the term "cancer" to ten compared to matching the term "breast".

Creators:
 Title:
 Abstract:
 Full Text:
 First Year: 1899
 Last Year: 2009

Medline (1989 - 2009)
 ISI (1981 - 2002)
 ISI (1981 - 2000)
 USPTO (1976 - 2007)

Search

Register for free access at <http://sdb.slis.indiana.edu>

Scholarly Database :: Results - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://sdb.slis.indiana.edu/search/results?q="artificial intelligence"

Most Visited Getting Started Latest Headlines Hotel Königshof - Bod...

SCHOLARLY DATABASE
 Cyberinfrastructure for Network Science Center, SLIS, Indiana University, Bloomington

Search Edit Profile Admin About Logout

Browse Results

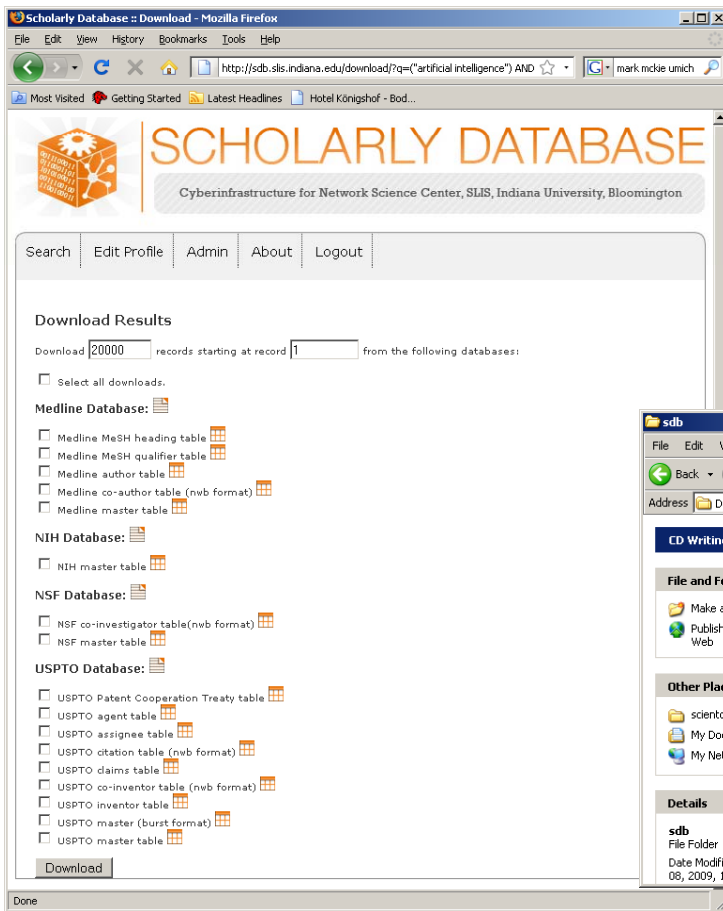
Your search returned 13,231 results in 0.295 seconds. [Download](#)

Total results per database: NIH: 2,103, Medline: 10,235, USPTO: 279, NSF: 614.

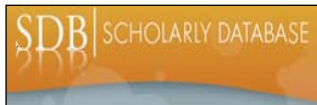
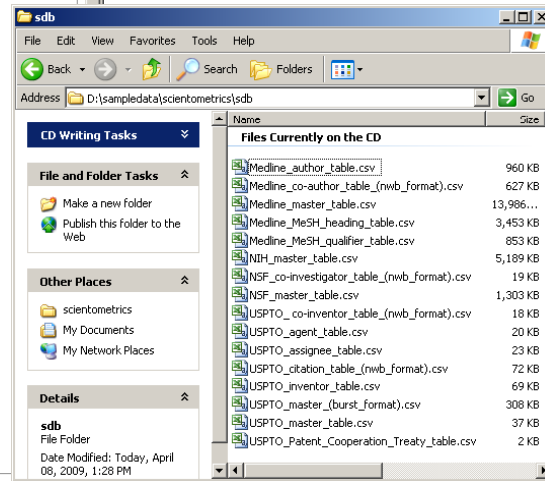
Results 1 through 20.

Next >>

Source	Authors/Creators	Year	Title	Score (out of 5.71)
Medline	LaCombe	1987	Artificial intelligence.	5.71
Medline		1989	Artificial intelligence: expert systems.	5.71
Medline	Schmitt	1990	[Artificial intelligence in dentistry]	5.71
Medline	Adlassnig and Adlassnig	2002	Artificial-intelligence-augmented systems.	5.60
Medline	Touretzky	1980	Artificial intelligence.	4.86
Medline	Goldenberg	1980	Artificial intelligence.	4.86



Since March 2009:
 Users can download networks:
 - Co-author
 - Co-investigator
 - Co-inventor
 - Patent citation
 and tables for
 burst analysis in NWB.

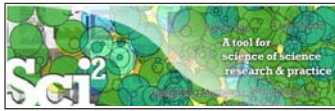


Scholarly Database: # Records, Years Covered

Datasets available via the Scholarly Database (* internally)

Dataset	# Records	Years Covered	Updated	Restricted Access
Medline	17,764,826	1898-2008	Yes	
PhysRev	398,005	1893-2006		Yes
PNAS	16,167	1997-2002		Yes
JCR	59,078	1974, 1979, 1984, 1989 1994-2004		Yes
USPTO	3, 875,694	1976-2008	Yes*	
NSF	174,835	1985-2004	Yes*	
NIH	1,043,804	1961-2002	Yes*	
Total	23,167,642	1893-2006	4	3

Aim for comprehensive time, geospatial, and topic coverage.



Mapping the Field of RNAi Research (SDB Data) (section 5.2.7)

RNAi	
Time frame:	1865-2008
Region(s):	Miscellaneous
Topical Area(s):	RNAi
Analysis Type(s):	Co-Author Network, Patent-Citation Network, Burst Detection

How many papers, patents, and funding awards exist on a specific topic?

Here we selected research on RNA interference (RNAi) is a system within living cells that helps to control which genes are active and how active they are.

The data for this analysis comes from a search of the Scholarly Database (SDB) (<http://sdb.slis.indiana.edu/>) for “RNAi” in “All Text” from MEDLINE, NSF, NIH and USPTO. A copy of this data is available in ‘*yoursci2directory*/sampledata/scientometrics/sdb/RNAi’. The default export format is .csv, which can be loaded in the Sci2 Tool directly.

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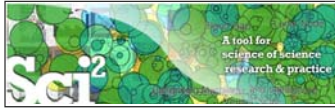


Mapping the Field of RNAi Research (SDB Data) (section 5.2.7)

Email: mwb@indiana.edu
Password: mwb

The **Scholarly Database** at Indiana University provides free access to 23,000,000 papers, patents, and grants. Since March 2009, users can also download networks, e.g., co-author, co-investigator, co-inventor, patent citation, and tables for burst analysis. For more information and to register, visit <http://sdb.slis.indiana.edu>.

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Mapping the Field of RNAi Research (SDB Data)

(section 5.2.7)

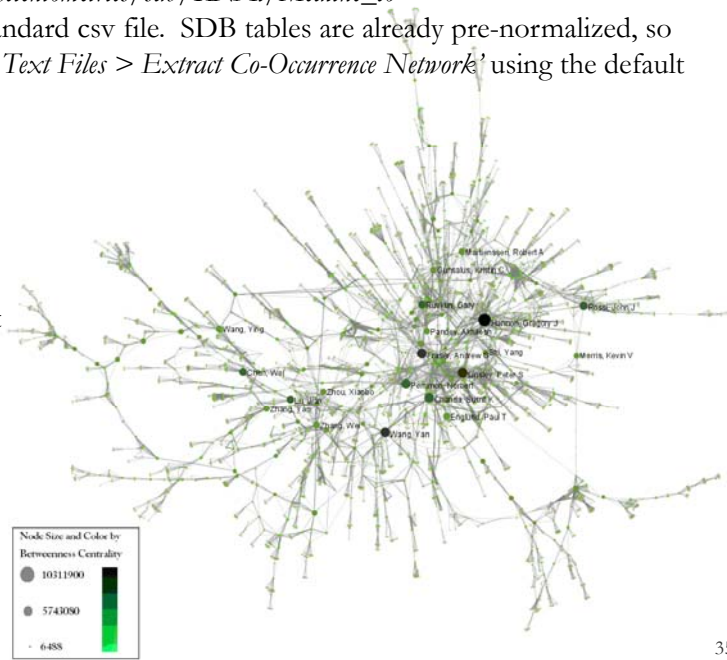
Co-Author Network

Load `*yoursci2directory*/sampledata/scientometrics/sdb/RNAi/Medline_co-author_table_(nwb_format).csv` as a standard csv file. SDB tables are already pre-normalized, so now simply run `Data Preparation > Text Files > Extract Co-Occurrence Network` using the default parameters.

Network Analysis Toolkit (NAT):
21,578 nodes with 131 isolates,
77,739 edges.

Extract only the largest component by running `Analysis > Networks > Unweighted and Undirected > Weak Component Clustering`.

Visualize with *GUESS* using `Layout > GEM`.
Use a custom python script to color and size the network.



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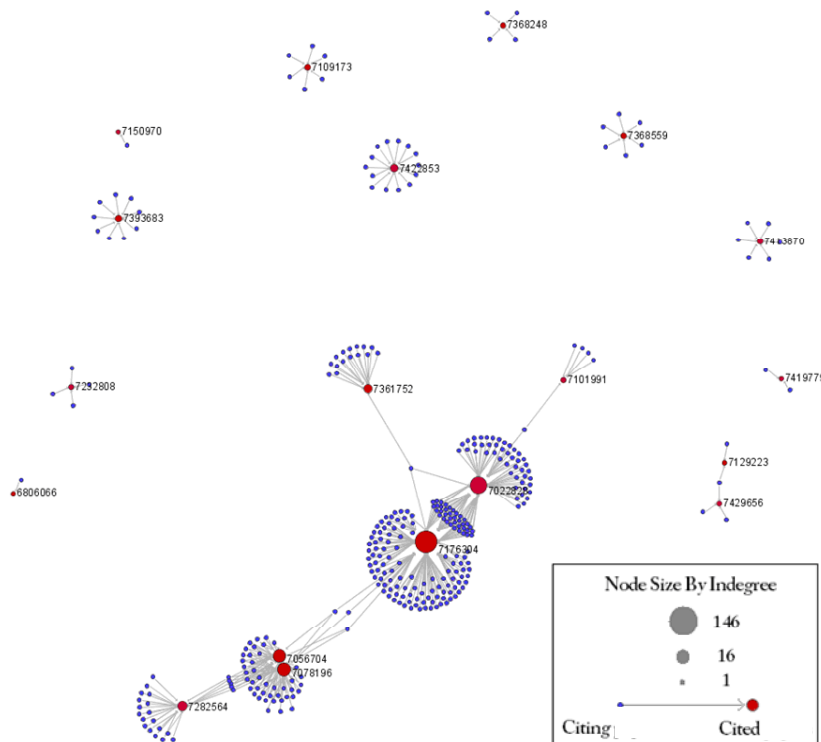


Mapping the Field of RNAi Research (SDB Data)

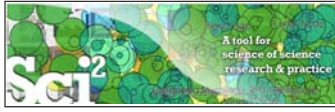
(section 5.2.7)

Patent Citation Network

To visualize the citation patterns of patents on RNAi, load `*yoursci2directory*/sampledata/scientometrics/sdb/RNAi/USPTO_citation_table_(nwb_format).csv` as a standard csv file and follow the instructions in the tutorial.



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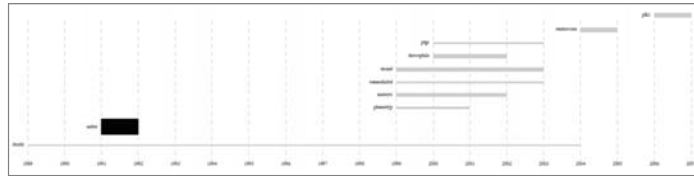
Mapping the Field of RNAi Research (SDB Data) (section 5.2.7)

Topic Bursts

Load `*yoursci2directory*/sampledat/scientometrics/sdb/RNAi/Medline_master_table.csv`. This table includes full records of MEDLINE papers, and can be used to find bursting terms from MEDLINE abstracts dealing with RNAi.

Load the file as a standard csv and run *Preprocessing > Topical > Normalize Text* with the default separator and the “abstract” box checked. Run *Analysis > Topical > Burst Detection* with “date_cr_year” in the Date Column and “abstract” in the Text Column, leaving the rest of the values default.

Right click on “Burst detection analysis (date_cr_year, abstract): maximum burst level 1” in the Data Manager and view the file. There are more words than can easily be viewed with the horizontal bar graph, so sort the list by “Strength” and prune all but the strongest 10 words. Save the file as a new .csv and load it into the Sci2 Tool as a standard csv file. Select the new table in the data manager and visualize it using *Visualize > Temporal > Horizontal Bar Graph*.



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Sci² Tool
A tool for science of science research & practice

Email Address

Password

Login

Forgot your password?
To recover your account password, please visit our [password recovery page](#).

Not registered yet?
[Register now](#)

Tutorials

Scott Weingart, Hanming Guo, Katy Börner, Kevin W. Boyack, Micah W. Linnemeier, Russell J. Duhon, Patrick A. Phillips, Chintan Tank, and Joseph Biberstine (2010) *Science of Science (Sci2) Tool User Manual*. Cyberinfrastructure for Network Science Center, School of Library and Information Science, Indiana University, Bloomington.

Katy Börner (2010) *Science of Science Research and Tools (12 Tutorials)*. Reporting Branch, Office of Extramural Research/Office of the Director, National Institutes of Health, Bethesda, MD.

- Tutorial #01: [Science of Science Research](#)
- Tutorial #02: [Network Science / Information Visualization](#)
- Tutorial #03: [CIShell Powered Tools: Network Workbench and Science of Science Tool](#)
- Tutorial #04: [Temporal Analysis—Burst Detection](#)
- Tutorial #05: [Geospatial Analysis and Mapping](#)
- Tutorial #06: [Topical Analysis & Mapping](#)
- Tutorial #07: [Tree Analysis and Visualization](#)
- Tutorial #08: [Network Analysis and Visualization](#)
- Tutorial #09: [Large Network Analysis and Visualization](#)
- Tutorial #10: Using the Scholarly Database at IU
- Tutorial #11: VIVO National Researcher Networking
- Tutorial #12: Future Developments

<http://sci.slis.indiana.edu/sci2>

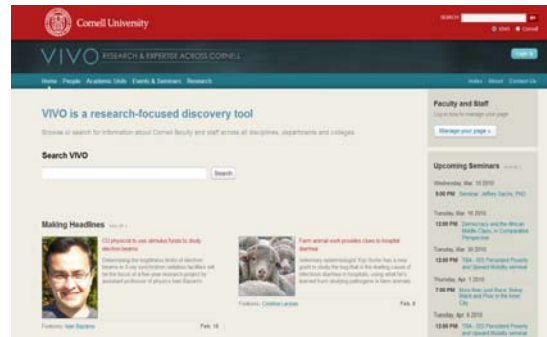
38

VIVO: A Semantic Approach to Creating a National Network of Researchers (<http://vivoweb.org>)

- Semantic web application and ontology editor originally developed at Cornell U.
- Integrates research and scholarship info from systems of record across institution(s).
- Facilitates research discovery and cross-disciplinary collaboration.

Soon:

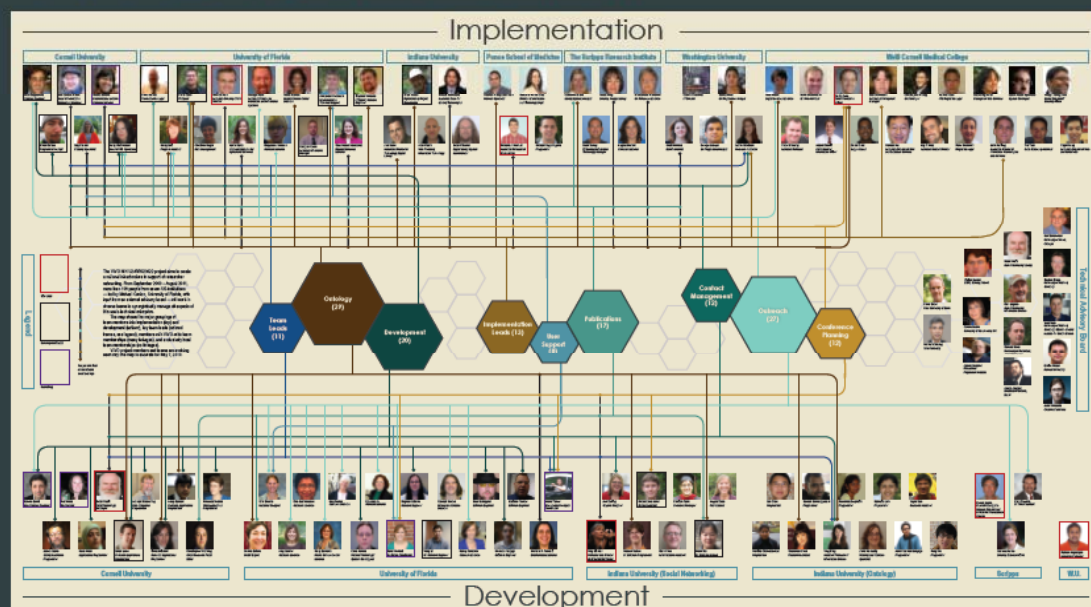
- Simplify reporting tasks, e.g., generate biosketch, department report.



Cornell University: Dean Krafft (Cornell PI), Manolo Bevia, Jim Blake, Nick Cappadona, Brian Caruso, Jon Corson-Rikert, Elly Cramer, Medha Devare, John Ferreira, Brian Lowe, Stella Mitchell, Holly Mistlebauer, Anup Sawant, Christopher Westling, Rebecca Younes. **University of Florida (VIVO and UF PI):** Cecilia Botero, Kerry Britt, Erin Brooks, Amy Buhler, Ellie Bushhausen, Chris Case, Valrie Davis, Nita Ferree, Chris Haines, Rae Jesano, Margeaux Johnson, Sara Kreinest, Yang Li, Paula Markes, Sara Russell Gonzalez, Alexander Rockwell, Nancy Schaefer, Michele R. Tennant, George Hack, Chris Barnes, Narayan Raum, Brenda Stevens, Alicia Turner, Stephen Williams. **Indiana University:** Katy Borner (IU PI), William Barnett, Shanshan Chen, Ying Ding, Russell Duhon, Jon Dunn, Micah Linnemeier, Nianli Ma, Robert McDonald, Barbara Ann O'Leary, Mark Price, Yuyin Sun, Alan Walsh, Brian Wheeler, Angela Zoss. **Ponce School of Medicine:** Richard Noel (Ponce PI), Ricardo Espada, Damaris Torres. **The Scripps Research Institute:** Gerald Joyce (Scripps PI), Greg Dunlap, Catherine Dunn, Brant Kelley, Paula King, Angela Murrell, Barbara Noble, Cary Thomas, Michaelen Trimarchi. **Washington University, St. Louis:** Rakesh Nagarajan (WUSTL PI), Kristi L. Holmes, Sunita B. Koul, Leslie D. McIntosh. **Weill Cornell Medical College:** Curtis Cole (Weill PI), Paul Albert, Victor Brodsky, Adam Cheriff, Oscar Cruz, Dan Dickinson, Chris Huang, Itay Klaz, Peter Michelini, Grace Migliorisi, John Ruffing, Jason Specland, Tru Tran, Jesse Turner, Vinay Varughese.

VIVO Enabling National Networking of Scientists

Project Members and Teams



VIVO Users and Needs

- Faculty/Researchers
 - Customize profile created via feeds; find potential collaborators, “people like me”; discovery via high search rankings; info on activity of colleagues...
- Students
 - Create profiles; easily find mentors + collaborators; locate facilities, events, funding opportunities...
- Administrators
 - Quickly find cross-disciplinary expertise (research area; geography); centralize public data from diverse sources; easily repurpose information for consumers; improve faculty collaboration within or across departments and institutions...
- Funding, donor, legislative agencies
 - Discover projects, grants, expertise (e.g. for review panels; targets for funding)...
- General public
 - Find expertise, learn about research in a region/institution...

VIVO Web Pages

The screenshot shows the VIVO web interface for Cornell University's College of Agriculture and Life Sciences. The page includes a search bar, navigation links, and a 'Welcome to CALS Research' section. The news items listed are:

- Chinese delegation visits campus to reclaim historic fungi collection after 70-year Cornell stewardship | [Cornell Chronicle feature](#) | [CALR 2009 Chronicle feature](#)
After years of careful stewardship by Cornell scientists, a collection of more than 2,000 species of native Chinese fungi, spirited out of the country for safety before World War II, is finally set to make its way home.
- Durrant honored by inclusion in institute's portrait gallery | [Cornell Chronicle feature](#) | [CALR 2009 Chronicle feature](#)
Richard Durrant has been selected for inclusion in the National Institute of Standards and Technology Portrait Gallery, which honors distinguished National Bureau of Standards (NBS/NIST) alumni for "outstanding career contributions to the work of NBS/NIST."
- In face of competition, male fruit flies change to gain reproductive edge | [Cornell Chronicle feature](#) | [CALR 2009 Chronicle feature](#)
A study by researchers from Cornell, University of East Anglia and University College London found that when male fruit flies sense competition during mating, they pack more proteins into their seminal fluid, boosting their reproductive success.
- CU study: Poverty can physically impair brain, reducing children's ability to learn | [Cornell Chronicle feature](#) | [CALR 2009 Chronicle feature](#)
Chronic stress from growing up in poverty can physiologically impact children's brains, impairing their working memory and diminishing their ability to develop language, reading and problem-solving skills, reports a new Cornell study.

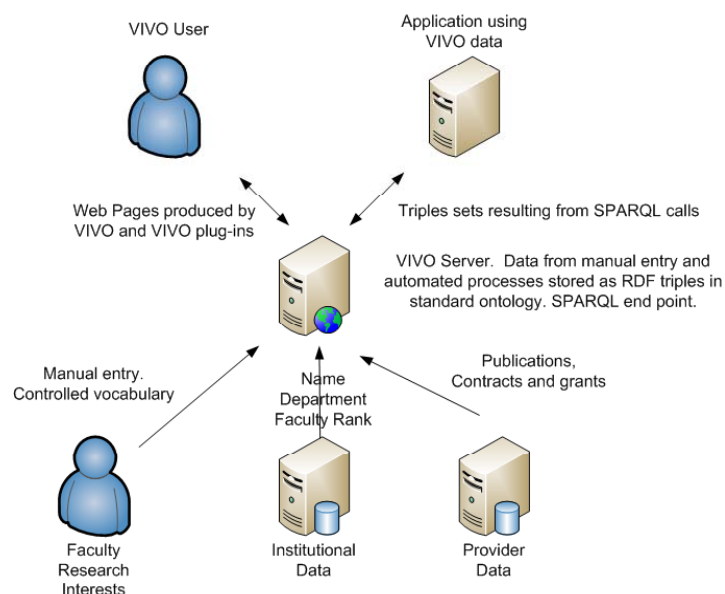
© 2008 Life Sciences Cornell University Ithaca, NY 14853
<http://research.cals.cornell.edu> Site Feedback

VIVO Data Providers & Users

- Eagle-i (“enabling resource discovery” U24 award)
- Federal agencies – NIH (NIH RePORTER), NSF, USDA, ...
- Search Providers – Google, Bing, Yahoo, ...
- Professional Societies – AAAS, ...
- Publishers/vendors – PubMed, Elsevier, Collexis, ISI...
- Semantic Web community – DERI, ...
- Consortia of schools – SURA, CTSA...
- Producers, consumers of semantic web-compliant data

Institutional Architecture

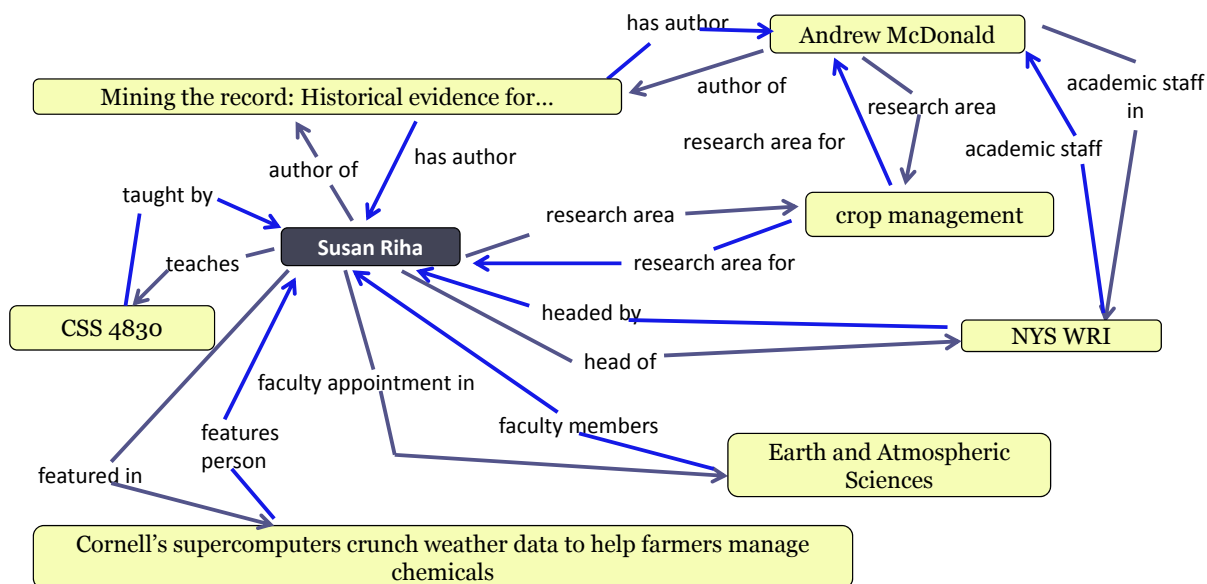
- Three sources of VIVO information
 - User data
 - Institutional data
 - Provider data
- Two formats for output
 - Web Pages for users
 - Resource Description Framework for applications



Data Representation using RDF Triples

Detailed relationships for a researcher at Cornell U.

Open source code (BSD) and ontology available at <http://vivoweb.org>.



VIVO & Linked Open Data

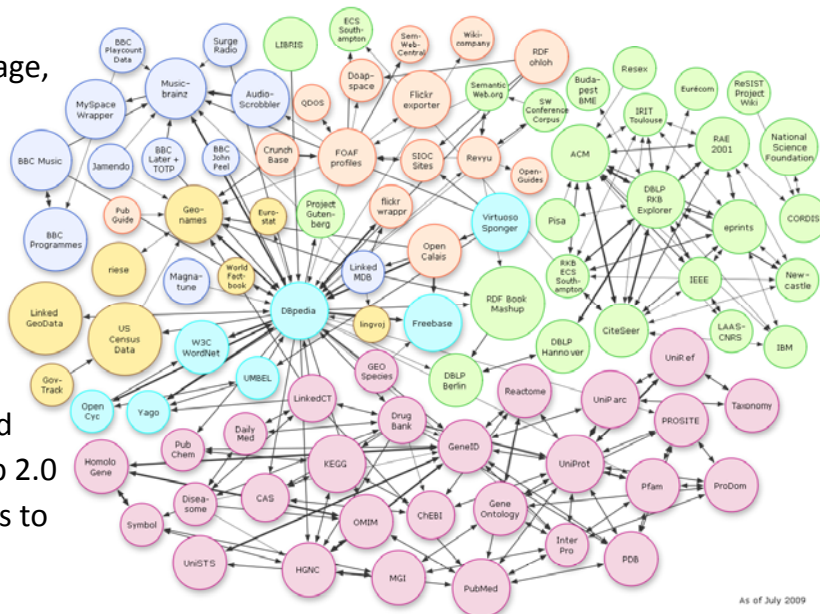
2010 National VIVO Conference August 12&13, NYC

<http://conferences.dce.ufl.edu/vivo>

VIVO makes high coverage,
high quality data from
systems of record

- available online
- for free, and
- in machine readable format.

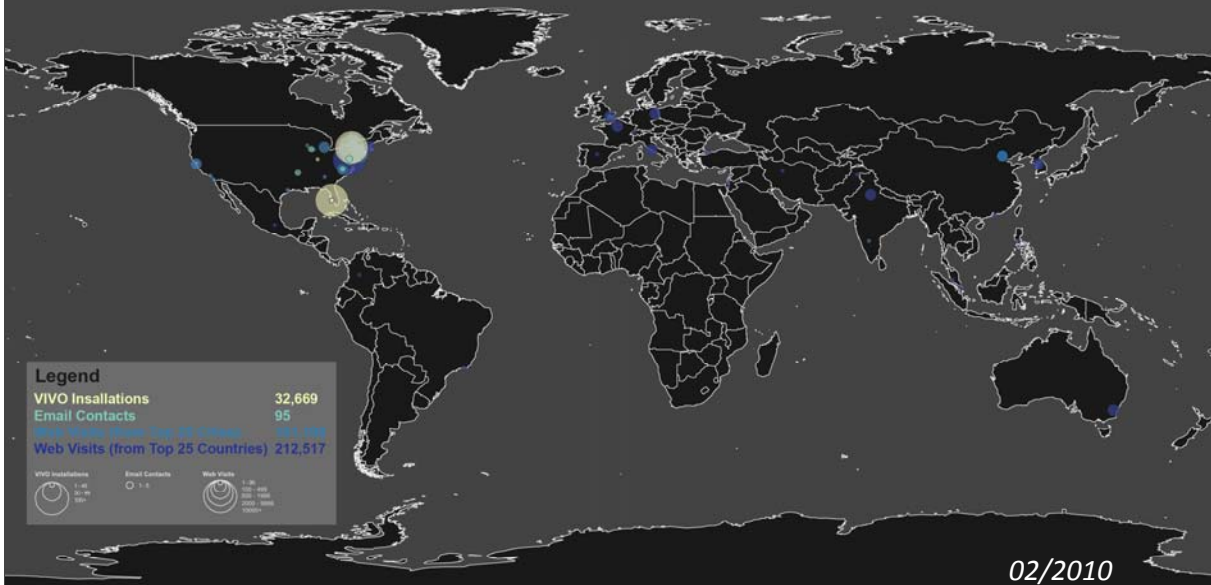
VIVO ontology is aligned
with many existing Web 2.0
and scholarly ontologies to
ease interoperability.



As of July 2009

<http://www4.wiwiw.fu-berlin.de/bizer/pub/lod-datasets> 2009-07-14 colored.png

VIVO Enabling National Networking of Scientists



Visualization created by: Katy Börner (concept), Jeni Coffey (design), Kaveh Ekbia (ArcGIS) and Justin Peters (ArcGIS).

The National Research Network: VIVO: Enabling National Networking of Scientists NIH U24RR029822

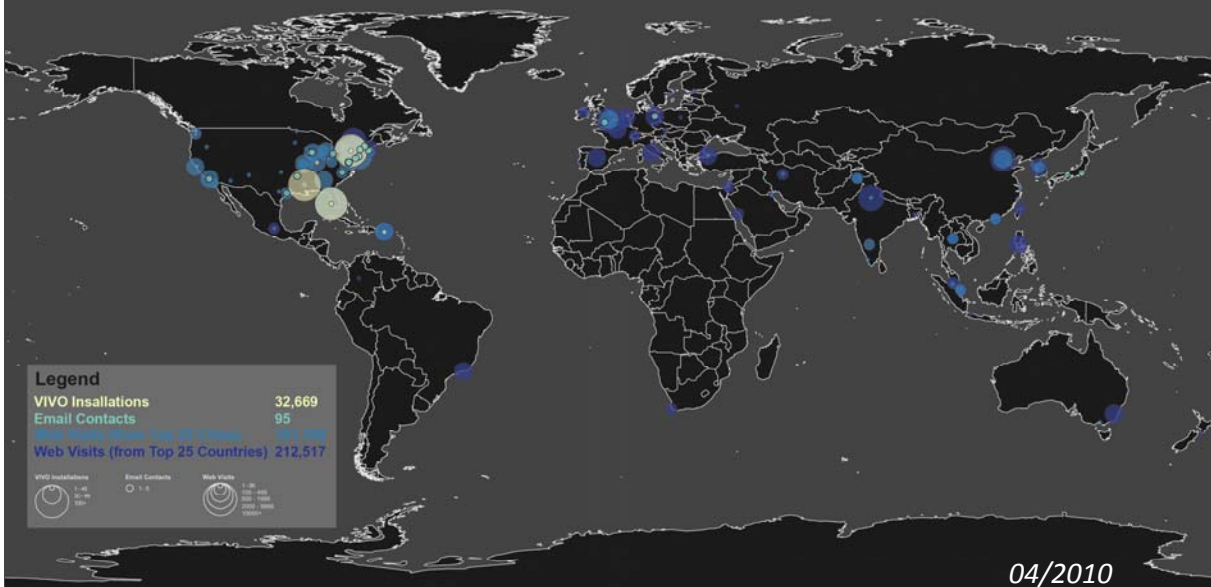
Start: Sept 2009

PI: Michael Conlon, University of Florida

Award amount: \$12,300,000

DRAFT

VIVO Enabling National Networking of Scientists



Visualization created by: Katy Börner (concept), Jeni Coffey (design), Kaveh Ekbia (ArcGIS) and Justin Peters (ArcGIS).

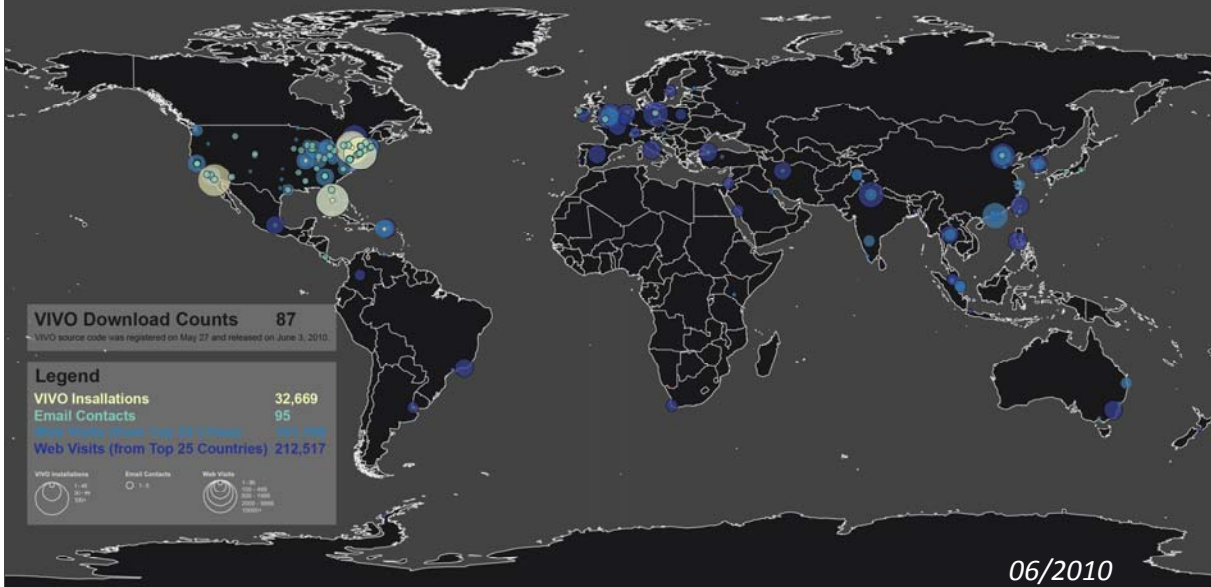
Shown are the number of people profiles in the 7 different installation sites.

Email contacts by data and service providers as well as institutions interested to adopt VIVO.

The number of visitors on <http://vivoweb.org>

DRAFT

VIVO Enabling National Networking of Scientists



Visualization created by: Katy Börner (concept), Jeni Coffey (design), Kaveh Ekbia (ArcGIS) and Justin Peters (ArcGIS).

VIVO 1.0 source code was publicly released on April 14, 2010

87 Downloads by June 11, 2010

The more institutions adopt VIVO, the more high quality data will be available to understand, navigate, manage, utilize, and communicate progress in science and technology.

DRAFT

cyberinfrastructure for NETWORK SCIENCE CENTER
School of Library and Information Science | Indiana University Bloomington

Research
People
Events
Jobs
Contact
News
Teaching
Outreach
Funding
Cyberinfrastructures

All papers, maps, cyberinfrastructures, talks, press are linked from <http://cns.slis.indiana.edu>