

Science of Science Maps, Tools, and Research



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, Kevin W. Boyack, the Mapping Science exhibit advisory board, and the VIVO Consortium

*National Academy of Sciences, Washington, DC
August 22, 2011*



Take terra bytes of data

- > 1 million ISI publications/year
- > 10 billion triples in the Linked Open Data cloud

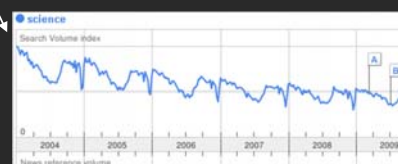
Black
Box



Find your way



Find collaborators, friends



Identify trends



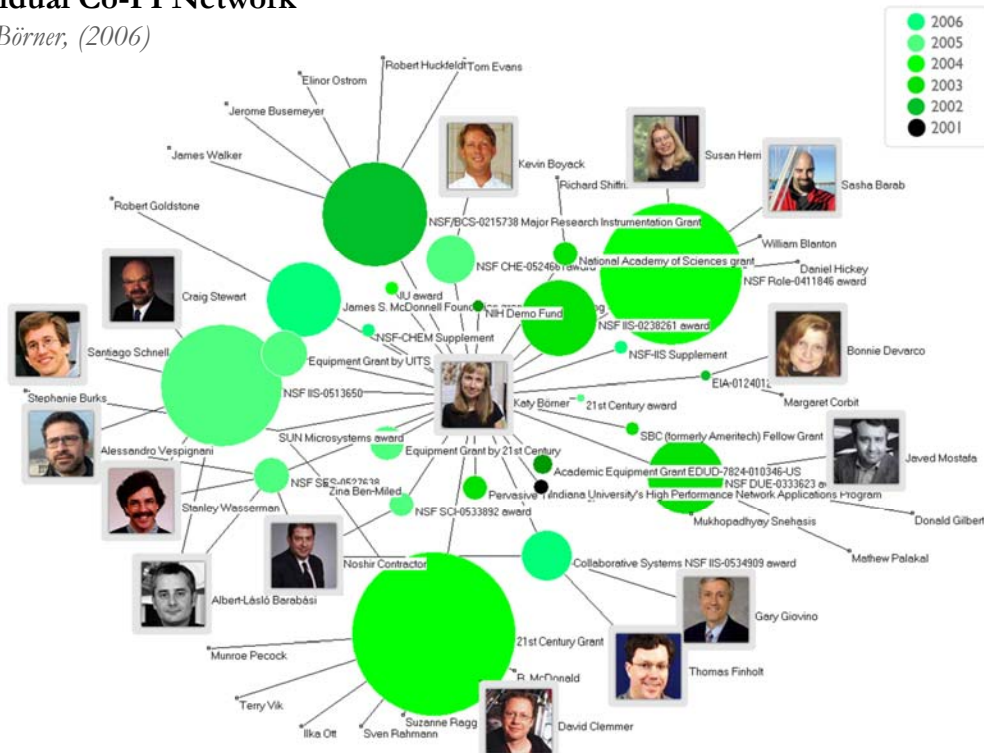
Type of Analysis vs. Level of Analysis

	<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 sci
Temporal Analysis (When)	Funding portfolio of one individual	Research bursts of PNAS	113 Years of P Research
Geospatial Analysis (Where)	Career trajectory of one individual	Mapping a s intellectual l	PNAS
Topical Analysis (What)		research	VxOrd/Topic r NIH funding
Network Analysis (With Whom?)	NSI network of one	Network	NIH's network

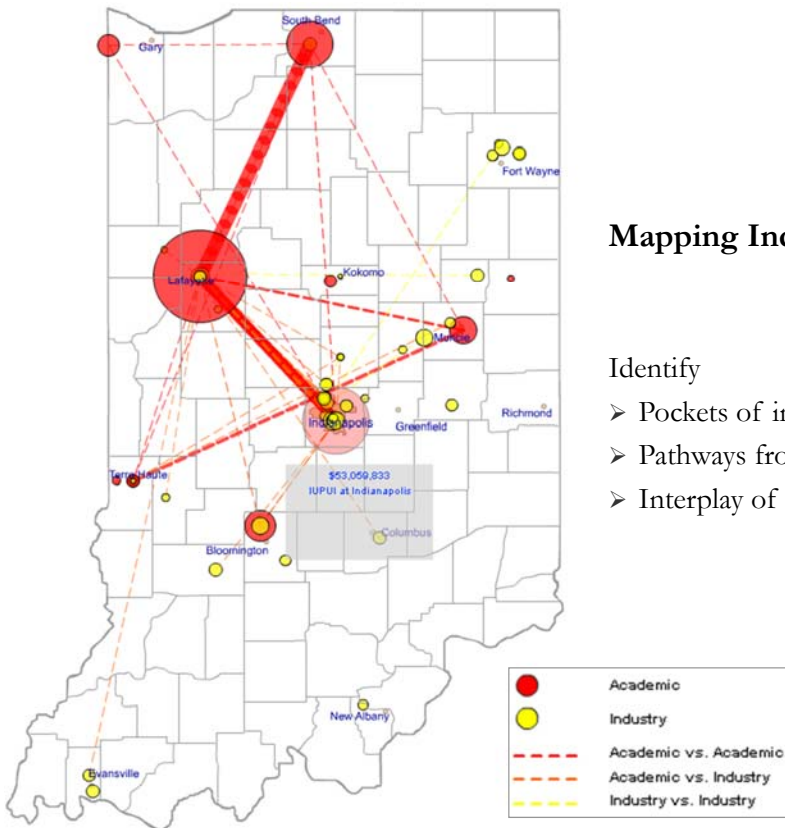
3

Individual Co-PI Network

Ke & Börner, (2006)



4



Mapping Indiana's Intellectual Space

Identify

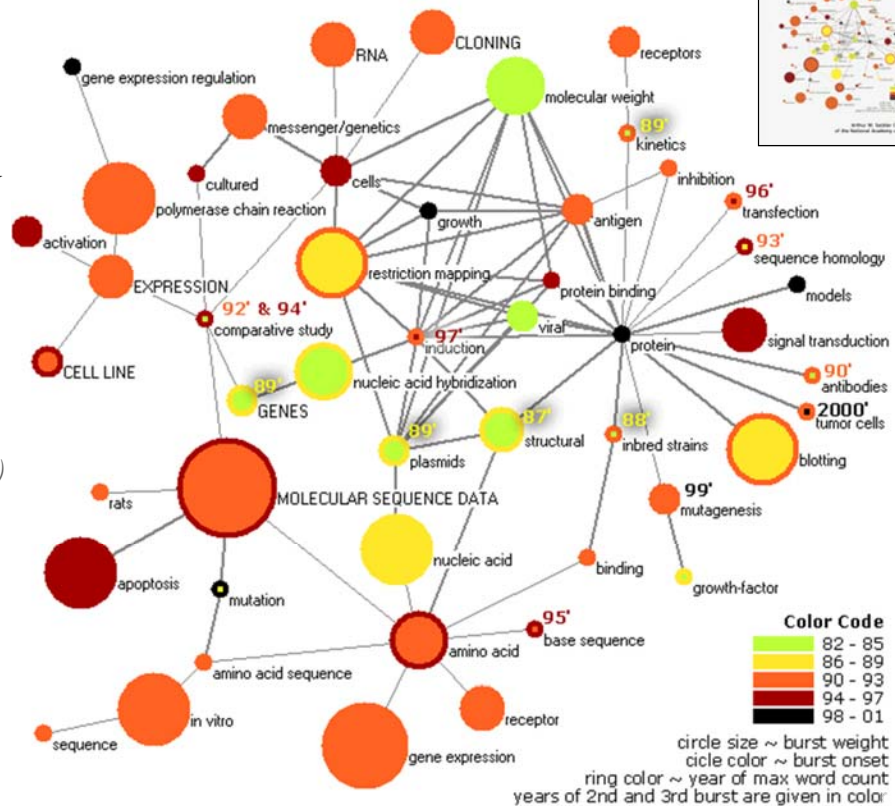
- Pockets of innovation
- Pathways from ideas to products
- Interplay of industry and academia

5

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.



6

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

Börner, Katy, Penumarty, 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.



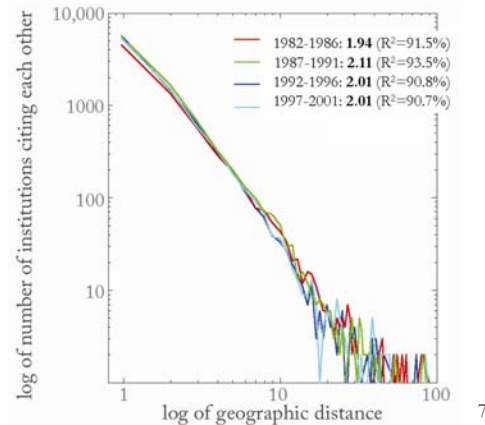
Research questions:

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.

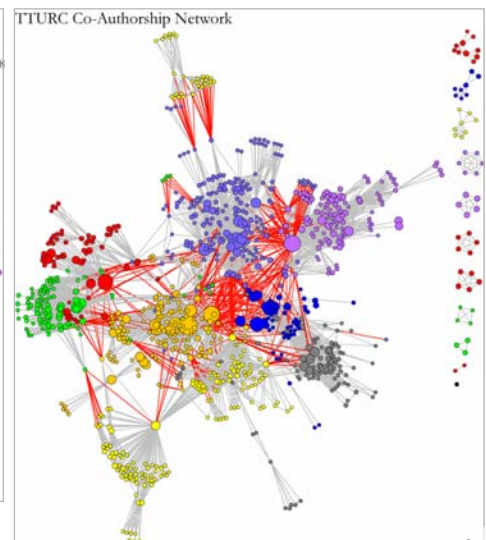
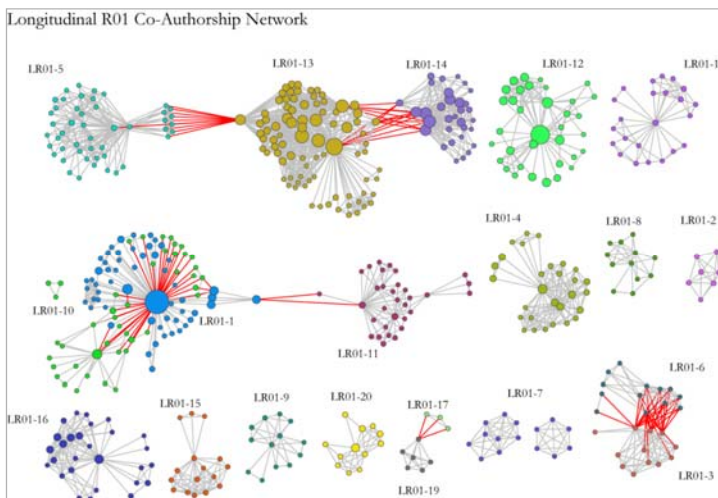
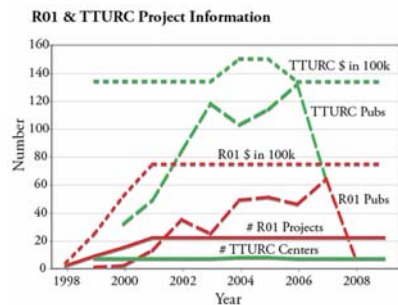


Mapping Transdisciplinary Tobacco Use Research Centers Publications

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

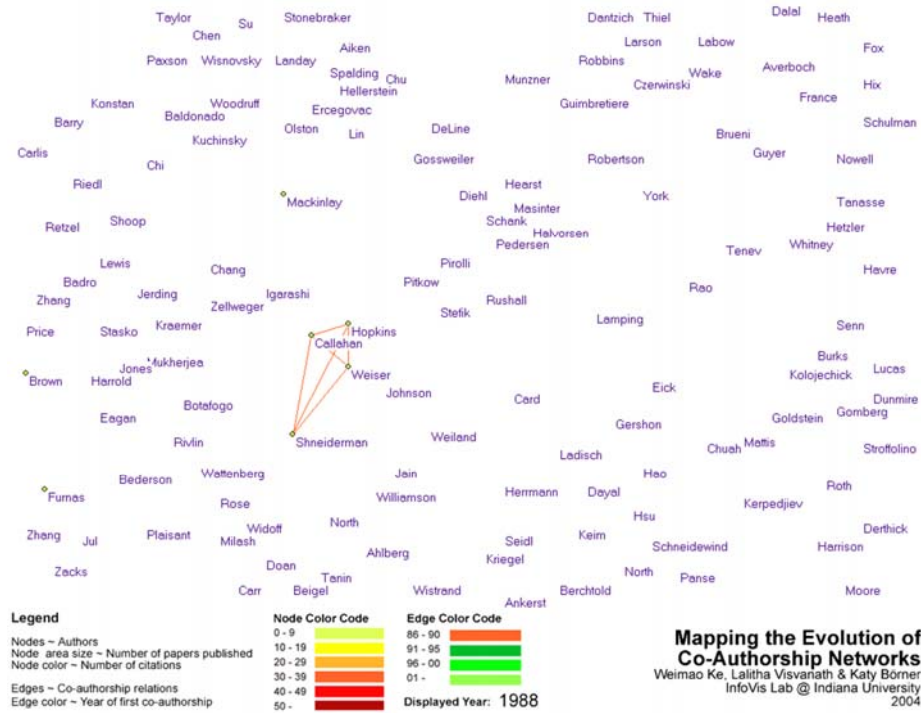
Zoss & Börner, forthcoming.

Supported by NIH/NCI Contract HHSN261200800812



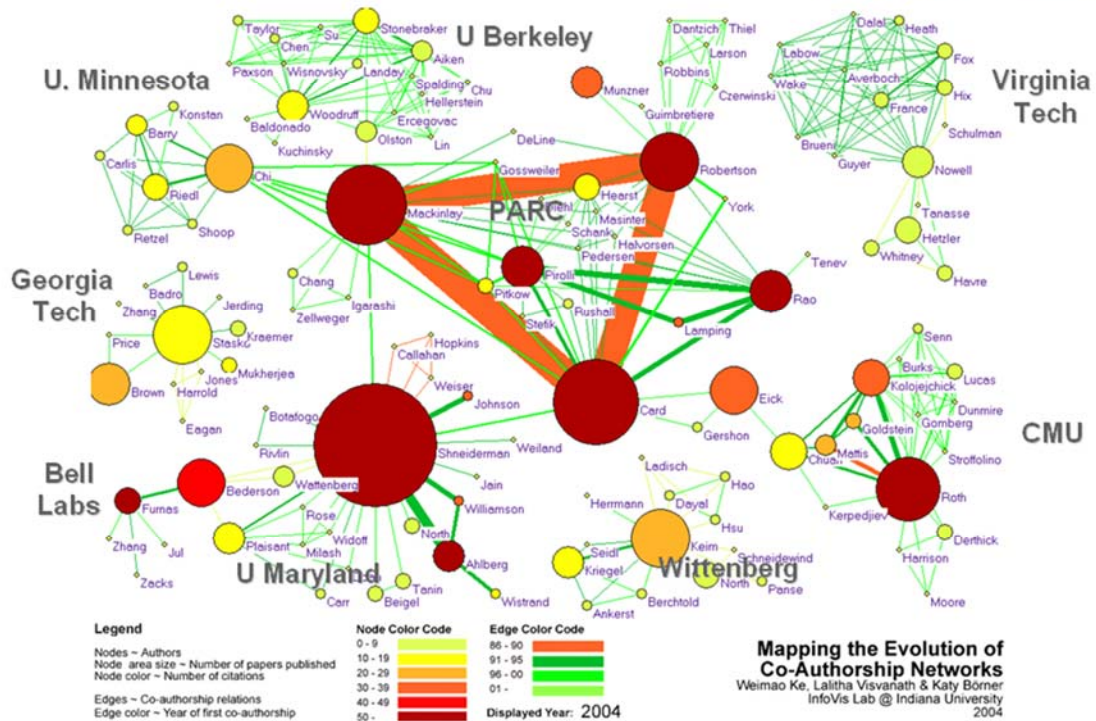
Mapping the Evolution of Co-Authorship Networks

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



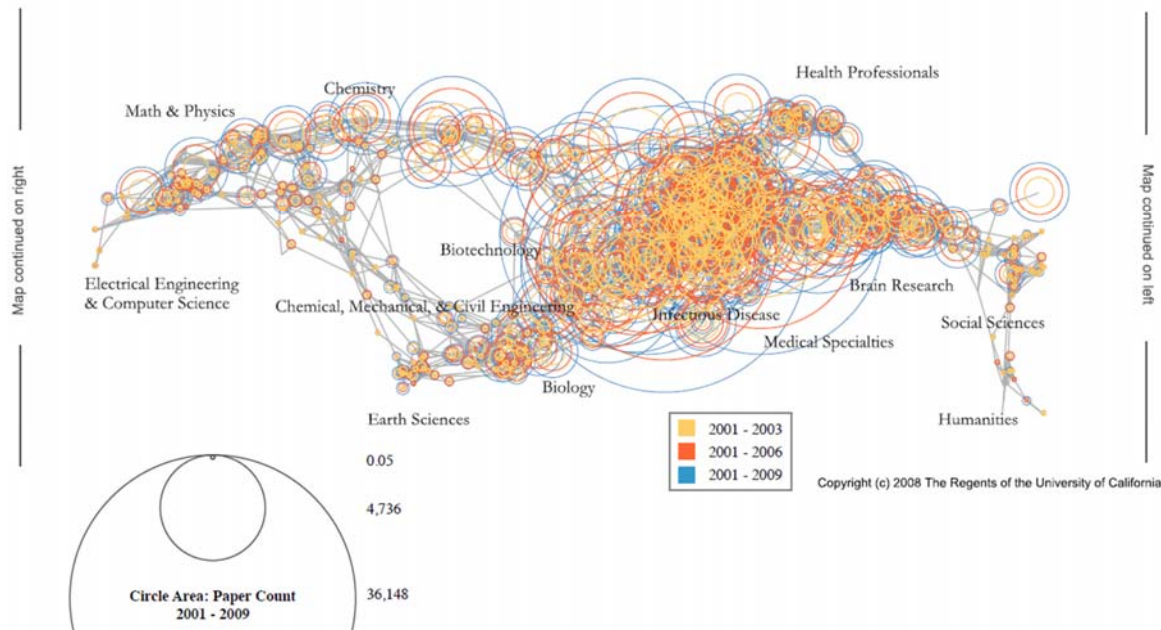
Mapping the Evolution of Co-Authorship Networks

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



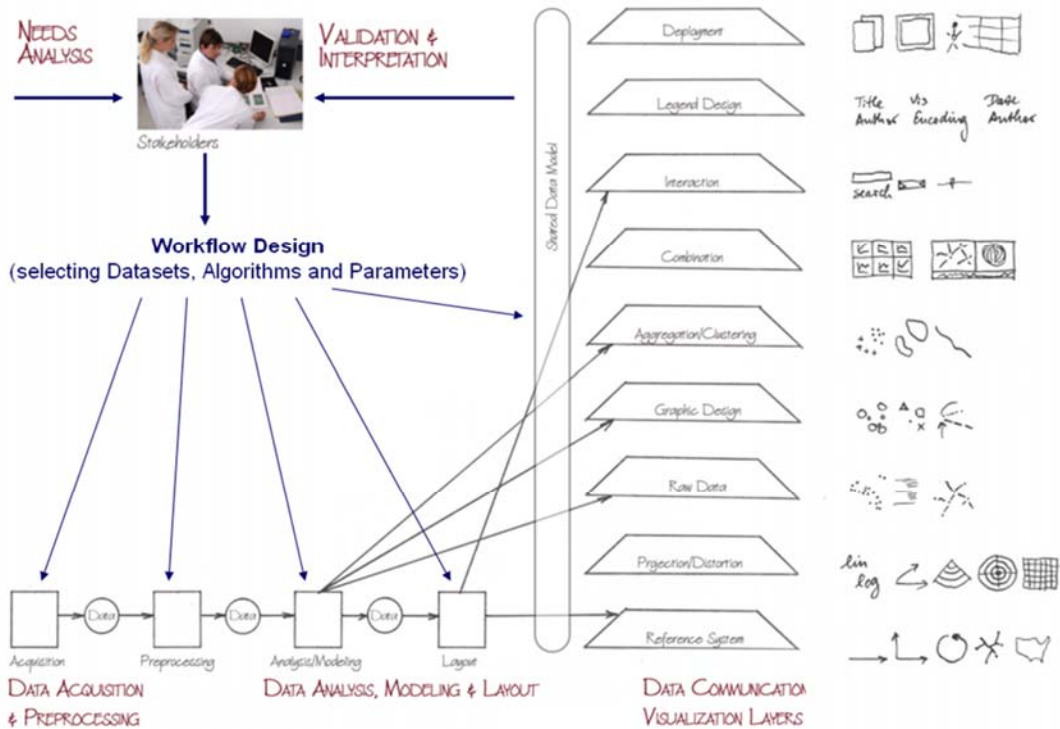
MEDLINE Publication Output by The National Institutes of Health (NIH) Using Nine Years of ExPORTER Data

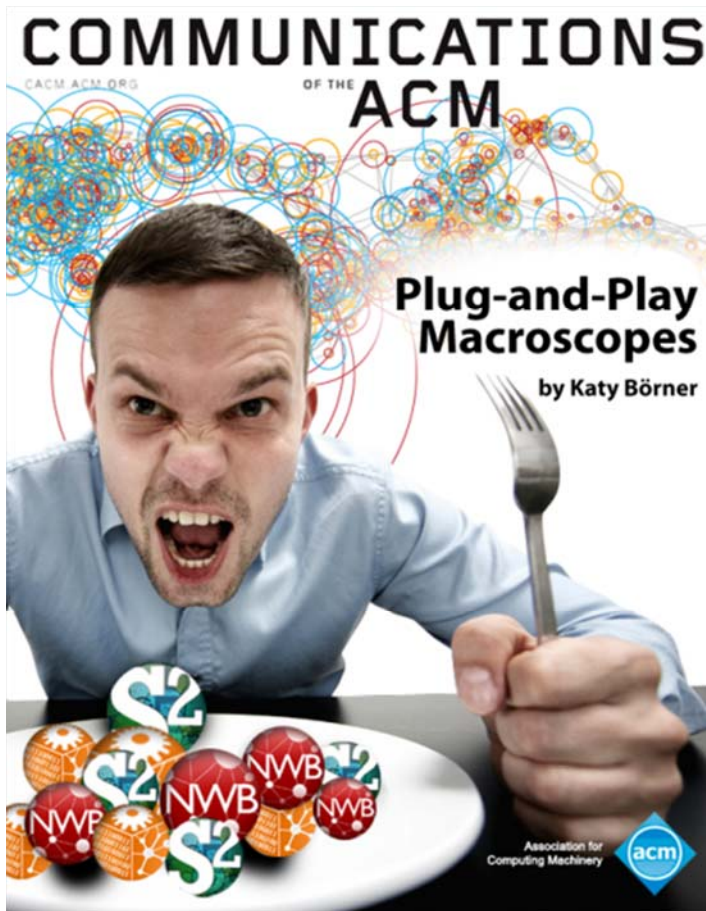
Katy Börner, Nianli Ma, Joseph R. Biberstine, Cyberinfrastructure for Network Science Center, SLIS, Indiana University, Robin M. Wagner, Rediet Berhane, Hong Jiang, Susan E. Ivey, Katrina Pearson and Carl McCabe, Reporting Branch, Division of Information Services, Office of Research Information Systems, Office of Extramural Research, Office of the Director, National Institutes of Health (NIH), Bethesda, MD.



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Needs-Driven Workflow Design using a modular data acquisition/analysis/ modeling/ visualization pipeline as well as modular visualization layers.





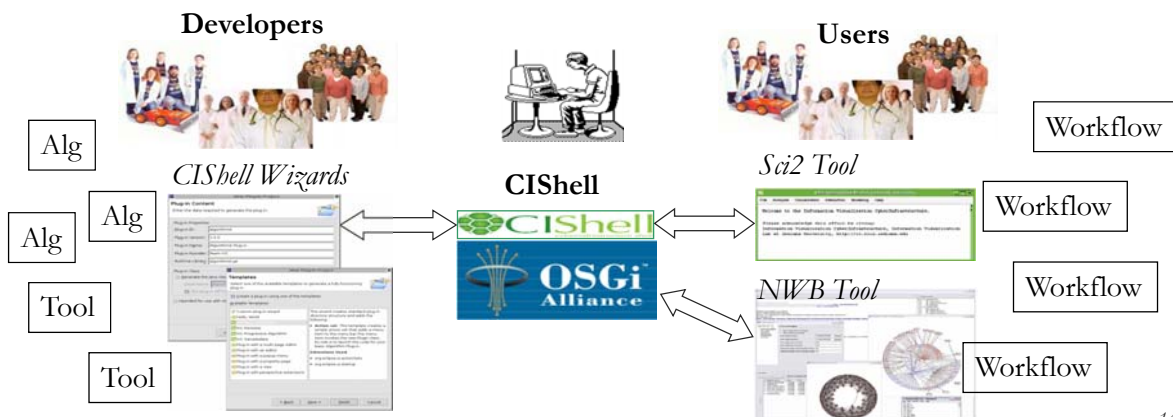
Börner, Katy. (March 2011). Plug-and-Play Macroscopes. *Communications of the ACM*, 54(3), 60-69.

Video and paper are at <http://www.scivee.tv/node/27704>



OSGi & CIShell

- CIShell (<http://cishell.org>) is an open source software specification for the integration and utilization of datasets, algorithms, and tools.
- It extends the Open Services Gateway Initiative (OSGi) (<http://osgi.org>), a standardized, component oriented, computing environment for networked services widely used in industry since more than 10 years.
- Specifically, CIShell provides “sockets” into which existing and new datasets, algorithms, and tools can be plugged using a wizard-driven process.





CIShell Developer Guide

(<http://cishell.wiki.cns.iu.edu>)



Edit Add ▾

1 Added by [Micah Linnemeier](#), last edited by [Micah Linnemeier](#) on Mar 16, 2011 ([view change](#))

About the Cyberinfrastructure Shell

The Cyberinfrastructure Shell (CIShell) is an open source, community-driven platform for the integration and utilization of datasets, algorithms, tools, and computing resources. Algorithm integration support is built in for Java and most other programming languages. Being Java based, it will run on almost all platforms. The software and specification is released under an Apache 2.0 License.

CIShell is the basis of [Network Workbench](#), [TexTrend](#), [Sci²](#) and the upcoming [EpiC](#) tool.

CIShell supports remote execution of algorithms. A standard web service definition is in development that will allow pools of algorithms to transparently be used in a peer-to-peer, client-server, or web front-end fashion.

CIShell Features

A framework for easy integration of new and existing algorithms written in any programming language

Using CIShell, an algorithm writer can fully concentrate on creating their own algorithm in whatever language they are comfortable with. Simple tools are provided to then take their algorithm and

Learn More...

- [CIShell Papers](#)
- [CIShell Powered Tools](#)
- [Algorithms](#)
- [Plugins \(coming soon\)](#)
- [Misc. Tool Documentation](#)
- CIShell Web Services (coming soon)
- [Screenshots](#)

Getting Started...

- [Documentation & Developer Resources](#)
- [Download](#)

Getting Involved...

- [Contact Us](#)

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CIShell Portal (<http://cishell.org>)

Cyberinfrastructure Shell (CIShell)
CIShell supports the plug-and-play of datasets and algorithms and their bundling into custom tools that serve the specific needs of a user group or research community. It has been applied to develop diverse custom tools, see below. Feel free to take plugins from any of these tools to design your personal dream tool.

Provided by the [Cyberinfrastructure for Network Science Center](#) at Indiana University.

Visit the CIShell wiki
to learn more about using CIShell as a platform for your tool!

Learn more about existing CIShell-powered tools below.

Network Workbench Tool (NWB)
The NWB Tool supports researchers, educators, and practitioners interested in the study of biomedical, social and behavioral science, physics, and other networks. It comes with a 77-page [user manual](#).

Gallery

Science of Science Tool (Sci²)
The Sci² Tool was specifically developed for science policy makers and researchers that study science by scientific means. It supports the temporal, geospatial, topical, and network analysis and visualization of scholarly datasets at the micro (individual), meso (local), and macro (global) levels. There exists a [112-page user manual](#) and 24 hours of [NIM tutorials](#) in this tool.

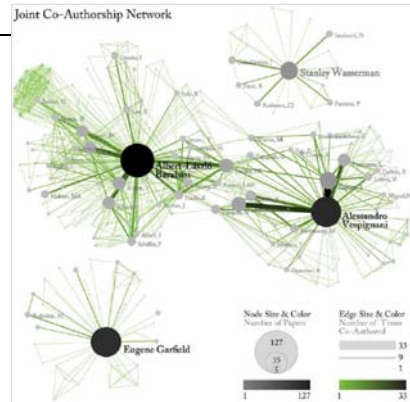
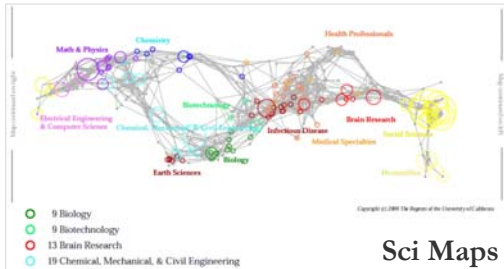
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Sci² Tool – “Open Code for S&T Assessment”

<http://sci2.cns.iu.edu>

OSGi/CIShell powered tool with NWB plugins and many new scientometrics and visualizations plugins.



Horizontal Bar Graphs



Börner, Katy, Huang, Weixia (Bonnie), Linnemeier, Micah, Dubon, Russell Jackson, Phillips, Patrick, Ma, Nianli, Zoss, Angela, Guo, Hanning & Price, Mark. (2009). *Reti-Netzwerk-Red: Analyzing and Visualizing Scholarly Networks Using the Scholarly Database and the Network Workbench Tool*. *Proceedings of ISSI 2009: 12th International Conference on Scientometrics and Informetrics, Rio de Janeiro, Brazil, July 14-17*. Vol. 2, pp. 619-630.



Sci² Tool

Sci² Tool

File Preprocessing Modeling Analysis Visualization Scientometrics Help

Console

Welcome to the Science of Science Tool (Sci²). The development of this tool is supported in Network Science center and the School of Li Indiana University, the National Science Foundation and IIS-0715303, and the James S. McDonnell Cyberinfrastructure portal (<http://sci.slis.indiana.edu>).

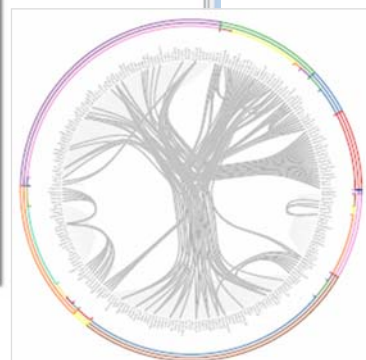
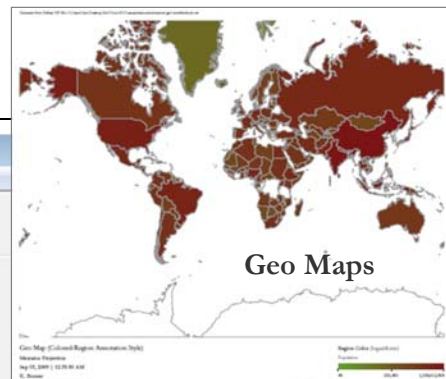
The primary investigators are Katy Börner, In SciTech Strategies Inc. The Sci² tool was developed by J. Duhon, Patrick A. Phillips, Chintan Tank, a Cyberinfrastructure Shell (<http://cishell.org>) for Network Science Center (<http://cns.slis.indiana.edu>). Many algorithm plugins were derived from the Network Workbench Tool (<http://nwb.slis.indiana.edu>).

Please cite as follows:
Sci² Team. (2009). Science of Science Tool. In SciTech Strategies Inc., <http://sci.slis.indiana.edu>.

Scheduler

Remove From List Remove completed

!	Algorithm Name	Date	Time	% Con
<input checked="" type="checkbox"/>	Extract Co-Author Netw...	09/03/2009	00:15:20 AM	100%
<input checked="" type="checkbox"/>	Load and Clean ISI File	09/03/2009	00:15:05 AM	100%





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
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://sci2.cns.iu.edu>
<http://sci2.wiki.cns.iu.edu>

Geetha Senthil (2010) [Multidisciplinary Nature of Work With Reference to PIs and ICs Within a Portfolio](#). PA Group at NIH.

NIH Office of Extramural Research and Katy Börner (2010) [Network Visualizations Using SPIRES Data and the Sci2 Tool](#). Office of Extramural Research at NIH.



Sci² Tool: Algorithms

Preprocessing

Extract Top N% Records
Extract Top N Records
Normalize Text
Slice Table by Line

Extract Top Nodes
Extract Nodes Above or Below Value
Delete Isolates

Extract top Edges
Extract Edges Above or Below Value
Remove Self Loops
Trim by Degree
MST-Pathfinder Network Scaling
Fast Pathfinder Network Scaling

Snowball Sampling (in nodes)
Node Sampling
Edge Sampling

Symmetrize
Dichotomize
Multipartite Joining

Geocoder
Extract ZIP Code

Modeling

Random Graph
Watts-Strogatz
Small World
Barabási-Albert Scale-Free
TARL

Analysis
Network Analysis Toolkit (NAT)
Unweighted & Undirected

Node Degree
Degree Distribution
K-Nearest Neighbor (Java)
Watts-Strogatz Clustering Coefficient
Watts Strogatz Clustering Coefficient over K

Diameter
Average Shortest Path
Shortest Path Distribution
Node Betweenness Centrality

Weak Component Clustering
Global Connected Components

Extract K-Core
Annotate K-Coreness

HITS

Weighted & Undirected

Clustering Coefficient
Nearest Neighbor Degree
Strength vs Degree
Degree & Strength
Average Weight vs End-point Degree
Strength Distribution
Weight Distribution
Randomize Weights

Blondel Community Detection

HITS

Unweighted & Directed
Node Indegree
Node Outdegree
Indegree Distribution
Outdegree Distribution

K-Nearest Neighbor
Single Node in-Out Degree Correlations

Dyad Reciprocity
Arc Reciprocity
Adjacency Transitivity

Weak Component Clustering
Strong Component Clustering



Sci² Tool: Algorithms cont.

<p>-----</p> <p>Extract K-Core</p> <p>Annotate K-Core-ness</p> <p>-----</p> <p>HITS</p> <p>PageRank</p> <p>Weighted & Directed</p> <p>HITS</p> <p>Weighted PageRank</p> <p>Textual</p> <p>Burst Detection</p>	<p>Visualization</p> <p>GnuPlot</p> <p>GUESS</p> <p>Image Viewer</p> <p>-----</p> <p>Radial Tree/Graph (prefuse alpha)</p> <p>Radial Tree/Graph with Annotation (prefuse beta)</p> <p>Tree View (prefuse beta)</p> <p>Tree Map (prefuse beta)</p> <p>Force Directed with Annotation (prefuse beta)</p> <p>Fruchterman-Reingold with Annotation (prefuse beta)</p> <p>-----</p> <p>DrL (VxOrd)</p> <p>Specified (prefuse beta)</p> <p>-----</p> <p>Horizontal Bar Graph</p> <p>Circular Hierarchy</p> <p>Geo Map (Circle Annotation Style)</p> <p>Geo Map (Colored-Region Annotation Style)</p> <p>Science Map (Circle Annotation)</p>	<p>Scientometrics</p> <p>Remove ISI Duplicate Records</p> <p>Remove Rows with Multitudinous Fields</p> <p>Detect Duplicate Nodes</p> <p>Update Network by Merging Nodes</p> <p>-----</p> <p>Extract Directed Network</p> <p>Extract Paper Citation Network</p> <p>Extract Author Paper Network</p> <p>-----</p> <p>Extract Co-Occurrence Network</p> <p>Extract Word Co-Occurrence Network</p> <p>Extract Co-Author Network</p> <p>Extract Reference Co-Occurrence (Bibliographic Coupling) Network</p> <p>-----</p> <p>Extract Document Co-Citation Network</p>
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Soon:
Database support for ISI and NSF data.

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Network Workbench Tool

<http://nwb.slis.indiana.edu>

The Network Workbench (NWB) tool supports researchers, educators, and practitioners interested in the study of biomedical, social and behavioral science, physics, and other networks.

In February 2009, the tool provides more than 169 plugins that support the preprocessing, analysis, modeling, and visualization of networks.

More than 50 of these plugins can be applied or were specifically designed for S&T studies.

It has been downloaded more than 89,000 times since December 2006.

Network Workbench
A Workbench for Network Science

Home People Research Publications

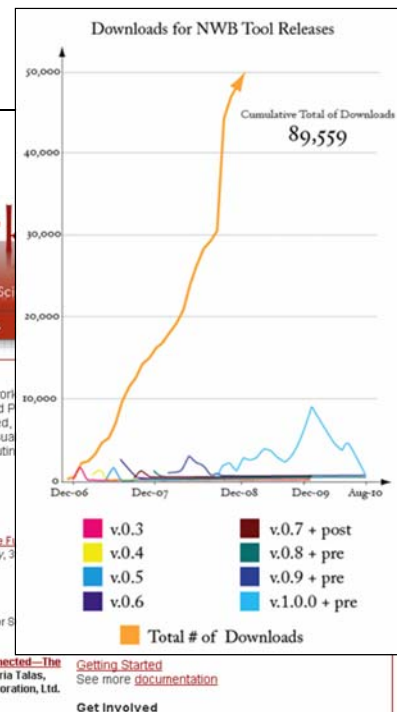
Summary
Network Workbench: A Large-Scale Network Toolkit for Biomedical, Social Science and P... evaluate, and operate a unique distributed, scale network analysis, modeling, and visual (NWB). The envisioned data-code-computr... more
[How to cite this project](#)

News & Updates

- 5.1.09 Kaelble, Steve. 2009. [Mapping the F... Knowledge, Research & Creative Activity, 3... \(website\) accessed 5/1/09](#)
- 3.23.09 [1.0.0 beta 5 Released](#)
- 1.23.09 Ann Mcranie's [tutorial abstract](#) for S... 2009
- 11.4.08 Two NWB PIs featured in "[Connected—The Power of Six Degrees](#)." 2008. Anna Maria Talas, Director. Australian Broadcasting Corporation, Ltd. [\[YouTube\]](#) [\[Full Video\]](#) (300MB)

[Getting Started](#)
See more [documentation](#)

[Get Involved](#)



Herr II, Bruce W., Huang, Weixia (Bonnie), Penumarthy, Shashikant & Börner, Katy. (2007). Designing Highly Flexible and Usable Cyberinfrastructures for Convergence. In Bainbridge, William S. & Roco, Mibail C. (Eds.), *Progress in Convergence - Technologies for Human Wellbeing* (Vol. 1093, pp. 161-179), *Annals of the New York Academy of Sciences*, Boston, MA.

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Computational Proteomics

What relationships exist between protein targets of all drugs and all disease-gene products in the human protein–protein interaction network?

Yildirim, Muhammed A., Kwan-II Goh, Michael E. Cusick, Albert-László Barabási, and Marc Vidal. (2007). Drug-target Network. Nature Biotechnology 25 no. 10: 1119-1126.



Figure 2 Drug-target network (DT network). The DT network is generated by using the known associations between FDA-approved drugs and their target proteins. Circles and rectangles correspond to drugs and target proteins, respectively. A link is placed between a drug node and a target node if the protein is a known target of that drug. The area of the drug (protein) node is proportional to the number of targets that the drug (protein) has (the number of drugs targeting the protein). Color codes are given in the legend. Drug nodes (circles) are colored according to their Anatomical Therapeutic Chemical Classification, and the target proteins (rectangular boxes) are colored according to their cellular component obtained from the Gene Ontology database.

23

Computational Economics

Does the type of product that a country exports matter for subsequent economic performance?

C. A. Hidalgo, B. Klinger, A.-L. Barabási, R. Hausmann (2007) The Product Space Conditions the Development of Nations. Science 317, 482 (2007).

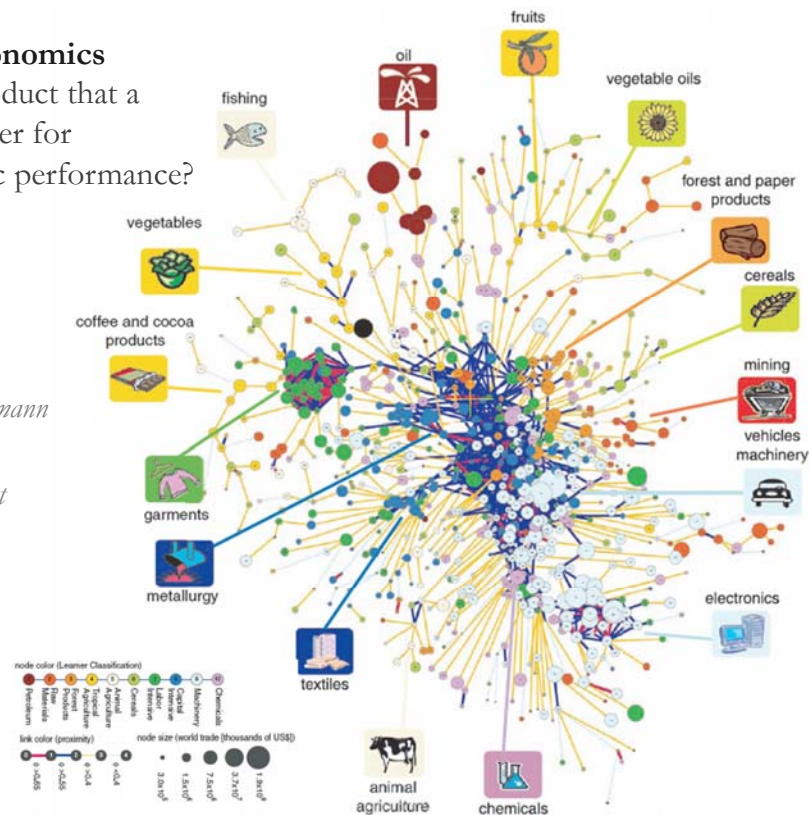


Fig. 1. The product space. (A) Hierarchically clustered proximity matrix representing the 775 SITC-4 product classes exported in the 1998–2000 period. (B) Network representation of the product space. Links are color coded with their proximity value. The sizes of the nodes are proportional to world trade, and their colors are chosen according to the classification introduced by Leamer.

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Computational Social Science

Studying large scale social networks such as Wikipedia

Second Sight: An Emergent Mosaic of Wikipedian Activity, The NewScientist, May 19, 2007

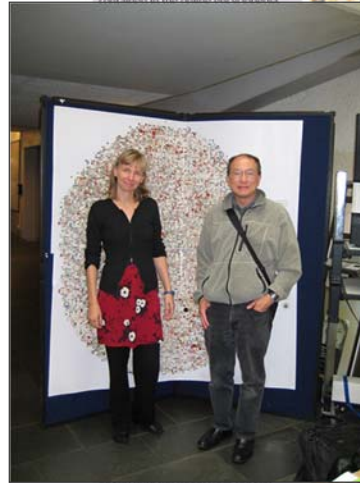


Second sight

Image: Bruce W. Hest and Todd M. Holloway

Power struggle

How do you keep track of the bobbling mass of information that is Wikipedia? This chaotic-looking mosaic is one attempt to show which topics are contained in the online encyclopedia.



...pages at the time of writing include entries on Sheffield Wednesday football club, Mikhail Gorbachev and pigs). The mosaic has been commended in a competition for images that visualise network dynamics, coinciding with this week's International Workshop and Conference on Network Science in Bloomington.

www.newscientist.com



19 May 2007 | NewScientist | 55

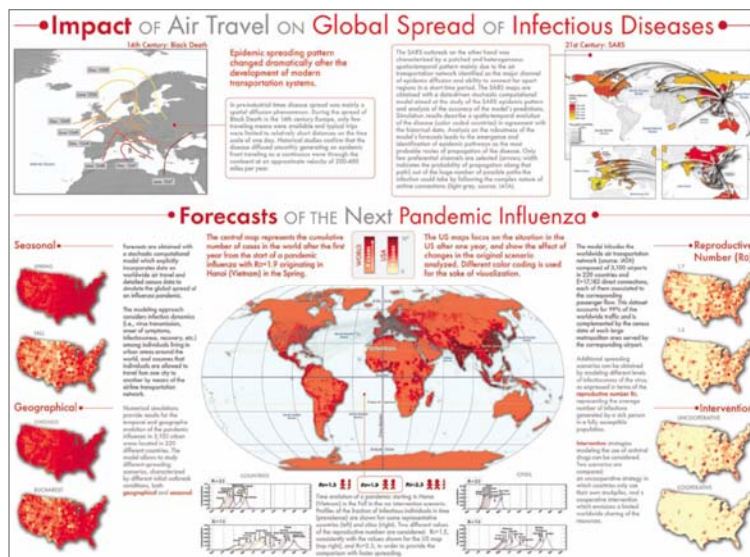
Computational Epidemics

Forecasting (and preventing the effects of) the next pandemic.

Epidemic Modeling in Complex realities, V. Colizza, A. Barrat, M. Barthelemy, A. Vespignani, Comptes Rendus Biologie, 330, 364-374 (2007).

Reaction-diffusion processes and metapopulation models in heterogeneous networks, V. Colizza, R. Pastor-Satorras, A. Vespignani, Nature Physics 3, 276-282 (2007).

Modeling the Worldwide Spread of Pandemic Influenza: Baseline Case and Containment Interventions, V. Colizza, A. Barrat, M. Barthelemy, A.-J. Valleron, A. Vespignani, PLoS-Medicine 4, e13, 95-110 (2007).





OSGi/CIShell Adoption

A number of other projects recently adopted OSGi and/or CIShell:

- *Cytoscape* (<http://cytoscape.org>) Led by Trey Ideker at UCSD is an open source bioinformatics software platform for visualizing molecular interaction networks and integrating these interactions with gene expression profiles and other state data (Shannon et al., 2002).
- *Taverna Workbench* (<http://taverna.org.uk>) Developed by the myGrid team (<http://mygrid.org.uk>) led by Carol Goble at the University of Manchester, U.K. is a free software tool for designing and executing workflows (Hull et al., 2006). Taverna allows users to integrate many different software tools, including over 30,000 web services.
- *MAEvis* (<https://wiki.ncsa.uiuc.edu/display/MAE/Home>) Managed by Jong Lee at NCSA is an open-source, extensible software platform which supports seismic risk assessment based on the Mid-America Earthquake (MAE) Center research.
- *TEXTrend* (<http://textrend.org>) Led by George Kampis at Eötvös Loránd University, Budapest, Hungary supports natural language processing (NLP), classification/mining, and graph algorithms for the analysis of business and governmental text corpuses with an inherently temporal component.
- *DynaNets* (<http://www.dynanets.org>) Coordinated by Peter M.A. Sloot at the University of Amsterdam, The Netherlands develops algorithms to study evolving networks.
- *SISOB* (<http://sisob.lcc.uma.es>) An Observatory for Science in Society Based in Social Models.

As the functionality of OSGi-based software frameworks improves and the number and diversity of dataset and algorithm plugins increases, the capabilities of custom tools will expand.

<http://mapofscience.com> and SciVal by Elsevier

Interactive World and Science Map of S&T Jobs

Angela Zoss, Michael Connover, Katy Börner (2010)

Visualization of Job Postings

Map of Science

Scientific domains are highly interconnected. The boundaries between different domains are often fuzzy. One way of thinking about the relationships between domains is to conceptualize all scientific domains as existing within a large **network of research**.

Creating a network of scientific research can be accomplished by looking at scientific journals and their articles. The UCSD Map of Science used here is the product of a large study by researchers at the University of California San Diego using 7.2 million papers and over 16,000 separate journals, proceedings, and series from Thomson Scientific and Scopus over the five year period from 2001 to 2005. The researchers used citations between the papers and journals to **cluster journals** into small groups of highly related journals.

Those clusters are represented by 554 individual nodes in the network. The links between the clusters show that some clusters are related to other clusters but are not as tightly connected as the journals that make up each cluster. Then the clusters are labeled both by the content area shared by the journals in the cluster and by the overarching scientific domain for that cluster (represented by one of 13 colors).

Maps of science like this one can be used to understand many different data sets and how they can be represented by topic. Here we are looking at the topics that appear in job postings from large, high-

Map of Science Geographic Visualization

Postdoc at Harvard Medical School
[Link to Post](#)

Map of Science Geographic

Math and Physics Chemistry Health Professionals
Medical Specialties Brain Research
Social Sciences
Infectious Diseases
Biology
Earth Sciences
Chemical, Mechanical, and Civil Engineering
Biotechnology

Map of Science Geographic

Search for Jobs

Search for Jobs

Search for Jobs

Biotechnology

Search

POWERED BY Google

Copyright © 2008 The Regents of the University of California - [Terms of Use](#)

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MAPSustain
Mapping Sustainability Research

Geographic Map **Science Map**

Detail **About**

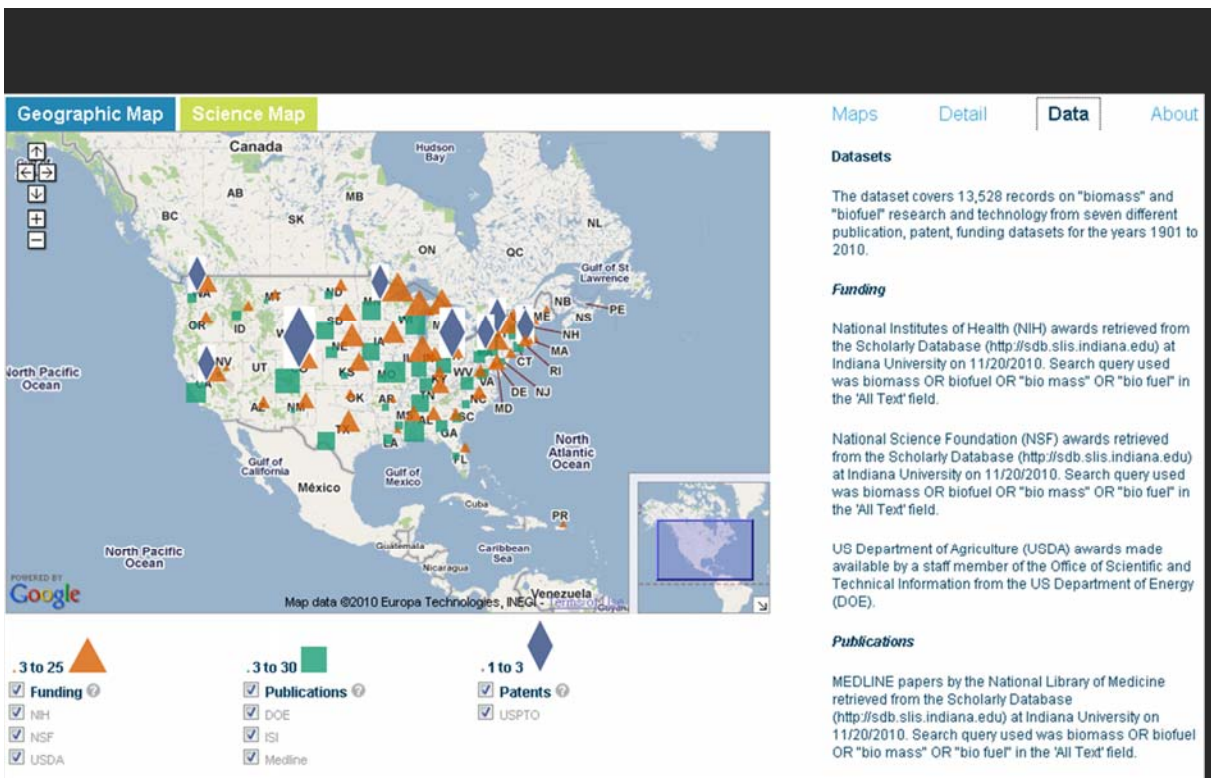
Geographic Visualization

Here we have a more traditional view of the records - a geographic overlay. Featured here are the records that list both a city and state in the United States. Feel free to search, zoom, pan, and click for descriptions.

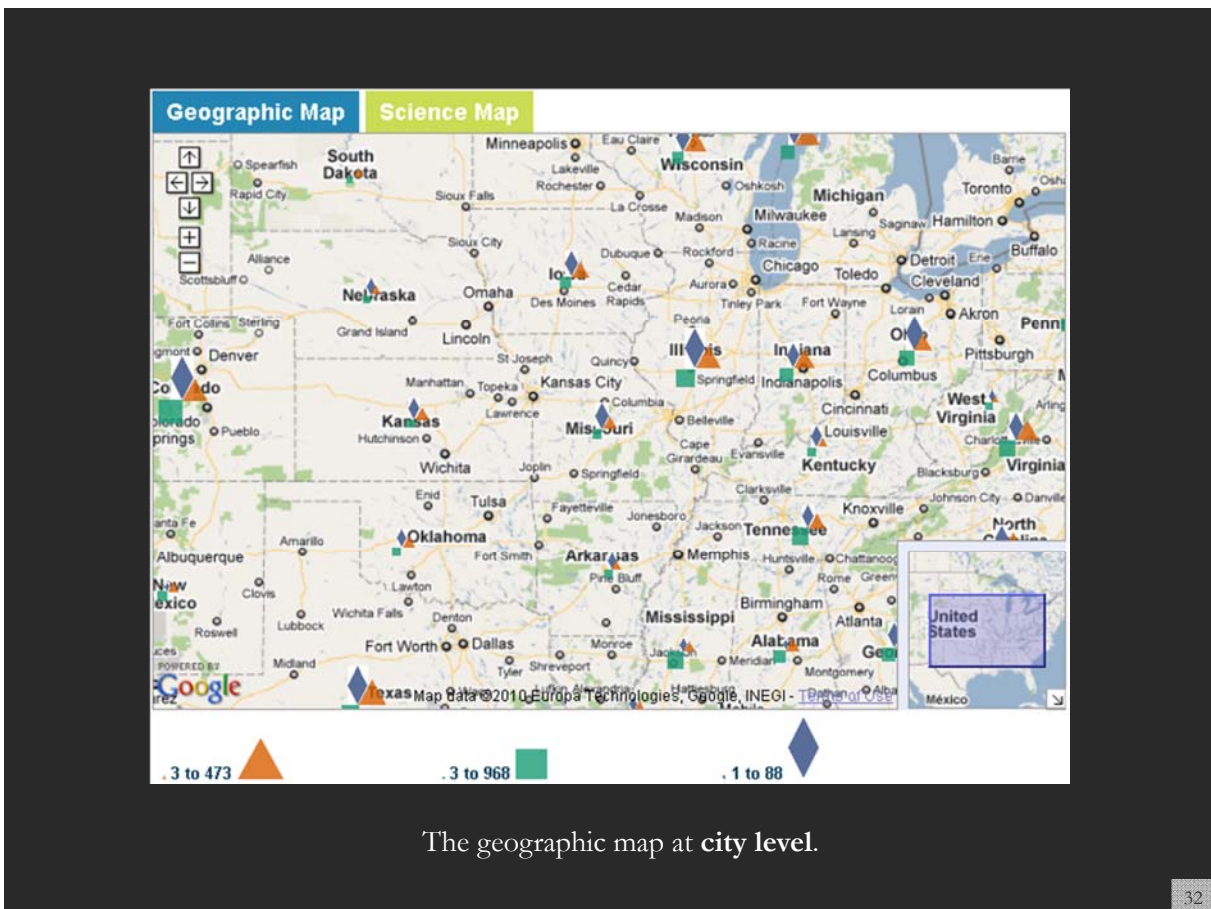
<http://mapsustain.cns.iu.edu>

CYBERINFRASTRUCTURE for NETWORK SCIENCE CENTER
School of Library and Information Science, Indiana University

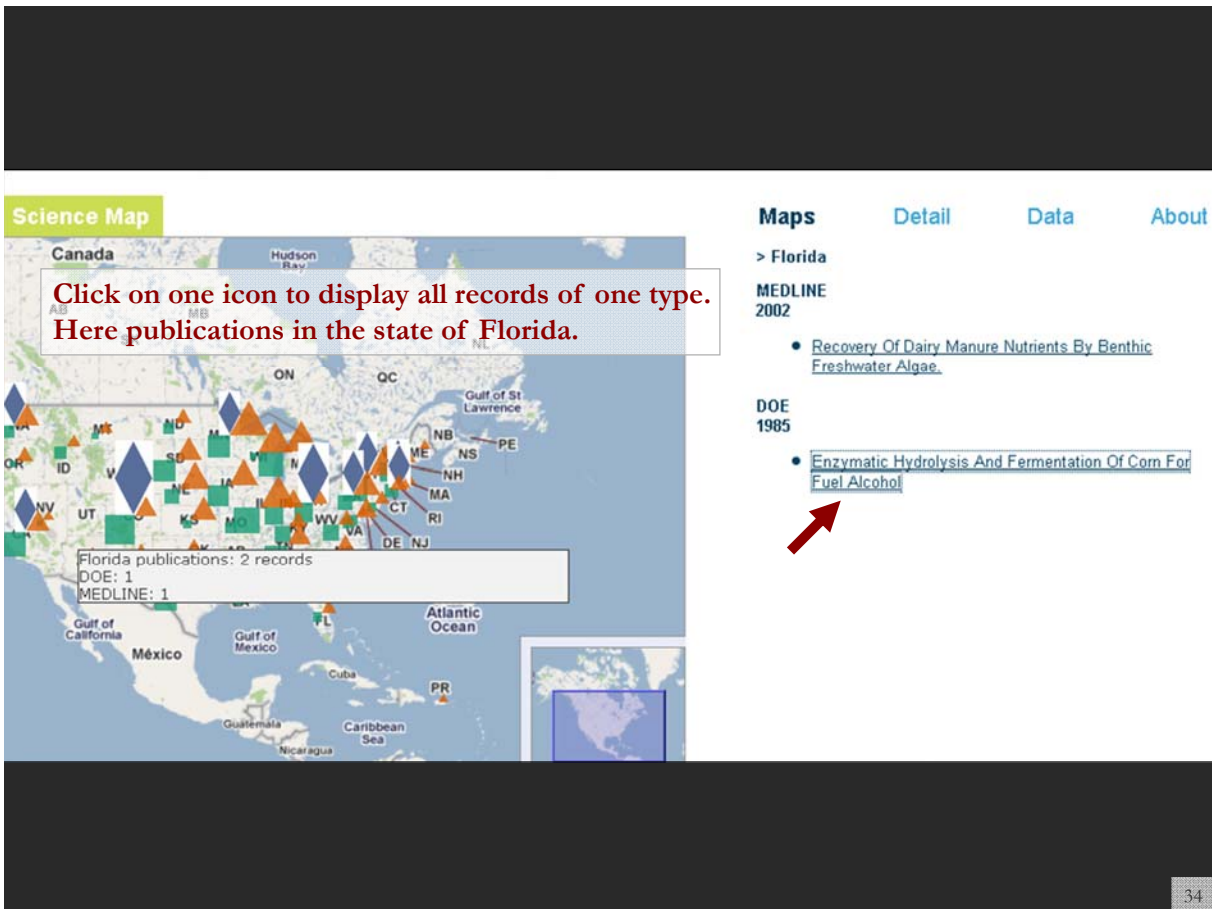
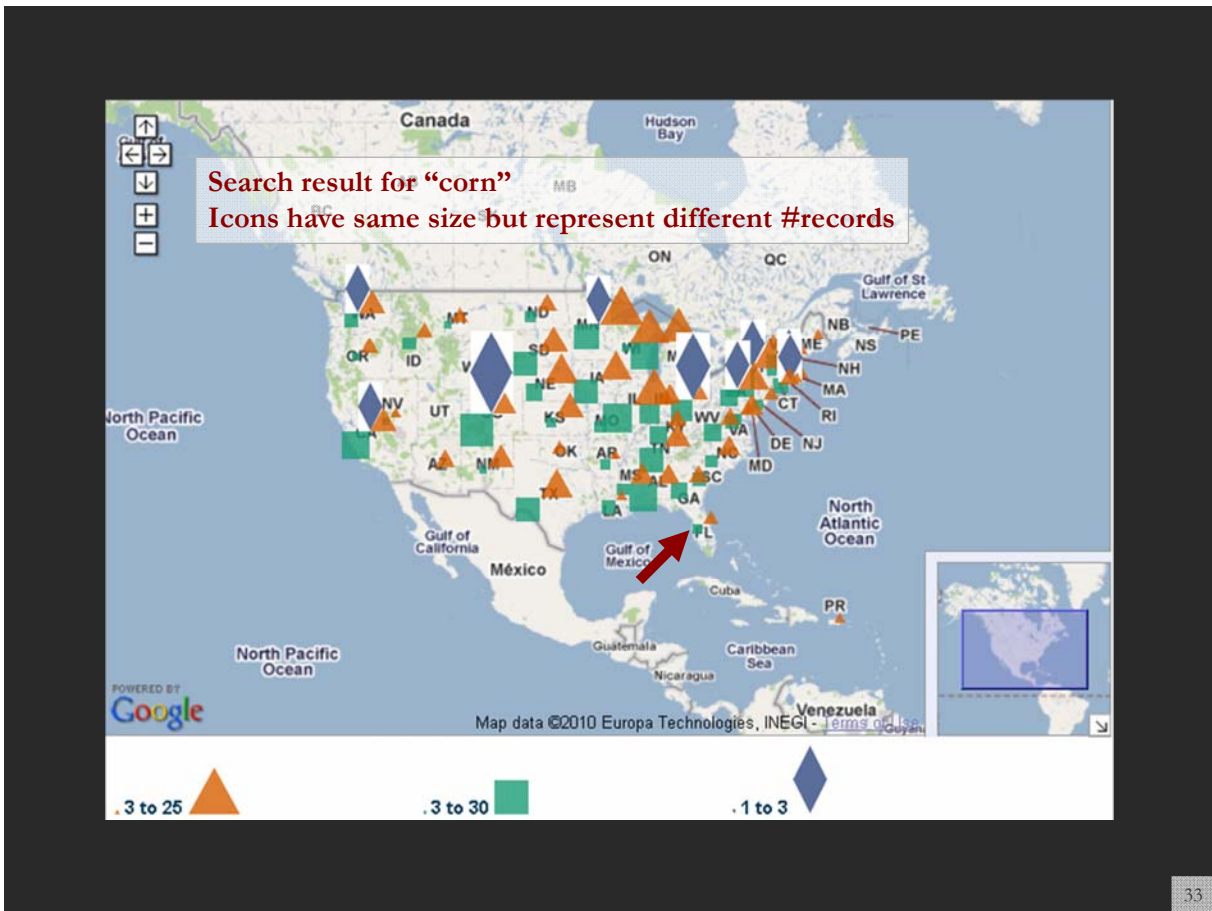
30



The geographic map at state level.



The geographic map at city level.



Information Bridge: DOE Scientific and Technical Information - - Document #5789929 - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.osti.gov/bridge/product.biblio.jsp?osti_id=5789929

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DOE Scientific and Technical Information

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Full Text Availability information may be found in the Availability, Publisher, Research Organization, Resource Relation and/or Author (affiliation information) fields and/or via the "Full-text Availability" link. For a journal article, please see the Resource Relation field.

Title Enzymatic hydrolysis and fermentation of corn for fuel alcohol
[Word Cloud](#) | [More Like This](#)

Creator/Author Mullins, J.T.

Publication Date 1985 Jan 01

OSTI Identifier OSTI ID: 5789929

Other Number(s) Journal ID: CODEN: BIBIA

Resource Type Journal Article

Resource Relation Journal Name: Biotechnol. Bioeng.; (United States); Journal Volume: 27:3

Research Org Univ. of Florida, Gainesville

Subject 09 BIOMASS FUELS; 32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION; ETHANOL FUELS; BIOSYNTHESIS; MAIZE; ENZYMATIC HYDROLYSIS; FERMENTATION; PRODUCTIVITY; COST; ENERGY EFFICIENCY; EXPERIMENTAL DATA; WASTE PRODUCT UTILIZATION; ALCOHOL FUELS; BIOCONVERSION; CEREALS; CHEMICAL REACTIONS; DATA DECOMPOSITION; EFFICIENCY; FUEL; GRASS; HYDROLYSIS; INFORMATION; LYSIS; NUMERICAL DATA; PLANTS;

Done

Detailed information on demand via original source site for exploration and study.

35

Geographic Map Science Map

Color B & W

Math and Physics Chemistry Health Professionals

Engineering and Computer Science Medical Societies

Biotechnology Brain Research

Chemical, Materials and Earth Sciences Biology Social Sciences

Humanities

Biology funding: 2112 records
 NSF: 1617
 NIH: 114
 USDA: 391

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Maps Detail Data Ab

> Biology

NIH
 2009

- Label-Free And Simultaneous Detection Of Multiple Bacterial Pathogens And Virulen
- Mechanism Of Psp Mediated Adhesion
- Label-Free And Simultaneous Detection Of Multiple Bacterial Pathogens And Virulen
- Novel Mechanism Of Uranium Reduction Via Microbial Nanowires
- Nano-Scale Mechanisms Of Metal(Loid) Rhizostabilization In Desert Mine Tailings
- Label-Free And Simultaneous Detection Of Multiple Bacterial Pathogens And Virulen
- Mechanism Of Psp Mediated Adhesion

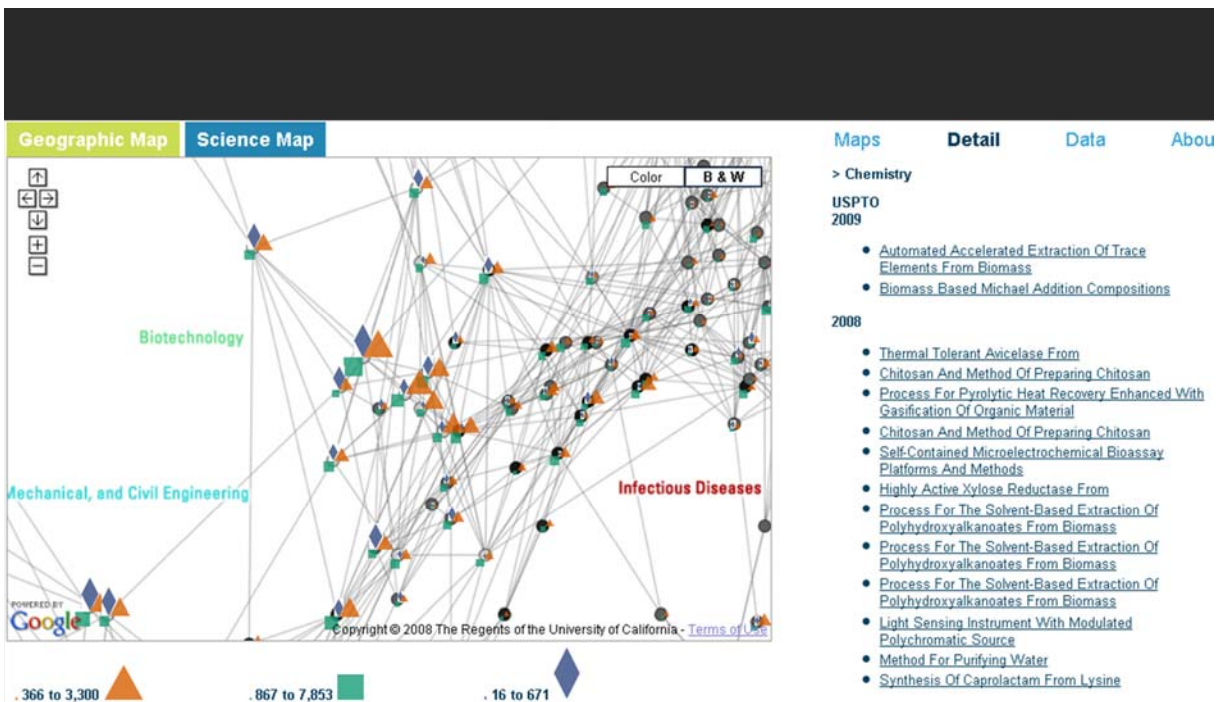
2008

- The Effect Of Inter-Species Interactions On The Virulence Of Streptococcus Mutans
- Cook-stove Replacement For Prevention Of Ari And Low Birthweight In Nepal
- Diverse Drug Lead Compounds From Bacterial Symbionts In Tropical Marine Mollusks
- Remote Sensing Of Wildfire Smoke Exposures To Assess Health Effects
- Cookstove Replacement For Prevention Of Ari And Low Birthweight In Nepal

.366 to 3,300 .867 to 7,853 .16 to 671

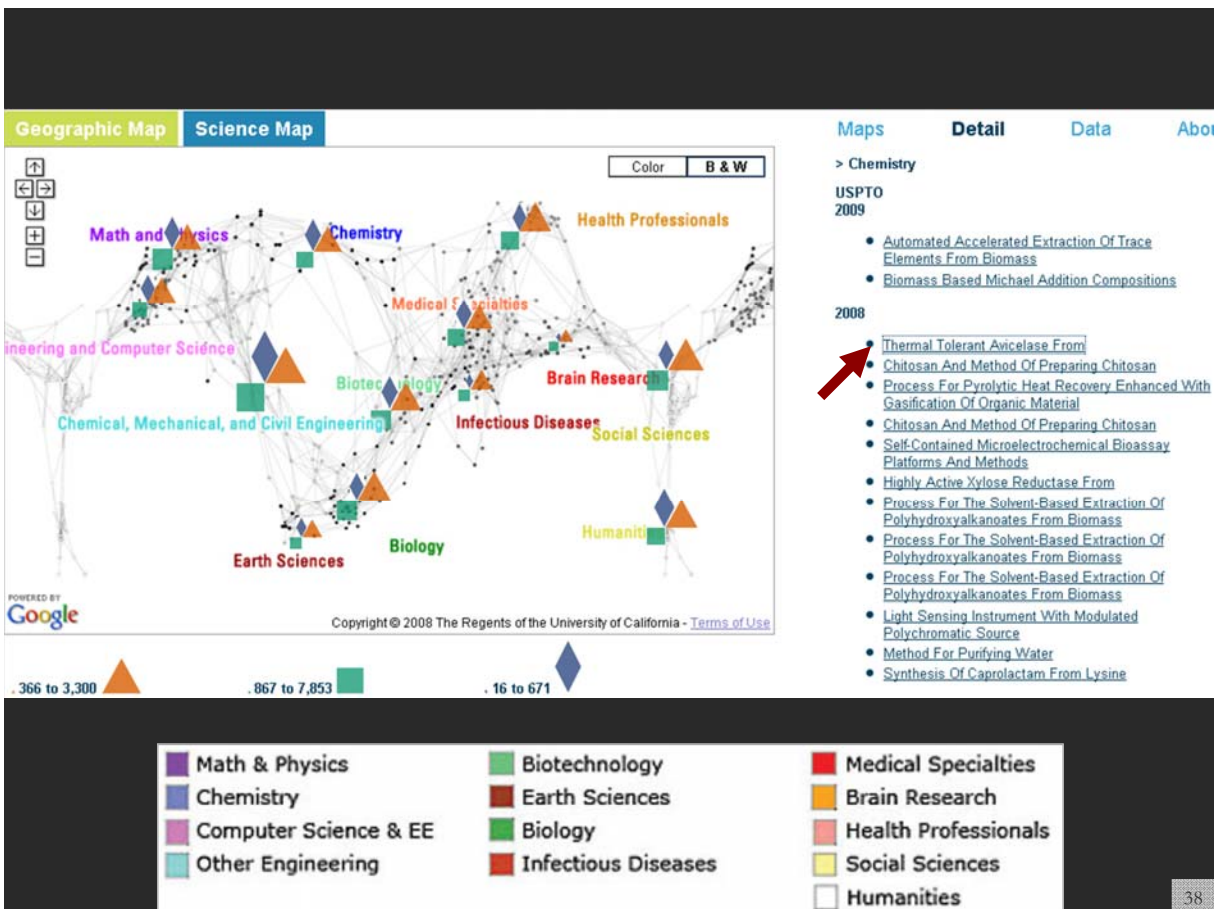
The science map at 13 top-level scientific disciplines level.

36



The science map at 554 sub-disciplines level.

37



38

NIH TOPIC MAPS

NIH Topic Browser Show Map Viewer ? Export Data Methods Feedback

Topics by NIH Institute Topics by Category

2009 ? add delete AND Exact Text Search Clear Search

2009 Grants (137) Institutes (9)

Col	NIH Inst	Project/Subproj#	Title	Investigator(s)	# 1 Topic	# 1 Topic Work	NIH Inst	# Grants	Count
	NCRR	3P20RR011792-10S2 6914	OBESITY, INSULIN RESISTANCE, IGF'S, AND BREAST CANCER RISK IN AFRICAN AMERICANS	CUI, YONG	686 (50%)	cancer brea...	NCI	116	
	NCI	3R01CA120562-03S1	Commonly Used Medications and Breast Cancer Recurrence	BOUDREAU, DENISE M	686 (42%)	cancer brea...	NCRR	10	
	NCI	5R01CA120562-03	Commonly Used Medications and Breast Cancer Recurrence	BOUDREAU, DENISE M	686 (42%)	cancer brea...	NIHES	5	
	NCI	5R01CA093772-06	Long-term Survivorship in Older Women with Early Stage Breast Cancer	SILLIMAN, REBECCA A	686 (42%)	cancer brea...	NCMHD	1	
	NCI	5R01CA064272-11	Shanghai Breast Cancer Study	ZHENG, WEI	686 (41%)	cancer brea...	NIA	1	
							NCCAM	1	
							NIHCHD	1	
							NIHR	1	
							NHGRI	1	

Topics Similar Grants Show Top 100 on Map

%	Topic	Topic Words	Title Words	Similar	C NIH Inst	Grant
25.91	686	cancer breast	cancers cancer_risk cancer_patients	6.51	NCI	1R01CA129639-01A2 Genome-Wide Association Study of Radiation Exposure and Bilateral Breast Cancer PI: BERNSTEIN, JONINE LISA
3.86	437	risk risk_factors cases cohort prospective high_ris	risk, risk_factors, v	6.46	NCI	1K07CA136758-01A1 Genetic variants in the PI3K pathway in mammographic density and breast cancer PI: THOMPSON, CHERYL L.
3.76	544	snps snp genome_wide_association cases genes	genome_wide_ass	6.31	NCI	5P50CA116199-05 UTMADACC SPORE in Breast Cancer PI: HORTOBAGYI, GABRIEL N.
3.70	173	genetic genes risk susceptibility polymorphisms	genetic, genetics,	6.02	NCI	2R01CA050385-21A1 Risk Factors for Breast Cancer in Younger Nurses PI: WILLETT, WALTER C.
2.62	252	treatment patients management patient outcom	management, trea	4.6	NCI	5R01CA127617-02 Who Cares For Older Breast Cancer Survivors And How Does It Affect Quality? PI: MANDELBLATT, JEANNE
1.64	235	conference meeting workshop symposium scienti	th, conference, sy			
1.63	351	community implementation community_based he	community, preve			
1.54	325	million disease treatment united_states public_h	disease, treatmen			
1.51	580	training candidate career skills applicant program	treatment, depres			

<https://app.nihmaps.org>

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

Funded by \$12 million NIH award.

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:** Mike Conlon (VIVO and UF PI), Cecilia Botero, Kerry Britt, Erin Brooks, Amy Buhler, Ellie Bushhousen, 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 Raam, 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 a National Network of Scientists

Home People Organizations Research Events

Davis, Vairie I | AST UNV LIBRA

Positions

- Medical Science Librarian**, Outreach Librarian for Agricultural Sciences (2002 - 2003)
- Medical Science Librarian**, Stark Maintenance Supervisor (2001 - 2002)
- AST UNV LIBRARIAN**

13 publications within the last 10 years (11 leads)

17 identifiers

History Web Page

Affiliations

Outreach Librarian for Agricultural Sciences

VIVO Enabling a National Network of Scientists

Home People Organizations Research Events

University of Florida

How do you want to compare?
by Publications

Who do you want to compare?
Search: [] X

Records 1 - 10 of 13

Entity Name	Publication Count	Entity Type
<input checked="" type="checkbox"/> Interdisciplinary Center for Bioremediation	18	UF Center, Agent, Center
<input checked="" type="checkbox"/> Continuing Education	24	UF Department, Agent, Non-Academic Department, Department
<input checked="" type="checkbox"/> Levin College of Law	17	Agent, UF College, College
<input checked="" type="checkbox"/> College of Agricultural and Life Sciences	14	Agent, UF College, College
<input type="checkbox"/> Whittier College of Agriculture and Horticulture	14	Agent, UF College, College
<input type="checkbox"/> Center for Environmental and Estuarine Science	8	UF Center, Agent, Center

Comparing Publications of Organizations in University of Florida

Total Number of Publications

You have selected 4 of a maximum 10 organizations to compare. **Clear**

- College of Agricultural and Life Sciences: 14
- Levin College of Law: 17
- Continuing Education: 24
- Interdisciplinary Center: 18

VIVO Enabling a National Network of Scientists

Home People Organizations Research Events

Search results for 'geriatrics'

Show only results of this type: **people activities organizations research**

AMERICAN GERIATRICS SOCIETY

- Geriatrics Education Curriculum, Residents (GEC) Program
- Evidence Based Decision Making in Geriatrics, Geriatrics, Disability

AMERICAN GERIATRICS SOCIETY

- Harford Geriatrics Leadership Scholar
- Geriatrics and Aging Research Institute on Aging (GRI)
- AGS ON GERIATRICS ACADEMIC PROGRAMS
- US OLTH RESOURCES AND SERVICES ADMIN
- Suifortn Study
- 2003 Scholar, Harford Institute of Geriatrics, Nursing Research, John A. Harford Institute for Geriatrics, Nursing, New York University
- Gene, Polysomnography and Prevention of Obstructive
- Insomnia in the Sea, Deborah, Ellen
- Cardiac Mitral Regurgitation, Regurgitation, and Mitral Regurgitation
- AMES, ACAD OF NURSING
- The Epidemiology of Stress and the Menopausal Syndrome
- Statement by a Sea, Deborah, Ellen

VIVO Enabling a National Network of Scientists

Home People Organizations Research Events

Welcome to VIVO

VIVO is a research-focused discovery tool that enables collaboration among scientists across all disciplines.

Browse or search information on people, departments, courses, grants, and publications.

Search VIVO

Log in

Search

Log in

Browse by

- Grants (11,814)
- People (48,721)
- Activities (11,818)
- Courses (1116)
- Events (379)
- Organizations (20,138)
- Research (11,283)
- Locations (378)

- Faculty Member (8882)
- Graduate Student (1)
- Librarian (67)
- Non-Academic (7536)
- Non-Faculty Academic (2)
- Alumn (8972)
- Professor Emeritus (802)

UF Clinical and Translational Science Institute
UNIVERSITY of FLORIDA

University of Florida

How do you want to compare?
by Grants

Who do you want to compare?
Search: [] X

Records 1 - 10 of 30

Entity Label	Grant Count	Entity Type
<input checked="" type="checkbox"/> Continuing Education	562	UF Department, Agent, Non-Academic Department, Department
<input checked="" type="checkbox"/> Florida Museum of Natural History	203	Museum, Agent
<input checked="" type="checkbox"/> College of Agricultural and Life Sciences	166	Agent, UF College, College
<input checked="" type="checkbox"/> College of Engineering	103	Agent, UF College, College
<input checked="" type="checkbox"/> Evelyn F. and William L. McKnight Brain Institute of the University of Florida	64	UF Center, Agent, Center
<input checked="" type="checkbox"/> International Center	54	UF Department, Agent, Non-Academic Department, Department
<input checked="" type="checkbox"/> Florida Sea Grant	44	UF Center, Agent, Center
<input type="checkbox"/> Whitney Laboratory for Marine Bioscience	42	UF Research Laboratory, Agent, Laboratory, Research Laboratory
<input type="checkbox"/> Water Institute	38	UF Center, Agent, Center
<input type="checkbox"/> College of Dentistry	35	Agent, UF College, College

Comparing Grants of Organizations in University of Florida

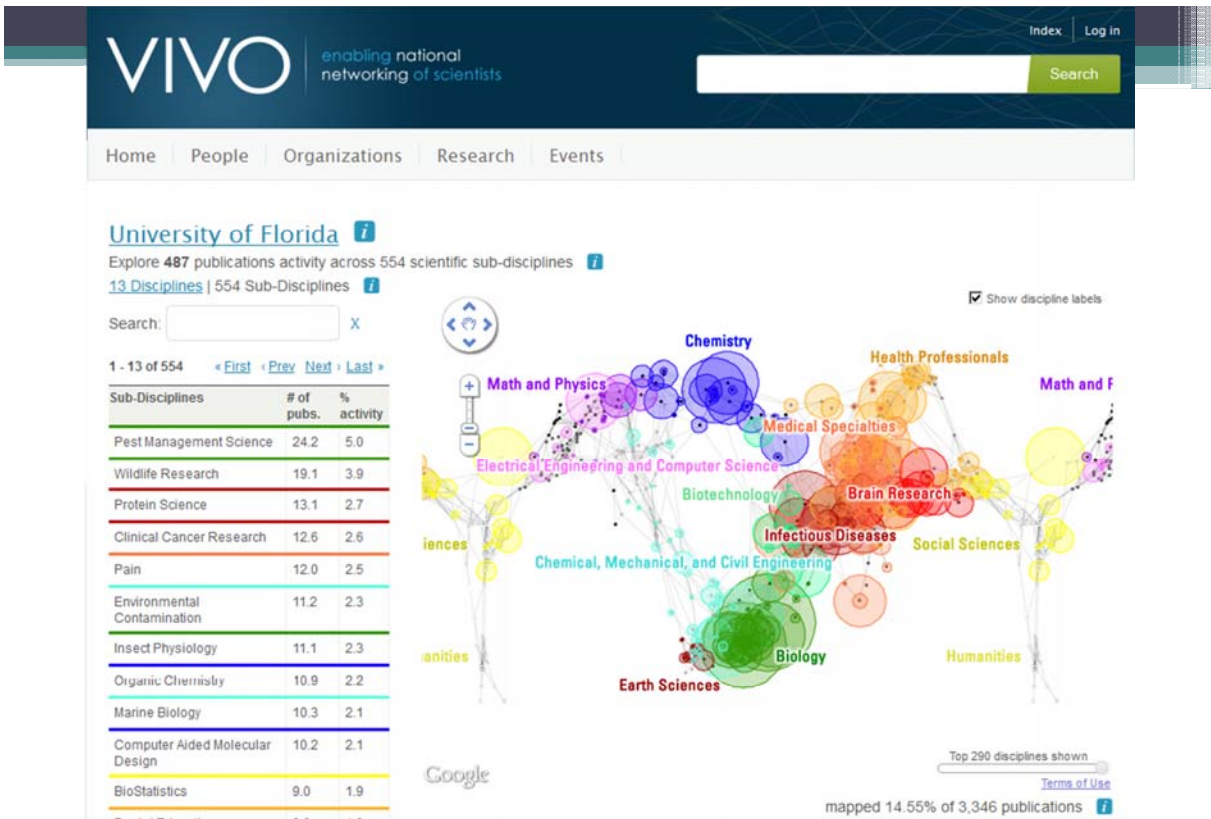
Total Number of Grants

You have selected 7 of a maximum 10 organizations to compare. **Clear**

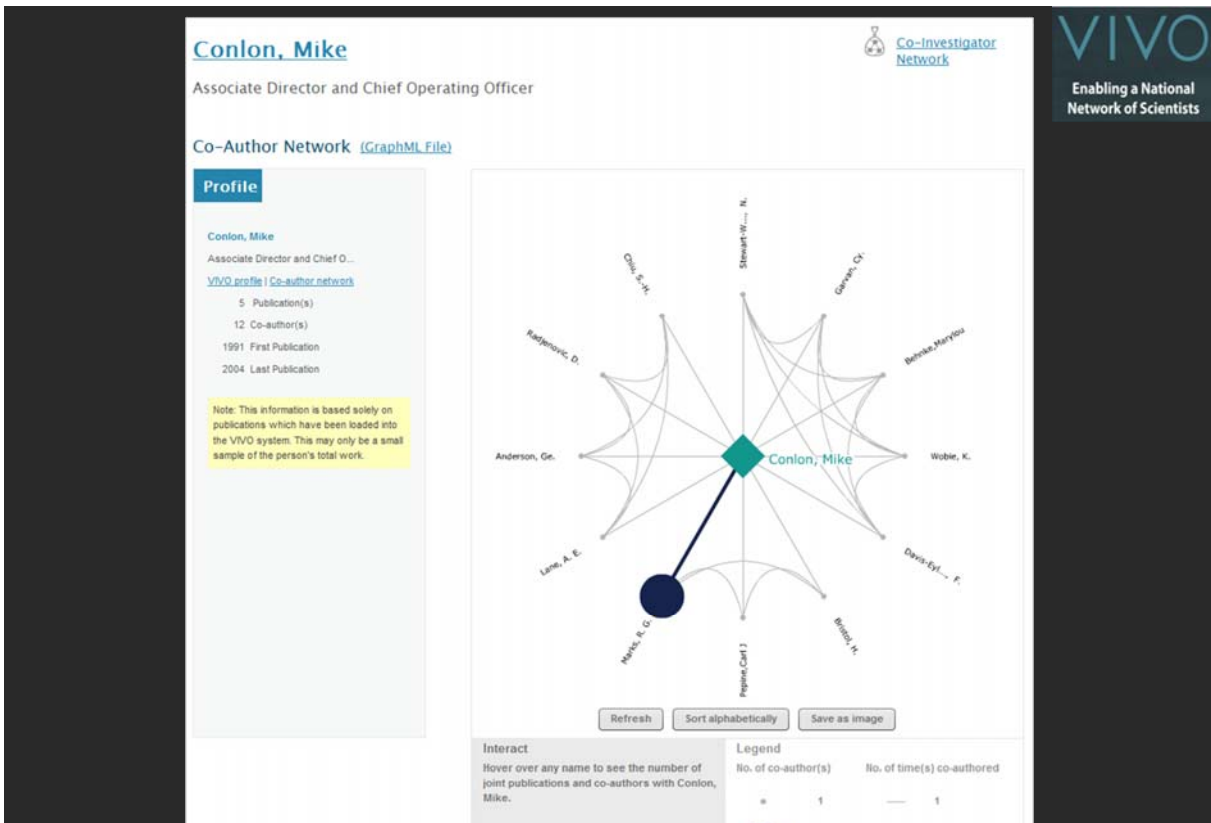
- Florida Sea Grant: 44
- International Center: 54
- Evelyn F. and William L. McKnight Brain Institute of the University of Florida: 64
- College of Engineering: 103
- College of Agricultural and Life Sciences: 166
- Florida Museum of Natural History: 203
- Continuing Education: 562

Save as CSV **Clear**

Temporal Analysis (When) Temporal visualizations of the number of papers/funding award at the institution, school, department, and people level



Topical Analysis (What) Science map overlays will show where a person, department, or university publishes most in the world of science. (in work)



Network Analysis (With Whom?) Who is co-authoring, co-investigating, co-inventing with whom? What teams are most productive in what projects?

National Researcher Networking Visualization 1.0

cyberinfrastructure for
NETWORK SCIENCE CENTER
cns.iu.edu



<http://nrn.cns.iu.edu>

VIVO enabling national
networking of scientists

Second Annual VIVO Conference

August 24-26, 2011

Gaylord National, Washington D.C.

<http://vivoweb.org/conference>



VIVO is supported by NIH Award U24 RR029822

Mapping Science Exhibit – 10 Iterations in 10 years

<http://scimaps.org>



Mapping Science Exhibit at MEDIA X, Wallenberg Hall, Stanford University

<http://mediax.stanford.edu>, <http://scaleindependentthought.typepad.com/photos/scimaps>

49

Mapping Science Exhibit – 10 Iterations in 10 years

<http://scimaps.org>

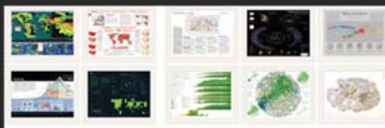
The Power of Maps (2005)



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)

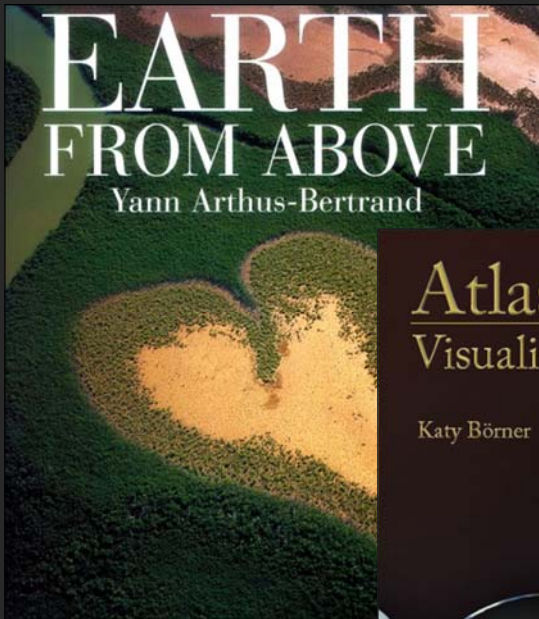
Science Forecasts (2013)

Towards Science Mapping Standards (2014)

Exhibit has been shown in 72 venues on four continents. Currently at
- NSF, 10th Floor, 4201 Wilson Boulevard, Arlington, VA
- Center of Advanced European Studies and Research, Bonn, Germany
- University of North Texas, Denton, Texas

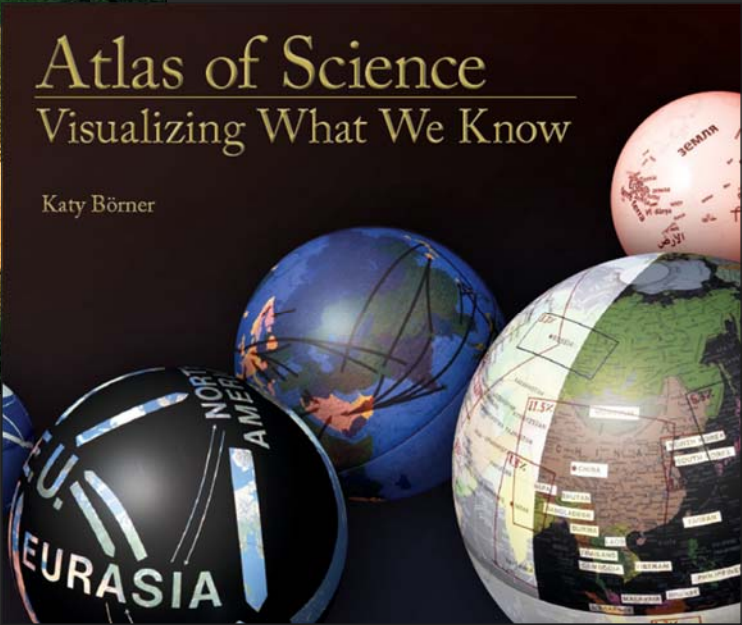


50



EARTH FROM ABOVE

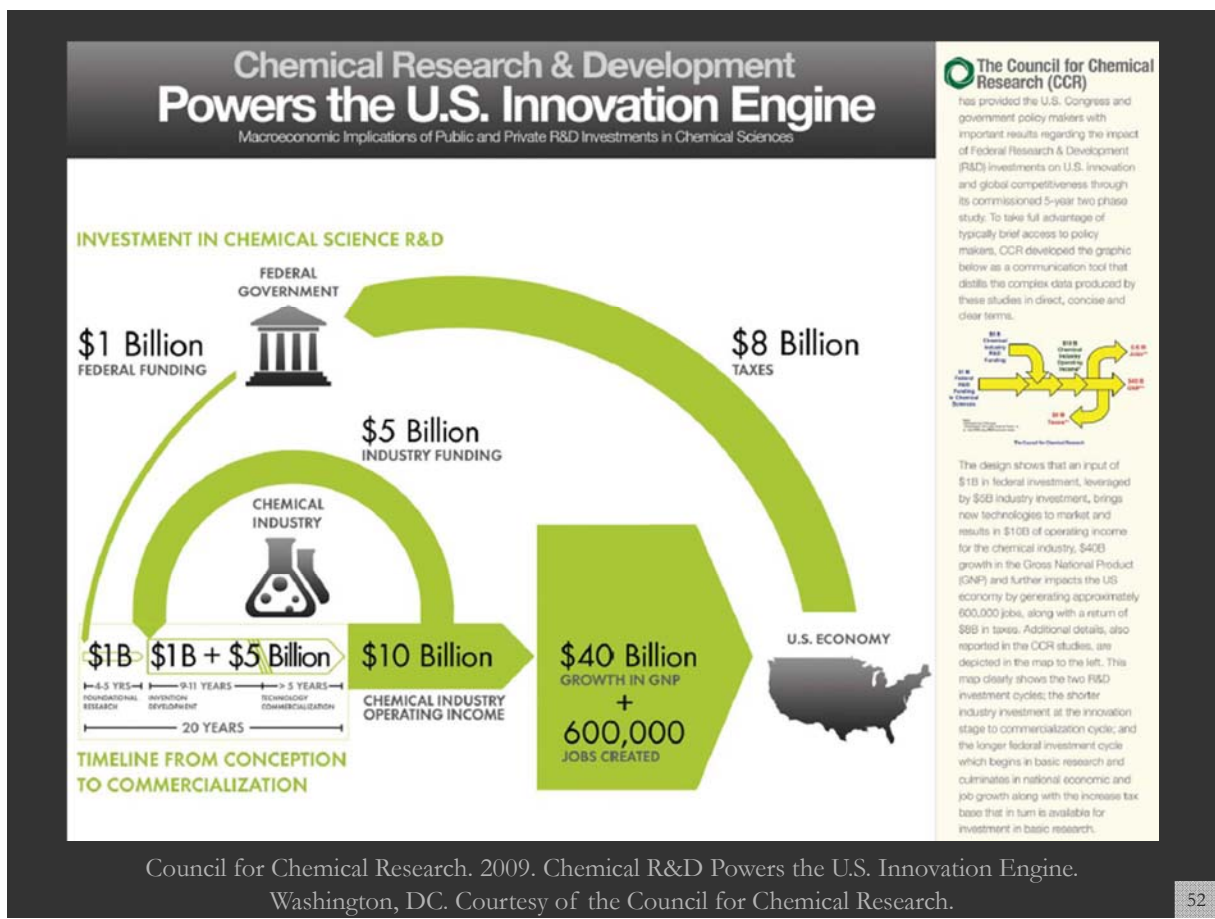
Yann Arthus-Bertrand



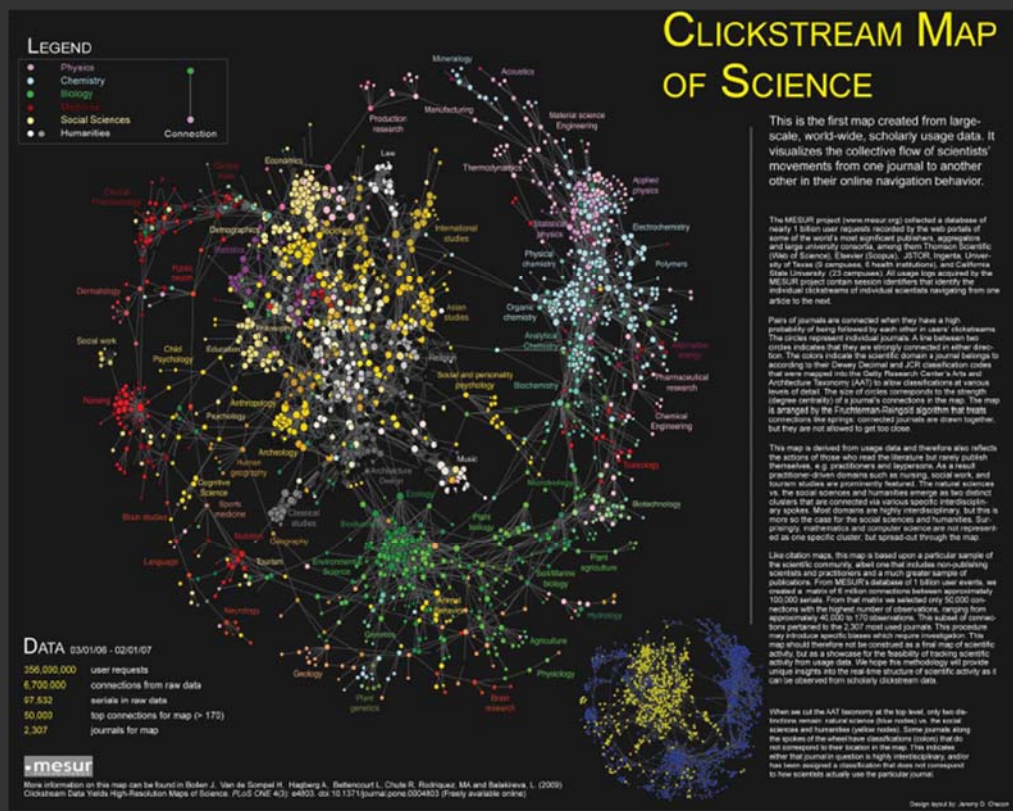
Atlas of Science

Visualizing What We Know

Katy Börner



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



Bollen, Johan, Herbert Van de Sompel, Aric Hagberg, Luis M.A. Bettencourt, Ryan Chute, Marko A. Rodriguez, Lyudmila Balakireva. 2008. A Clickstream Map of Science. 53





Science Maps in “Expedition Zukunft” science train visiting 62 cities in 7 months, 12 coaches, 300 m long. <http://www.expedition-zukunft.de>



This is the only mockup in this slide show.
Everything else is available today.

References

Börner, Katy, Chen, Chaomei, and Boyack, Kevin. (2003). **Visualizing Knowledge Domains**. In Blaise Cronin (Ed.), *ARIST*, Medford, NJ: Information Today, Volume 37, Chapter 5, pp. 179-255.

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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/

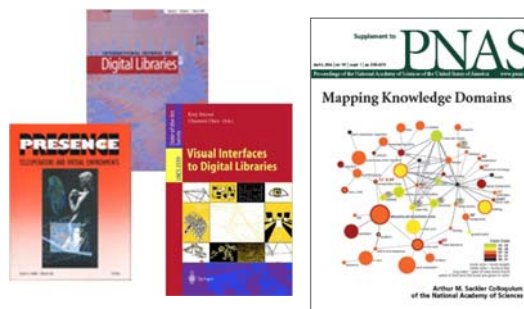
Börner, Katy, Sanyal, Soma and Vespignani, Alessandro (2007). **Network Science**. In Blaise Cronin (Ed.), *ARIST*, Information Today, Inc., Volume 41, Chapter 12, pp. 537-607.

<http://ivl.slis.indiana.edu/km/pub/2007-borner-arist.pdf>

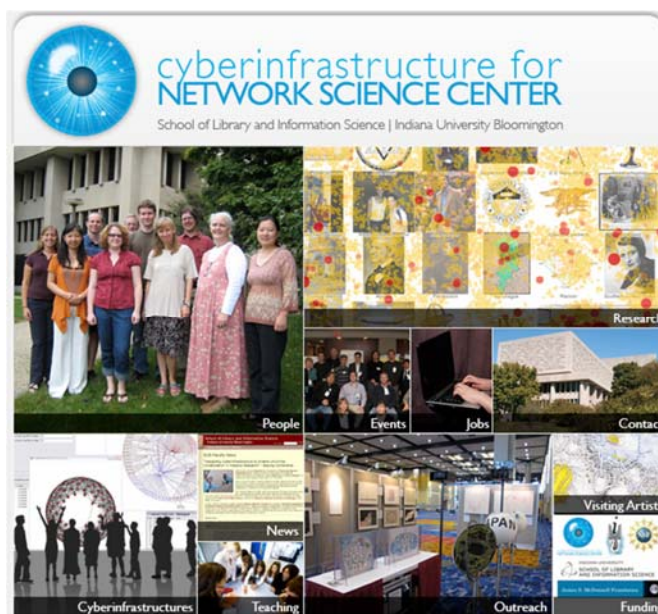
Börner, Katy (2010) **Atlas of Science**. MIT Press.

<http://scimaps.org/atlas>

Scharnhorst, Andrea, Börner, Katy, van den Besselaar, Peter (2011) **Models of Science Dynamics**. Springer Verlag.



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All papers, maps, tools, talks, press are linked from <http://cns.iu.edu>

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Mapping Science Exhibit Facebook: <http://www.facebook.com/mappingscience>