

Cartographies of Science

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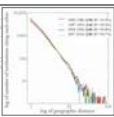
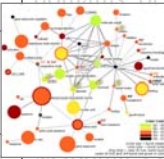



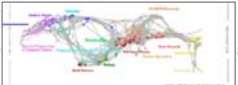
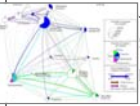


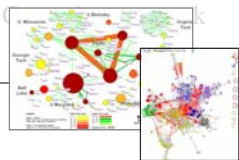
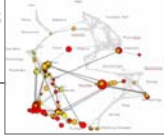
With special thanks to the members at the Cyberinfrastructure for Network Science Center, Kevin W. Boyack, the Mapping Science exhibit advisory board.

*Brownbag Talk, Sara Irina Fabrikant's Team
 University of Zürich*

June 23, 2011

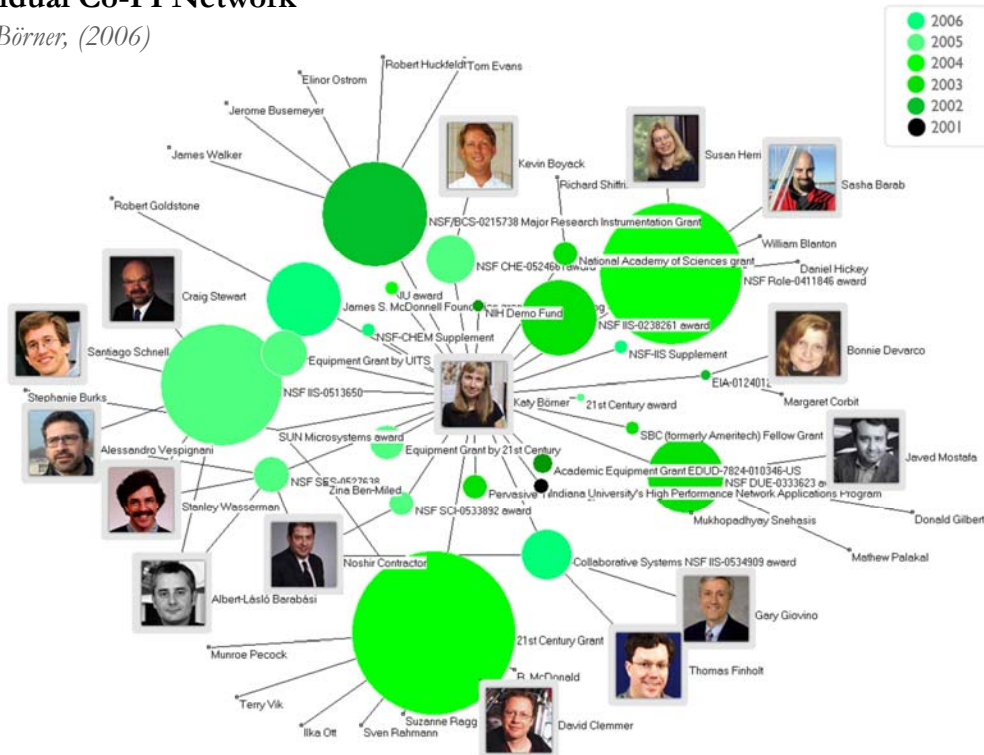


Type of Analysis vs. Level of Analysis

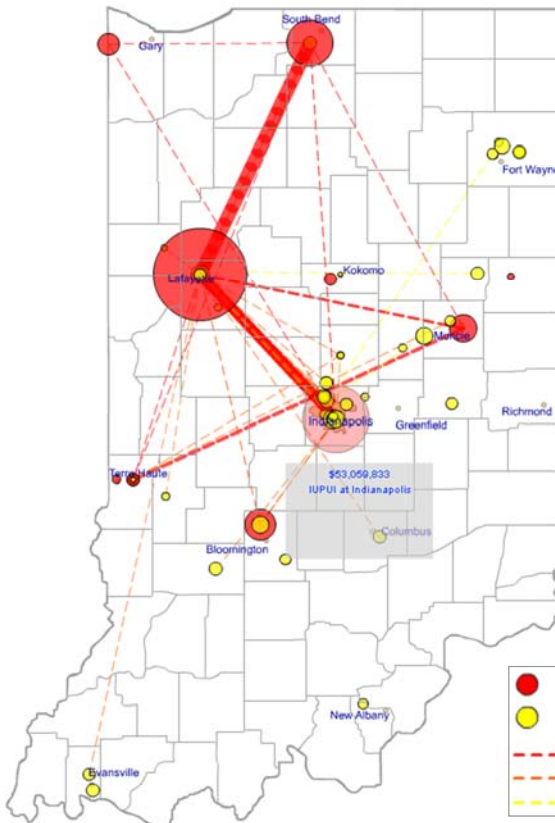
	Micro/Individual (1-100 records)	Meso/Local (101-10,000 records)	Macro/Global (10,000 < records)
Statistical Analysis/Profiling	Individual person and their expertise profiles	Larger labs, centers, universities, research domains, or states	All of NSF, SA, all of sci 
Temporal Analysis (When)	Funding portfolio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

Individual Co-PI Network

Ke & Börner, (2006)



3



Mapping Indiana's Intellectual Space

Identify

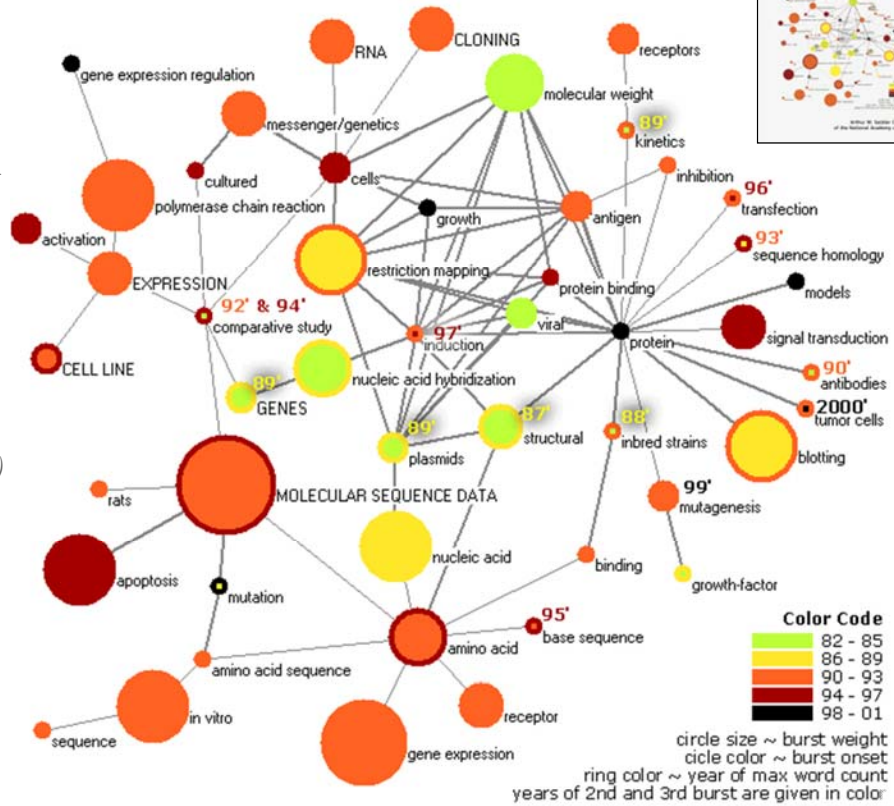
- Pockets of innovation
- Pathways from ideas to products
- Interplay of industry and academia

4

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.



5

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

Börner, Katy, Penumarthu, 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

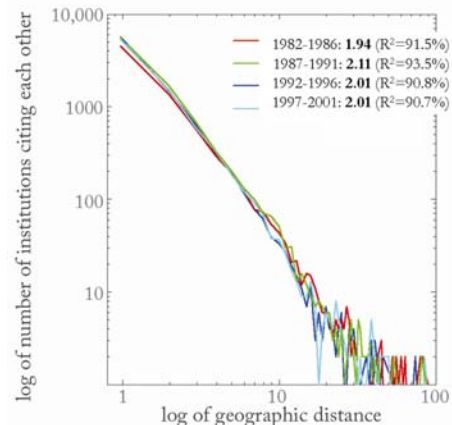


Research questions:

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.

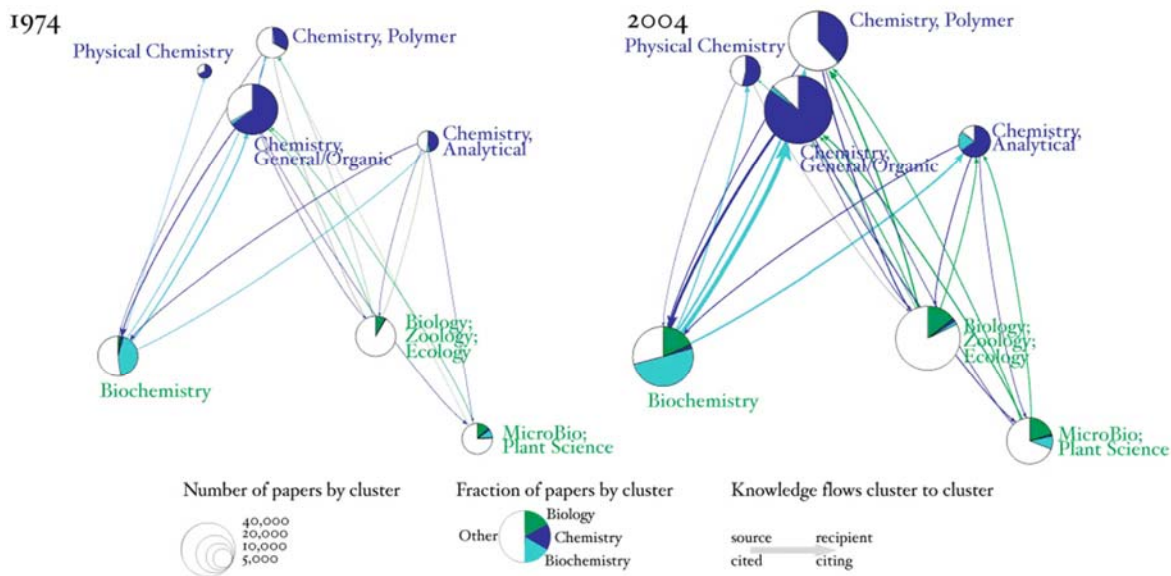


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Topical Composition and Knowledge Flow Patterns in Chemistry Research for 1974 and 2004

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

Chemistry - Biology Interface



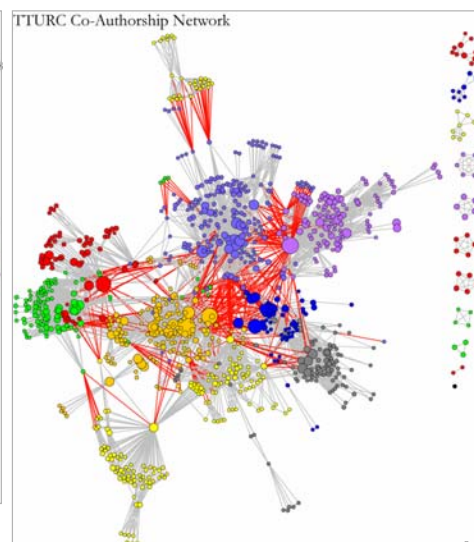
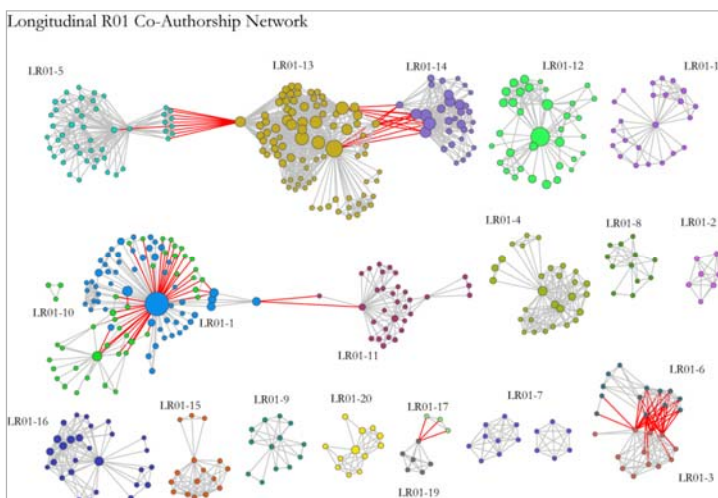
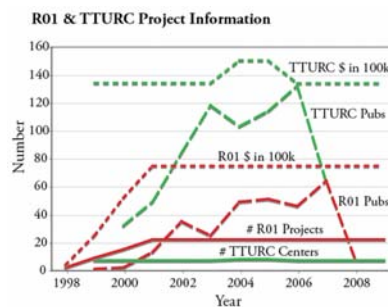
7

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*.

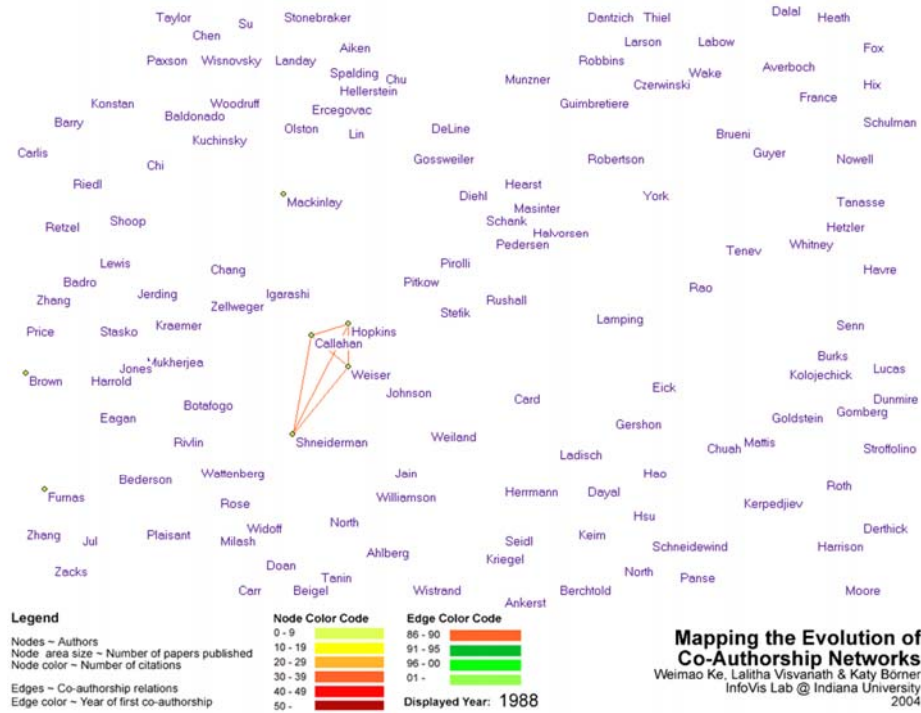
Supported by NIH/NCI Contract HHSN261200800812



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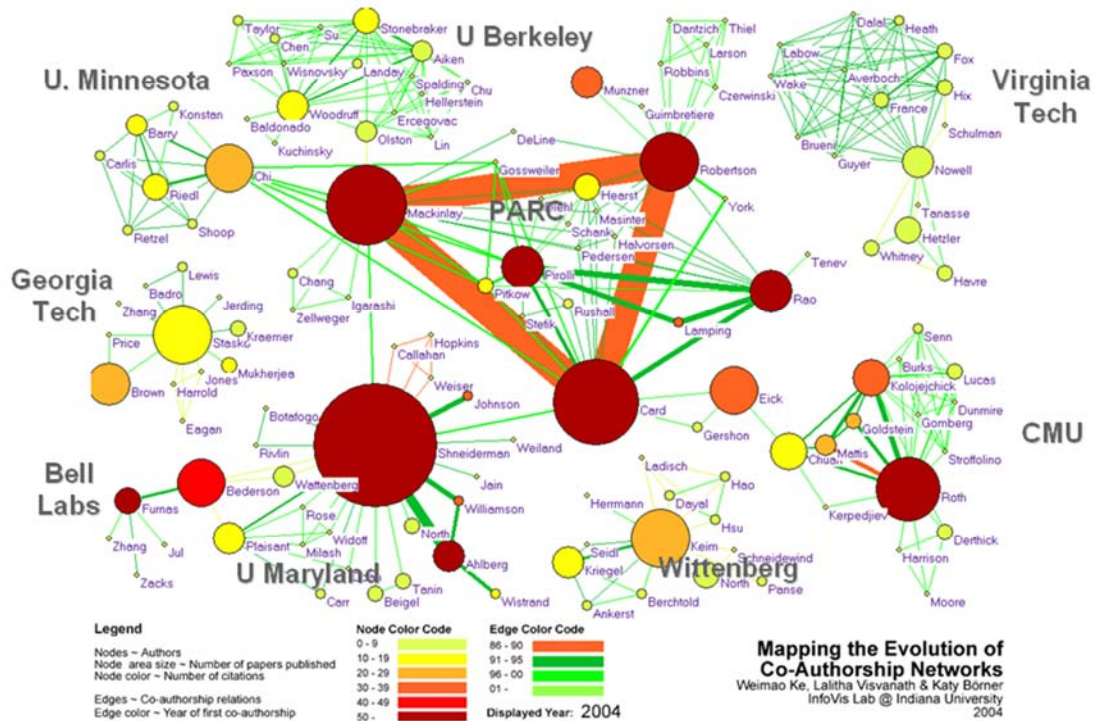
Mapping the Evolution of Co-Authorship Networks

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



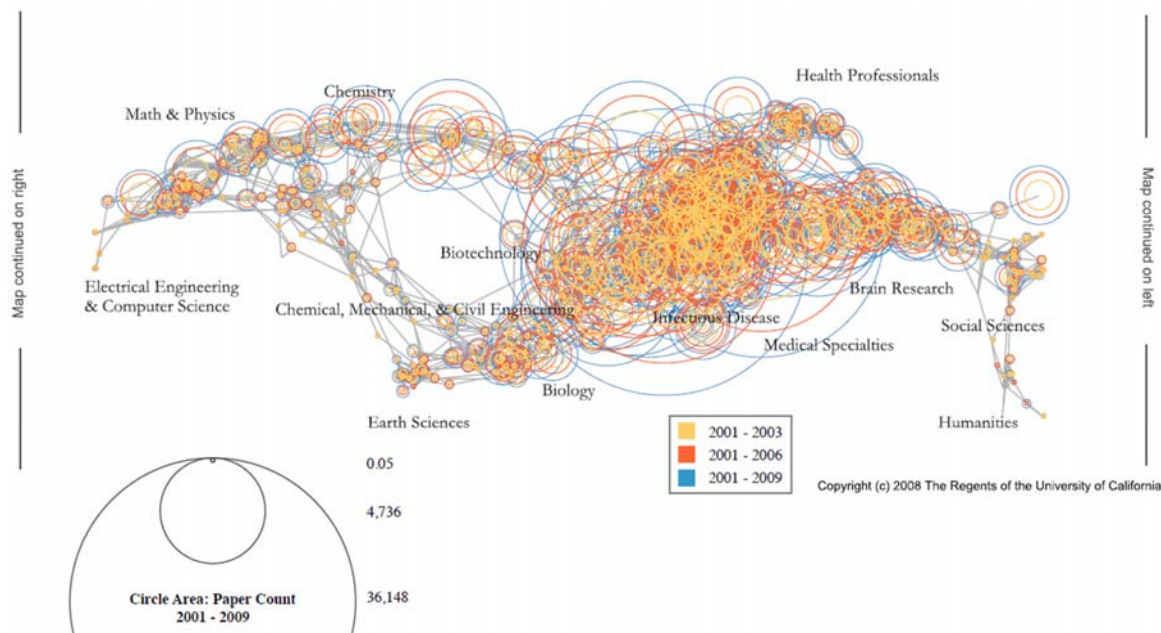
Mapping the Evolution of Co-Authorship Networks

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



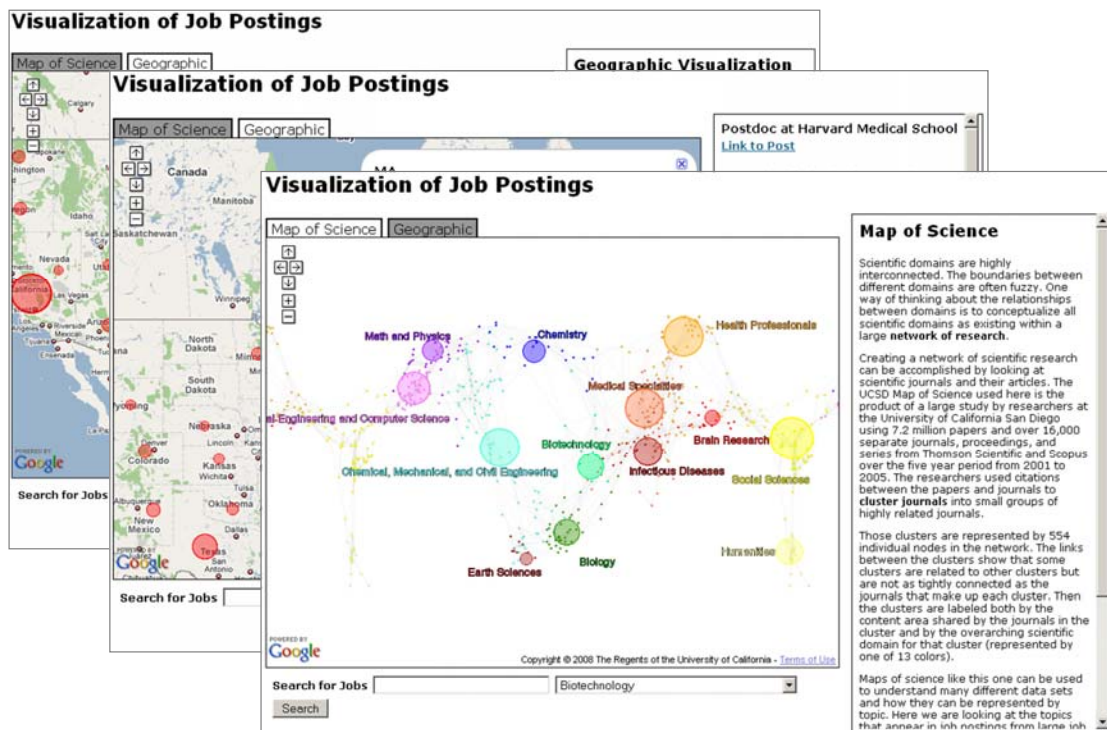
MEDLINE Publication Output by The National Institutes of Health (NIH) Using Nine Years of ExPORTER Data

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.



Interactive World and Science Map of S&T Jobs

Angela Zoss, Michael Connover, Katy Börner (2010)



Geographic Map

Science Map



Funding
 NIH
 NSF
 USDA

Publications
 DOE
 ISI
 Medline

Patents
 USPTO

Citations Count

Amount Count

From year 1901 to year 2009

Search by keyword

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

Geographic Map

Science Map



Funding
 NIH
 NSF
 USDA

Publications
 DOE
 ISI
 Medline

Patents
 USPTO

Maps Detail **Data** About

About

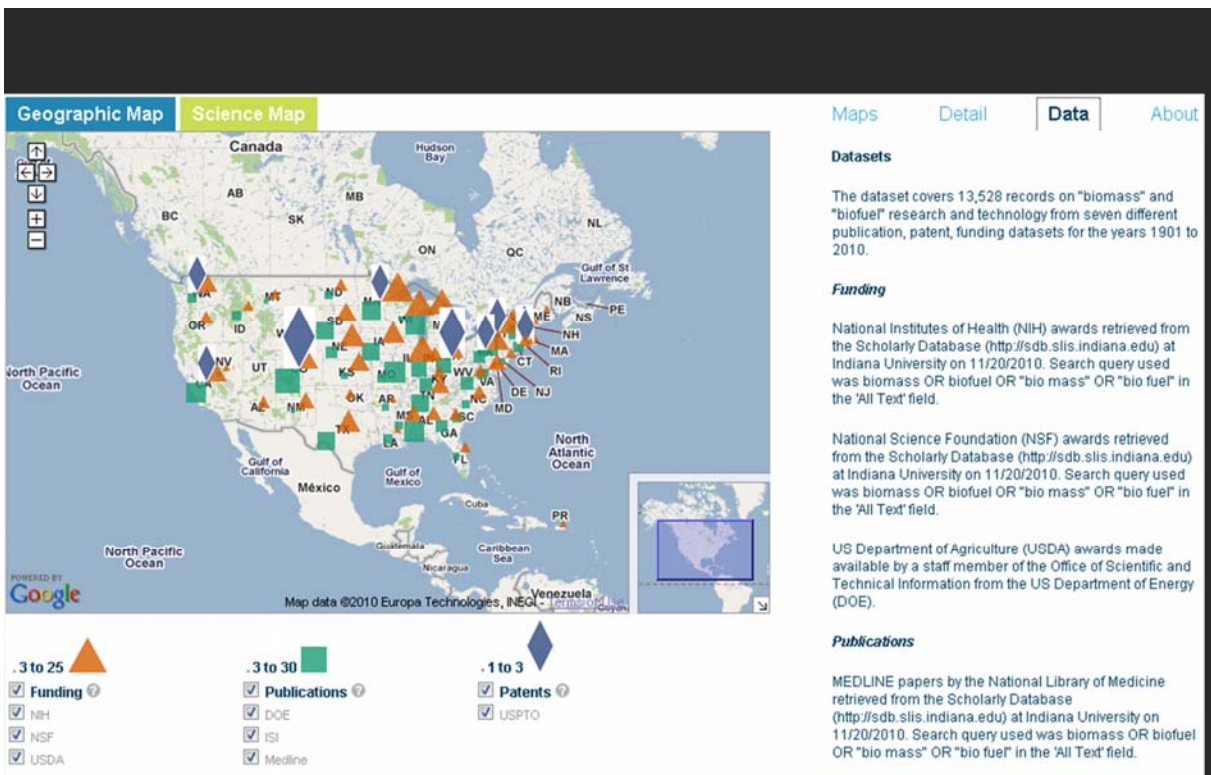
A new field of *Sustainability Science and Engineering* is emerging that seeks to understand the fundamental character of interactions between nature and human society and to help steer the impact of humanity's needs on the planet's natural resources towards sustainable trajectories. The field is unified in clear terms by its ultimate goals but occupies an interdisciplinary position among traditional research fields, spanning both science and engineering and spreading across disciplines as diverse as agriculture, ecology, oceanography, climate studies, economics, a diverse set of social sciences, energy and materials and several additional aspects of engineering, physics, biology, and chemistry. Although Sustainability Science and engineering is by now widely discussed in the scientific and engineering community, and is beginning to be connected to the political agenda for economic and social development, it remains unclear to what extent its many facets are being integrated into a global perspective and whether researchers are utilizing it as a nexus to collaborate across traditional scientific and engineering fields.

Please consult the [Mapping the Structure and Evolution of Sustainability Science](#) workshop web page for further information and details.

Web Page Design

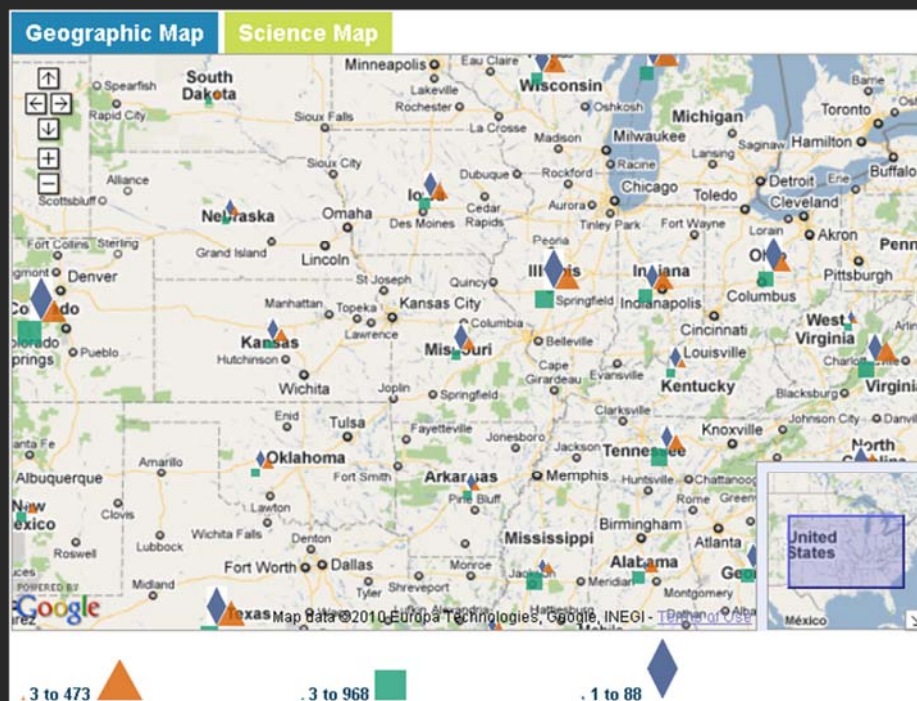
This web site provides an interactive interface to publication, patent, and funding data on 'biomass' and 'biofuel' research. Visitors are invited to explore what funding is available in what geospatial regions and in what areas of science and what publications and patents

Google Map JavaScript API was used to implement both maps with two aggregation layers for each. The geographic map aggregates to the **state level** and the **city level**. The science map has a high level of aggregation of 13 top-level scientific **disciplines** and a low level of 554 **sub-disciplines**.



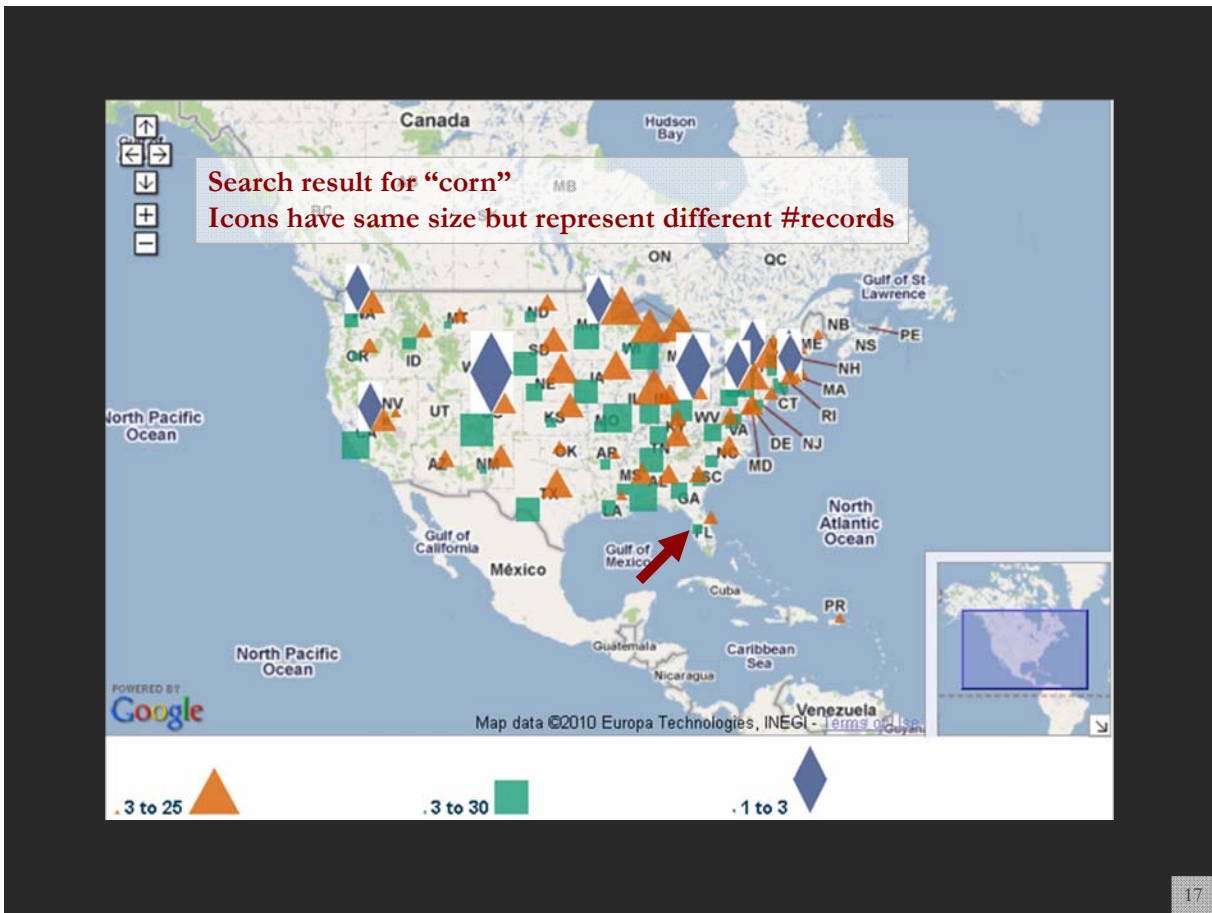
The geographic map at state level.

15



The geographic map at city level.

16



Science Map

Click on one icon to display all records of one type.
Here publications in the state of Florida.

Florida publications: 2 records
DOE: 1
MEDLINE: 1

Maps Detail Data About

> Florida

MEDLINE
2002

- [Recovery Of Dairy Manure Nutrients By Benthic Freshwater Algae](#)

DOE
1985

- [Enzymatic Hydrolysis And Fermentation Of Corn For Fuel Alcohol](#)

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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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MapSustain Information Bridge: DOE Scientifi...

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; FUELS; GRASS; HYDROLYSIS; INFORMATION; LYSIS; NUMERICAL DATA; PLANTS;

Done

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

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Geographic Map **Science Map**

Search result for "Miscanthus," a special energy biomass crops for second generation biofuel.

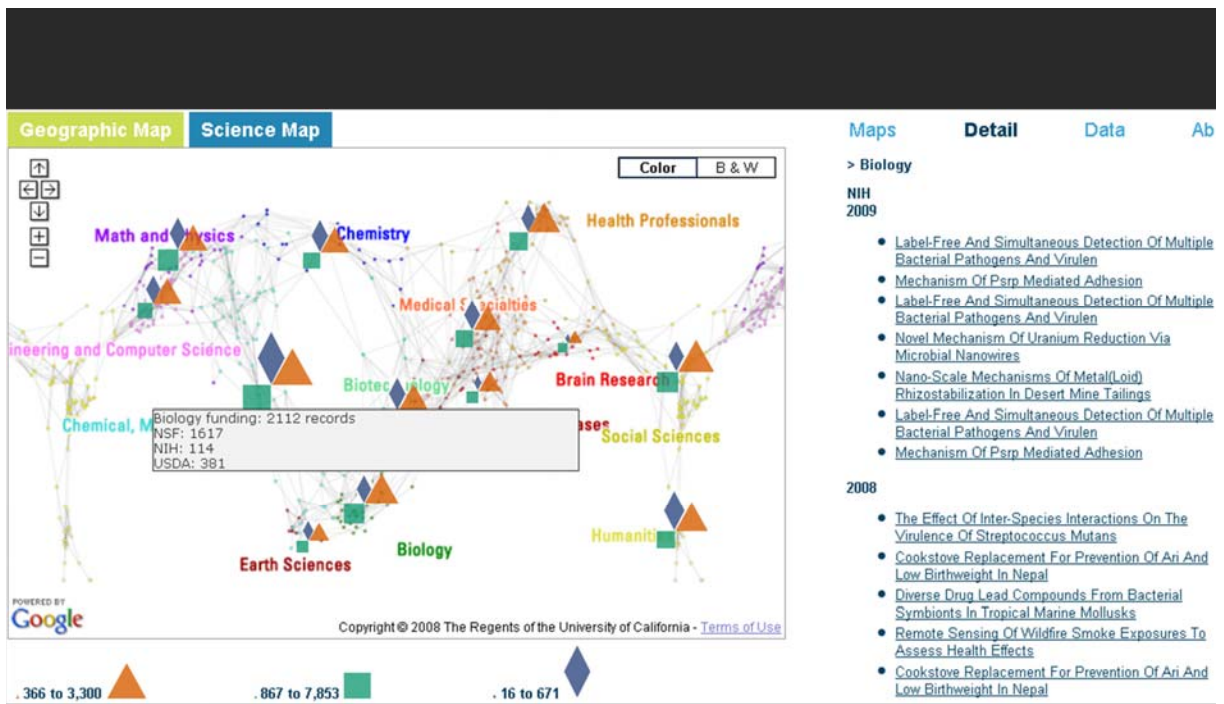
POWERED BY Google

Map data ©2010 Europa Technologies, INEGI

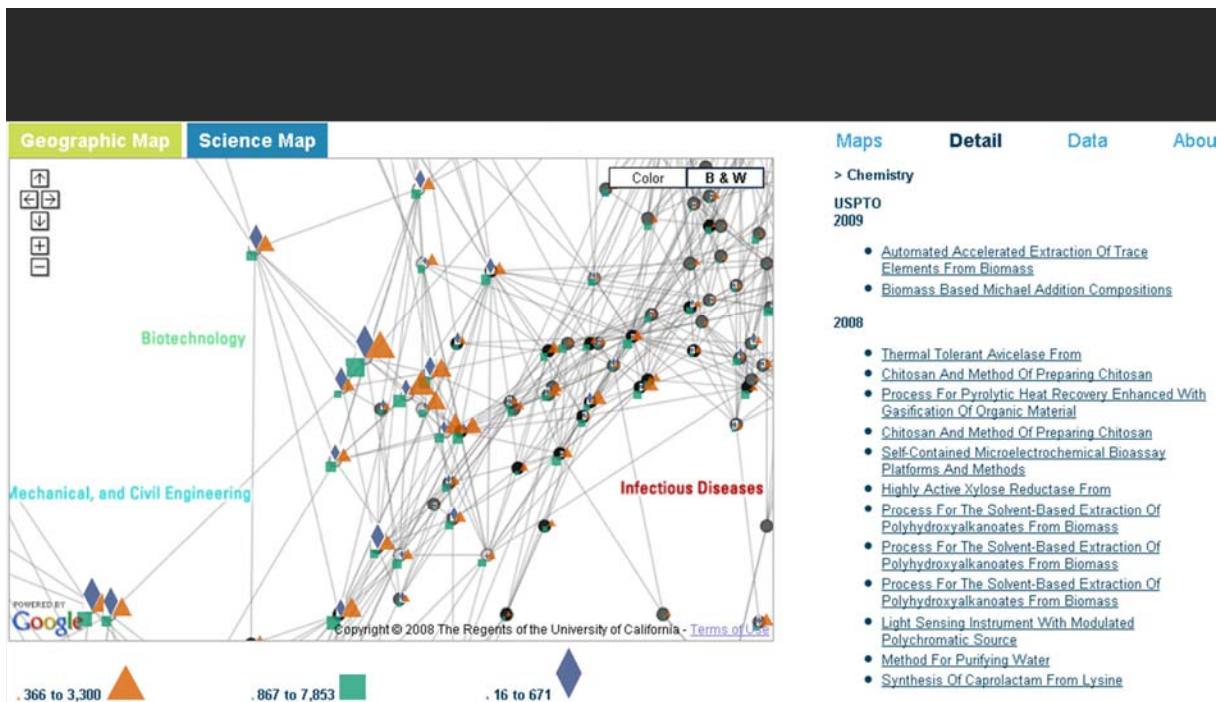
2 to 2 .3 to 4 .0 to 0

Venezuela

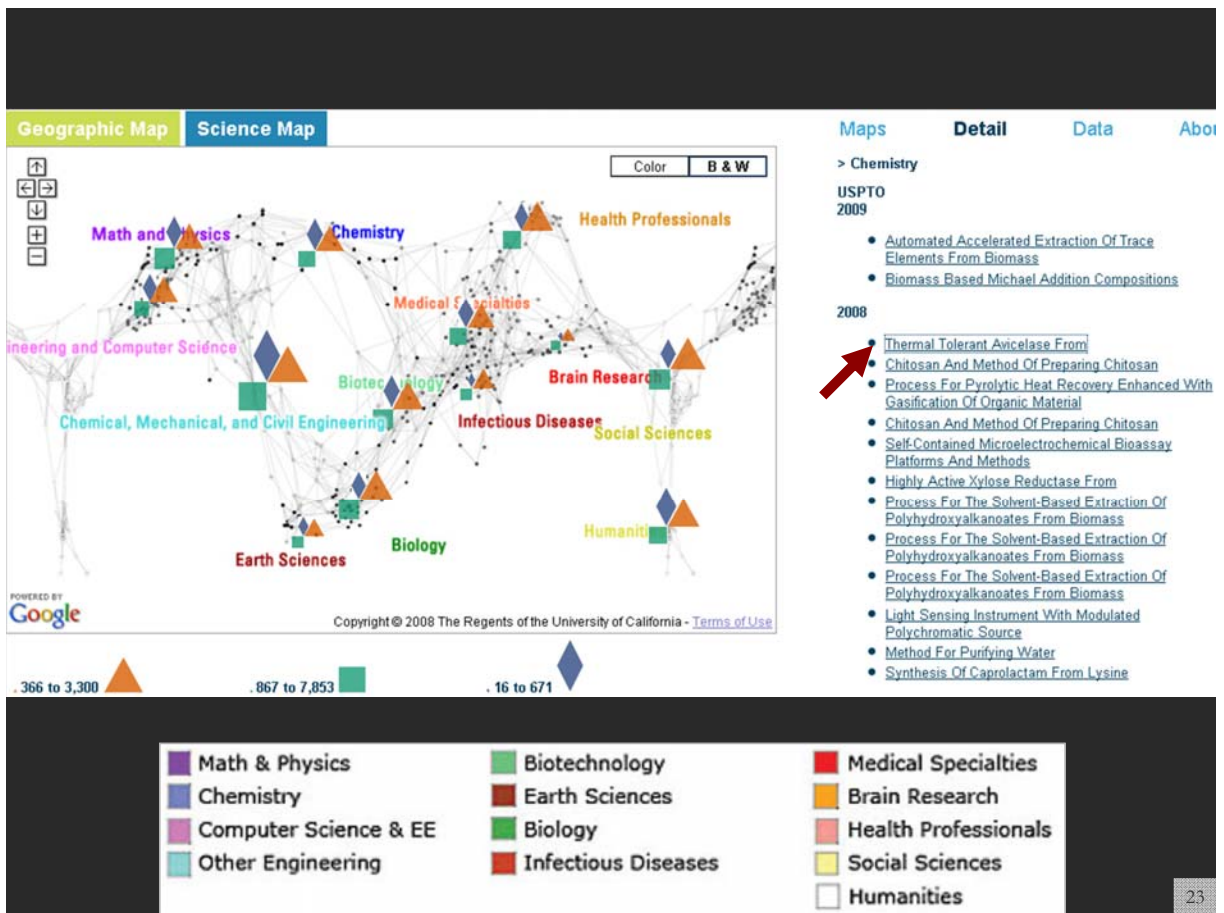
20



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



The science map at 554 sub-disciplines level.



- Maps Detail Data About
- > Chemistry
- USPTO
- 2009
- Automated Accelerated Extraction Of Trace Elements From Biomass
 - Biomass Based Michael Addition Compositions
- 2008
- Thermal Tolerant Avicelase From Chitosan And Method Of Preparing Chitosan
 - Process For Pyrolytic Heat Recovery Enhanced With Gasification Of Organic Material
 - Chitosan And Method Of Preparing Chitosan
 - Self-Contained Microelectrochemical Bioassay Platforms And Methods
 - Highly Active Xylose Reductase From Process For The Solvent-Based Extraction Of Polyhydroxyalkanoates From Biomass
 - Process For The Solvent-Based Extraction Of Polyhydroxyalkanoates From Biomass
 - Process For The Solvent-Based Extraction Of Polyhydroxyalkanoates From Biomass
 - Light Sensing Instrument With Modulated Polychromatic Source
 - Method For Purifying Water
 - Synthesis Of Caprolactam From Lysine

United States Patent: 7364890 - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PALL&p=1&u=/netacgi/PTO/srch

MapSustain United States Patent: 7364890 United States Patent: 7364890 Information Bridge: DOE Scientific a...

USPTO PATENT FULL-TEXT AND IMAGE DATABASE

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Bottom

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Images

(1 of 1)

United States Patent 7,364,890
Ding, et al. April 29, 2008

Thermal tolerant avicelase from *Acidothermus cellulolyticus*

Abstract

The invention provides a thermal tolerant (thermostable) cellulase, AvIII, that is a member of the glycoside hydrolase (GH) family. AvIII was isolated and characterized from *Acidothermus cellulolyticus* and, like many cellulases, the disclosed polypeptide and/or its derivatives may be useful for the conversion of biomass into biofuels and chemicals.

Inventors: Ding; Shi-You (Golden, CO), Adney; William S. (Golden, CO), Vinzant; Todd B. (Golden, CO), Himmel; Michael E. (Littleton, CO)

Assignee: Midwest Research Institute (Kansas City, MO)

App. No. 09/017,276

Done

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NIH TOPIC MAPS

A Topic Database of NIH-Funded Grants

NIH Map Viewer

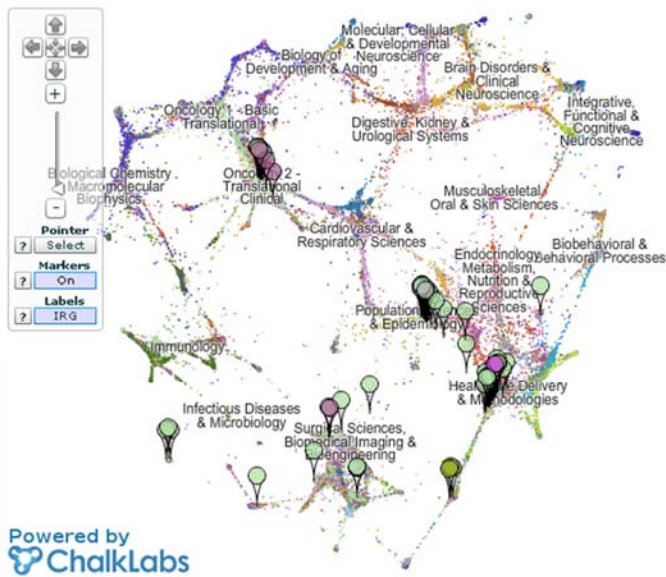
Show Topic Browser ?

Export Data

Methods

Feedback

2009 ? add delete AND Topic Words cancer breast cancers cancer_risk cancer_p 20 0/0 ? Search Clear Search



- FIC
- NCCAM
- NCI
- NCMHD
- NCRR
- NEI
- NHGRI
- NHLBI
- NIA
- NIAAA
- NIAID
- NIAMS
- NIBIB
- NICHD
- NIDA
- NIDCD
- NIDCR
- NIDDK
- NIEHS
- NIGMS
- NIMH
- NINDS
- NINR
- NLM
- OD

Institutes (9) ?

NIH Inst	#Grants	Count	+
NCI		116	
NCRR		10	
NIEHS		5	
NCMHD		1	
NIA		-	

Topics ?

%	Title Words	+
25.9	breast, cancer, cancer_risk, women, cancer_sui	
3.86	risk, risk_factors, cancer, prospective, women,	
3.76	genome_wide_association, loci, genome_wide,	
3.70	genetic, genetics, genes, gene_environment, i	

Grants (137) ?

NIH Inst	Grant	+
NCRR	3P20RR011792-10S2 6914 OBESITY, INSULIN RESISTANCE, IGF'S, AND BREAST CANCER RISK IN AFRICAN AMERICANS PI: CUI, YONG	
NCI	3R01CA120562-03S1 Commonly Used Medications and Breast Cancer Recurrence PI: BOUDREAU, DENISE M	
NCI	3R01CA120562-03 Commonly Used Medications and Breast Cancer Recurrence PI: BOUDREAU, DENISE M	
NCI	3R01CA093772-06 Long-term Survivorship in Older Women with Early Stage Breast	

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<https://app.nihmaps.org>

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NIH TOPIC MAPS

A Topic Database of NIH-Funded Grants

NIH Topic Browser - Institute Information

NLM NCI NEI NCCAM NIEHS NIGMS NINR NICHD NINDS NIA NCMHD NIAMS NIH NIDDK NHLBI NIAAA NIMH NHGRI FIC NIBIB NIDCR NCRR NIAID NIDA NIDCD

Institute: NCI - National Cancer Institute

Export Data

Top Topics

%	Topic	Topic Words	Title Words	Phrases	+
4.05	210	cancer cancer_center program cancer_research	cancer_center, program, cancer, core, spore, tra	anderson cancer_center, shared resource, canc	
2.42	597	cancer tumor tumorigenesis tumors myc tumor_	cancer, tumorigenesis, myc, tumor_suppressor,	tumor progression, malignant transformation, tu	
2.28	430	cancer treatment therapy patients tumor disea	cancer, therapy, treatment, tumor, prostate, bre	cancer treatment, treatment cancer, metastatic	
1.73	16	metastasis invasion tumor metastatic progressi	metastasis, cancer, invasion, breast, tumor, pro	tumor progression, invasion metastasis, cancer	
1.47	345	clinical_trials trials oncology cancer treatment di	clinical_trials, clinical_oncology, oncology, unit,	clinical_trials unit, phase_j clinical_trials, cancer	
1.43	686	cancer breast cancers cancer_risk cancer_pati	breast, cancer, cancer_risk, women, cancer_sur	breast cancer, breast cancer_risk, breast cancer	
1.41	370	tumor immunotherapy t_cells t_cell immunity an	tumor, immunotherapy, t_cell, immunity, t_cells,	antitumor immunity, adoptive immunotherapy, t	
1.14	480	therapeutic agents treatment therapies targets	therapeutic, targeting, agents, treatment, there	therapeutic agents, therapeutic targets, therap	
1.08	346	biomarkers markers biomarker disease patients	biomarkers, biomarker, markers, disease, cance	disease progression, biomarker validation, seru	
0.98	660	prostate cancer pca cancer_cells incap androge	prostate, cancer, cancer_cells, androgen_recep	prostate cancer, prostate cancer_cells, prostate	
0.90	171	scientific committee administrative management	core, administrative, administration, planning, a	steering committee, internal external, institutor	
0.87	182	breast cancer her2 cancer_cells human mcd7 ne	breast, cancer, cancer_cells, her2, human, estre	breast cancer, breast cancer_cells, her2 neu, br	
0.85	437	risk risk_factors cases cohort prospective high_	risk, risk_factors, cancer, prospective, women,	cases controls, prospective cohort_study, modif	
0.85	23	tumor tumors tumor_growth mice treatment tun	tumor, tumors, cancer, tumor_growth, targeting	tumor regression, tumor burden, tumor progres	
0.85	695	core statistical projects biostatistics investigat	core, biostatistics, data_management, bioinform	biostatistics core, projects core, data_manager	
0.79	603	intervention interventions program prevention p	intervention, prevention, interventions, program	randomized_controlled trial, intervention reduce	

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NIH TOPIC MAPS

A Topic Database of NIH-Funded Grants

NIH Topic Browser

Show Map Viewer ?

Export Data

Methods

Feedback

Topics by NIH Institute

Topics by Category

2009

?

add

delete

AND

Exact Text

cancer

Search

Clear Search

2009 Grants (137)

Institutes (9)

Col	NIH Inst	Project/Subprojec	Title	Investigator(s)	# 1 Topic	# 1 Topic Word	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	116
	NCI	3R01CA120562-03S1	Commonly Used Medications and Breast Cancer Recurrence	BOUDREAU, DENISE M	686 (42%)	cancer brea...	NCRR	10	10
	NCI	5R01CA120562-03	Commonly Used Medications and Breast Cancer Recurrence	BOUDREAU, DENISE M	686 (42%)	cancer brea...	NIHHS	5	5
	NCI	5R01CA093772-06	Long-term Survivorship in Older Women with Early Stage Breast Cancer	SILLIMAN, REBECCA A	686 (42%)	cancer brea...	NCMHD	1	1
	NCI	5R01CA064277-11	Shanghai Breast Cancer Study	ZHENG, WEI	686 (41%)	cancer brea...	NIA	1	1
							NCCAM	1	1
							NIHCHD	1	1
							NIHNR	1	1
							NHGRI	1	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 g	genetic, genetics, tre	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, tre	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			

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NIH TOPIC MAPS

A Topic Database of NIH-Funded Grants

3P20RR011792-10S2 6914

Map Viewer

Topic Browser

Export Data

Methods

Feedback

2009 NCRR CUI, YONG

NIH RePORTer

Map Similar Grants

Highlight on Map

Show Parent/Other Subs

OBESITY, INSULIN RESISTANCE, IGF'S, AND BREAST CANCER RISK IN AFRICAN AMERICANS

The purpose of this study is to better understand how lifestyle factors and their interaction with genetic factors influence a women's risk of developing breast cancer. In order to learn more about the causes of breast cancer, we need to compare the lifestyles of people who have breast cancer with those who do not. 600 women are expected to be enrolled.

Top Topics

50.00	686	cancer breast	cancers cancer_risk cancer_patients women cancer_surviv
11.54	378	african_american white ethnic racial african_americans black race white	
11.54	548	obesity weight bmi obese overweight weight_loss body_mass_index kg	

Tags

NIH Reporting Categories	
Breast Cancer...	Cancer... Obesity
NIH Concept Keywords	
African American...	cancer risk... Clinical Research... Computer Retrieval of Information on

Similar Grants

Similar	Co	NIH Inst	Project/Subprojec	Title	Investigator(s)	# 1 Topic	# 1 Topic Word
0.54		NCI	3K22CA127519-03S1	Beyond Adiposity: Insulin and Inflammation in Postmenopausal Breast Cancer	NUNEZ, NOMELI PANIAGUA	686 (33%)	cancer breast...
0.54		NCI	5K22CA127519-03	Beyond Adiposity: Insulin and Inflammation in Postmenopausal Breast Cancer	NUNEZ, NOMELI PANIAGUA	686 (33%)	cancer breast...
0.48		NCI	5R01CA128799-02	Mechanisms for Increased Breast Cancer Risk in Type 2 Diabetes	LEROITH, DEREK	66 (17%)	diabetes diab...
0.48		NCI	3P30CA013696-36S2 0007	BREAST CANCER RESEARCH	PARSONS, RAMON E	210 (40%)	cancer cancer...
0.48		NCI	3P30CA013696-36S3 0007	BREAST CANCER RESEARCH	PARSONS, RAMON E	210 (40%)	cancer cancer...

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NIH TOPIC MAPS

NIH Map Viewer Show Topic Browser ? Export Data Methods Feedback

2009 ? add delete AND Related Grants 7960745 Top 100 Search Clear Search

Pointer
Select
Markers
On
Labels
IRG

FIC
NCCAM
NCI
NCMHD
NCRR
NEI
NHGRI
NHLBI
NIA
NIAAA
NIAID
NIAMS
NIBIB
NICHD
NIDA
NIDCD
NIDCR
NIDDK
NIEHS
NIGMS
NIMH
NINDS
NINR
NLM
OD

Institutes (3) ?

NIH Inst	#Grants	Count	+
NCI		94	
NCRR		6	
NCMHD		1	

Topics ?

%	Title Words	+
14.7%	breast, cancer, cancer_risk, women, cancer_sui	
11.0%	breast, mammography, mammographic, canc	
9.60%	risk, risk_factors, cancer, prospective, women,	
3.23%	genome_wide_association, lod, genome_wide,	

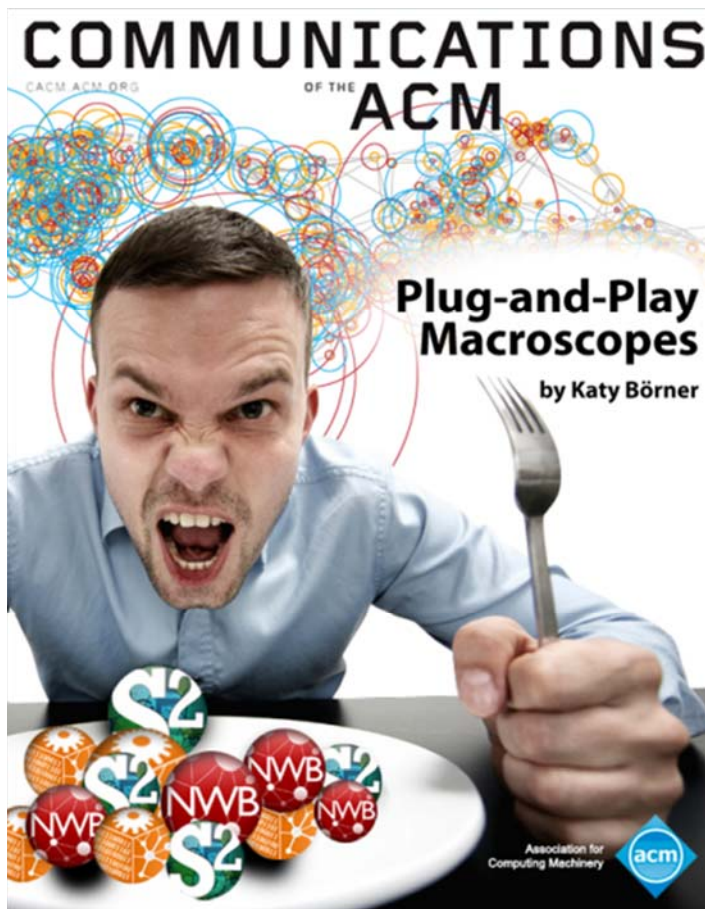
Grants (101) ?

NIH Inst	Grant	+
NCRR	3P20RR011792-10S2-6914 OBESITY, INSULIN RESISTANCE, JGFs, AND BREAST CANCER RISK IN AFRICAN AMERICANS P1: CUI, YONG	
NCI	3R01CA120562-03S1 Commonly Used Medications and Breast Cancer Recurrence PI: BOUDREAU, DENISE M	
NCI	3R01CA120562-03 Commonly Used Medications and Breast Cancer Recurrence PI: BOUDREAU, DENISE M	
NCI	3R01CA093772-06 Long-term Survivorship in Older Women with Early Stage Breast	

Powered by ChalkLabs

<https://app.nihmaps.org>

29



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>

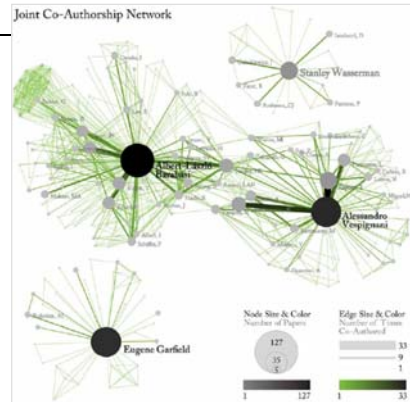
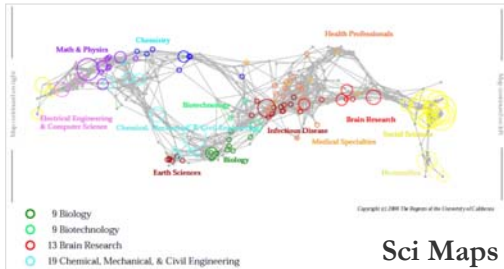
30



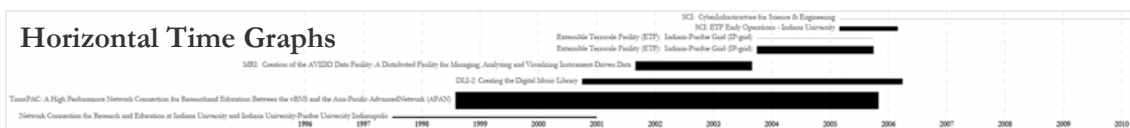
Sci² Tool – “Open Code for S&T Assessment”

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

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



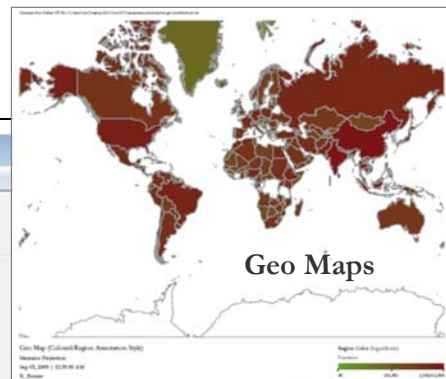
Horizontal Time Graphs



Börner, Katy, Huang, Weixia (Bonnie), Linnemeier, Micah, Dubon, Russell Jackson, Phillips, Patrick, Ma, Nianli, Zoss, Angela, Guo, Hanning & Price, Mark. (2009). *Rete-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>).

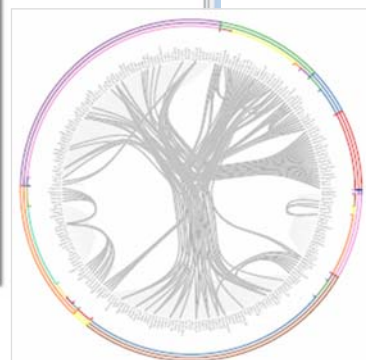
The primary investigators are Katy Börner, In SciTech Strategies Inc. The Sci² tool was developed by J. Duhon, Patrick A. Phillips, Chintan Tank, a Cyberinfrastructure Shell (<http://cishell.org>) for Network Science Center (<http://cns.slis.indiana.edu>). Many algorithm plugins were derived from the 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	<div style="width: 100%;"></div>
<input checked="" type="checkbox"/>	Load and Clean ISI File	09/03/2009	00:15:05 AM	<div style="width: 100%;"></div>



Sci² Tool

A tool for science of science research & practice

Email Address

Password

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.

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 Michigan, Ann Arbor, MI

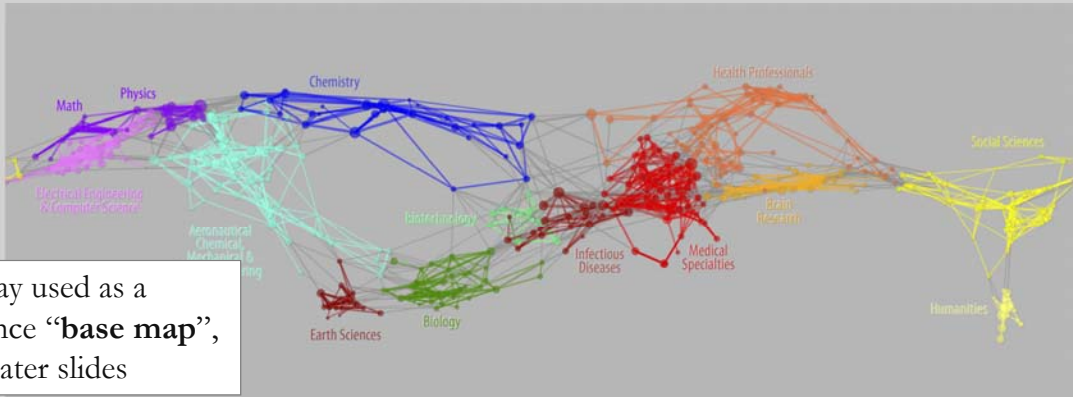
The map of science was constructed by sorting more than 10,000 journals into disciplines. Disciplines, represented as nodes, are only shown if they have a common literature. Connections between disciplines are pairs of disciplines that share a common literature. A three-dimensional model was used to determine the best way to display the map. The model was designed to allow for viewing the map from any angle. The model was also designed to allow for viewing the map from any angle. The model was also designed to allow for viewing the map from any angle.

MAPS OF SCIENCE

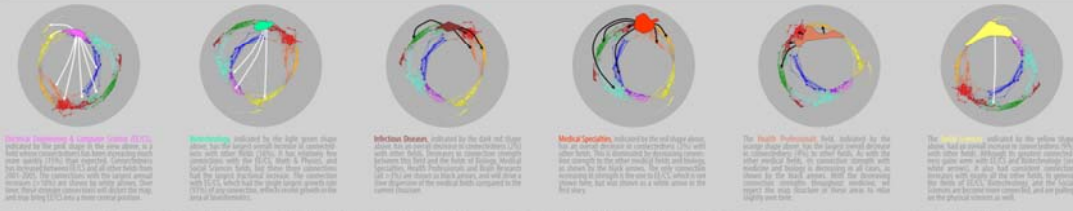
A visualization of 7.2 million scholarly documents appearing in over 16,000 journals, proceedings or symposia between Jan, 2001 and Dec, 2005

Forecasting Large Trends in Science

Calculations were performed using the large network strategy of disciplines. Clusters to determine if any of these were likely to show large growth in the direction of science were found. Correlations between fields were calculated for each individual year from 2001 to 2005. A single regression analysis was conducted to see if there were significant changes in these correlations over the five-year period.



Today used as a science “base map”, see later slides

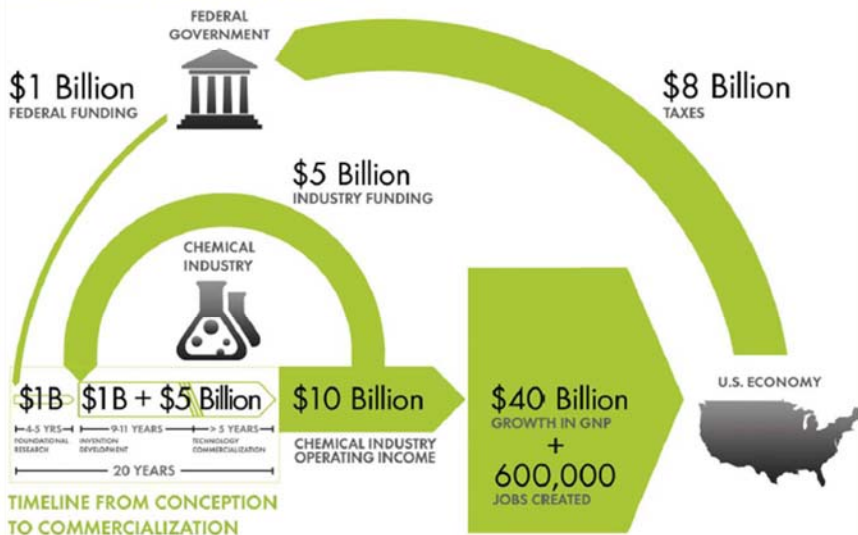


Richard Klavans & Kevin W. Boyack. 2007. Maps of Science: Forecasting Large Trends in Science

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

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

INVESTMENT IN CHEMICAL SCIENCE R&D



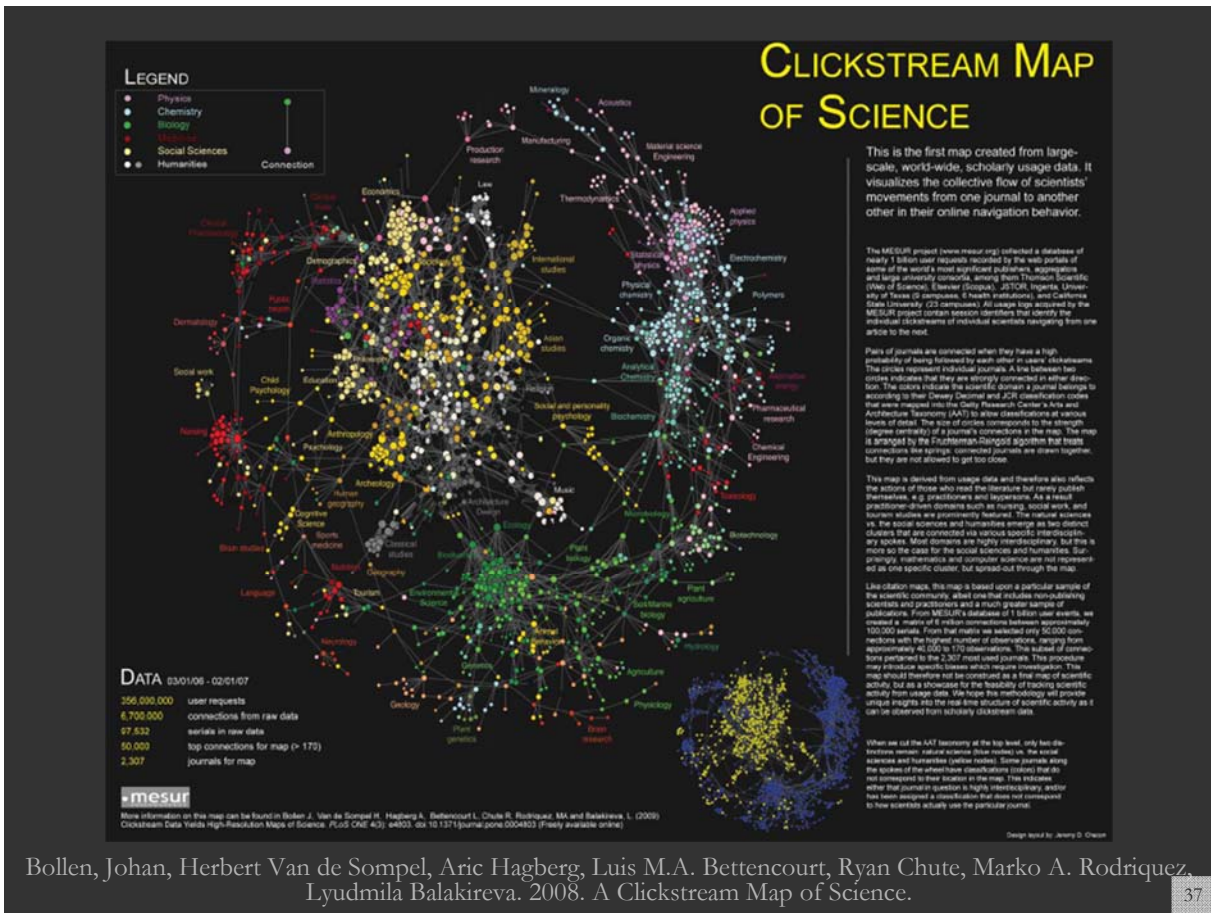
The Council for Chemical Research (CCR)

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.

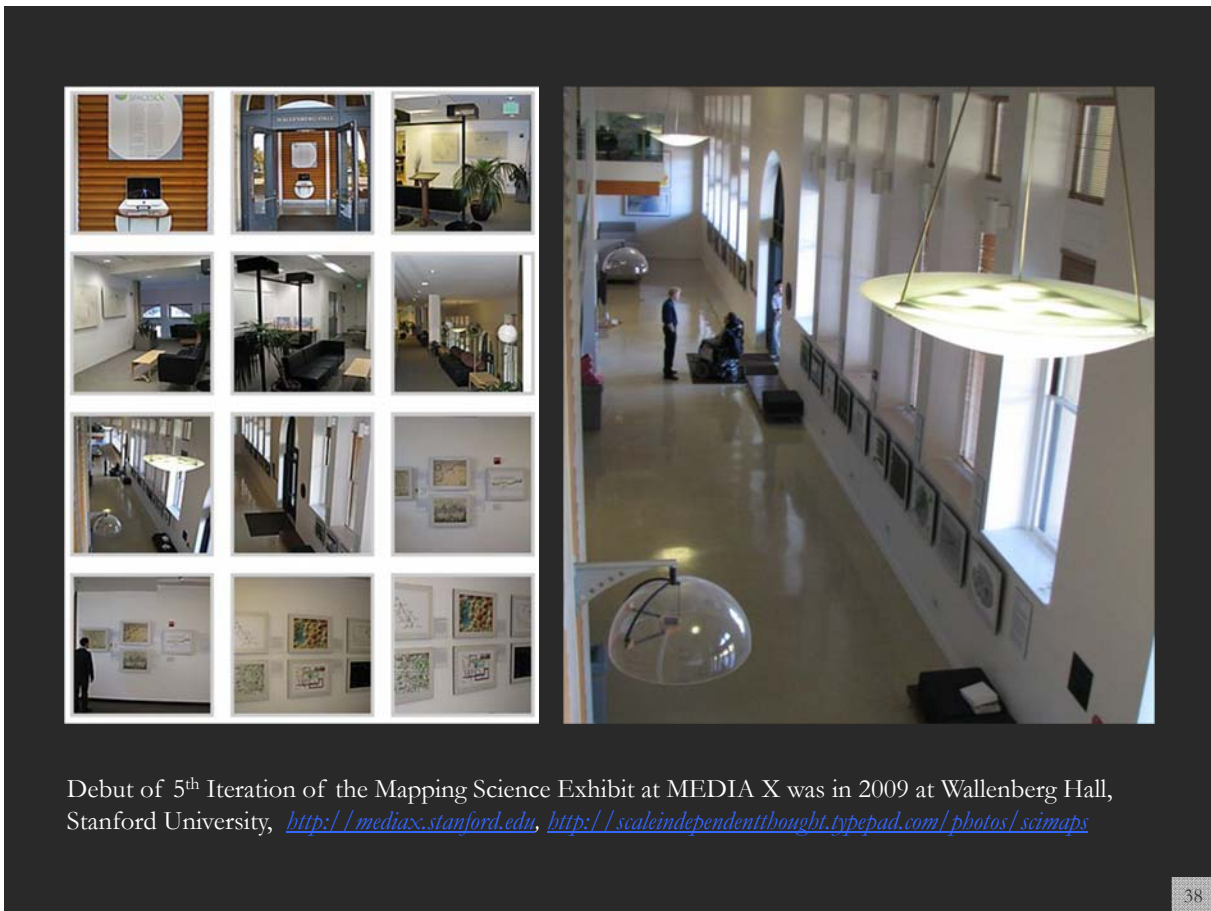


The design shows that an input of \$1B in federal investment, leveraged by \$5B industry investment, brings new technologies to market and results in \$10B of operating income for the chemical industry, \$40B growth in the Gross National Product (GNP) and further impacts the US economy by generating 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.



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. 37



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



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

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.

<http://ivl.slis.indiana.edu/km/pub/2003-borner-arist.pdf>

Shiffryn, 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/

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<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>

CNS Facebook: <http://www.facebook.com/cnscenter>

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