

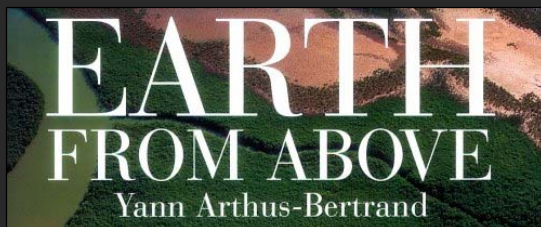
Atlas of Science: Envisioning Scholarly Data

Dr. Katy Börner

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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, the Mapping Science exhibit map makers, the exhibit advisory board, and the VIVO Collaboration.

HUBhub 2011: The HUBzero Conference (<http://hubzero.org/hubhub2011>)
April 6, 2011



Atlas of Science Visualizing What We Know

Katy Börner





Take terra bytes of data

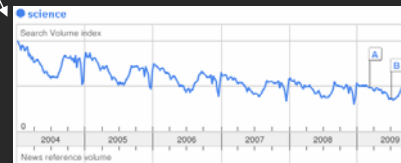
Black
Box



Find your way



Find collaborators, friends



Identify trends

Early Maps of the World

VERSUS

Early Maps of Science



- 3D
- Physically-based
- Accuracy is measurable
- Trade-offs have more to do with granularity
- 2-D projections are very accurate at local levels
- Centuries of experience
- Geo-maps can be a template for other data**



- n-D
- Abstract space
- Accuracy is difficult
- Trade-offs indirectly affect accuracy
- 2-D projections neglect a great deal of data
- Decades of experience
- Science maps can be a template for other data**

Mapping Science Exhibit – 10 Iterations in 10 years

<http://scimaps.org>

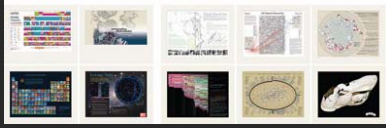
The Power of Maps (2005)



Science Maps for Economic Decision Makers (2008)



The Power of Reference Systems (2006)



Science Maps for Science Policy Makers (2009)



The Power of Forecasts (2007)



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)

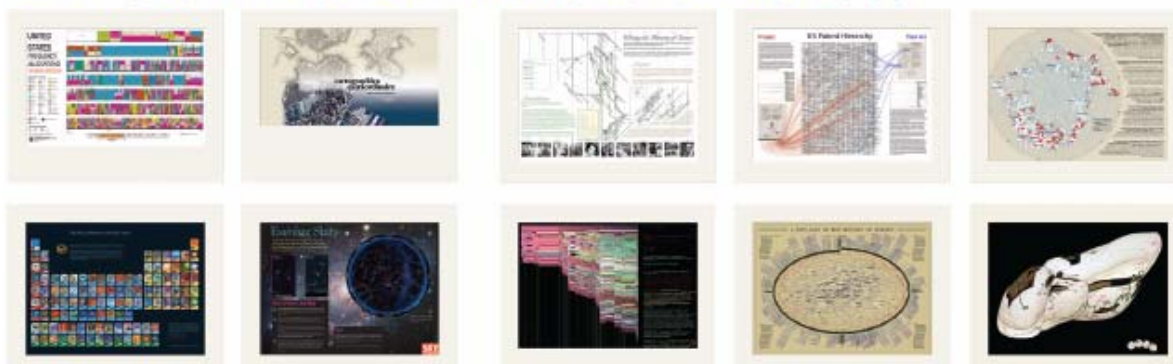
Exhibit has been shown in 72 venues on four continents. Currently at
 - NSF, 10th Floor, 4201 Wilson Boulevard, Arlington, VA
 - Center of Advanced European Studies and Research, Bonn, Germany
 - University of Michigan, Ann Arbor, MI



THE POWER OF MAPS 2005



THE POWER OF REFERENCE SYSTEMS 2006



THE POWER OF FORECASTS 2007



SCIENCE MAPS FOR ECONOMIC DECISION MAKERS 2008



The map of science was constructed by sorting more than 16,000 journals into disciplines. Discipline-specific journals are part of a field that has a common literature. The two-dimensional maps are sets of disciplines that share a common literature. A three-dimensional map is used to determine the position of each discipline on the basis of a system based on the linkage between disciplines. The model search for the most likely arrangement of these maps is done by each other. The disciplines are then sorted into a 3D space.

The spherical map, which is not shown here, was used to represent projections that were used to show the geometry of the map in a two-dimensional map. The map shows the large map shown below. The projection shows the position of the entire map of science at each time. The disciplines are sorted into a 3D space. The map shows the position of each discipline at the top of the map. The map shows the position of each discipline at the top of the map. The map shows the position of each discipline at the top of the map.

The six map projections shown at the bottom are images of what would be looking directly down at the south pole of the map, at six different rotations. When viewed this way, the map looks like a sphere with an open top and open ring. The sphere of science corresponds very closely with the two-dimensional maps we have previously produced.

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 projection of disciplines (links to disciplines) in order to forecast large trends in the structure of science over time. Correlation coefficients between fields were calculated for each individual year (2001-2005). Correlation coefficients were calculated to see if there were significant changes in their correlation coefficients from year to year.

If the structure of science shown below is showing overall stability, we would expect correlations between neighboring fields to increase, and correlations between distant fields to decrease. We found the opposite, suggesting that the underlying structure is unstable and likely to change dramatically over the next decade.

We believe, suggesting how the structure is likely to change, are provided below. Maps with dark arrows represent increases in correlation. Maps with light arrows represent decreases in correlation. Maps with dark arrows represent fields that are closely related, and that are likely to become more distant. The light arrows represent fields that are distant, and that are likely to become more closely related. The light arrows represent fields that are distant, and that are likely to become more closely related. The light arrows represent fields that are distant, and that are likely to become more closely related.

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

Dark Ecology & Complex Systems (DECS), indicated by the red map above, shows the most significant increase in correlation with other fields. This is primarily due to the growth of the field of complex systems, which is a new interdisciplinary field that combines elements of physics, chemistry, and biology. The growth of this field is primarily due to the growth of the field of complex systems, which is a new interdisciplinary field that combines elements of physics, chemistry, and biology.

Infectious Diseases, indicated by the dark red map above, shows the most significant increase in correlation with other fields. This is primarily due to the growth of the field of infectious diseases, which is a new interdisciplinary field that combines elements of biology, medicine, and public health. The growth of this field is primarily due to the growth of the field of infectious diseases, which is a new interdisciplinary field that combines elements of biology, medicine, and public health.

Medical Specialties, indicated by the dark red map above, shows the most significant increase in correlation with other fields. This is primarily due to the growth of the field of medical specialties, which is a new interdisciplinary field that combines elements of medicine, biology, and public health. The growth of this field is primarily due to the growth of the field of medical specialties, which is a new interdisciplinary field that combines elements of medicine, biology, and public health.

Health Professionals, indicated by the orange map above, shows the most significant increase in correlation with other fields. This is primarily due to the growth of the field of health professionals, which is a new interdisciplinary field that combines elements of medicine, biology, and public health. The growth of this field is primarily due to the growth of the field of health professionals, which is a new interdisciplinary field that combines elements of medicine, biology, and public health.

Humanities, indicated by the yellow map above, shows the most significant increase in correlation with other fields. This is primarily due to the growth of the field of humanities, which is a new interdisciplinary field that combines elements of social sciences, history, and culture. The growth of this field is primarily due to the growth of the field of humanities, which is a new interdisciplinary field that combines elements of social sciences, history, and culture.

SCIENCE MAPS FOR SCIENCE POLICY MAKERS 2009



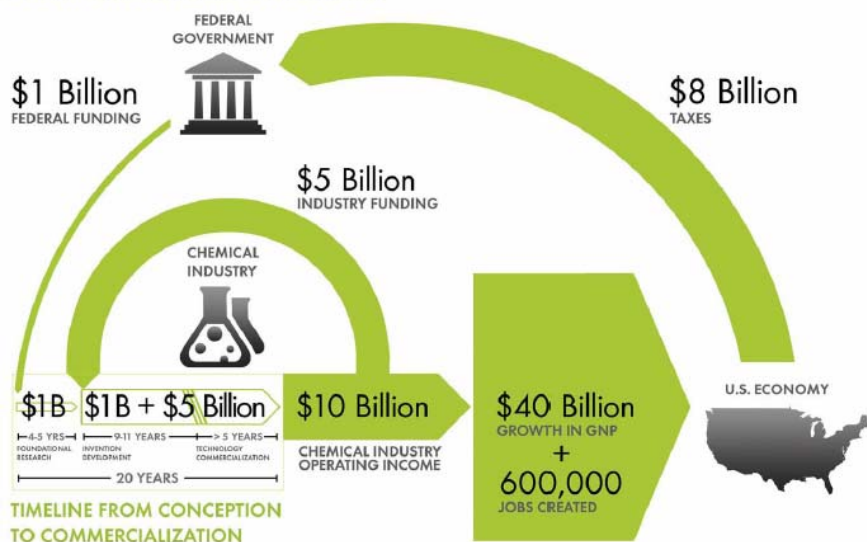
SCIENCE MAPS FOR SCHOLARS 2010



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

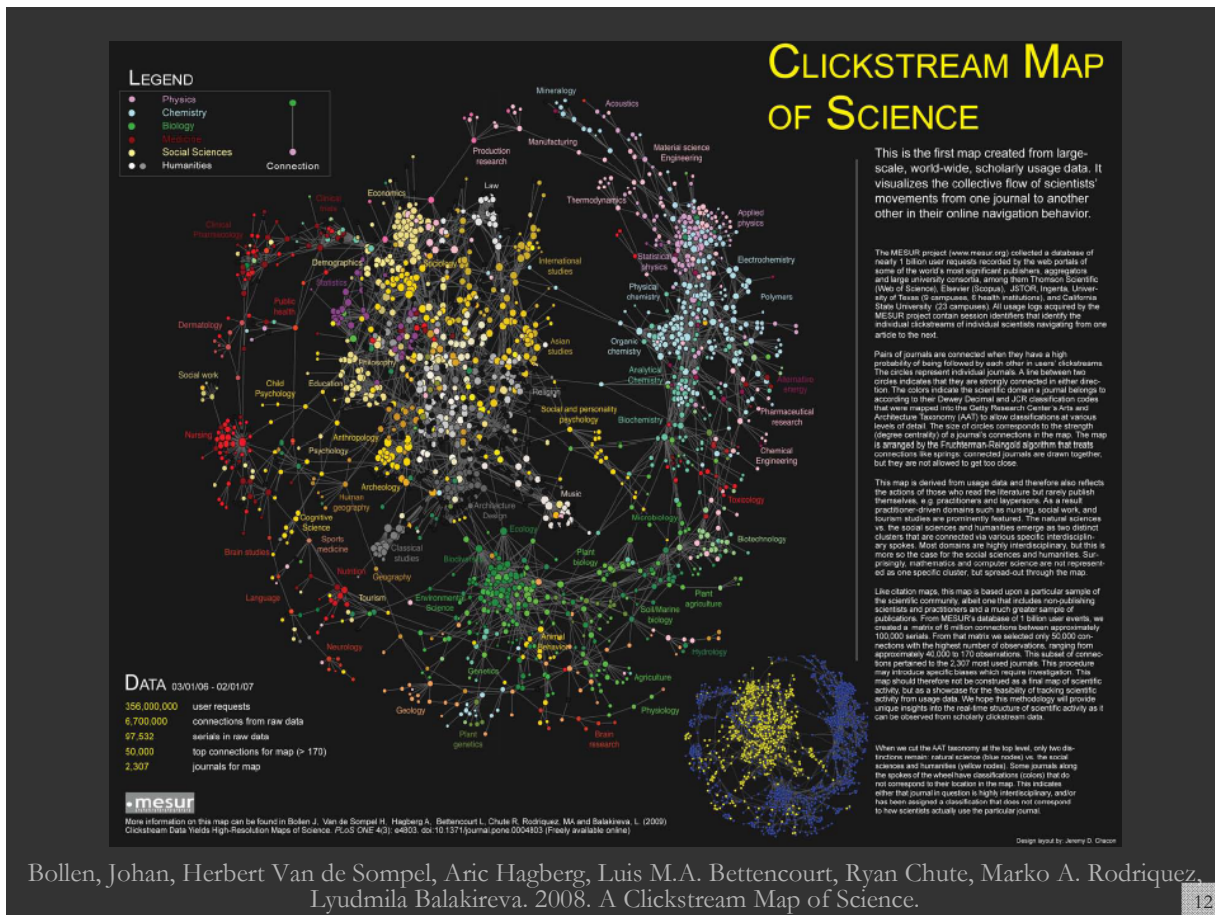
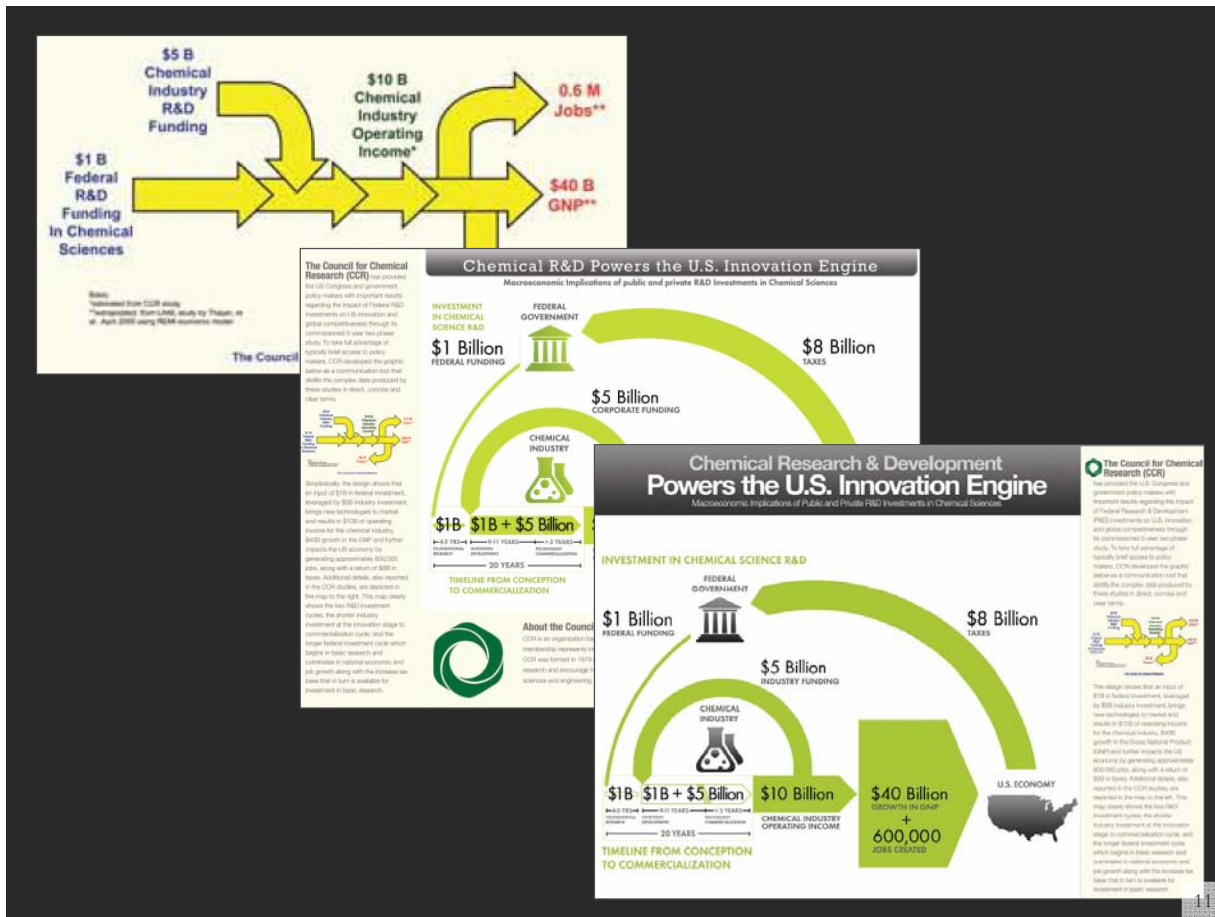


The Council for Chemical Research (CCR)

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.



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.



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>

Interactive S&T Maps



Scholarometer



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y zhang	247
m cohen	235
j taylor	217
c smith	214
j walker	177
sh snyder	176
ha simon	173
r schwartz	173

Latest Updates

Scholarometer Tool scholarometer

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G Alexander and 1 other author in discipline #behavioral_sciences. <http://bit.ly/fufWvg>
3 hours ago · reply

<http://scholarometer.indiana.edu>

Maps of Science - Windows Internet Explorer

http://mapofscience.com/

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Maps of Science

MAPS OF SCIENCE

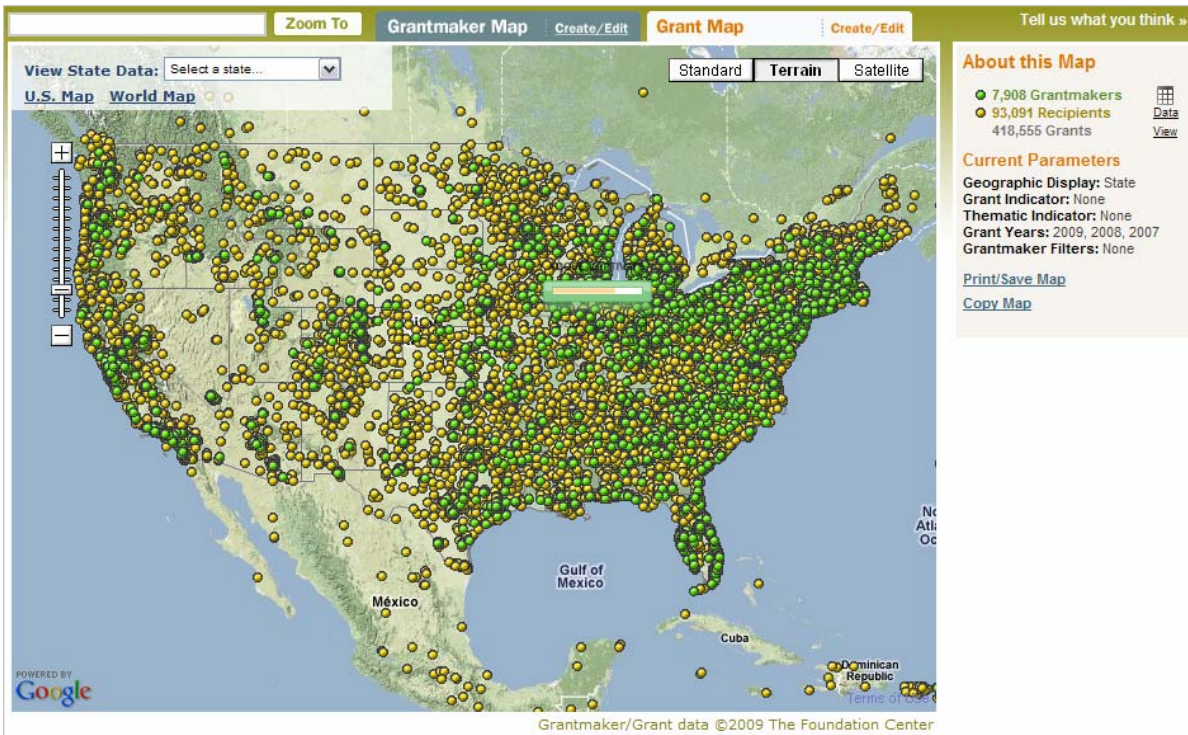
Overview Detail Disciplinary Maps Competency Maps Paradigm Maps Posters Education

BETTER MAPS • BETTER DECISIONS

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

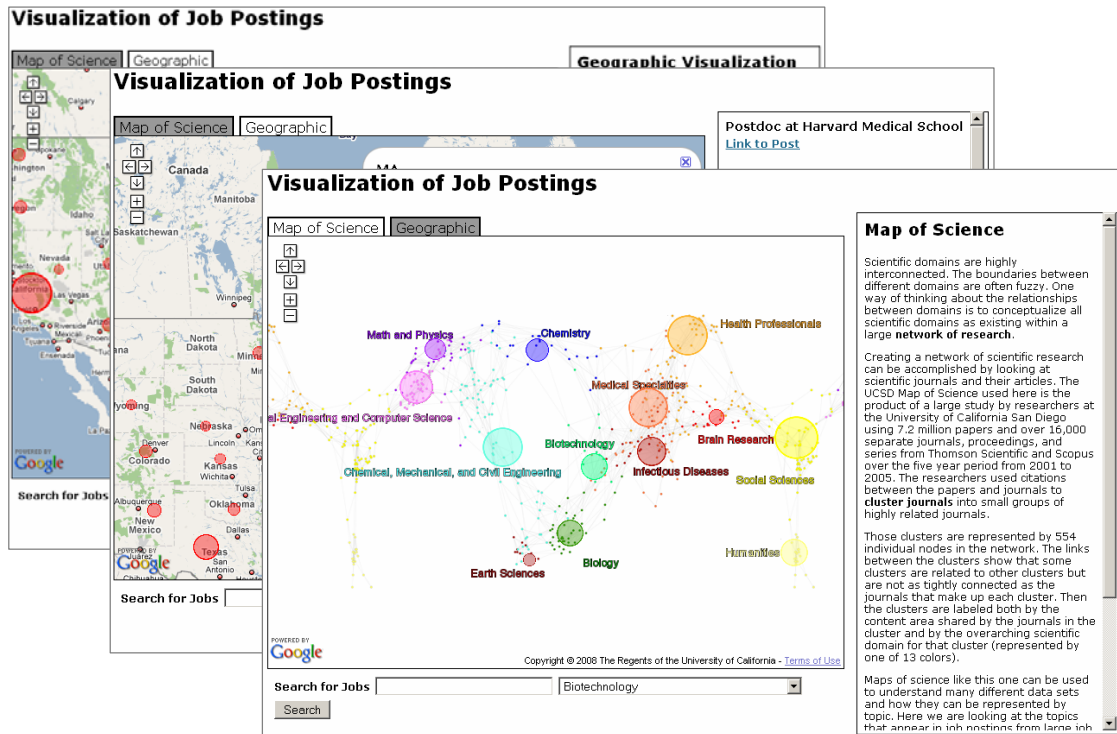
Interactive Maps of Science – Philanthropy

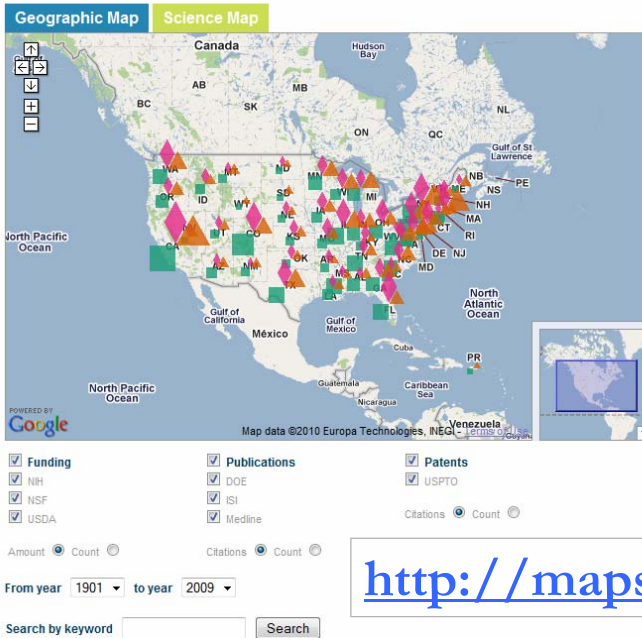


<http://www.philanthropyinsight.org>

Interactive World and Science Map of S&T Jobs

Angela Zoss, Michael Connover, Katy Börner (2010)



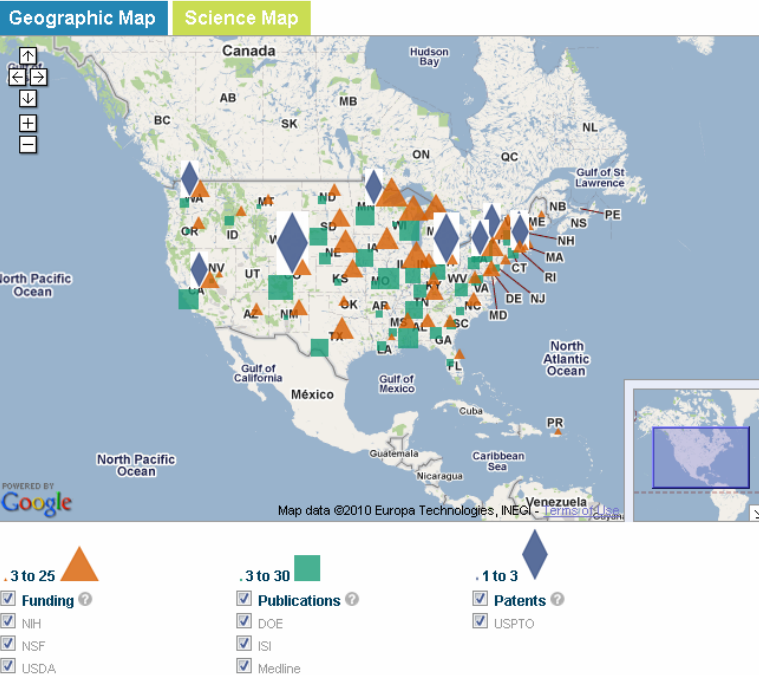


[Detail](#) [About](#)

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>



[Maps](#) [Detail](#) [Data](#) [About](#)

About

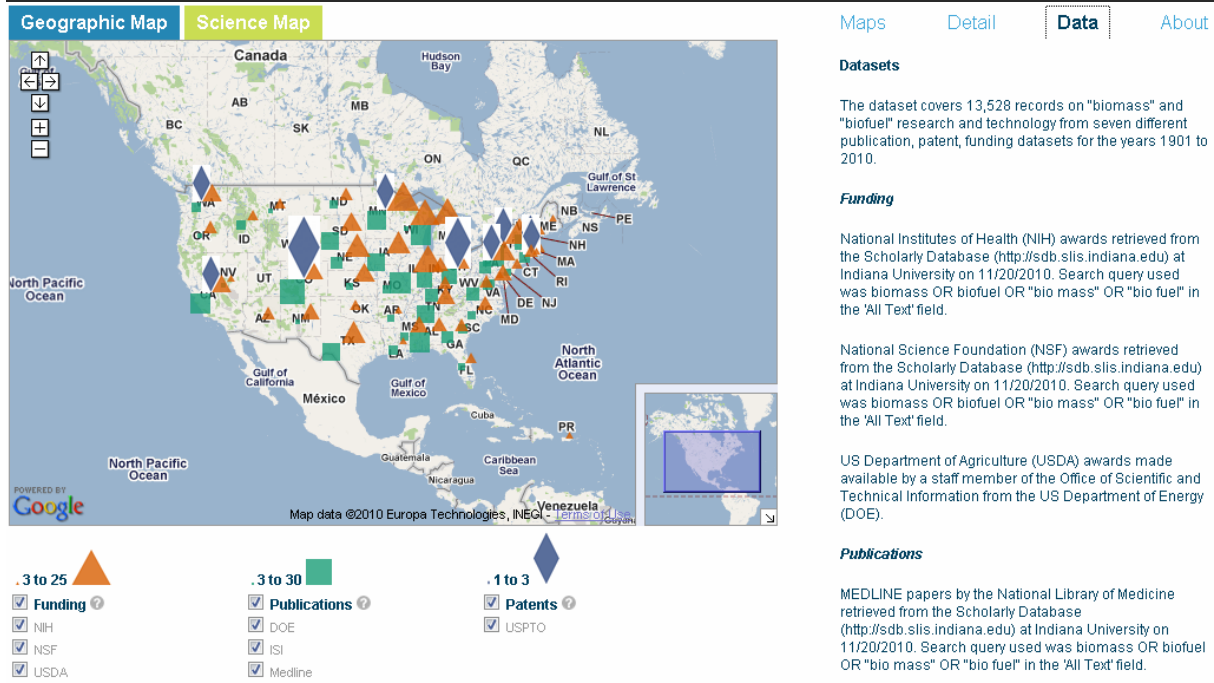
A new field of *Sustainability Science and Engineering* is emerging that seeks to understand the fundamental character of interactions between nature and human society and to help steer the impact of humanity's needs on the planet's natural resources towards sustainable trajectories. The field is unified 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.

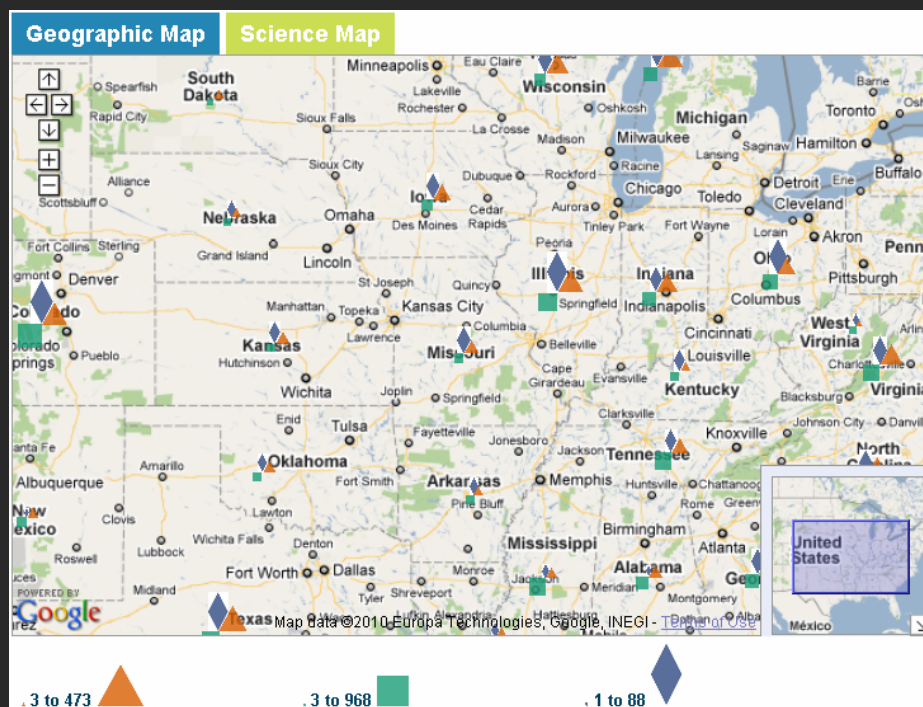
Web Page Design

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

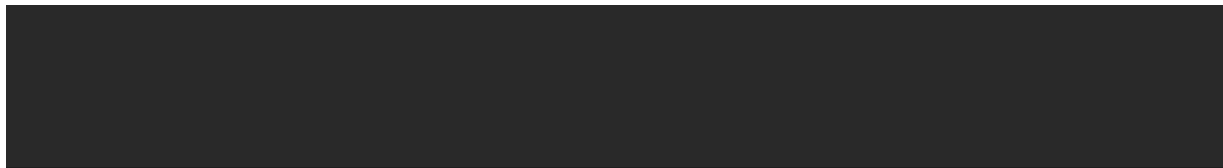
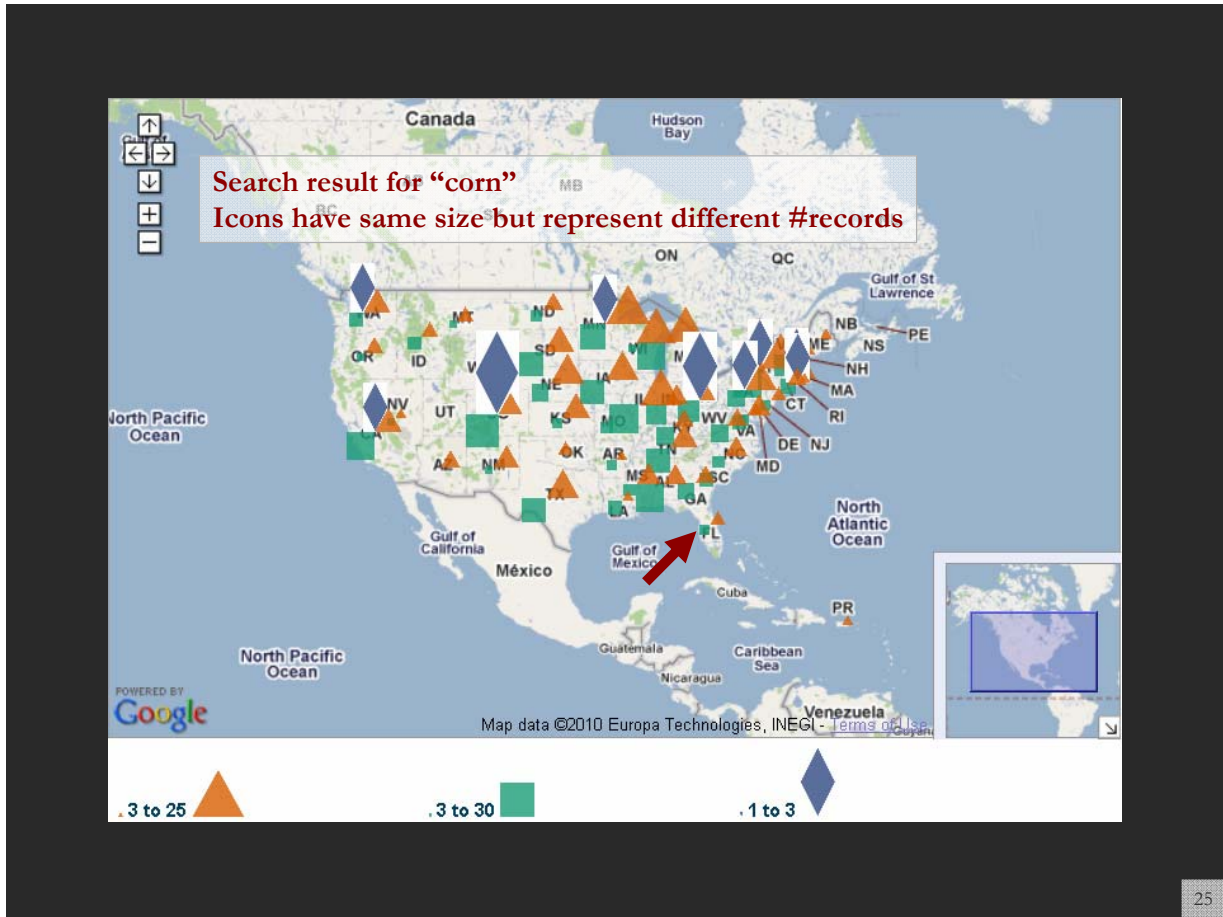
Google Map JavaScript API was used to implement both maps with two aggregation layers for each. The geographic map aggregates to the **state level** and the **city level**. The science map has a high level of aggregation of 13 top-level scientific **disciplines** and a low level of 554 **sub-disciplines**.



The geographic map at state level.



The geographic map at city level.



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

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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; CEREALES; 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.

27

Geographic Map **Science Map**

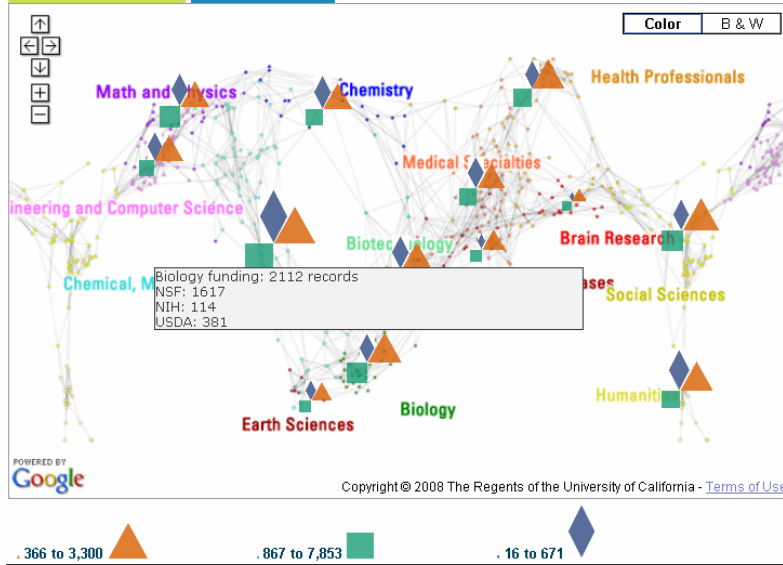
Search result for "Miscanthus," a special energy biomass crops for second generation biofuel.

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Map data ©2010 Europa Technologies, INEGI, TerraMetrics, and others

2 to 2 3 to 4 0 to 0

28



> Biology

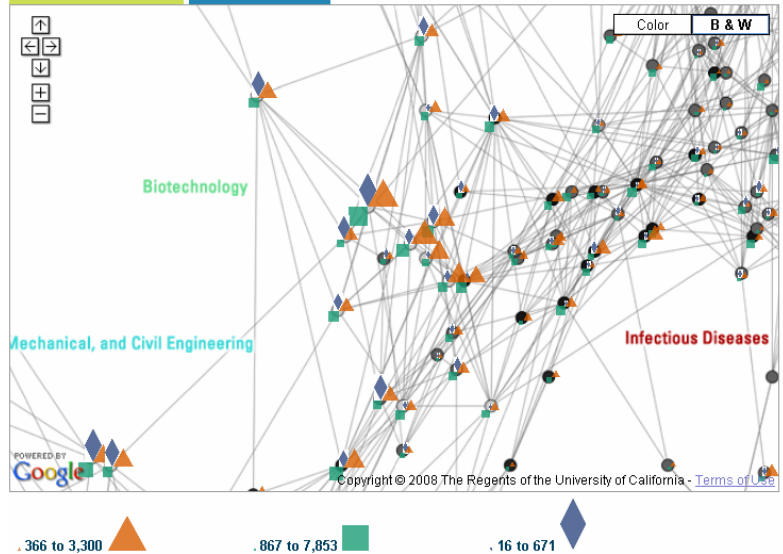
NIH
2009

- [Label-Free And Simultaneous Detection Of Multiple Bacterial Pathogens And Virulen](#)
- [Mechanism Of Pspc 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 Pspc Mediated Adhesion](#)

2008

- [The Effect Of Inter-Species Interactions On The Virulence Of Streptococcus Mutans](#)
- [Cookstove 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](#)

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



> Chemistry

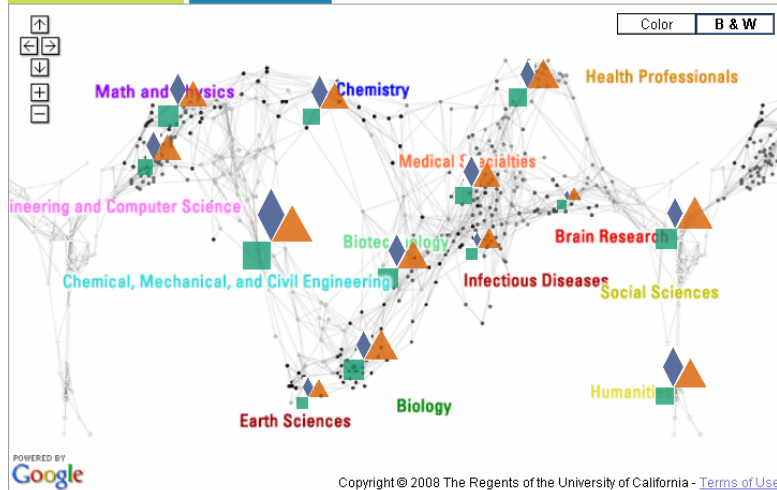
USPTO
2009

- [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](#)

The science map at 554 sub-disciplines level.



> 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
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- 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



Math & Physics	Biotechnology	Medical Specialties
Chemistry	Earth Sciences	Brain Research
Computer Science & EE	Biology	Health Professionals
Other Engineering	Infectious Diseases	Social Sciences
		Humanities

United States Patent: 7364890 - Mozilla Firefox

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

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(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 E.** (Golden, CO), **Himmel; Michael E.** (Littleton, CO)

Assignee: **Midwest Research Institute** (Kansas City, MO)

Appl. No.: **00,017,236**

Done

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% Search Clear Search

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33

NIH Topic Browser - Institute Information Copy Close

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 diseas	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, p	clinical_trials unit, phase_i clinical_trials, cancer
1.43	686	cancer breast cancers cancer_risk cancer_patier	breast, cancer, cancer_risk, women, cancer_sur	breast cancer, breast cancer_risk, breast cance
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, thera	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 lncap androgen	prostate, cancer, cancer_cells, androgen_recept	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 mcf7 nei	breast, cancer, cancer_cells, her2, human, estr	breast cancer, breast cancer_cells, her2 neu, br
0.85	437	risk risk_factors cases cohort prospective high_u	risk, risk_factors, cancer, prospective, women, e	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 investigato	core, biostatistics, data_management, bioinform	biostatistics core, projects core, data_managerr
0.79	603	intervention interventions program prevention p	intervention, prevention, interventions, program	randomized_controlled trial, intervention reduce

<https://app.nihmaps.org>

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	
	NCCR	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...		NCCR	10		
	NCI	5R01CA120562-03	Commonly Used Medications and Breast Cancer Recurrence	BOUDREAU, DENISE M	686 (42%)	cancer brea...		NIEHS	5		
	NCI	5R01CA093772-06	Long-term Survivorship in Older Women with Early Stage Breast Cancer	SILLIMAN, REBECCA A	686 (42%)	cancer brea...		NCMHQ	1		
	NCI	5R01CA064277-11	Shanghai Breast Cancer Study	ZHENG, WEI	686 (41%)	cancer brea...		NIA	1		
								NCCAM	1		
								NICHD	1		
								NINR	1		
								NHGRI	1		

Topics

Similar Grants

Show Top 100 on Map

%	Topic	Topic Words	Title Words		Simil	NIH Inst	Grant	
25.91	686	cancer breast cancers cancer_risk cancer_patients	breast, cancer, car		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>

3P20RR011792-10S2 6914

Map Viewer

Topic Browser

Export Data

Methods

Feedback

2009 NCCR 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_survivi
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 Words	
0.54		NCI	3K22CA127519-03S1	Beyond Adiposity: Insulin and Inflammation in Postmenopausal Breast Cancer	NUNEZ, NOMEI PANIAGUA	686 (33%)	cancer brea...	
0.54		NCI	5K22CA127519-03	Beyond Adiposity: Insulin and Inflammation in Postmenopausal Breast Cancer	NUNEZ, NOMEI PANIAGUA	686 (33%)	cancer brea...	
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...	

<https://app.nihmaps.org>

NIH Map Viewer [Show Topic Browser](#) [?](#) [Export Data](#) [Methods](#) [Feedback](#)

2009 [?](#) [add](#) [delete](#) **AND** **Related Grants** 7960745 **Top 100** [Search](#) [Clear Search](#)

Institutes (3)

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

Topics

%	Title Words	+
14.7%	breast, cancer, cancer_risk, women, cancer_su	
11.0%	breast, mammography, mammographic, cance	
9.60%	risk, risk_factors, cancer, prospective, women,	
3.23%	genome_wide_association, loci, genome_wide,	

Grants (101)

NIH Inst	Grant	+
NCCR	3P20RR011792-10S2 6914 OBESITY, INSULIN RESISTANCE, IGF'S, AND BREAST CANCER RISK IN AFRICAN AMERICANS PI: CUI, YONG	
NCI	5R01CA120562-03S1 Commonly Used Medications and Breast Cancer Recurrence PI: BOUDREAU, DENISE M	
NCI	5R01CA120562-03 Commonly Used Medications and Breast Cancer Recurrence PI: BOUDREAU, DENISE M	
NCI	5R01CA093772-06 Long-term Survivorship in Older Women with Early Stage Breast	

Powered by **ChalkLabs**

<https://app.nihmaps.org>

37

R+D Dashboard Tracking our progress. Leading the world in scientific and technological innovation. **BETA**

[Home](#) [Investments](#) [Outputs](#) [About](#) [Contact](#)

Publications
Discover Publications by clicking on map or using the options below.

Illinois
NIHNSF
Year(s): 2000-2009

Refine results by selecting institutions or topics:

Top Research Institutions

- University of Illinois at Urbana-Champaign
- Northwestern University
- University of Chicago
- RUSH UNIVERSITY MEDICAL CENTER
- LOYOLA UNIVERSITY CHICAGO
- Southern Illinois University at Carbondale

[Download selected data as CSV](#)

EVANSTON, NORTH CHICAGO, GLENCOE and 11 neighboring areas (zoom for detail).

Top Institutions:

- Northwestern University
- ROSALIND FRANKLIN UNIV OF MEDICINE & SCI
- NORTHSHORE UNIV HEALTHSYSTEM RES INST
- EVANSTON NORTHWESTERN HEALTHCARE RES INS
- EVANSTON HOSPITAL

Show 100 entries

Year	Publication Number	Grant Number	Federal Agency	Receiving Institution
2009	PMID 19129223	1R01HL094585-01	NIH	CHILDREN'S MEMORIAL HOSPITAL

<http://rd-dashboard.nitrd.gov/pub.html>

38

R+D Dashboard BETA Tracking our progress. Leading the world in scientific and technological innovation.

Home | Investments | **Outputs** | About | Contact

Publications

Discover Publications by clicking on map or using the options below.

Illinois

National Science Foundation

Year(s): 2000-2009

Refine results by selecting institutions or topics:

- Top Research Institutions
- Top Topics**
 - climate model atmospheric data global
 - flow fluid transport wave dynamic
 - optical laser light high system
 - economic policy market decision public**
 - technology engineering team technologies

Download selected data as CSV

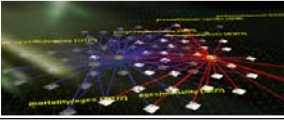
Select multiple topics by clicking on each topic; to de-select, click again.

Search: _____

Year	Publication Number	Grant Number	Federal Agency	Receiving Institution
2009	PUB 5767715	0848647	NSF	American Bar Foundation

39

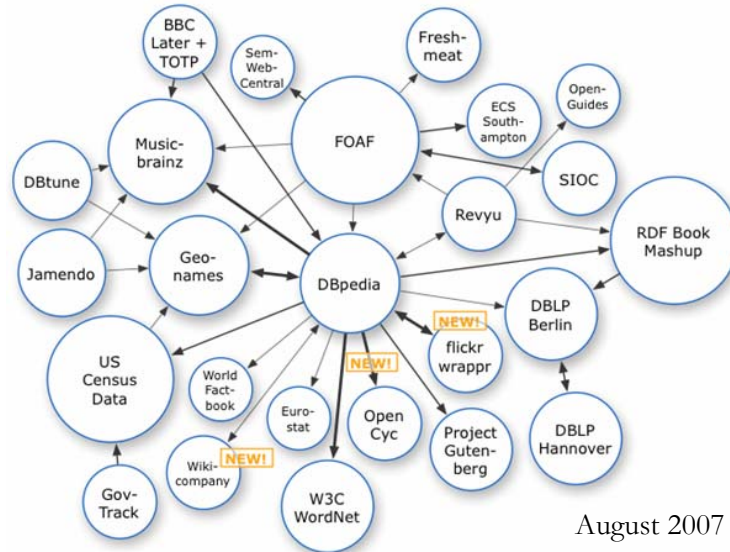
S&T Studies Using Semantic Web Data



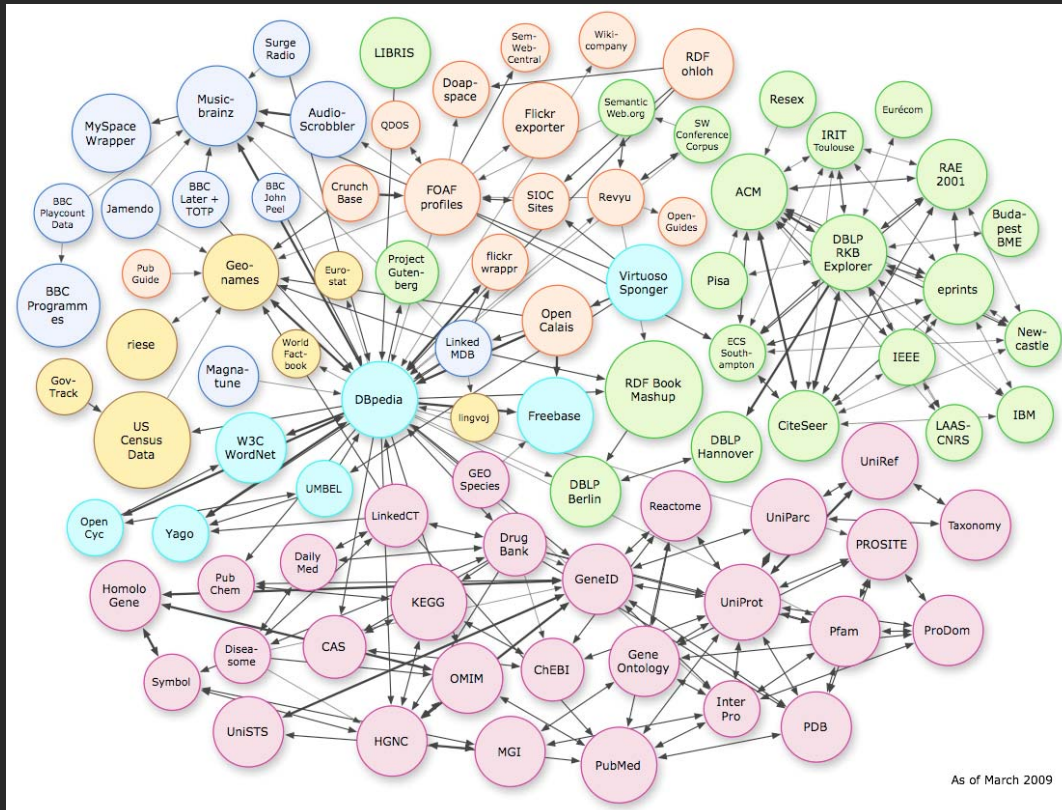
Linked Open Data

- Interlinking existing data silos and
- Exposing them as structured data
- Adding new high quality data relevant for S&T studies

<http://linkeddata.org>



41

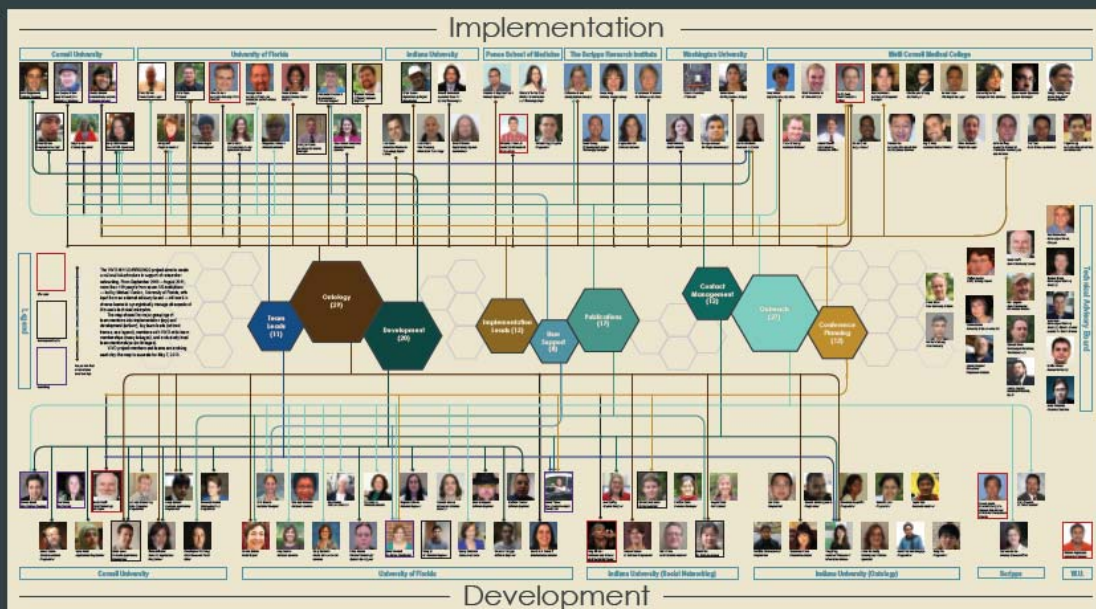


http://www4.wiviss.fu-berlin.de/bizer/pub/lod-datasets_2009-03-05_colored.png

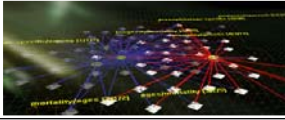
42

UF Clinical and Translational
Science Institute
UNIVERSITY OF FLORIDA

VIVO Enabling National Networking of Scientists Project Members and Teams



Please send comments and questions to [Jeri Culley](mailto:Jeri.Culley@clinicaltrials.ucsf.edu) or [Valerie Davis](mailto:Valerie.Davis@clinicaltrials.ucsf.edu).
For more information, visit www.vivo.colostate.edu.
2010.05.07



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 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)		Research flows in research	VxOrd/Topic in NIH funding
Network Analysis (With Whom?)	NSF network of one	Network	NIH's network

47

University of Florida

How do you want to compare?
by Grants

Who do you want to compare?
Search: X

Records 1 - 10 of 30 < First < Prev Next > Last >

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

[Save as CSV](#) [Clear](#)

VIVO
Enabling a National Network of Scientists

Comparing Grants of Organizations in University of Florida

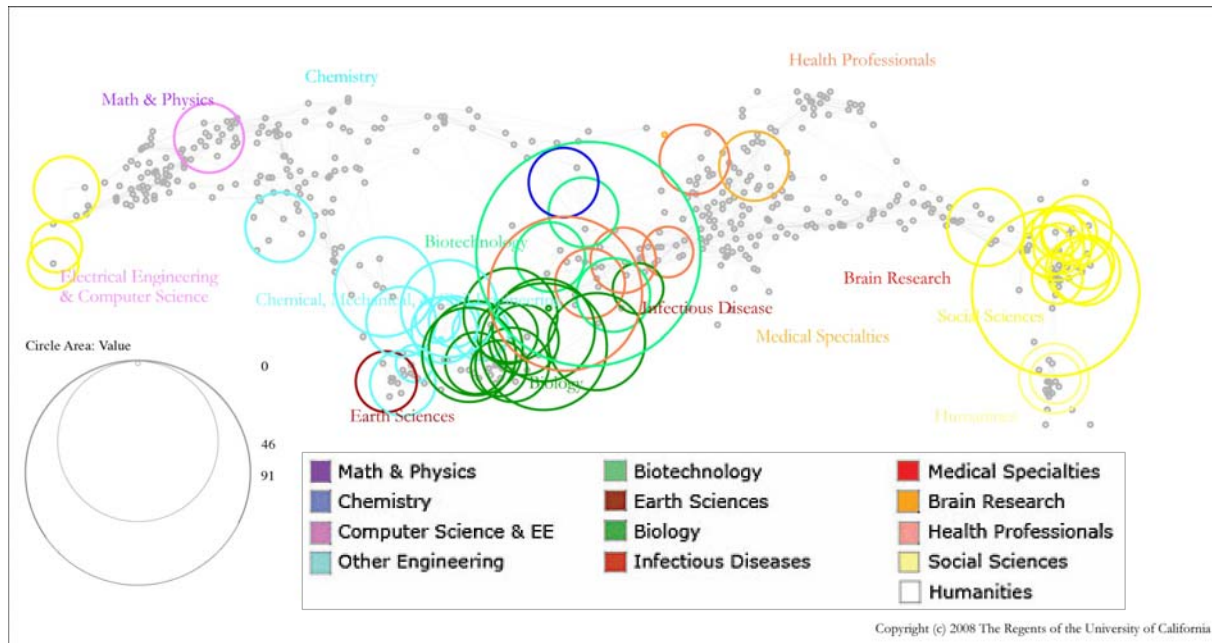
Total Number of Grants

You have selected 7 of a maximum 10 organizations to compare. [Clear](#)

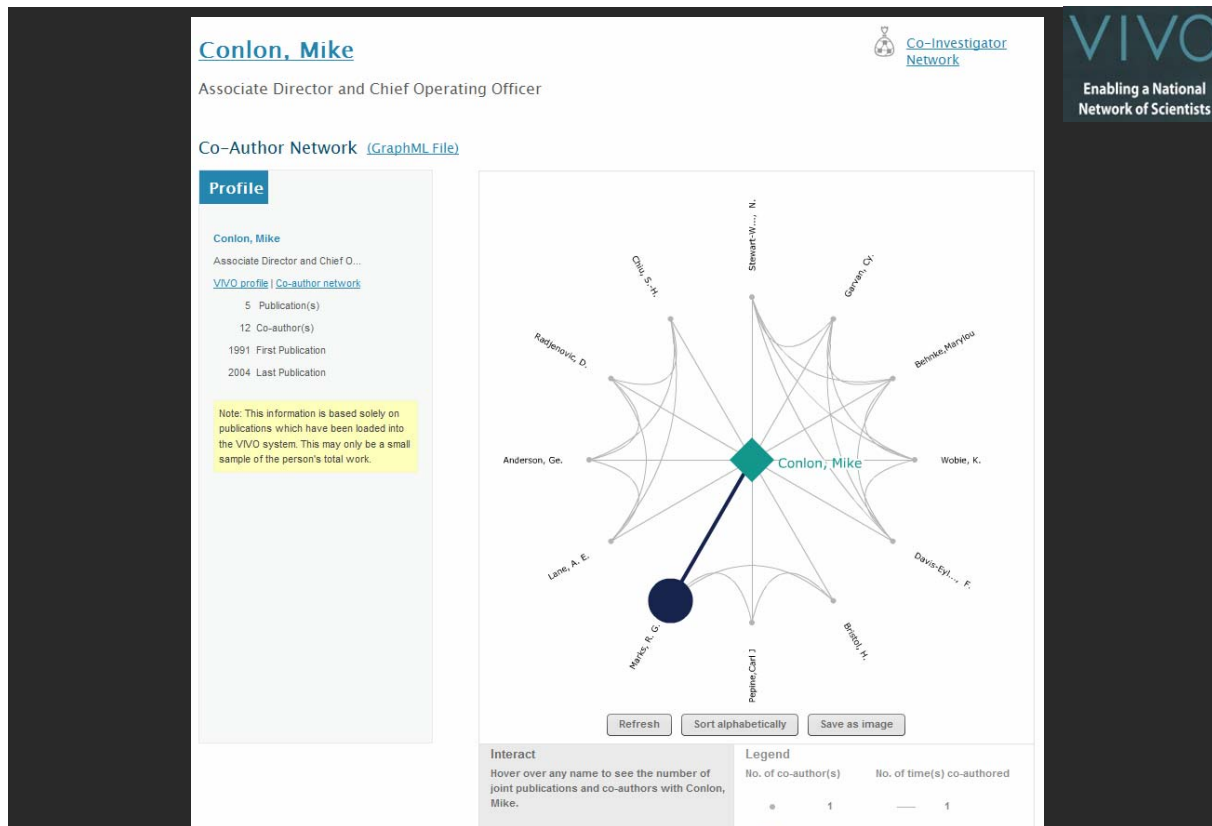
- Florida Sea Grant 44
- International Center 54
- Evelyn F. and William L. McKnight Brain Institute of the University of Florida 64
- College of Engineering 103
- College of Agricultural and Life Sciences 166
- Florida Museum of Natural History 203
- Continuing Education 562

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

48



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?

This XML file does not appear to have any style information associated with it. The document tree is shown below.

```

- <rdf:RDF>
- <rdf:Description rdf:about="http://vivo.ufl.edu/individual/n56206">
  <rdfs:label rdf:datatype="http://www.w3.org/2001/XMLSchema#string">Member</rdfs:label>
  <rdf:type rdf:resource="http://www.w3.org/2002/07/owl#Thing"/>
  <rdf:type rdf:resource="http://vivoweb.org/ontology/core#Role"/>
  <rdf:type rdf:resource="http://vivoweb.org/ontology/core#MemberRole"/>
  <j.3:roleIn rdf:resource="http://vivo.ufl.edu/individual/n57238"/>
  <j.3:memberRoleOf rdf:resource="http://vivo.ufl.edu/individual/n25562"/>
  <j.3:startYear rdf:datatype="http://www.w3.org/2001/XMLSchema#Year">1997</j.3:startYear>
</rdf:Description>
- <rdf:Description rdf:about="http://vivo.ufl.edu/individual/n78765">
  <rdfs:label rdf:datatype="http://www.w3.org/2001/XMLSchema#string">Member</rdfs:label>
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  <rdf:type rdf:resource="http://vivoweb.org/ontology/core#Role"/>
  <rdf:type rdf:resource="http://vivoweb.org/ontology/core#MemberRole"/>
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  <j.3:memberRoleOf rdf:resource="http://vivo.ufl.edu/individual/n25562"/>
  <j.3:startYear rdf:datatype="http://www.w3.org/2001/XMLSchema#Year">1980</j.3:startYear>
</rdf:Description>
- <rdf:Description rdf:about="http://vivo.ufl.edu/individual/n25562">
  <j.3:featuredIn rdf:resource="http://vivo.ufl.edu/individual/n6868"/>
  <j.3:featuredIn rdf:resource="http://vivo.ufl.edu/individual/n3884"/>

```

Home Index About Search

Networks and Complex Systems Research at Indiana University

This VIVO instance provides information on networks and complex systems

- [Faculty](#) and their [departments](#)
- [Publications](#)
- [Grants](#)
- [Courses](#)

at Indiana University. The site was created in support of a NSF IGERT grant application. A major intent is to cross-fertilize between research done in the social and behavioral sciences, research in natural sciences such as biology or physics, but also research on Internet technologies.

The site will be continuously updated to help

- New faculty to get in contact with relevant researchers.
- Faculty and policy makers to pool teams in response to funding solicitations.
- Faculty to coordinate research efforts – collaborations using existing funding/resources.
- Faculty to coordinate teaching.
- Students identify relevant courses, potential advisors, funding.
- Organize the Mon talk series on [Networks and Complex Systems](#).
- Arrange research meetings for visitors with relevant faculty/students

Profile

Daniels, Michael Joseph

PROFESSOR

[VIVO profile](#) | [Co-investigator network](#)

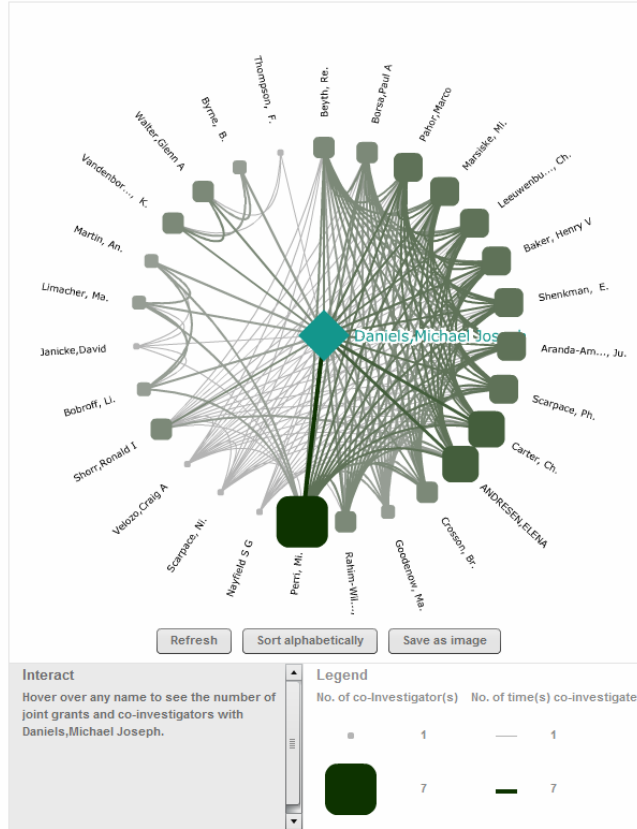
17 Grant(s)

27 Co-investigator(s)

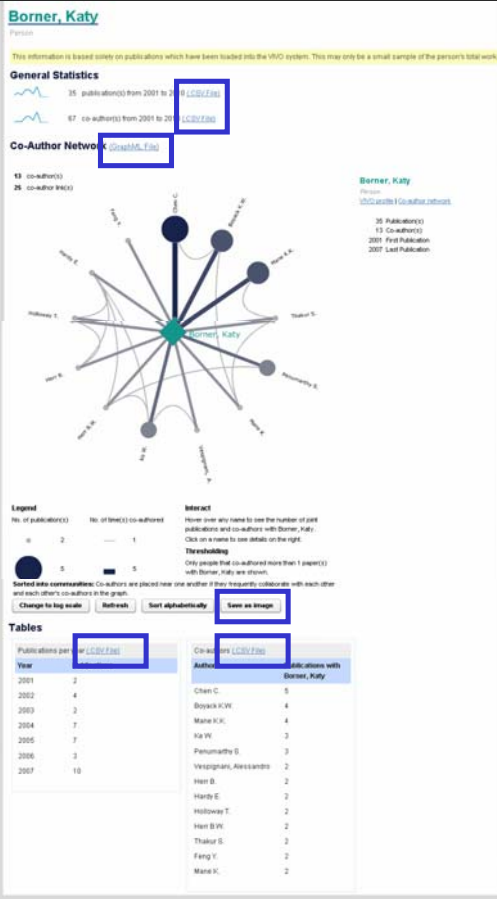
2003 First Grant

2010 Last Grant

Note: This information is based solely on grants which have been loaded into the VIVO system. This may only be a small sample of the person's total work.



Sorted into communities: Co-investigators are placed near one another if they frequently co-investigate grants.



Data Download Support

General Statistics

- 36 publication(s) from 2001 to 2010 ([.CSV File](#))
- 80 co-author(s) from 2001 to 2010 ([.CSV File](#))

Co-Author Network

([GraphML File](#))

Save as Image (.PNG file)

Tables

- Publications per year ([.CSV File](#))
- Co-authors ([.CSV File](#))

36 publication(s) from 2001 to 2010 ([.CSV File](#))

Year	Publications
2001	2
2002	4
2003	2
2004	7
2005	7
2006	3
2007	10
2010	1

80 co-author(s) from 2001 to 2010 ([.CSV File](#))

Year	Count	Co-Author(s)
2001	1	Chen C.
2002	3	Chen C.; McMahon T.; Feng Y.
2003	2	Chen C.; Boyack K.W.
2004	17	Sengupta A.; Penumathy S.; Thakur S.; Sooriamurthi R.; Maru J.T.; Shiffrin R.M.; Mane K.; Moor K.A.;

Co-author network ([GraphML File](#))

```

1 <?xml version="1.0" encoding="UTF-8"?>
2 <graphml xmlns="http://graphml.graphdrawing.org/xmlns"
3   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
4   xsi:schemaLocation="http://graphml.graphdrawing.org/xmlns
5     http://graphml.graphdrawing.org/xmlns/1.0/graphml.xsd">
6 <key id="label" for="node" attr.name="label" attr.type="string" />
7 <key id="number_of_authored_works" for="node" attr.name="number_of_authored_works" attr.type="int" />
8 <key id="num_unknown_publication" for="node" attr.name="num_unknown_publication" attr.type="int" />
9 <key id="num_latest_publication" for="node" attr.name="num_latest_publication" attr.type="int" />
10 <key id="latest_publication" for="node" attr.name="latest_publication" attr.type="int" />
11 <key id="profile_url" for="node" attr.name="profile_url" attr.type="string" />

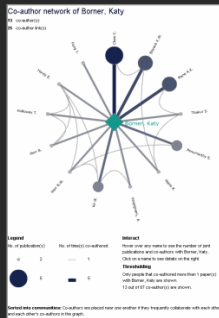
```

Save as Image (.PNG file)

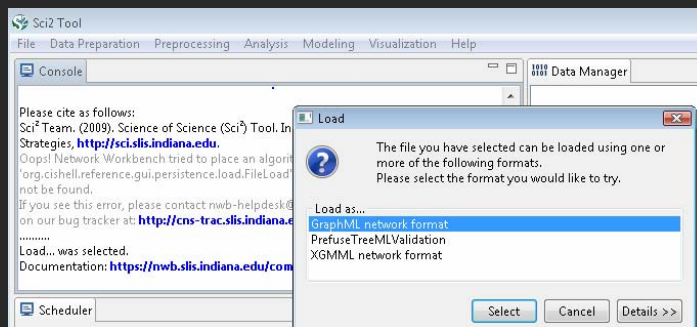
Publications per year ([.CSV File](#)), see top file.

Co-authors ([.CSV File](#))

Co-Author	Count
Andrienko G.	1
Andrienko N.	1
Ben-Miled Z.	1
Blackwell A.	1
Boyack K.W.	4
Bozicevic M.	1
Brodbeck D.	1
Burkhard R.A.	1
Chen C.	5

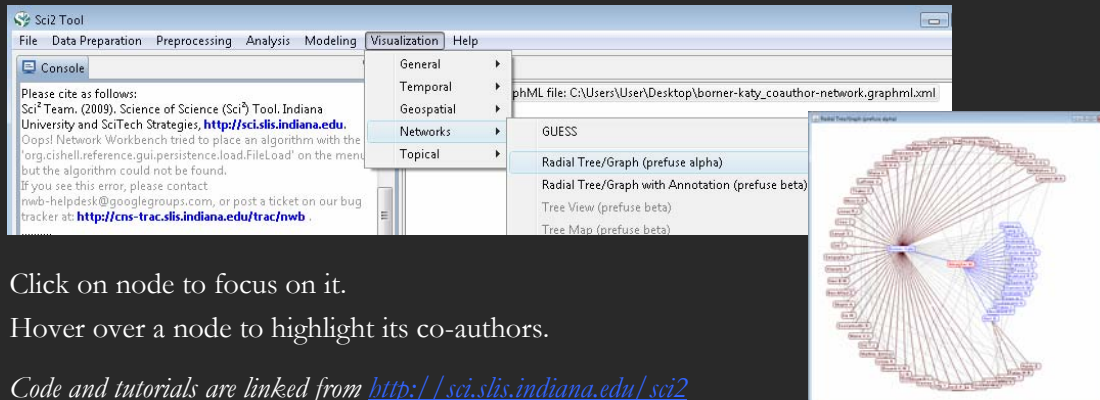


Run Science of Science (Sci2) Tool and load Co-Author Network ([GraphML File](#))



Network Analysis Toolkit
Nodes: 81
Edges: 390

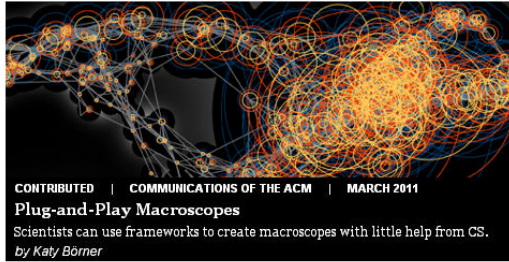
Visualize the file using Radial Graph layout.



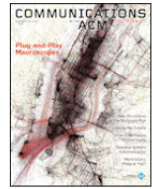
Click on node to focus on it.

Hover over a node to highlight its co-authors.

Code and tutorials are linked from <http://sci.slis.indiana.edu/sci2>



CURRENT ISSUE # MARCH 2011

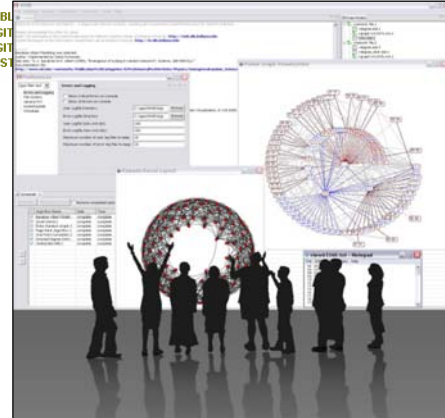


Fumbling the Future

Computer and Information Science and Engineering: One Discipline, Many Specialties

B.Y.O.C (1,342 Times and Counting)

TABU
DIGIT
DIGIT
PAS



VIVO Research Networking

<http://vivoweb.org>



Network Workbench Tool & Community Wiki

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



Science of Science (Sci²) Tool

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

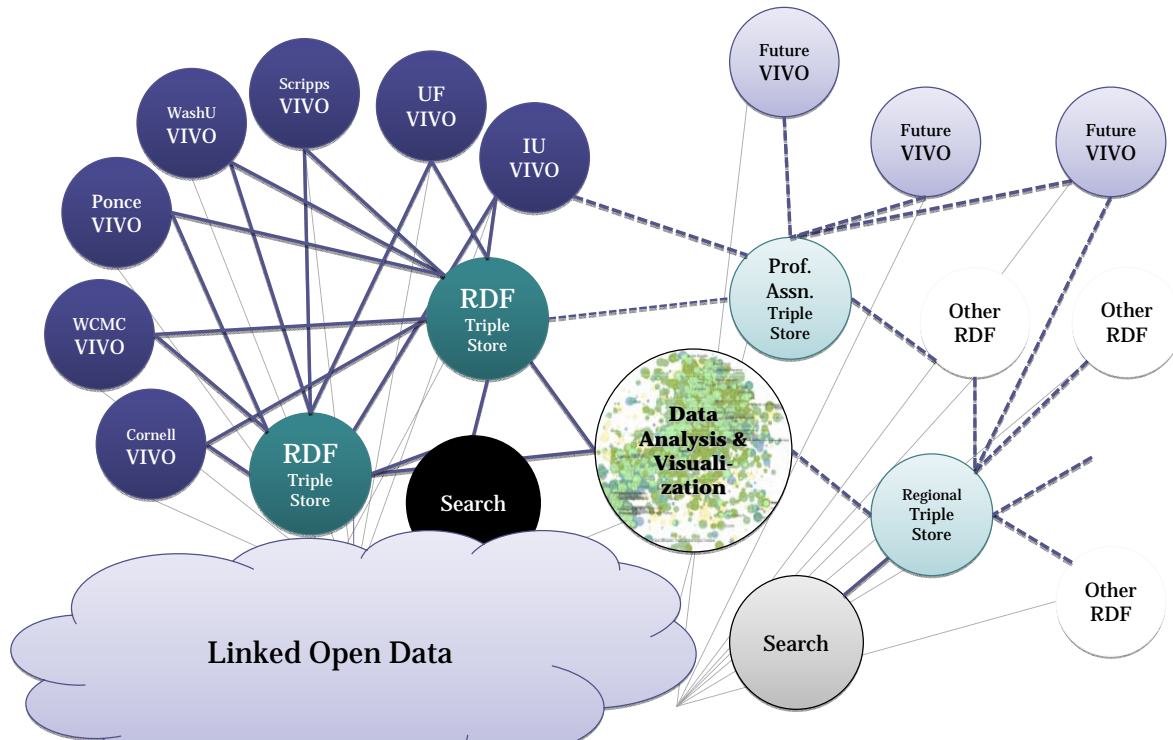


Epidemics Cyberinfrastructure

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

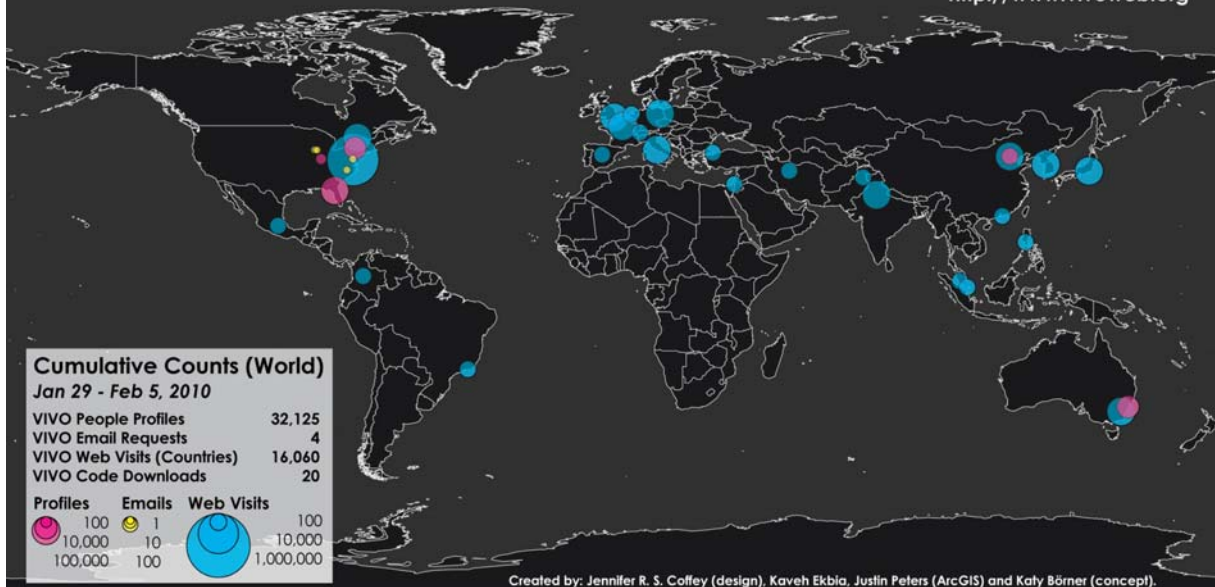


VIVO National Level Visualizations



VIVO Enabling National Networking of Scientists

<http://www.vivoweb.org>



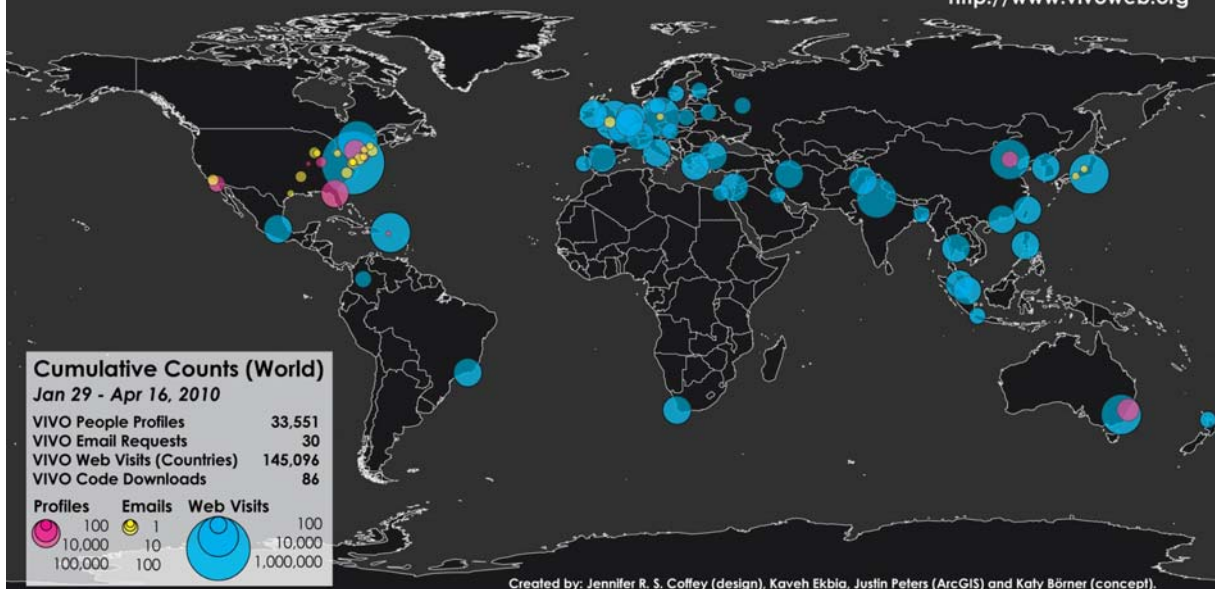
Science is global. World view of VIVO activity.
Web site visits are aggregated at the country level.

Geospatial Analysis (Where) Where is what science performed by whom? Science is global and needs to be studied globally. (in work)

59

VIVO Enabling National Networking of Scientists

<http://www.vivoweb.org>



Shown are the

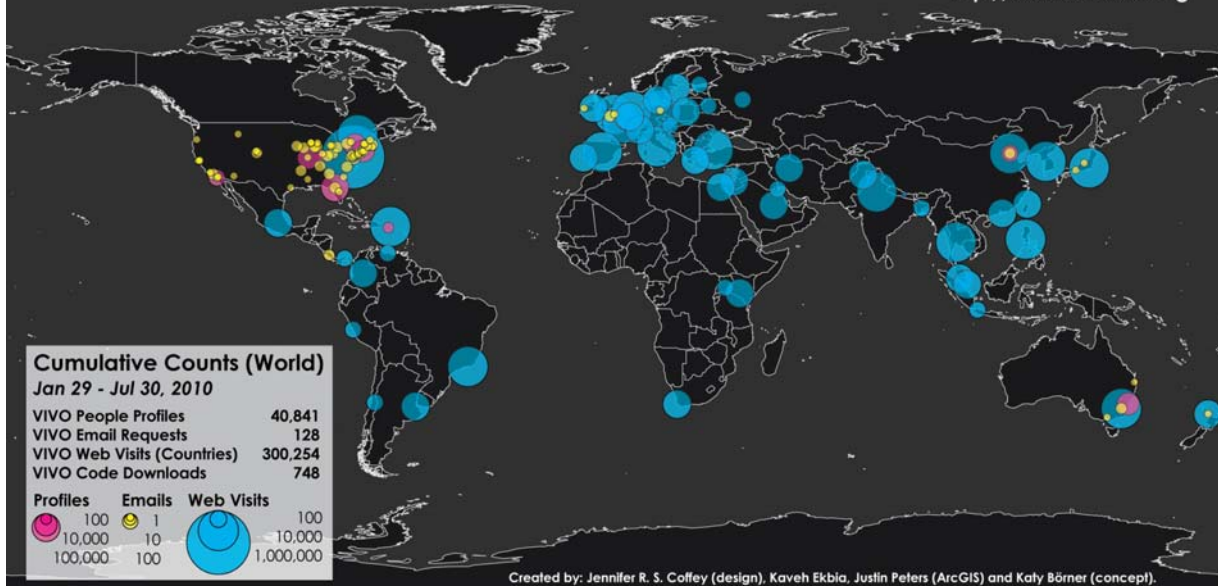
- Number of people profiles in the 7 different VIVO installation sites plus CAS and U Melbourne.
- Email contacts by data and service providers as well as institutions interested to adopt VIVO.
- The number of visitors on <http://vivoweb.org>

Circles are area size coded using a logarithmic scale.

60

VIVO Enabling National Networking of Scientists

<http://www.vivoweb.org>



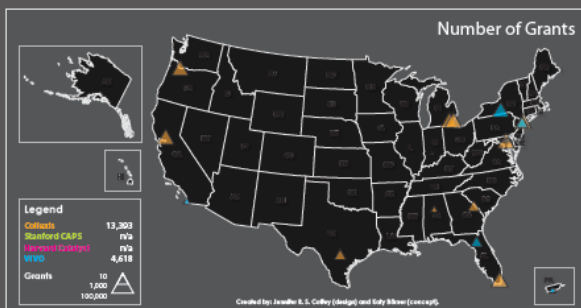
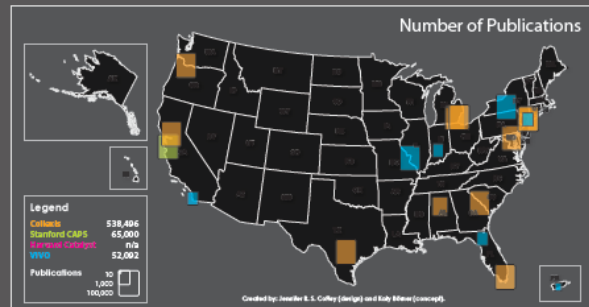
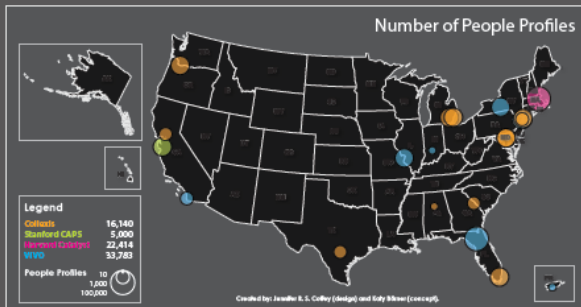
VIVO 1.0 source code was publicly released on April 14, 2010

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.

National Research Networking (NRN) Activity Visualization

VIVO
Enabling a National
Network of Scientists



Federated Search University of Florida

Search Term: Search

Results for "cancer".

University of Florida 29 People

UF VIVO contains all 6,900 faculty and 7,600 full-time staff of the University of Florida, as well as award information for all grants. UF students, affiliates and employees of Shands HealthCare can request to be added.

Cornell University 200 People

Participants in the VIVO National Network include institutions with local installations of VIVO or those with research discovery and profiling applications that can provide seamless interoperable data.

<http://vivoexperts.ctsi.ufl.edu>

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

References

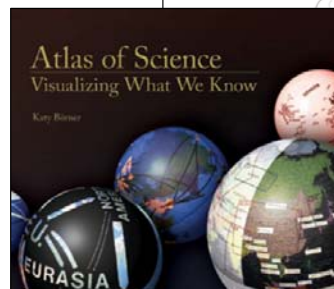
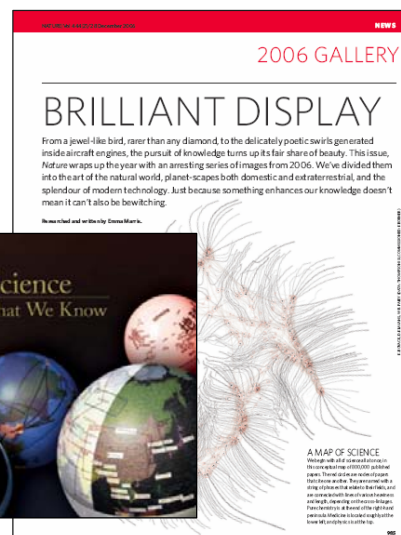
Börner, Katy, Chen, Chaomei, and Boyack, Kevin. (2003). **Visualizing Knowledge Domains**. In Blaise Cronin (Ed.), *ARIST*, Medford, NJ: Information Today, Volume 37, Chapter 5, pp. 179-255.
<http://ivl.slis.indiana.edu/km/pub/2003-borner-arist.pdf>

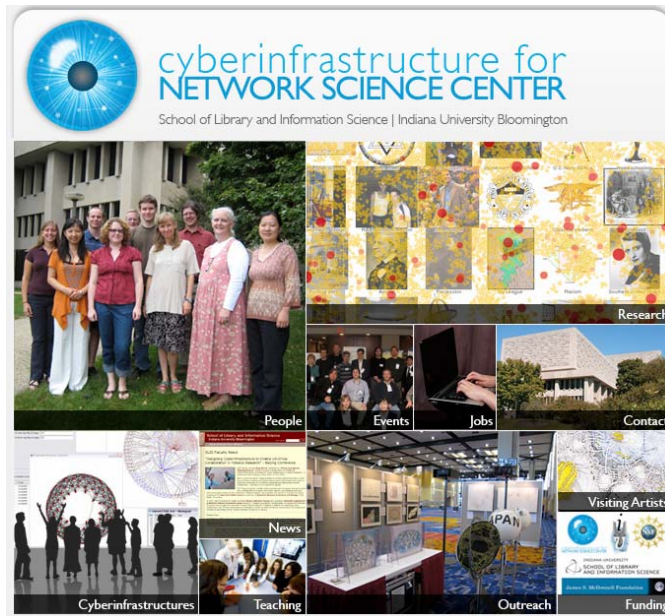
Shiffrin, Richard M. and Börner, Katy (Eds.) (2004). **Mapping Knowledge Domains**. *Proceedings of the National Academy of Sciences of the United States of America*, 101(Suppl_1).
http://www.pnas.org/content/vol101/suppl_1/

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.





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

CNS Facebook: <http://www.facebook.com/pages/Cyberinfrastructure-for-Network-Science-Center/144339535612571>

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