

Mapping Interactions Within the Evolving Science of Science and Innovation Policy Community

Angela M. Zoss and Dr. Katy Börner
Cyberinfrastructure for Network Science Center
Information Visualization Laboratory
School of Library and Information Science
Indiana University, Bloomington, IN
<http://cns.iu.edu>

*13th Conference for the International Society for
Scientometrics and Informetrics
Durban, South Africa; July 4-7, 2011*

July 6, 2011



Science of Science & Innovation Policy (SciSIP) program at the National Science Foundation (NSF)

- Aim is to fund projects that develop, improve and expand models, analytical tools, data and metrics that can be directly applied in the science policy decision making process.
- At time of study, **162** active and expired awards (now 185)
- SciSIP Listserv:
 - active since January 2009
 - in January 2011 there were almost **700** subscribers

To subscribe to the listserv, send a blank email to SUBSCRIBE-SCISIP@LISTS.NSF.GOV

The screenshot shows the 'User account' page on the Science of Science Policy website. At the top, there is a header with the Office of Science and Technology Policy logo and the text 'OFFICE OF SCIENCE AND TECHNOLOGY POLICY Executive Office of the President' and 'SCIENCE OF SCIENCE POLICY'. A 'Home' link is visible in the top right. Below the header is a navigation bar with links for 'SoSP Central', 'News & Events', 'Community Resources', 'SciSIP Central', and 'IWG Central'. The main content area is titled 'SoSP Users » User account' and 'User account'. It features three buttons: 'Create new account', 'Log in', and 'Request new password'. Underneath is a section for 'Account information' with two input fields: 'Username: *' and 'E-mail address: *'. The 'Username' field has a note: 'Spaces are allowed; punctuation is not allowed except for periods, hyphens, and underscores.' The 'E-mail address' field has a note: 'A valid e-mail address. All e-mails from the system will be sent to this address. The e-mail address is not made public and will only be used if you wish to receive a new password or wish to receive certain news or notifications by e-mail.'

<http://scienceofsciencepolicy.net>

3

Problems Mapping Growing Communities

- Traditional network analysis methods use publication data
 - **Low availability** of publication data during the early stages (ongoing research, publication lag)
 - **Inconsistent connections** between funding sources and publications
 - **Doesn't capture** informal knowledge networks across institutional and national boundaries or the agency of individuals who do the work of connecting data silos, both of which influence community growth
- Supplementing traditional data sources with data on **informal communication patterns** (e.g., listserv messages) can contextualize and provide more detail for traditional community mapping studies.

4

Research Questions

- What interactions are made visible by analysis of formal communication channels like awards and publications?
- How can analysis of informal communication supplement traditional analysis techniques?
- What roles do researchers play in the various interaction networks?

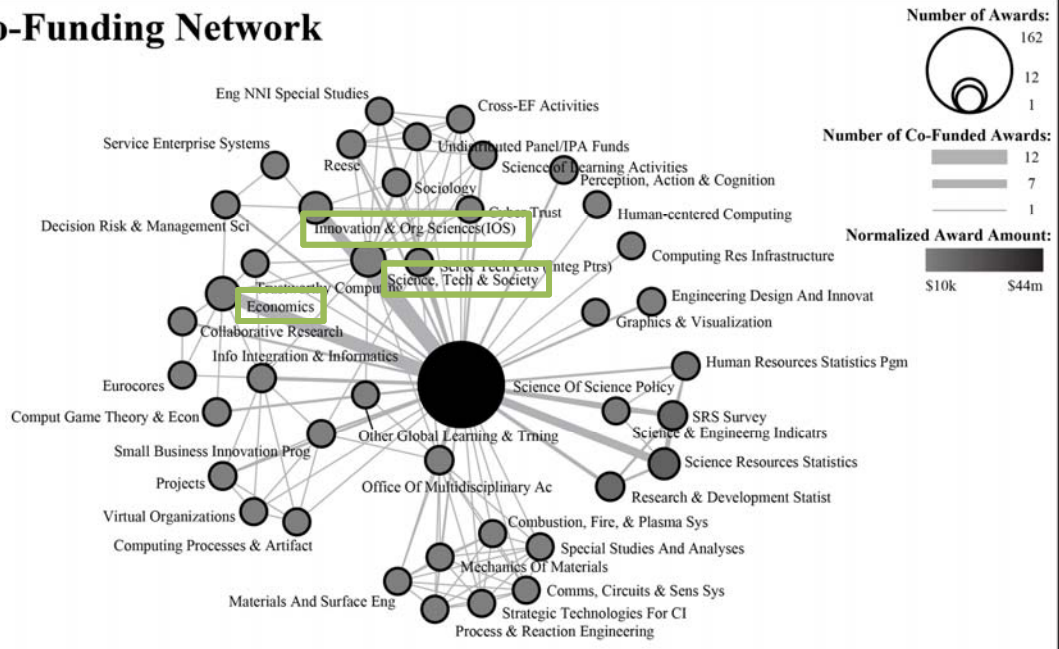
5

Data Sets

- Award and publication data (retrieved Jan. '11)
 - Metadata for 162 active and expired awards, totaling \$81 million
 - Metadata for 56 publications, associated with 22 of the awards
- Listserv data
 - 919 messages over 2 years (Jan. '09 to Jan. '11)
 - Subscription lists, retrieved toward the middle and end of the sampling period

6

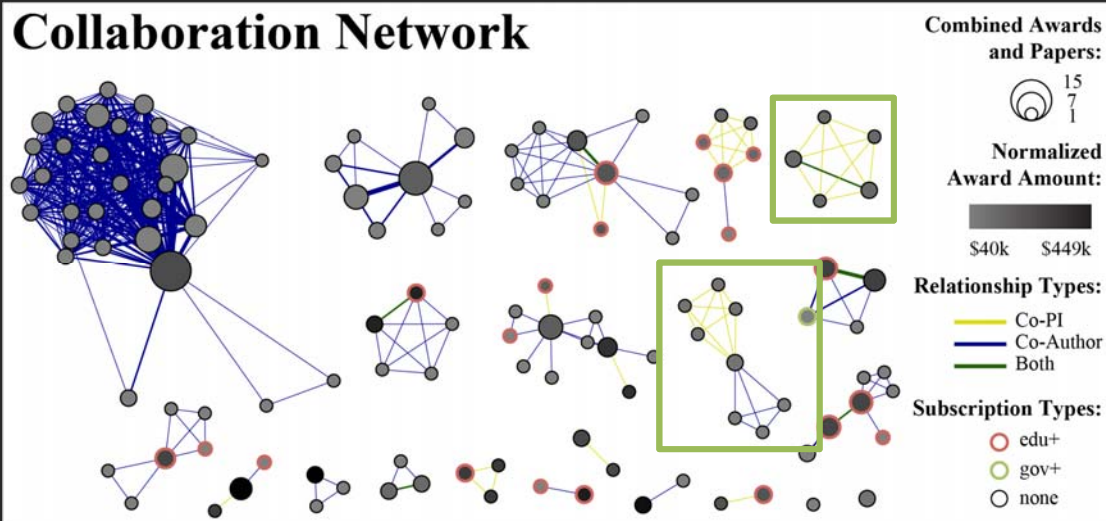
Co-Funding Network



Publication Data

		<i>Award Start Date in</i>			
		2006	2007	2008	2009
<i>Number of Awards:</i>		2	5	13	2
<i>Papers Published in:</i>	2007	4	3	1	0
	2008	5	1	8	0
	2009	1	2	14	2
	2010	0	3	11	1

56 publications, associated with 22 of the awards



9

Listserv Data

- **Subscribers:**
 - 3 subscription lists showing 475 (2/21/10), 659 (12/18/10), and 674 (1/10/11) members
 - After merging subscribers and senders, total of 728 participating individuals
- **Messages:**
 - 919 messages from 199 senders
 - 426 threads started; 104 received a response (avg. length of multi-message thread: 5.74)

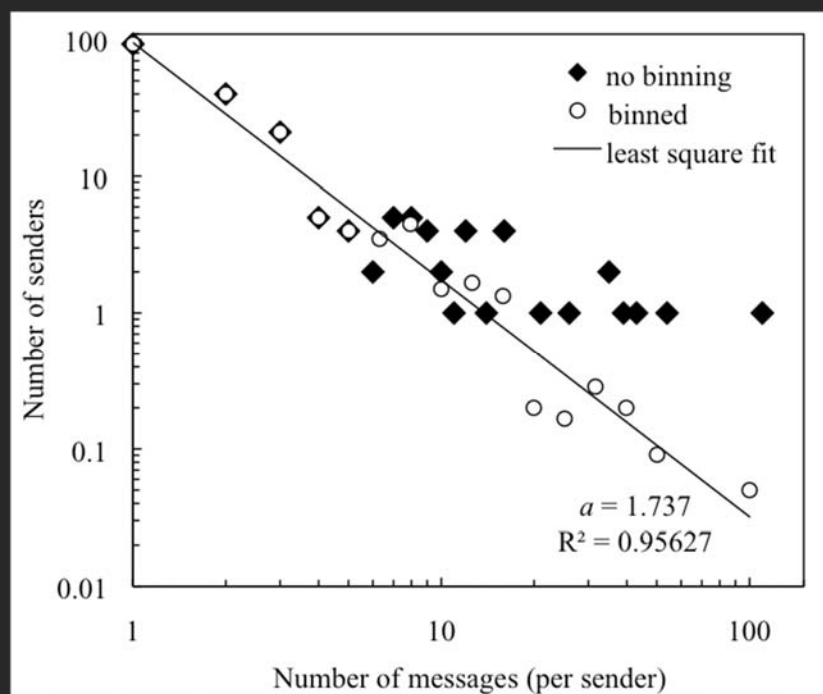
10

Coding Listserv Data

- Participants
 - Affiliation (com+, edu+, gov+, org+)
 - Country
- Messages
 - Date
 - Sender
 - Thread
 - For thread initiations
 - Type of message
 - Ability to generate response

11

Listserv Sender Activity



12

Message Type

- Analysis uncovered four major message types:
 - announcement of a resource (e.g., papers, tools, websites) or event (e.g., conference, workshop) of interest
 - request for submissions to a formal solicitation (e.g., CFP, RFA)
 - request for feedback or input on a posed question or topic (e.g., looking for literature on a particular subject)
 - other (e.g., subscription attempts, technical matters)

13

Participation Summary

	<i>Full List</i>	<i>Senders</i>
com+	96 (13%)	14 (7%)
edu+	284 (39%)	94 (47%)
gov+	250 (34%)	66 (33%)
org+	98 (13%)	25 (13%)
Total	728 (100%)	199 (100%)

	<i>Full List</i>	<i>Senders</i>
us	608 (83.52%)	167 (83.92%)
uk	27 (3.71%)	10 (5.03%)
se	20 (2.75%)	3 (1.51%)
ca	15 (2.06%)	3 (1.51%)
au	6 (0.82%)	3 (1.51%)
nl	4 (0.55%)	3 (1.51%)
(24 omitted)
Total	728 (100%)	199 (100%)

	<i>All Threads</i>	<i>com+</i>	<i>edu+</i>	<i>gov+</i>	<i>org+</i>
resource or event of interest	261 (61.4%)	15 (78.9%)	113 (62.8%)	119 (60.1%)	14 (50.0%)
request for submissions	91 (21.4%)	1 (5.3%)	42 (23.3%)	43 (21.7%)	5 (17.9%)
request for feedback	57 (13.4%)	1 (5.3%)	20 (11.1%)	29 (14.6%)	7 (25.0%)
other	16 (3.8%)	2 (10.5%)	5 (2.8%)	7 (3.5%)	2 (7.1%)
Total	425 (100%)	19 (100%)	180 (100%)	198 (100%)	28 (100%)

14

Ability to Elicit Response

Affiliation of Sender

	<i>All Messages</i>	<i>com+</i>	<i>edu+</i>	<i>gov+</i>	<i>org+</i>
initiations with no response	322 (35.0%)	18 (23.4%)	141 (34.3%)	143 (39.3%)	20 (29.9%)
initiations with response	104 (11.3%)	1 (1.3%)	39 (9.5%)	55 (15.1%)	9 (13.4%)
messages that do not initiate	493 (53.6%)	58 (75.3%)	231 (56.2%)	166 (45.6%)	38 (56.7%)
Total	919 (100.0%)	77 (100.0%)	411 (100.0%)	364 (100.0%)	67 (100.0%)

Type of Message

	<i>All Threads</i>	<i>With Response</i>	<i>Without Response</i>	<i>Average # of Messages in Thread</i>
resource or event of interest	261 (61.4%)	49 (47.1%)	212 (66.0%)	1.6
request for submissions	91 (21.4%)	19 (18.3%)	72 (22.4%)	1.5
request for feedback	57 (13.4%)	31 (29.8%)	26 (8.1%)	6.2
other	16 (3.8%)	5 (4.8%)	11 (3.4%)	1.5
Total	425 (100%)	104 (100.0%)	321 (100.0%)	2.2

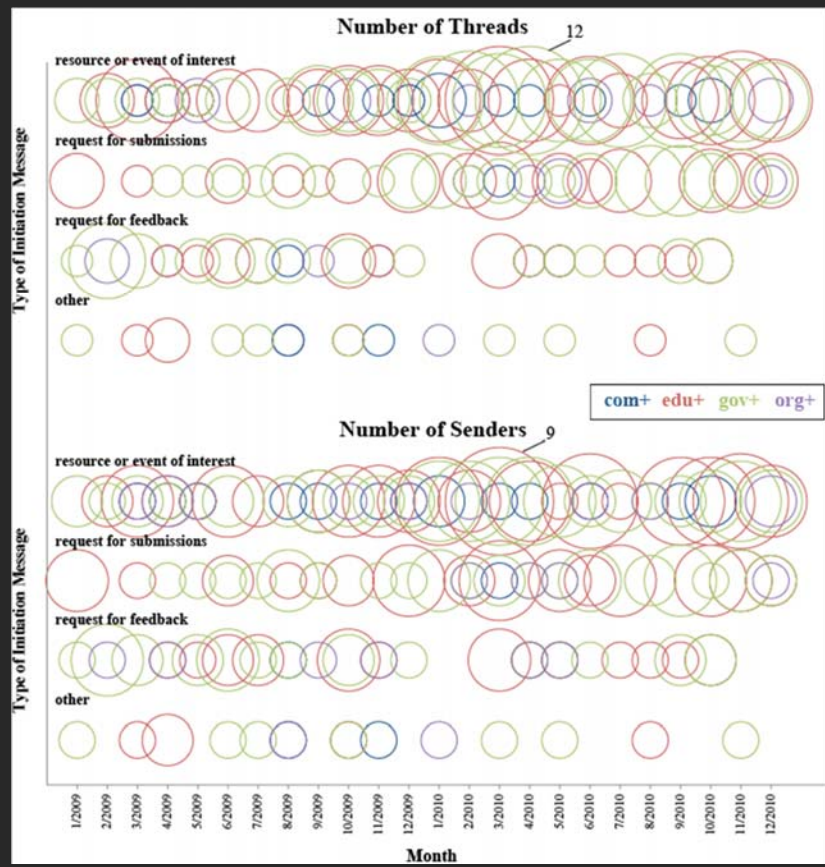
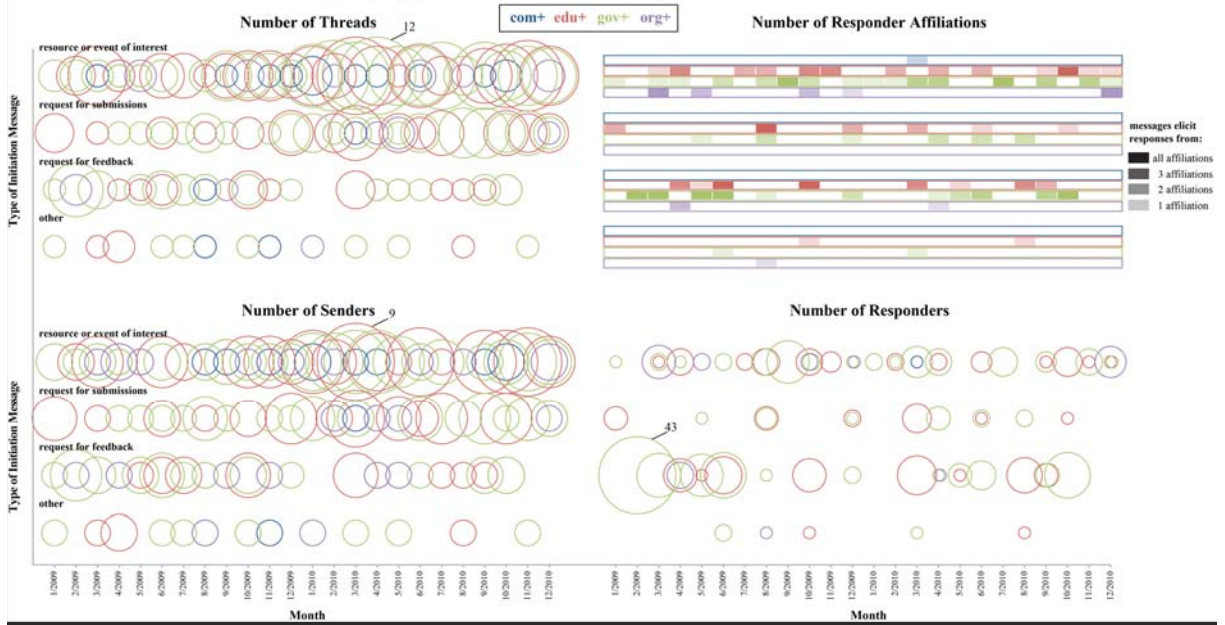
15

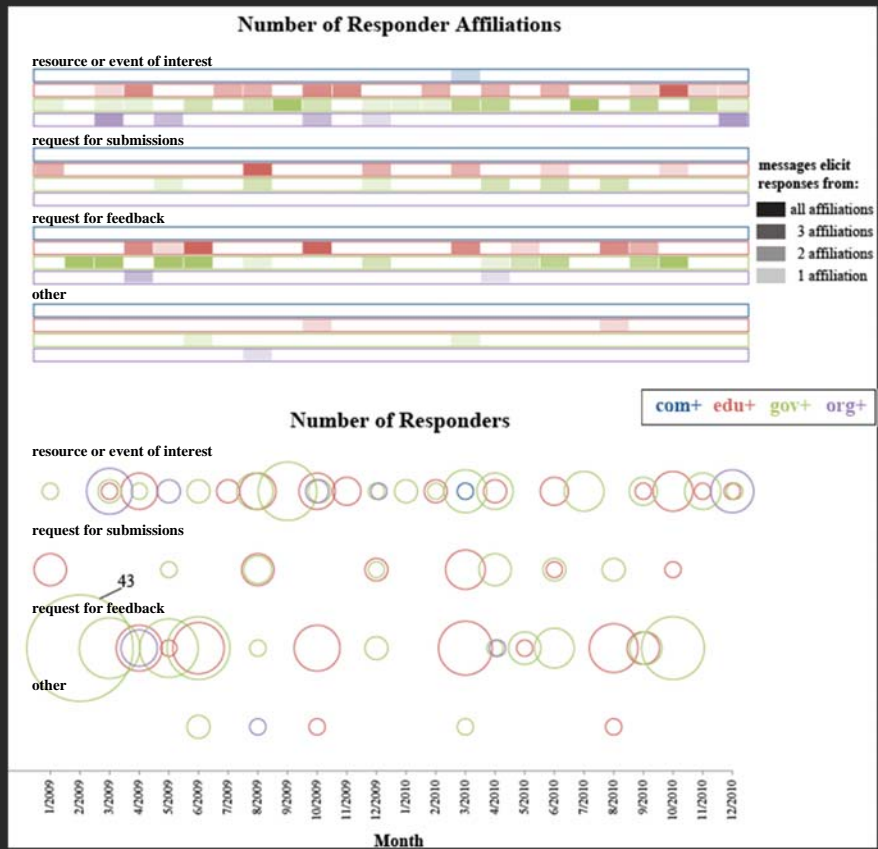
Top Ten Most Active Threads

<i>Subject</i>	<i>Number of Messages in Thread</i>	<i>Initiator Affiliation</i>	<i>Type of Initiation Message</i>	<i>Length of Thread (in Days)</i>
Congressional and Executive branch requests for information...	66	gov+	request for feedback	8
Illustration of Innovation Ecology	33	gov+	request for feedback	14
need a reference	19	gov+	request for feedback	3
Wiki vs blog vs ???	16	gov+	request for feedback	2
Question from the executive branch	14	gov+	request for feedback	4
US S&T book/article query?	13	edu+	request for feedback	2
Energy Innovation Systems from the Bottom Up...	12	edu+	resource or event of interest	2
Help re citations data	12	gov+	request for feedback	2
Federal Innovation Inducement Prizes	12	gov+	request for feedback	2
FW: Collaboration - Achieving Better Results by Working Together	12	gov+	request for feedback	2

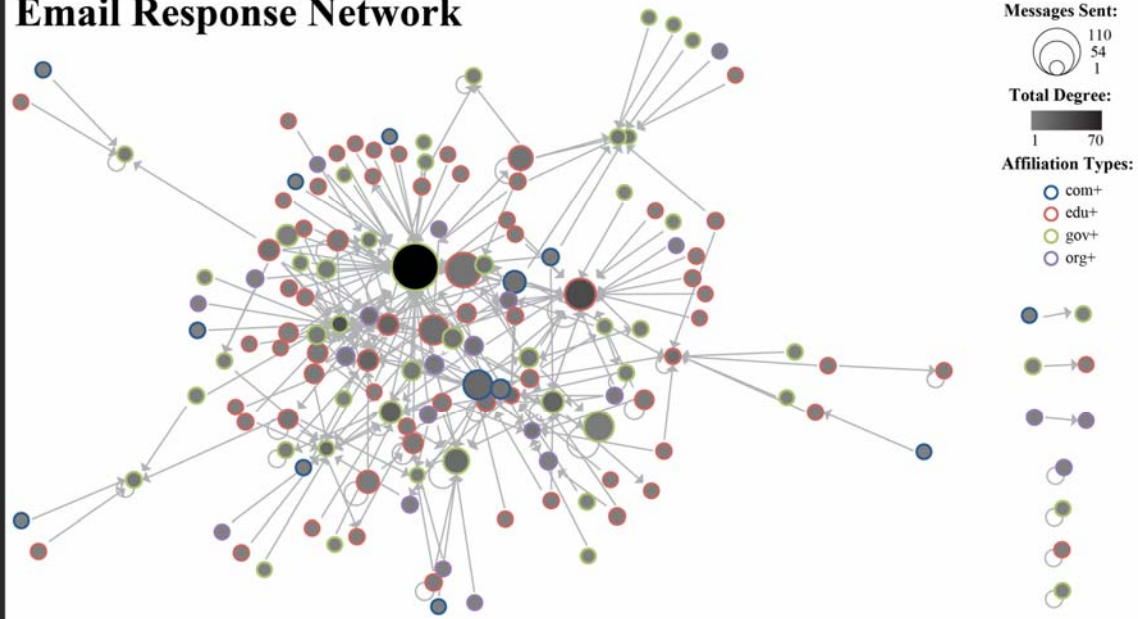
16

Thread Activity by Type of Initiation Message and Affiliation of Sender, Over Time





Email Response Network



Open Questions & New Directions

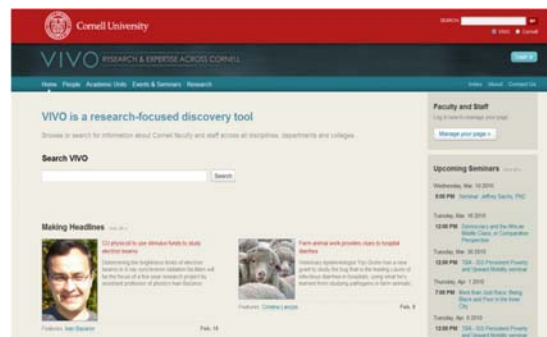
- Evaluation of results using expert interpretation
- Ways to automate analysis of informal communication?
- Other ways to capture structure and dynamics of new/growing communities?
- Ways to incorporate additional temporal, geospatial, and topical information?

21

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.

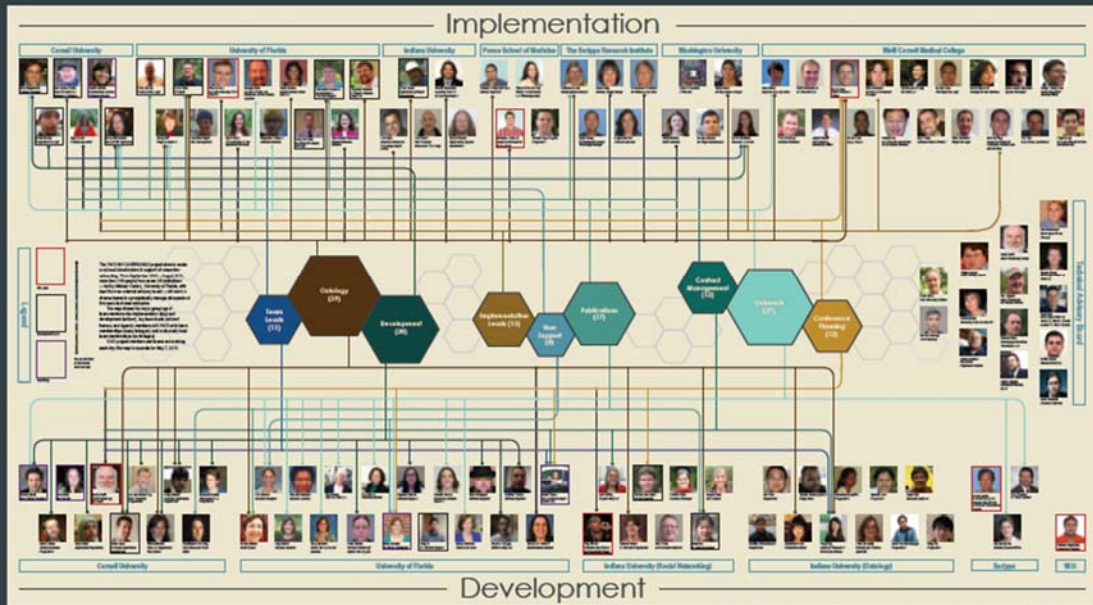


Funded by \$12 million NIH award.

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 Raum, Brenda Stevens, Alicia Turner, Stephen Williams. **Indiana University:** Katy Borner (IU PI), William Barnett, Shanshan Chen, Ying Ding, Russell Duhon, Jon Dunn, Micah Linnemeier, Nianli Ma, Robert McDonald, Barbara Ann O'Leary, Mark Price, Yuyin Sun, Alan Walsh, Brian Wheeler, Angela Zoss. **Ponce School of Medicine:** Richard Noel (Ponce PI), Ricardo Espada, Damaris Torres. **The Scripps Research Institute:** Gerald Joyce (Scripps PI), Greg Dunlap, Catherine Dunn, Brant Kelley, Paula King, Angela Murrell, Barbara Noble, Cary Thomas, Michaelen Trimarchi. **Washington University, St. Louis:** Rakesh Nagarajan (WUSTL PI), Kristi L. Holmes, Sunita B. Koul, Leslie D. McIntosh. **Weill Cornell Medical College:** Curtis Cole (Weill PI), Paul Albert, Victor Brodsky, Adam Cheriff, Oscar Cruz, Dan Dickinson, Chris Huang, Itay Klaz, Peter Michelini, Grace Migliorisi, John Ruffing, Jason Specland, Tru Tran, Jesse Turner, Vinay Varughese.

VIVO Enabling National Networking of Scientists

Project Members and Teams



Please send comments and questions to jeff.culley@vivo-network.org (design) and john.s.boyd@vivo-network.org (data acquisition) and john.boyd@vivo-network.org. For more information, visit www.vivo-network.org.

2010.05.07

How do you want to compare?

by Grants

Who do you want to compare?

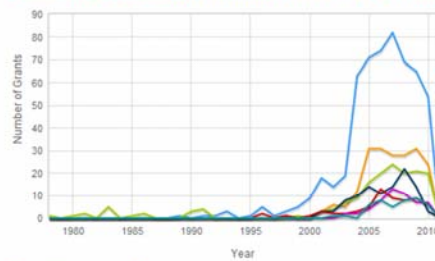
Search: X

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

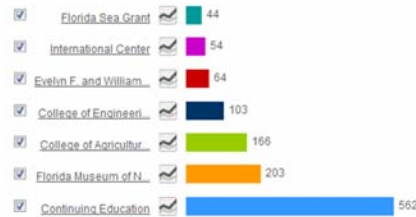
Save as CSV Clear

Comparing Grants of Organizations in University of Florida



Total Number of Grants

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



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

VIVO enabling national networking of scientists

Index Log in

Home People Organizations Research Events

University of Florida *i*

Explore 487 publications activity across 554 scientific sub-disciplines *i*

13 Disciplines | 554 Sub-Disciplines *i*

Search: X

1 - 13 of 554 < First < Prev Next > Last >

Sub-Disciplines	# of pubs.	% activity
Pest Management Science	24.2	5.0
Wildlife Research	19.1	3.9
Protein Science	13.1	2.7
Clinical Cancer Research	12.6	2.6
Pain	12.0	2.5
Environmental Contamination	11.2	2.3
Insect Physiology	11.1	2.3
Organic Chemistry	10.9	2.2
Marine Biology	10.3	2.1
Computer Aided Molecular Design	10.2	2.1
BioStatistics	9.0	1.9

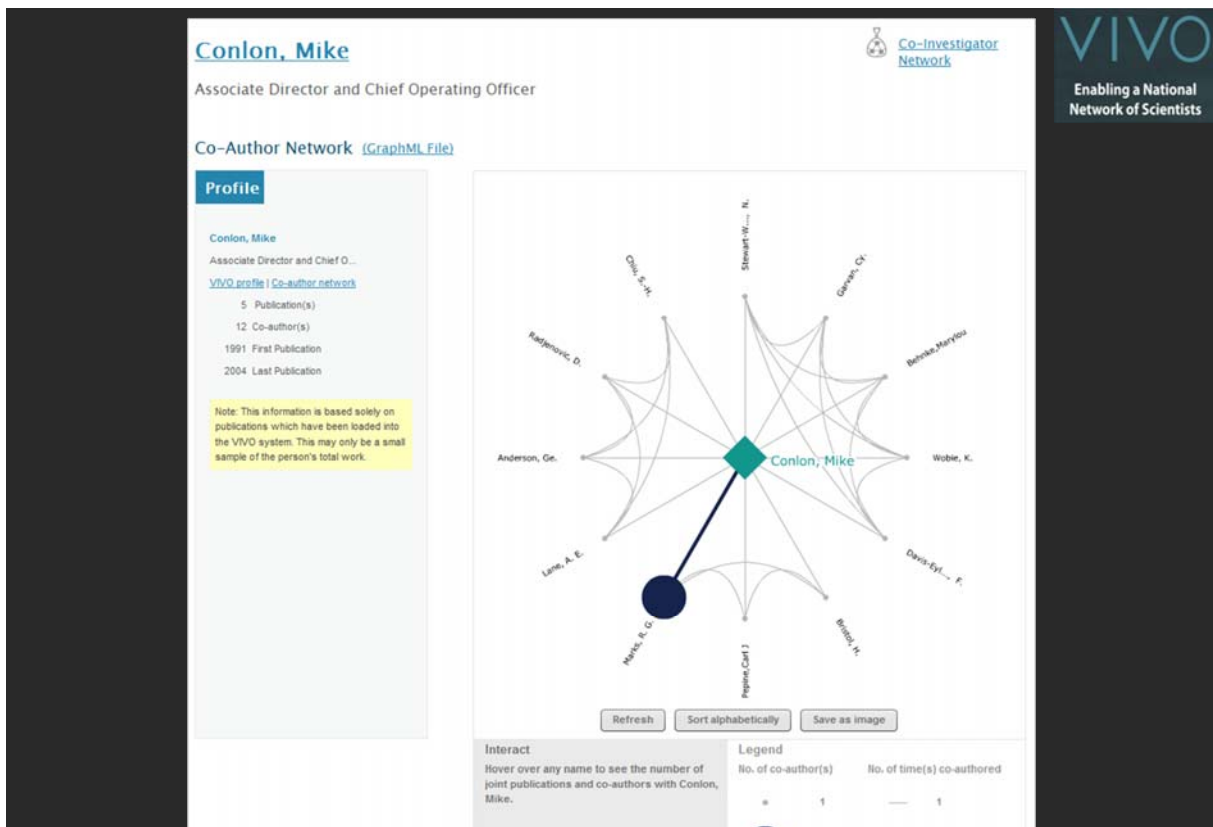
Top 290 disciplines shown

mapped 14.55% of 3,346 publications *i*

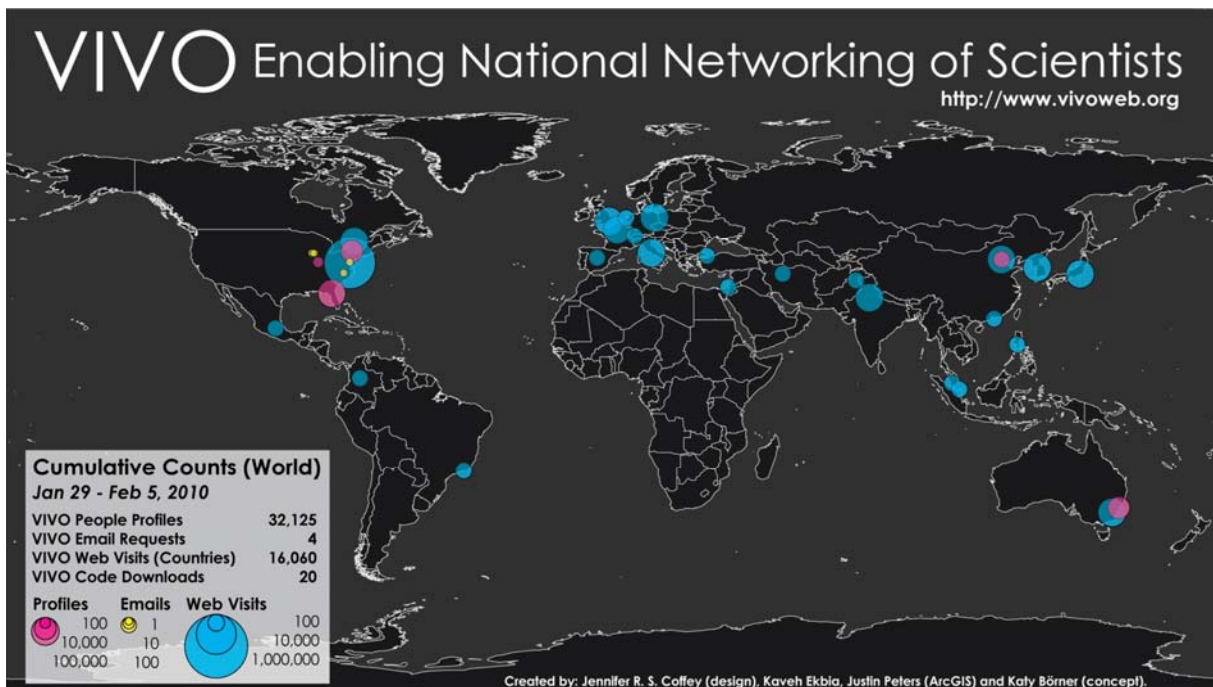
Google

Terms of Use

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?

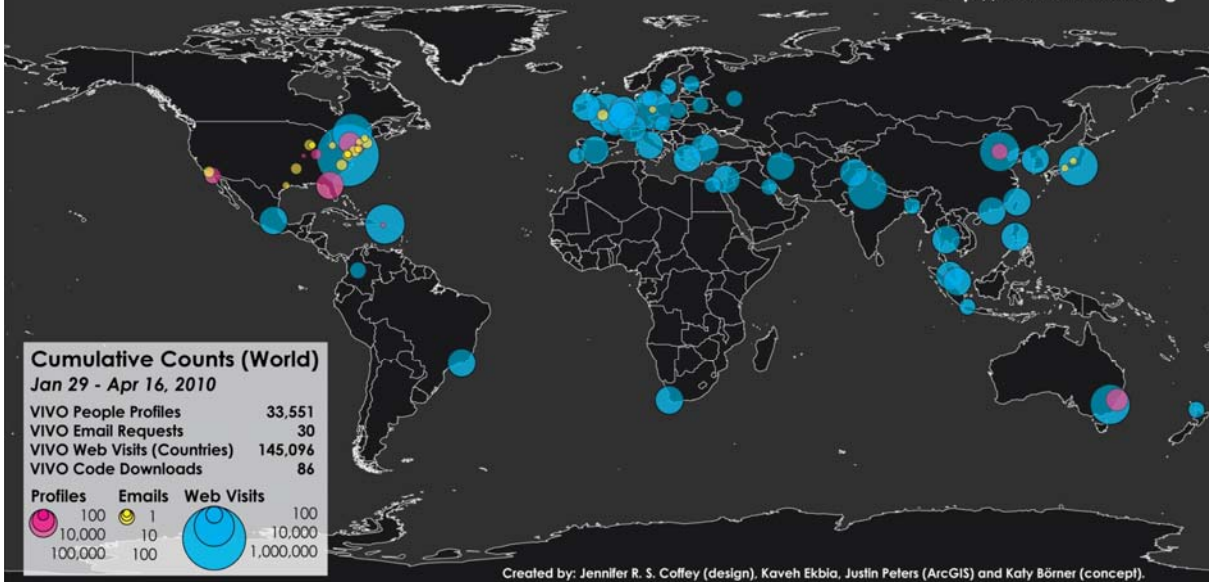


Science is global. World view of VIVO activity.
Web site visits are aggregated at the country level.

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

VIVO Enabling National Networking of Scientists

<http://www.vivoweb.org>



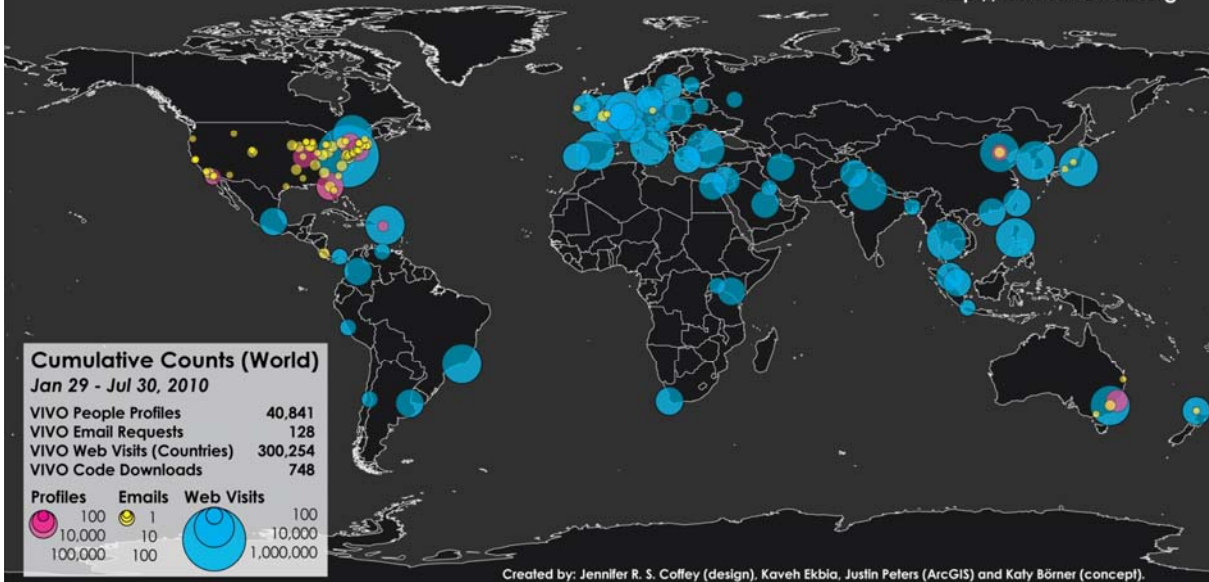
Shown are the

- 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.

29

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.

30

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