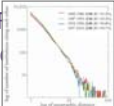



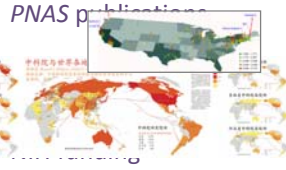
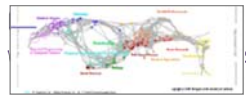
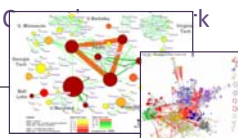
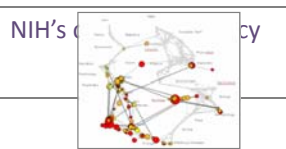

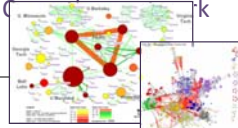



# Type of Analysis vs. Level of Analysis

	<b>Micro/Individual</b> (1-100 records)	<b>Meso/Local</b> (101–10,000 records)	<b>Macro/Global</b> (10,000 < records)
<b>Statistical Analysis/Profiling</b>	Individual person and their expertise profiles	Larger labs, centers, universities, research domains or states	All of NSF, A, all of science 
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<b>Geospatial Analysis (Where)</b>	Career trajectory of one individual	Wrapping a state intellectual landscape 	PNAS publications 
<b>Topical Analysis (What)</b>		Knowledge flows in chemistry research 	
<b>Network Analysis (With Whom?)</b>	NSF one 	Work of 	NIH's 

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## Information Visualization MOOC

### Unit 1: Visualization Framework & Workflow Design

#### Visualization Framework

- Type of Analysis (temporal ... network)
- Level of Analysis (micro ... macro)

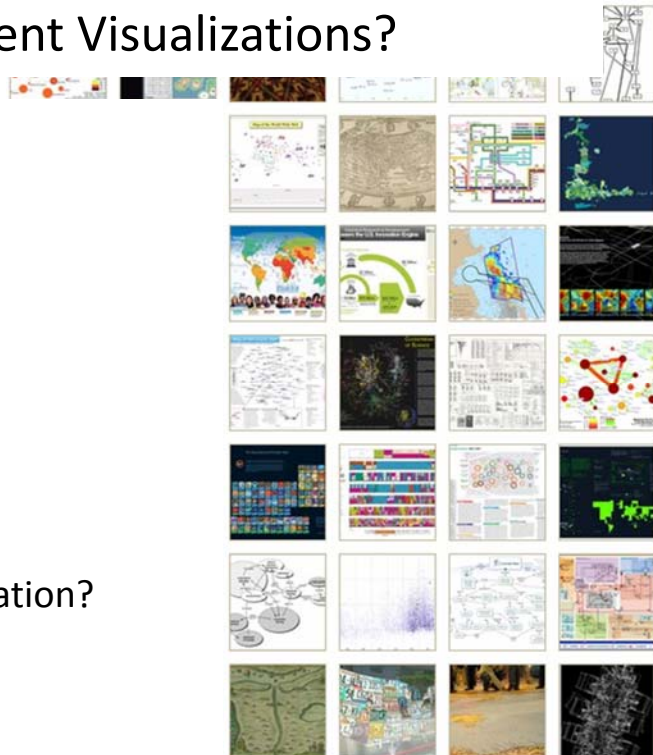


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## How to Classify Different Visualizations?

By

- User insight needs?
- User task types?
- Data to be visualized?
- Data transformation?
- Visualization technique?
- Visual mapping transformation?
- Interaction techniques?
- Or ?



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## Different Question Types



Terabytes of data

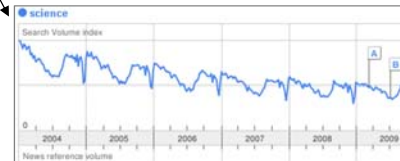
Descriptive &  
Predictive  
Models



Find your way



Find collaborators, friends

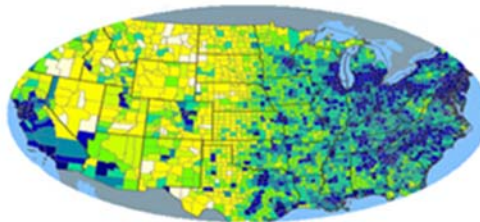


Identify trends

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## Different Levels of Abstraction/Analysis

Macro/Global  
Population Level



Meso/Local  
Group Level



Micro  
Individual Level



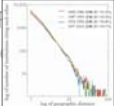
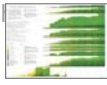
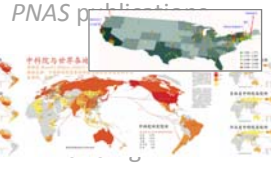
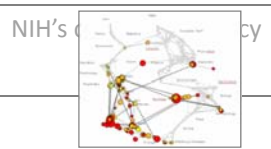



21

## Type of Analysis vs. Level of Analysis

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<b>Topical Analysis (What)</b>	Base knowledge from which one grant draws.	Knowledge flows in chemistry research	VxOrd/Topic maps of NIH funding
<b>Network Analysis (With Whom?)</b>	NSF Co-PI network of one individual	Co-author network	NIH's core competency

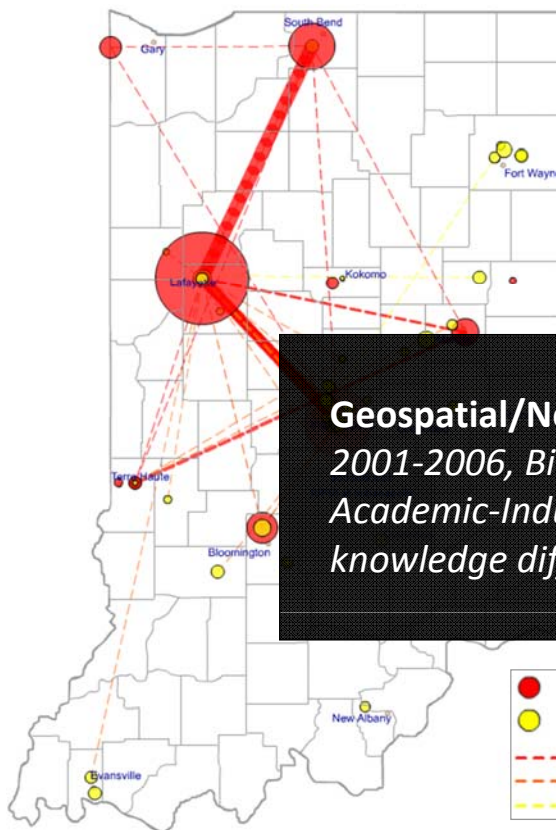
22

## Type of Analysis vs. Level of Analysis

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## Mapping Indiana's Intellectual Space

Identify  
**Geospatial/Network Analysis**  
2001-2006, BioMed, IN Scope  
Academic-Industry collaborations and  
knowledge diffusion

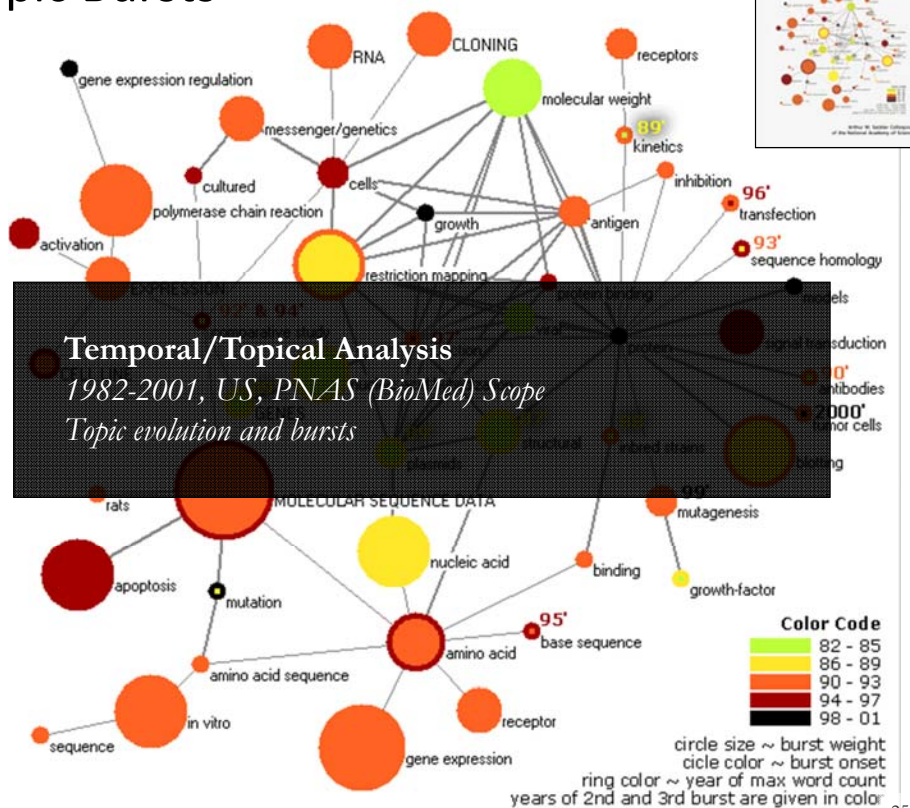


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## Mapping Topic Bursts

Co-word space of the top-50 most 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.



25

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

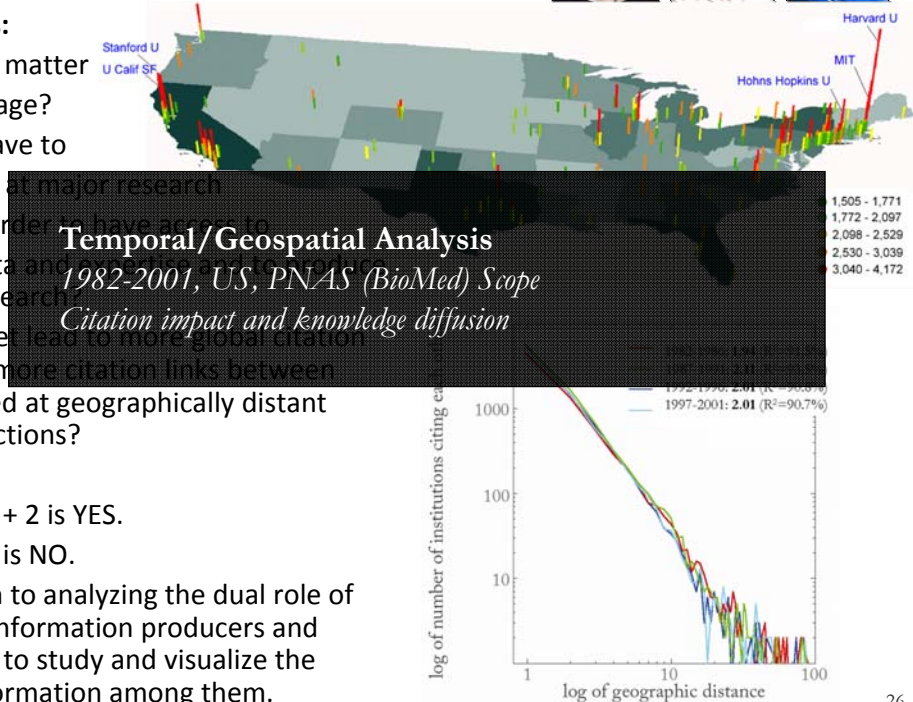
Börner, Penumathy, Meiss, & Ke.

2006. "Mapping the Diffusion of Scholarly Knowledge Among Major U.S. Research Institutions." *Scientometrics* 68 (3): 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?



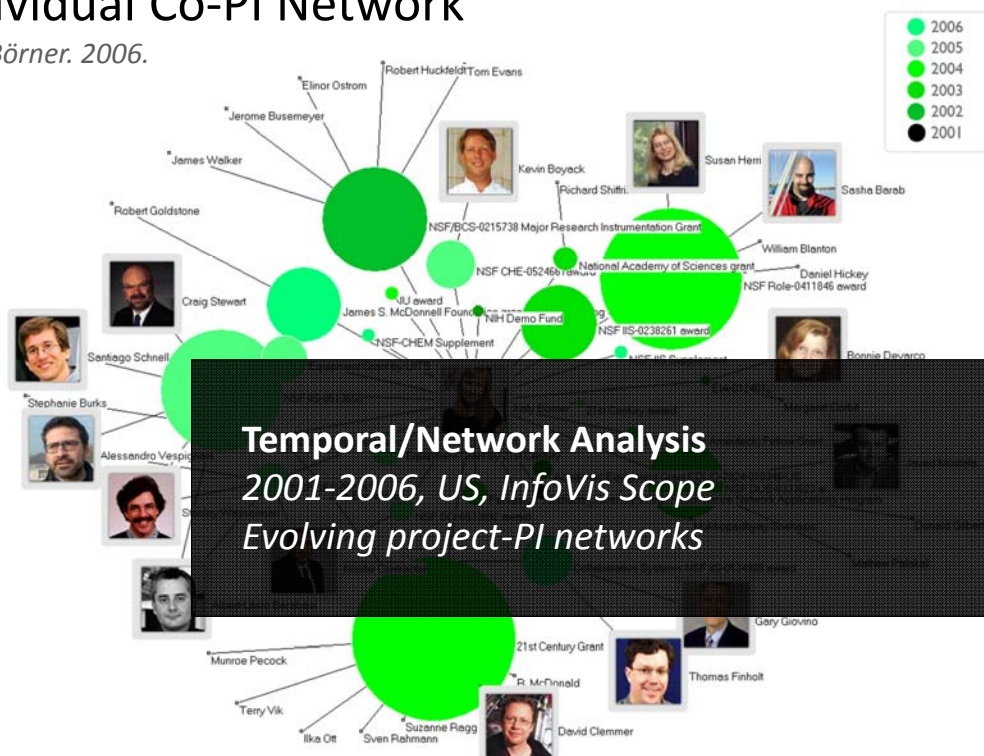
### Contributions:

- 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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## Individual Co-PI Network

Ke & Börner. 2006.

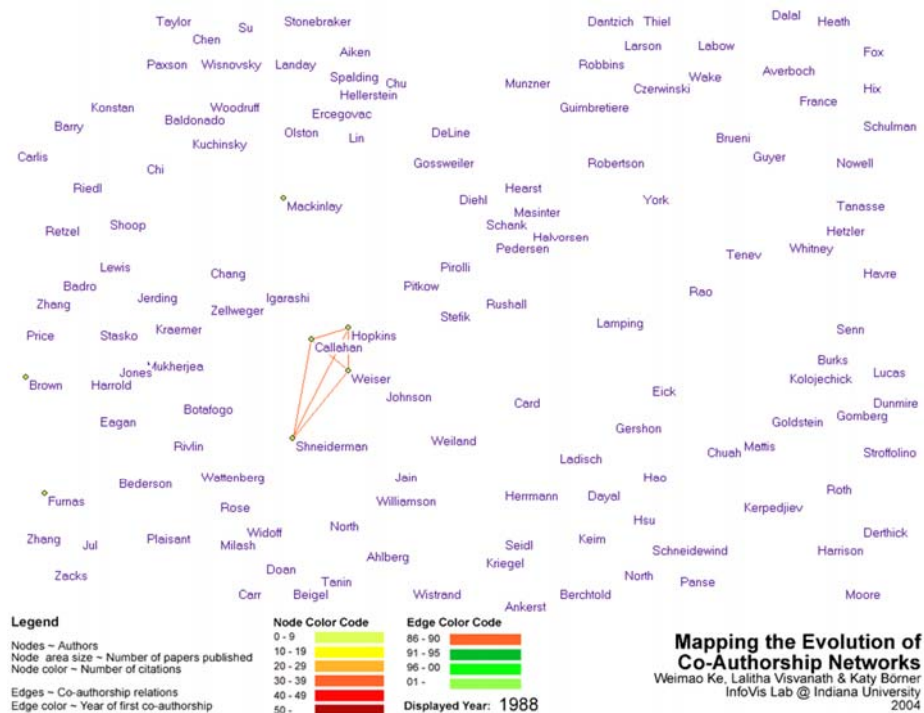


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# Mapping the Evolution of Co-Authorship Networks

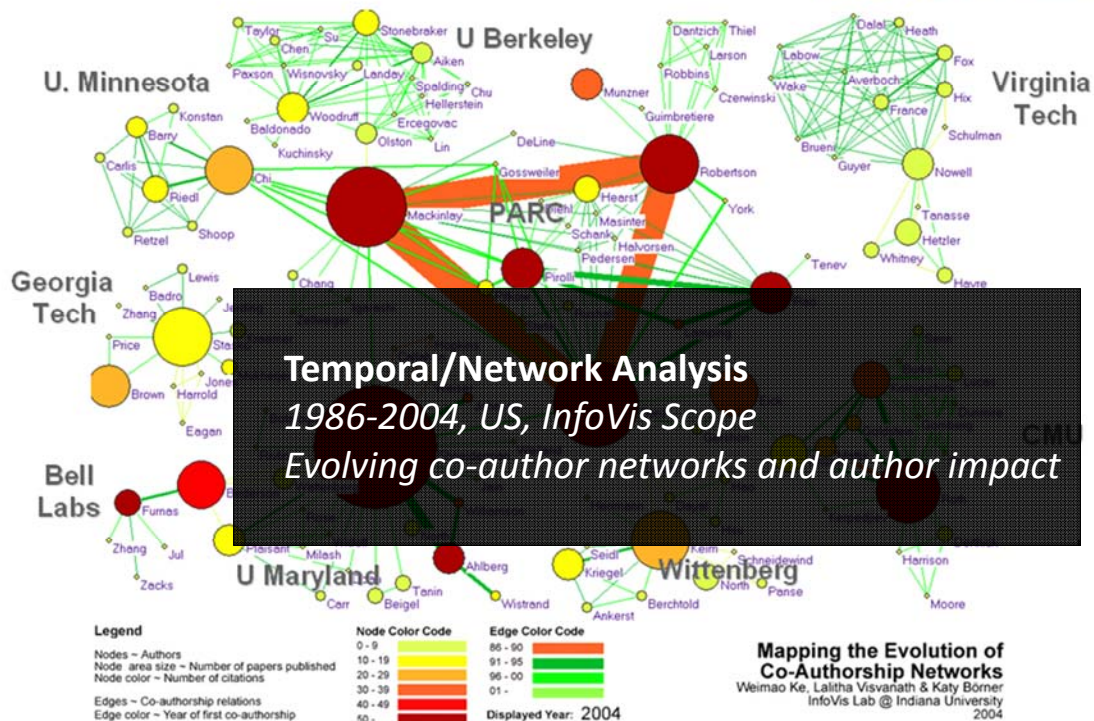
Ke, Visvanath & Börner. 2004. Won 1st prize at the IEEE InfoVis Contest.



28

# Mapping the Evolution of Co-Authorship Networks

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



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

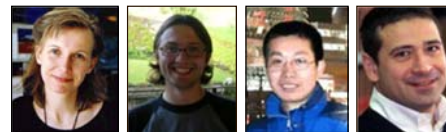
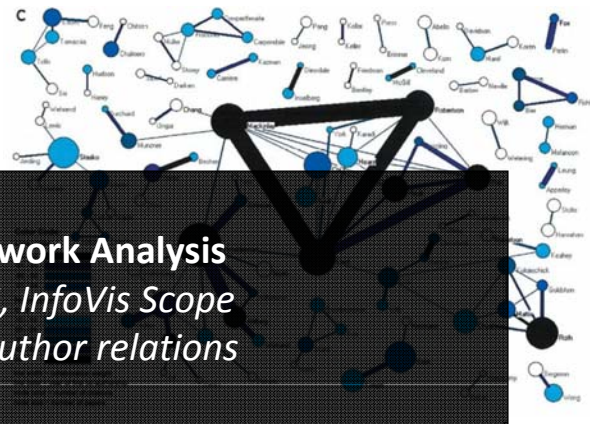
Börner, Dall'Asta, Ke & Vespignani. 2005. *Complexity* 10 (4):58-67.

## Research question:

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

## Contributions:

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

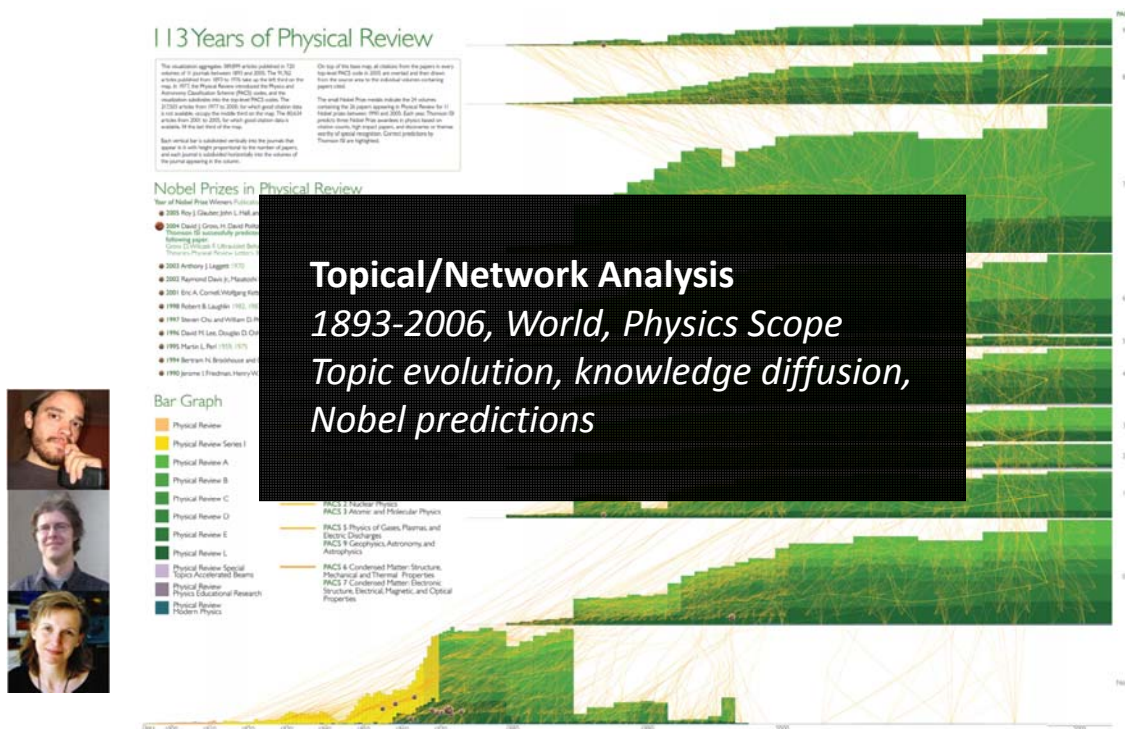


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# 113 Years of *Physical Review*

[http://scimaps.org/dev/map\\_detail.php?map\\_id=171](http://scimaps.org/dev/map_detail.php?map_id=171)

Herr II, Duhon, Hardy, Penumarthu & Börner.



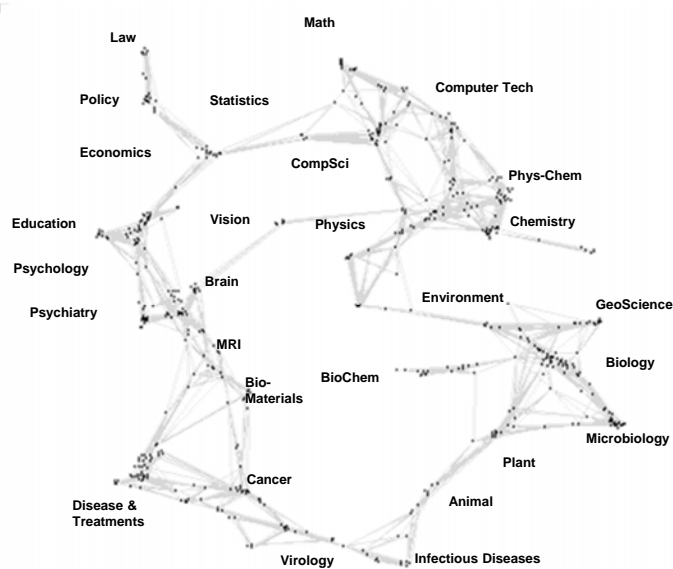
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# Science Maps: Identifying Core Competency

*Boyack, Börner & Klavans. 2007.*

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

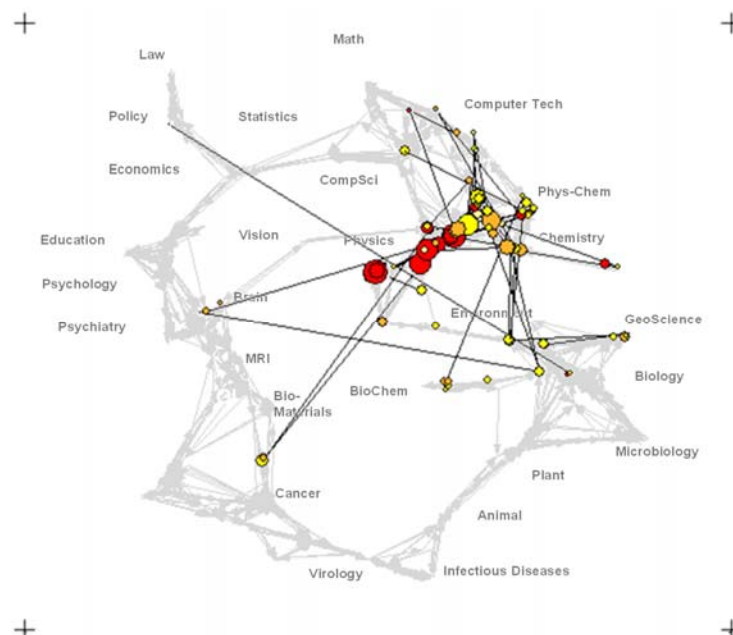


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# Science Maps: Identifying Core Competency

*Boyack, Börner & Klavans. 2007.*

Funding patterns of the US Department of Energy (DOE)

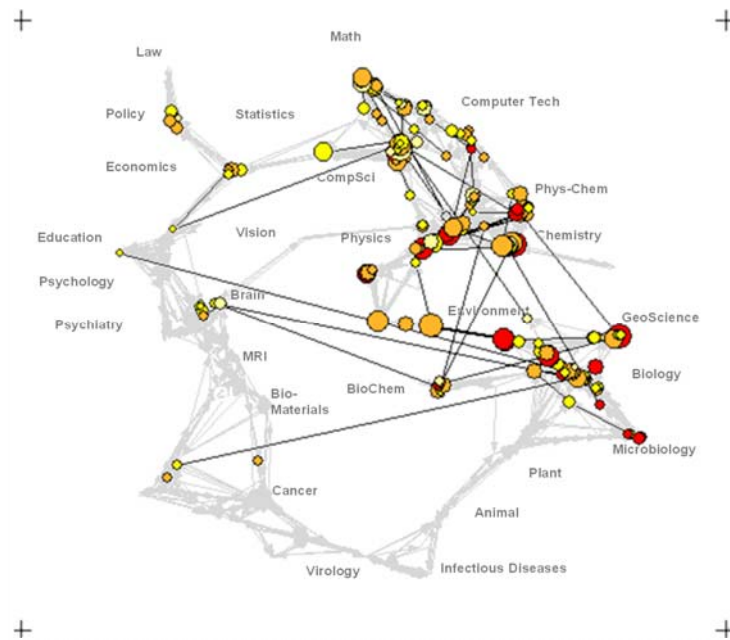


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# Science Maps: Identifying Core Competency

*Boyack, Börner & Klavans. 2007.*

## Funding Patterns of the National Science Foundation (NSF)

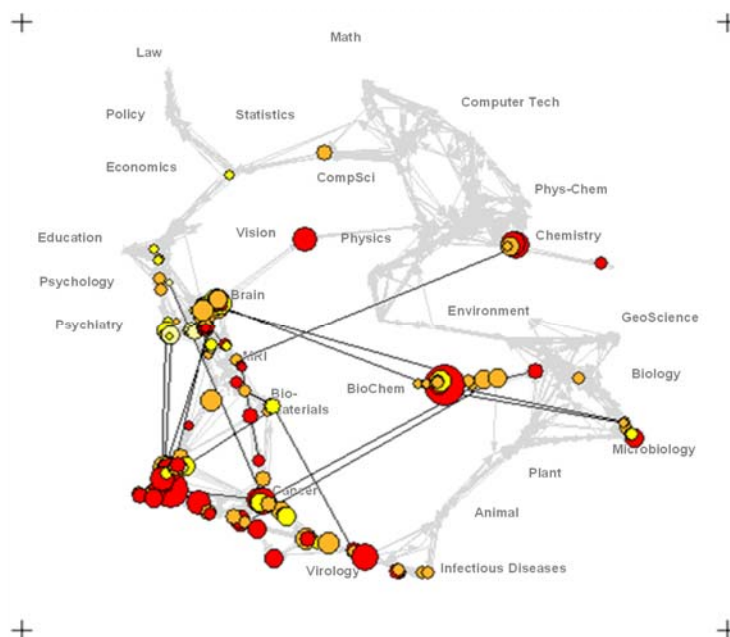


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# Science Maps: Identifying Core Competency

*Boyack, Börner & Klavans. 2007.*

## Funding Patterns of the National Institutes of Health (NIH)

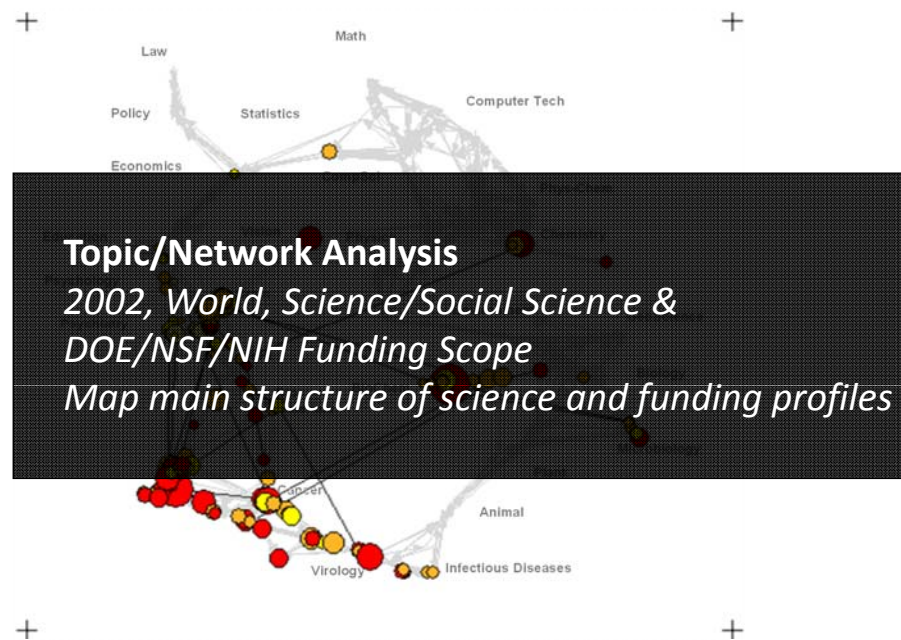


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# Science Maps: Identifying Core Competency

Boyack, Börner & Klavans. 2007.

## Funding Patterns of the National Institutes of Health (NIH)



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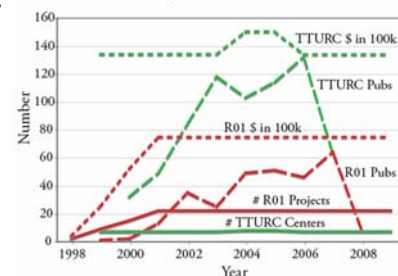
## Mapping Transdisciplinary Tobacco Use Research Centers Publications

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

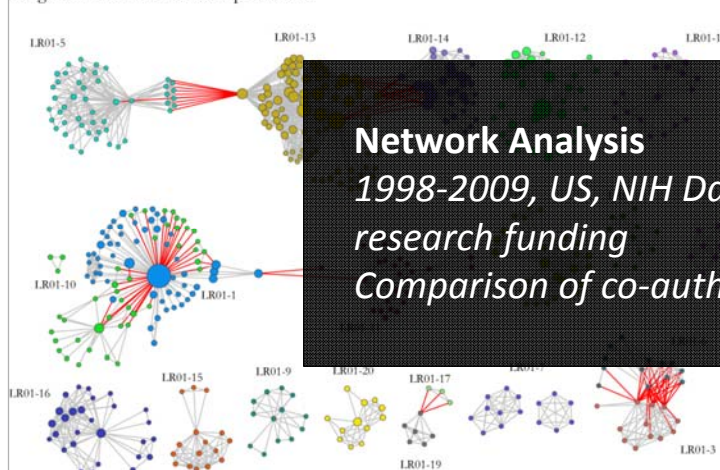
Zoss & Börner. Forthcoming.

Supported by NIH/NCI Contract HHSN261200800812

R01 & TTURC Project Information



Longitudinal R01 Co-Authorship Network



TTURC Co-Authorship Network



## Network Analysis

1998-2009, US, NIH Data on Tobacco  
research funding  
Comparison of co-author networks

37



# Research Collaborations by the Chinese Academy of Sciences

Huang, Duhon, Hardy & Börner



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## Type of Analysis vs. Level of Analysis

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