## Type of Analysis vs. Level of Analysis

<table>
<thead>
<tr>
<th>Type of Analysis</th>
<th>Micro/Individual (1-100 records)</th>
<th>Meso/Local (101–10,000 records)</th>
<th>Macro/Global (10,000 &lt; records)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Statistical Analysis/Profiling</strong></td>
<td>Individual person and their expertise profiles</td>
<td>Larger labs, centers, universities, research domains, or states</td>
<td>All of NSF, all of science, all of SA, etc.</td>
</tr>
<tr>
<td><strong>Temporal Analysis (When)</strong></td>
<td>Funding portfolio of one individual</td>
<td>Mapping topic bursts in PNAS</td>
<td>113 Years of Physics Research</td>
</tr>
<tr>
<td><strong>Geospatial Analysis (Where)</strong></td>
<td>Career trajectory of one individual</td>
<td>Mapping a state's intellectual landscape</td>
<td>PNAS/ARPA/NIH Funding</td>
</tr>
<tr>
<td><strong>Topical Analysis (What)</strong></td>
<td>Topical maps of research</td>
<td>NIH's Funding</td>
<td>VxOrd/Topic maps of NIH Funding</td>
</tr>
<tr>
<td><strong>Network Analysis (With Whom?)</strong></td>
<td>NSF Co-PI network of one individual</td>
<td>NIH's Co-PI network</td>
<td>NIH's Co-PI network</td>
</tr>
</tbody>
</table>
Individual Co-PI Network
Ke & Börner, (2006)

Mapping Indiana’s Intellectual Space

Identify
➢ Pockets of innovation
➢ Pathways from ideas to products
➢ Interplay of industry and academia
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.


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


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

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

Chemistry - Biology Interface

1974

2004

Mapping Transdisciplinary Tobacco Use Research Centers Publications

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

Zoss & Börner, forthcoming.

Supported by NIH/NCI Contract HHSN261200800812
Mapping the Evolution of Co-Authorship Networks
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)
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.
Click on one icon to display all records of one type. Here publications in the state of Florida.
Search result for “Miscanthus,” a special energy biomass crops for second generation biofuel.
The science map at 13 top-level scientific disciplines level.

The science map at 554 sub-disciplines level.

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

Mapping Science Exhibit – 10 Iterations in 10 years

http://scimaps.org

The Power of Maps (2005)


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
Today used as a science “base map”, see later slides.
Debut of 5th Iteration of the Mapping Science Exhibit at MEDIA X was in 2009 at Wallenberg Hall, Stanford University, [https://medias.stanford.edu](https://medias.stanford.edu), [https://scaleindependentthought.typepad.com/phones/scimaps](https://scaleindependentthought.typepad.com/phones/scimaps)
Science Maps in “Expedition Zukunft” science train visiting 62 cities in 7 months, 12 coaches, 300 m long. [http://www.expedition-zukunft.de](http://www.expedition-zukunft.de)
References


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

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