Biography (about 250 words)

Katy Börner is an Associate Professor of Information Science in the School of Library and Information Science, Adjunct Associate Professor in the School of Informatics, Core Faculty of Cognitive Science, Research Affiliate of the Biocomplexity Institute, Member of the Advanced Visualization Laboratory and directs the Information Visualization lab at Indiana University. Her research focuses on the development of data analysis and visualization techniques that improve information access, understanding, and management. She is particularly interested in the study of the structure and evolution of scientific disciplines; the analysis and visualization of online activity, e.g., user actions in 3D virtual worlds; and the development of cyberinfrastructures for scientific collaboration and computation, e.g., the information visualization cyberinfrastructure (http://iv.slis.indiana.edu). She co-edited a book on 'Visual Interfaces to Digital Libraries' published by Springer in 2002, a special issue of PNAS on 'Mapping Knowledge Domains' published in April 2004, a special issue on 'Collaborative Information Visualization Environments' in PRESENCE: Teleoperators and Virtual Environments, MIT Press that appeared in Feb. 2005, and a special issue on 'Information Visualization Interfaces for Retrieval and Analysis' in the Journal of Digital Libraries that appeared in March 2005. Börner is the recipient of many fellowships and awards, including Outstanding Junior Faculty Award, Pervasive Technology Laboratories Fellowship, SBC Fellow, NSF CAREER Award, and Trustees Teaching Award. She is currently PI or Co-PI on 12 grants that are funded by NSF, the James S. McDonnell Foundation, 21st Century Fund, and SUN Microsystems.

Photo: http://www.slis.indiana.edu/images/faculty/f_borner.jpg
Homepage: http://ella.slis.indiana.edu/~katy/

Relevant Publications: (visit http://ella.slis.indiana.edu/~katy/cv for full list)


Holloway, Todd, Bo icevic, Miran and Börner, Katy. (in press) Analyzing and Visualizing the Semantic Coverage of Wikipedia and Its Authors. Complexity, Special issue on Understanding Complex Systems. Also available as cs.IR/0512085.


**General Questions**

What is your main interest in attending the workshop?

I am interested to study the structure and evolution of our collective knowledge by scientific means. I believe we need to develop better information access and management tools or we are doomed to reinvent the wheel again and again. The human mind and body seems to be optimized for local decision making and action. Yet the survival of our species will require global thinking and action. Global science (weather) forecasts might help people understand and use what we know.

What is your main interest in ‘mapping science’ or ‘forecasting science’?

We will need to run predictive models to figure out what collaborations would be most beneficial, what opportunities exist, what funding models work best, etc. to solve major challenges mankind is facing. The little tax money that is reserved for science needs to be spent wisely. Models and maps of science might help also be a key to interest and engage the general public in science.

What is the best static visualization of dynamic phenomena, e.g., growth or diffusion processes, you have ever seen? Examples could come from science, art, or any other field of human endeavor.

I will present a visual feast of the best I have seen at the workshop.

**Questions for Map Makers**

Please provide higher resolution images, a brief description, and if available citation references for up to three science maps you have created and are most proud of. Use one page per map.

Attached.
What opportunities / solutions do maps / forecasts of science offer for what stakeholders?

**Students** can gain an overview of a particular knowledge domain, identify major research areas, experts, institutions, grants, publications, patents, citations, and journals as well as their interconnections, or see the influence of certain theories.

**Researchers** can monitor and access research results, relevant funding opportunities, potential collaborators inside and outside the fields of inquiry, the dynamics (speed of growth, diversification) of scientific fields, and complementary capabilities.

**Grant agencies/R&D managers** could use the maps to select reviewers or expert panels, to augment peer-review, to monitor (long-term) money flow and research developments, evaluate funding strategies for different programs, decisions on project durations, and funding patterns, but also to identify the impact of strategic and applied research funding programs.

**Industry** can use the maps to access scientific results and knowledge carriers, to detect research frontiers, etc. Information on needed technologies could be incorporated into the maps, facilitating industry pulls for specific directions of research.

**Data providers** benefit as the maps provide unique visual interfaces to digital libraries.

Last but not least, the availability of dynamically evolving maps of science (as ubiquitous as daily weather forecast maps) would dramatically improve the communication of scientific results to the general public.

What main challenges do you foresee for designing effective maps of science or science forecasts?

Gaining access, integrating, and preserving all scholarly data – in all languages and of all types, e.g., publication, patent, grant, scholar, data, software. Then of course, this data needs to be analyzed and mapped but given access to cyberinfrastructures this is less a technical but might be a serious political problem. An interesting scientific and design/artistic challenge is the development of a language that describes the structure and evolution of science in a language that anybody can understand. Having a common science reference system helps. But human perception and cognition is not optimized for interpreting large-scale evolving networks with millions of nodes. Major patterns, trends, outliers need to be identified by automatic means and made visible using a visual language – similar to the language used in weather forecasts.
See animated gif at http://iv.slis.indiana.edu/ref/iv04contest/Ke-Borner-Viswanath.gif
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

Börner, Katy & Penumarthy, Shashikant. (2005) Does Internet lead to more global citation patterns, i.e., more citation links between papers produced at geographically distant research institutions?

Analysis of top 500 most highly cited U.S. institutions.

Each institution is assumed to produce and consume information.

\[ \gamma_{82-86} = 1.94 \quad (R^2=91.5\%) \]
\[ \gamma_{87-91} = 2.11 \quad (R^2=93.5\%) \]
\[ \gamma_{92-96} = 2.01 \quad (R^2=90.8\%) \]
\[ \gamma_{97-01} = 2.01 \quad (R^2=90.7\%) \]
Collaborative Works on Display in the NYPL Exhibit