Science Standards

Dr. Katy Börner
Cyberinfrastructure for Network Science Center, Director
Information Visualization Laboratory, Director
School of Library and Information Science
Indiana University, Bloomington, IN
katty@indiana.edu

With special thanks to the Cyberinfrastructure for Network Science Center team.

Workshop on Modeling and Mapping Science. Standards Session
Indiana University, Bloomington, IN

March 20, 2011
Types of Standards

Terminology
- Definitions of research front, invisible college, etc. See Ch1 in ModSciDyn book

Metrics
- H-index, Impact Factors (see also relations to SAT, GRE, IQ scores)
- ScienceMetrics efforts to translate into different languages

Science Map Reference Systems and Projections
- Locally and globally consistent maps
- What projections?
- What visual metaphors, visual languages/grammars?

Alignment of Science Maps and Science with Ontologies/Taxonomies/Classifications
- NCBO BioPortal

Choices will depend on the ultimate usage of the maps.
Reference Systems and Projections
Authors are mortal. Papers are immortal. Monsters = ‘the unknown’ or voids.
Impact of funding on science (yellow). Good and bad years.
Chart showing the number of papers/Wikipedia entries for different databases and publication years.


Contact Katy Borner <katy@indiana.edu> or Eliska Hardy <cfhardy@indiana.edu> for details.
Science as accumulation of knowledge.
“Scholarly brick laying”.
Standing on the shoulders of giants.

Densely knit communities.
The importance of weak links.
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 colored connections of disciplinary fields to determine if any of them were likely to grow large enough to be seen changes in the structure of science over time. Correlations between fields were calculated for each individual year from 2001-2005. A simple network analysis was conducted because it only required changes in the underlying structure to unfold and to change dramatically over the next decade.

Sixty maps, representing twenty six key areas of science, were then overlaid to create a visual representation of the structure and growth of ideas in the twenty-six key areas of science. Each map is shown in red, yellow, and green, with each color representing a different level of growth. The colors are used to indicate the relative size of the area, with red indicating the largest growth, yellow indicating moderate growth, and green indicating the smallest growth. Each map is shown in a different color, with red indicating the smallest growth, yellow indicating moderate growth, and green indicating the largest growth.

Source: University of California, San Diego Knowledge Mapping Laboratory. Color images: 3D-4D Angenieux of the University of California. This underlying data comes from TomTom: Thomson & CSF. Mapping methods and analysis conducted by Dick Kosara, Subway, Mark Davis, and Randy Johnson. Graphics & typography by Eric Auclair and Ralph Foltz. ©2007 by Dick Kosara, all rights reserved.
Genealogy of Science OR Phylogeny of Science
Katy Börner, Angela M. Zoss, and M'hamed el M Aisati, IU and Elsevier
This is the first attempt to render Zeller’s “Hypothetical Model of the Evolution of Science” using real data; the 2001-2005 structure should resemble “Maps of Science: Forecasting Large Trends in Science” that was compiled from 7.2 million publications by Klavans and Boyack, both maps appeared in the 3rd Iteration of the exhibit.
Visual Languages
Social (People, Institutions)
Cognitive (Terms, Papers, Patents, Journals)
Regulations (Funding, Laws)

Undirected
Directed
Unweighted
Weighted

Direct link (citation)
Co-occurrence (co-author, co-word)
Co-citation (author CC, paper CC)

Three node symbols have same area size for same weight.
Combinations of weighted+directed+dotted (see below) are possible.

Time, geo, topic are attributes. Use node/edge color coding for qualitative variables, e.g., type, gender, and area size coding for quantitative values, e.g., counts.
Visual Interfaces
Japan earthquake map: video reports

The day after the biggest earthquake on record
Social Media Map

This map pulls in social media related to the recent events in Japan. In the Social Media box, you can change the search term for YouTube and Flickr by hovering over the name of the feed, and then typing a new word into the displayed box.
Sendai Airport
Alignment of Science Maps and Science with Ontologies/Taxonomies/Classifications
Welcome to NCBO BioPortal

Use BioPortal to access and share ontologies that are actively used in biomedical communities. You can search for terms in ontologies (try typing "Melanoma" in the "Search all ontologies" box in the left column), browse a list of ontologies in BioPortal (type "NCI Thesaurus" in the "Find an ontology" box in the middle column), search biomedical resources that we automatically annotated with ontology terms (try typing "Melanoma" in the "Search resources" box in the right column). You can create ontology-based annotations for your own text, link your own project to the description of those ontologies, find and create relations between terms in different ontologies, review and comment on ontologies and their components as you browse them. Sign in to BioPortal to submit a new ontology or ontology-based project, provide comments on ontologies or add ontology mappings.

---

**Most Viewed Ontologies (February, 2011)**

<table>
<thead>
<tr>
<th>Ontology</th>
<th>Views</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNOMED Clinical Terms</td>
<td>4192</td>
</tr>
<tr>
<td>MedDRA</td>
<td>2362</td>
</tr>
<tr>
<td>COSTART</td>
<td>2257</td>
</tr>
<tr>
<td>NCI Thesaurus</td>
<td>1416</td>
</tr>
<tr>
<td>Mouse adult gross anatomy</td>
<td>707</td>
</tr>
</tbody>
</table>

**Statistics**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontologies</td>
<td>255</td>
</tr>
<tr>
<td>Terms</td>
<td>4,809,250</td>
</tr>
<tr>
<td>Resources Indexed</td>
<td>24</td>
</tr>
</tbody>
</table>

**Latest Notes**

- **Agree (RadLex)** 10 days ago by beverlycollins
  Thanks, Philipp, we agree that the terms in this category more correctly belong in the "composi..."

- **does not fit to taxonomy (RadLex)** 12 days ago by daumkep
  Hi all, to my view, "osseus" does not really fit as a child of "disc composition" as it can appe..."

- **Definition for ECO:0000298 (Evidence codes)** 17 days ago by mchibucos
  "ECO:0000298 cleavage arrested development" is now defined as "A type of experimental phenotypic ..."

- **Definition of ECO:0000299 (Evidence codes)** 17 days ago by mchibucos
  The term "ECO:0000299 cytochalasin experiment result" now reads: "A type of..."
The NCBO BioPortal Annotator processes text submitted by users, recognizes relevant biomedical ontology terms in the text and returns the annotations to the user. Use the interface below to submit sample text to get ontology-based annotations. Hover the mouse pointer on any button to see what it does. Click on the (?) to see a detailed help panel. Try typing this sample text: "Melanoma is a malignant tumor of melanocytes which are found predominantly in skin but also in the bowel and the eye". Choose SNOMEDCT as your ontology of interest. The annotator——when used as a web service——allows users to utilize ontologies for annotation of biomedical data on their sites in order to facilitate interoperability, search and translational discoveries. You can use the interface below to test different parameters and settings before using the Annotator programmatically.

Subscribe to the NCBO Annotator Users Google group to learn more about who and how the Annotator is being used in different projects.
Identify
- different types of science standards
- existing major work on each type
- Key people
- But also examples of how other areas of science set standards, e.g., WC3

In preparation of a workshop in August 2011.

The exhibit should support and promote standards.
All papers, maps, tools, talks, press are linked from
http://cns.iu.edu