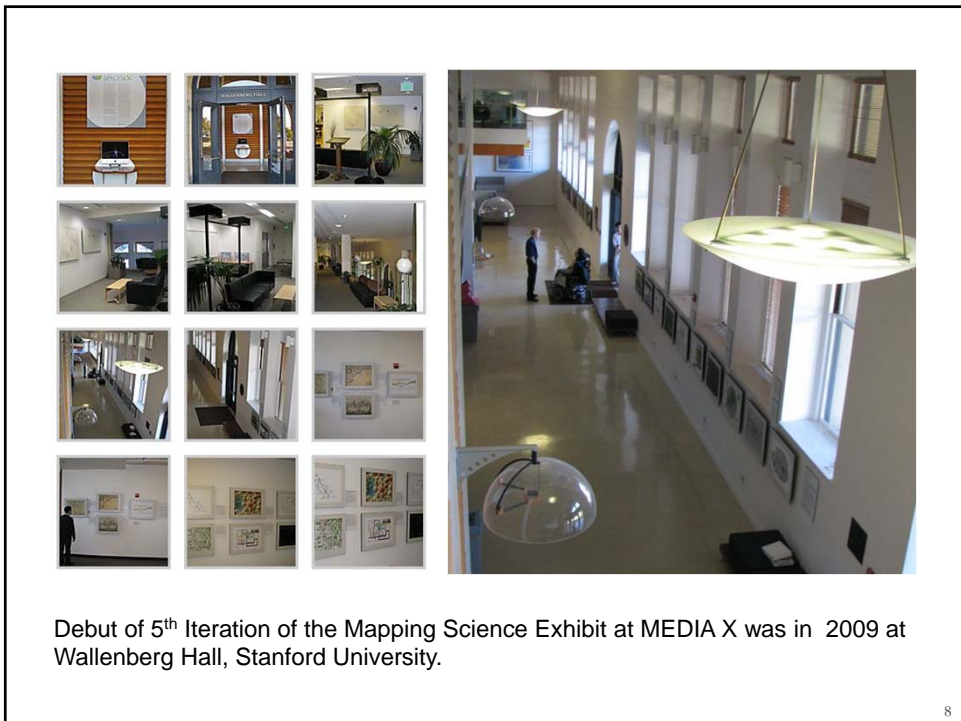
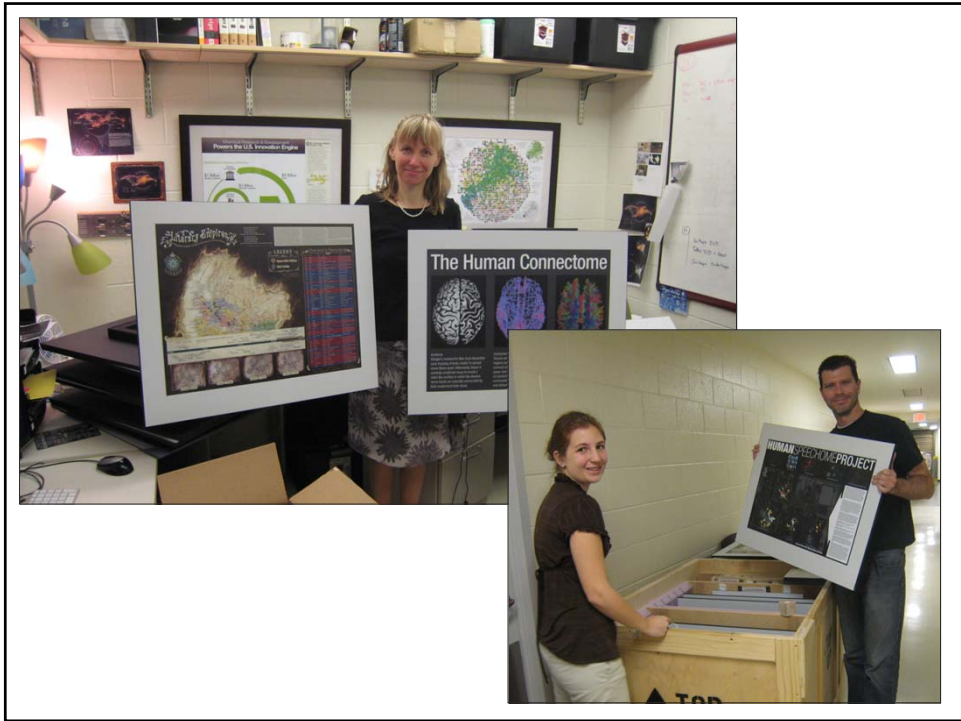


How can we communicate the beauty, structure, and dynamics of science to a general audience?



April, 2005: 101st Annual Meeting of the Association of American Geographer, Denver, Colorado.





Debut of 5th Iteration of the Mapping Science Exhibit at MEDIA X was in 2009 at Wallenberg Hall, Stanford University.

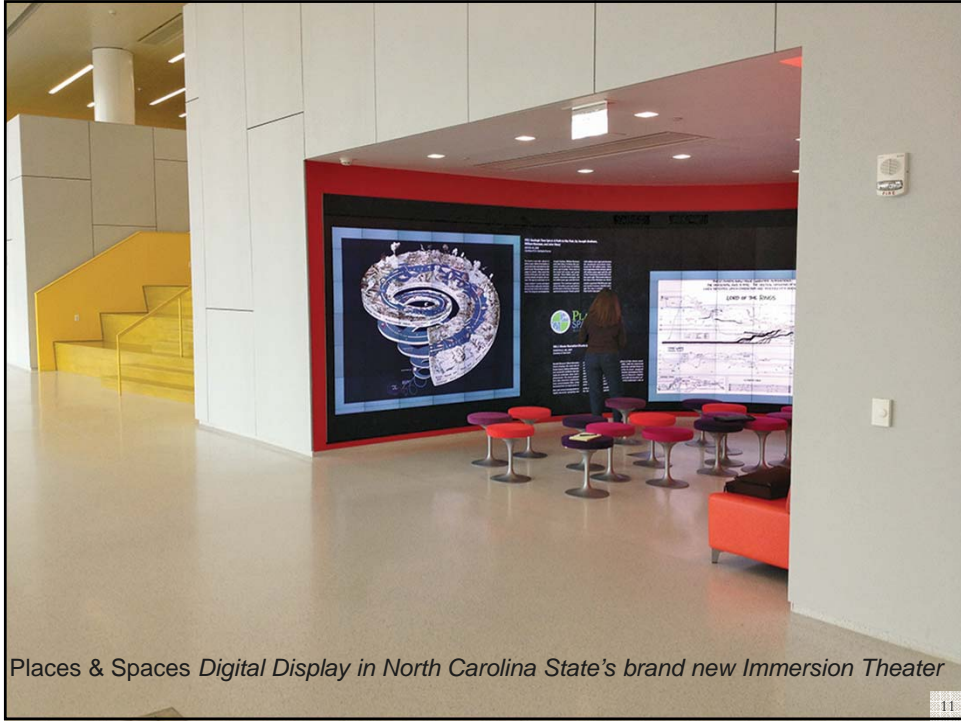


Science Maps in "Expedition Zukunft" science train visited 62 cities in 7 months. Opening was on April 23rd, 2009 by German Chancellor Merkel

9



Ingo Gunther's Worldprocessor globe design on display at the Museum of Emerging Science and Innovation in Tokyo, Japan



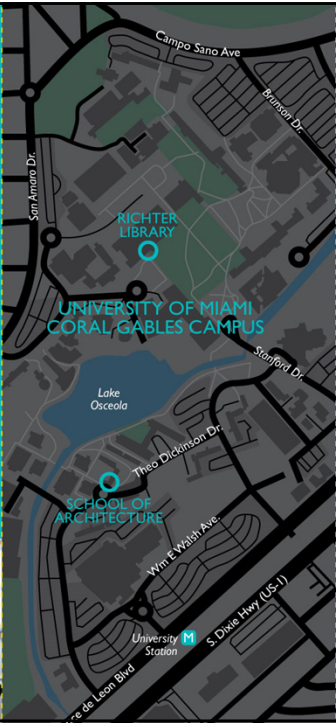
Places & Spaces: Mapping Science is meant to inspire cross-disciplinary discussion on how to best track and communicate human activity and scientific progress on a global scale. It has two components: the physical part supports the close inspection of high quality reproductions of maps for display at conferences and education centers; the accompanying website provides links to a selected series of maps and their makers along with detailed explanations of how these maps work.

The exhibit is a 10-year effort. Each year, 10 new maps were added, resulting in **100 maps in the current exhibit, divided into 10 iterations.**

LOCATIONS

- Iterations 1-5 (50 maps) are displayed in the Stanley and Jewell Glasgow Hall, Perez Architecture Center, on the first floor of the School of Architecture.
- Iterations 6-10 (50 maps), the globes, and the illuminated diagram are displayed in the first and second floors of the Otto G. Richter Library.





**UNIVERSITY OF MIAMI
CORAL GABLES CAMPUS**

RICHTER LIBRARY

SCHOOL OF ARCHITECTURE

CALENDAR OF EVENTS

This schedule can be subject to changes. For updates, visit visualization.miami.edu

Thursday, SEPTEMBER 4
Inauguration of the exhibit. Keynote talk by Katy Börner. Glasgow Hall, School of Architecture, 6-8 PM

Thursday, SEPTEMBER 18
Creative visualization and data art, with Manuel Lima. Glasgow Hall, School of Architecture, 6-7 PM

Monday, SEPTEMBER 29
Mapping Informal Cities, with Adib Cure, Carrie Penabad and Chris Mader. Glasgow Hall, School of Architecture, 6-7 PM

Thursday, OCTOBER 2
How science can inspire art, with Nela Ochoa, Xavier Cortada, and Patricia Van Dalen. CAS Wesley Gallery, 5:30-7:30 PM

Thursday, OCTOBER 9
Humor in visualization and infographics, with Nigel Holmes. Glasgow Hall, School of Architecture, 6-7 PM

Thursday, OCTOBER 23
Visualization for effective communication, with Stephen Few and John Grimwade. Glasgow Hall, School of Architecture, 6-8 PM

Sunday, NOVEMBER 9
Family day. Details on the website.

Wednesday, NOVEMBER 13
Cross-Resonance in the Arts and Sciences, with Ruth West. Richter Library, 3rd floor conference room, 6-7 PM

Monday, NOVEMBER 17th
Data Mapping and 3D Visualization with Li Yi. Glasgow Hall, School of Architecture, 6-7 PM

Wednesday, NOVEMBER 19
GIS day. Richter Library, 3rd floor conference room, 6-7 PM

Sunday, DECEMBER 7
Art Basel Self-Guided Tours of the Exhibit and Brunch at the Lowe Art Museum. Lowe Art Museum, 9-11:30 AM

Thursday, DECEMBER 11
Closing ceremony. Keynote talk by Juhong Park. Glasgow Hall, School of Architecture, 6-8 PM





PLACES & SPACES
MAPPING SCIENCE

PLACES & SPACES
MAPPING SCIENCE

Exhibiting at
the University of Miami

September 4 - December 11, 2014

Sponsored by
Center for Computational Science
School of Communication
College of Arts & Sciences

For more information:
visualization.miami.edu
cimaps.org/miami

Display locations

The Stanley and Jewell Glasgow Hall, Perez Architecture Center, School of Architecture
1223 Theo Dickinson Dr, Coral Gables, FL 33146

Otto G. Richter Library
1300 Memorial Dr, Coral Gables, FL 33146

UNIVERSITY OF MIAMI



10 iterations over 10 years
equal
 $10 \times 10 = 100$ maps!

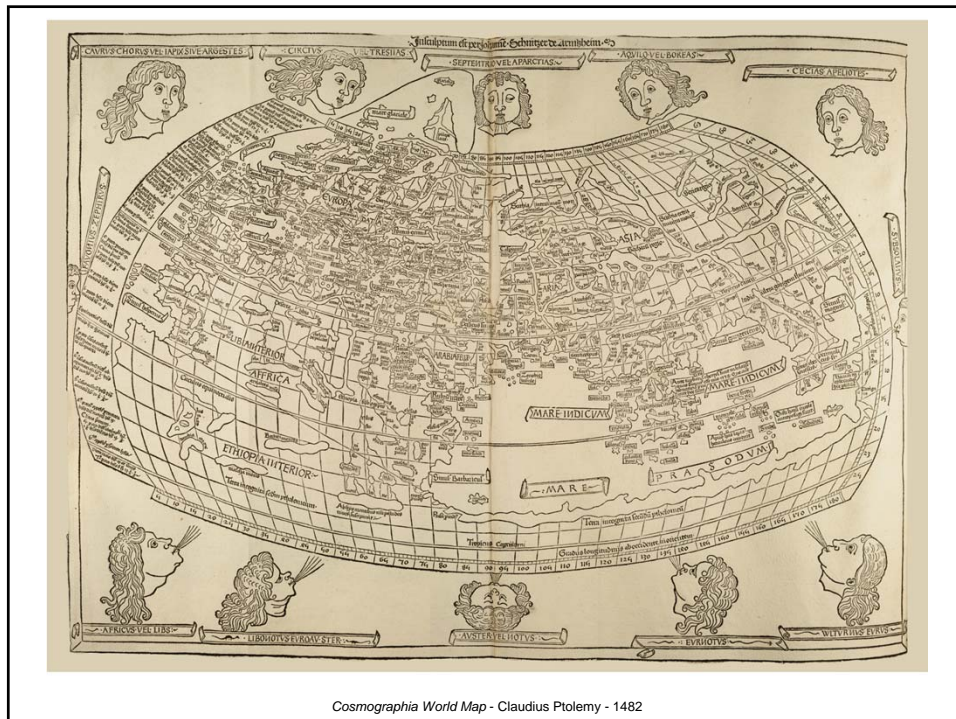
The Power of Maps 2005

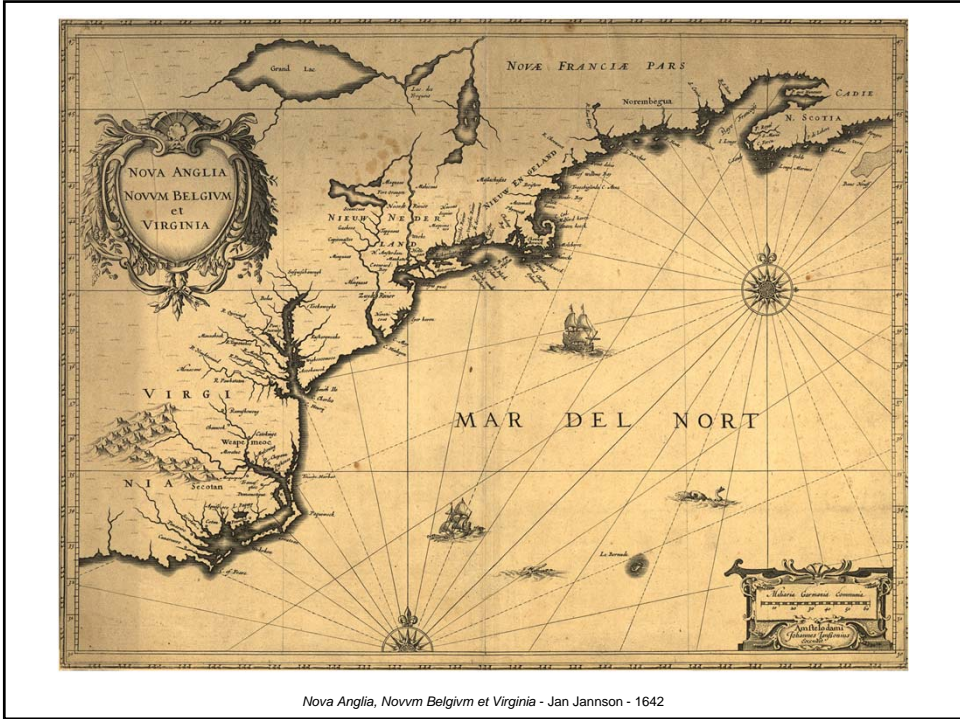


Cartographic maps of physical places have guided mankind's explorations for centuries.

They enabled the discovery of new worlds while also marking territories inhabited by the unknown.

Without maps, we would be lost.





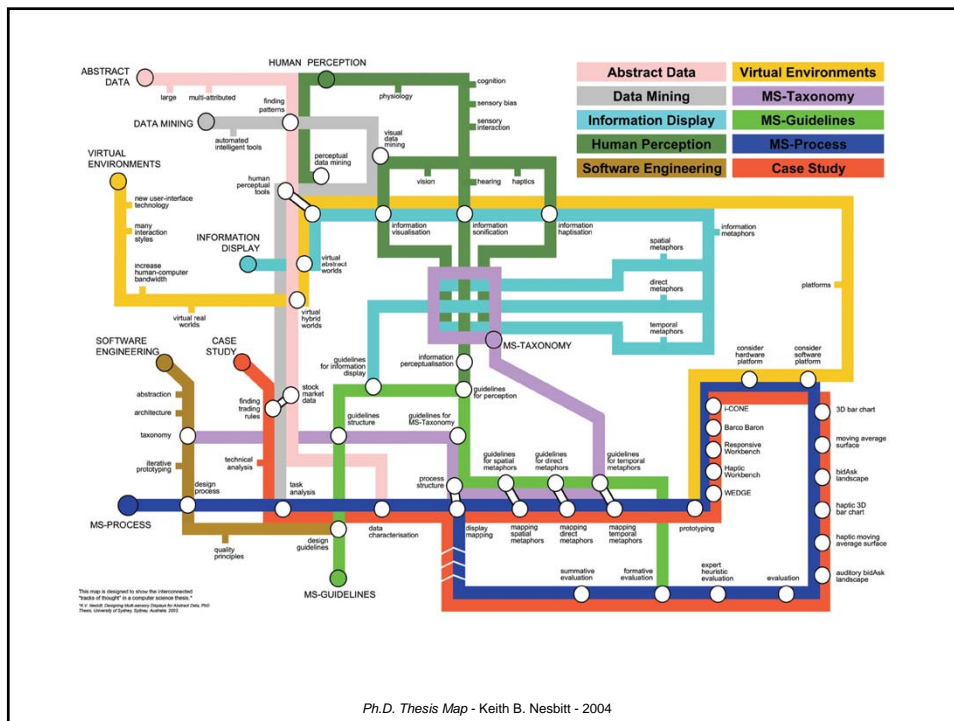
Nova Anglia, Novvm Belgivm et Virginia - Jan Jansson - 1642

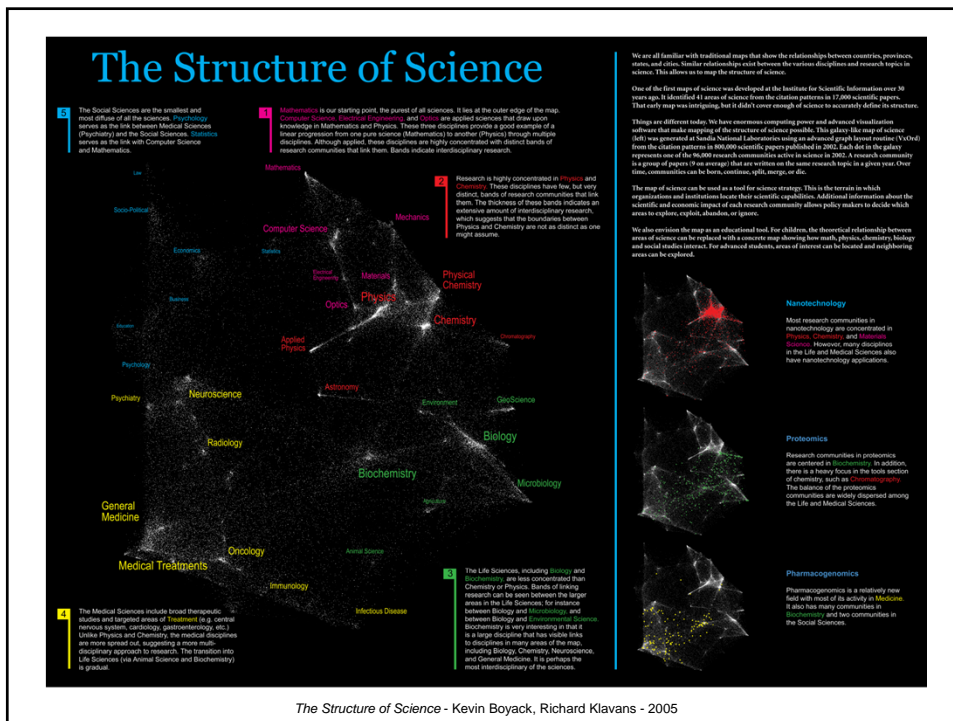
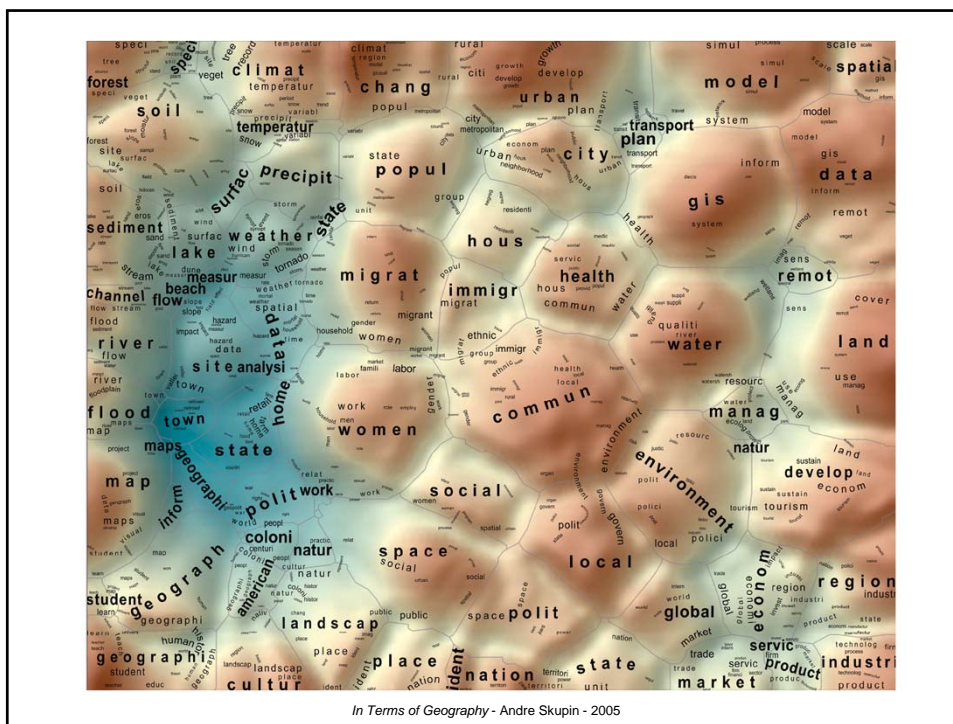


A New Map of the Whole World with Trade Winds According to the Latest and Most Exact Observations - Herman Moll - 1736

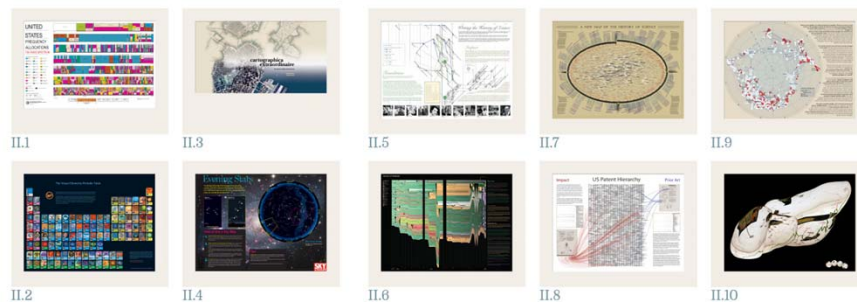
Science maps of abstract semantic spaces aim to serve today's explorers navigating the world of science.

They can be used to identify objectively major experts, institutions, collections. They allow us to track the emergence, evolution, and disappearance of topics and help to identify the most promising areas of research.






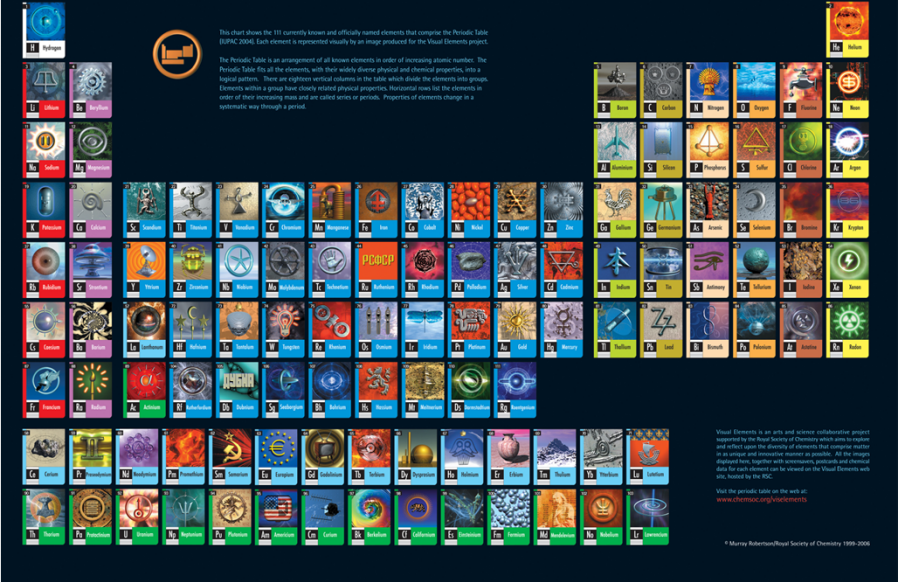
The Power of Reference Systems 2006



The Visual Elements Periodic Table


 This chart shows the 111 currently known and officially named elements that comprise the Periodic Table (IUPAC, 2004). Each element is represented visually by an image produced for the Visual Elements project.

The Periodic Table is an arrangement of all known elements in order of increasing atomic number. The Periodic Table fits all the elements, with those within doing periodic and chemical properties, into a logical pattern. There are eighteen vertical columns in the table which divide the elements into groups. Elements within a group have closely related physical properties. Horizontal rows list the elements in order of their increasing mass and are called series or periods. Properties of elements change in a systematic way through a period.



Visual Elements is an arts and science collaborative project supported by the Royal Society of Chemistry which aims to explore and reflect upon the diversity of elements that comprise matter in a general and accessible manner in a playful and engaging way. All the images displayed here, together with atomograms, isotopes and chemical data for each element can be viewed on the Visual Elements web site, hosted by the RSC.

Visit the periodic table on the web at: www.visual-elements.org/visual-elements

© Murray Robertson/Royal Society of Chemistry 1999-2006

Visual Elements Periodic Table - Murray Robertson, John Emsley - 2005

Evening Stars

The Big Dipper floats high in the northeast these early spring evenings, while Orion sinks low in the southwest. These are just a few of the celestial sights you can find on any clear evening in April using a sky map like the one shown here.

April 5-6
Morning after dark

Looking very high toward SW

April 12-14
Around 10 p.m.

How to Use a Sky Map

- Check the dates and times of night.** Take your map out under the night sky around the right time, and bring along a flashlight to read it by. It helps to attach a piece of red paper over the front or to use a flashlight with red LEDs; the dim red light won't spoil your night vision.
- Details, you need to know which direction you're facing.** If you're unsure, just note where the Sun sets, that's west. (Whichever way you're facing, make sure the corresponding yellow label along the curved edge of the map is at the bottom, "right-side up". This curved edge represents the horizon. The stars above it on the map match the stars in front of you. The further up from the map's edge they appear, the higher they'll be in the sky. The center of the map is the zenith (straight overhead). So a star halfway from the edge of the map to the center will appear halfway from straight ahead to straight up. Ignore all the parts of the map above horizons you're not facing.
- Let's give it a try!** Pretend you're facing the southwest horizon (labeled "Facing SW"). Just a little way up (that is, a little way in from the edge of the map) is Sirius, the brightest star in the night sky, in the constellation Canis Major. Further up, nearly halfway overhead, is the star Procyon in Canis Minor. Still further up is the ringed planet Saturn. Go out at the right time, face southwest, and look up into the sky — there they are!

When to Use This Map

Early April: 10 pm (daylight-saving time)
Late April: Dark

Tips

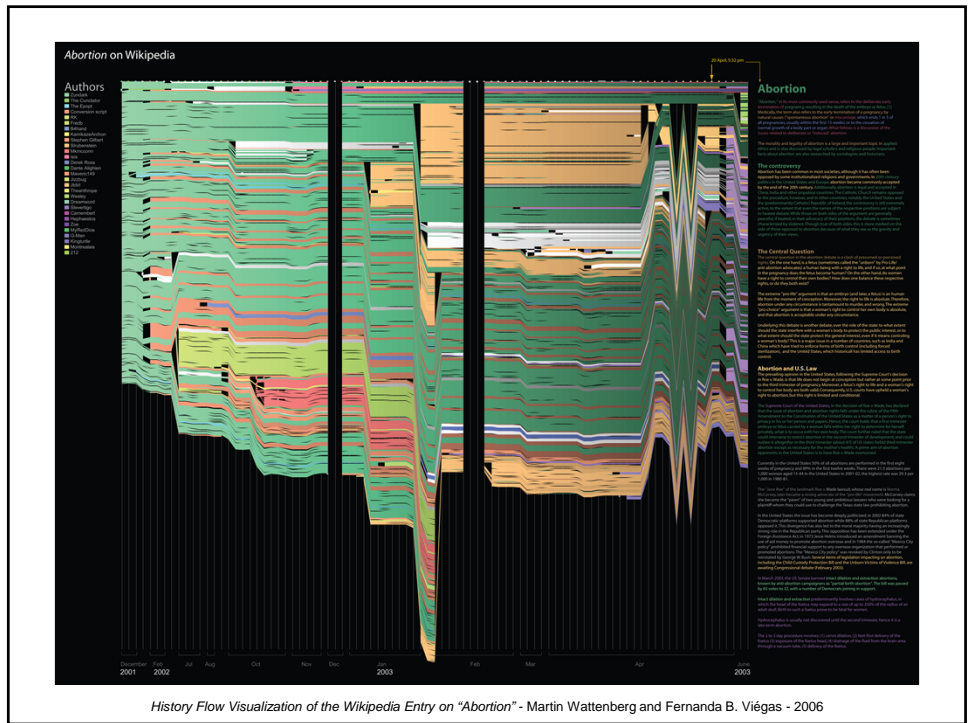
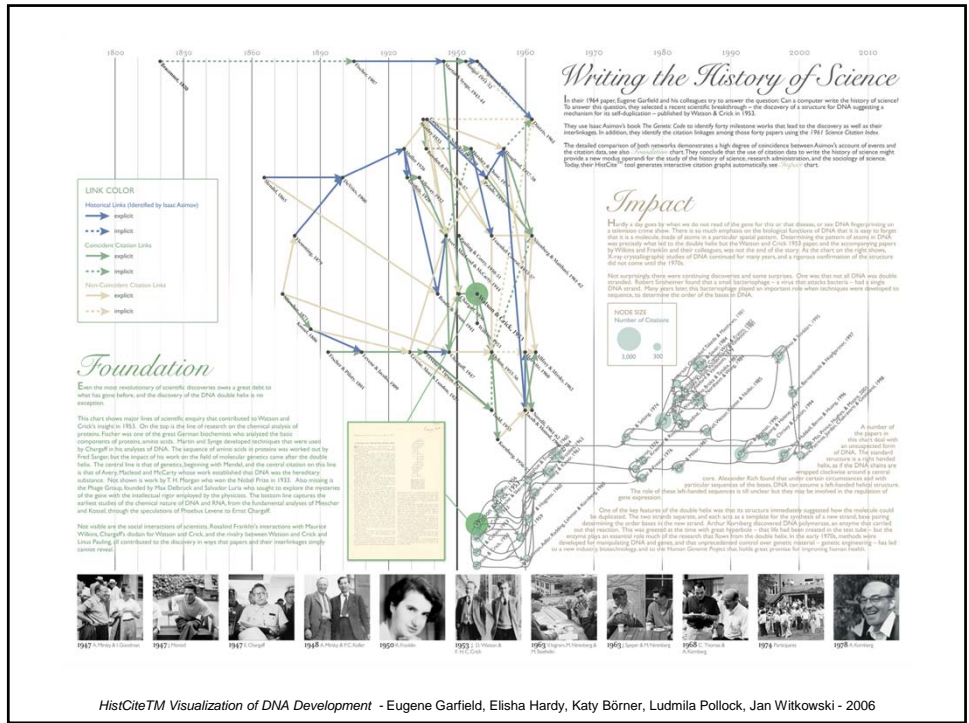
A couple of tips: Look for the brightest stars and constellations first; light pollution or moonlight may wash out the fainter ones. And remember that star patterns in the sky will look a lot bigger than they do here on paper. With a map like this, you can identify celestial sights all over the sky. Go out the next clear night and make some stargazing friends!

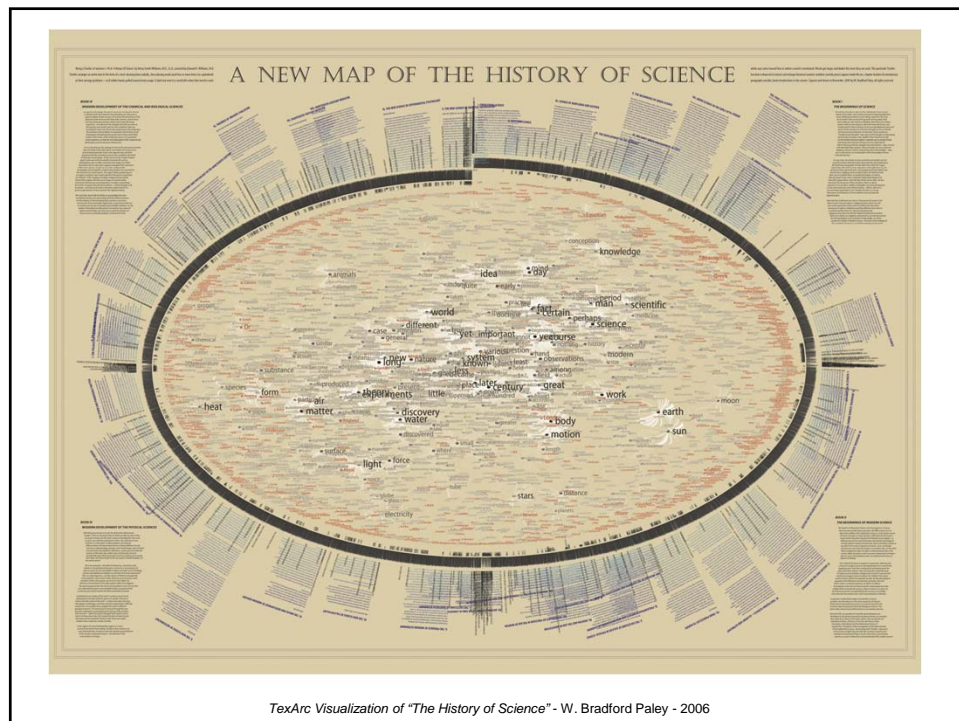
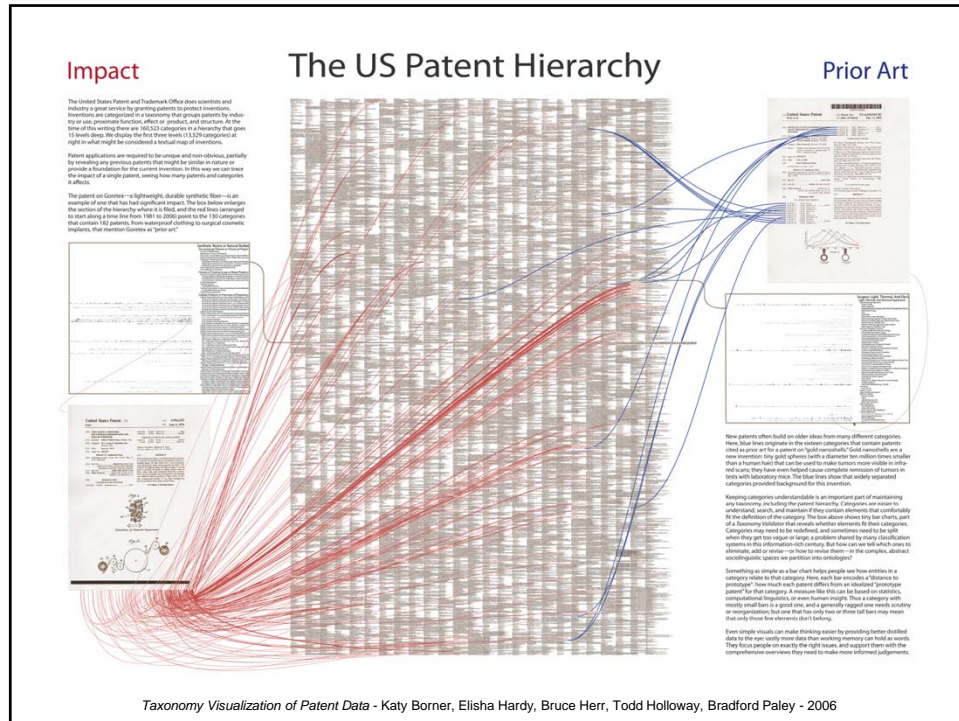
You can customize a night sky map for any time and place at [Skymap/telescope.com](http://Skymap.telescope.com).

Sky Chart of New York City in April 2006 - Roger W. Sinnott, Interactive Factory - 2006

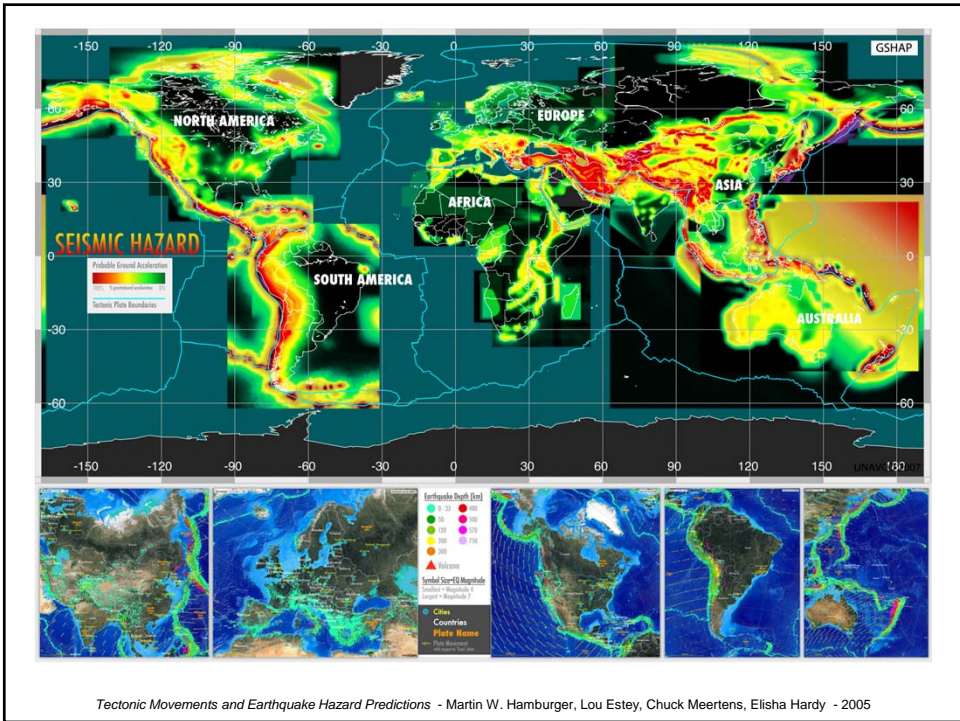
How would a reference system for all of science look?

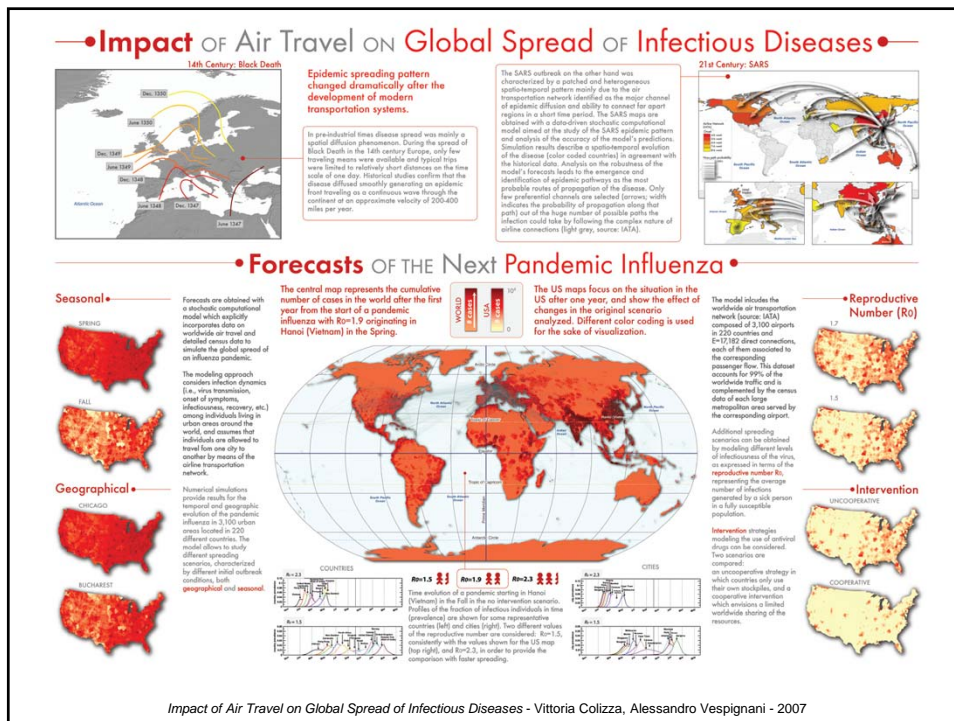
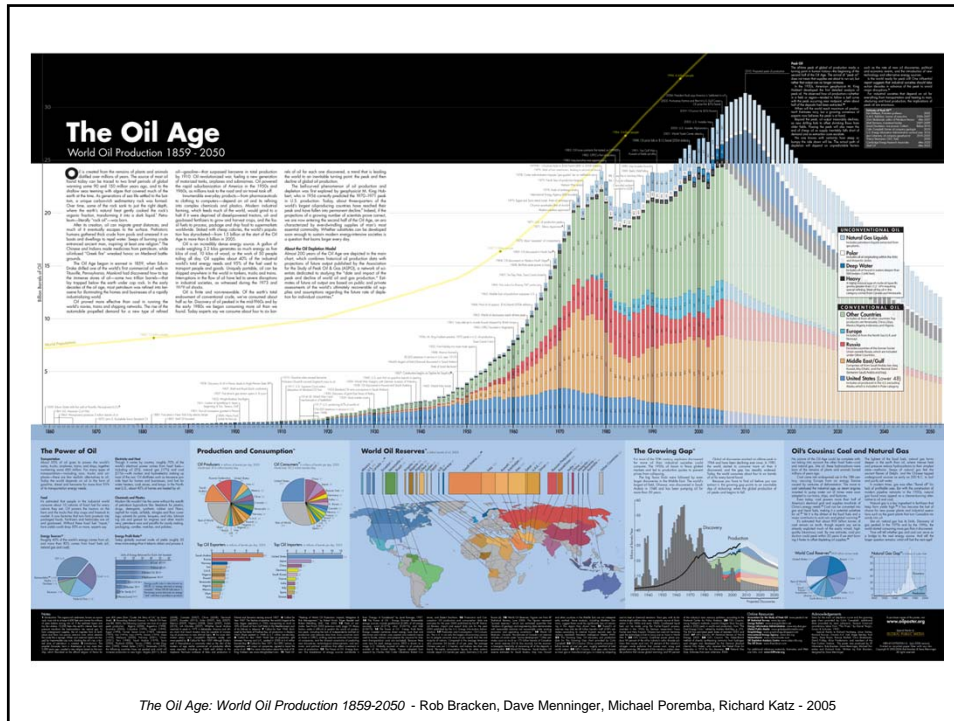
What dimensions would it have?

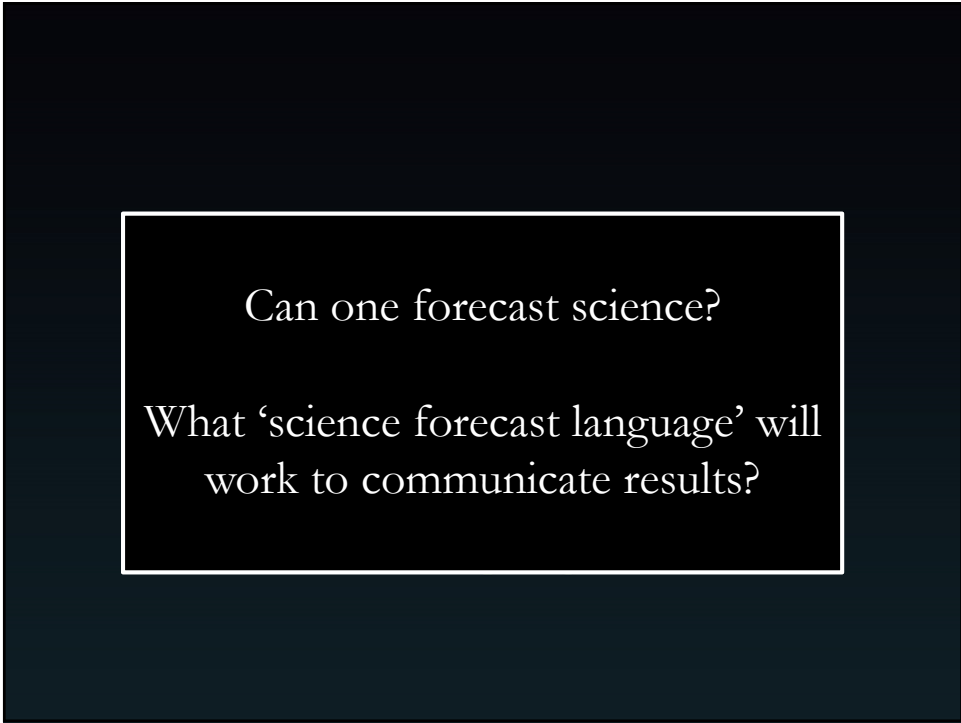




The Power of Forecasts 2007







INSTITUTE FOR THE FUTURE
Science & Technology Outlook: 2005-2055

Technology Horizons Program
Institute for the Future
12A University Avenue, 2nd Floor, Palo Alto, CA 94301
415.954.2022 415.954.9191 www.iftf.org



As a tool for navigating an uncertain future, the use of the map, Science & Technology Outlook: 2005-2055, is not an attempt to predict the future, but rather a tool for prediction. For that matter, the product of prediction, for it is impossible to make objective predictions in which we see an abstract number of values, like GPS coordinates, to show the right path. Rather, it's more to discuss low-tech navigational techniques with their reliance on an array of weak signals such as wind direction, the low and high of the water, and the shape of formations, taken together. These signals form a path that can be followed for navigation. Low-tech methods because, in addition to being less expensive, they are "right" with the signals combinable information and causal dependencies and connections between seemingly unrelated events, thus enriching our understanding of a landscape. They provide the reader a deeper contextual understanding of the landscape and its point of the intricate and interdependencies between trends.

MAP THEMES

- 1. Globalization**
After 20 years of basic research and development at the 100-nanometer scale, the emergence of nanotechnology as a science of materials is already well advanced. This trend, however, will define how nanotechnology will unfold, and what concepts and how fast nanotechnology is not a single field with a coherent intellectual program, it is an open-ended hybrid, shaped by a combination of functional research questions, growing technical applications, and venture and public capital. Systems nanotechnology is viewed as one of the most important small-scale mechanical engineering—which assembles basic mechanical systems from individual atoms—toward one which is able to create self-assembling systems. A focus on molecular biology and biochemistry contribute essential tools to the program that build nanosystems. Finally, nanotechnology will also serve as a model for interdisciplinary work. A focus on molecular biology and biochemistry contribute essential tools to the program that build nanosystems. Finally, nanotechnology will also serve as a model for interdisciplinary work. A focus on molecular biology and biochemistry contribute essential tools to the program that build nanosystems. Finally, nanotechnology will also serve as a model for interdisciplinary work.

- 2. Information Biology**
For a 30-year period, evolution has generated biology as the planet's data bank. After Nature takes a combinatorial explosion to build and refine the genetic code, life's basic programming ability to manipulate biology from the bottom up. We'll see only generalities about the genetic code, but we'll see only generalities about the genetic code, but we'll see only generalities about the genetic code, but we'll see only generalities about the genetic code.

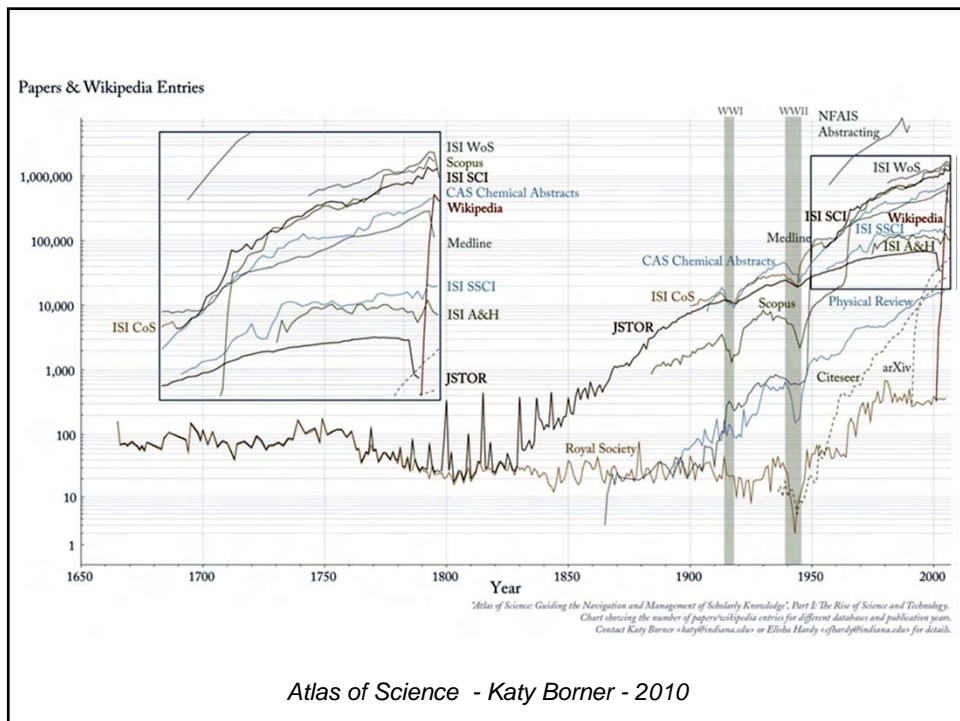
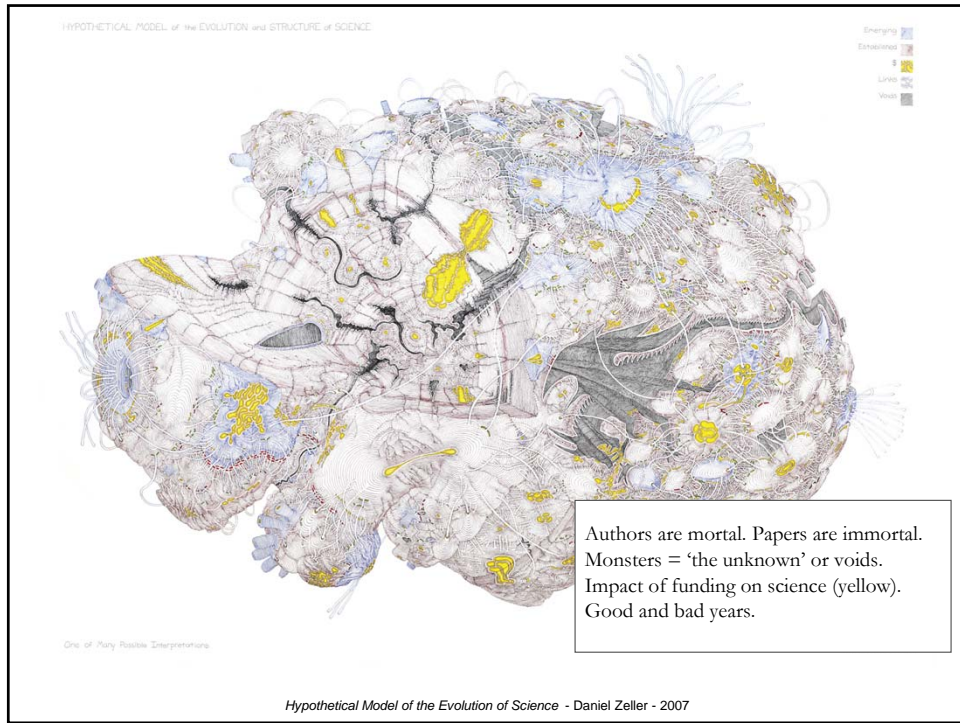
- 3. Sensor Transformation**
In the next year, physical objects, places, and even human beings themselves will increasingly become embedded with computational devices that can sense, understand, and act upon their environment. They will be able to react to contextual data about the physical world, and even emotional data of people and things in their surroundings. As a result, increasing the ability of physical objects to sense, understand, and act upon their environment will be a major trend in the next 30 years. Information processing is already a key and humans will be deployed in various sensory forms: via graphics, gestures, patterns, sounds, smells, and tactile experiences. This extended sensory environment will coincide with major breakthroughs in our understanding of the brain—in how we process sensory information and connect various sensory functions.

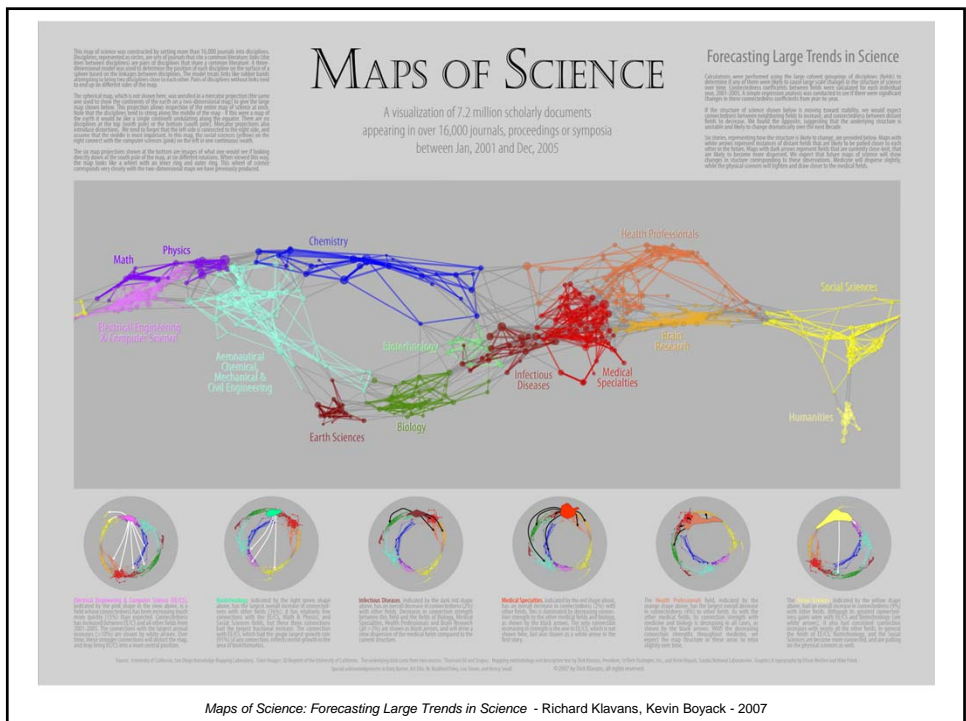
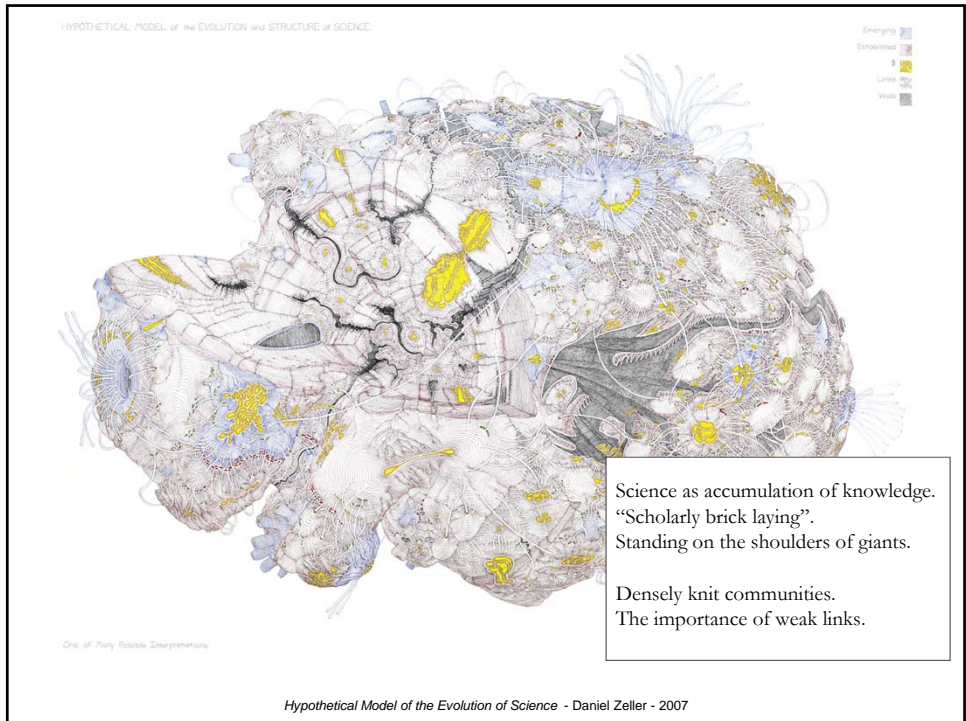
- 4. Mathematical Innovation**
Before the 20th century, many of the greatest scientific discoveries and technical innovations were made by amateur scientists and independent inventors. In the last 100 years, a professional class of scientists and engineers, supported by university salaries, and the state, pushed innovation to a higher level. At the national scale, the capital-intensive character of scientific research made it impossible for the property of professional advanced nations. In the new century, a number of trends and technologies will lower the barriers to participation in science and technology, both for individuals and for emerging countries. The result will be a renaissance of the amateur scientist, the growth of new scientific and technical centers of excellence in developing countries, and a more global distribution of world-class scientists and technologists.

- 5. Transdisciplinary**
The last few centuries, natural philosophy and natural history branched into the new familiar disciplines of physics, chemistry, biology, and earth. The sciences entered one after another into the modern era of professional specialization. But in the 21st century, the growth of the sciences and associated career pressures, encouraged ever-greater specialization. To the contrary, transdisciplinary research will become an imperative. According to Howard Rheingold, a prominent futurist and author, "transdisciplinary is not about bringing together researchers from different disciplines to work in multidisciplinary teams. It means educating researchers who can speak languages of multiple disciplines—biologists who can understand mathematics, mathematicians who understand biology."

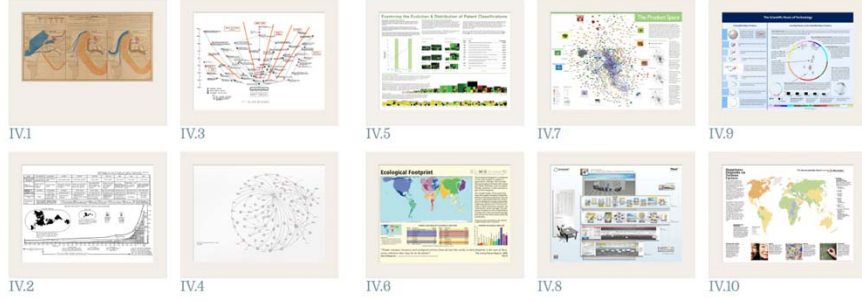
- 6. Emergent Systems**
The phenomenon of self-organizing systems that generate complex behavior by following simple rules will likely become an important research area, and an important model for understanding how the natural world works and how artificial systems can be designed. Emergent phenomena have been observed across a variety of fields and problems to which it can be applied. It is a primary tool for managing areas of a very wide range of phenomena. Meanwhile, emergence can be modeled using relatively simple computational tools, although those models often require substantial processing power. More generally, it is a 21st-century tool as a way of thinking about designing complex, robust technological systems. Finally, emergence is an accessible and vivid paradigm for understanding science. Just as classical physics profited from popular treatments of Newtonian mechanics, so will scientific study and technical manifestations of emergent phenomena likely derive benefits from the popularization of its underlying concepts.

Science & Technology Outlook: 2005-2055 - Alex Soojung-Kim Pang, David Pescovitz, Marina Gorbis, Jean Hagan - 2006



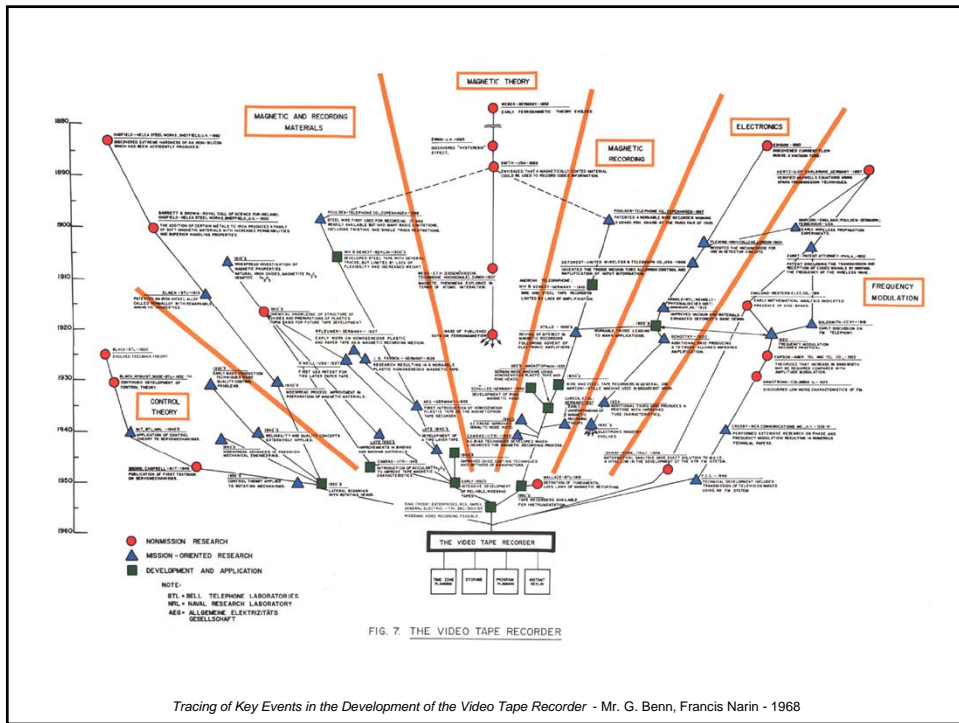
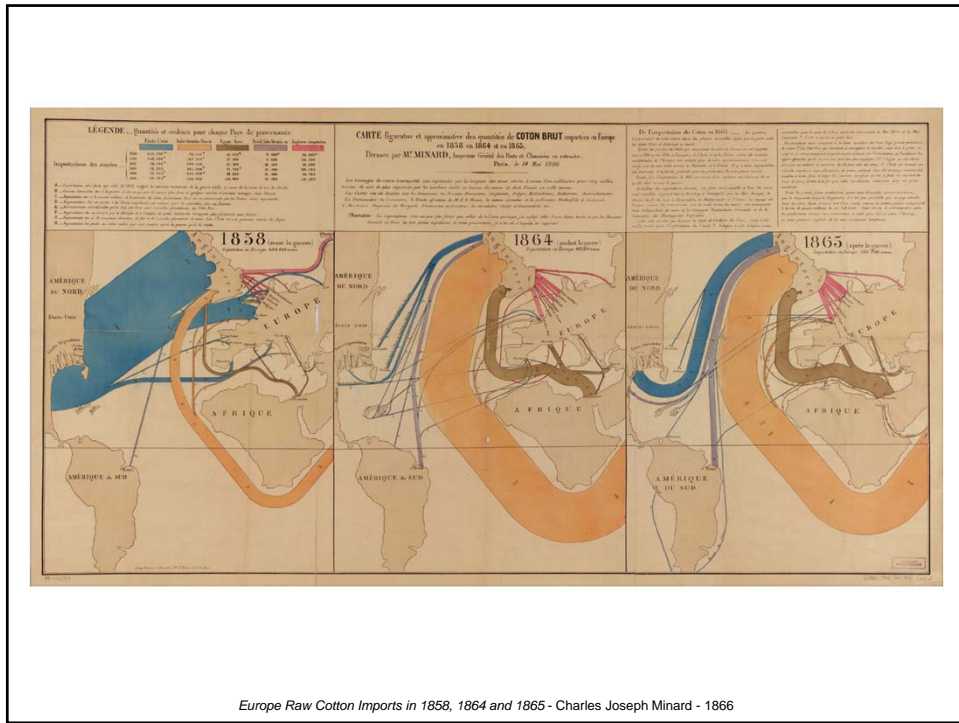


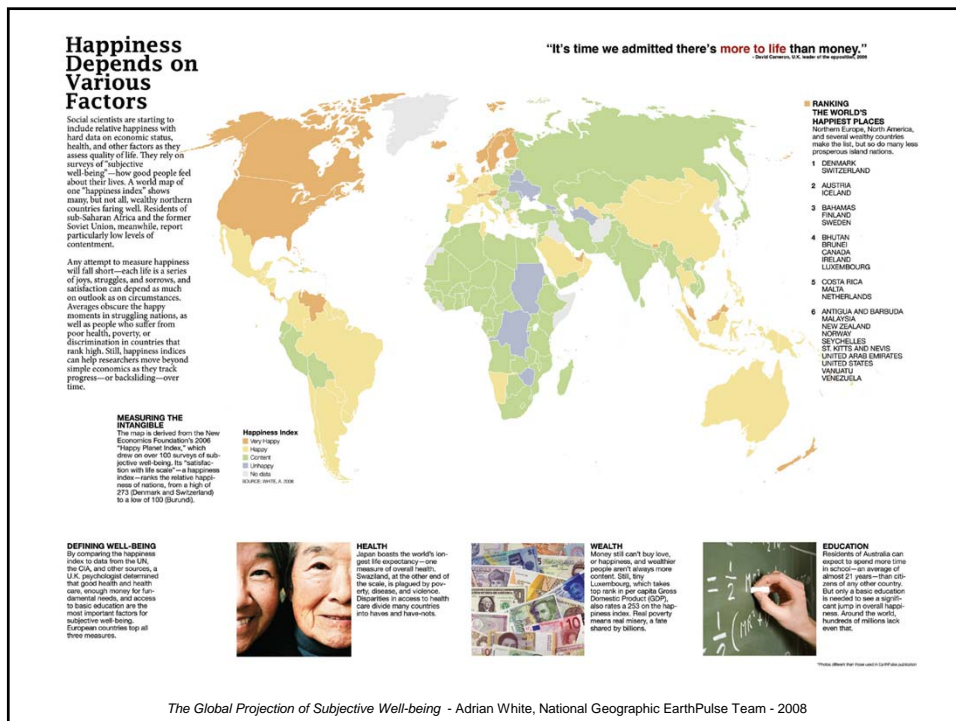
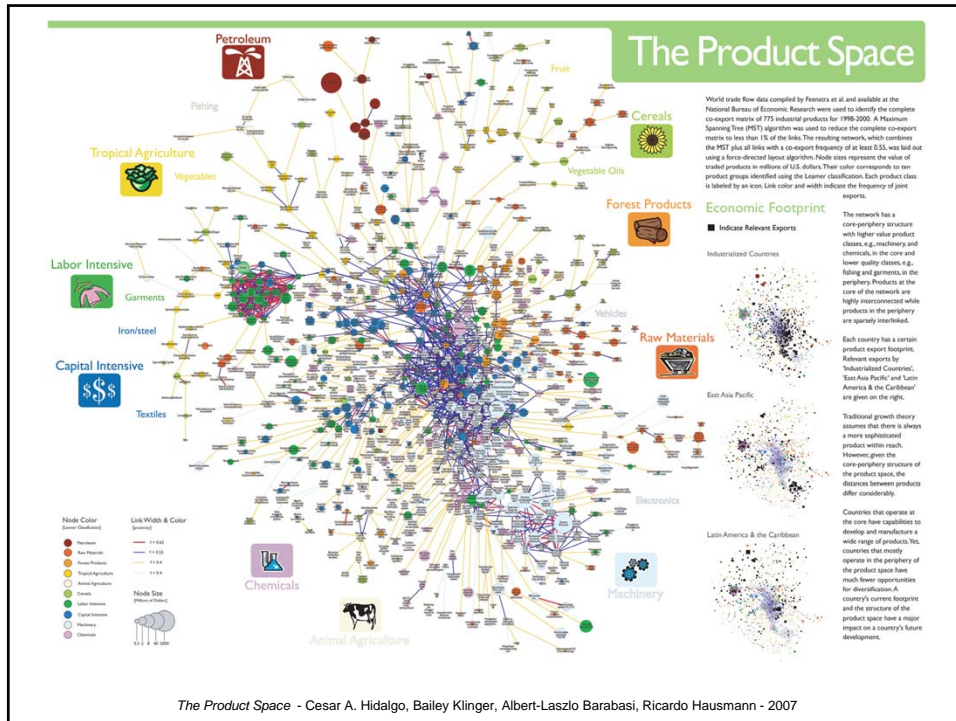
Science Maps for Economic Decision Makers 2008



What insight needs to economic decision makers have?

What data views are most useful?



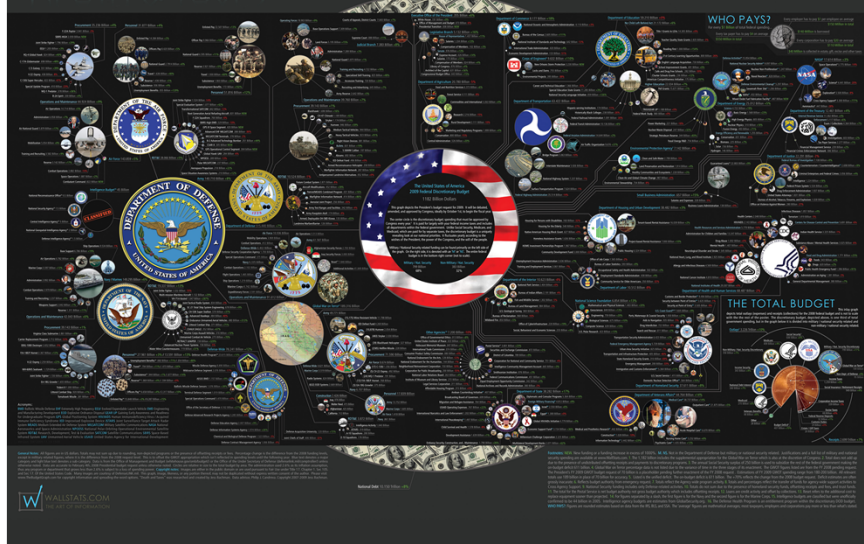


Science Maps for Science Policy Makers 2009

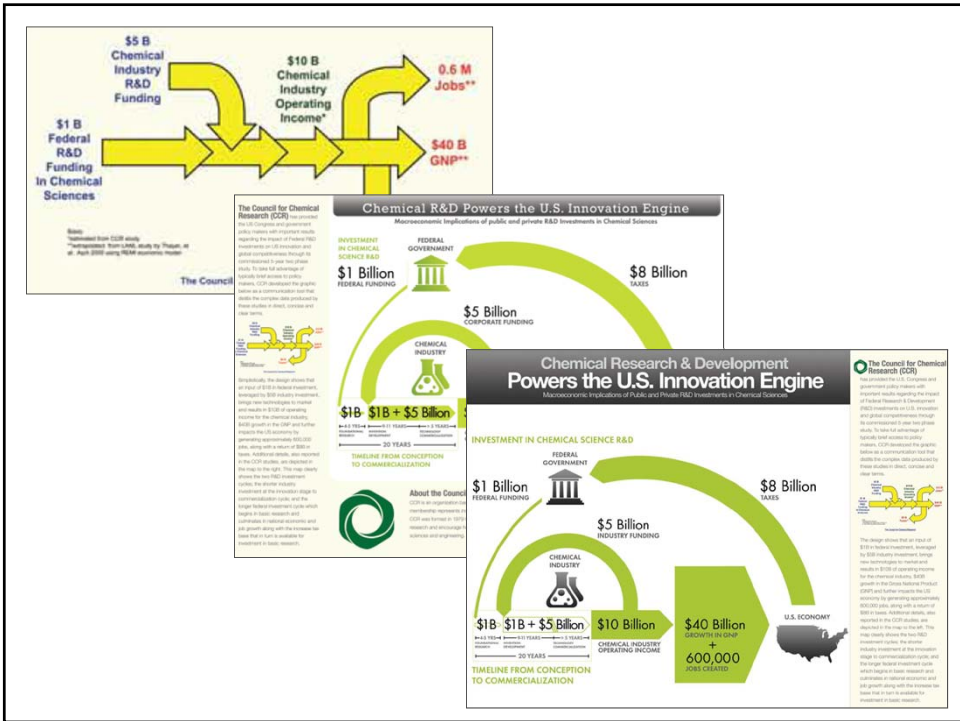
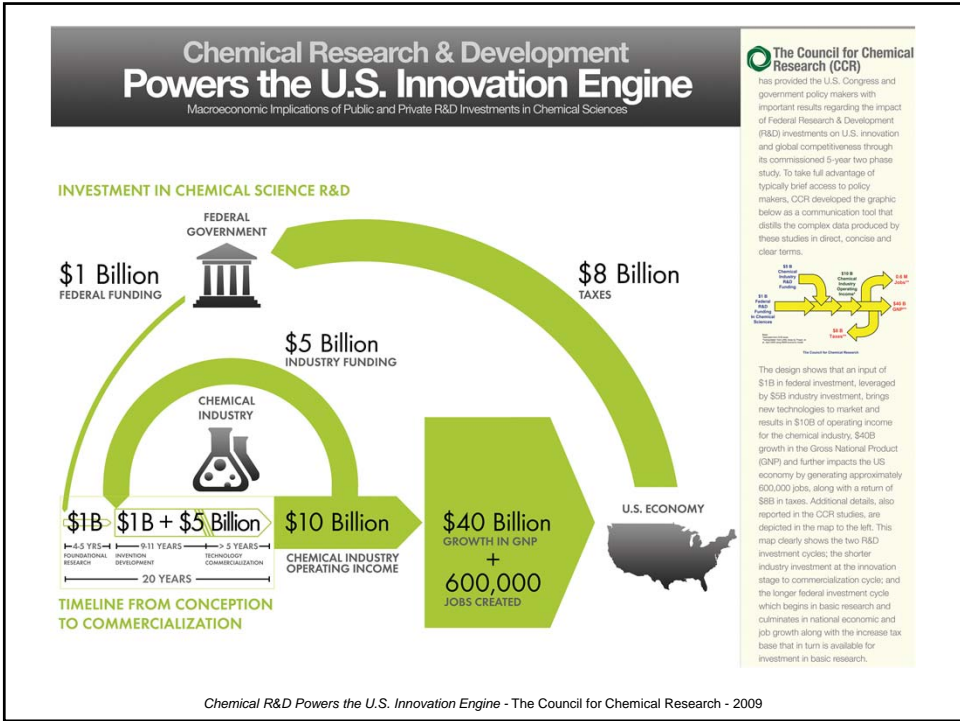


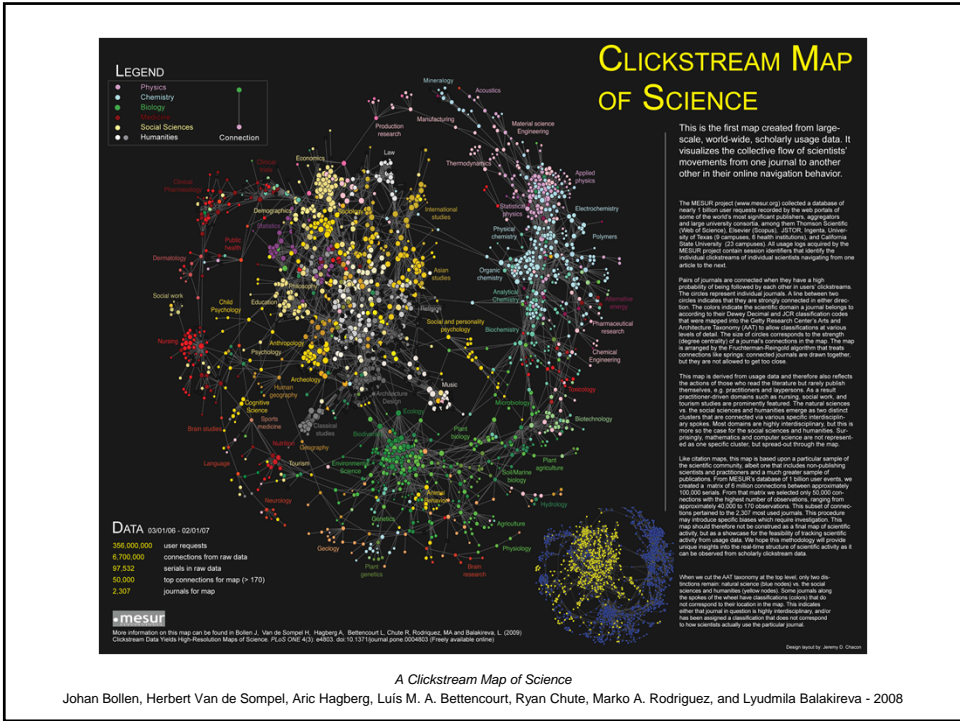
DEATH & TAXES

A VISUAL GUIDE TO WHERE YOUR FEDERAL TAX DOLLARS GO



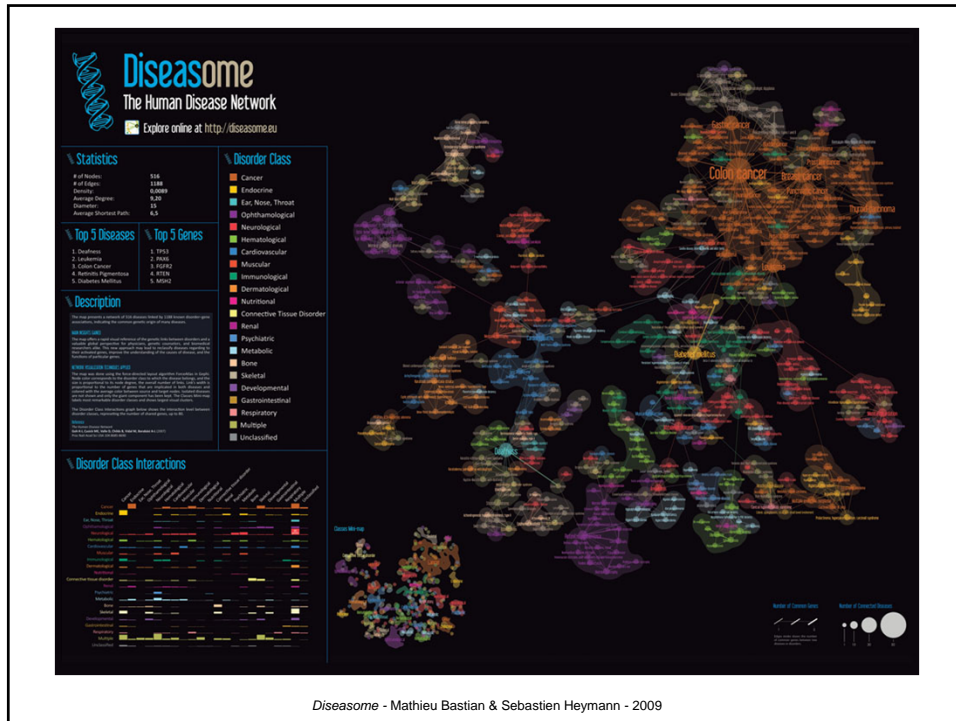
Death and Taxes 2009 - Jess Bachman - 2009



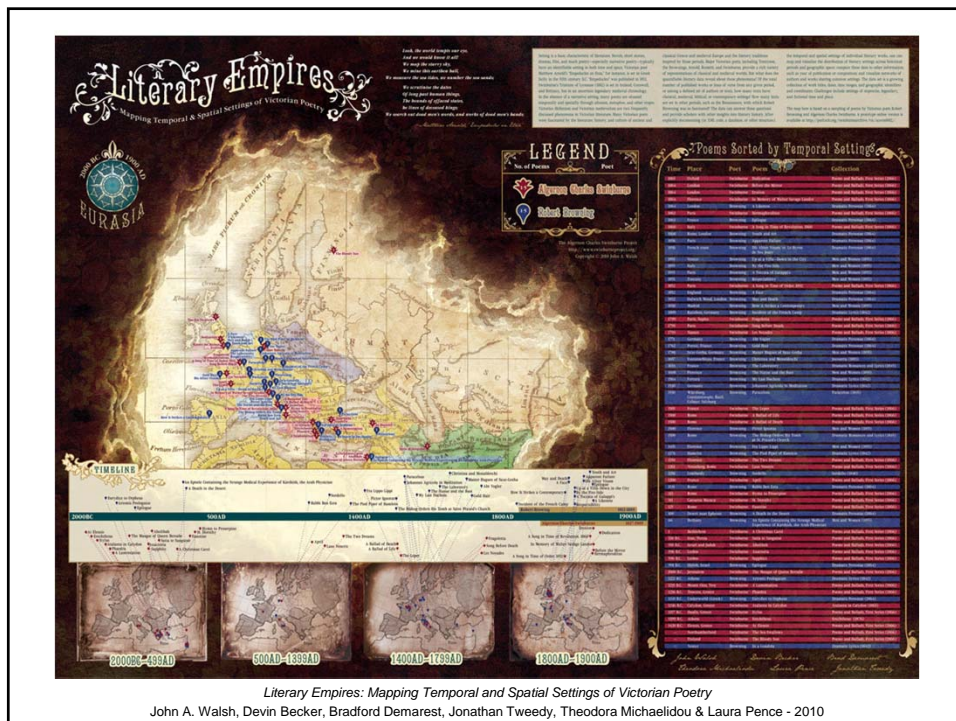


Science Maps for Scholars 2010

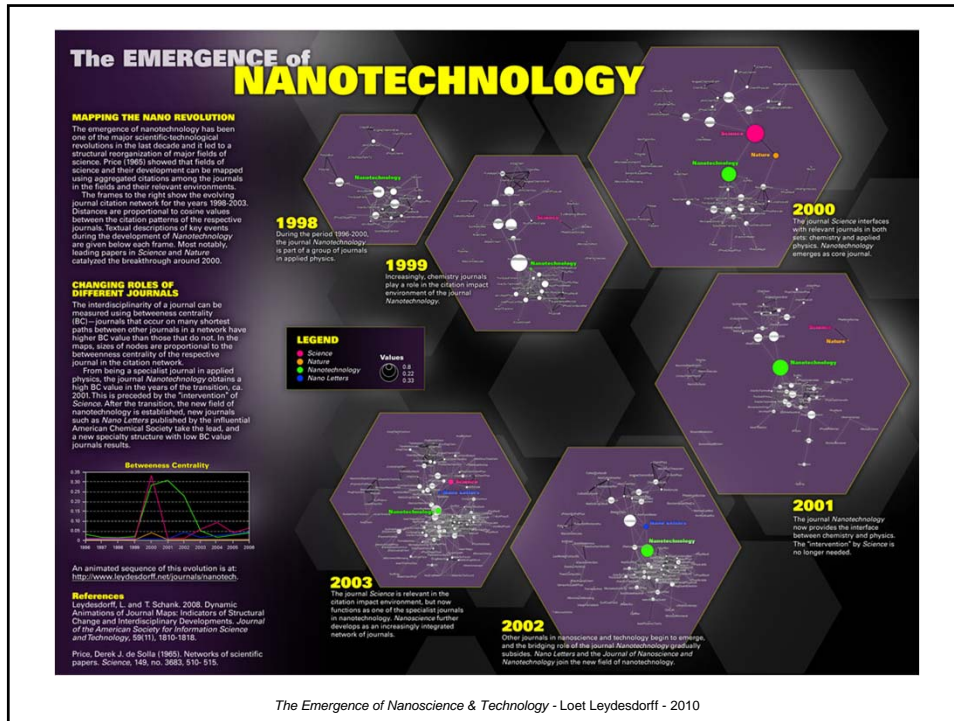


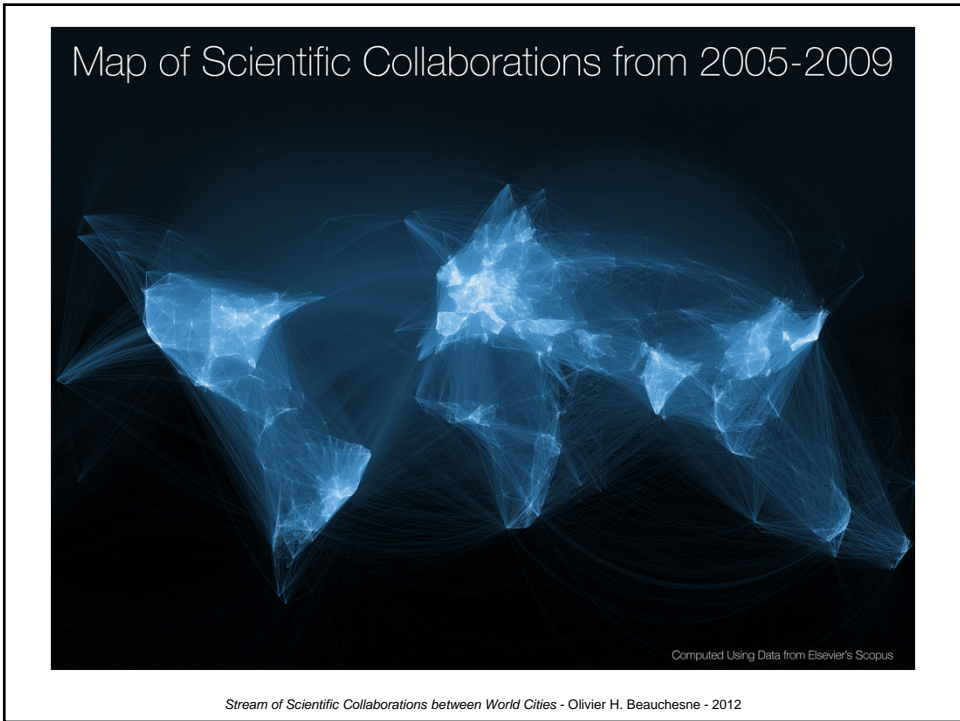
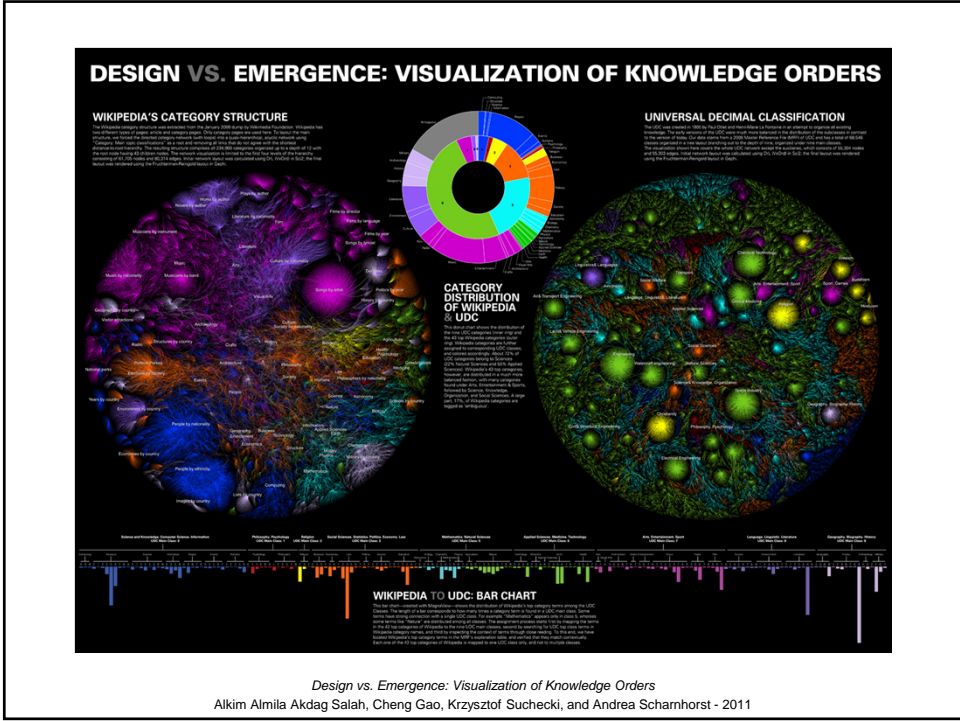


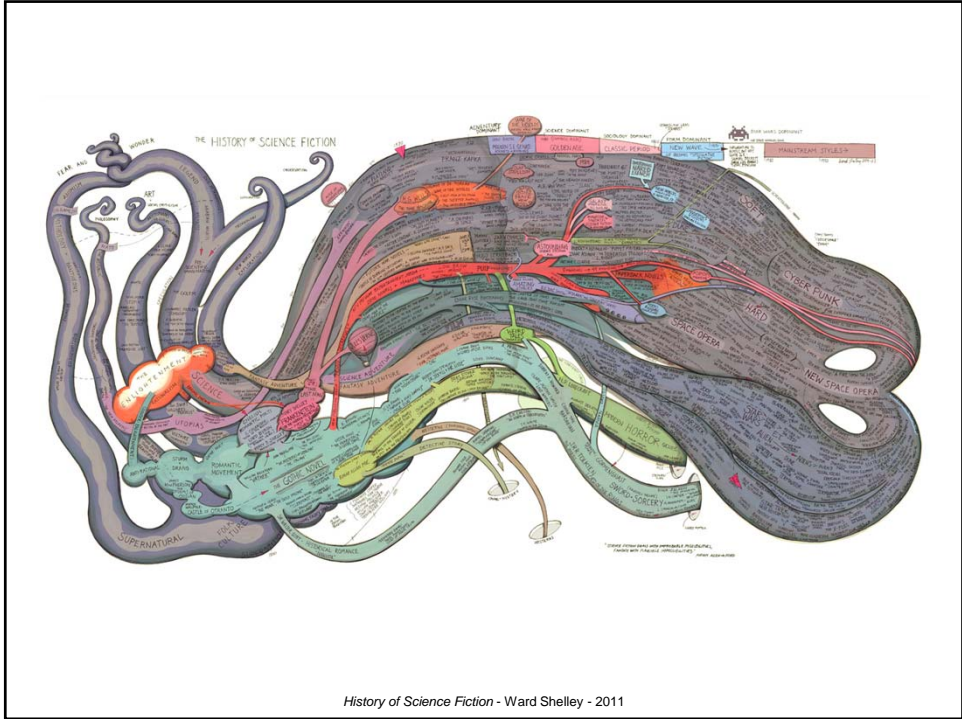
Diseaseome - Mathieu Bastian & Sebastien Heymann - 2009



Literary Empires: Mapping Temporal and Spatial Settings of Victorian Poetry
John A. Walsh, Devin Becker, Bradford Demarest, Jonathan Tweedy, Theodora Michaelidou & Laura Pence - 2010

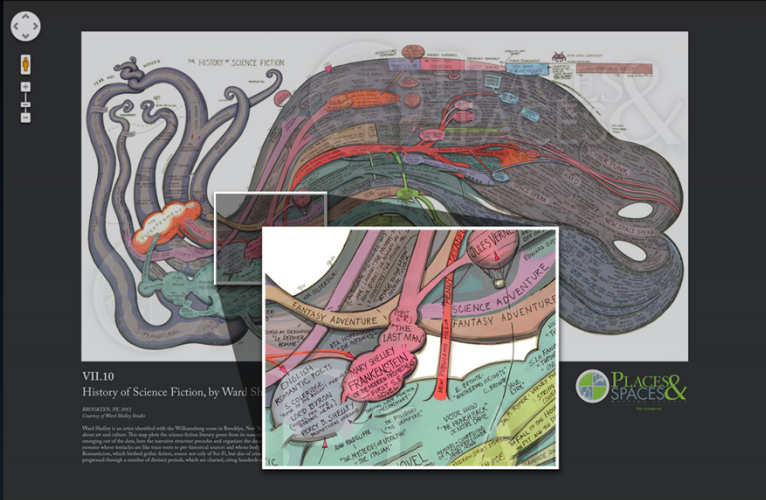






History of Science Fiction - Ward Shelley - 2011

Check out our Zoom Maps online!

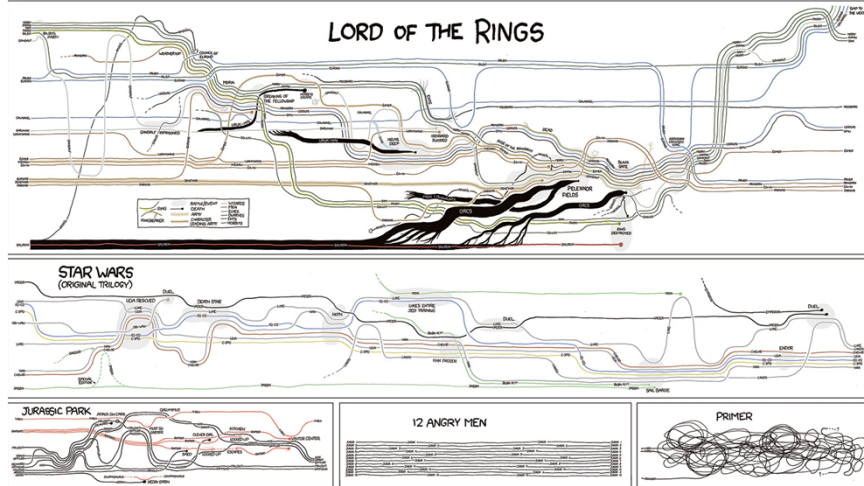


Visit scimaps.org and check out all our maps in stunning detail!

Science Maps for Kids 2012



THESE CHARTS SHOW MOVIE CHARACTER INTERACTIONS.
THE HORIZONTAL AXIS IS TIME. THE VERTICAL GROUPING OF THE
LINES INDICATES WHICH CHARACTERS ARE TOGETHER AT A GIVEN TIME.



Movie Narrative Charts (Comic #657) - Randall Munroe - 2009

Knowledge Web
A project of the James Burke Institute
Visit the Knowledge Web at kweb.org

Knowledge Web
With the Knowledge Web, you can fly through time and space, following your interests anywhere they lead you, even from Napoleon to the computer. With more than 2800 people and inventions, there are tens of thousands of different possibilities, so you never know what surprising connections you'll find. The globe display will tell you where you are, and the timeline will tell what else is going on at the same time. Along the way, you can visit historic places like Marie Curie's lab, talk to her and do experiments—with no danger from radiation!

Lyons Playfair
Lyons Playfair came up with the paper-proposed rotary switch for the telegraph. He also helped organize the 1853 World Exhibition in London.

David Livingstone
David Livingstone was an explorer, missionary and doctor who discovered Victoria Falls. He also discovered the Nile River's source.

Lord William Thomas Kelvin
Lord Kelvin discovered the absolute zero of temperature. Queen Victoria honored him by the name of the temperature through which Kelvin, and Kelvin.

Cyrus West Field
Cyrus West Field was the first to propose a cable across the Atlantic Ocean. He was the first to propose a cable across the Atlantic Ocean.

Samuel Finley Breese Morse
Samuel Finley Breese Morse invented the telegraph. He also invented the telegraph. He also invented the telegraph.

Noah Webster
Noah Webster invented the first dictionary. He also invented the first dictionary. He also invented the first dictionary.

Apple strudel
The apple strudel was first made in the town of Struditz. It was first made in the town of Struditz. It was first made in the town of Struditz.

Postcard
The first postcard was invented in 1869. It was first made in the town of Struditz. It was first made in the town of Struditz.

Sir Rowland Hill
Sir Rowland Hill invented the postage stamp. He also invented the postage stamp. He also invented the postage stamp.

Ada Lovelace
Ada Lovelace was the first computer programmer. She also invented the first computer programmer. She also invented the first computer programmer.

William Whewell
William Whewell was the first to use the word "scientist". He also invented the first scientist. He also invented the first scientist.

Sir James Clark Ross
Sir James Clark Ross discovered the magnetic north pole. He also discovered the magnetic north pole. He also discovered the magnetic north pole.

Charles Macintosh
Charles Macintosh invented the first waterproof fabric. He also invented the first waterproof fabric. He also invented the first waterproof fabric.

Raincoat
The first raincoat was invented in 1823. It was first made in the town of Struditz. It was first made in the town of Struditz.

Gateways
20th Century
19th Century
18th Century
17th Century
16th Century
15th Century
14th Century
13th Century
12th Century
11th Century
10th Century
9th Century
8th Century
7th Century
6th Century
5th Century
4th Century
3rd Century
2nd Century
1st Century
0th Century

Knowledge Web - James Burke, Patrick Mc Kercher, and Michael J. Stamper - 2012

MANGA UNIVERSE
883 Series
62,172 Chapters
1,074,790 Pages

The visualization of manga series is based on the number of chapters and pages. The size of the point represents the number of chapters and pages. The color of the point represents the year of publication. The points are clustered into four groups: 1. Shounen, 2. Seinen, 3. Shojo, 4. Isekai.

1. Shounen
2. Seinen
3. Shojo
4. Isekai

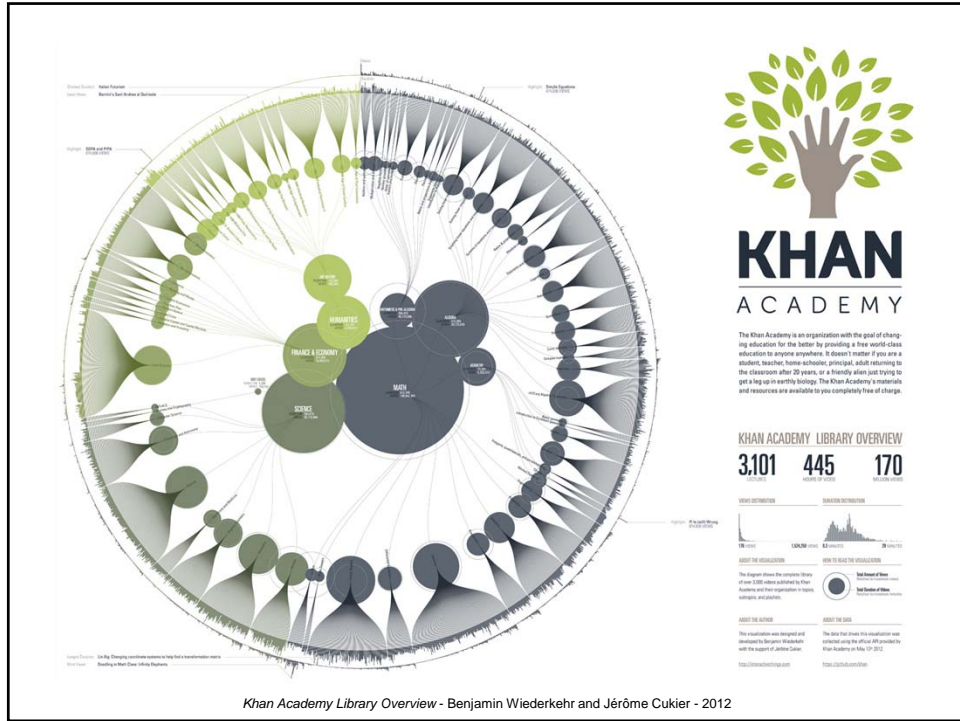
The visualization shows the distribution of manga series across different genres and time periods. The points are clustered into four groups: 1. Shounen, 2. Seinen, 3. Shojo, 4. Isekai.

1. Shounen
2. Seinen
3. Shojo
4. Isekai

The visualization shows the distribution of manga series across different genres and time periods. The points are clustered into four groups: 1. Shounen, 2. Seinen, 3. Shojo, 4. Isekai.

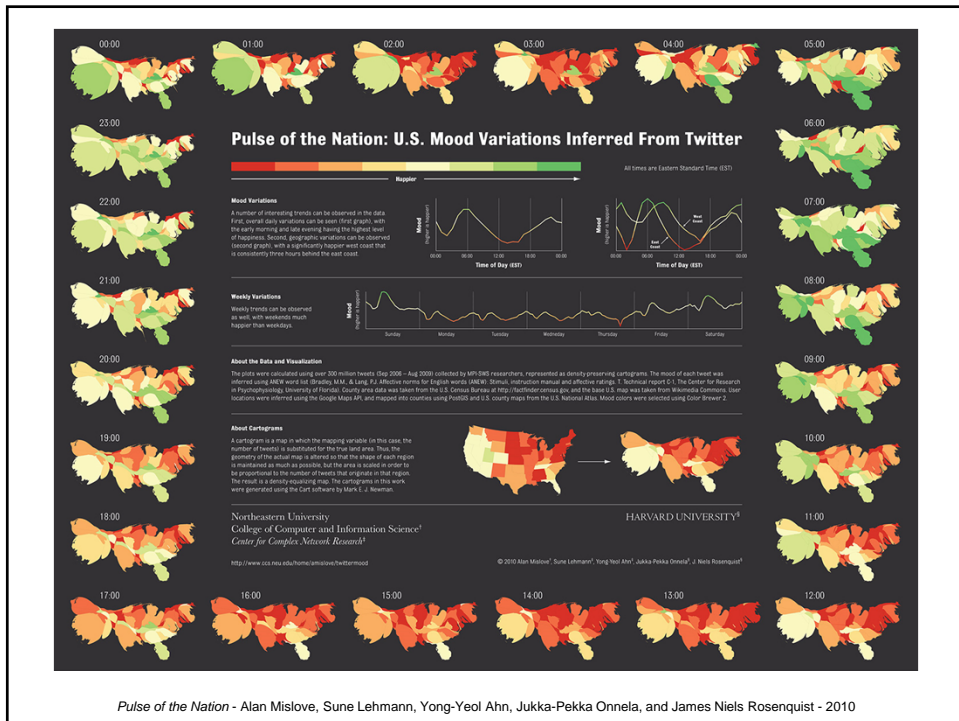
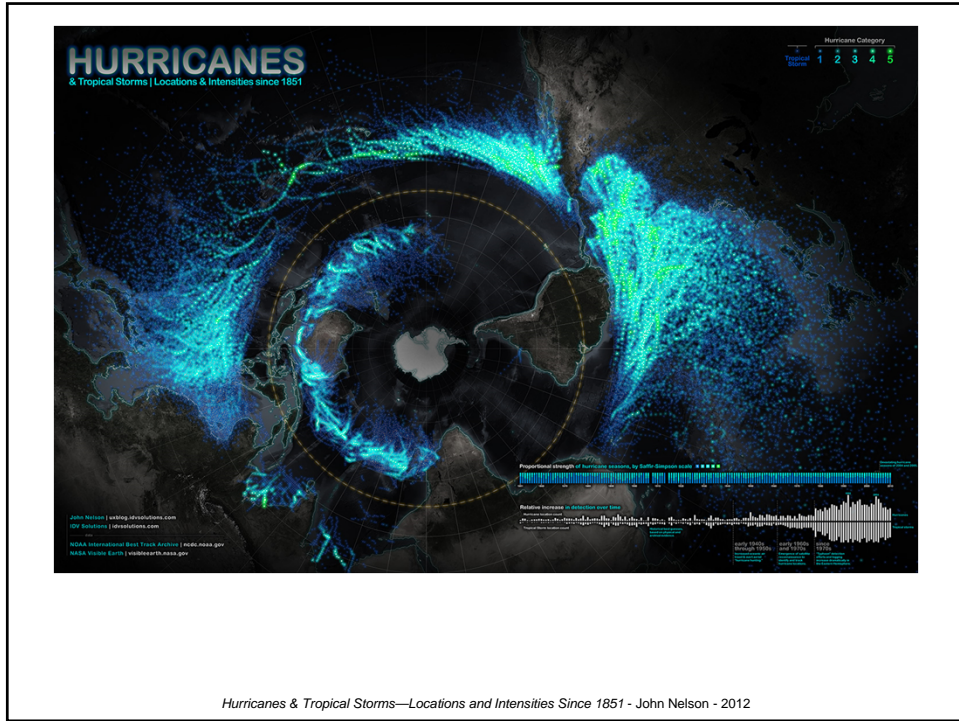
1. Shounen
2. Seinen
3. Shojo
4. Isekai

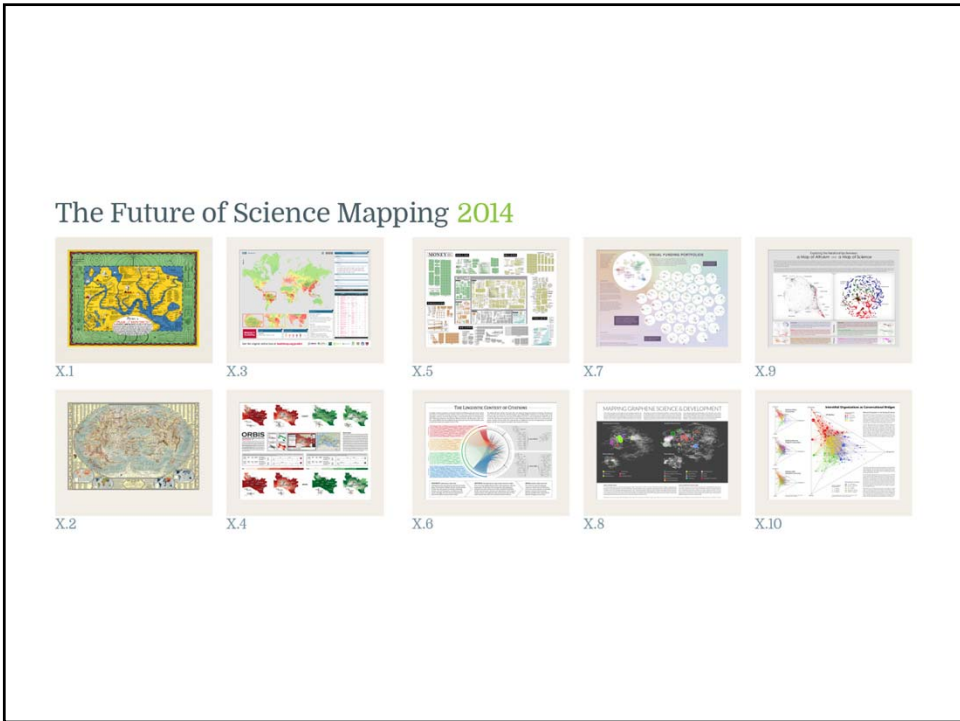
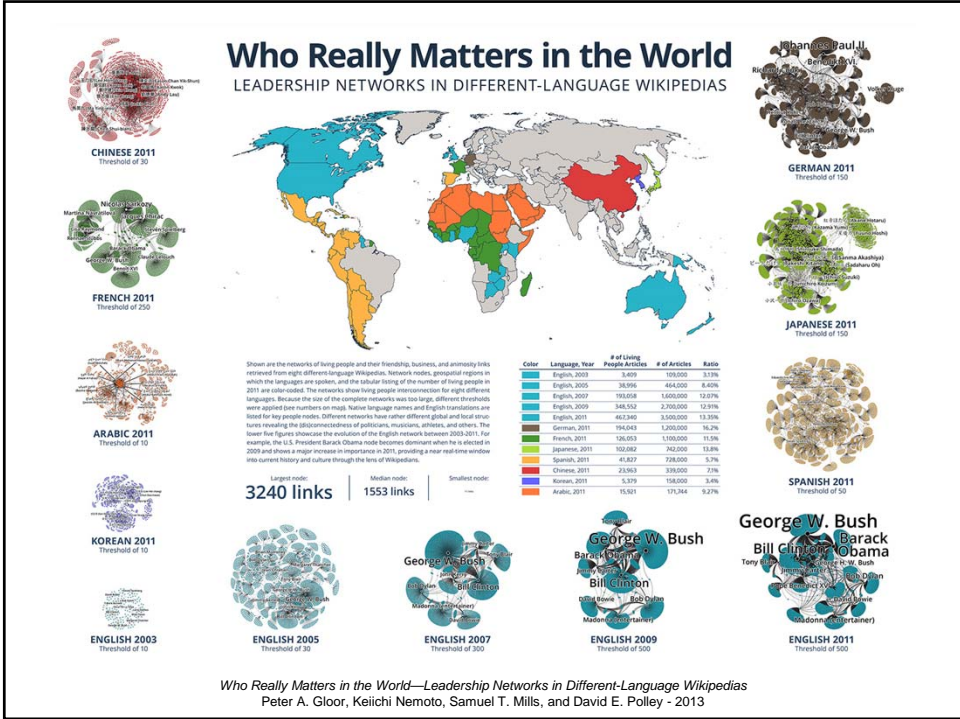
Manga Universe - Lev Manovich and Jay Chow - 2012

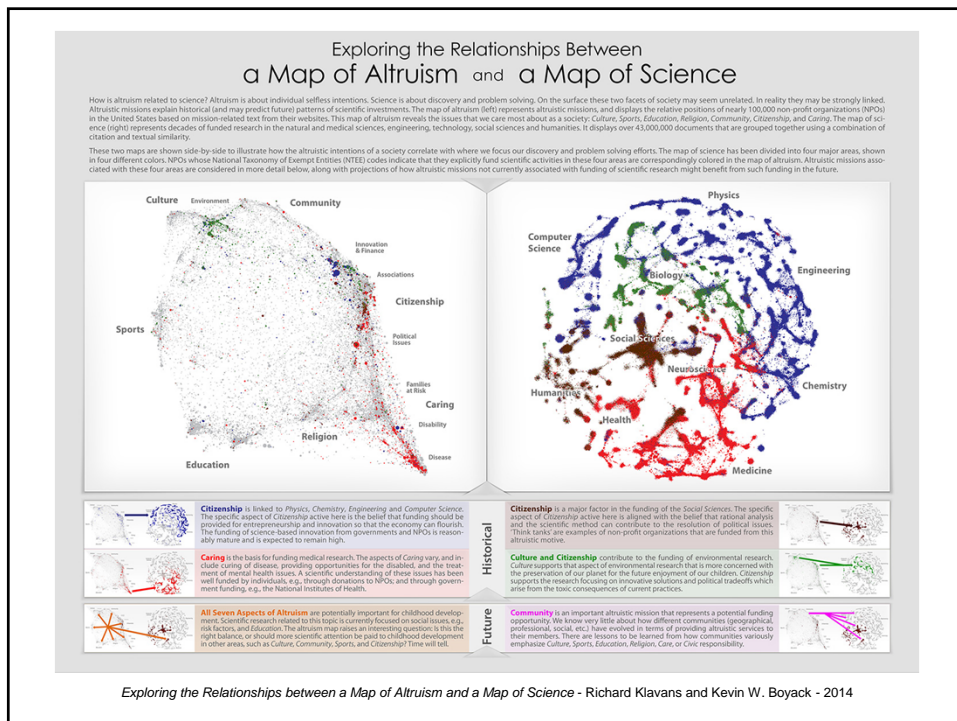
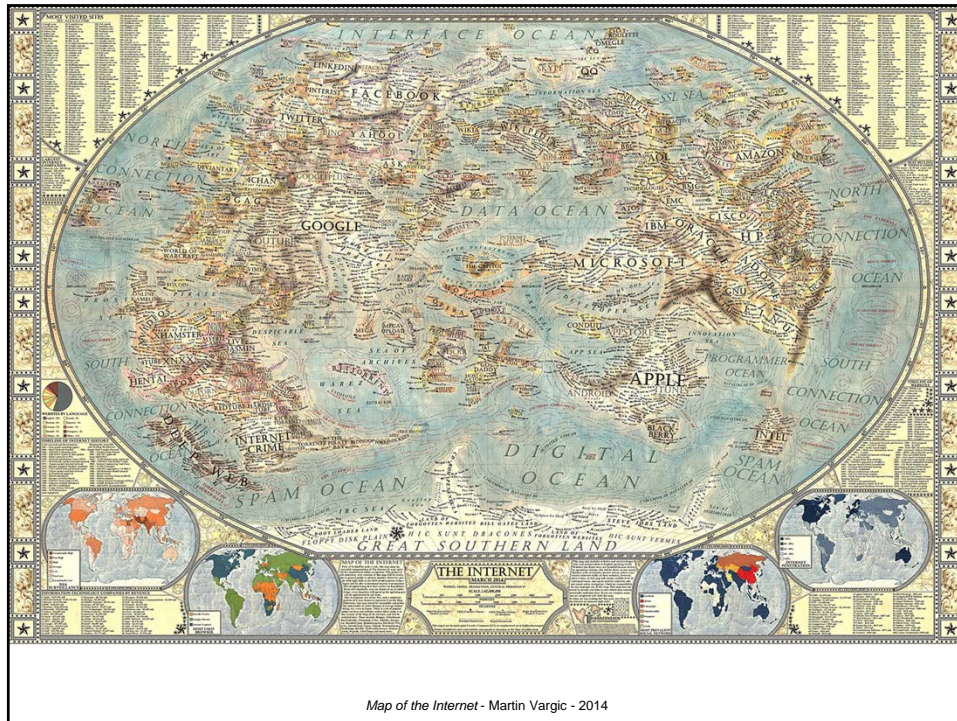


Science Maps Showing Trends and Dynamics 2013





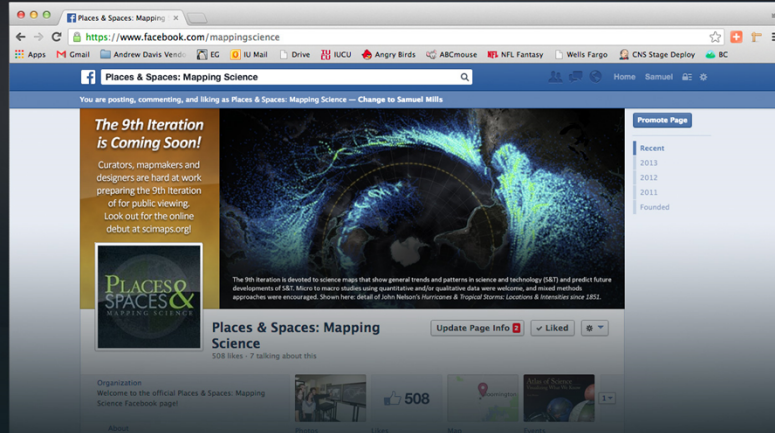




Explore the maps and background information at <http://scimaps.org>



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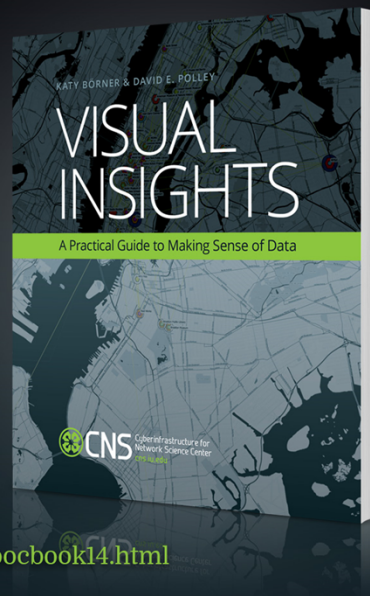
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This textbook offers a gentle introduction to the design of insightful visualizations. It seamlessly blends theory and practice, giving readers both the theoretical foundation and the practical skills necessary to render data into insights.

The book accompanies the Information Visualization MOOC that attracted students, scholars, and practitioners from many fields of science and more than 100 different countries.



cns.iu.edu/ivmooobook14.html

Information Visualization MOOC

 INDIANA UNIVERSITY
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Overview

This course provides an overview about the state of the art in information visualization. It teaches the process of producing effective visualizations that take the needs of users into account.

This year, the course can be taken for three Indiana University credits as part of the Online Data Science Program just announced by the School of Informatics and Computing. Students interested in applying to the program can find more information here.


Among other topics, the course covers:

- Data analysis algorithms that enable extraction of patterns and trends in data
- Major temporal, geospatial, topical, and network visualization techniques
- Discussions of systems that drive research and development.

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Everyone who registers gains free access to the Scholarly Database (26 million paper, patent, and grant records) and the Sci2 Tool (100+ algorithms and tools).

Please watch the introduction video to learn more.

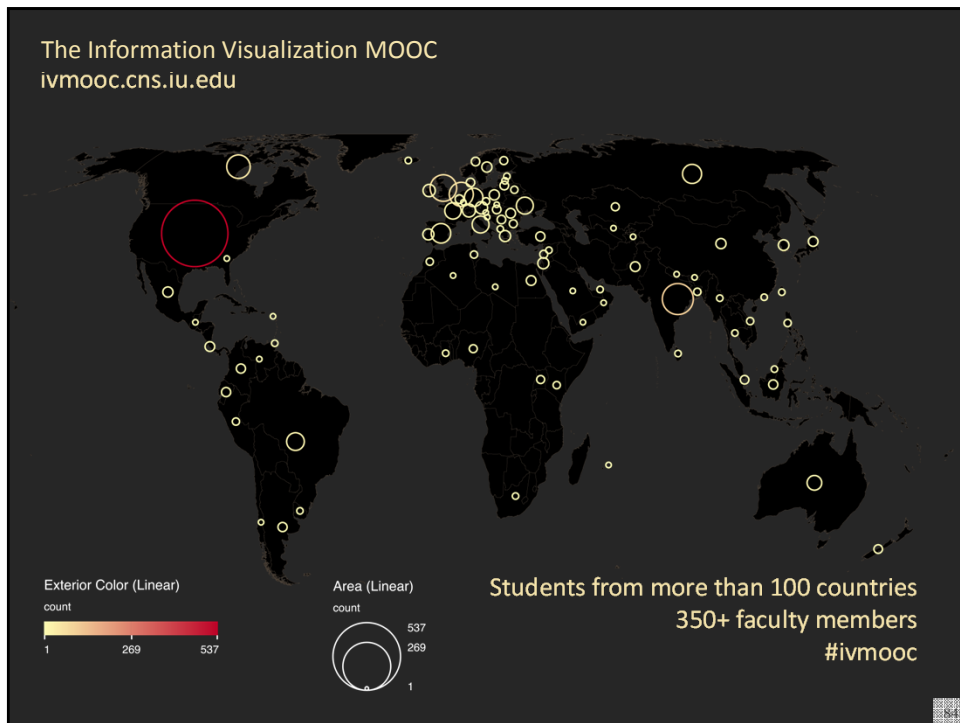


Register for Course

IVMOOC 2014 course materials will be available until end of November 2014. The IVMOOC 2015 will open in January 2015 with new materials and a cloud computing setup.

Register for free at <http://ivmooc.cns.iu.edu>. Class restarts Jan. 2015.

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Load One File and Run Many Analyses and Visualizations

Times Cited	Publication Year	City of Publisher	Country	Journal Title (Full)	Title	Subject Category	Authors
12	2011	NEW YORK	USA	COMMUNICATIONS OF THE ACM	Plug-and-Play Macroscopes	Computer Science	Borner, K
18	2010	MALDEN	USA	CTS-CLINICAL AND TRANSLATIONAL SCIENCE	Advancing the Science of Team Science	Research & Experimental Medicine	Falk-Krzesinski, HJ Borner, K Contractor, N Fiore, SM Hall, KL Keyton, J Spring, B Stokols, D Trochim, W Uzzi, B
13	2010	WASHINGTON	USA	SCIENCE TRANSLATIONAL MEDICINE	A Multi-Level Systems Perspective for the Science of Team Science	Cell Biology Research & Experimental Medicine	Borner, K Contractor, N Falk-Krzesinski, HJ Fiore, SM Hall, KL Keyton, J Spring, B Stokols, D Trochim, W Uzzi, B

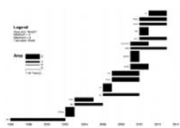


Statistical Analysis–p. 44

Temporal Burst Analysis–p. 48

Geospatial Analysis–p. 52

Geospatial Analysis–p. 52

Location	Count	# Citations
Netherlands	13	292
United States	9	318
Germany	11	36
United Kingdom	1	2

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CNS Cyberinfrastructure for Network Science Center

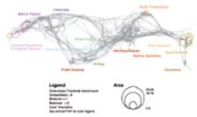

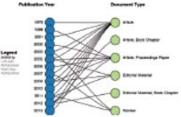
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Topical Analysis–p. 56

Paper Citation Network–p. 60

Bi-Modal Network–p. 60

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Co-author and many other bi-modal networks.

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