Published: 22 December 2010

Communication: Mapping science

Ben Shneiderman

Nature **468**, 1037(2010) | Cite this article

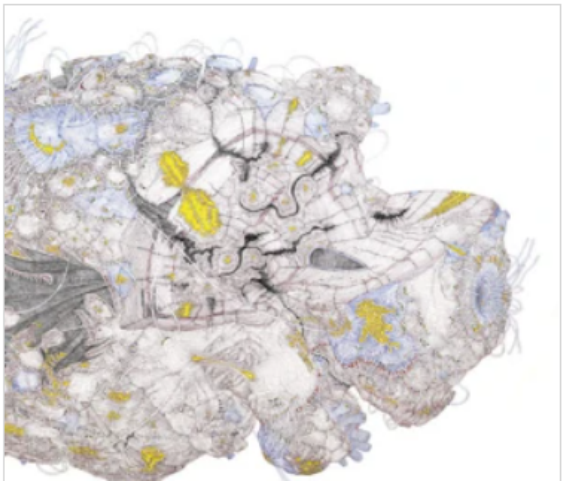
Ben Shneiderman enjoys a tome full of tools for discovery.

Atlas of Science: Visualizing What We Know

Katy Börner

MIT Press: 2010. 288 pp. $29.95 9780262014458 | ISBN: 978-0-2620-1445-8

The desire to visualize science is intense. Whereas telescopes, microscopes and magnetic resonance imaging (MRI) scans have revealed aspects of the natural world, new tools are needed to study science itself and how it changes over time. The challenge of depicting intangible processes has invigorated the growing research community dedicated to information visualization. From capturing moments of discovery to watching emerging research fronts, such tools can help us to understand the dynamics of innovation and guide its future.



This detail from a conceptual model of the evolution and structure of science shows emerging fields in blue, funding boosts in yellow and gaps in knowledge as black voids. Credit: D. ZELLER, PIEROGI GALLERY, NEW YORK/G-MODULE, PARIS

In the *Atlas of Science*, information scientist Katy Börner highlights examples that summarize the evolution of research and its interlocking communities in pictorial form. The book accompanies Börner's ambitious travelling exhibitions, *Places & Spaces: Mapping Science*, an ongoing programme of well-crafted visual presentations that have conveyed aspects of science to the public in libraries and museums since 2005 (http://scimaps.org). Contributors to the book get bylines and photos, making the collection a collaborative effort with diverse voices. Each two-page spread is a sumptuous feast of dense prose, delicious visuals and engaging quotations. Börner's use of map-making as metaphor is mostly on target, but it underemphasizes the inherently interactive nature of information visualization.

Unlike in scientific visualization, which centres on three-dimensional representations of objects such as stacked MRI scans, researchers who visualize information seek patterns, clusters, relationships, gaps and anomalies in many dimensions. Such methods may be used, for example, to study financial trading patterns over time, hierarchical structures in library catalogues, networks of social relationships and medical patient attributes. In exploring these multi-dimensional spaces with bespoke software, users manipulate control panels to zoom in on desired items, filter out undesired items and select details.

The past decade has produced a steady flow of prototype software for information visualization, such as Spotfire, Tableau, ILOG and Hive Group. Many of these commercial success stories have been acquired by large business-intelligence or software companies. Despite the wide impact of these programmes in drug discovery, genomic data analysis and social-network analysis, they unfortunately get little mention in the *Atlas of Science*.

These tools also support discovery by integrating rich data manipulation and statistical analyses. Data-sharing platforms such as ManyEyes or Swivel encourage discussion around visualizations, and US government sites such as data.gov and recovery.gov raise expectations of open data and cultivate policy-oriented communities. The growing interest in 'big data' has spread from the pure sciences to the social sciences and humanities. Some journalists have also become innovators in presenting graphic data, providing readers with the same opportunity to explore information and make their own discoveries.

In the *Atlas of Science*, Börner sets out the story of scientific map-making well. She shows a range of examples based on aspects of science: geographical maps, historical timelines, taxonomic hierarchies, citation networks and various forms of textual graphics. Readers will learn about the geographic concentrations of the creative class in Europe, North America and Japan; Wikipedia editing patterns; rising patent citations; and pathways to discoveries such as the structure of DNA. A recurring theme is the relative size and connectedness of disciplines, from the expected closeness of biology and ecology to the surprising linkage between computer science and social sciences.

Börner is generous in giving credit to many scientific map-makers, but her choice is subjective and some readers will favour different heroes. The book mostly lacks critiques — only one visualization is challenged for its hard-to-read labels and partially obscured links. But other displays have advantages and drawbacks that merit debate. Börner and her contributors sometimes seem more entranced by a compelling visual than by its comprehensibility.

In converting such displays to static paper, the *Atlas of Science* necessarily loses the interactive nature of information visualization. Seeing inspirational photos from Roman Vishniac's microscope or the Hubble Space Telescope can only suggest the excitement of those who operate the controls. Nevertheless, Börner's magnificent book offers provocative new maps of science that will inspire fresh thinking.

Author information

Author information

Affiliations

Ben Shneiderman is professor of computer science at the University of Maryland, College Park, Maryland 20742, USA, and co-author of Analyzing Social Media Networks with NodeXL. ben@cs.umd.edu

Ben Shneiderman

Rights and permissions

About this article

Cite this article

Shneiderman, B. Communication: Mapping science. *Nature* **468,** 1037 (2010).
https://doi.org/10.1038/4681037a

Published
22 December 2010

Issue Date
23 December 2010

DOI
https://doi.org/10.1038/4681037a

Share this article