



Computers and Information Sciences Picturing Science

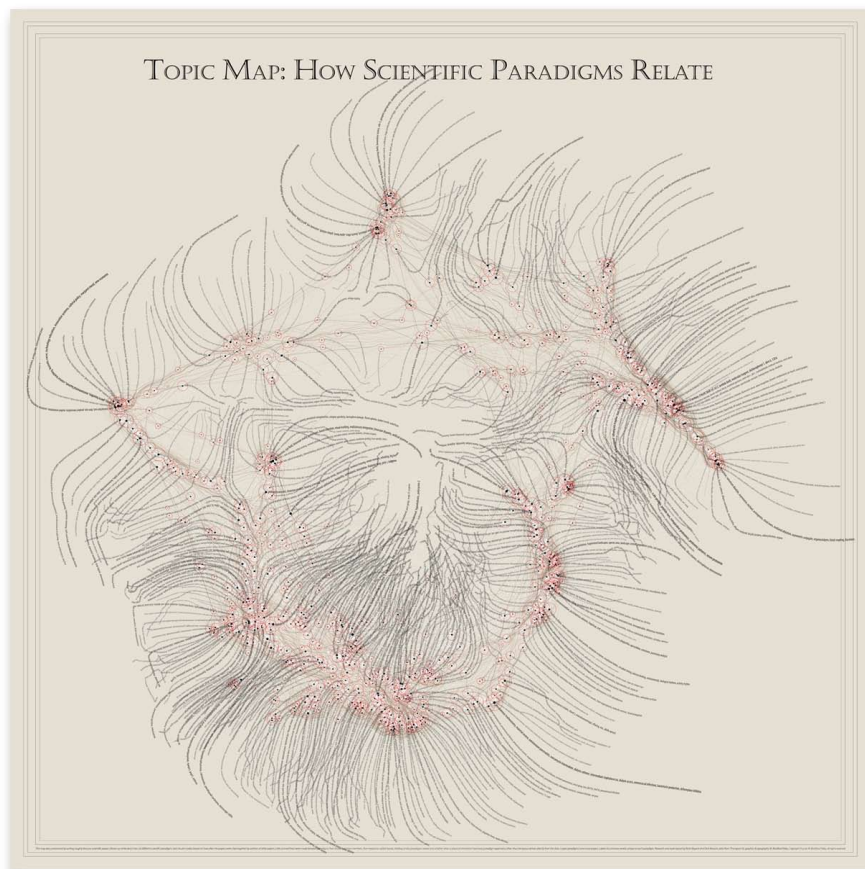


Figure 1. Map of scientific paradigms

Mapping scientific paradigms

Mapping scientific paradigms illustrates the relationships between different scientific disciplines and provides correlated information for planning and evaluation purposes.

With the seemingly limitless amount of information that is now available at one's fingertips, it is increasingly important to evaluate new research ideas with respect to pertinent scientific knowledge databases. Connections between ideas and knowledge are critical and can now be mapped out. Such a map of science resembles a filamentous microorganism you might see under a microscope (Figure 1). The map represents 800,000 scientific papers (portrayed as white dots) and shows relationships between them and different scientific disciplines. The "filaments" are common words unique to each "scientific paradigm," which are depicted as the 776 red circular nodes or clusters of papers

(Figure 2, next page). Each node contains papers that are commonly cited together; larger nodes have more papers. The nodes are connected with lines of various lengths and thicknesses, denoting the strength of the citation linkages between them. Layout of the node positions was done with cosine index values generated from co-citation statistics using a recursive process and the VxOrd graph layout routine authored at Sandia. Chemistry papers are found in the right-hand peninsula while astrophysics papers are located at the top. Medicine covers the large region at the lower left.

A four-foot-square version of the map was displayed at the New York Hall of Science as part of the Places & Spaces: Mapping Science exhibition. This image also appeared in the Gallery section of the 2006 year-end issue of *Nature* (vol. 444, p. 985).

Scientists from Sandia and SciTech Strategies, of Berwyn, PA, produced the map using 2003 data from Thomson Scientific. It was enabled by work performed under a Laboratory Directed Research and Development project whose purpose was to generate large-scale maps of science for planning and evaluation purposes.

For more information on interpreting the map, see <http://didi.com/brad/mapOfScience>.

For details on the exhibition, see www.scimaps.org.

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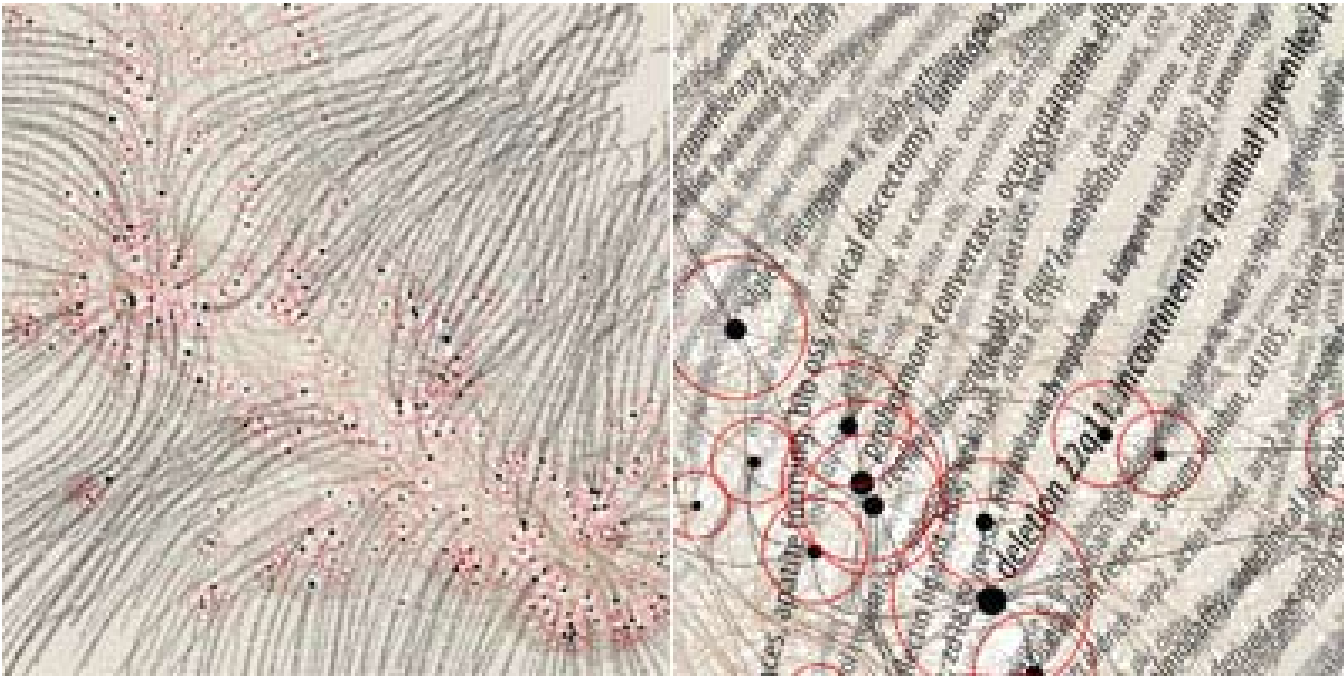


Figure 2. (Left) Enlarged view of a node section. (Right) Magnified view showing common “scientific paradigm” words.