

Nodes in Evolving Networks – Visualizing the Citation Environment of *Social networks* over time

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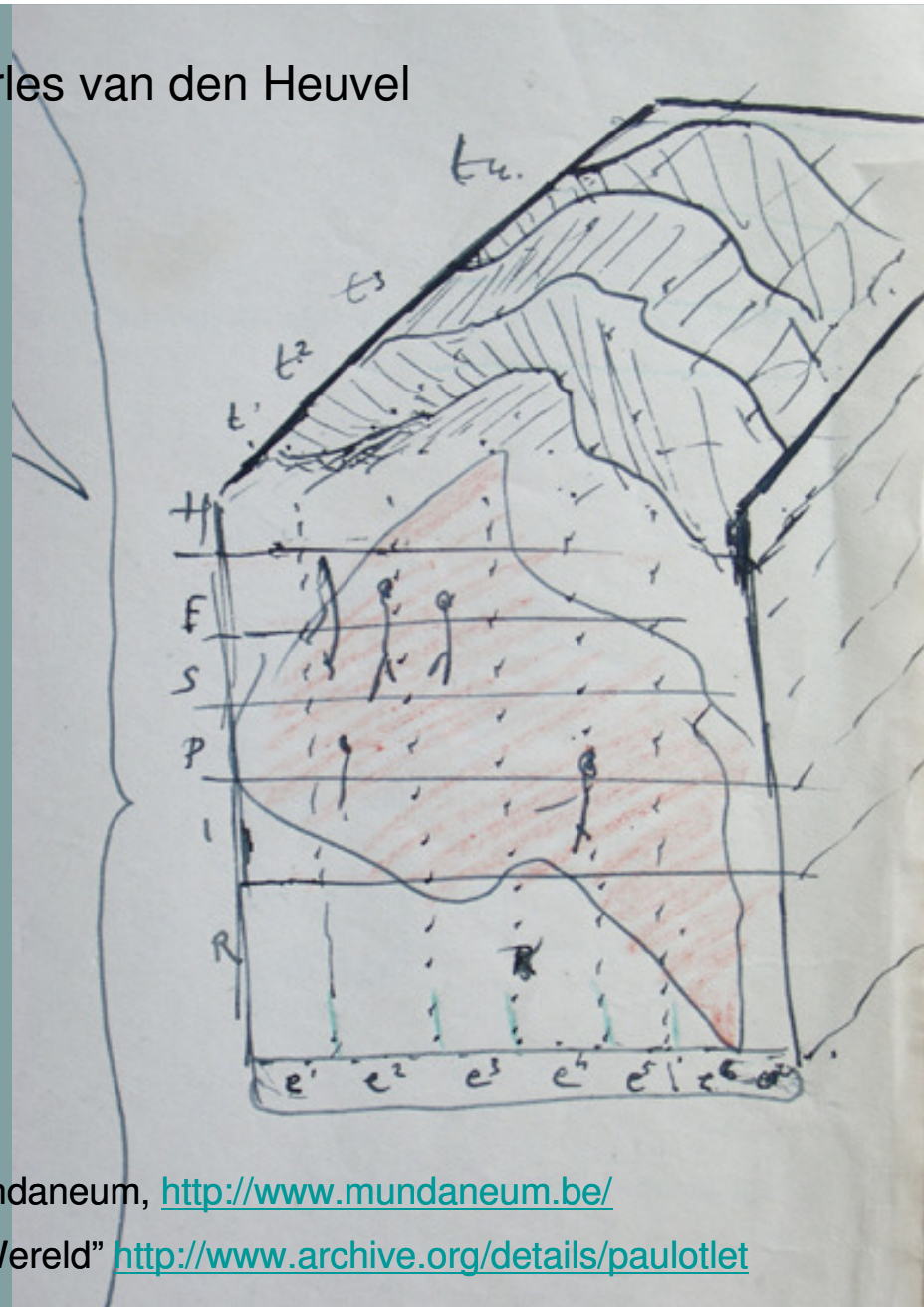


Storybook

- **Start with visions**
- Evolving networks – what to visualize?
- How to visualize?
- Movie
- What we know and what we don't know



Courtesy of Charles van den Heuvel



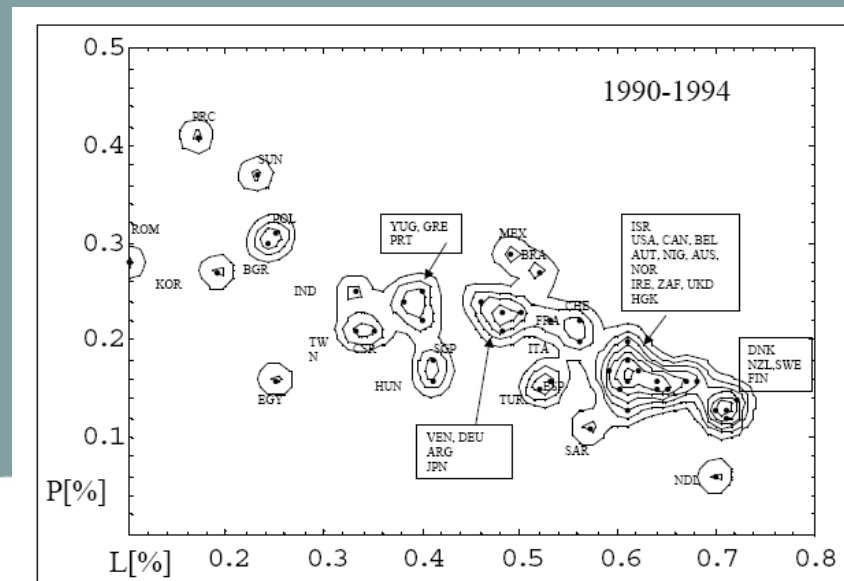
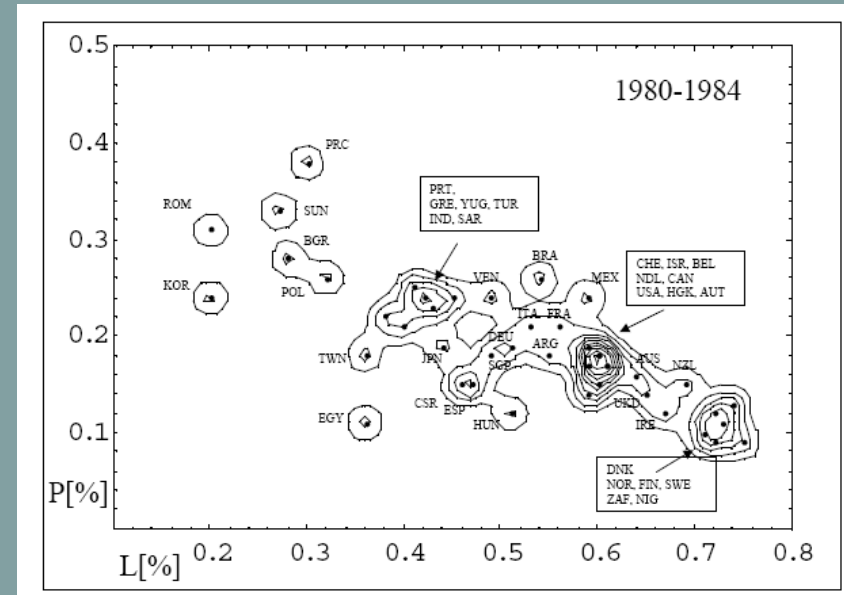
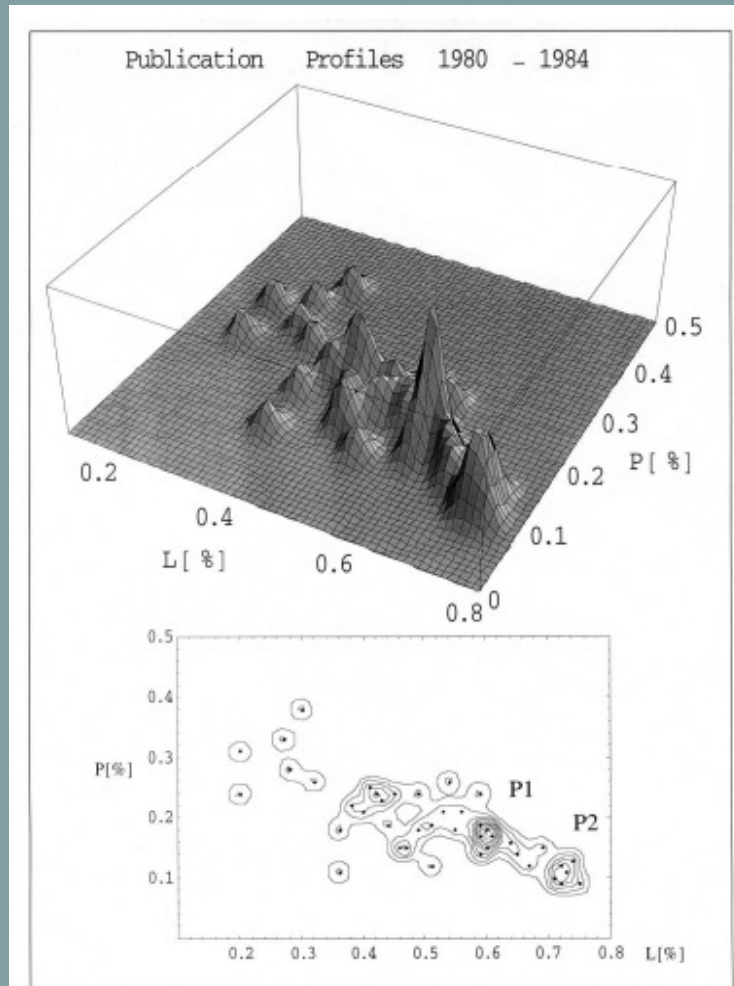
Paul Otlet, Mundaneum, <http://www.mundaneum.be/>

“Alle Kennis van de Wereld” <http://www.archive.org/details/paulotlet>



virtual knowledge studio

Publication profiles of countries



M. Bonitz, E. Bruckner, A. Scharnhorst: The Structure of World Science in the Eighties: Country Maps 1985-1989 versus 1980-1984. In: *Proceedings of the Fifth International Conference of the International Society for Scientometrics and Informetrics*, June 7-10, 1995, River Forest, Il., U.S.A.. Eds. M.E.D. Koenig, A. Bookstein. Learned Information, Medford, New Jersey, 1995, pp. 63-72.



Visualizing knowledge spaces as networks

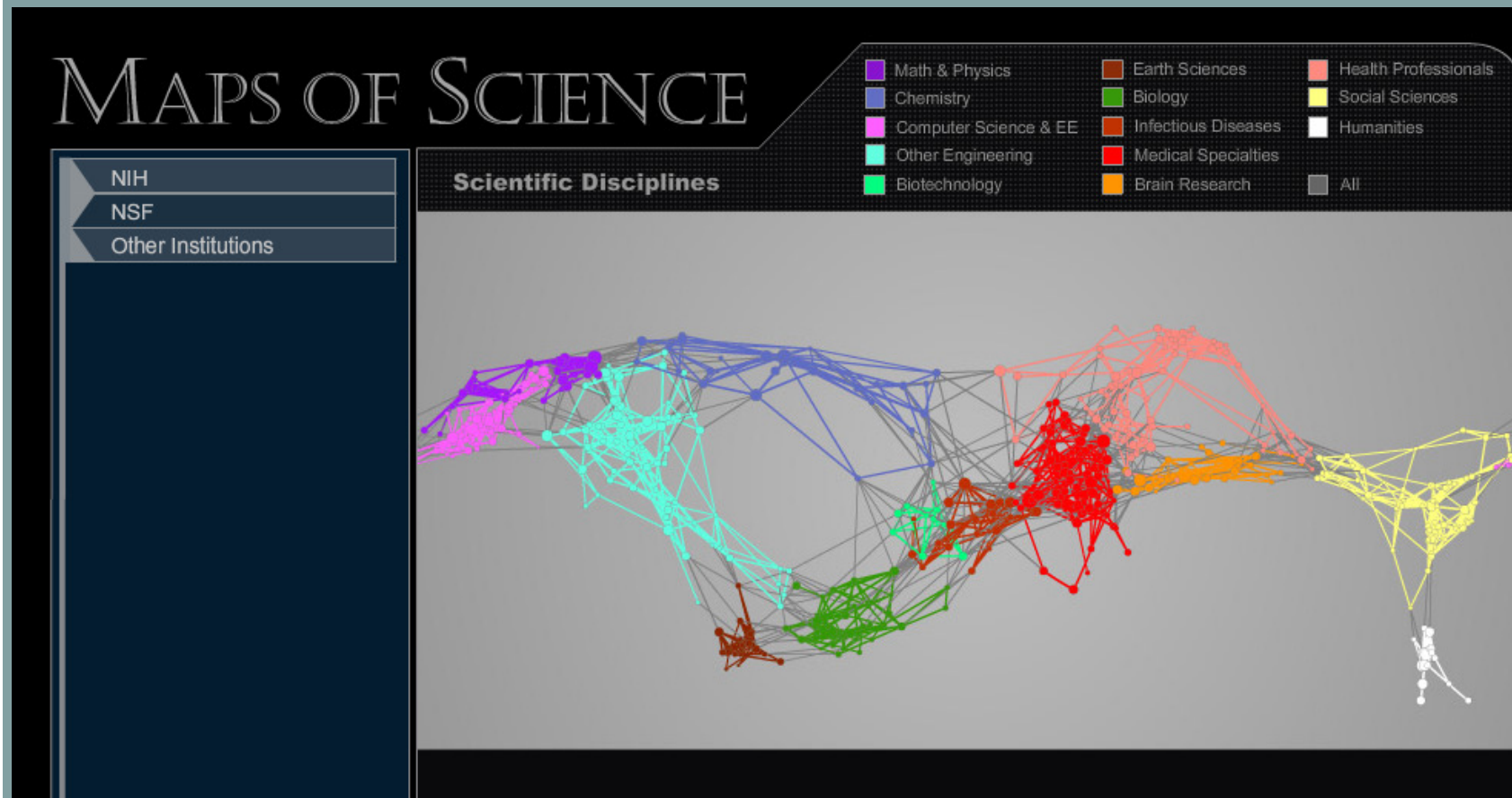


Figure from www.mapofscience.org
See also "Places and Spaces" www.scimaps.org

► www.virtualknowledgestudio.nl

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Critical events in evolving networks

- Emerging structures in scientific communication
- New scientific fields
- Changing role of scientific journals



New fields – re-structuring of citation networks among scientific journals

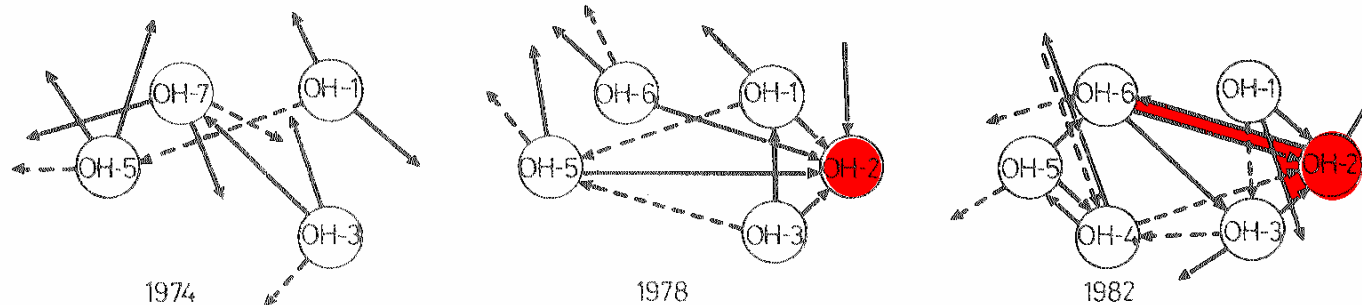
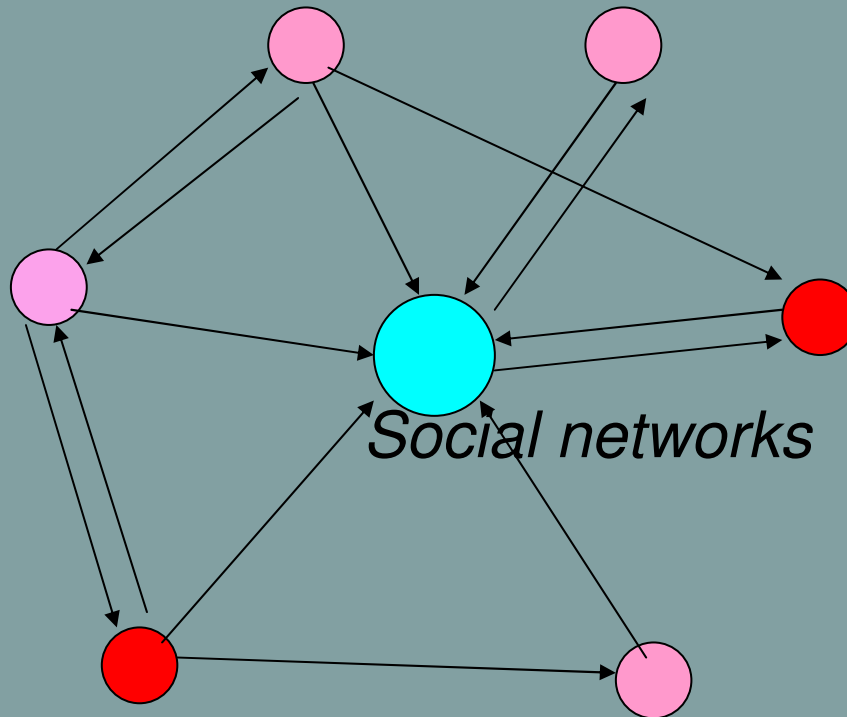


Fig. 3. Emergence of a journal cluster for 'occupational hygiene'.

- OH 1 Journal of Occupational Medicine
- OH 2 Scandinavian Journal of Work Environment and Health
- *OH 3 British Journal Industrial Medicine
- OH 4 Annals of Occupational Hygiene
- *OH 5 American Industrial Hygiene Association Journal
- *OH 6 International Archives of Occupational and Environmental Health

“Ego-network” of *Social networks*

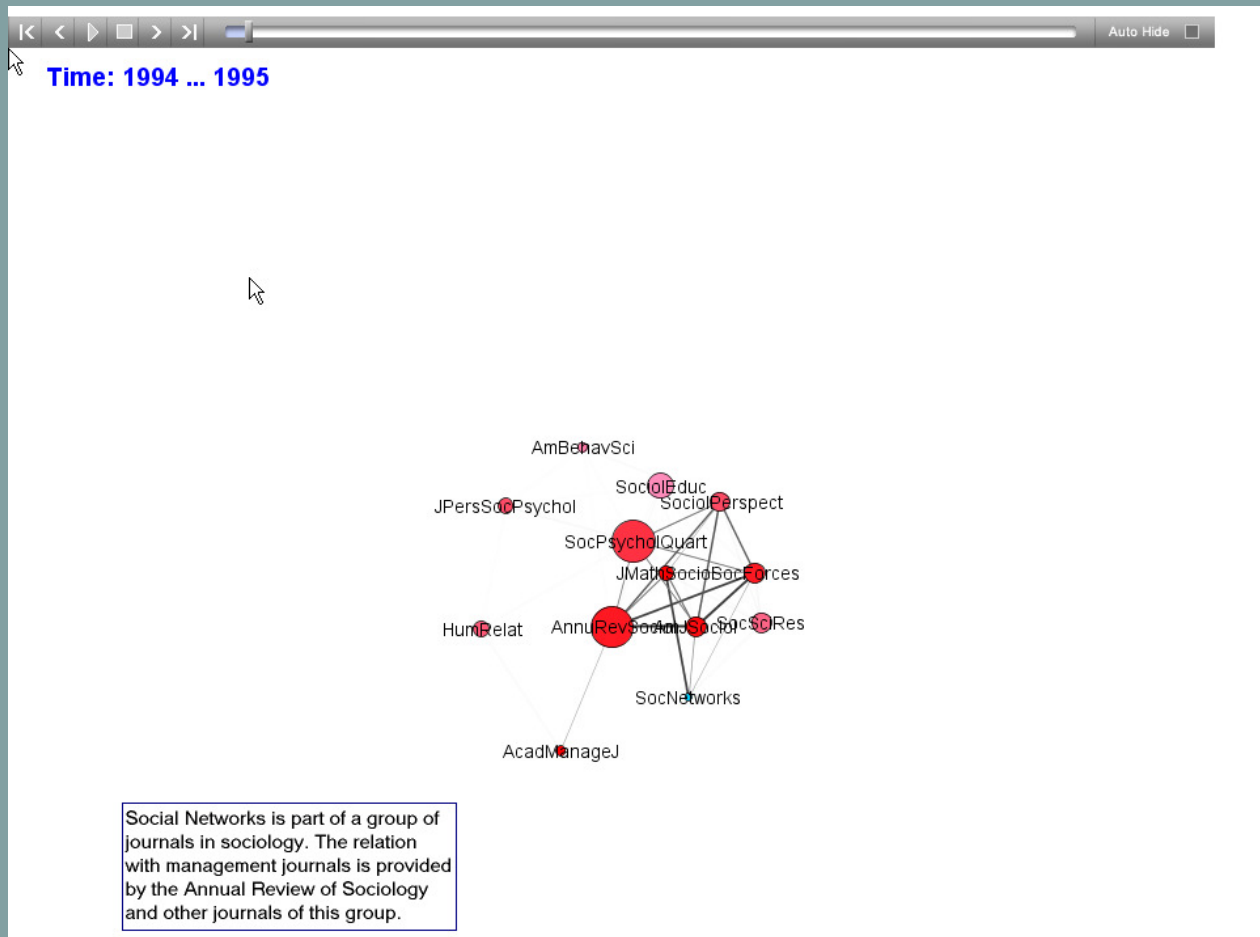


Year t

Journal Citation Report



Opening the black box of citations – from citing to similarities in being cited



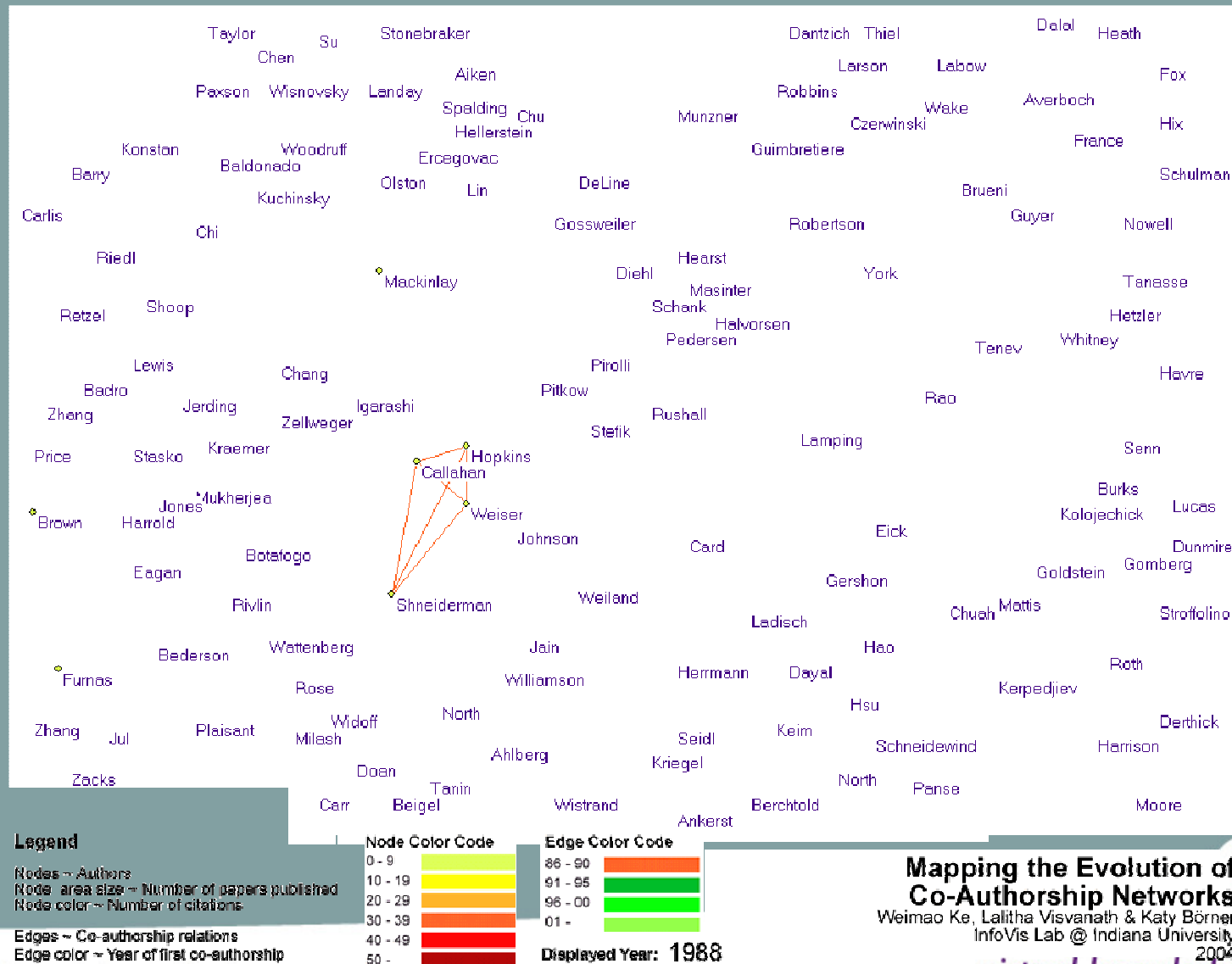
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Mapping the Evolution of Co-Authorship Networks

Ke, Visvanath & Börner, (2004) Won 1st price at the IEEE InfoVis Contest.



Mapping the Evolution of Co-Authorship Networks
 Weimao Ke, Lalitha Visvanath & Katy Börner
 InfoVis Lab @ Indiana University
 2004



virtual knowledge studio

Kamada & Kawai (1989):

$$S = \sum_{i \neq j} \frac{1}{d_{ij}^2} (\|x_i - x_j\| - d_{ij})^2$$

majorant function (Gansner *et al.*, 2004);

dynamic stress minimalization (Schank, 2008):

$$S = \left[\sum_t \sum_{i \neq j} \frac{1}{d_{ij}^2} (\|x_i - x_j\| - d_{ij})^2 \right] + \left[\sum_{1 \leq t < |T|} \sum_i \omega \|x_{i,t} - x_{i,t+1}\|^2 \right]$$



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Dynamic layouter in VISON

- Animation of the citation environment of *Social networks* 1994-2007

<http://users.fmg.uva.nl/lleydesdorff/journals/socnetw/index.htm>



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What we know and what we don't know

- We got a visualization which allows us more easily to follow the “target journal” and we developed a “dynamic perspective” on citation environments of journals. In our case, we see
 - Excursions from “disciplinary” basins of attraction
 - No “interdisciplinarity,” but “bi-disciplinarity”
 - no stabilization of an interface between the social and the natural sciences
- We are not sure how much we detected trends or “just” fluctuations (sample size).
- We are interested in further differentiate between “changes in projection” and “changes in disciplinary composition”.
- We search for explaining factors and further operationalization of the knowledge landscape of science.



References

- <http://users.fmg.uva.nl/lleydesdorff/visone/index.htm>
- Loet Leydesdorff, Thomas Schank, “Dynamic Animations of Journal Maps: Indicators of Structural Changes and Interdisciplinary Developments,” *Journal of the American Society for Information Science and Technology* (2008, forthcoming)
- Loet Leydesdorff, Thomas Schank, Andrea Scharnhorst, Wouter de Nooy, “Animating the development of Social Networks over time using a dynamic extension of multidimensional scaling, (2008, submitted)”

