

***Interactive activities of researchers captured
in research impact assessment***

KATARINA LARSEN

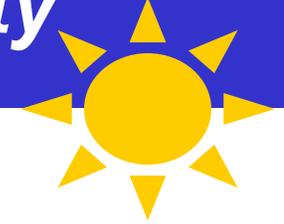
IATUL Conference

Global Access to Science – Scientific Publishing for the Future

International Association of Technological University Libraries

June 2007

RINAS - Research Innovation and Network Analysis targeting Sustainability



Post-doc (2006/07)

Stanford University at research unit Scancor – Scandinavian
Consortium for Organizational Research, US

Cespri – Center for innovation & internationalization of research, Italy

EPFL – Ecole Polytechnique Fédérale de Lausanne, Switzerland

**Funded by the Sweden-America Foundation and
the Swedish Research Council Formas**

Presentation outline

- I. Knowledge networks and Embeddedness**
- II. Research objectives and motivation**
- III. Researcher interaction and Methods**
- IV. Nano and solar cell technology**
- V. Results: citation patterns and impact measures**
- VI. Conclusions and Further work**

Knowledge networks and Embeddedness

- **Scientific collaboration networks:** relational data on co-authorships and citations showing cognitive representation of relations between papers, journals, or authors (Persson, 1994; Chen, 2007; Larsen, Forthcoming 2008)
- **Evolution of networks and hubs:** The well-connected nodes that newcomers attach to becomes hubs that create short paths between many pairs in the network (Powell et al., 2005)
- **Embeddedness in structures of social relations**
 - relational embeddedness: pairwise (dyadic) relations
 - structural embeddedness: actors in cohesive groups (Granovetter, 1985 & 1992)

Research objectives and Motivation

Objectives:

- I) Examine research interaction captured in bibliometric measures of science-based solar cell technology
- II) Analyse the roles of relational and structural embeddedness for emergence of scientific fields.

Field selected: Interdisciplinary hands-on, science-based technology, highly international field, NanoTech goes CleanTech public discourse, US-Swe “The one big thing”

Research interaction in international projects, shared equipment reflected in co-authorship, but also limitations since not all collaboration shows in co-authorship data and also other ways to interact

Researcher interaction and Methods

Bibliometric data combined with case studies:

➤ **Analysis & visualization of knowledge networks**

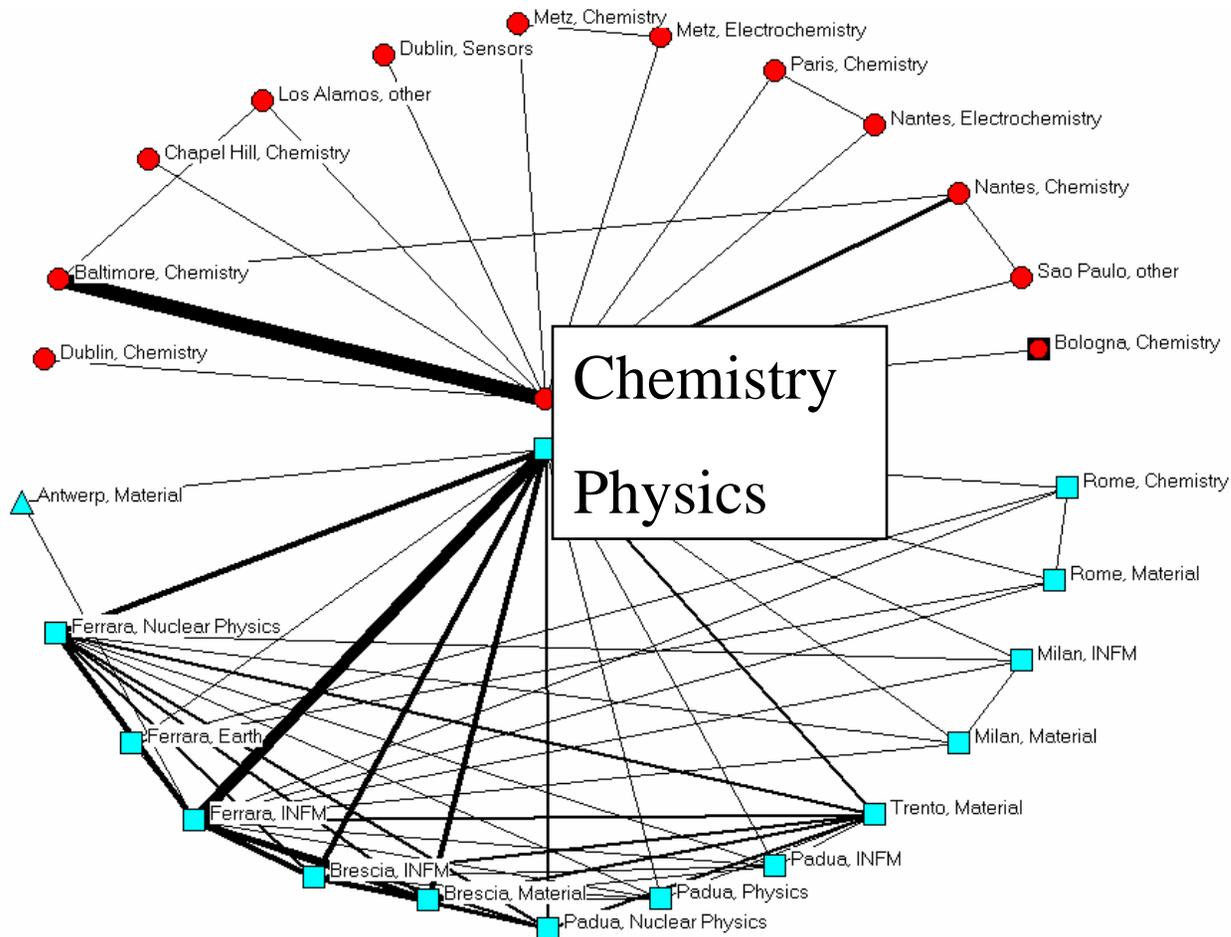
Foundations for co-authorship relations

Co-citation and Bibliographic coupling: intellectual base and research fronts, knowledge domain visualization and cognitive representation (Persson, 1994; Chen, 2007)

➤ **Studies of knowledge networks**

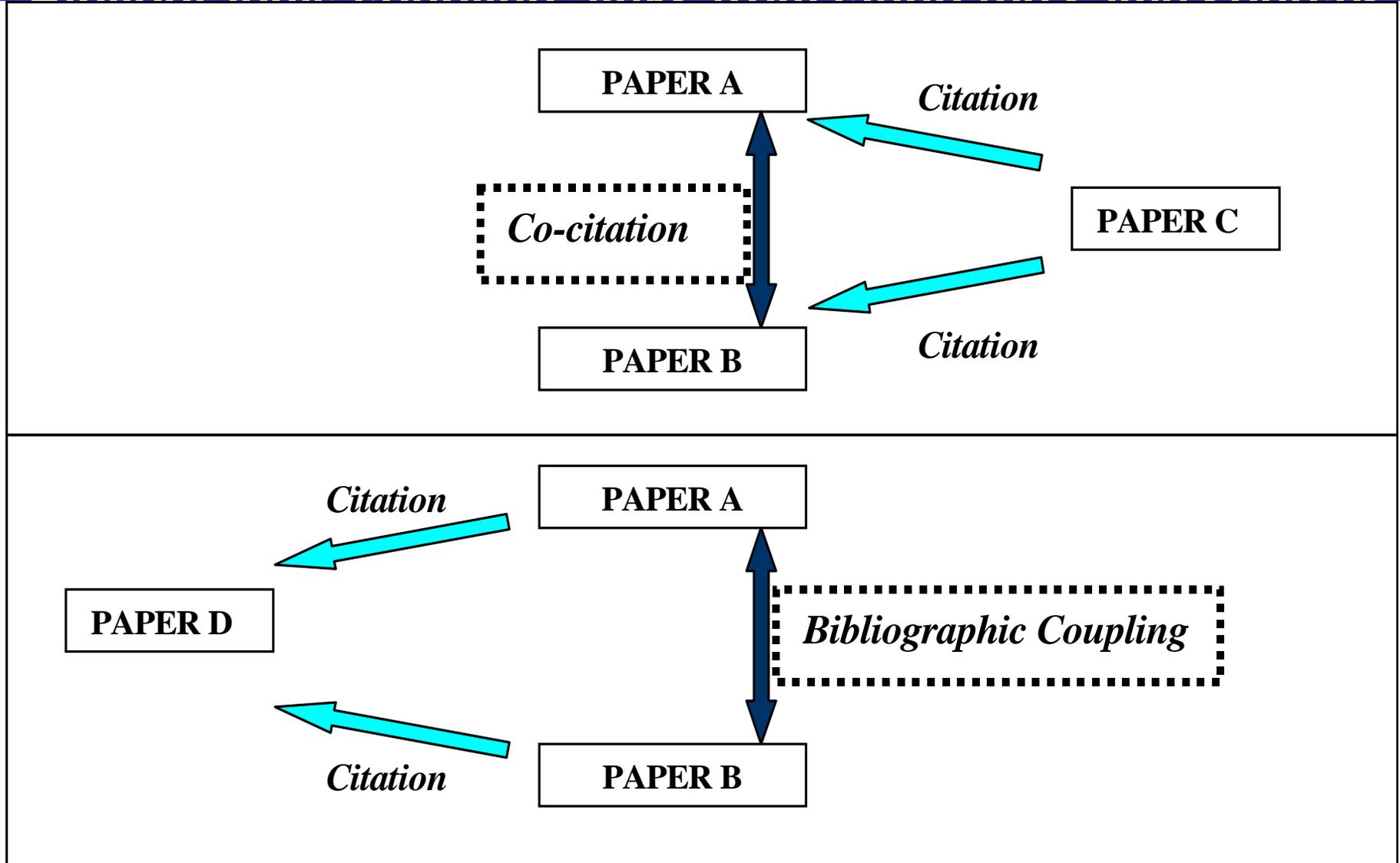
Fractional counting (Gauffriau & Olesen Larsen, 2005) and
Network analysis and centrality measures
(White et al. 1976, Wasserman and Faust 1994)

Knowledge network example in Italy: research groups (co-authorships)



Co-citation: links between documents cited together by others

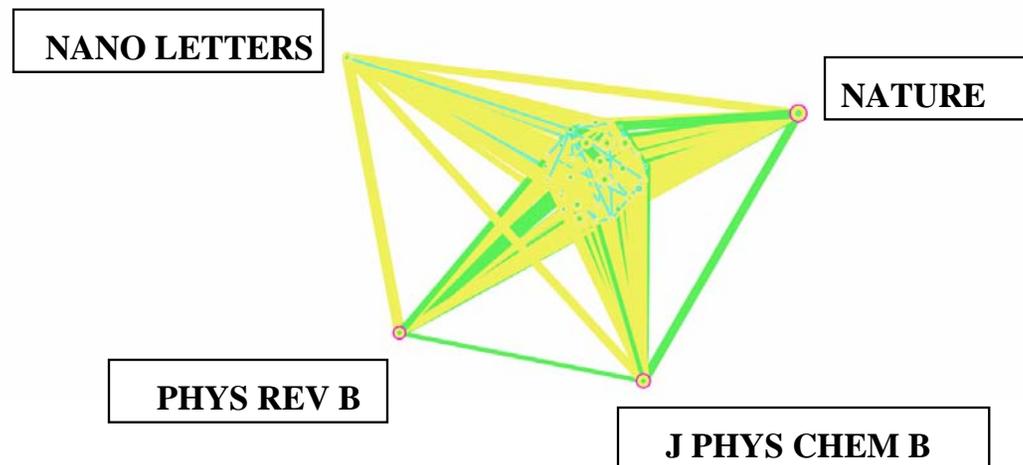
Bibliographic coupling: links from citing the same sources



Journal Co-citation

**JCA – Journal Co-citation analysis of data from journal Nano Letters:
Strong influence by Nano Letters, Phys Rev B, Nature, J Phys Chem B.**

Colour legend: 2004-05= yellow, 2002-03= green, 2000-2001= turquoise



Nano and solar cell technology

Nanostructured dye-sensitised solar cells.

Nanoparticle film that provides a large surface area for adsorption of light harvesting molecules

Technical definition (NNI, Darby and Zucker, 2003)
research at the 1-100 nanometer range concerned with the **novel properties and functions of structures, devices and systems because of their small or intermediate size.**

...or wider scope including all research activities undertaken at the **nanometric scale** “thus including much of research in the field of biotechnology and macromolecular chemistry undertaken during the last two decades” (OECD, 2003).

Nano related studies A-D

Type A: Nano as an emerging S&T area (Darby and Zucker 2003, Braun 1997)

Type B: S&T relations in emerging nano communities
(Meyer 2000, Meyer and Persson 1998)

Type C: Policy studies of nano S&T raising questions about impact of new applications of technology (Royal Society 2005, ESRC 2003, Arnall 2003)

Type D: Advances in the different areas of nano applications in natural science journals (JACS, J Phys Chem B, Nanoletters, Solar Energ Mat Sol C)

Research impact measures

combining structure, temporal, collaborative citation patterns

Fractional counting

Reduction of citations received by going from total counting to fractional counting

Time periods examined 1991-2004 vs. 1996-2004

Single and multiple location authored papers

following approach by the Centre for Science and Technology Studies (CWTS) in the Netherlands
CWTS-study (2005) comparing citations made to national scientific publication and internationally co-authored publications

Conclusions and Further work

- I. Researcher interaction** and “diffusion by attraction” in early phases in application of research results (relational embeddedness)
- II. Knowledge networks and institutions**
department affiliations and co-authorship networks, organisational networks formalised in laboratory networks (structural embeddedness)
- III. Early and later phases** further examined (in Italy and Switzerland autumn 2007) using bibliometric data, patent, in combination with interviews and archival data.