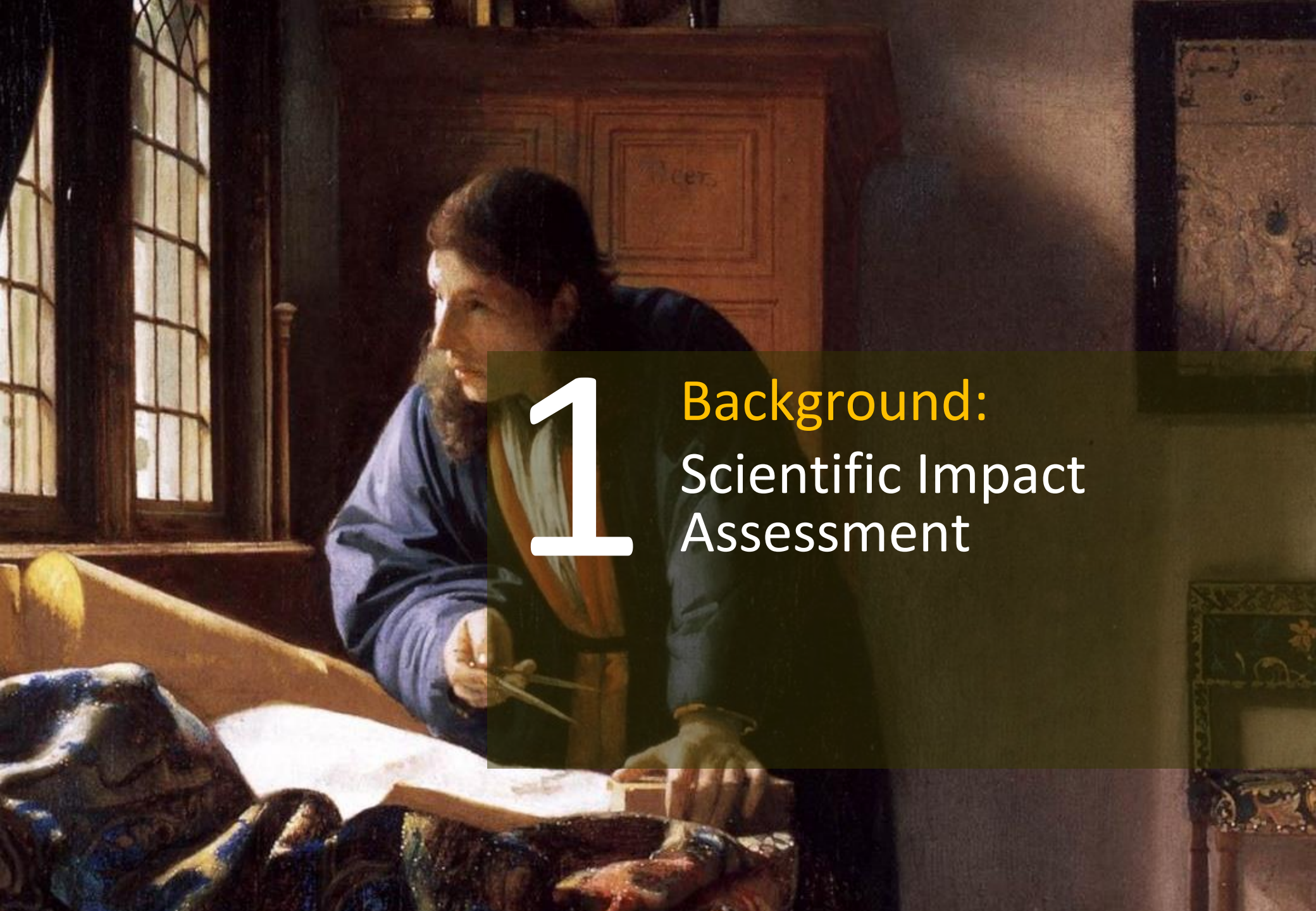




Christian Hoffmann, Christoph Lutz  
DGPuK 2014

A detailed painting of a man with a beard, wearing a blue robe, seated at a desk. He is looking down at a book or document on the desk, with his hands resting on it. The desk is cluttered with various items, including a blue and gold patterned cloth. In the background, there is a large wooden cabinet and a window with a grid pattern. The lighting is warm and focused on the man and his work.

1

Background:  
Scientific Impact  
Assessment

# «What gets measured gets done»



- The way we assess the impact of our research influences resource allocation in academia: how much time and money do we spend on the research of which phenomena, and how do we conduct this research?

*Peer-review is "an inherently conservative process ... [that] ... encourages the emergence of **self-serving cliques of reviewers**, who are more likely to review each others' grant proposals and publications favourably than those submitted by researchers from outside the group."*

UK Parliamentary Office of Science and Technology, 2002

Parliamentary Office of Science and Technology

# postnote

September 2002 Number 182

## PEER REVIEW

Peer review (box 1) is the process used to determine how science funding is allocated (£1.6 billion to be distributed by the UK research councils in 2002-03), which research is published and where it is published. It is of interest not only to the scientific community: the trend towards evidence-based policy means that peer-reviewed science informs decision making across an increasingly wide range of areas. In recent years a number of high profile cases have emerged highlighting possible flaws in the peer review process. This briefing note describes how peer review operates, provides an overview of its strengths and weaknesses, and considers what improvements might exist.

**Peer review in the UK**

Peer review is used in the UK for three main purposes:

- Allocation of research funding. The main funding bodies such as the research councils and biomedical charities all use peer review for advice on which research projects should be funded in the first place and to assess the progress of funded projects. An indication of the scale of research spending by such bodies is given in the table below.
- Publication of research in scientific journals. Peer review is used to assess the quality of research submitted for publication and to assess its importance. The process thus influences what science enters the public domain, where it is published and what impact it will have (the more prestigious the journal, the greater the likely impact of the publication).
- Assess the research rating of university departments. Peer review has been used as part of the Research Assessment Exercise (RAE) to judge the quality of research conducted by each department. The results are used to direct the distribution of public funds (£5 billion following the 2001 RAE) to each institute. In addition to the above, peer reviewed science is playing an increasingly influential role in the formulation of UK policy and decision making. The following sections analyse the issues arising from the use of peer review.

**Box 1 What is peer review?**

Peer review is a system whereby research – or a research proposal – is scrutinised by (largely unpaid) independent experts (peers). In general, the process serves a technical function (is the science interesting, important and/or groundbreaking?). The flowchart below gives a brief overview of how the process works to select science for funding and publication, although in practice, there is considerable variation in peer review processes between funding bodies and journals.

**Research expenditure by main funders (2001)**

| Funding body                                                   | £M     |
|----------------------------------------------------------------|--------|
| Engineering and Physical Sciences Research Council (EPSRC)     | 64,77M |
| Medical Research Council (MRC)                                 | 43,88M |
| Biotechnology and Biological Sciences Research Council (BBSRC) | 62,09M |
| Natural Environment Research Council (NERC)                    | 41,97M |
| Particle Physics and Astronomy Research Council (PPARC)        | 62,13M |
| Economic and Social Research Council (ESRC)                    | 68,2M  |
| Arts and Humanities Research Board (AH/RB)                     | 45,1M  |
| The Royal Society                                              | 6,9M   |
| The Wellcome Trust                                             | 25,44M |
| Cancer Research UK                                             | 41,76M |



*" However,  
despite the popularity of this  
measure [Journal Impact Factor], it  
is **slow, narrow, secretive and  
irreproducible**, open to gaming,  
and based on journals, not the  
articles they contain."*

Priem & Hemminger, 2010



# New media provide new opportunities

- As scientists and their audiences adopt new media to share, discuss and evaluate research, new opportunities for impact assessment arise.
- New media are characterized by speed, immediacy, transparency, personalization.

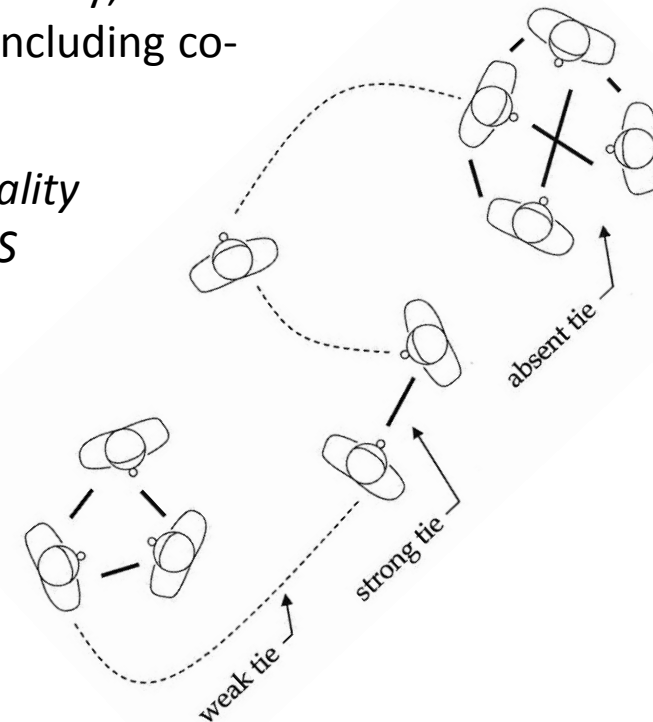


## Example: Altmetrics



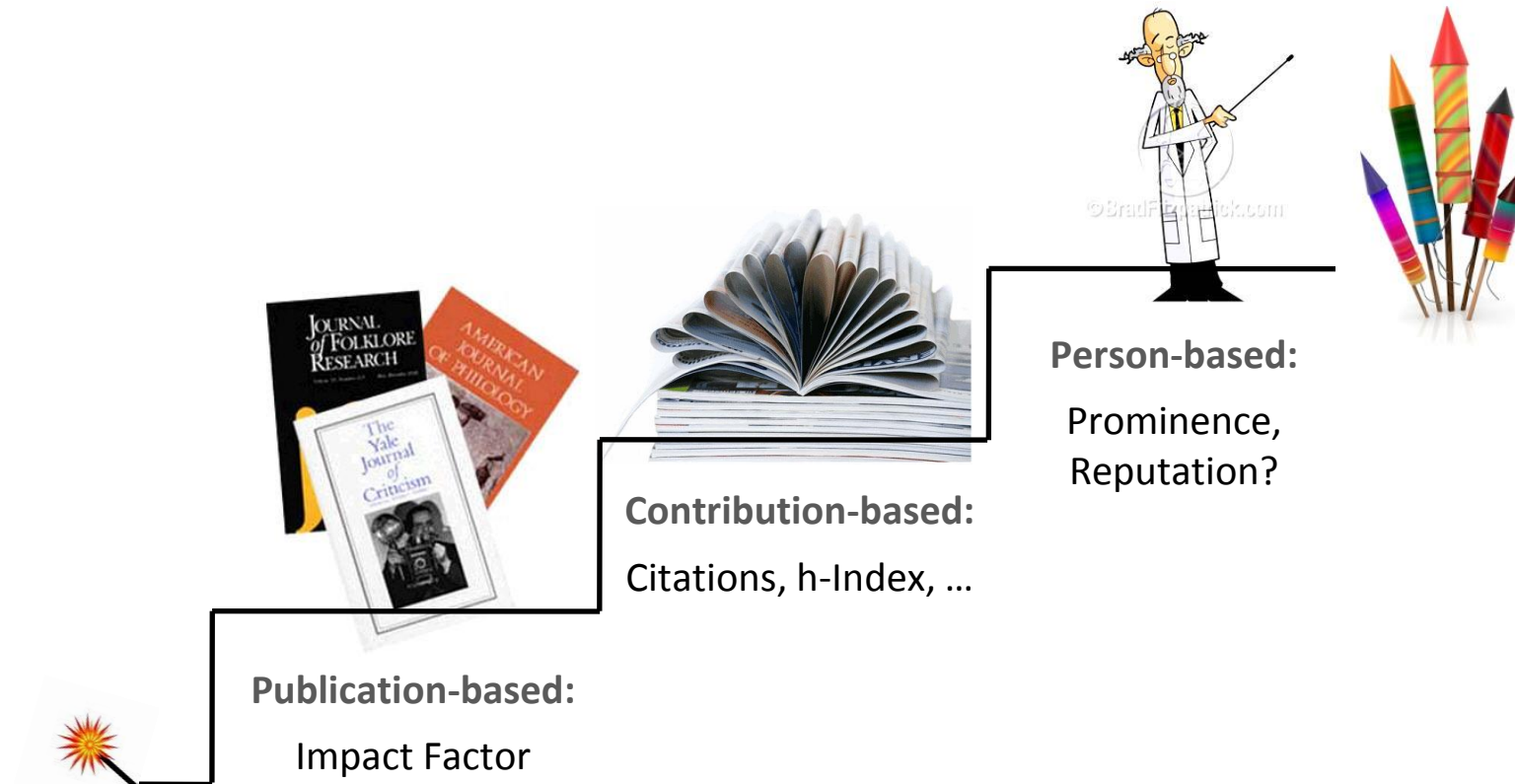
# A structural perspective

- Critics point out that traditional forms of impact assessment (and even altmetrics) overlook the importance of social capital in academia.
- «Members [of invisible colleges] convene meetings; talk to and write other members; battle over claims and theories; exchange drafts, preprints, and reprints of their articles for critical scrutiny; and routinely enter into various forms of collaboration, including co-authorships.» (White, 2011:275)
- RQ: *What is the relationship between network centrality measures derived from the analysis of academic SNS and established measures of scientific impact?*





# Development of Scientific Impact Assessment (?)

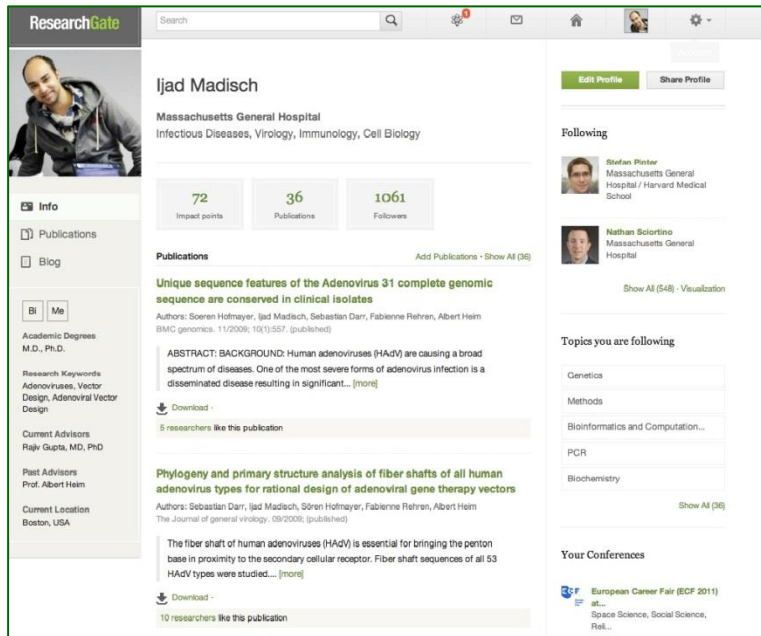




# 2

## Methods: The Research Project

# ResearchGate



- Biggest SNS for scientists with 2.8 million users.
- Based in Berlin, founded in 2008 by virologists Iljad Madisch and Sören Hofmayer and computer scientist Horst Fickenscher.
- More than 30 million publication entries.
- Vivid community, especially popular with young researchers in developing and emerging countries.

# Sample

- 55 colleagues from the business department of our university signed up for the pilot project.
- Wide range of academic positions; from twelve independent organizations (institutes) covering various fields of research, such as media and communications, technology management, pedagogy, IS or marketing.
- 50 percent doctoral students/research associates, 30 percent post-docs/junior/assistant professors, 20 percent full professors.
- Data collected between Sep 2012 and Feb 2013.



# Measures

## Seniority

doctoral students (1), post-docs and project managers without professorship (2), junior/assistant professors (3), and full professors (4)

## Publication success:

h-index (ISI Web of Knowledge, complemented by Google Scholar)

## Publication resonance (RG):

weighted index of #publication views, #downloads, #upvoted publications, #bookmarked publications

## Network centrality (RG):

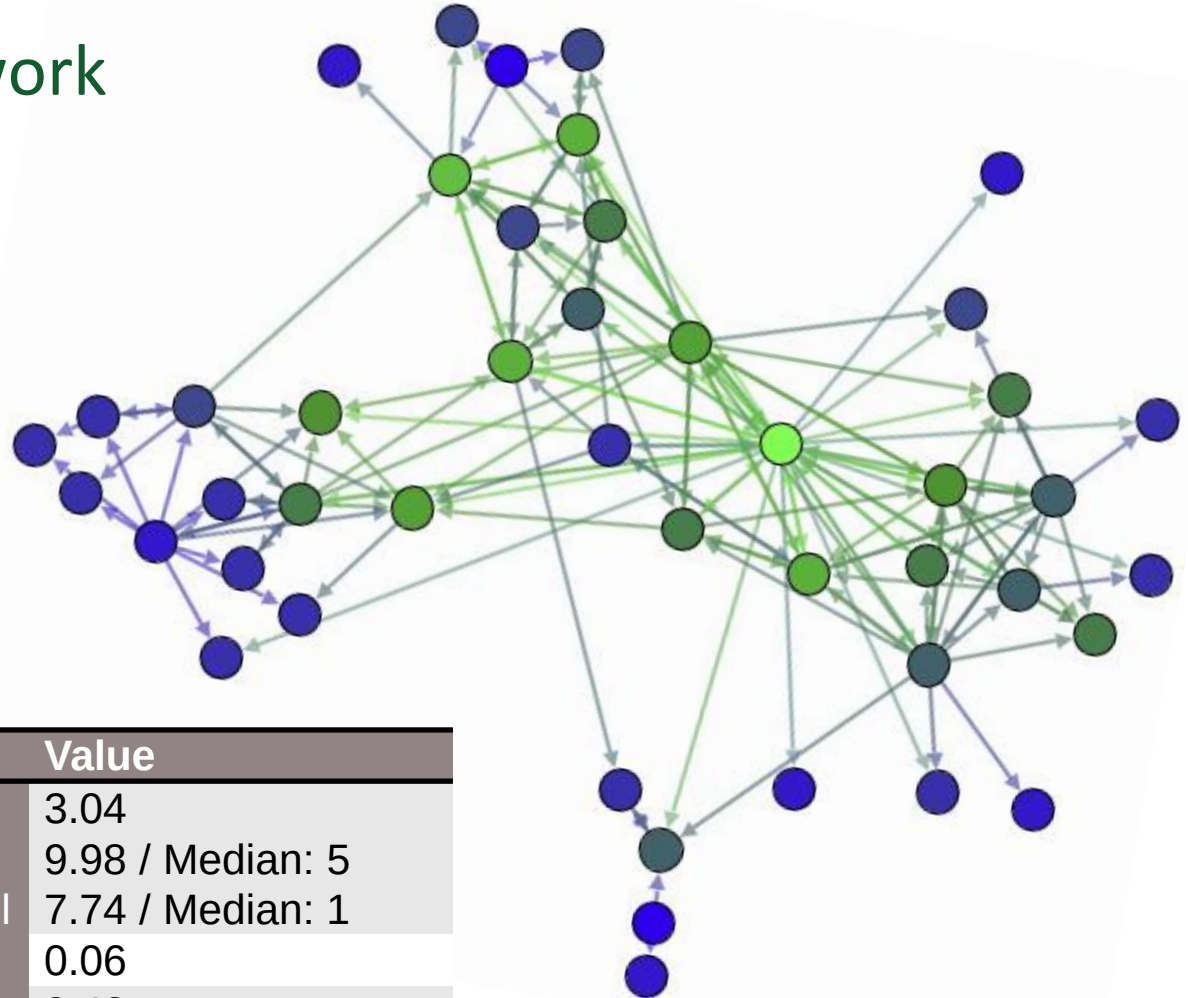
(in)degree centrality (sample and network), Freeman's closeness/farness centrality, betweenness centrality and eigenvector centrality

## Online activity (RG):

normalized index of #uploaded fulltext publications, #followings, #questions, #answers

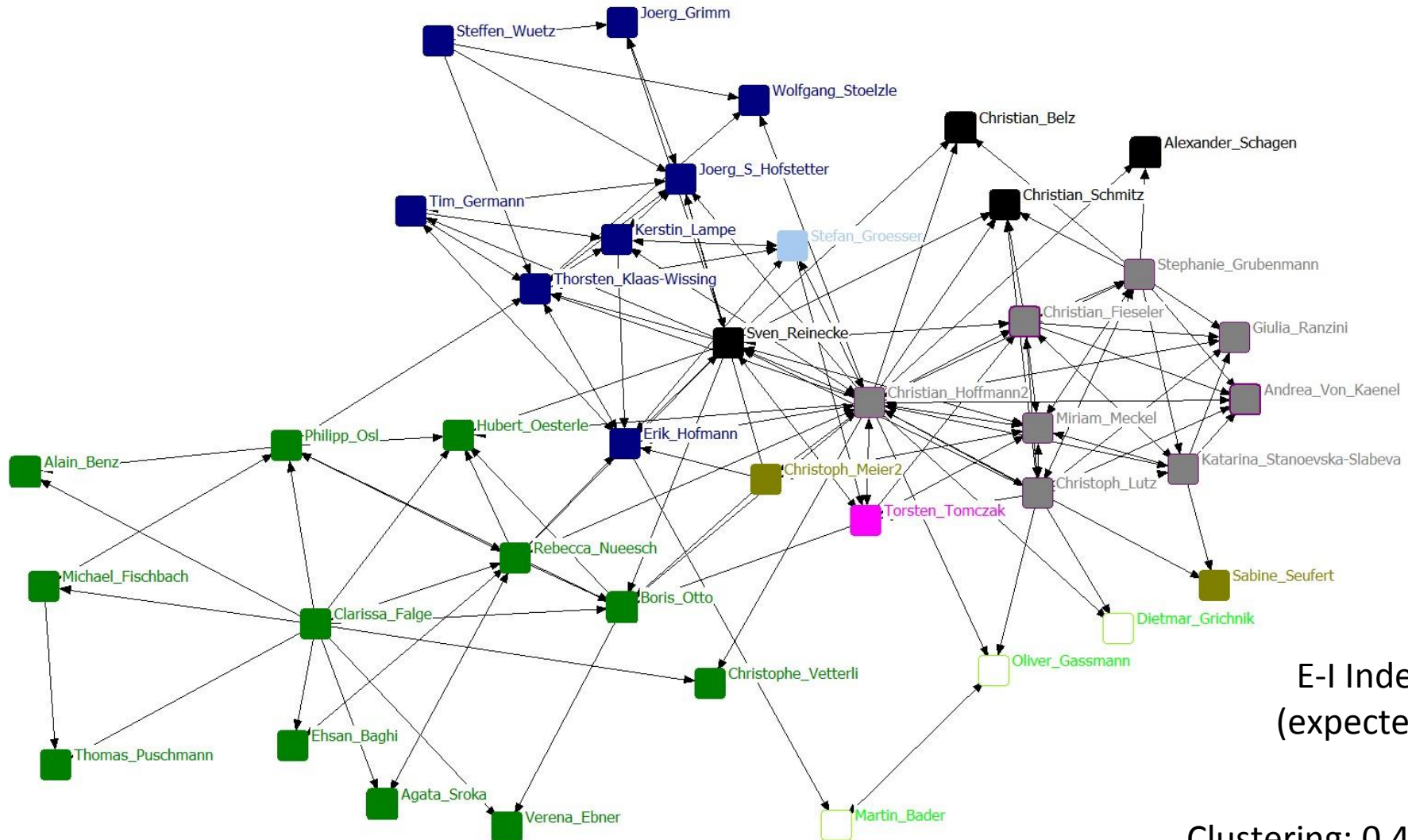


# The Sample Network



| Measure                              | Value                  |
|--------------------------------------|------------------------|
| Average Degree Sample                | 3.04                   |
| Average and Median Indegree Overall  | 9.98 / Median: 5       |
| Average and Median Outdegree Overall | 7.74 / Median: 1       |
| Density                              | 0.06                   |
| Clustering Coefficient               | 0.48                   |
| E-I Index fore Institute Membership  | -0.08 (expected: 0.69) |
| Average Distance                     | 2.43                   |
| Diameter                             | 6                      |
| Isolates                             | 10                     |

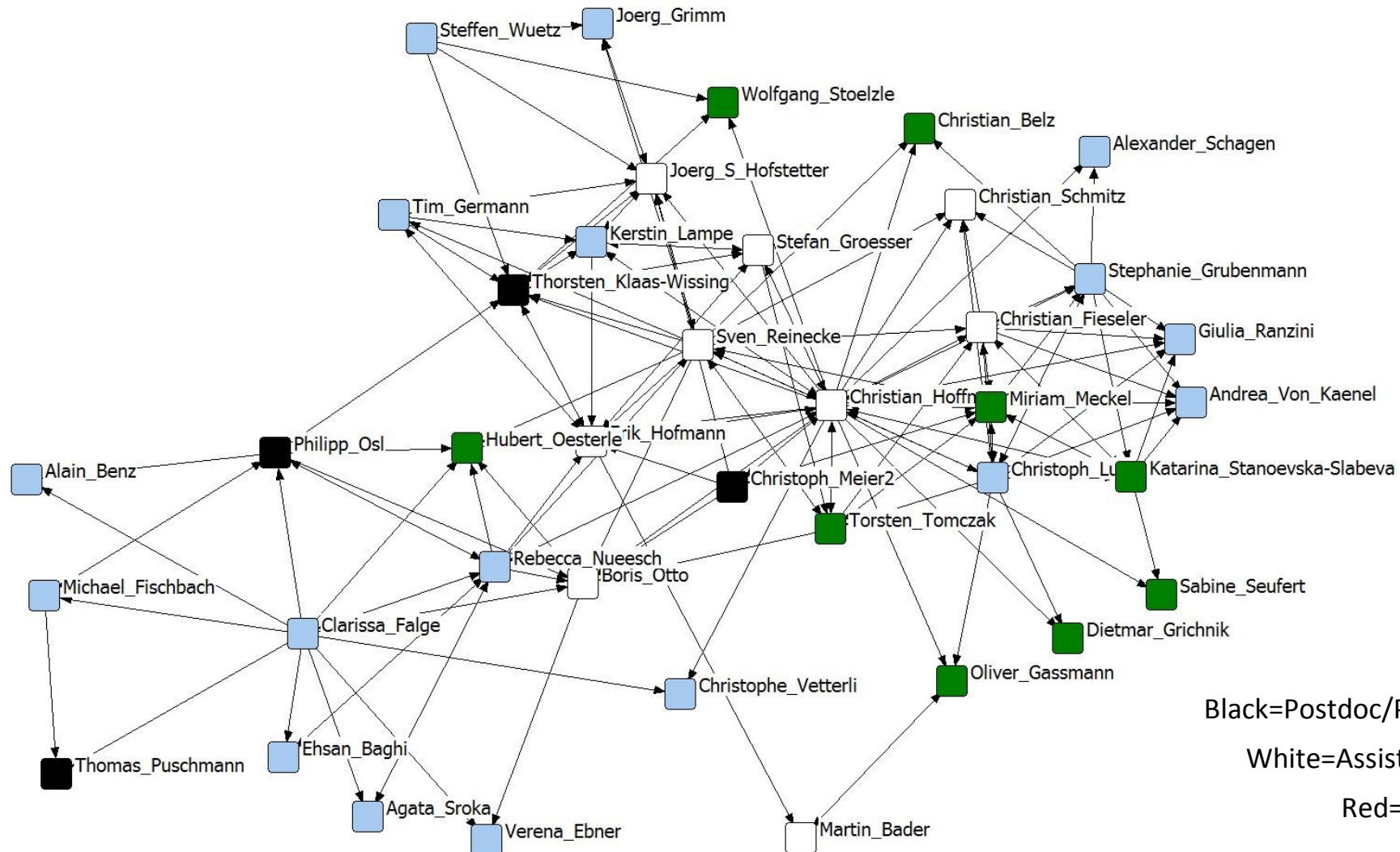
# Network and Institute Membership



E-I Index: -0.08  
(expected: 0.69)

Clustering: 0.48 (0.27)

# Network and Institute Membership



# Correlation Analysis

|                                       | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      |
|---------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| <b>Activity (RG) (1)</b>              | .64*** | .54*** | .35*** | .59*** | .55*** | n. s.  | n. s.  | n. s.  |
| <b>Centrality (RG)</b>                |        |        |        |        |        |        |        |        |
| <b>Overall Indegree (2)</b>           |        | .79*** | .56*** | .44*** | .74*** | .48*** | .51*** | .53*** |
| <b>Sample Indegree (3)</b>            |        |        | .71*** | .61*** | .94*** | .30*   | n. s.  | .36*** |
| <b>Closeness (4)</b>                  |        |        |        | n. s.  | .71*** | .39**  | n. s.  | .44*** |
| <b>Betweenness (5)</b>                |        |        |        |        | .49*** | n. s.  | n. s.  | n. s.  |
| <b>Eigenvector (6)</b>                |        |        |        |        |        | .33*   | n. s.  | .42*** |
| <b>Publication Resonance (RG) (7)</b> |        |        |        |        |        |        | .65*** | .79*** |
| <b>Publication Success (8)</b>        |        |        |        |        |        |        |        | .54*** |
| <b>Seniority (9)</b>                  |        |        |        |        |        |        |        |        |

# Summary & Conclusion

- Only activity correlates with network centrality: engagement and prominence go hand in hand. No correlation with publication success or resonance.
- Publication resonance correlates with publication success and seniority (altmetrics argument).
- Seniority correlates with centrality (except betweenness): social capital.
- Only overall indegree centrality correlates with publication success.
- Betweenness centrality a more “junior” phenomenon.







**Thank you for your attention!**

# Welche Impact-Masse bietet die Netzwerkanalyse?



- **Indegree:** Anzahl Follower/Freunde, «Prominenz»
- **Betweenness:** Brückenfunktion / Verbindung verschiedener Cluster, «Kooperation»
- **Closeness:** Nähe zu anderen Mitgliedern, «Zentralität»
- **Eigenvector:** Verbindungen erster und zweiter Ordnung, «Einfluss»