



AIMinScience 2020

1st International Workshop on Assessing Impact and Merit in Science

Lyon, France / August 25, 2020

Co-located with TPD, ADBIS, and EDA

Beyond the impact factor: possibilities of scientometrics to understand science and society

Rodrigo Costas

Centre for Science and Technology Studies (CWTS-Leiden University),
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Stellenbosch University), South Africa



Universiteit
Leiden

25 August 2020



Outline

- Scientometrics as data science
- Scientometrics to understand science...
- ... and society
 - Altmetrics and social media metrics



Scientometrics as a branch of Data Science

- “Data science is a multi-disciplinary field that uses scientific methods, processes, algorithms and systems to extract knowledge and insights from structured and unstructured data” (Wikipedia)
- **Scientometric data sources and applications** conform a powerful approach to analyzing: scientific dynamics, trends, activities, interactions, impacts, etc. of multiple scholarly (and non-scholarly) actors through ‘**traces**’ recorded in scientific publications (and indexed in global bibliographic scientific databases)

Why Scientometrics?

A bibliographic record from any scientometric database is a rich source of **multiple ‘traces’ of information**, all of them with diverse analytical possibilities.

Let's see an example from the Web of Science...

What do university rankings by fields rank? Exploring discrepancies between the organizational structure of universities and bibliometric classifications

By: Robinson-García, N (Robinson-García, Nicolas)^{1,2}; Calero-Medina, C (Calero-Medina, Clara)^{2,1}
View Web of Science ResearcherID and ORCID

SCIENTOMETRICS

Volume: 98 Issue: 3 Pages: 1955-1970
DOI: 10.1007/s11192-013-1157-7
Published: MAR 2014
Document Type: Article
View Journal Impact

Abstract

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KeyWords Plus: JOURNAL PUBLICATION PROFILE; SPANISH UNIVERSITIES; NETWORK ANALYSIS

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Close funding text

Thanks are due to the two anonymous referees for their constructive suggestions. The authors would also like to thank Thed N. van Leeuwen and Daniel Torres-Salinas for their helpful comments on previous versions of this paper. Nicolas Robinson-García is currently supported by a FPU Grant from the Spanish Ministerio de Economía y Competitividad.

Publisher

SPRINGER, VAN GODEWIJCKSTRAAT 30, 3311 GZ DORDRECHT, NETHERLANDS

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Web of Science Categories: Computer Science, Interdisciplinary Applications; Information Science & Library Science

Document Information

Language: English
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eISSN: 1588-2861



Textual/semantic data (topics, ideas, keywords, classifications)

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Actors (authors, institutions, countries, journals, Funders)

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Other factors: time, types of outputs, informal relationships, languages, Open Access

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Impact and interactions

Citation Network

In Web of Science Core Collection

8

Times Cited

 Create Citation Alert

All Times Cited Counts

8 in All Databases

See more counts

26

Cited References

View Related Records

JOURNAL ARTICLE PDF AVAILABLE

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Robinson-García N, Calero-Medina C

Scientometrics (2014) 98(3) 1955-1970

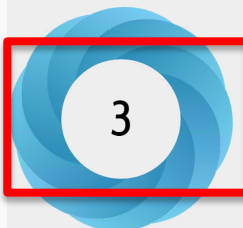
DOI: 10.1007/s11192-013-1157-7

9
Citations

46
Readers

What do university rankings by fields rank? Exploring discrepancies between the organizational structure of universities and bibliometric classifications

Overview of attention for article published in *Scientometrics*, October 2013




 About this Attention Score

SUMMARY

Twitter

Dimensions citations

 So far, Altmetric has seen 5 tweets from 5 users, with an upper bound of 3,686 followers.



Gilbert Meyns

@GMeyns

489

FOLLOWERS

RT @SusanasGil: What do university rankings by fields rank? Exploring discrepancies between the organizational....<http://t.co/tjRxhjv5B>

06 Mar 2016

 Reply  Retweet  Favourite



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
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Beyond the Journal Impact Factor (or h-index)

Scientometrics

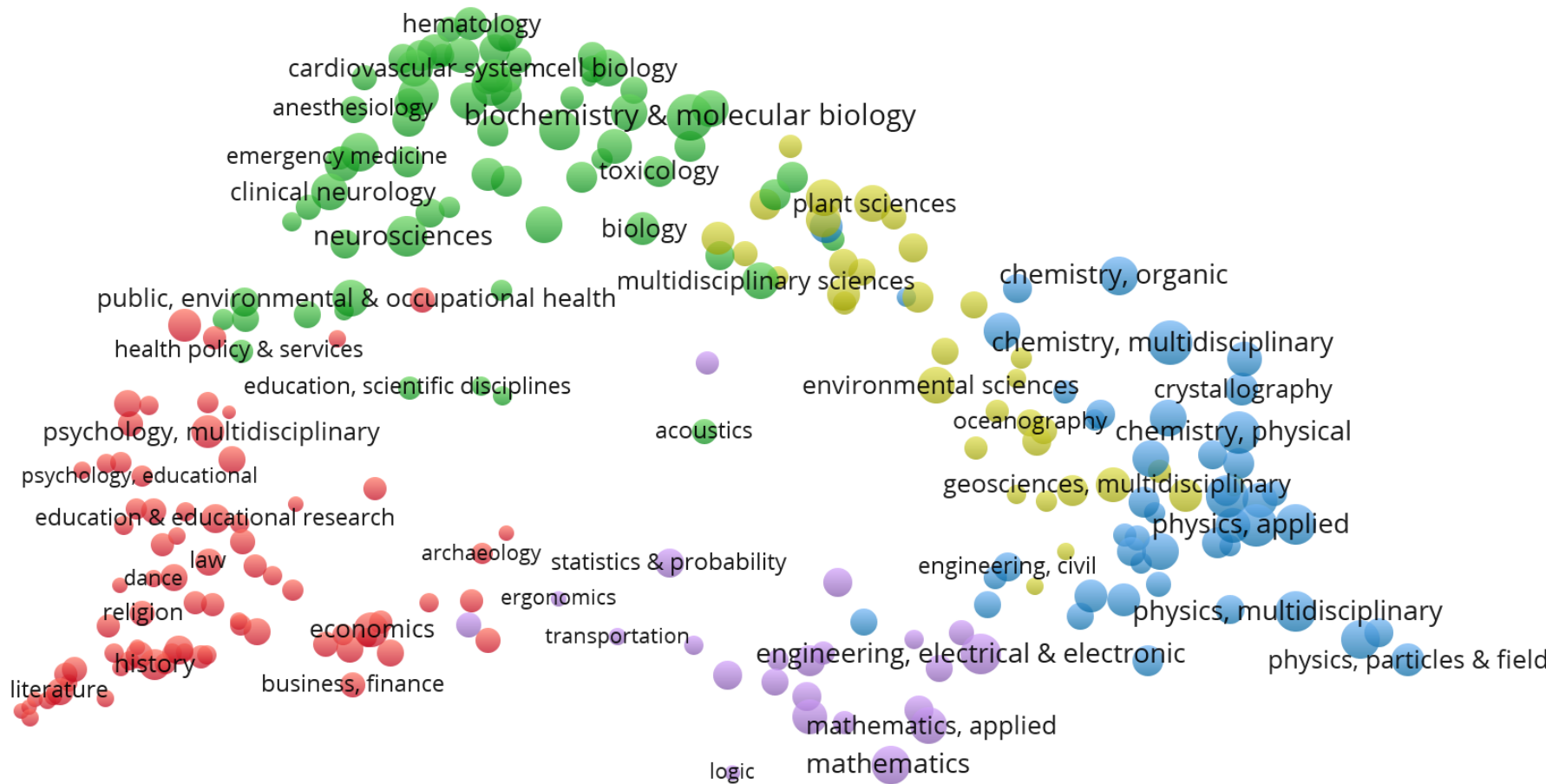
- Science of science
 - Maps of science
- Research management
 - Workforce indicators
 - Mobility of scholars

Altmetrics

- Science communication
 - Social media landscapes
- Societal interactions
 - Heterogeneous couplings



Maps of science



(advanced) Maps of Science

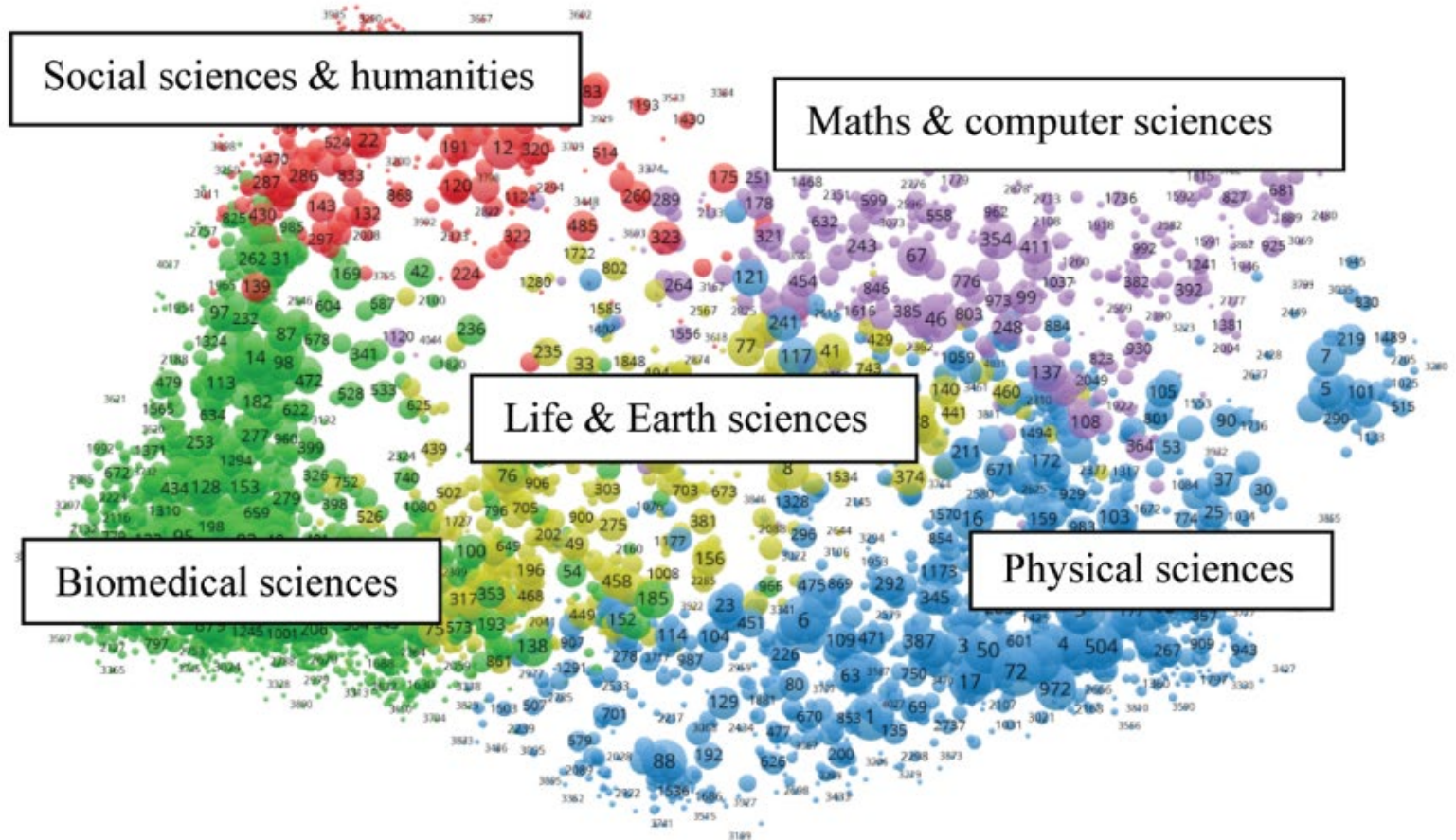


Figure 1. Landscape of science (data: Web of Science 2000–2017). Circles represent clusters of publication (areas), size represents relative volume (numbers of publications), color represents main fields, disciplines.



Research management: Workforce analysis

- 2008 onwards: author-affiliation linkage in Web of Science publications

Is Scientific Literature Subject to a 'Sell-By-Date'? A General Methodology to Analyze the 'Durability' of Scientific Documents

By: **Costas, R** (Costas, Rodrigo)^[1]; van Leeuwen, TN (van Leeuwen, Thed N.)^[1]; van Raan, AFJ (van Raan, Anthony F. J.)^[1]

JOURNAL OF THE AMERICAN SOCIETY FOR INFORMATION SCIENCE AND TECHNOLOGY

Volume: 61 Issue: 2 Pages: 329-339

DOI: 10.1002/asi.21274

Published: FEB 2010

[View Journal Information](#)

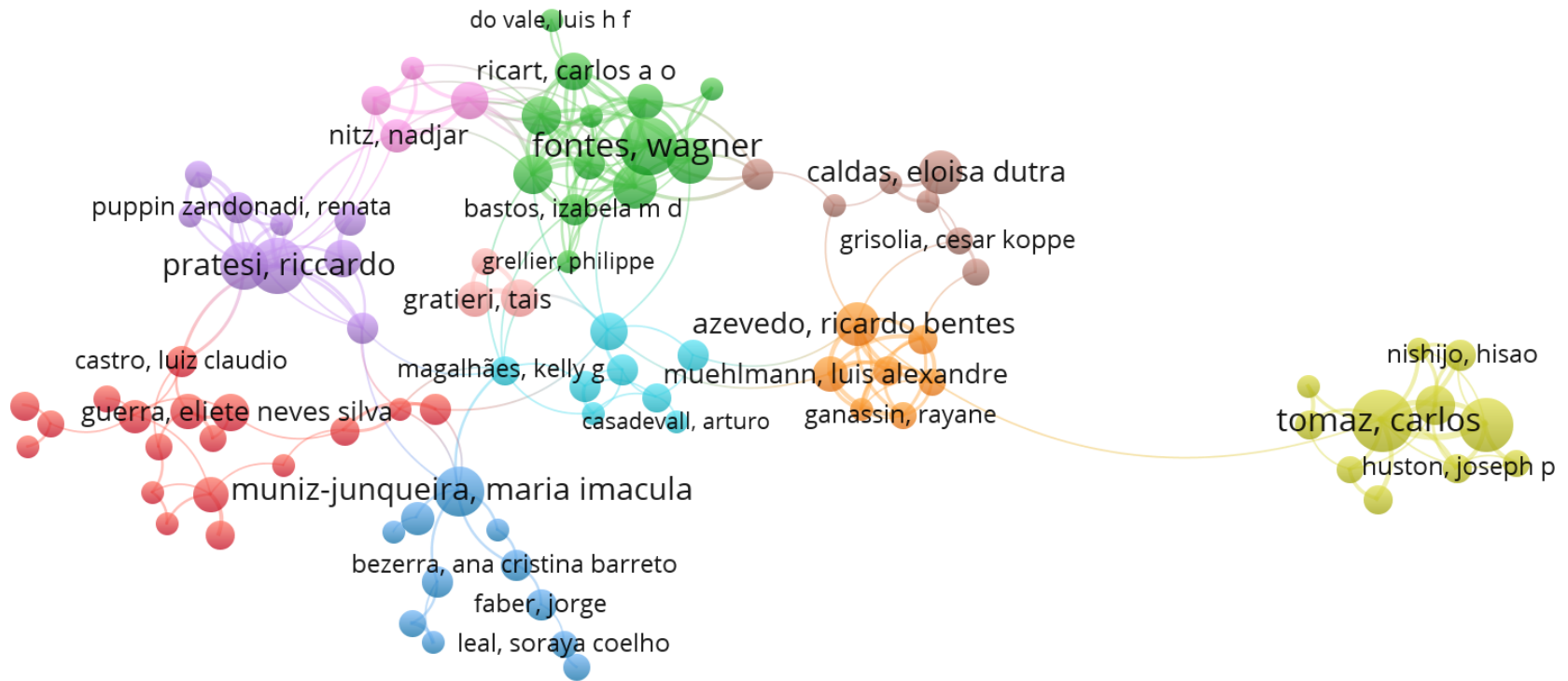
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Collaboration networks (selected scholars from UnB – Europe PMC, VOSviewer)



Mobility analysis

2008 onwards: author-affiliation linkage in WoS publications

Is g-index better than h-index? An exploratory study at the individual level

By: **Costas, R** (Costas, Rodrigo)^[1]; Bordons, M (Bordons, Maria)^[1]

SCIENTOMETRICS

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Conceptualizing mobility

NOT MOBILE



MIGRANT



TRAVELER



NON DIRECTIONAL

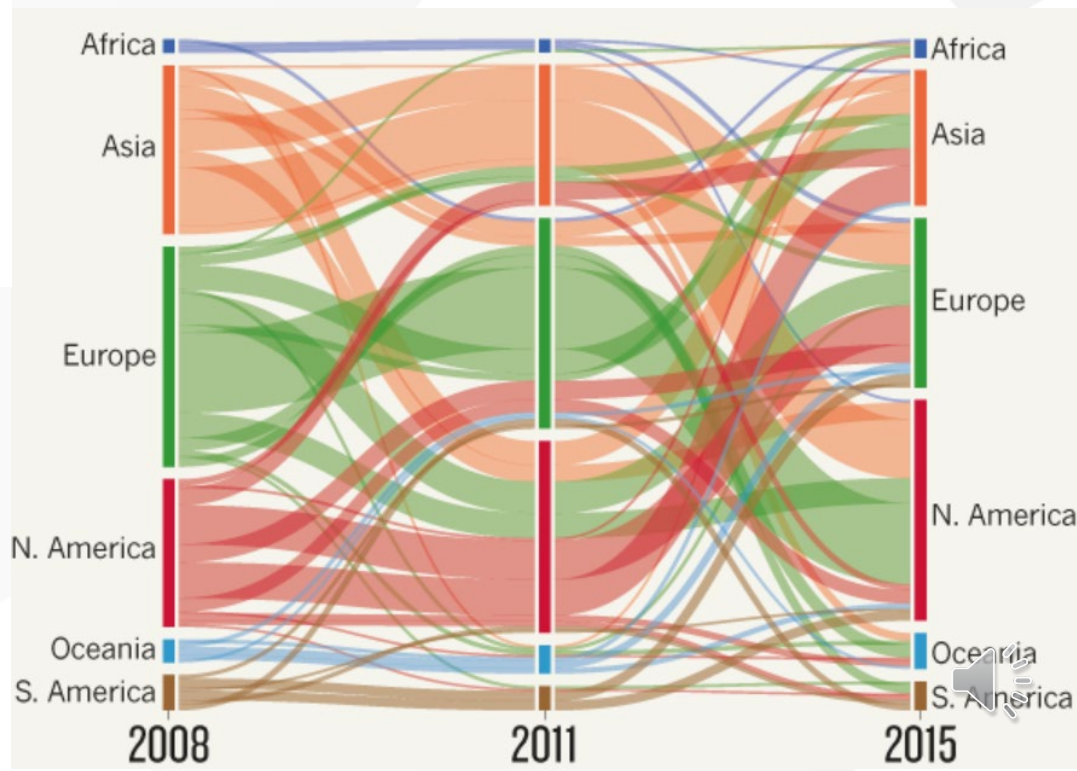
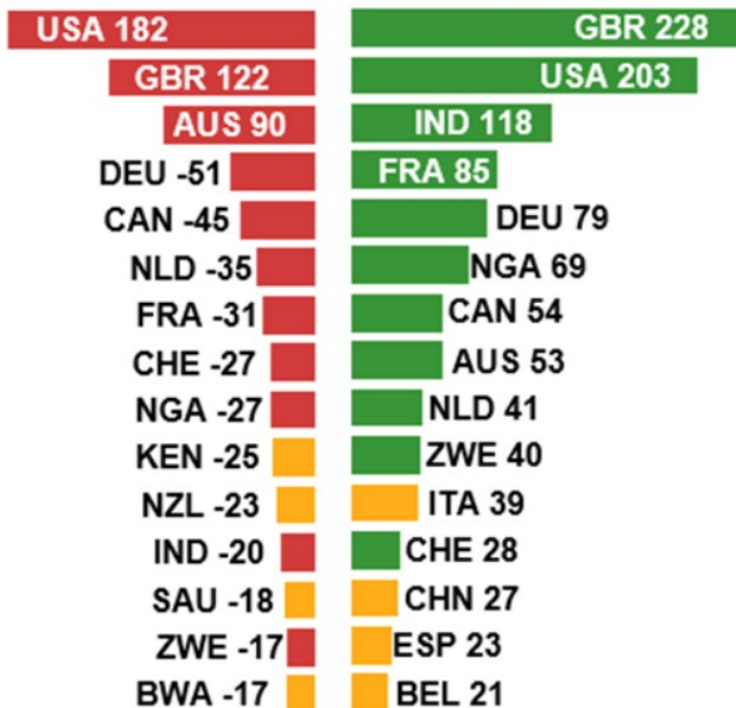


Mobility analytics – flows, profiles, networks

F) SOUTH AFRICA

Emigrating to

Immigrating from



Altmetrics & Social media metrics

What are altmetrics & social media metrics?

- Altmetrics Manifesto (2010) (<http://altmetrics.org/manifesto/>)
- *Difficult to define:*
 - Working definition: *events on social and mainstream media platforms related to scholarly content or scholars [...] and are not the same as [...] citations* (Haustein, Bowman, Costas, 2015)
 - Heterogeneity!



- Main challenge: **what do they mean?**



How does it look like in real life?

Presumed Asymptomatic Carrier Transmission of COVID-19

Overview of attention for article published in JAMA: Journal of the American Medical Association, February 2020



About this Attention Score

In the top 5% of all research outputs scored by Altmetric

Mentioned by

- 94 news outlets
- 6 blogs
- 3126 tweeters
- 11 Facebook pages
- 1 Wikipedia page
- 4 Redditors
- 1 video uploader

Citations

- 7 Dimensions

SUMMARY

- News
- Blogs
- Twitter
- Facebook
- Wikipedia
- Reddit
- Video
- Dimensions citations

So far, Altmetric has seen 3501 tweets from 3126 users, with an upper bound of 9,522,745 followers.

Showing items 1-100

1 2 3 4 5 6 7 8 9 ... 35 36

Amy B #resist @brownberry1717

RT @AbraarKaran: 7/ Expanding on this, these studies showed that you indeed can still *spread* it without any symptoms at all - @JAMA_curre...

06:04PM

Richard G. Clegg @richardclegg

@bayvel_p Asymptomatic carriers still shed the virus and can infect others. <https://t.co/TFXu85e77h>

02:19PM

Kathi McGraw @kathimcgraw

@replouiegohmert <https://t.co/KVAmQsgev5> Oh wait, I forgot, he doesn't have symptoms so he's fine - what if you're an asymptomatic carrier and you're spreading the virus. The pinnacle of irresponsibility, especially given that your state is in the top five

RTEK WOLF @RTEK777

@emtee2355 @TrumpGirlOnFire @SenRonJohnson <https://t.co/Mxwvj4jOda> <https://t.co/88tXHgpS8O>

05:22PM

Silvia Ivani @Silvinalv

RT @Tamer_Nawar: . @RIVM takes it as certain that people who do not have symptoms cannot transmit, but there is strong evidence against thi...

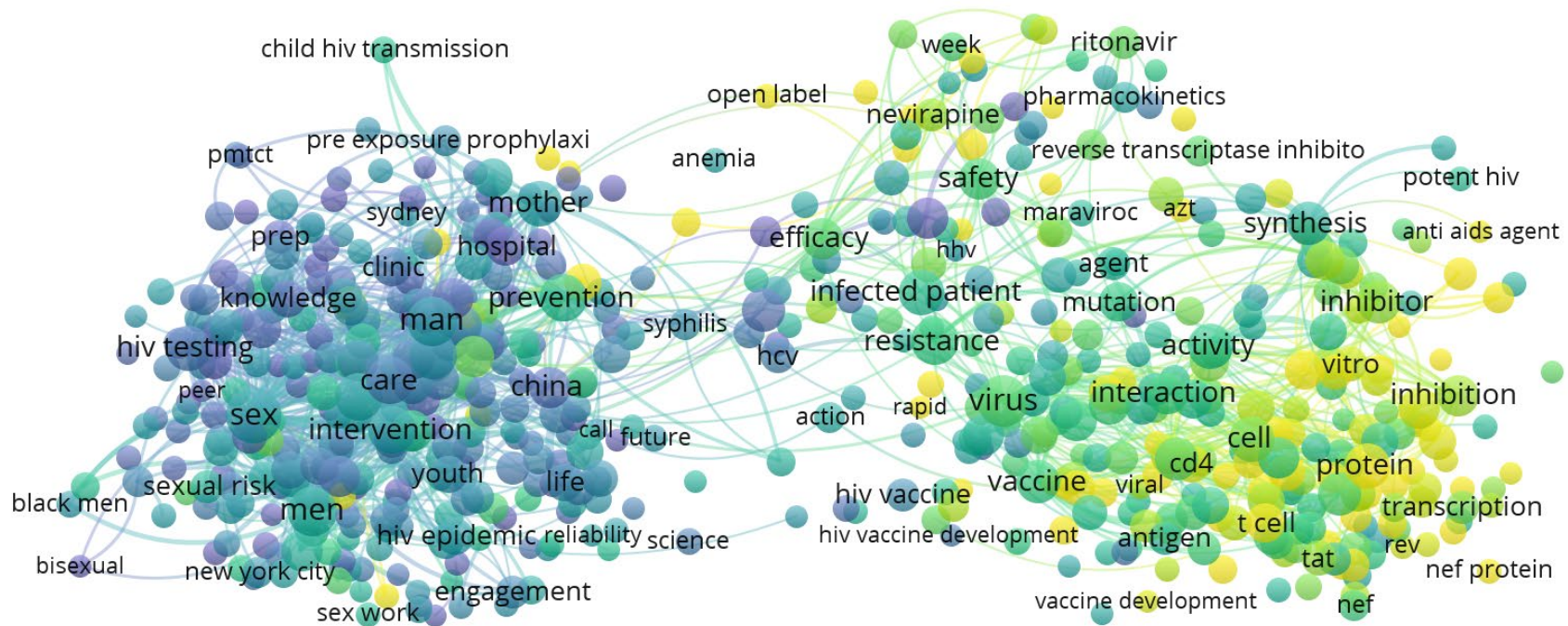
01:24PM

Anckarström, Esq. MASEPS @ibnkafka

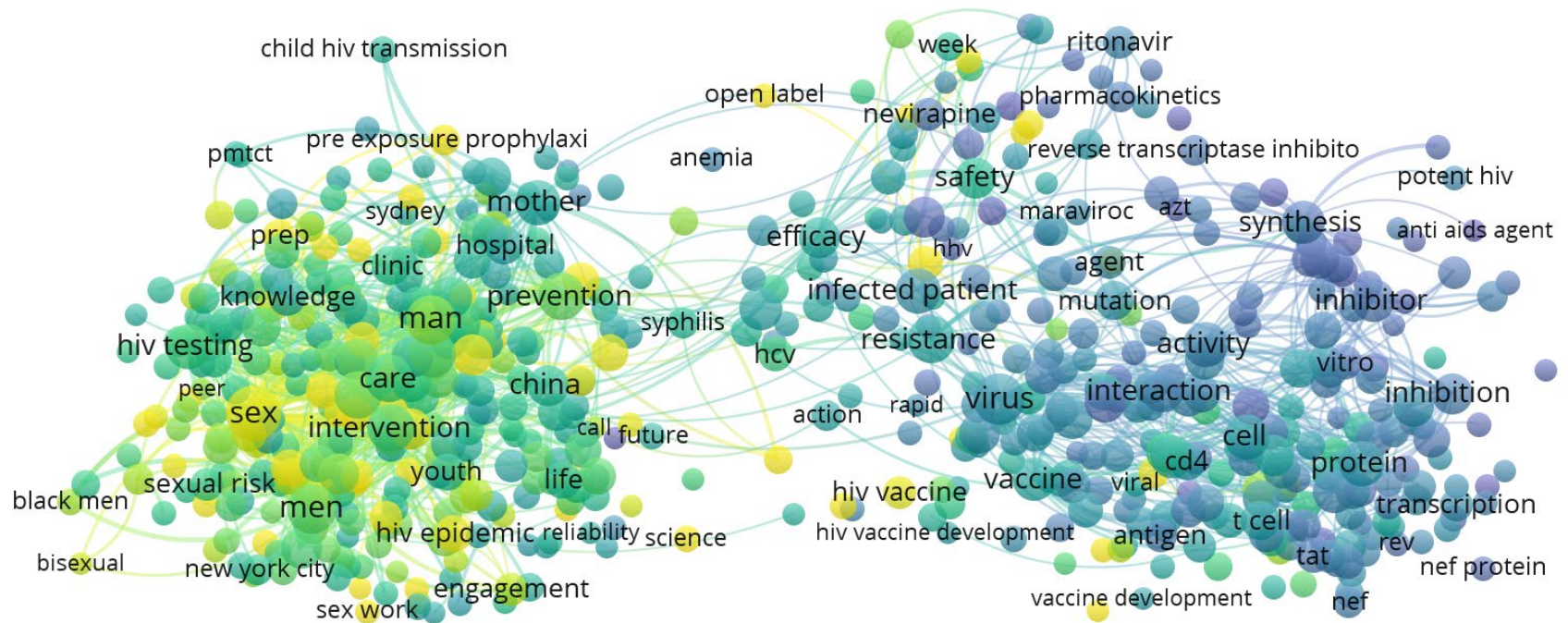
RT @Tamer_Nawar: In fact, viral load at early stage is high and so presymptomatic transmission is major problem <https://t.co/TNepgpjWUA> ht...

12:55PM

Altmetric landscapes: HIV research [Dimensions] – VOSviewer (citations)

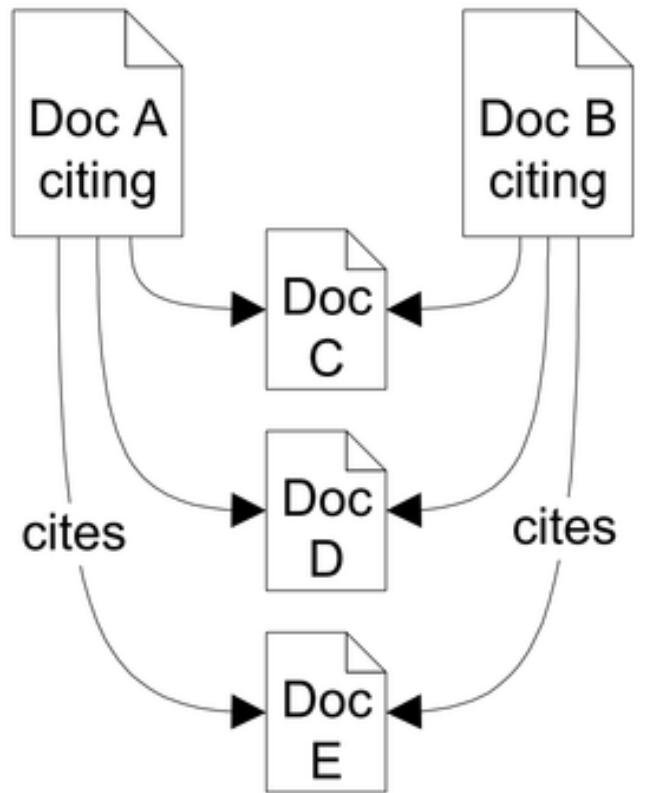


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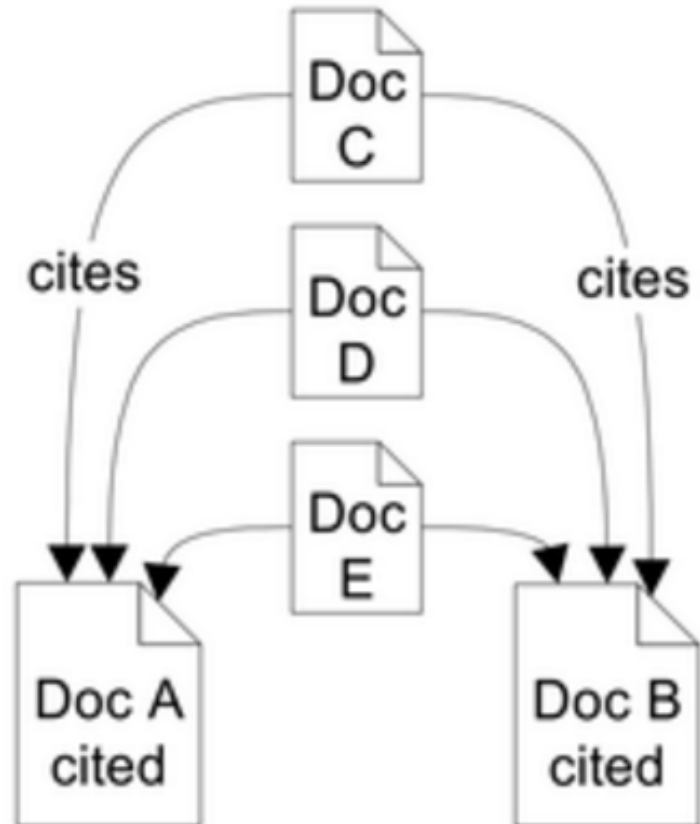


Towards the conceptualization of 'heterogeneous couplings'

Bibliographic coupling
(co-linking)*

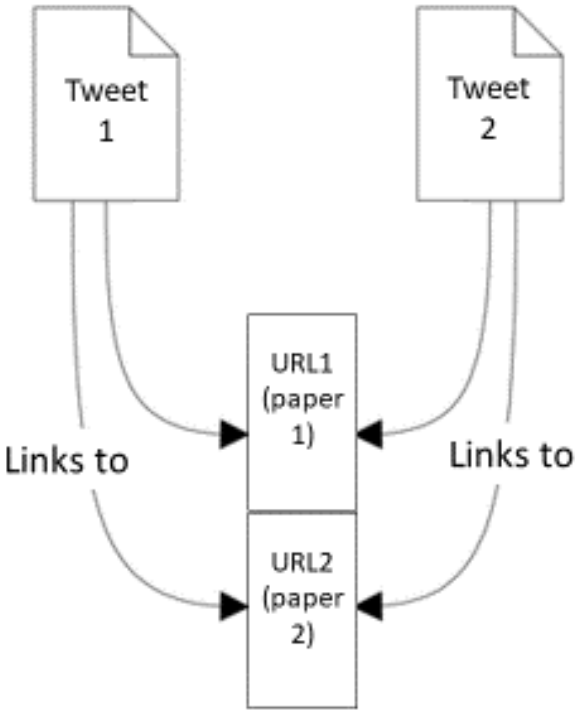


Co-citation (Boyack & Klavans, 2010)
(co-linked)*

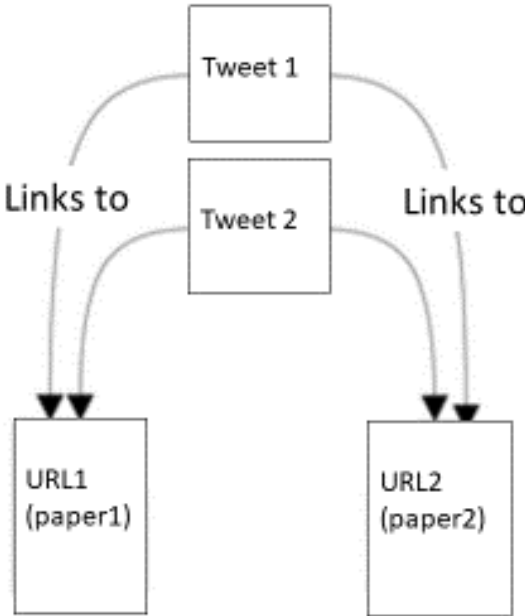


Heterogeneous couplings on Twitter – tweets

Tweet coupling

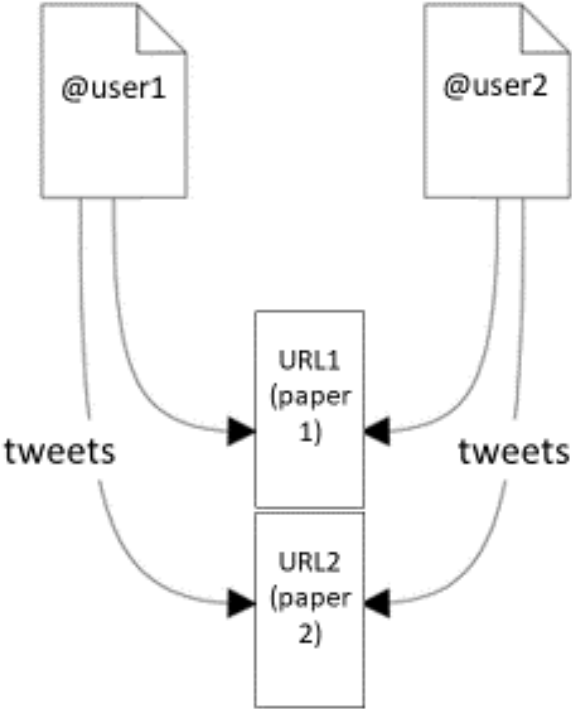


Co-tweet linked

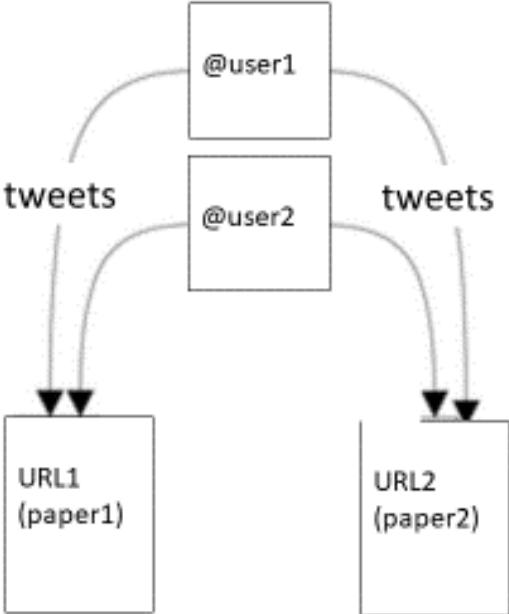


Heterogeneous couplings on Twitter – tweeter

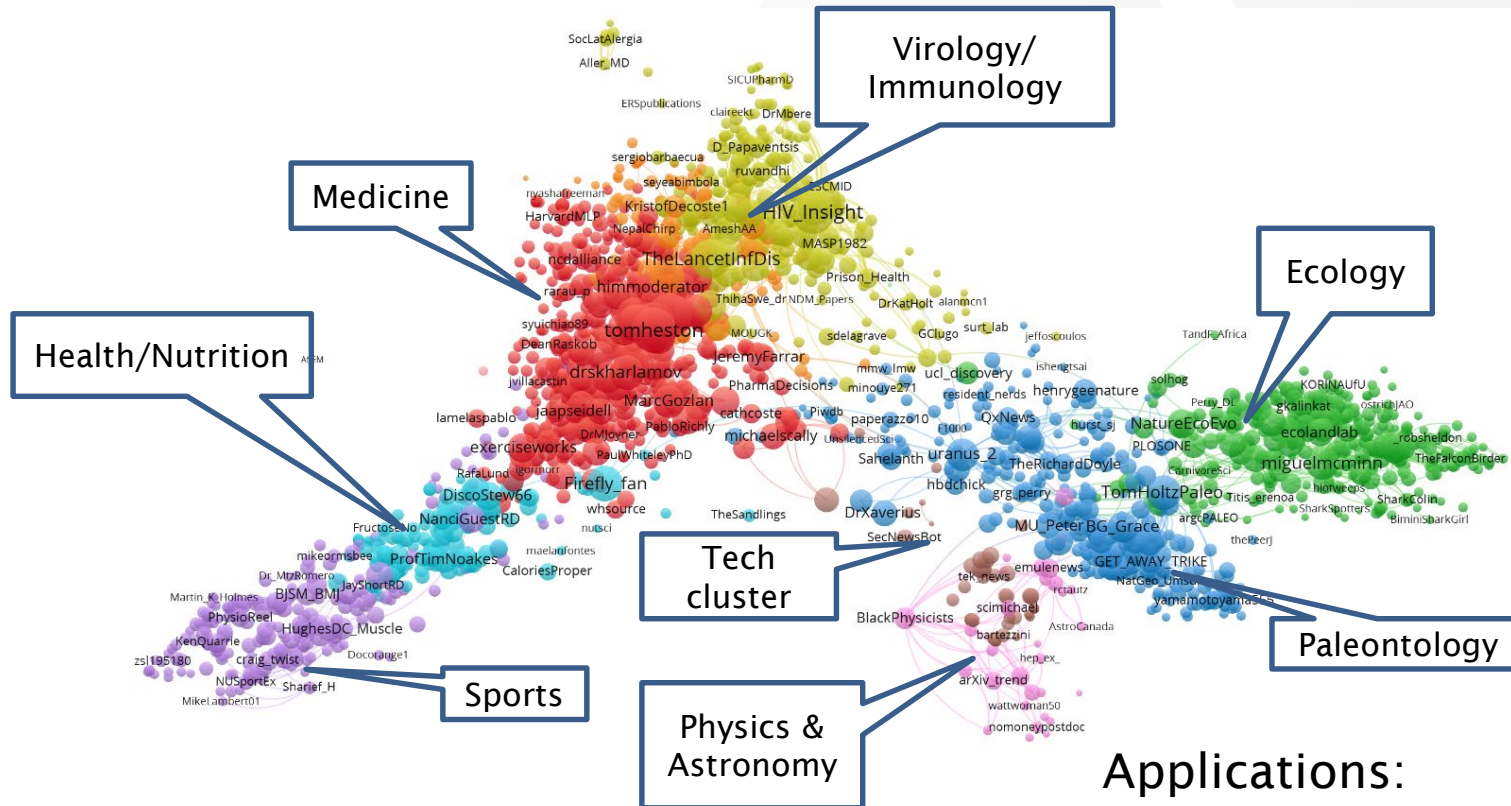
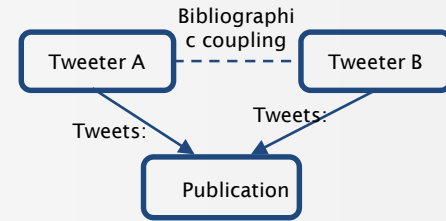
Tweeter coupling



Co-tweeter linked



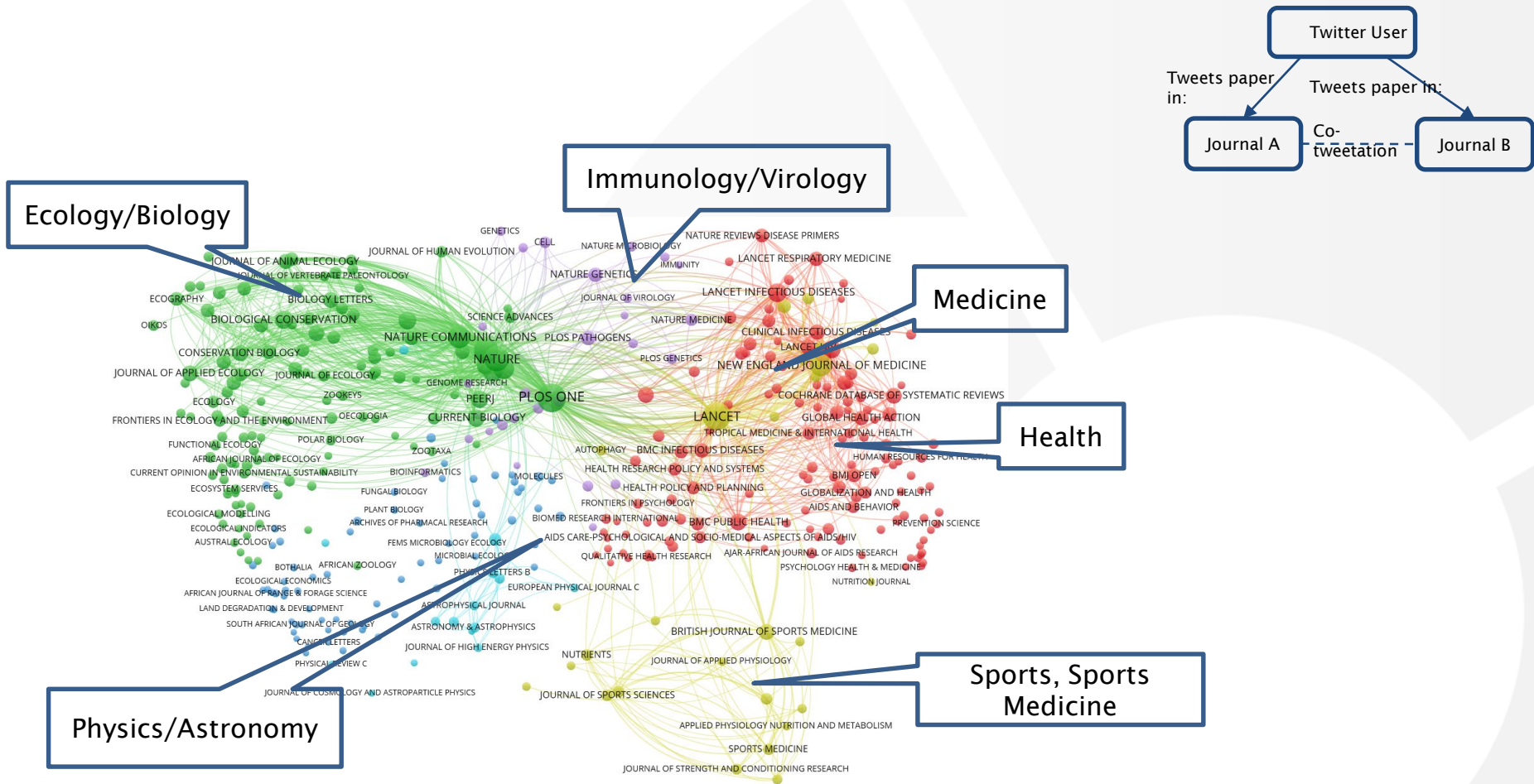
Tweeter coupling based on ZA-research (Community of attention)



Applications:

- Communities of attention
- Diversity of audiences
- Identification of stakeholders
- Cognitive bridges

Co-tweeter linkage of journals based on ZA-research



VOSviewer

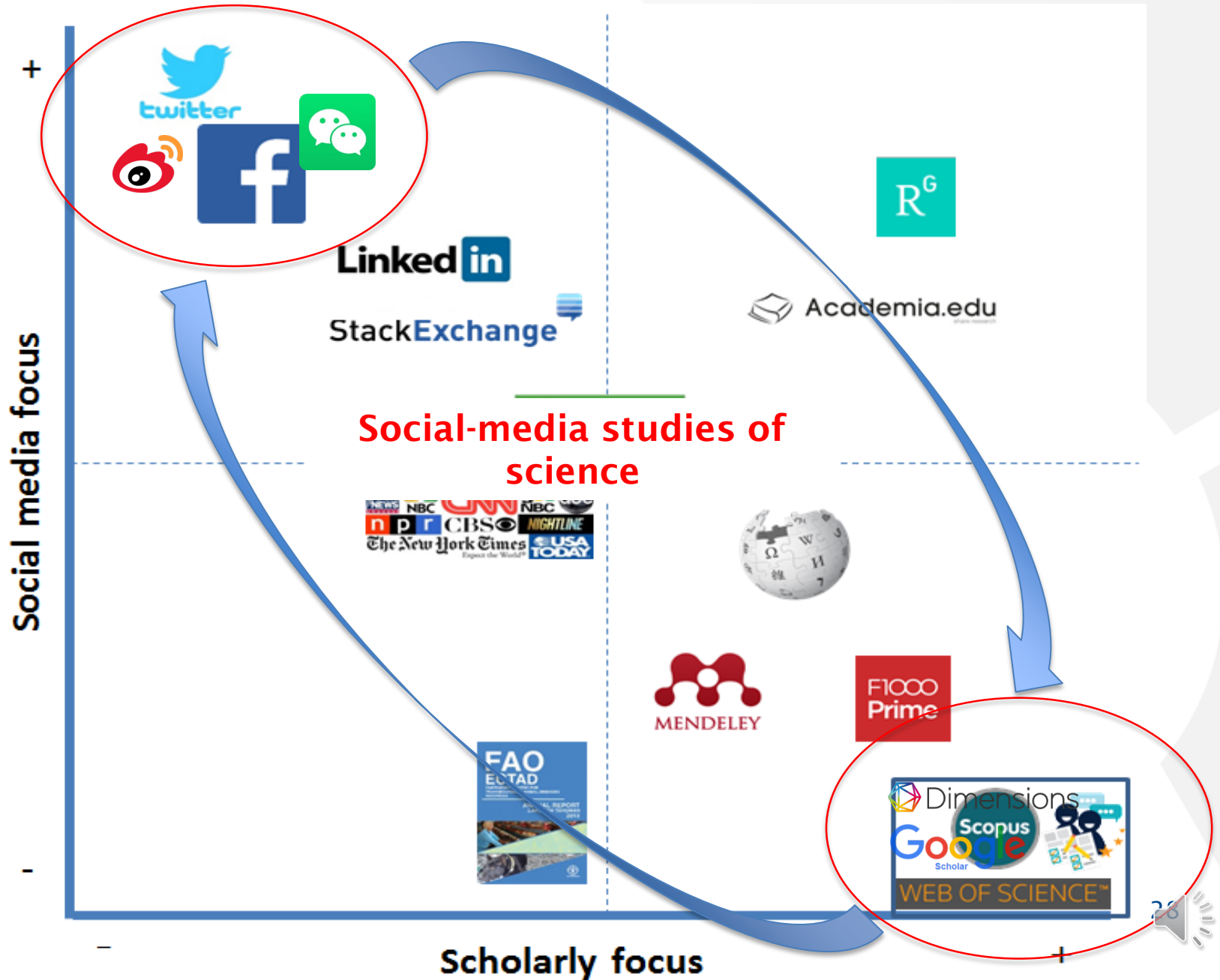


Applications:

- New maps of science
- *Societal* clusters of publications/topics
- Cognitive gaps
- Misinformation



The future



Thank you very much