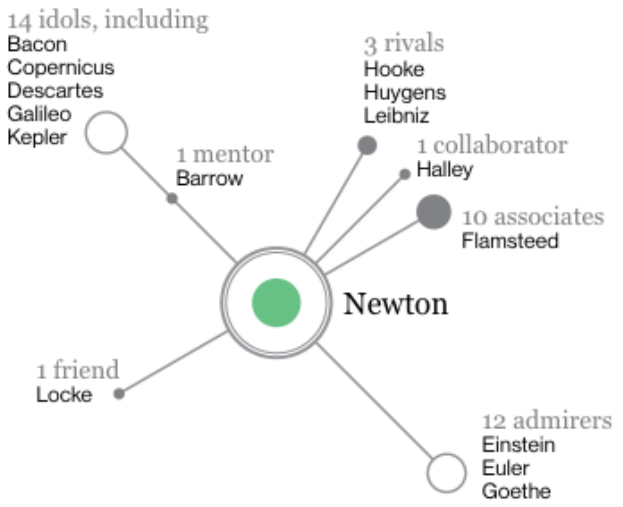
Networking and Performance

江彥生

The social making of geniuses

Social Networks of Genius

Lone geniuses are exceedingly rare. Dean Keith Simonton scoured biographical dictionaries for mentions of relationships among 2,026 scientists and 772 artists. He found that members of each field created within a web of connections, as shown below for Isaac Newton and Michelangelo.

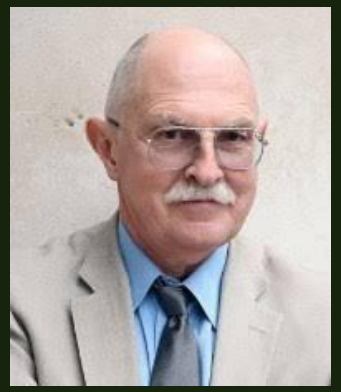


According to the poet William Wordsworth, Isaac Newton was "a mind for ever Voyaging through strange seas of Thought, alone." But Newton knew the leading scientists in Europe. He read their work, and they read his. In a letter Newton wrote, "If I have seen further it is by standing on the shoulders of Giants."

With help from his father, Michelangelo landed an apprenticeship with Domenico Ghirlandaio, a Florentine painter. The teacher soon sent his gifted student to work in Lorenzo de' Medici's sculpture garden. That break immersed Michelangelo in some of the world's greatest art—and its deepest pockets.

Source: DEAN KEITH SIMONTON, PROFESSOR EMERITUS, UNIVERSITY OF CALIFORNIA, DAVIS
PORTRAIT PHOTOS: PAUL D. STEWART, SCIENCE SOURCE (NEWTON); SCALA/ART RESOURCE, NY (MICHELANGELO)

The social networks of philosophers



Randal Collins

The Sociology of Philosophies

(2000) Harvard University Press

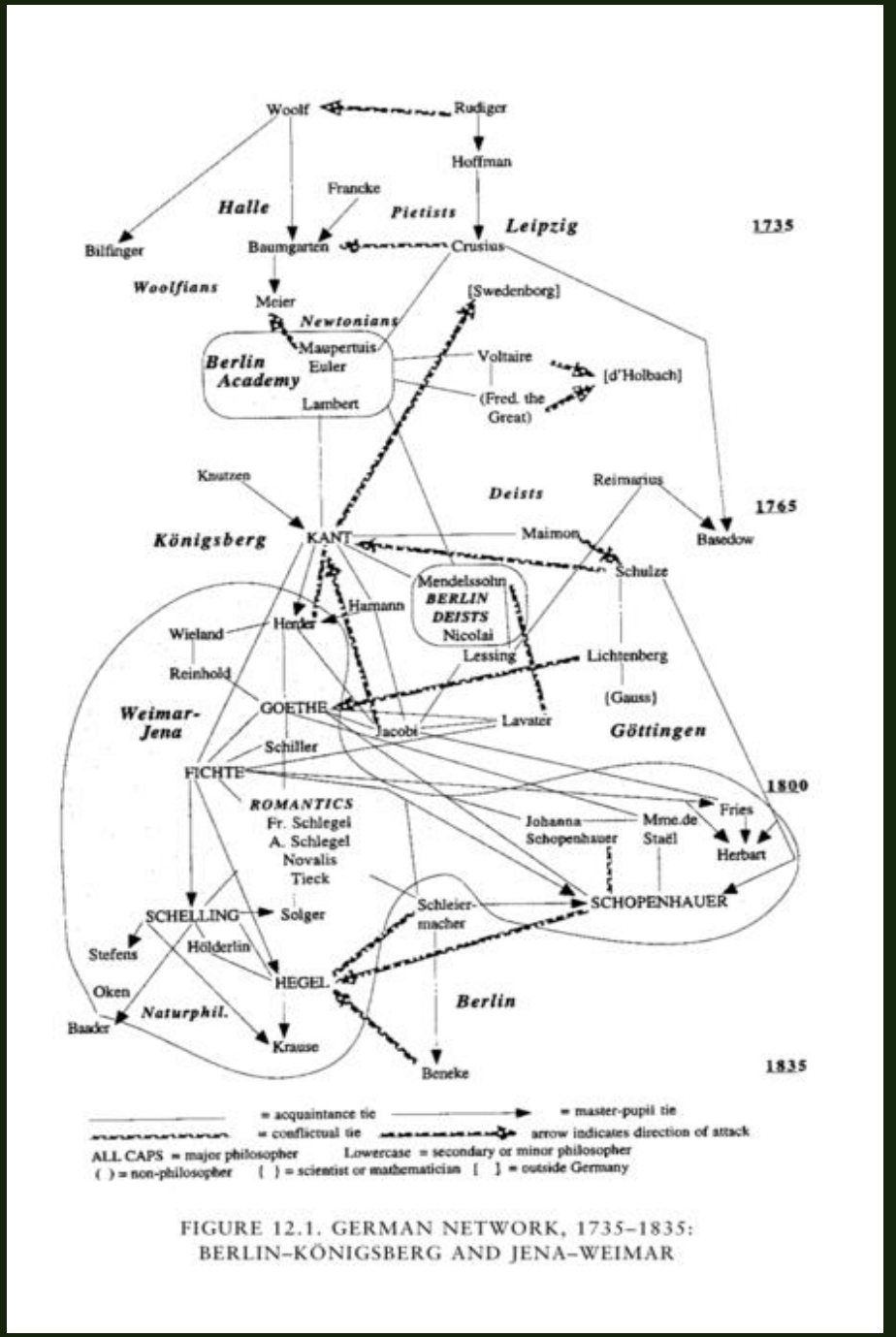


FIGURE 12.1. GERMAN NETWORK, 1735–1835: BERLIN–KÖNIGSBERG AND JENA–WEIMAR

Importance of team work in science

REVIEW

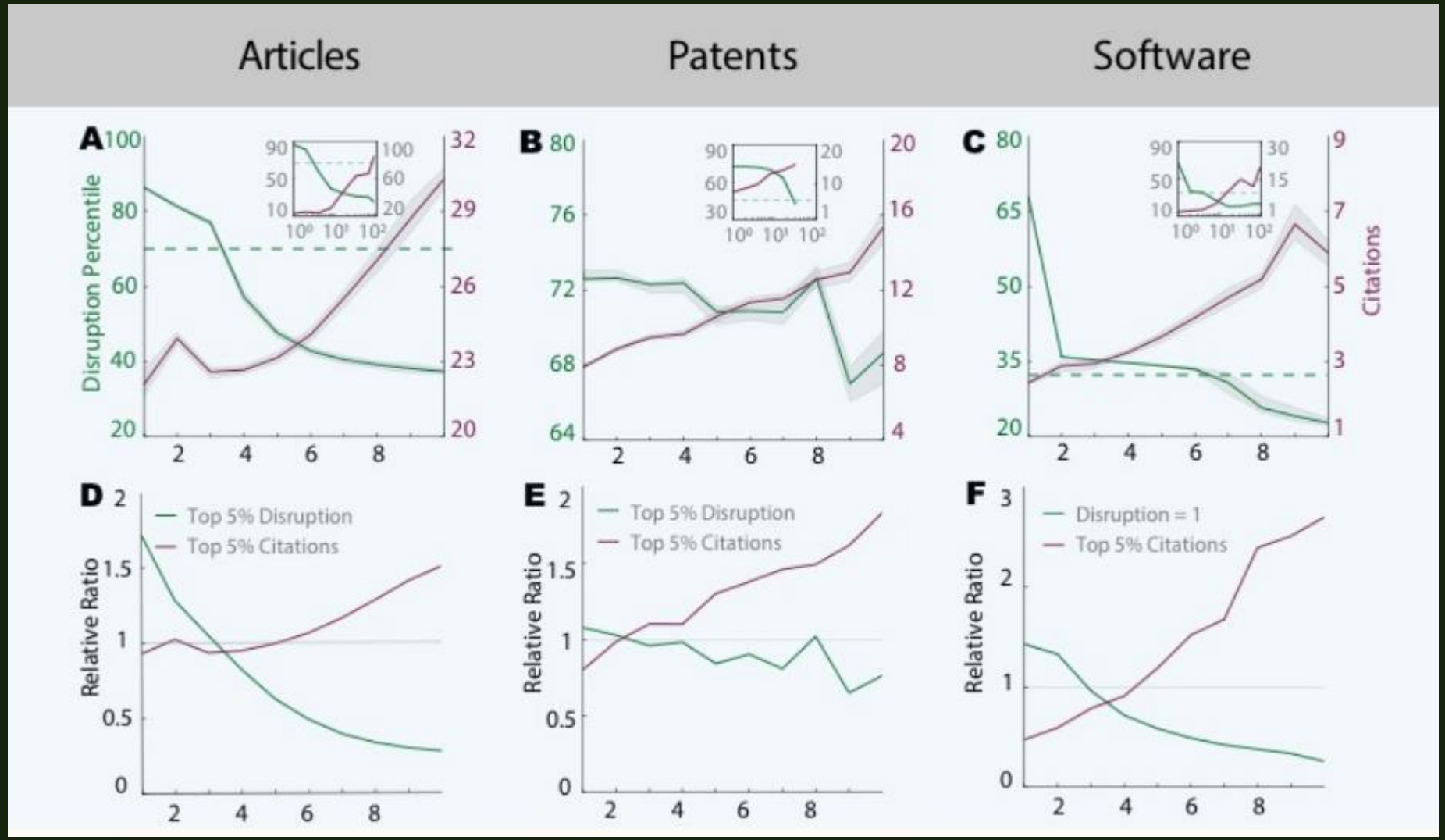
SCIENCE COMMUNITY

Science of science

Santo Fortunato,[1,2]* Carl T. Bergstrom,[3] Katy Börner,[2,4] James A. Evans,[5] Dirk Helbing,[6] Staša Milojević,[1] Alexander M. Petersen,[7] Filippo Radicchi,[1] Roberta Sinatra,[8,9,10] Brian Uzzi,[11,12] Alessandro Vespignani,[10,13,14] Ludo Waltman,[15] Dashun Wang,[11,12] Albert-László Barabási[8,10,16]*

"Nowadays, a team-authored paper in science and engineering is **6.3** times more likely to receive 1000 citations or more than a solo-authored paper, a difference that cannot be explained by self-citations" (p. 3)

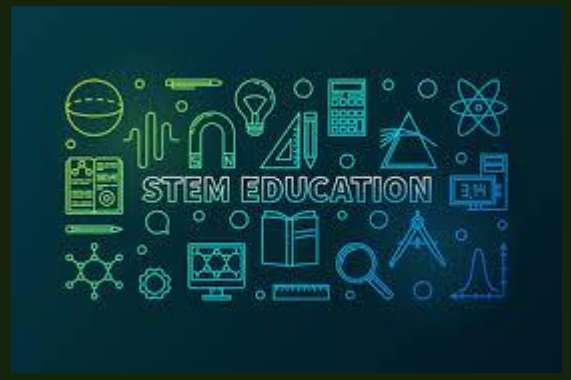
Small vs. Big Teams



Source: Liu et al. (2017)

Social Networks

STEM



Brains and Biology

Social Networks

Social Capital Theory

Performance and Achievement

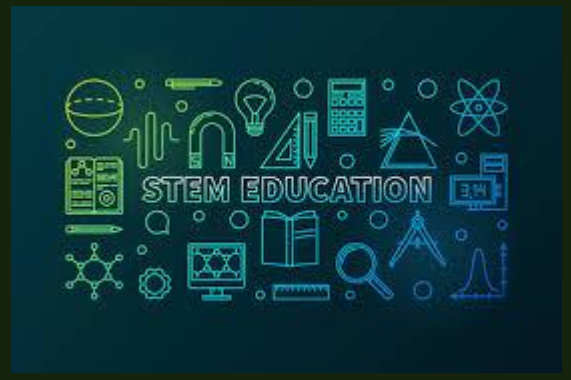
STEM

Brains and Biology

Social Networks

Social Network Neuroscience

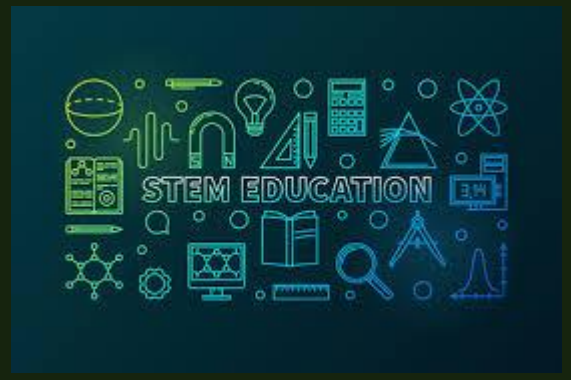
STEM



Brains and Biology

Social Networks

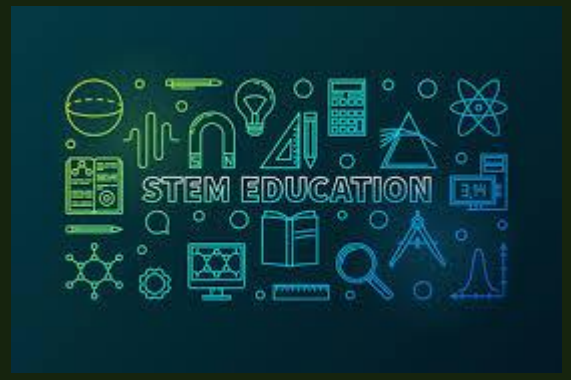
STEM



Brains and Biology

Social Networks

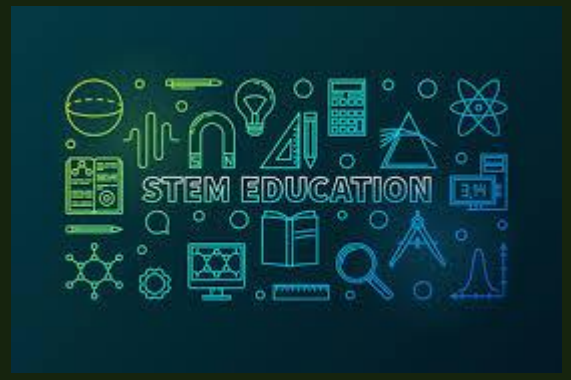
STEM



Brains and Biology

Social Networks

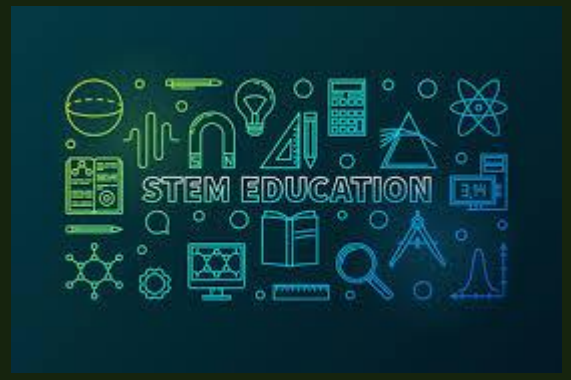
STEM



Brains and Biology

Social Networks

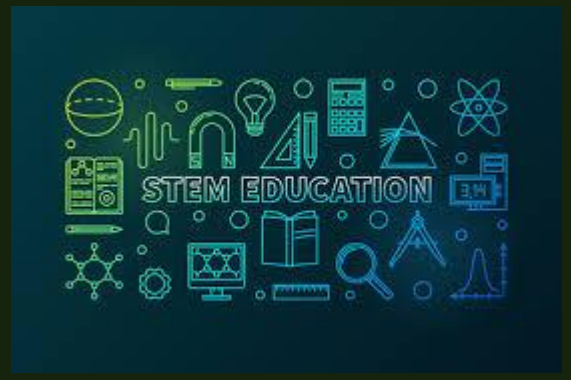
STEM



Brains and Biology

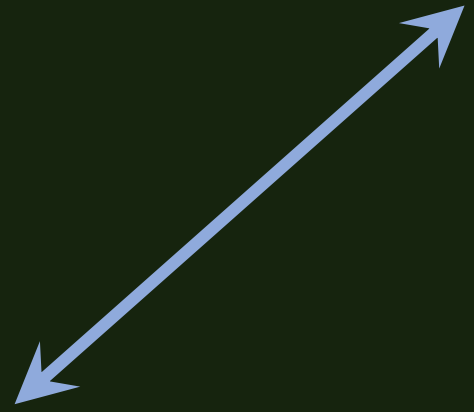
Social Networks

STEM

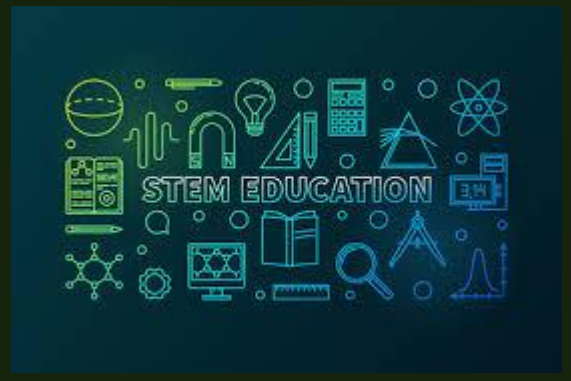


Brains and Biology

Social Networks



STEM



Part I
Outside the Brain

Social Influence on Academic Performance

a. Norms in peer groups

b. Exchange of information

c. Provision of education-related resources

Social Selection on Academic Performance

a. Mutual understanding

b. Signals of other social characteristics

c. Instrumental purpose

ELSEVIER

Social Networks

Volume 52, January 2018, Pages 251-260

Selection and influence processes in academic achievement—More pronounced for girls?

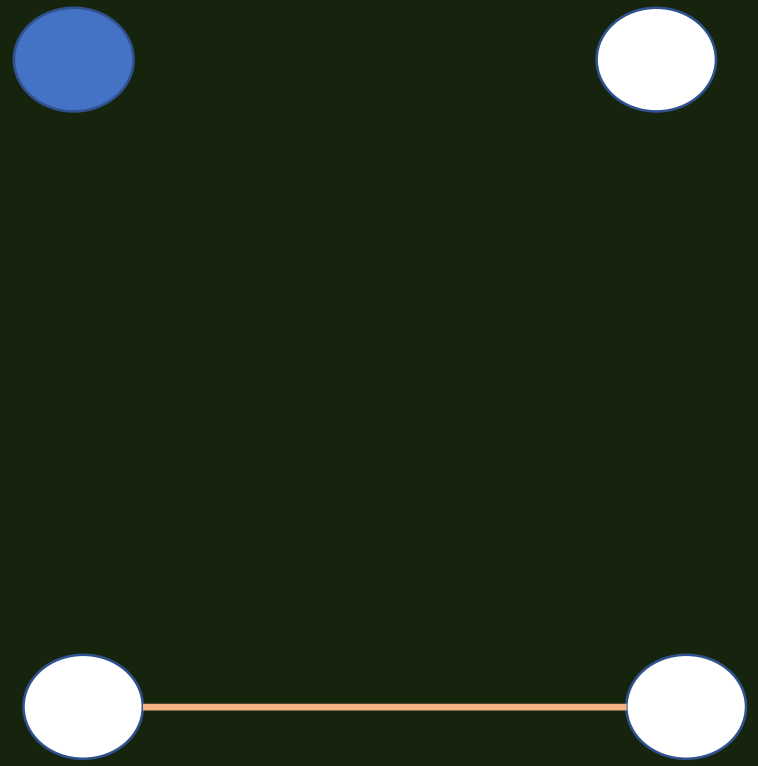
David Kretschmer [a, b], Lars Leszczensky [a, b], Sebastian Pink [a, b, c]

Q: How do we tell apart "social influence" and "social selection"?

Stochastic actor-oriented models

(Snijders et al., 2010)

- Statistical test on dynamic networks
  - Simulation based
- Take variables responsible for the formation and deletion of networks
  - Node level, tie-level and beyond
- Take variables responsible for the change of states of the nodes

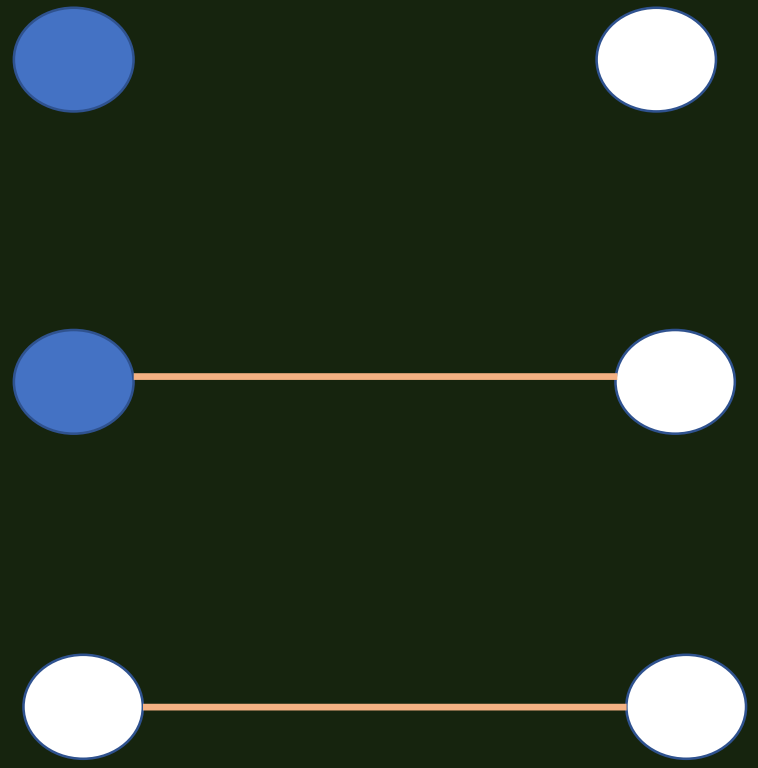


Influence

Stochastic actor-oriented models

(Snijders et al., 2010)

- Statistical test on dynamic networks
  - Simulation based
- Take variables responsible for the formation and deletion of networks
  - Node level, tie-level and beyond
- Take variables responsible for the change of states of the nodes



Selection

Stochastic actor-oriented models

(Snijders et al., 2010)

- Statistical test on dynamic networks
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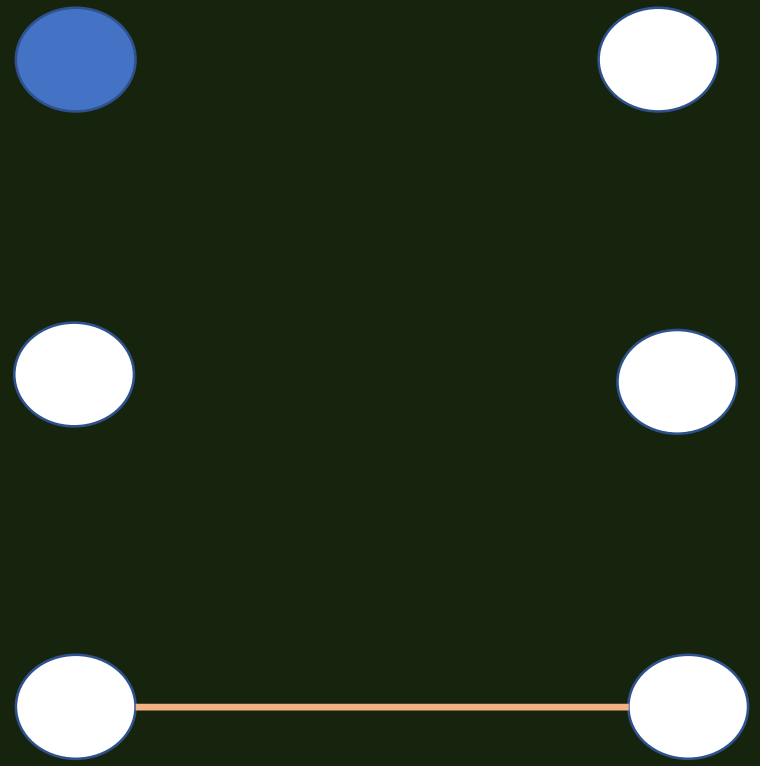
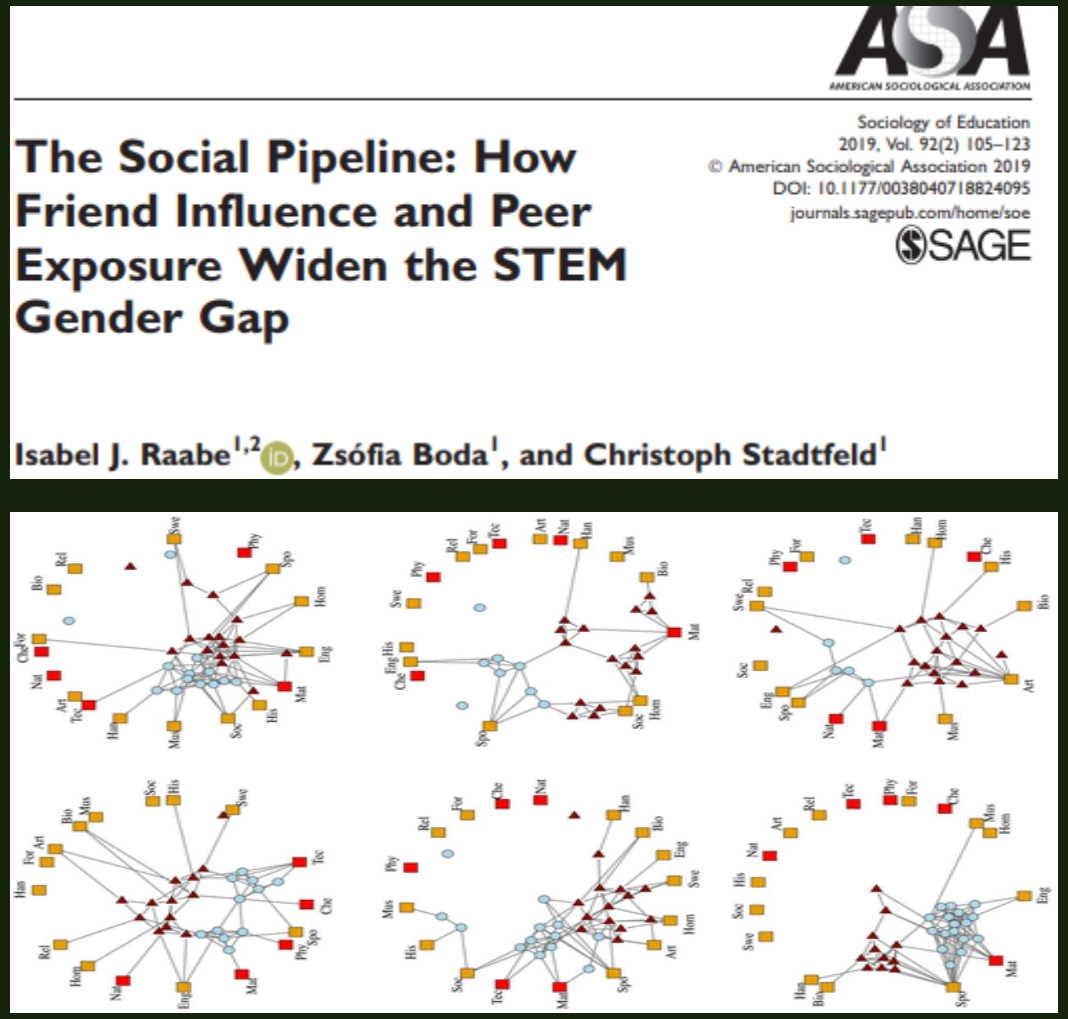
  - Node level, tie-level and beyond
- Take variables responsible for the change of states of the nodes



Peer influence on interests in STEM



ASA
AMERICAN SOCIOLOGICAL ASSOCIATION

Sociology of Education
2019, Vol. 92(2) 105–123
© American Sociological Association 2019
DOI: 10.1177/0038040718824095
journals.sagepub.com/home/soe
SAGE

The Social Pipeline: How Friend Influence and Peer Exposure Widen the STEM Gender Gap

Isabel J. Raabe[1,2], Zsófia Boda[1], and Christoph Stadtfeld[1]

a. Panel data on adolescents from Sweden (218 classrooms, 4,998 students) for the first 2 waves

b. Use the dynamic network analysis (SAOM)

c. Findings
   1. Strong influence effects; particularly stronger for girls
   2. No significant selection effect

Social Networks

Part II
Inside the Brain

Brains and Biology

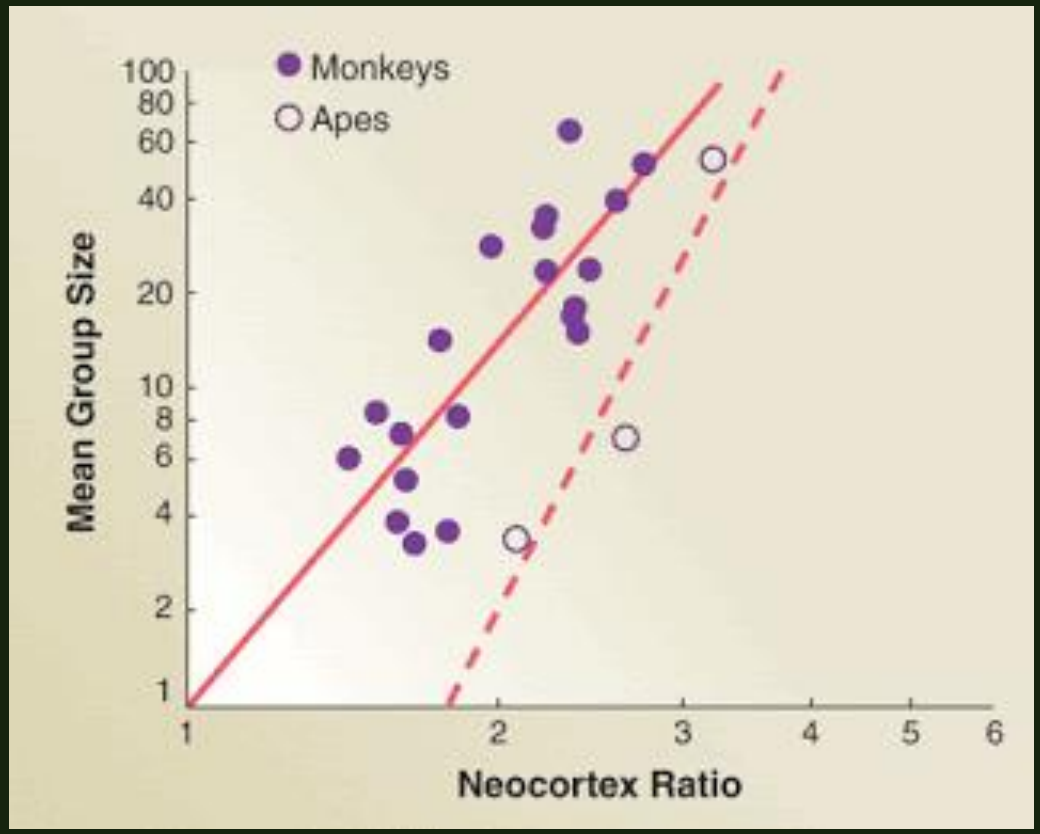
The Quantity of Good Quality

RIM Dunbar
Oxford University

Dunbar's number: 150

applicable offline and online

Social Brain Hypothesis



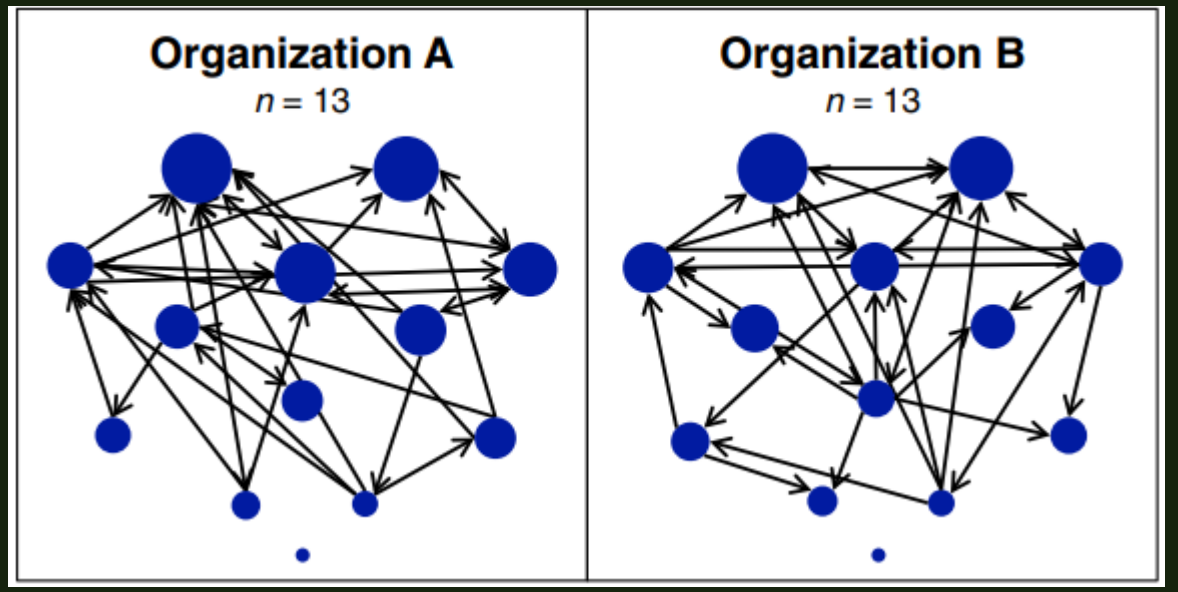
More than mere number .....

PNAS
Proceedings of the National Academy of Sciences of the United States of America

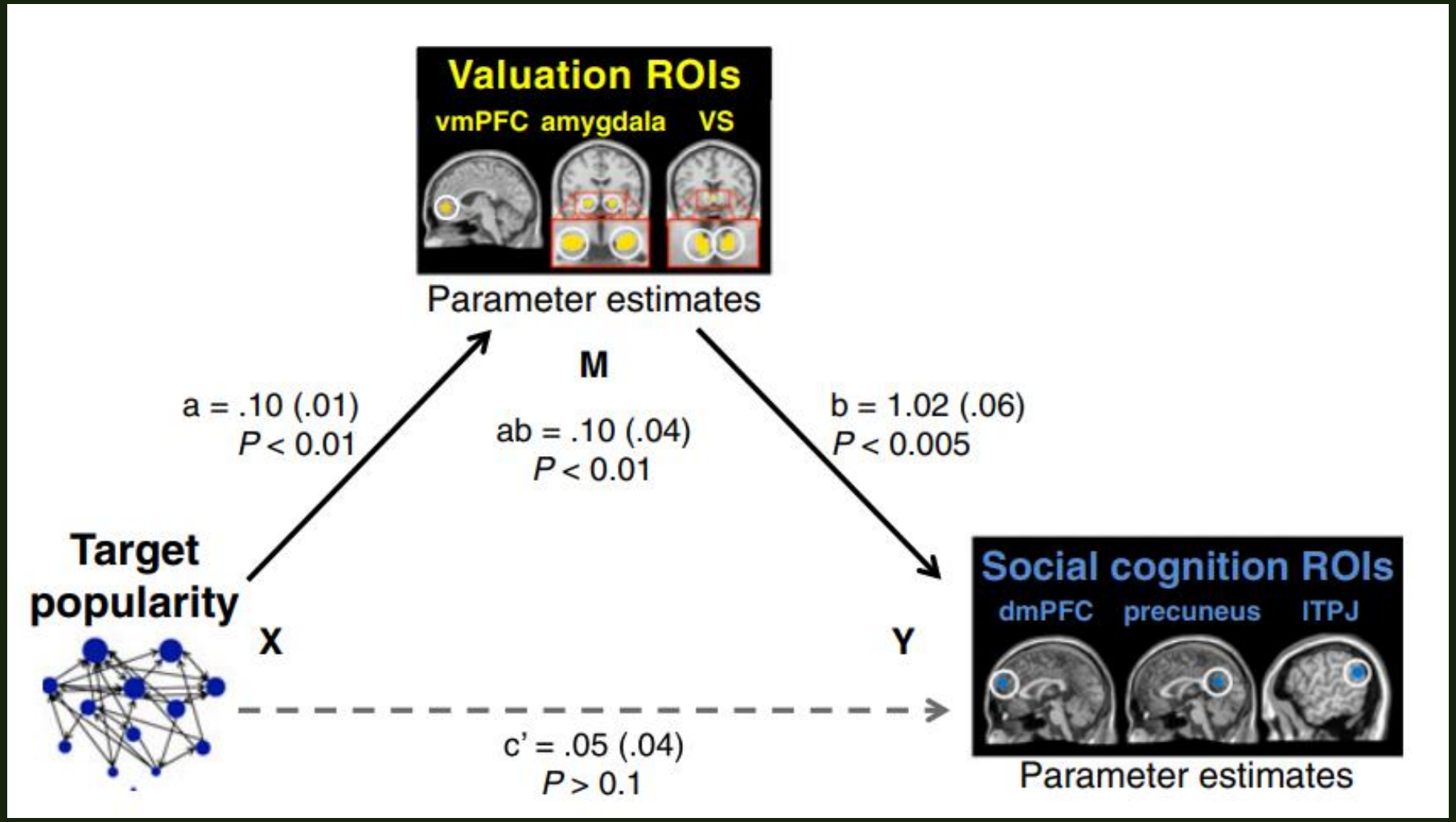
Neural mechanisms tracking popularity in real-world social networks

Noam Zerubavel, Peter S. Bearman, Jochen Weber, and Kevin N. Ochsner

PNAS December 8, 2015 112 (49) 15072-15077; first published November 23, 2015;



The neuro-processing of tracking social popularity



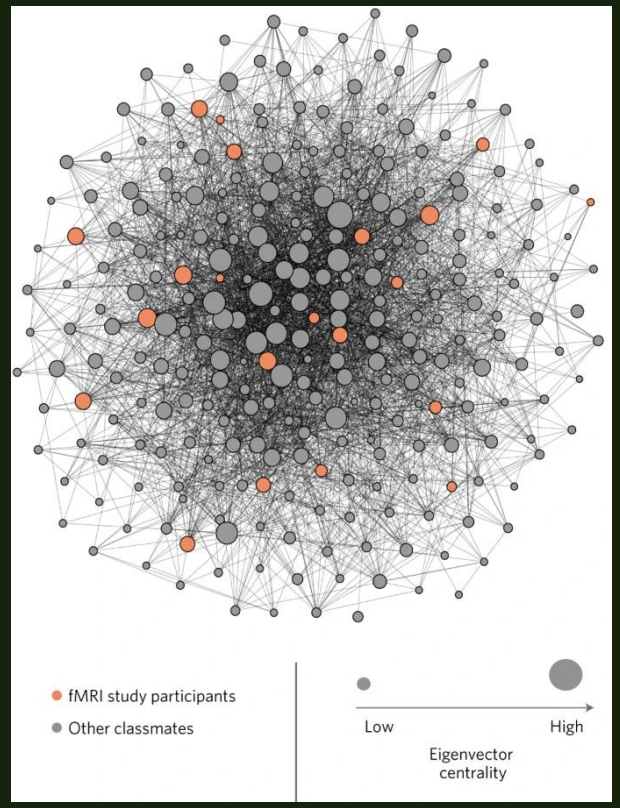
Perception of Network Position

nature human behaviour

Spontaneous neural encoding of social network position

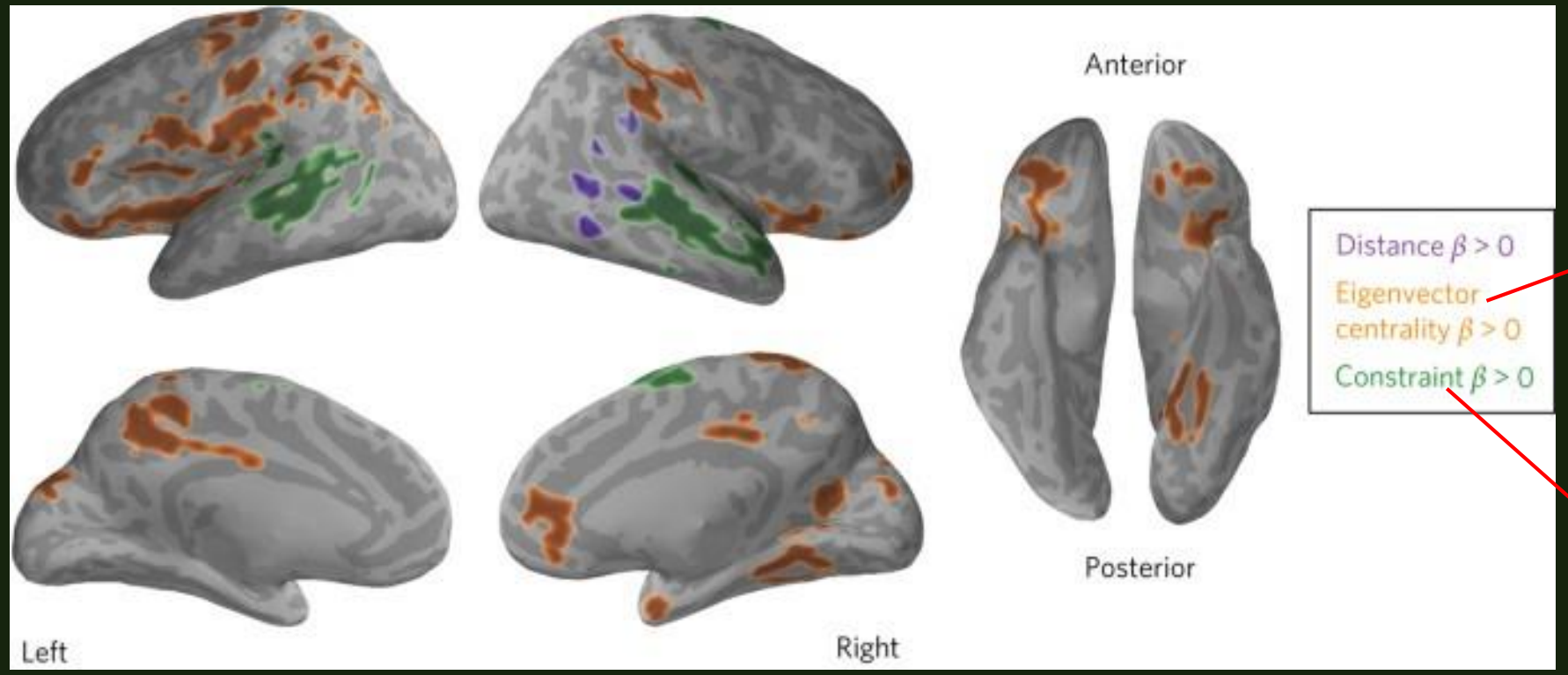
Carolyn Parkinson, Adam M. Kleinbaum & Thalia Wheatley

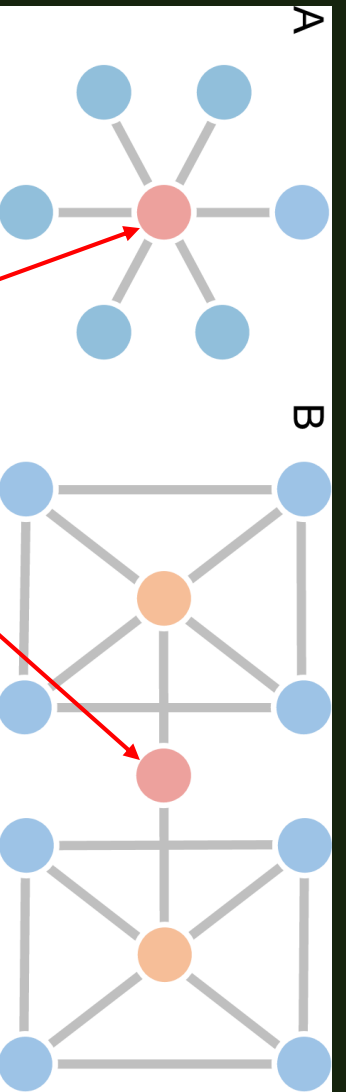
Nature Human Behaviour **1**, Article number: 0072 (2017) | Cite this article



Q: *How does human brain encode social network position?*

Perception of Network Structure





Social Networks

Brains and Biology

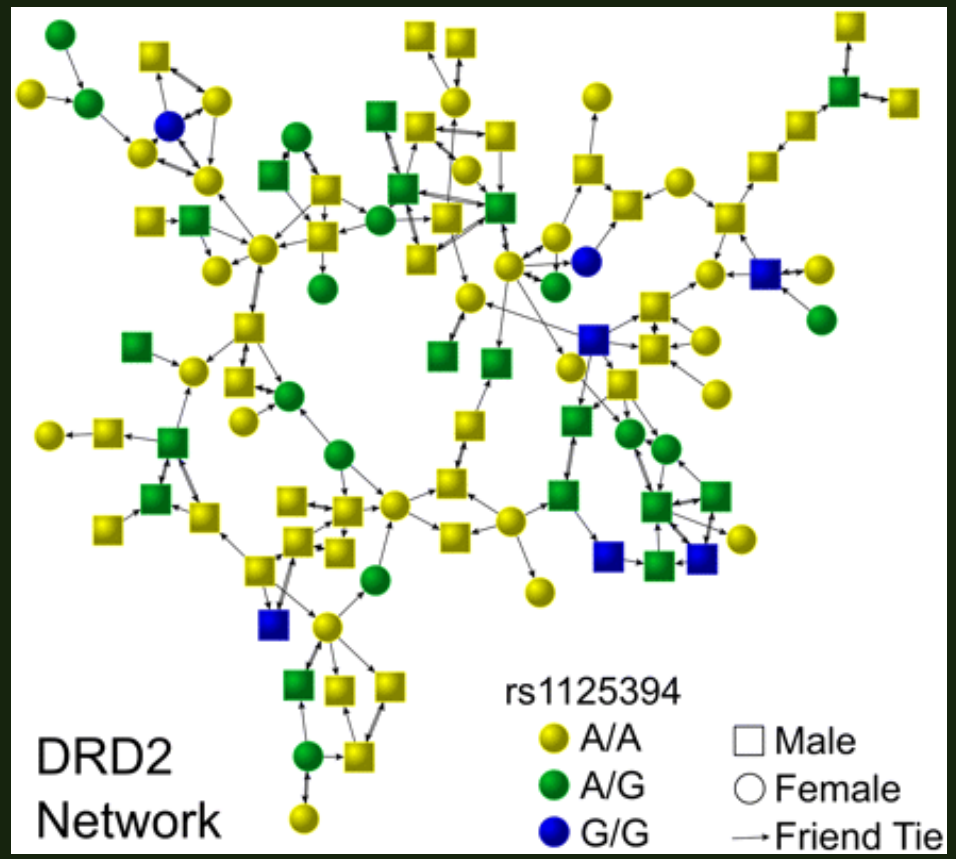
PNAS Proceedings of the National Academy of Sciences of the United States of America

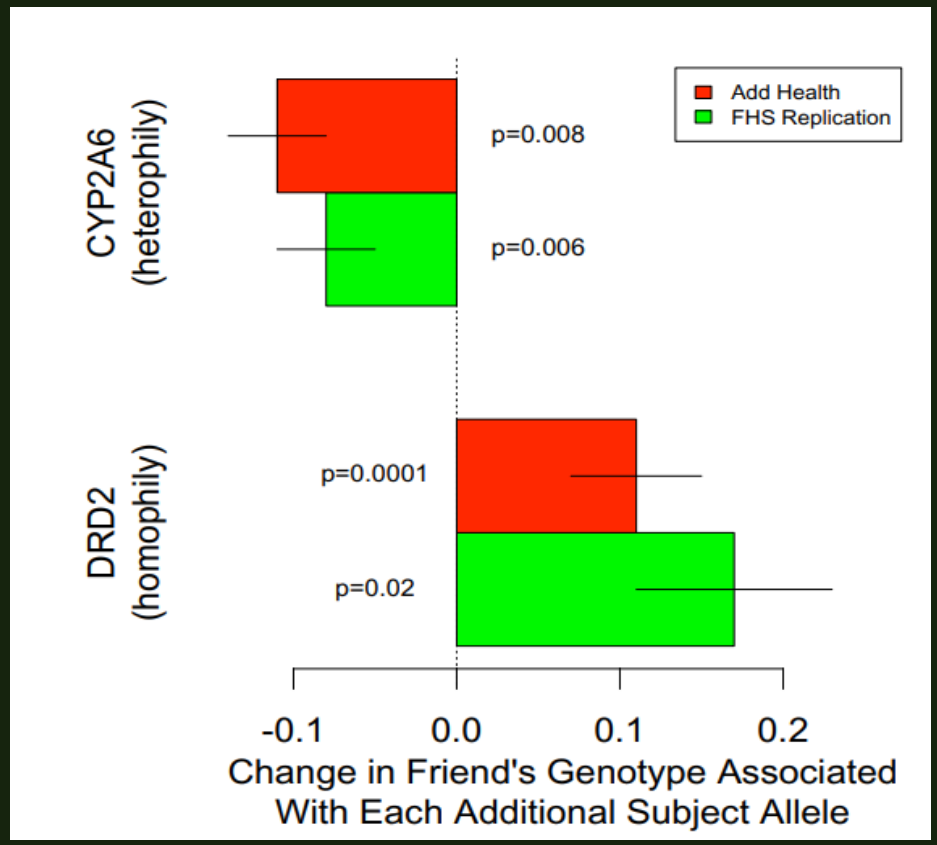
Correlated genotypes in friendship networks

James H. Fowler, Jaime E. Settle, and Nicholas A. Christakis

PNAS February 1, 2011 108 (5) 1993-1997; https://doi.org/10.1073/pnas.1011687108

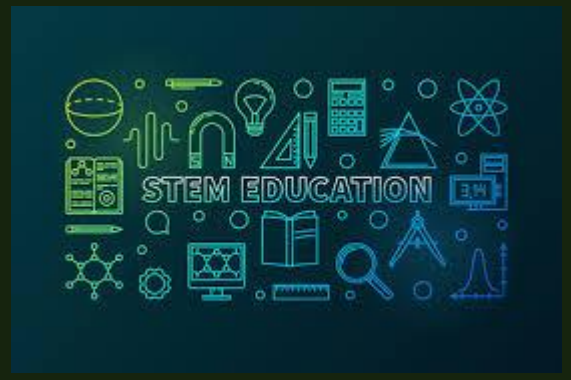
Friends share similar genotypes





Social Networks

STEM



Brains and Biology

Outstanding Questions

a. Bilateral causality: *Which one is stronger?*

b. Intervention: *Change the network? Change the brain?*

c. The golden time: *When is it?*

d. The optimal social network: *How does it look like?*

Components of promising research

Longitudinal study

Random trial

Biological assessment

Social network data

….

Thank You!