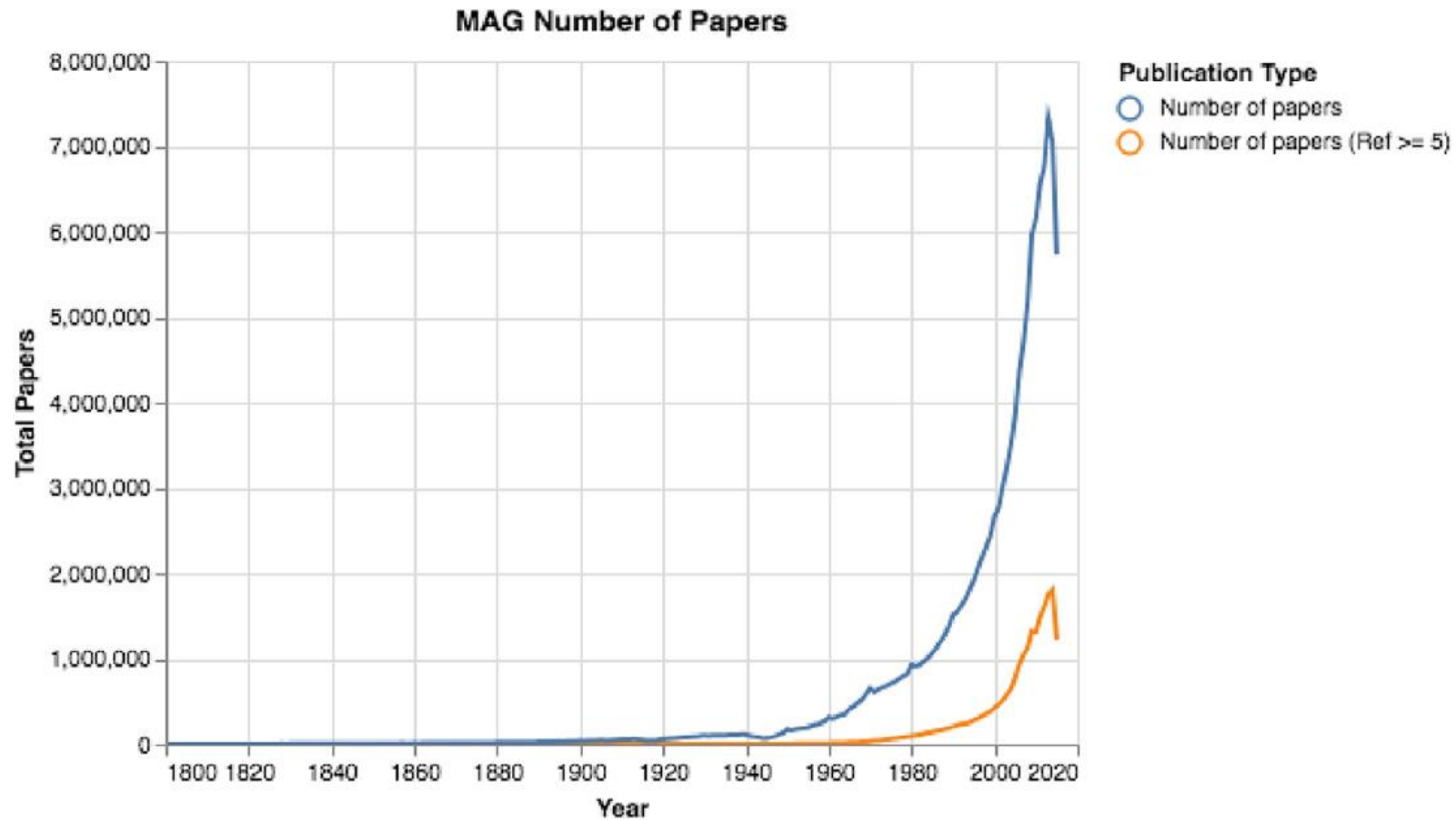


The future of research (you)

... and a dive into metascience

Exponential development



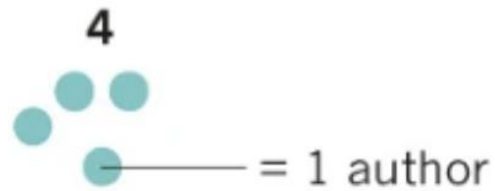
From Michael Fire, and Carlos Guestrin (2019): Over-optimization of academic publishing metrics: observing Goodhart's Law in action *GigaScience*, 8, 1–20

«Thousands of scientists publish a paper every five days»

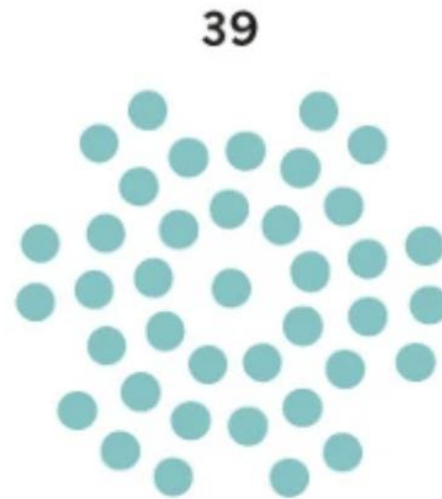
- > 72 papers (one every 5 days) at least one year between 2000 and 2016
- ‘full papers’
- More than 9000 authors
- 7888 in physics (large International teams e.g. the accelerator in Cern)
- Issues with Korean and Chinese names
- 265 where contacted

Increase in authoring (+72 «real» articles)

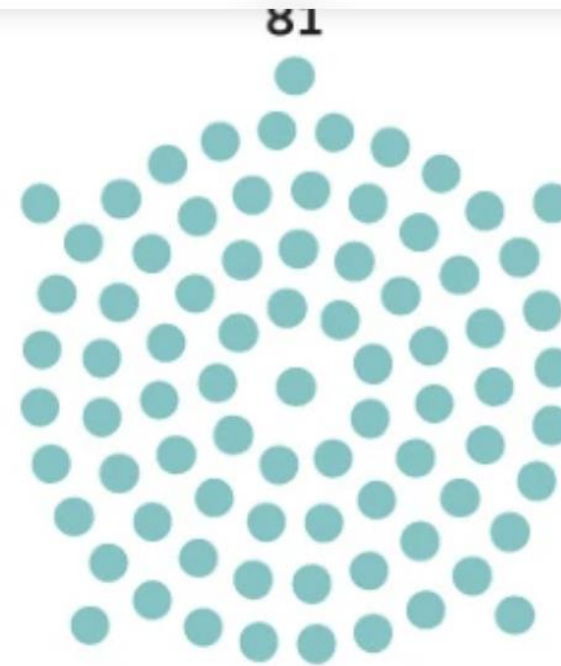
increased dramatically over time.



2002



2008

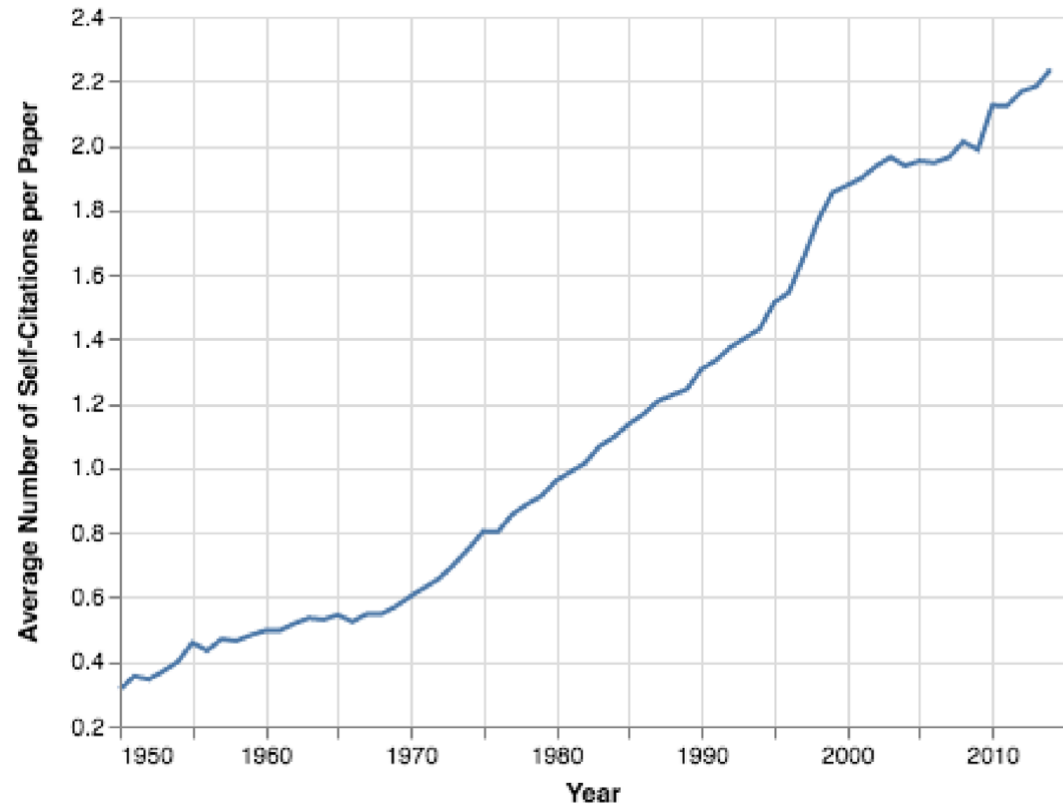


2016

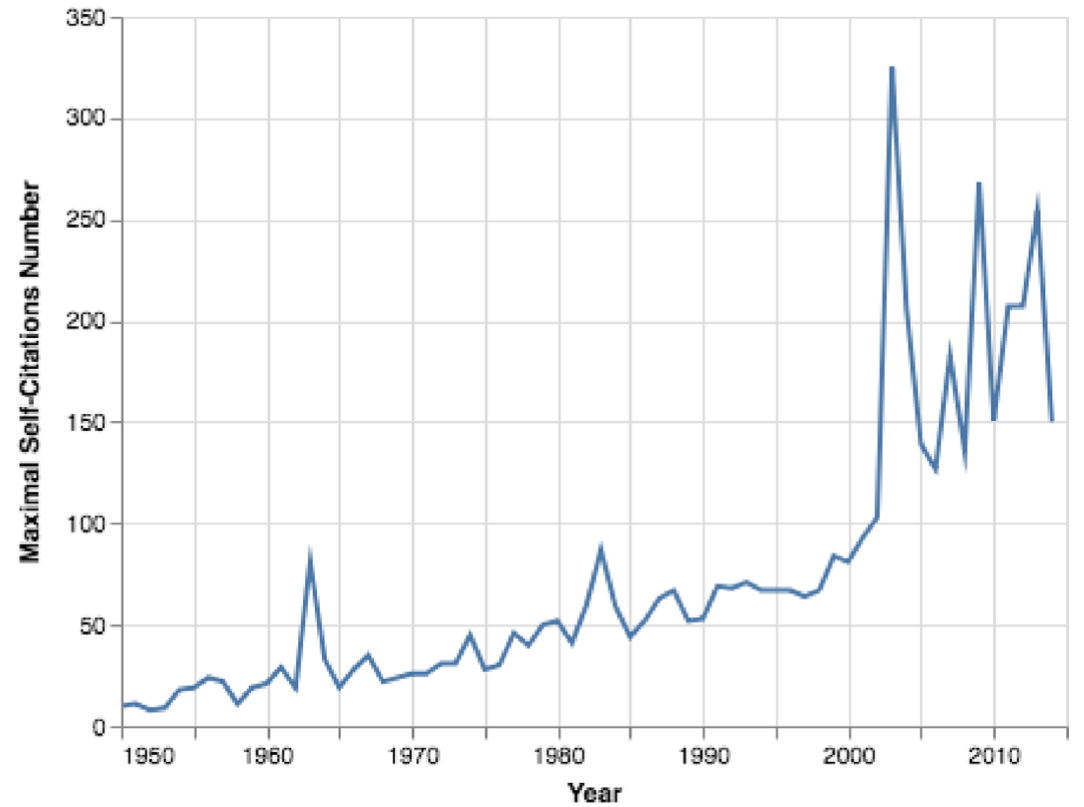
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Self-Citations

Average Number of Self-Citations per Paper over Time



Maximal Self-Citations Number over Time



Some conclusions and results from Fire and Guestrin (2019)

- Support Goodhart's Law as it relates to academic publishing: the measures (e.g., number of papers, number of citations, h-index, and impact factor) have become targets, and now they are no longer good measures.
- «Dozens of journals publish >1,000 papers each year»
- First time authors decrease in top journals

Marc A. Edwards and Siddhartha Roy. Academic Research in the 21st Century: Maintaining Scientific Integrity in a Climate of Perverse Incentives and Hypercompetition. Environmental Engineering Science. Jan 2017. 51-61.

<i>Incentive</i>	<i>Intended effect</i>	<i>Actual effect</i>
"Researchers rewarded for increased number of publications."	"Improve research productivity," provide a means of evaluating performance.	"Avalanche of" substandard, "incremental papers"; poor methods and increase in false discovery rates leading to a "natural selection of bad science" (Smaldino and McElreath, 2016); reduced quality of peer review
"Researchers rewarded for increased number of citations."	Reward quality work that influences others.	Extended reference lists to inflate citations; reviewers request citation of their work through peer review
"Researchers rewarded for increased grant funding."	"Ensure that research programs are funded, promote growth, generate overhead."	Increased time writing proposals and less time gathering and thinking about data. Overselling positive results and downplay of negative results.

Untrue research

- "Why Most Published Research Findings Are False" 2005 essay by John Ioannidis, professor at the Stanford School of Medicine, Published in PLOS Medicine
- Richard Horton, the editor of *The Lancet* : "[Much of the scientific literature, perhaps half, may simply be untrue.](#)"
- "small sample sizes, tiny effects, invalid exploratory analyses, and flagrant conflicts of interest, together with an obsession for pursuing fashionable trends of dubious importance." Horton laments: "Science has taken a turn towards darkness."

Is it becoming a part of the culture?

- Granovetter's Threshold Model of Collective Behavior (1978):

Unethical actions have become “embedded in the structures and processes” of a professional culture, and nearly everyone has been induced to view corruption as permissible” (Ashforth and Anand,

[2003](#))

How has research changed?

- What are the consequences of exponential growth ? Relations to breakthroughs ?
- Research going from 'truth-seeking' to a tool to promote a position ?
- Research as mainly a sector of work like any other?
- Big question: Is it a self-repairing system?

What is at stake ?:

- Ultimately: How society can trust research

The Cure

- Prepare for change
 - Peer review
 - Metrics
 - Competition to get university positions?
- You have to be curious about something
- Do not fail «the John Cleese test» (Richard Dawkins did)
- Be faithful to - and develop - your inner mystery