Peer Review Meets Analytics
A serendipitous journey

Manolis Antonoyiannakis

Physical Review B

The American Physical Society

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Let me introduce myself

Background
➢ Grew up in Crete, Greece
➢ Was educated in UK & US:
  ➢ BS (Royal Holloway)
  ➢ MS (Illinois)
  ➢ PhD (Imperial College; thesis advisor: John Pendry)
➢ In scientific publishing since 2000:
• Crete University Press (textbook publisher | translation & editing)
• American Physical Society (research journals | editor, analyst)
  • Physical Review B
  • Physical Review Letters
  • Physical Review X
➢ Sabbatical on science policy at European Research Council (funding agency | scientific advisor)
➢ High-school teaching/tutoring

Presently at

➢ Physical Review B, as
                Associate Editor
➢ The American Physical Society, as
                Bibliostatistics Analyst
➢ APAM, Columbia, as
                Adj. Assoc. Res. Scientist

Interested in:
• Peer review (statistical, historical, sociological aspects)
• Scientometrics
• Information Science
• Sociology of Science
• Tools to analyze
    scientific publishing
    & enhance research assessment

1. How did I get here?
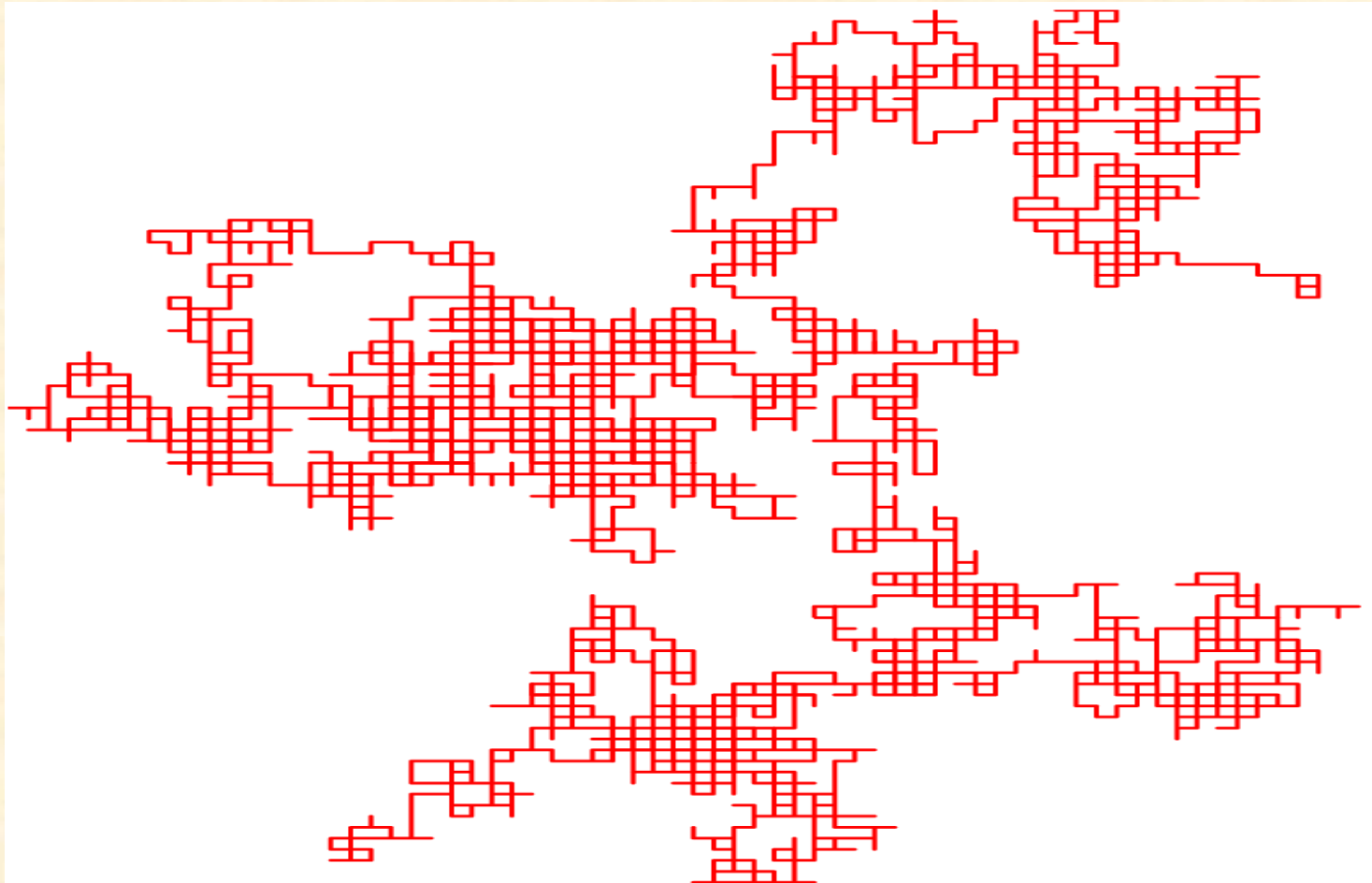
Through a random (serendipitous) walk!

Urbana-Champaign: My 1st culture shock! Waking-up dream after 1st night in Urbana, August 1992

A culture shock is an opportunity to grow
and break from our biases & preconceptions

My experiences until I came to Urbana

Crete

London
(Royal Holloway)

Among UIUC friends, 1992

My UIUC office (1992)

Quantum Mechanics books in Greek!?
By Stefanos Trachanas, Crete University Press

I never thought I'd want to be an editor…

"If you want to make God laugh, tell him about your plans"

I had always wanted to become an academic

Anything other than research + teaching at a university seemed like a sellout

Gradually, however, a feeling of doubt settled in, during my time at UIUC… this feeling continued through my PhD years at Imperial College London

Not so much self-doubt

("can I make it?")

but more like

"do I really want this life/career?"

"Sometimes I wonder if there's more to life than unlocking the mysteries of the universe."

What was it?

Burnout?

A young person's idealistic expectations?

Confusion, inexperience?

Old certainties (and biases) die, leaving turmoil

Whatever it was, I feared that I might end up like this

More importantly:

How would I spend my life? What would I focus on? And why? What mattered?

Long journey to self awareness:

ca. 1993-2003

(volunteering for a humane society in Crete; national military service in Greece; trying out several jobs)

In the end, I realized I wanted to stay connected to science, via an alternative career… preferably, in a nonprofit environment


"I'm looking for a position where I can slowly lose sight of what I originally set out to do with my life, with benefits."

If not academia, then what?
Serendipity, trial and error

- **Secondary school teaching & tutoring in Greece**
  - Rewarding at times but also limited, I became disillusioned
  - Reverse culture shock! Crete was now too small!
- **Textbook publishing: Crete University Press**
  - I translated & edited physics textbooks
  - Excellent environment; I learned a lot, but I got burnout from translating + I yearned to leave Crete
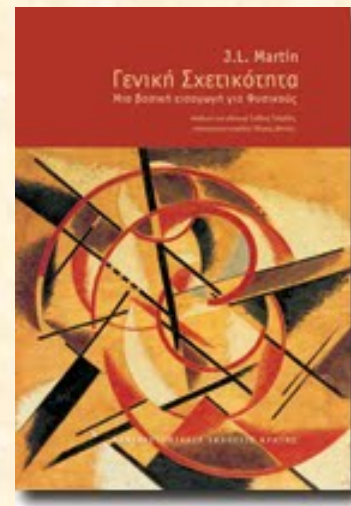
If not academia, then what? Serendipity, trial and error

- **Science Policy: Advisor to the President, European Research Council (London & Brussels)**
  - I was happy in PRL, but the opportunity arose for a "sabbatical"
  - The personality of ERC President, Fotis Kafatos, was so inspiring that I felt compelled to work with him
  - Greater purpose: Promoting research excellence in Europe
  - All-absorbing job, extraordinary people to learn from
  - My 1.5 year sabbatical in London was a fantastic experience, but I was glad to return to the APS… also, by then, I really wanted to do "my thing" (bibliostatistics)

The importance of mentors
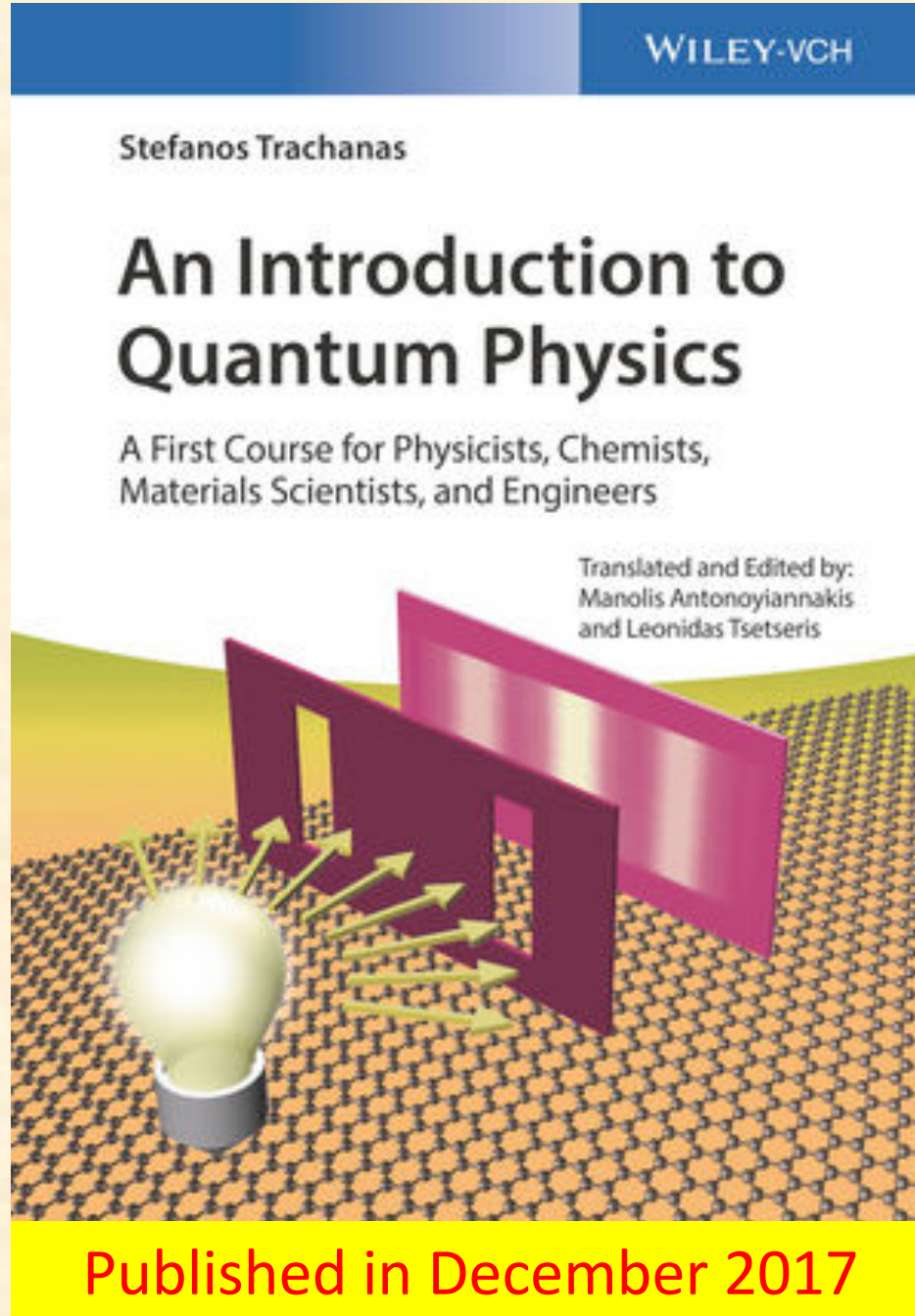

STEFANOS TRACHANAS

Educator, University of Crete

Author, textbooks on QM & DE

Publisher, Crete Univ. Press

I learned quantum mechanics
from his Greek books

Gave me 1st peer review lesson

"Language experiments"

Charismatic teacher

WILEY-VCH

Stefanos Trachanas

An Introduction to Quantum Physics

A First Course for Physicists, Chemists,
Materials Scientists, and Engineers

Translated and Edited by:
Manolis Antonoyiannakis
and Leonidas Tsetseris

Published in December 2017

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The importance of mentors

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JACK SANDWEISS

Editor, PRL

Professor, Yale

Encouraged me to apply statistics to peer review & quantitatively analyze scientific publishing

"Everything is interesting"

FOTIS KAFATOS

Professor, Imperial College London

President, European Research Council

Taught me how to write better

Institution builder

A true leader. His motto: Excellence – cooperation – inclusiveness

Reinventing editorial job

1. Telecommuting from New York
2. Adjunct position at Columbia university for access to people & ideas
3. Who said the study of scientific publishing is not interesting? Fun with statistical, sociological, and historical aspects of peer review
4. Fun projects with data (journal acceptance rates, GDP vs. publications, impact factors, impact metrics, etc.)
5. Bringing data analysis to editorial job:
   ➢ Bibliostatistics Analyst (2013–)
   ➢ APS Business Analytics Group (2017–)

Editors: Role & Challenges

EDITORS' ROLE

- ➢ Select & promote quality research through rigorous peer review
- ➢ Help good papers get published as quickly as possible
- ➢ Filter out unsuitable papers by editorial rejection & peer review
- ➢ Add value to papers:
  - • Improve papers via editorial & peer review
  - • Select the best papers to highlight
- ➢ Help researchers become skilled referees

CHALLENGES FOR EDITORS

- ➢ Influential papers are often controversial
- ➢ Experts' judgment not always faultless
- ➢ Editors' knowledge of field & people is limited
- ➢ Editors' time constraints (3-4 NEW papers daily/editor)
- ➢ Selective journals are subjective by definition: 41st chair effect
- ➢ Social, cultural factors affect behavior of authors & referees and can thereby affect the fate of papers
- ➢ Responsible, conscientious, knowledgeable referees are hard to find

Why do we write/publish?

To explain our work

To influence others

To claim ownership

To advance our career

To organize our thoughts

To *communicate*

To *become better scientists*

Published paper is record of work:

In science, work unpublished

is work not done

("tree falls in a lonely forest")

But a paper is not *just* that…

Notion that

"real" work is the research "itself"

& that

paper "just" describes research

is misleading & unproductive:

Writing is an integral part

of the research process.

Why do we write/publish?

To explain our work

To influence others

To claim ownership

} To *communicate*

To advance our career

To organize our thoughts

} To *become better scientists*

Paper is more than a record of things done
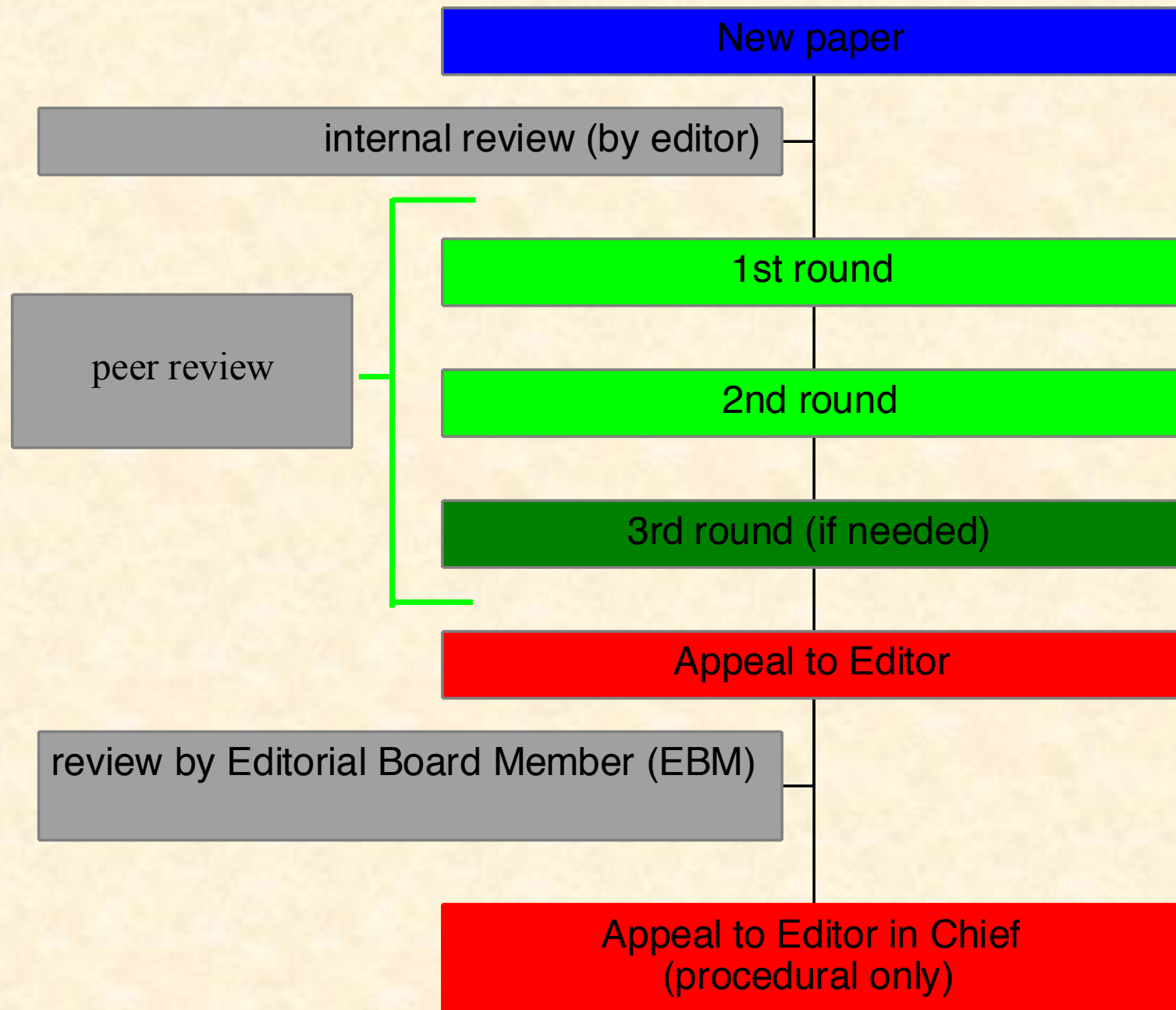
Writing process helps to:

- organize thoughts & data *while* research is going on
- conduct experiments & calculations
- plan research in progress
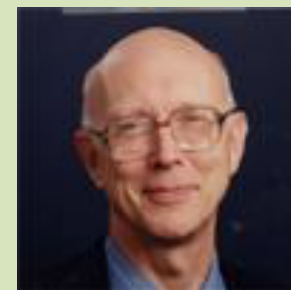
Whitesides' Group: Writing a paper
Adv. Mater. **16**, 1375 (2004)

Review Process in a nutshell

New paper

internal review (by editor)

1st round

peer review

2nd round

3rd round (if needed)

Appeal to Editor

review by Editorial Board Member (EBM)

Appeal to Editor in Chief (procedural only)

Internal Review

WHAT IS IT?

➢ Editors assess paper and decide whether to Reject Without External Review (RWER)

➢ If external review is needed, editors select referees

➢ Typically, handling editor makes decision on her own; on occasion, she consults editorial colleagues, an Editorial Board Member, or a trusted expert for a quick yes/no opinion on whether paper merits external review

WHAT DO EDITORS LOOK FOR?

➢ Focus on Abstract, Introduction, Conclusions

➢ Quality of writing

➢ Is paper suitable for journal (subject, etc.)

➢ References

➢ Overall quality & importance

➢ Punch line, interest, appeal

Remember: poor writing ⇔ poor paper

WHY DO YOU CARE?

➢ Your paper needs to pass through the editor to be reviewed by experts

➢ Not just black & white: Editors form an impression about paper, which can affect the review process later on (e.g., when referees disagree about importance, editor can weigh in)

CAVEAT

Highly selective journals (acc rate <= 10%):

Once you get past the editor, you have ~35%-50% chance to make it

JOURNAL	ACCEPTANCE RATE	RWER RATE
Nature, Science, Nature Phys/Mater/Nano/Phot.	~5-10%	85%-90%
PRL	~20%	30%
PRX	10%	70%
PRA/B/C/D/E/Applied/Fluids	50%-65%	5%-25%

Rejection Without External Review (RWER)

WHAT IS IT?

➢ An editorial rejection letter, upon initial receipt, with editors' judgment of impact / innovation / interest / significance / importance

WHY?

➢ To preserve time[*] & effort of referees (our most precious resource)…

➢ … and help authors find a better-suited journal with minimal delay

[*] Time effectiveness is key

HOW DO EDITORS DECIDE? RED FLAGS:

➢ Obvious marginal extension or incremental advance; too specialized

➢ Subject matter or readership does not fit

➢ Sloppy presentation, opaque writing

➢ Introduction: lacks clarity, no context, poorly describes prior work, no broad picture, too many technical details, no motivation

➢ Referencing: too many old / specialized / self- / 'confined' references

➢ no punch-line in conclusions:

• what is the main message of the paper?

• why is it important?

• how does it advance the field?

ELEVATOR PITCH metaphor

➢ Do not waste your readers' time

➢ Guide your readers

➢ Explain clearly and early in the paper what you have done, and why they should care

The UPS Store UPS
ELEVATOR PITCH
with Marcus Lemonis

How do the editors find referees for a paper?
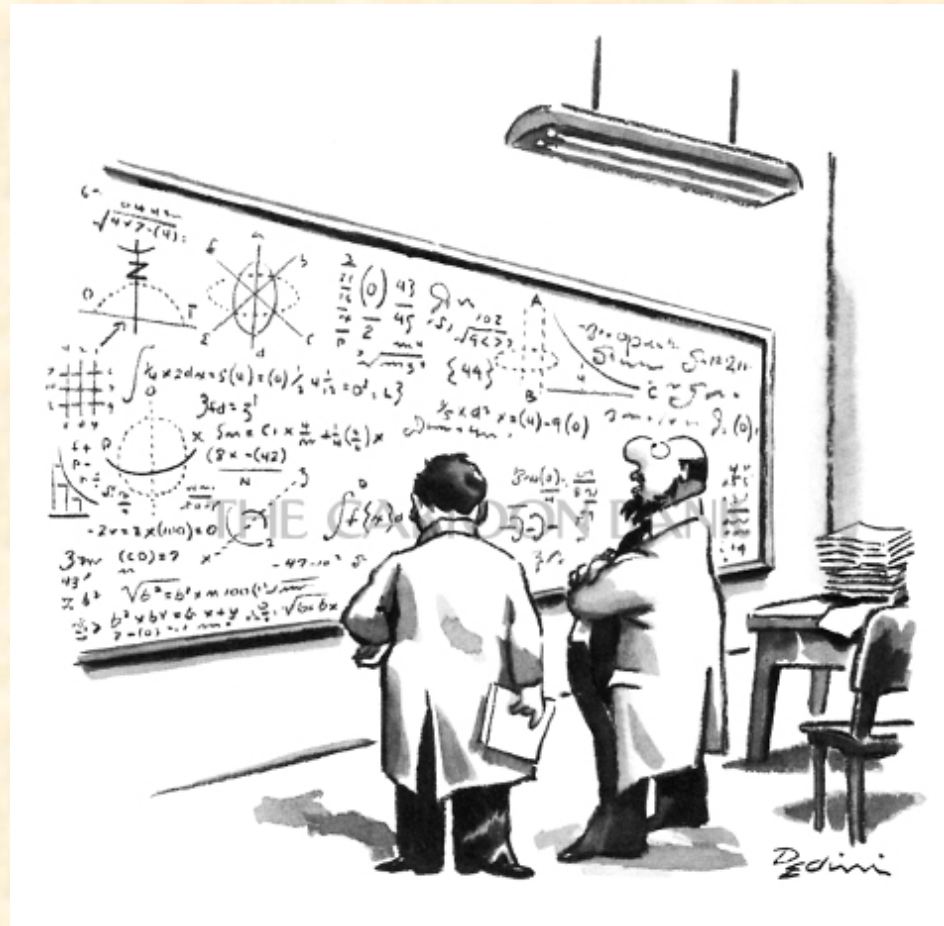
"This is fine as far as it goes. From here on, it's who you know."

How do the editors find referees?

WE LOOK FOR POTENTIAL REFEREREES IN:

- ➤ **References** (authors of, referees of)
- ➤ **Related papers** in Web of Science, Google Scholar, SPIN, NASA, APS database (authors, citing papers)
- ➤ **Suggested referees**
- ➤ **Referee expertise** in APS database (>60,000 referees)
- ➤ **Mental database**

WE GENERALLY AVOID:

- ➤ **Undesirable** referees
- ➤ **Coauthors**
- ➤ Referees **at same institution** as authors
- ➤ **Acknowledged** persons
- ➤ Direct **competitors** (if known)
- ➤ **Busy** referees (currently reviewing for PR/PRL)
- ➤ **Overburdened** referees (> 15 mss/past year)
- ➤ **Consistently slow** referees (>8 weeks to review)
- ➤ Referees who **consistently provide poor reports**

Highlighting papers: What & Why

What is it?

Editor-provided lists of *select* papers (highlights) that are deemed to be of higher quality, importance, or interest than average paper in source journals

Intra-highlights: Publishers select from own journals (benefit of peer review)

Inter-highlights: Publishers select from other journals

Selected papers get a marker, editor' summary, or expert's commentary

Sliding scale of importance

Why?

Global research output growing exponentially

➔ New challenges for publishers, authors, and readers: tsunami of information, fragmentation, interdisciplinarity

➔ To assist readers navigating to papers of interest & relevance

➔ To reward authors of excellent papers by providing visibility & publicity

➔ To remain competitive

What are select papers called?

News & Views, Research Highlights, Perspectives, Editors' Choice, IOP Select, Editors' Summary, Spotlight on Optics, Editors' Picks, Viewpoint, Synopsis, Editors' Suggestion, etc.

Growth of research papers

Exponential!
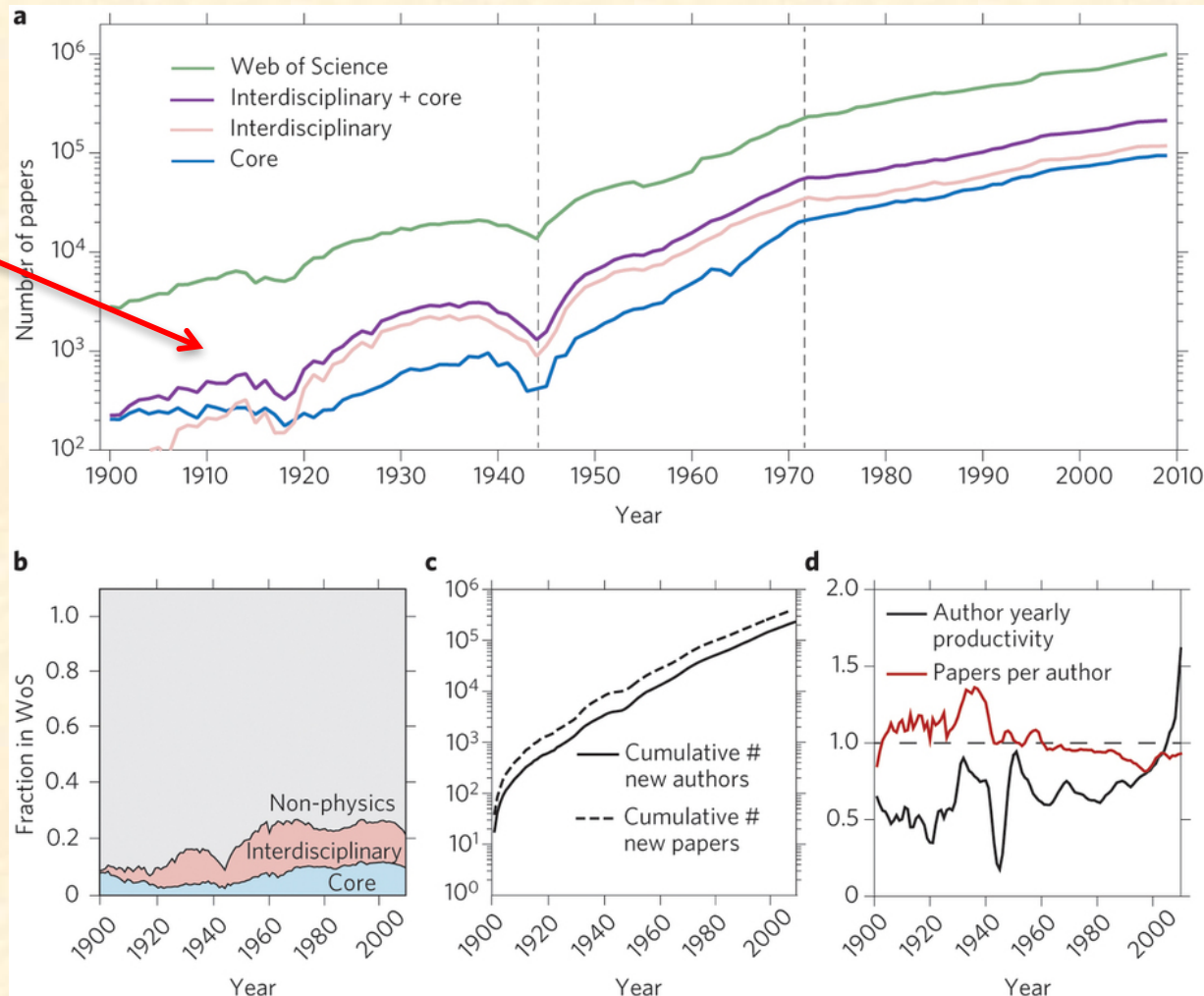
Bibliostatistics Analyst: My role

➢ Support the APS Editorial Office by responding to requests for data analysis on publications, citation impact metrics, etc.

➢ Understand metrics—and their limitations—that quantify the impact of scientific research (impact statistics of journals, individuals and groups)

➢ Understand and enhance peer review using analytics

➢ Support the APS *Business Analytics Group* by analyzing publications, identifying trends in scientific publishing, etc.

Bibliostatistics:
Examples of what I do

"My question is: Are we making an impact?"

Basic citation metrics for groups (journals, departments, universities)

Metric	Abbrev.	Citation & Publication Years	Measures	Remarks	Caution
Impact Factor	JIF	CY = Y PY = Y-1, Y-2	Average citations/paper (approximately)	Average metric; large journals cannot have high IF	➔ Small journals ➔ highly skewed distributions with outliers
Median Citation Index	MCI	CY = Y PY = Y-1, Y-2	Median citations/paper	Robust metric	
Immediacy Index	II	CY = Y PY = Y	Average citations/paper (approximately)	Average metric	➔ Penalizes papers published late in year
EigenFactor	EF	CY = Y-4, …, Y	eigenvector centrality in	market share of	

Abstract: Y11.00014 : Median Citation Index vs Journal Impact Factor
10:36 AM–10:48 AM

Preview Abstract   MathJax **On** | Off   ← Abstract
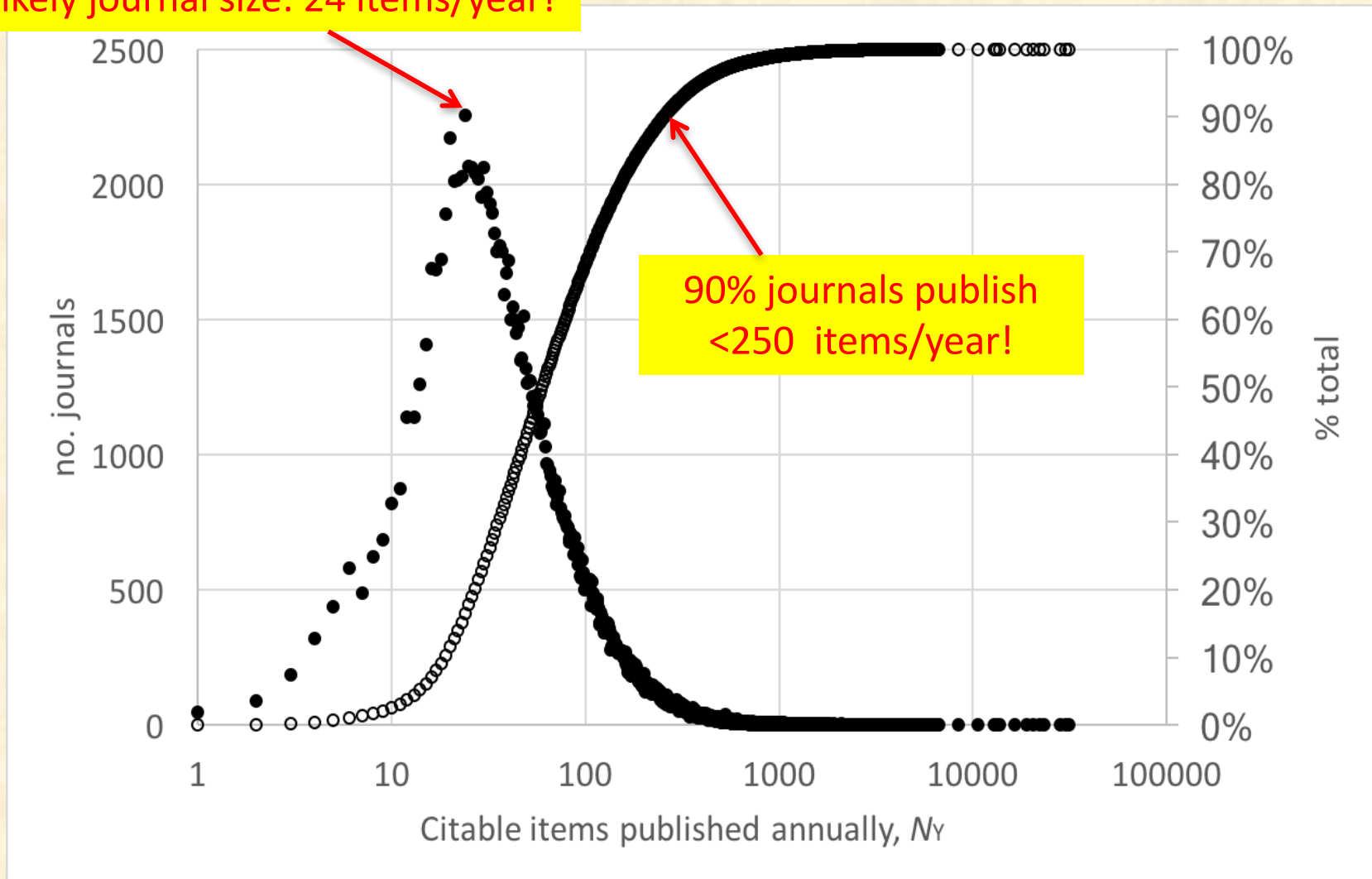
Author:
  Manolis Antonoyiannakis
    ((1) Columbia University (2) American Physical Society)

The Journal Impact Factor is an arithmetic mean: It is the average number of citations, in a year, to a journal's articles that were published the previous two years. But for the vast majority of scholarly journals, the distribution of these citations is skewed (non-symmetric). We argue that a more representative member of the skewed distribution of citations is its median, not the mean. We thus introduce the Median Citation Index (MCI) and compare it to the journal Impact Factor (JIF) as a potentially more suitable choice of the ``center'' of the distribution, or its typical value. Unlike the JIF, the MCI is far less sensitive to outlier (very highly cited) papers or to gaming, and does not lend itself to the hype of calculating it to three decimal digits.

To cite this abstract, use the following reference: http://meetings.aps.org/link/BAPS.2015.MAR.Y11.14

Small journals are extremely common

Most likely journal size: 24 items/year!

90% journals publish <250 items/year!

no. journals

% total

Citable items published annually, N_Y

Data from Clarivate Analytics, Journal Citation Reports, 1997-2016

Large journals cannot have high Impact Factors

28
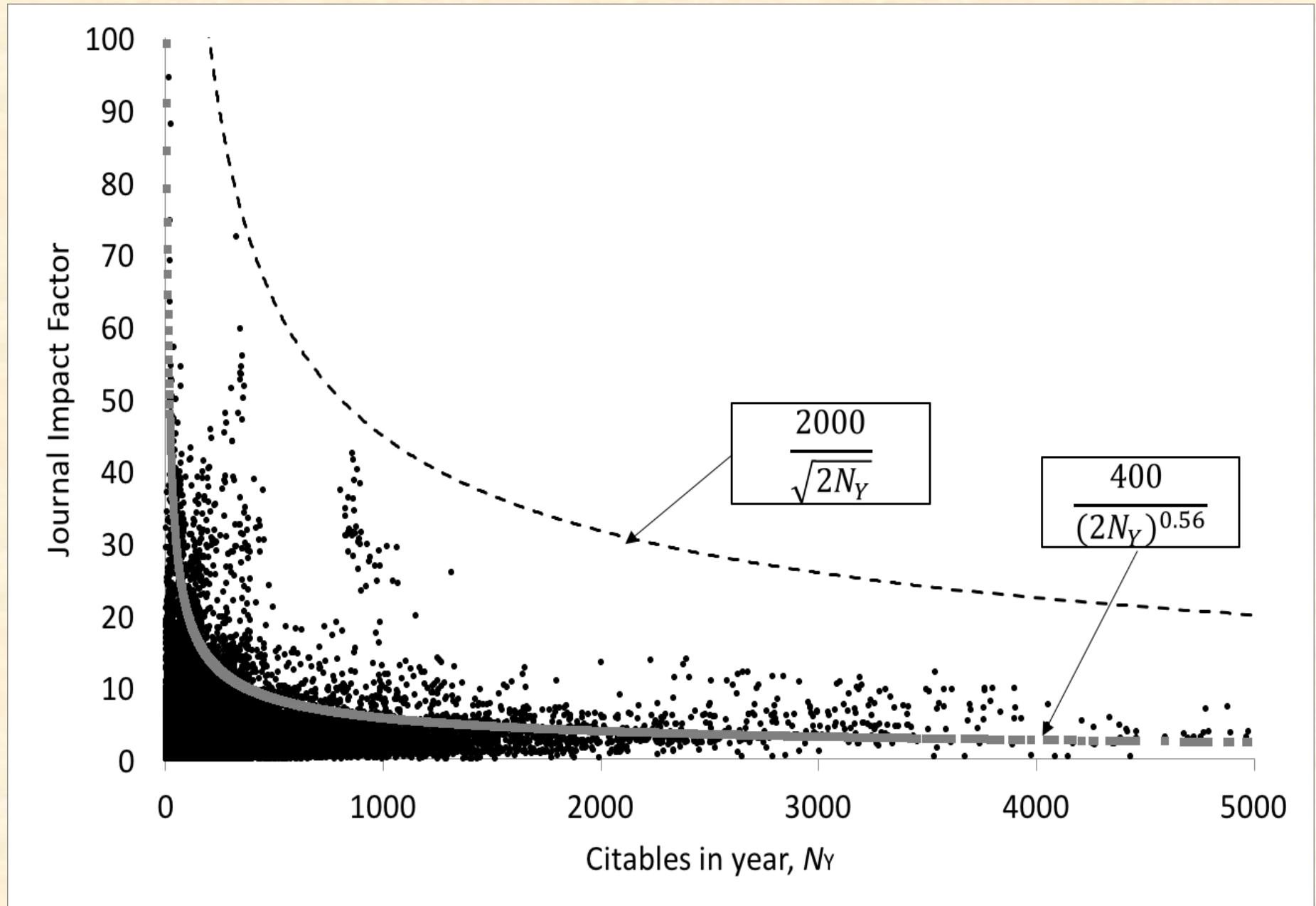
Large journals cannot have high Impact Factors

WHY?

DEFINITION

$$JIF_Y = \frac{\text{citations to journal on year Y}}{\text{articles and reviews published in years Y-1, Y-2}} = \frac{C_Y}{N_{Y-1, Y-2}}$$

1/N dependence of JIF penalizes large-N journals

The contribution of a given paper to JIF is HIGHLY sensitive to the 'environment', i.e., the journal size

| Journal	Journal size, N	Citations, C	JIF	New paper citations, c	Adjusted JIF=(C+c)/(N+1)	Δ(JIF)	% change
A	100	1000	10	100	10.89	0.89	8.9%
B	1000	1000	1	100	1.10	0.10	9.9%
C	10,000	100,000	10	100	10.01	0.01	0.1%

<u>Compare A & B:</u>

B is 10 times larger. For every highly cited paper A publishes, B needs to publish (almost) 9 equally cited papers to compete!
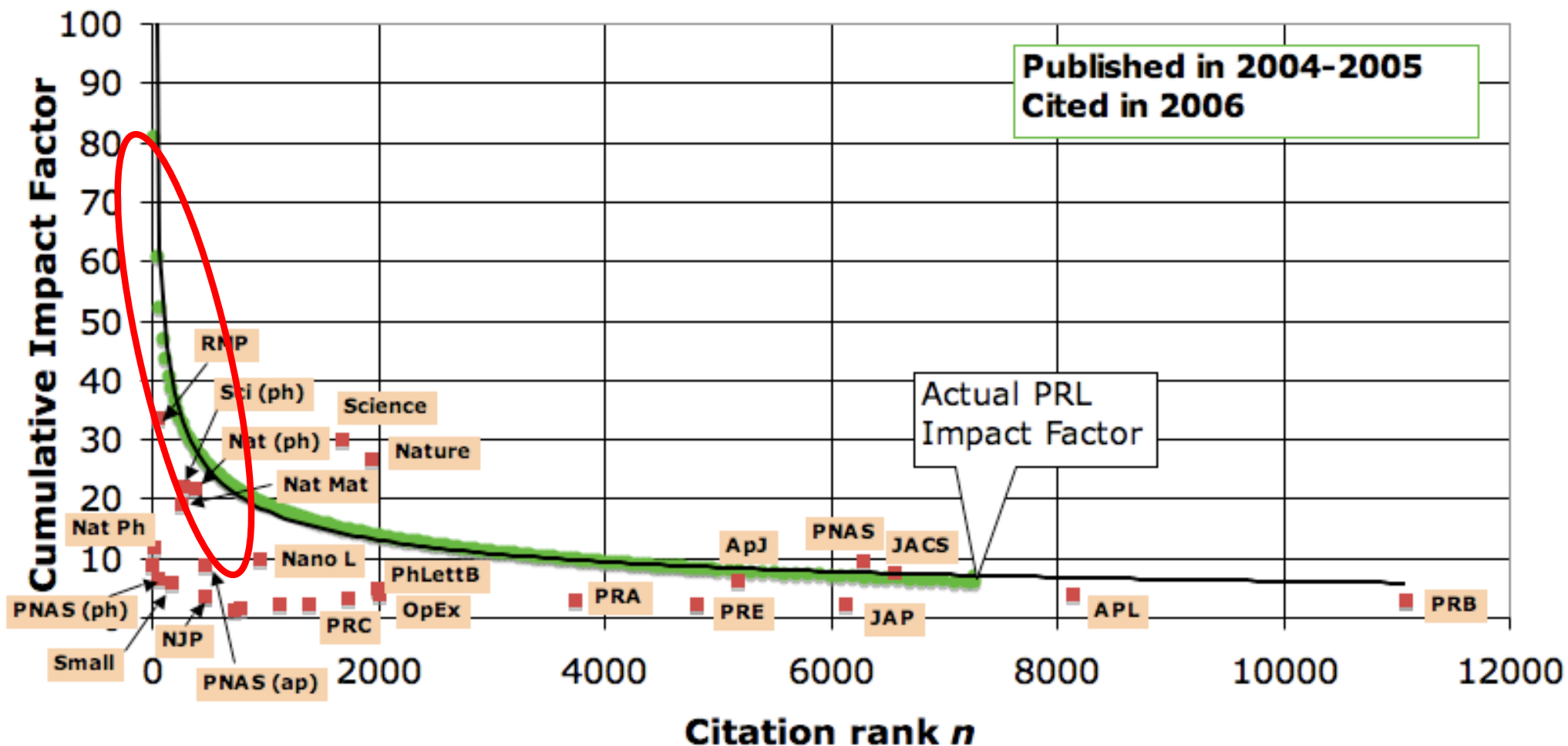
<u>Compare A & C:</u>

Same JIF. C is 100 times larger. For every highly cited paper A publishes, C needs to publish 100 equally cited papers to compete!

Impact Factors of small journals are highly volatile (=sensitive to outlier papers)
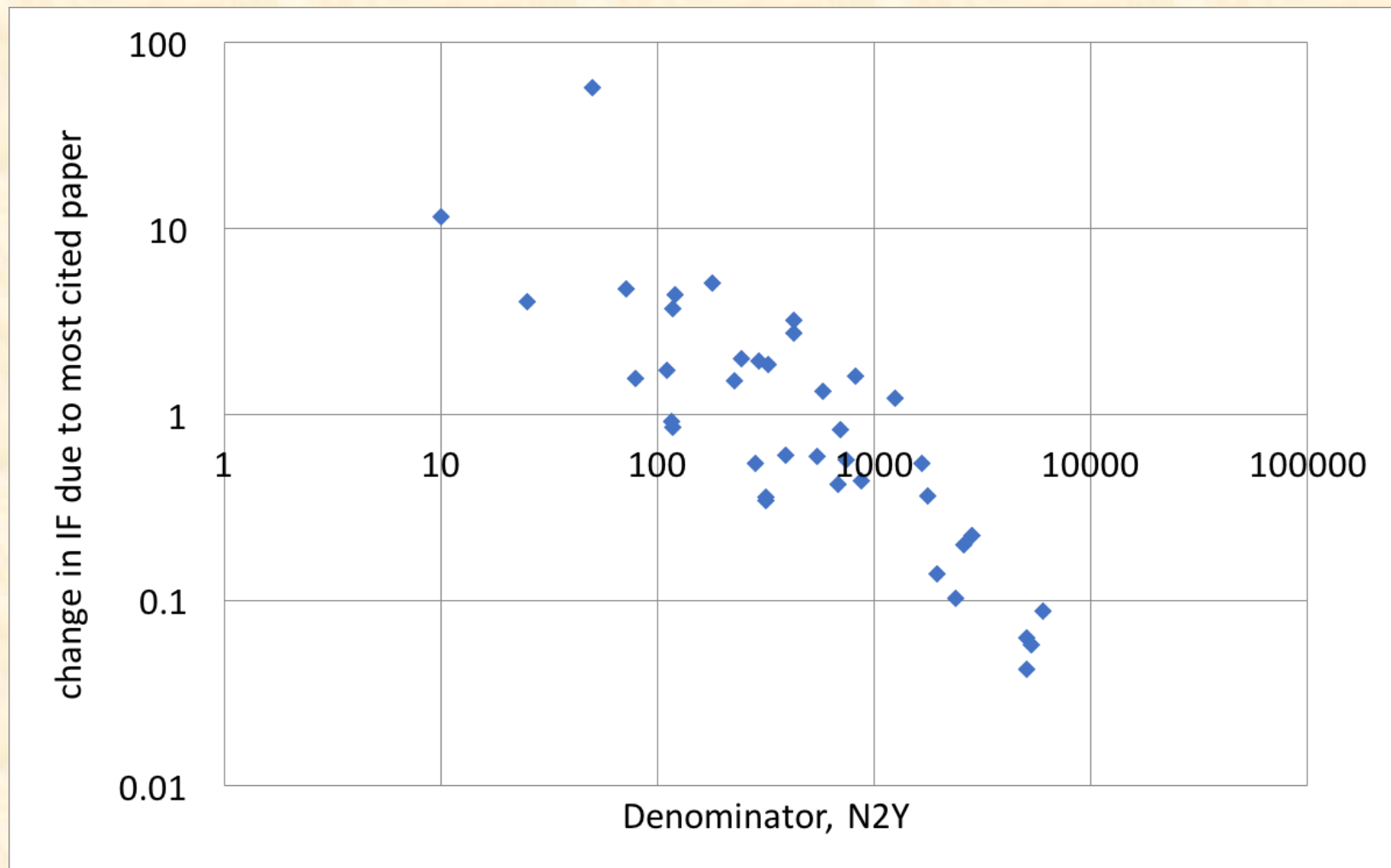
PRL (& most journals) have a highly-cited subset

Cumulative Impact Factor of *n* most cited *Letters*

Published in 2004-2005
Cited in 2006

Actual PRL Impact Factor

Labels on chart: RMP, Sci (ph), Science, Nat (ph), Nature, Nat Mat, Nat Ph, Nano L, PhLettB, PNAS (ph), OpEx, PRC, PRA, PRE, JAP, APL, PRB, ApJ, PNAS, JACS, NJP, Small, PNAS (ap)

Y-axis: Cumulative Impact Factor
X-axis: Citation rank *n*

"Is PRL too large to have an 'impact'?", Antonoyiannakis & Mitra, PRL **102**, 060001 (2009)

Highlighting & citations: cause or effect?

➢ Look at PRL papers highlighted as:

- Cover (CVR)
- Editors' Suggestion (LSUGG)
- Synopsis in *Physics*
- Viewpoint in *Physics*

➢ DATASET (unique markers):

- 257 PRL covers (CVR)
- 1134 Editors' Suggestions (LSUGG)
- 288 Synopses
- 86 Viewpoints

PY=2008-14 CY=PY+1, PY+2	PRL	CVR	LSUGG	Synopsis	Viewpoint
Mean citations	15.3	14.2	22	19.5	45.6
P value	N/A	0.072	<0.000001	0.0003	0.0002

➢ RESULTS (on INTRA-HIGHLIGHTS):

- Publicity alone (CVR) does NOT cause impact (CVR is chosen for aesthetics, not importance) [*]
- When APS Editors highlight papers with criterion of importance, highlighted papers are cited more
- Stratification of citations (Viewpoints > Suggestions > Synopses) confirms APS editors' hierarchy of highlighting schemes

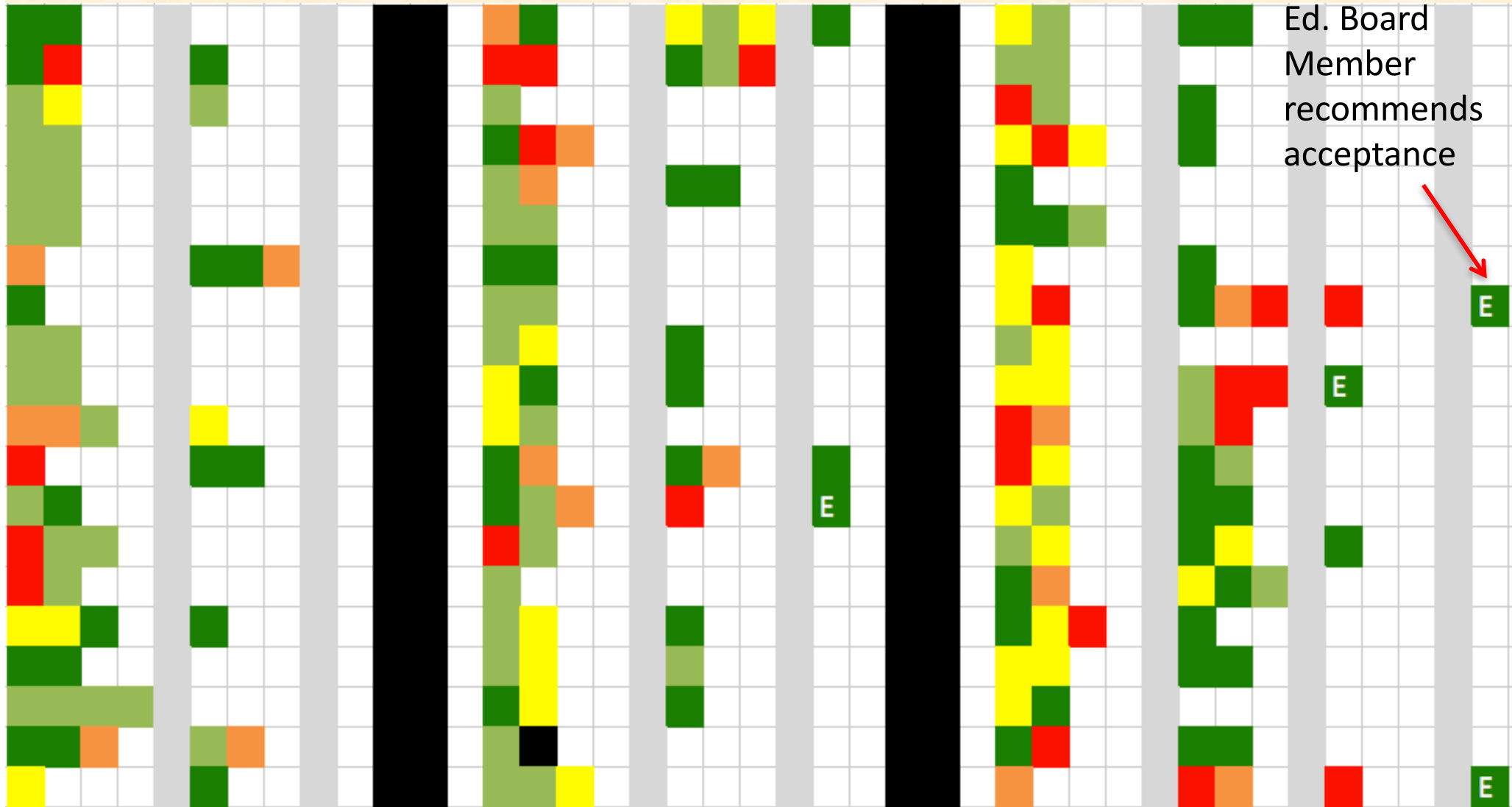➔ When importance is the main criterion, highlighting seems to identify impact, not cause it.

[*] Same result is found for covers (CVR) in *Nature Physics*.

© M. Antonoyiannakis

How hard is consensus? Top-60 cited PRL's in 2001-2006 (randomized)

Rounds of Review

Legend:
- Publish as is (green)
- P w/minor edits (light green)
- P w/major edits (yellow)
- Review after major edits (orange)
- Reject (red)
- No recommend. (black)

1   2   1   2   3   1   2   3   4

Ed. Board Member recommends acceptance

How hard is consensus? Top-60 cited PRL's in 2001-2006 (randomized)

Rounds of Review

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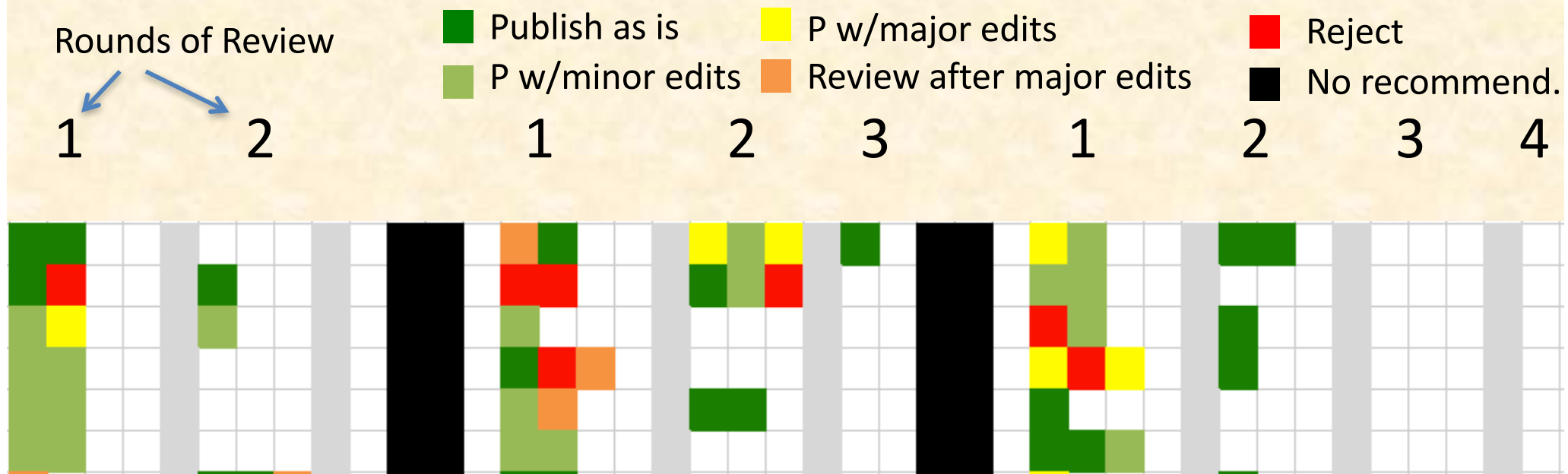
Influential papers are often controversial:

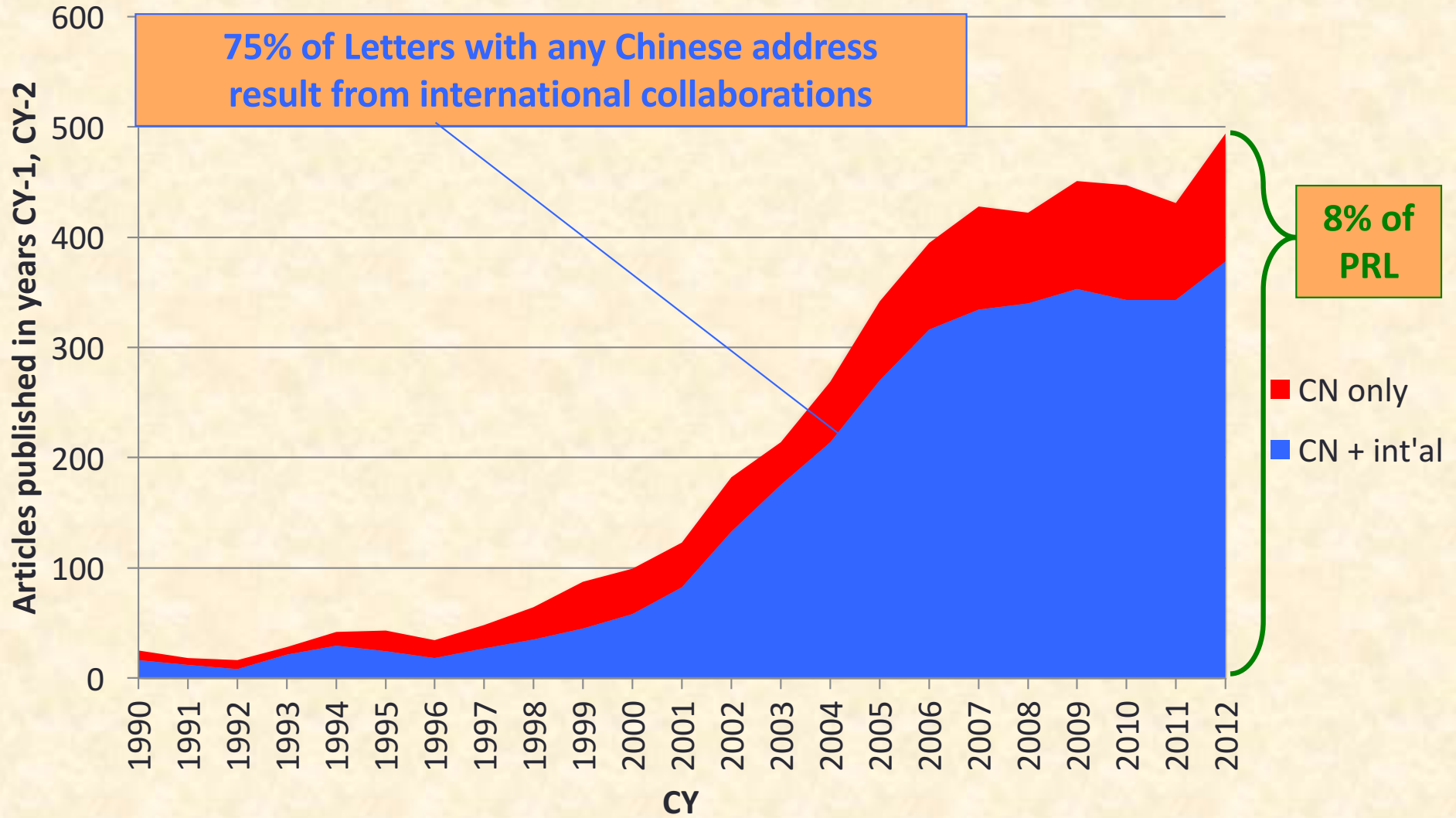→ Top-10 cited Letters are 10 times more likely to attract a Comment

→ In 10 out of the top-20 cited papers in PRL
(published 1991-2000 in plasmonics, photonic crystals & negative refraction)
at least one report was negative in the 1st round of review

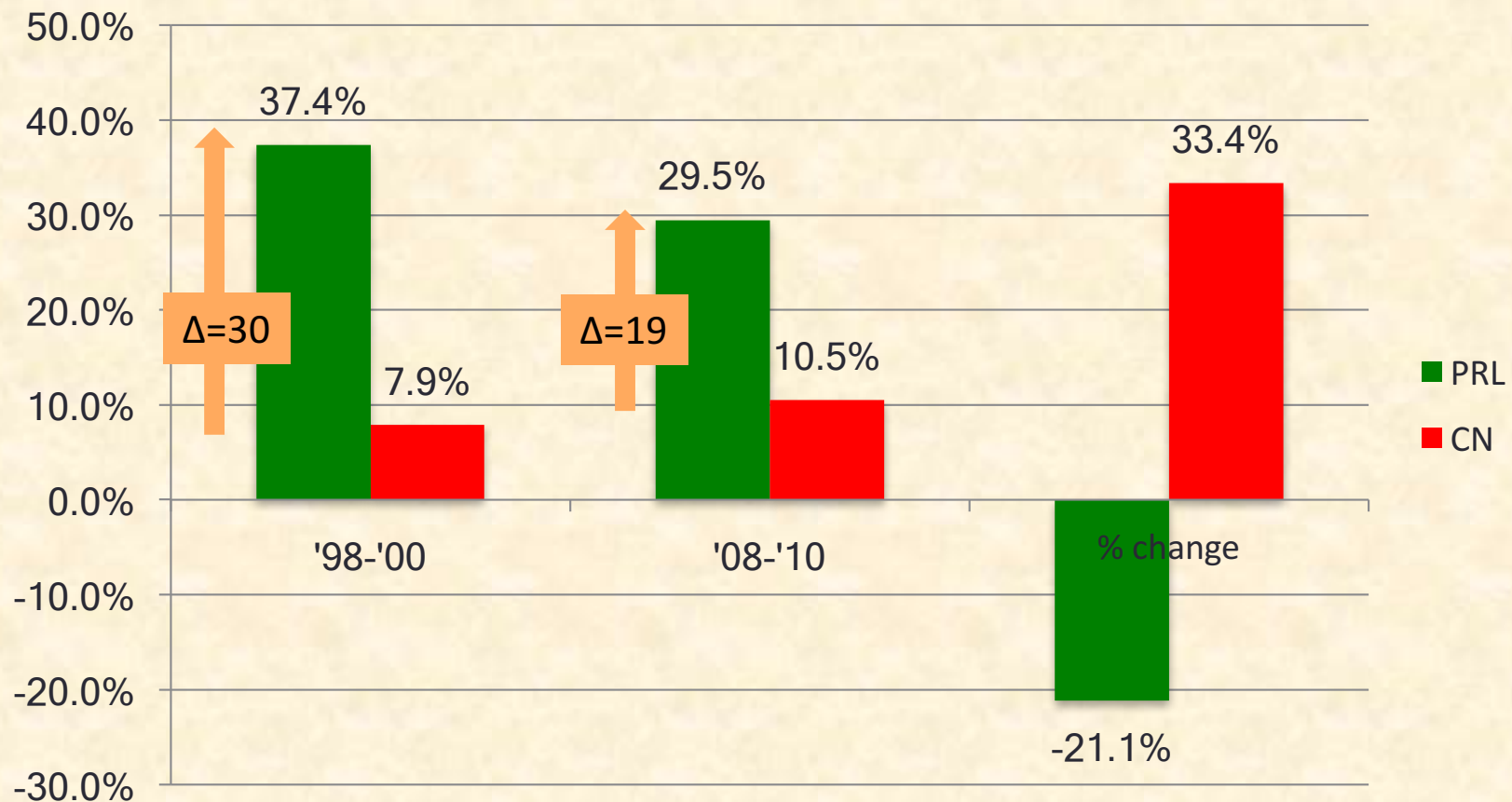# Growth in international collaborations

**PRL: articles with at least one address from China**

75% of Letters with any Chinese address result from international collaborations

8% of PRL

CN only
CN + int'al

Articles published in years CY-1, CY-2

CY

Acceptance rates for Chinese papers in PRL: Still below US & Europe… but gap (Δ) is closing!

My very first data analysis project in APS (based on an idea by Jack Sandweiss)

APS publications vs. GDP

~2.5 bn $/paper

1990-2008

World

EU

US

DE

FR

JP

CA

ES

CN

IN

RU

UK

BR

GDP (current US$)
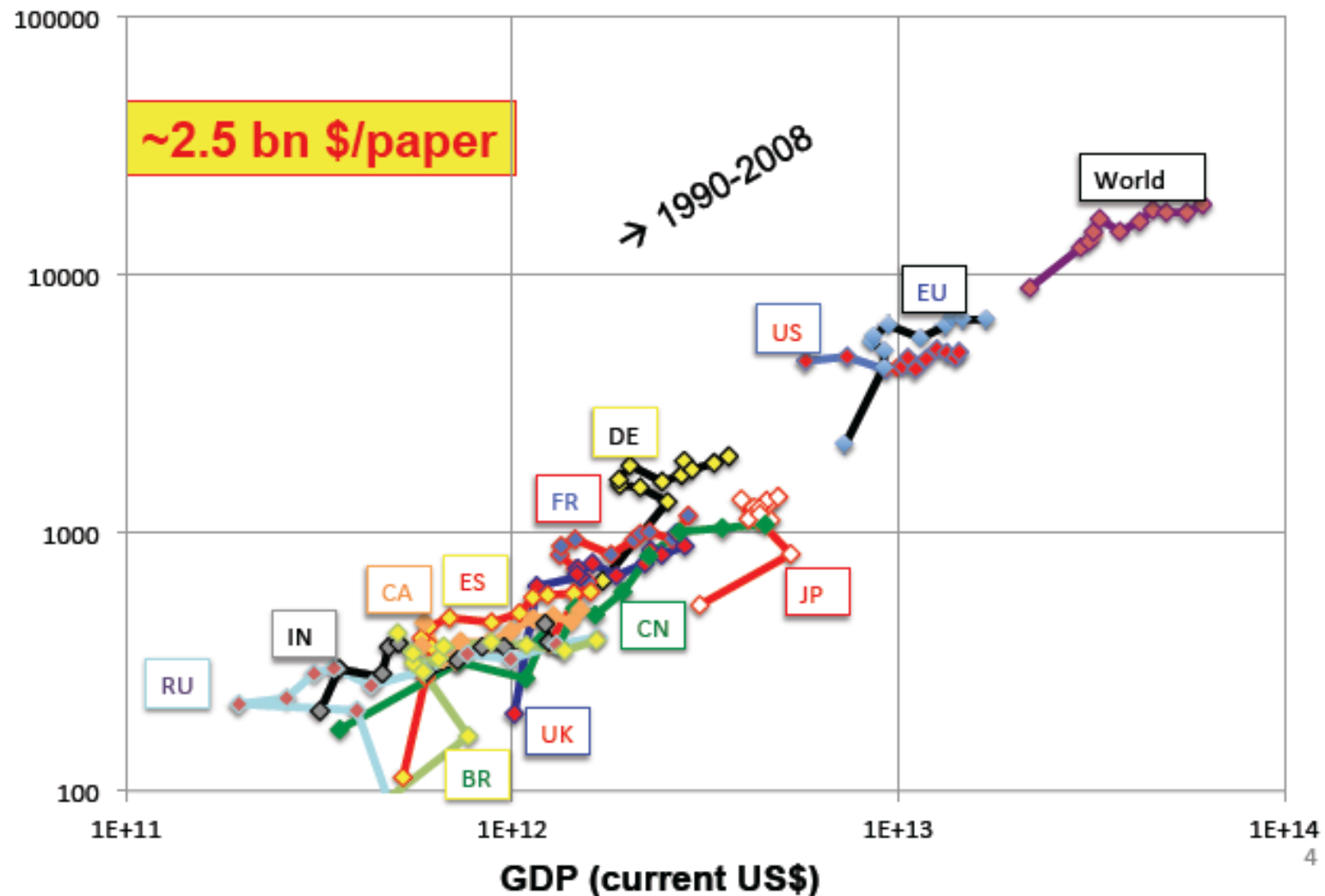
Sociology of Science
"Science of Science"
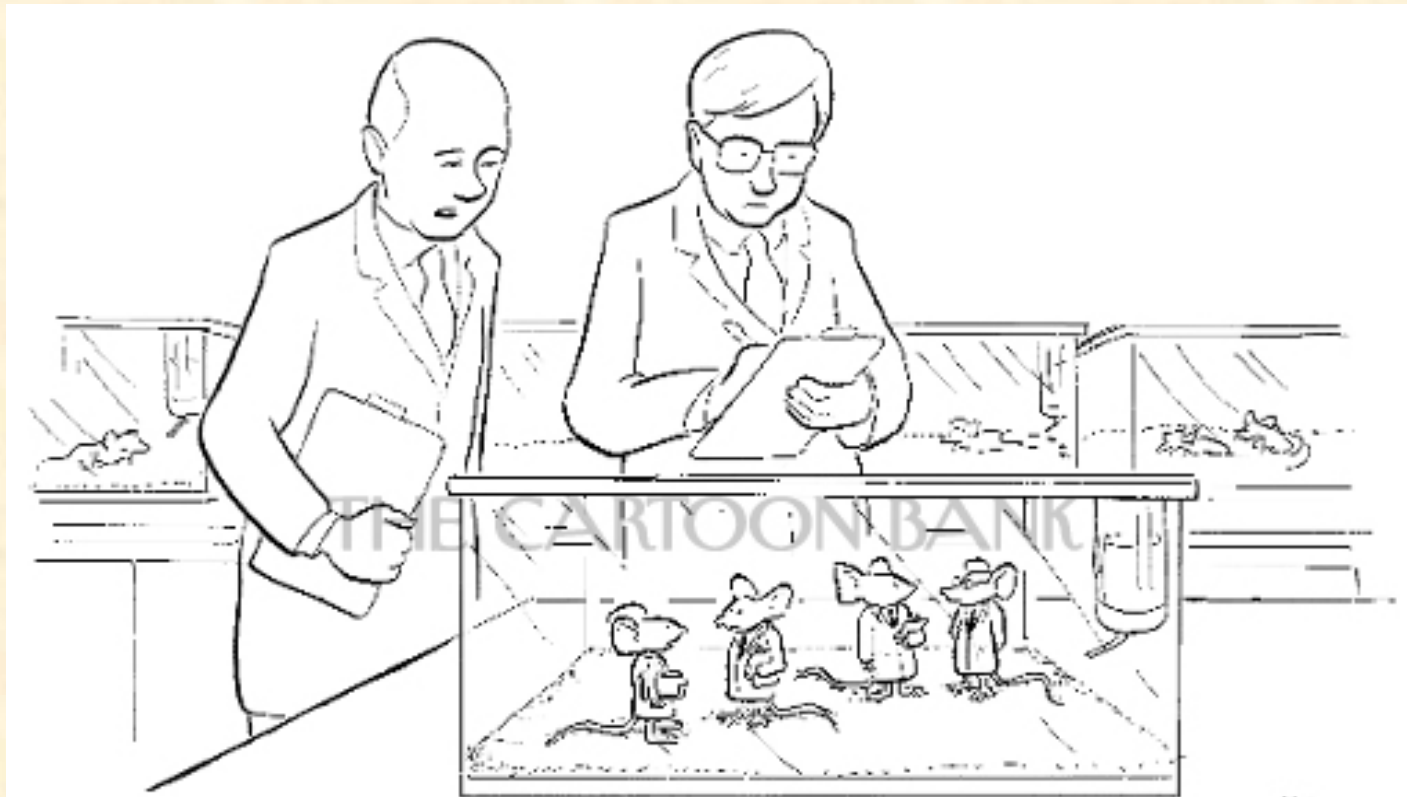
"O.K., let's slowly lower in the grant money."

Tribute to: Robert Merton

Columbia News
### the Public Affairs and Record Home Page

Current News | News Archive | Video Briefs | Video Forums | Photo Gallery | Home Page

Renowned Columbia Sociologist and National Medal of Science Winner Robert K. Merton Dies at 92

By Jason Hollander

Robert K. Merton, the esteemed Columbia University sociologist, and one of America's trailblazers in the social sciences, died Sunday, February 23rd in New York at the age of 92. Best known for founding the sociology of science and for his theoretical work analyzing social structures, particularly the intended and unintended consequences of social action, Merton became the first sociologist ever to win the National Medal of Science in 1994.
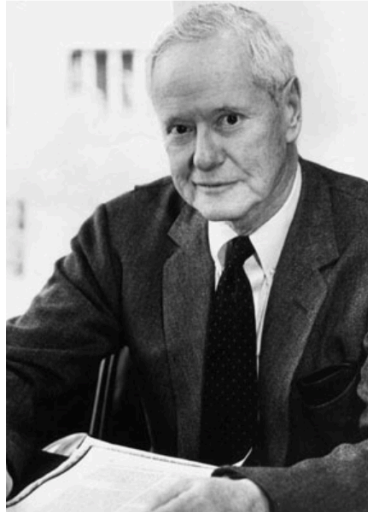
Merton, who lived in Manhattan, was an institution at Columbia, joining the faculty in 1941 and helping to build one of the most prominent sociology departments in the world through the relentless pursuit of subtle patterns in society. By concentrating on "middle range" theory -- rather than grand scale or abstract speculation -- Merton established concepts that reached into everyday life. He coined the phrase "self-fulfilling prophecy," developed the idea of role models and created, with his colleagues, the "focused interview" that was used in "focus groups" -- now a staple of contemporary business albeit a distortion of Merton's intention.

Merton generated many of his ideas through human interaction and observation. The skillful logic of his findings once inspired Eugene Garfield, an information specialist, to write, "So much of what he says is so absolutely obvious, so transparently true, that one can't imagine why no one else has bothered to point it out."

Robert K. Merton

Robert K. Merton (1910-2003)
Sociologist of Science

Jan.28,1961 THE NEW YORKER Price 25 cents
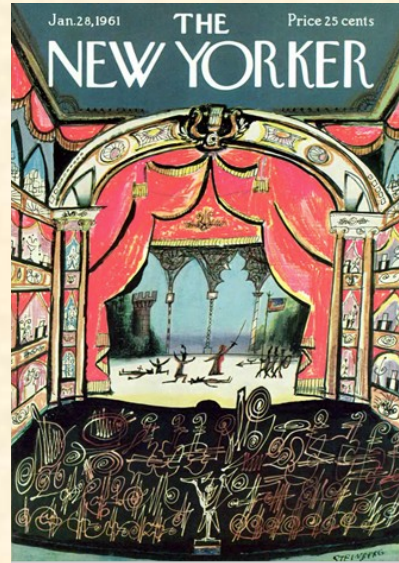
· · P R O F I L E S · ·
HOW DOES IT COME TO BE SO?

As a rule, one of the rewards of a profession is the deference that the public accords its label. Doormen beam upon anyone called Judge, club-women flutter about an author like pigeons about stale bread crusts, and practically every-body fawns on a physicist as though he were some kind of thaumaturge. Sociologists, who have a special idiom for express-ing such things—and everything else—people re... reflects its... with som... detachment... concerned... standing of... their own image. Robert K. Merton, of Colum-bia University, one of the most eminent members of the profes-sion, concluded a study of the matter a while back on a note

does away with Scotch, neat, and displays a surprising cath-olicity of interests and a tal-ent for good conversation, im-paired only slightly by the fact that he is alarmingly well in-formed about everything from baseball to Kant and is unhesi-tatingly ready to tell anybody about any or all of it. Most of his social acquaintances tend to think of him as some sort of humanist scholar. One neighbor, the sculptor Jacques Lipchitz, tried to pin him down for a visitor by saying, "Merton is interested in everything human. He collects so much informa-tion! But I have absolutely no idea what he does with it all, or what he makes out of it. I would say that he *analyzes* it somehow. He's a scientist, I think."
In a way, Lipchitz was not too far off. What Merton does in

Robert K. Merton

"Mr. Sociology"

Father of sociology of science

Terms coined:

Role model
   self-fulfilling prophecy
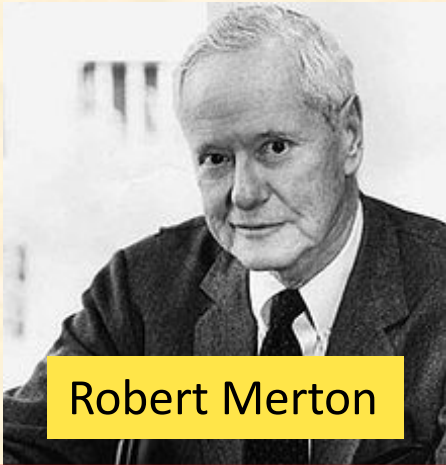   *obliteration by incorporation*
         Matthew effect
            Law of unintended consequences
               etc.

The 41st Chair Effect

Robert Merton

The 41st Chair effect:
In any highly selective process, it is impossible to select all and only the 'best' candidates

Selective clubs[*] are subjective by necessity
[*] University departments, journals, prizes, Oscar awards, etc.

The 41st Chair Effect
"The **French Academy** decided early that **only a cohort of 40 could qualify as members** and so emerge as immortals. This limitation of numbers made inevitable, of course, the exclusion through the centuries of many talented individuals who have won their own immortality. The familiar list **of occupants of this 41st chair includes Descartes, Pascal, Moliere, Bayle, Rousseau, Saint-Simon, Diderot, Stendhal, Flaubert, Zola, and Proust.**

What holds for the French Academy holds in varying degree for every other institution designed to identify and reward talent."

R. K. Merton, *Science* **159**, 56, (1968)

- Sam Goudsmit, *Editorial*, PRL **28**, 331 (1972) "Acceptance of a Letter is somewhat similar to selection to an Academy: For every one selected there are always a few equally qualified candidates who lost by a couple of votes."

The 41st Chair Effect

Can you come up with any examples of the 41st Chair Effect?

Demonstration of the 41st Chair Effect

People who probably deserved the Nobel Prize but did not get it:

| Name	Nobel Prize not awarded	Notable works
Lise Meitner	Chemistry/Physics	Nuclear fission
Mahatma Ghandi	Peace	
Oskar Schindler	Peace	
Satyendra Nath Bose	Physics	Bose statistics
Chien-Shiung Wu	Physics	Parity violation
Tim Berners-Lee	?	World Wide Web
Thomas Edison	Physics	Light bulb, motion picture camera, etc.
Nikola Tesla	Physics	ac current, remote radio control, etc.
Stephen Hawking	Physics	Hawking radiation
Nikos Kazantzakis	Literature	Prose: *Zorba the Greek, Report to Greco*, etc.
C. P. Cavafy	Literature	Poetry: *Ithaca, Thermopylae, The City*, etc.

Matthew Effect

Matthew effect

Eminent scientists often get more credit than a comparatively unknown researcher, even if their work is similar… credit will usually be given to researchers who are already famous ("the rich get richer").

…as a Nobel laureate in chemistry put it: "If my name was on a paper, people would remember *it* and not remember who else was involved."

➔ Resist the temptation to cite mostly the famous people
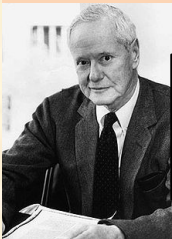
← **Robert K. Merton**
Harriet Zuckerman ➔

Matilda effect

Similar to the Matthew effect but the bias is now against female scientists vs. men. Named after Matilda Joslyn Gage by Margaret Rossiter.

➔ Beware of implicit bias against citing female scientists

Matthew Effect, from the biblical gospel of Matthew 25:29:

"…τῷ γὰρ ἔχοντι παντὶ δοθήσεται
καὶ περισσευθήσεται,
ἀπὸ δὲ τοῦ μὴ ἔχοντος καὶ ὃ ἔχει
ἀρθήσεται ἀπ᾽ αὐτοῦ."

"For to all those who have, more will be given, and they will have an abundance; but from those who have nothing, even what they have will be taken away."

Stigler's law of eponymy:

"No scientific discovery is named after its original discoverer."

Malcolm Gladwell, "In the air: Who says big ideas are rare?", **The New Yorker**, May 12, 2008

Discovery	
Fourier Transforms	Laplace employed Fourier Transforms in print before Fourier published on the topic
Laplace Transforms	Lagrange presented Laplace Transforms before Laplace began his scientific career
Cauchy distribution	Poisson published the Cauchy distribution in 1824, 29 years before Cauchy touched on it in an incidental manner
Chebychev Inequality	Bienaymé stated and proved the Chebychev Inequality a decade before and in greater generality than Chebychev's first work on topic
Pythagorean theorem	the Pythagorean theorem was known before Pythagoras
Gaussian distributions	Gaussian distributions were not discovered by Gauss
Stigler's Law	Idea that credit does not align with discovery was first put forth by Merton
Fullerene	It is one of Archimedes' 13 semi-regular polyhedra
Calculus	Discovered by Newton and Leibniz, but anticipated by Archimedes

Simultaneous discovery: Multiples

"There are just too many people with an equal shot at those ideas floating out there in the ether. We think we're pinning medals on heroes. In fact, we're pinning tails on donkeys."

Malcolm Gladwell, **The New Yorker**, May 12, 2008

Discovery	
Evolution	Charles Darwin and Alfred Russel Wallace both discovered evolution
decimal fractions	"Invented" by three mathematicians
Oxygen	Discovered by Joseph Priestley, in Wiltshire, in 1774, and by Carl Wilhelm Scheele, in Uppsala, a year earlier
Color photography	invented at same time by Charles Cros and by Louis Ducos du Hauron
Logarithms	invented by John Napier and Henry Briggs in Britain, and by Joost Bürgi in Switzerland
sunspots	4 independent discoveries, all in 1611: Galileo in Italy, Scheiner in Germany, Fabricius in Holland and Harriott in England
thermometer	at least 6 different inventors
telescope	9 claimants of the invention
Typewriting machines	invented simultaneously in England & America by several individuals
steamboat	discovery of Fulton, Jouffroy, Rumsey, Stevens and Symmington
law of conservation of energy	formulated four times independently in 1847, by Joule, Thomson, Colding and Helmholz; anticipated by Robert Mayer in 1842

Sleeping beauties in science

Unrecognized for several years after publication.

Three parameters (by A. van Raan)

- Length of sleep
- Depth of sleep
- Awake intensity

Certain fields (e.g., physics, chemistry, mathematics) can produce SB's more often

Top SB's achieve delayed exceptional importance in disciplines different from where originally published.

Delayed recognition occurs on wide & continuous range

Examples:

1. Memristor paper (1971): "Memristor—The Missing Circuit Element," *IEEE Transactions on Circuit Theory* **18**, 507 (1971)

2. Veselago paper: "ELECTRODYNAMICS OF SUBSTANCES WITH SIMULTANEOUSLY NEGATIVE VALUES OF SIGMA AND MU," *SOVIET PHYSICS USPEKHI-USSR* **10**, 509 (1968)

3. Weyl fermions: Weyl, Hermann, *ZEITSCHRIFT FUR PHYSIK* **56**, 330 (1929)
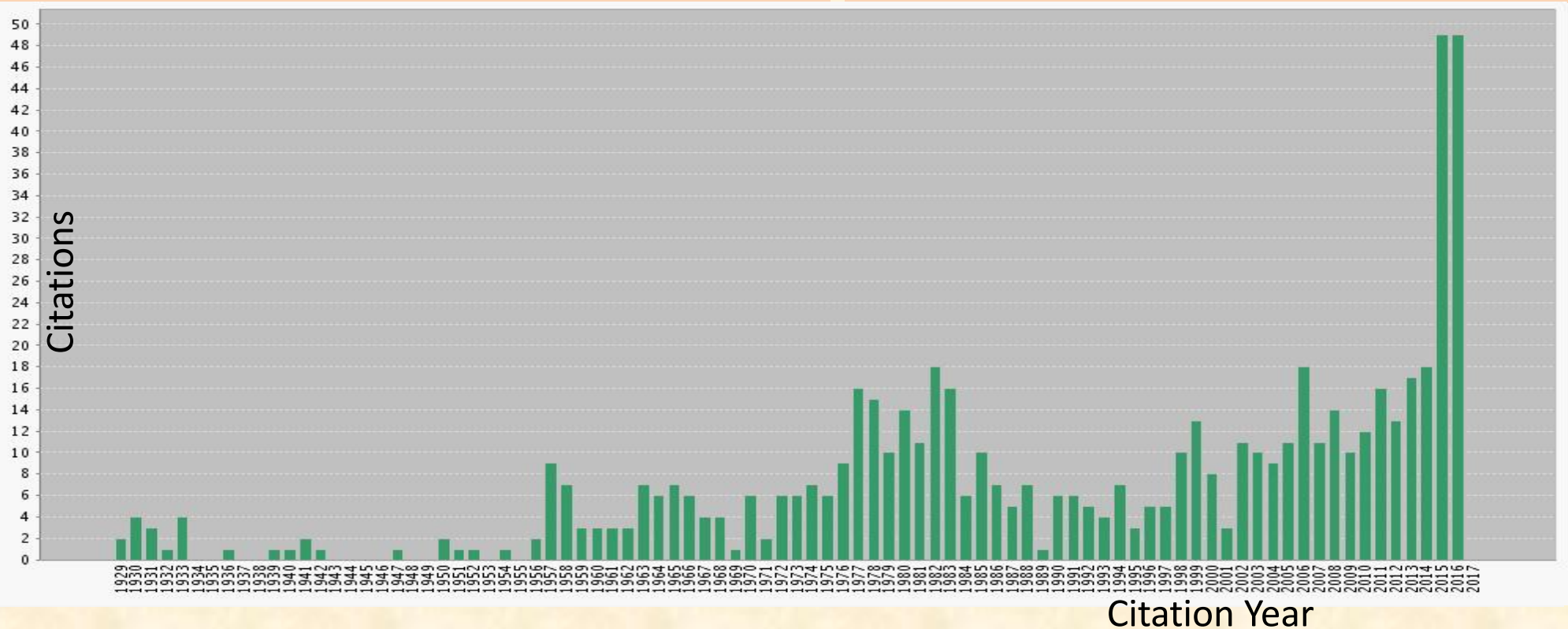
Is this career for you?
Editorial job in APS

Society publisher (non-profit)

Leading professional institution

Semi-academic environment

Job security & stability

Opportunities to learn & grow within the job:

- learn more physics
- writing
- design own projects
  (e.g., bibliostatistics, coding, data science)
- some exceptionally talented colleagues to learn from

Meet new faces, see new places (travel & remote work)

Modest salary (Long Island & NY areas are quite expensive)

Good benefits

Desired traits of an editor

Integrity

Service-oriented

Critical thinking

Emotional intelligence (maturity, humility,…)

Communication skills

Sense of humor

Common sense!

Self-motivated & able to work independently

Research background in at least one field
                        (typically: PhD + post-doc)

Willingness to learn (about physics + people)

Questions to consider:
What is important to you?

- Do what you love?
  - Are you OK with failing?
  - What is your backup plan?
- Or do what you "must?"
  - How long can you last?
  - What skills and connections can you pick up?
- Money considerations: How much is enough for you?
- Job security
- Job location
- Work–life balance: 9–5 or around the clock?
- Work environment:
  - Opportunities for growth
  - Intellectual independence
  - Room for creativity
  - Mentors

> Keep in mind:
> Sometimes what we once
> loved ceases to excite us…
> and while busy doing what we "must" we
> may discover things we love in the process
> (life has its ways of surprising us)

Thank you, and good luck!

I hope you enjoyed this talk…

Questions? Feedback?

Contact me!

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