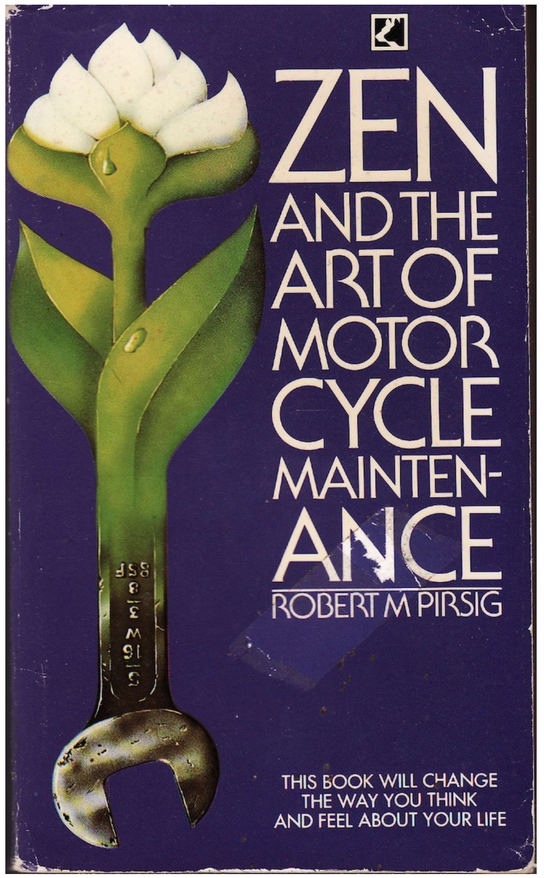
Zen and the Art of Science Communication

Stephen Curry

Imperial College

Diamond Light Source/CCP4 workshop | 19 Dec 2016

Zen and the Art of Academic Maintenance



An Inquiry into Values

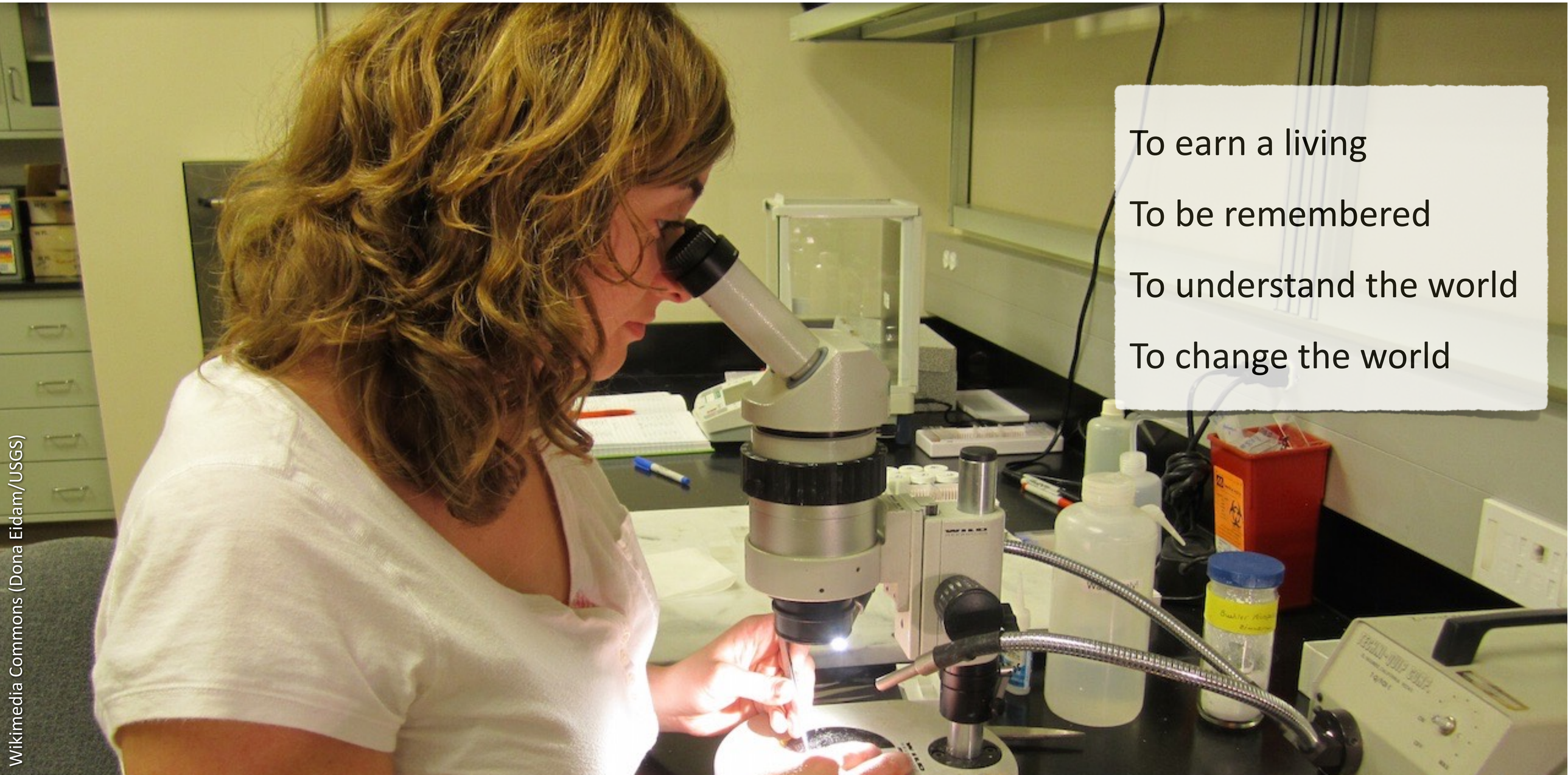
"this book will change the way you **think** and **feel** about your life"

Stephen Curry

Imperial College

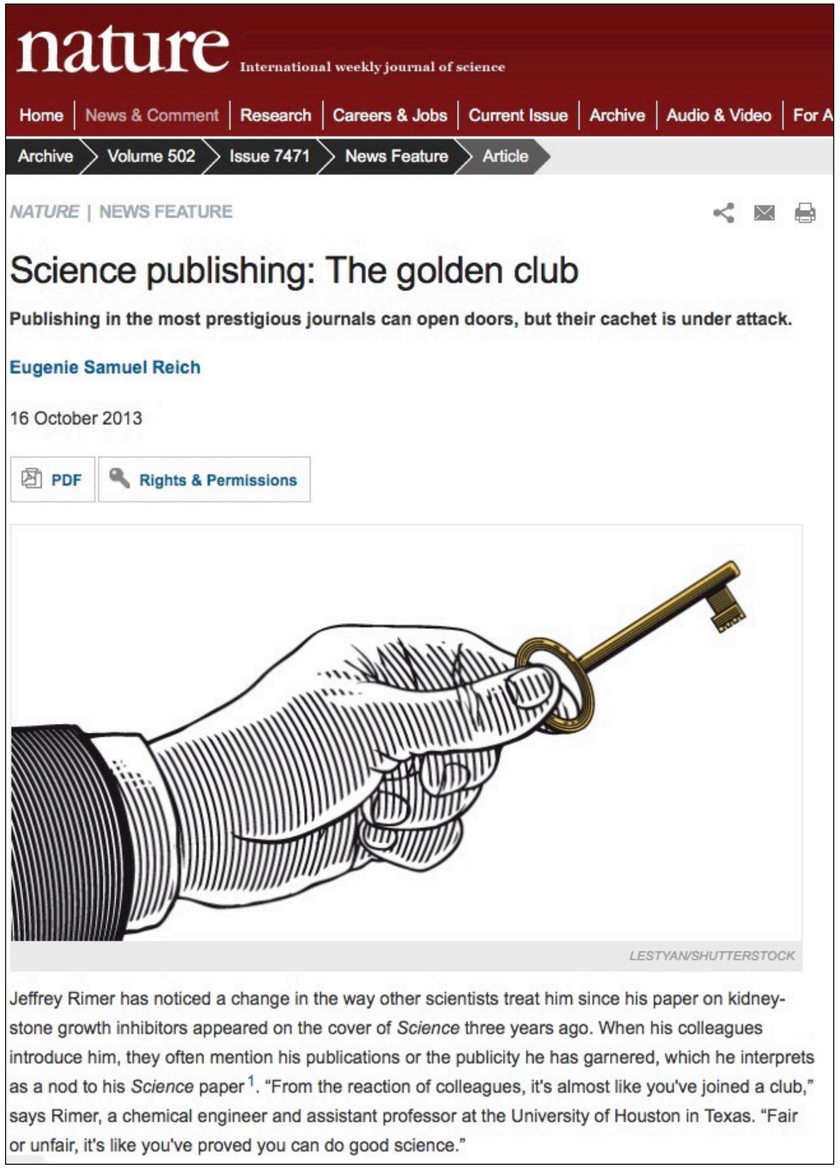
Diamond Light Source/CCP4 workshop | 19 Dec 2016

Why do people become researchers?



Wikimedia Commons (Dona Eidam/USGS)

How do people become **successful** researchers?



nature International weekly journal of science

Home | News & Comment | Research | Careers & Jobs | Current Issue | Archive | Audio & Video | For A

Archive > Volume 502 > Issue 7471 > News Feature > Article

NATURE | NEWS FEATURE

Science publishing: The golden club

Publishing in the most prestigious journals can open doors, but their cachet is under attack.

Eugenie Samuel Reich

16 October 2013

PDF | Rights & Permissions

LESTYAN/SHUTTERSTOCK

Jeffrey Rimer has noticed a change in the way other scientists treat him since his paper on kidney-stone growth inhibitors appeared on the cover of *Science* three years ago. When his colleagues introduce him, they often mention his publications or the publicity he has garnered, which he interprets as a nod to his *Science* paper[1]. "From the reaction of colleagues, it's almost like you've joined a club," says Rimer, a chemical engineer and assistant professor at the University of Houston in Texas. "Fair or unfair, it's like you've proved you can do good science."

http://www.nature.com/news/science-publishing-the-golden-club-1.13951

By publishing in high impact factor journals

Measurement has its uses. In sports…

Position	Club	Played	Won	Drawn	Lost	GF	GA	GD	Points
1	Leicester City	38	23	12	3	68	36	32	**81**
2	Arsenal	38	20	11	7	65	36	29	**71**
3	Tottenham Hotspur	38	19	13	6	69	35	34	**70**
4	Manchester City	38	19	9	10	71	41	30	**66**
5	Manchester United	38	19	9	10	49	35	14	**66**
6	Southampton	38	18	9	11	59	41	18	**63**
7	West Ham United	38	16	14	8	65	51	14	**62**
8	Liverpool	38	16	12	10	63	50	13	**60**
9	Stoke City	38	14	9	15	41	55	-14	**51**
10	Chelsea	38	12	14	12	59	53	6	**50**
11	Everton	38	11	14	13	59	55	4	**47**
12	Swansea City	38	12	11	15	42	52	-10	**47**

English Premier League Table (2015-16)



https://www.premierleague.com/tables?co=1&se=42&mw=-1&ha=-1

…and in business…



http://www.aronline.co.uk/blogs/news/news-uk-car-manufacturing-enjoys-bumper-2013/



https://www.nuh.com.sg/patients-and-visitors/patients-and-visitors-guide/choice-of-accomodation/ward-types.html

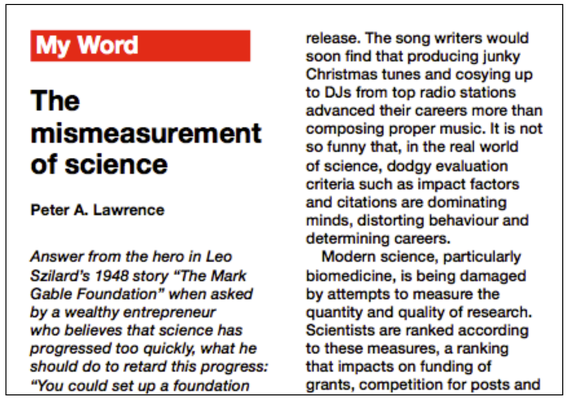
…but where are the limits?

The *Times Higher Education* World University Rankings

World University Rankings 2013-2014

1	California Institute of Technology (Caltech)	United States	94.9
2	Harvard University	United States	93.9
2	University of Oxford	United Kingdom	93.9
4	Stanford University	United States	93.8
5	Massachusetts Institute of Technology (MIT)	United States	93.0
6	Princeton University	United States	92.7
7	University of Cambridge	United Kingdom	92.3
8	University of California, Berkeley	United States	89.8
9	University of Chicago	United States	87.8
10	Imperial College London	United Kingdom	87.5
11	Yale University	United States	87.4

Focusing researcher assessment on publishing is problematic



My Word

The mismeasurement of science

Peter A. Lawrence

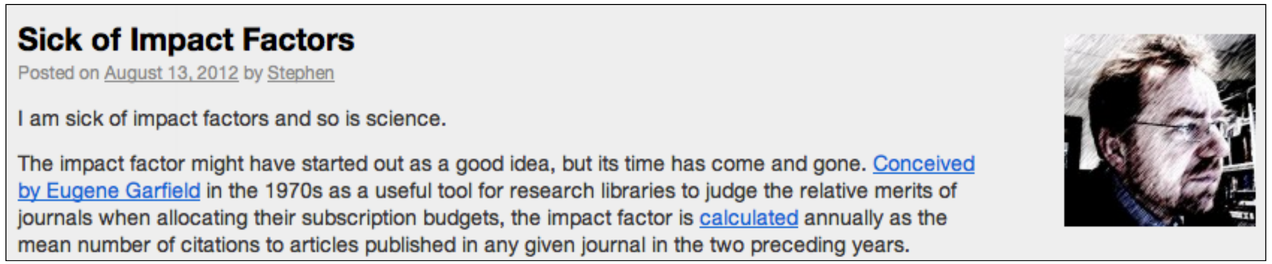
Answer from the hero in Leo Szilard's 1948 story "The Mark Gable Foundation" when asked by a wealthy entrepreneur who believes that science has progressed too quickly, what he should do to retard this progress: "You could set up a foundation

release. The song writers would soon find that producing junky Christmas tunes and cosying up to DJs from top radio stations advanced their careers more than composing proper music. It is not so funny that, in the real world of science, dodgy evaluation criteria such as impact factors and citations are dominating minds, distorting behaviour and determining careers.

Modern science, particularly biomedicine, is being damaged by attempts to measure the quantity and quality of research. Scientists are ranked according to these measures, a ranking that impacts on funding of grants, competition for posts and

http://dx.doi.org/10.1016/j.cub.2007.06.014

- Publication slowed by the impact factor chase
- Novelty & positive results favoured over rigour & reproducibility
- Incentivises fraud
- Weakens public trust



Sick of Impact Factors

Posted on August 13, 2012 by Stephen

I am sick of impact factors and so is science.

The impact factor might have started out as a good idea, but its time has come and gone. Conceived by Eugene Garfield in the 1970s as a useful tool for research libraries to judge the relative merits of journals when allocating their subscription budgets, the impact factor is calculated annually as the mean number of citations to articles published in any given journal in the two preceding years.

http://occamstypewriter.org/scurry/2012/08/13/sick-of-impact-factors/



OPEN ACCESS Freely available online

PLOS | MEDICINE

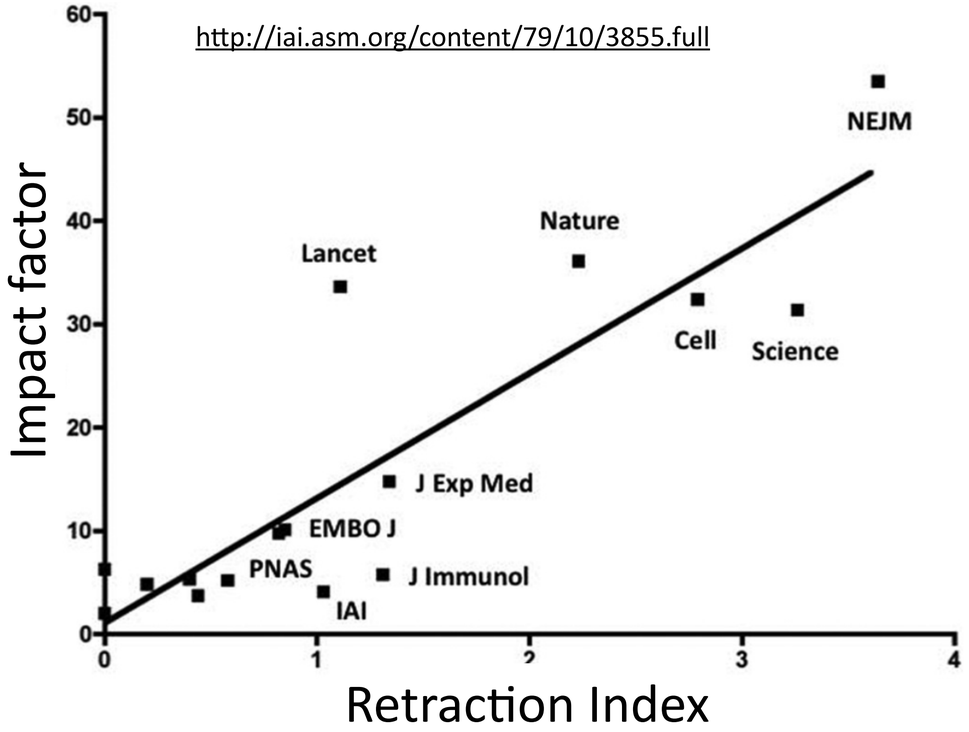
Essay

How to Make More Published Research True

John P. A. Ioannidis[1,2,3,4*]

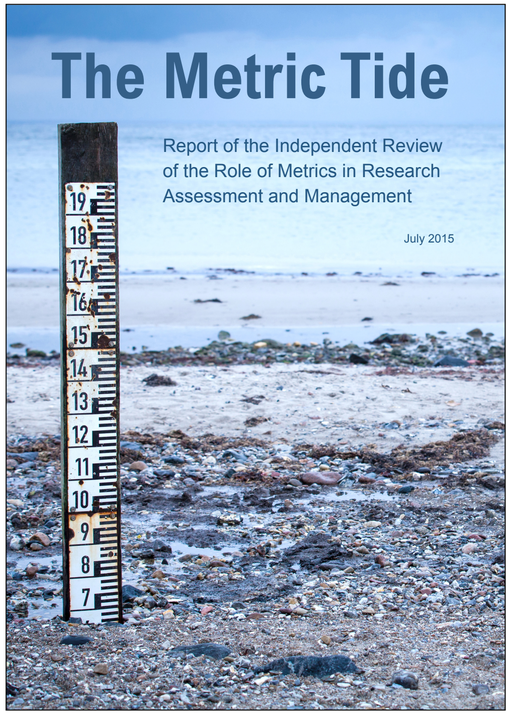
http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1001747

http://iai.asm.org/content/79/10/3855.full



The Metric Tide (2015): Main conclusions

- **Responsible metrics**
- Mind your language: *indicators*, not metrics
- Metrics inform but do not replace judgement
- Institutions need to be transparent about use
  - Do not delegate measures of excellence to league tables or journals
  - Dialogue with staff
  - Clearly state of principles for assessment
- Data need to be transparent (challenge to providers)
- Builds on DORA
- But will require adoption and implementation…



San Francisco DORA
Declaration on Research Assessment

http://www.ascb.org/dora/

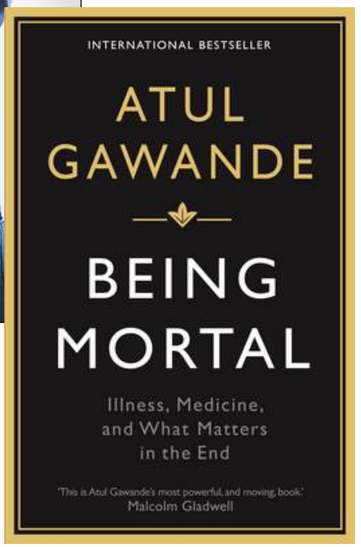
http://www.hefce.ac.uk/pubs/rereports/Year/2015/metrictide/Title,104463,en.html

Can we swim against the metric tide?

"In the end, people don't view their life as merely the average of all its moments – which, after all, is mostly nothing much plus some sleep.

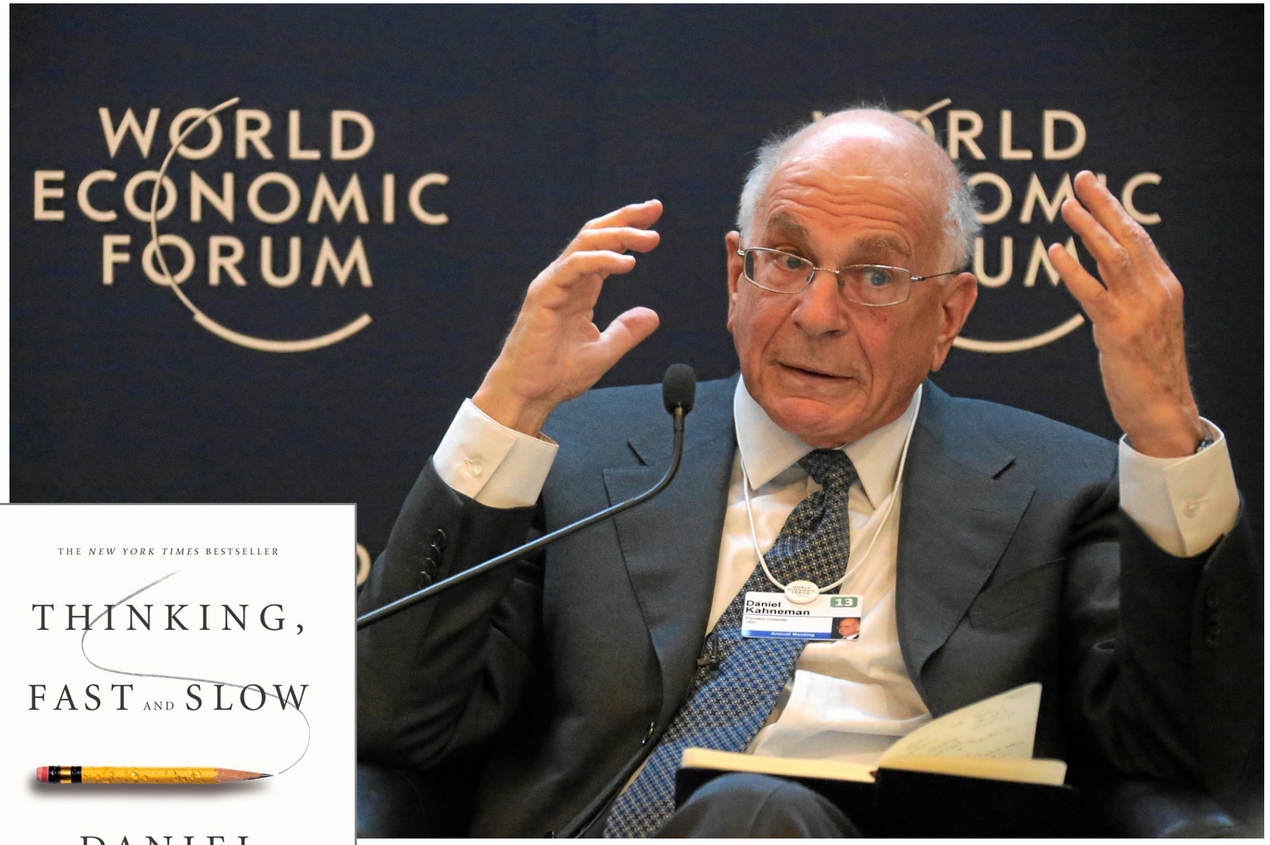
Measurements of people's minute-by-minute levels of pleasure and pain miss this fundamental aspect of human existence… *We have purposes larger than ourselves*."





On your deathbed - will your bibliography or h-index be uppermost in your mind?

Can we swim against the metric tide? Psychological aspects



"Nothing in life is as important as you think it is when you are thinking about it."

Evaluation is hard - we get it wrong all the time

Halo effects

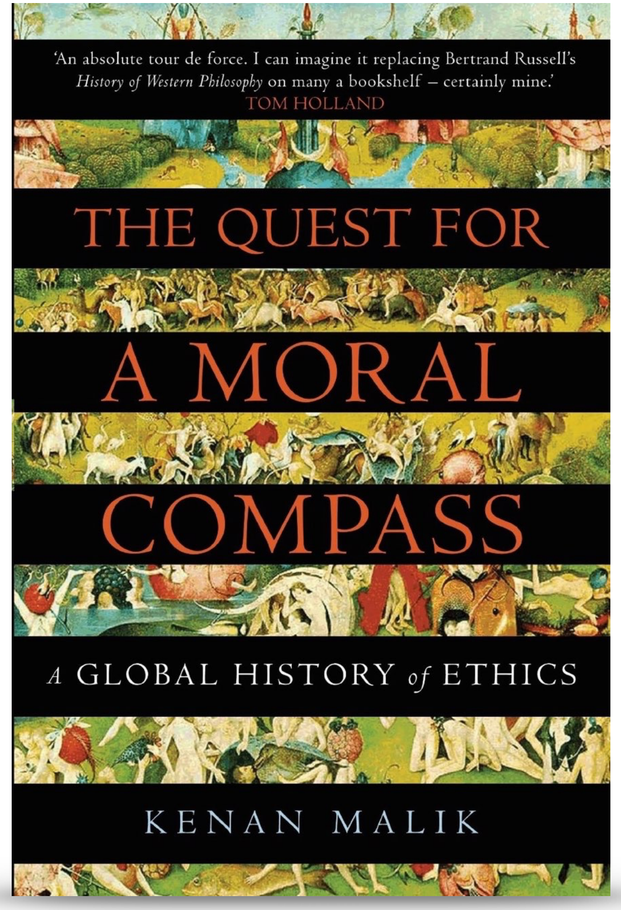
Anchoring effects

Hindsight bias

Loss aversion – the sunk cost fallacy

The fallacy of **W**hat **Y**ou **S**ee **I**s **A**ll **T**here **I**s

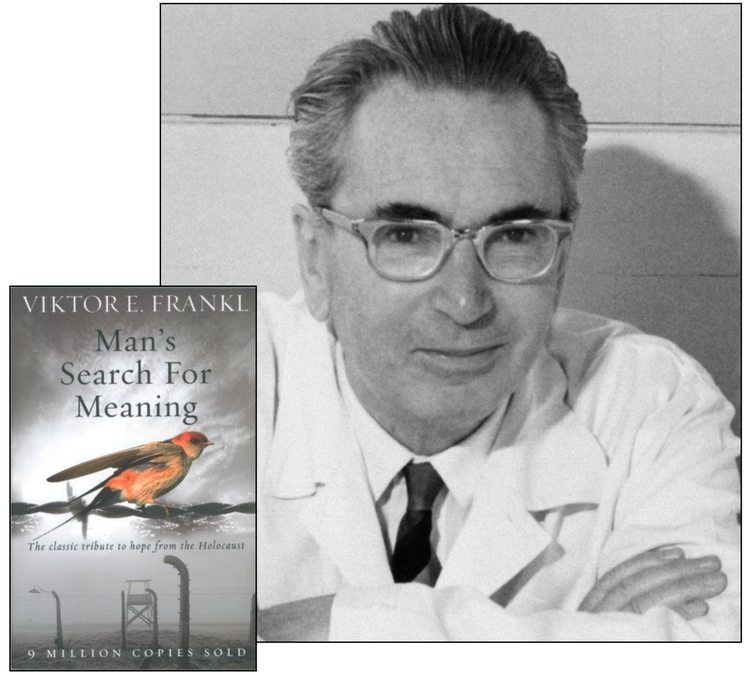
Can we swim against the metric tide? Moral considerations



"As new possibilities of social transformation were opened up… people asked themselves not simply 'What moral claims are rational given the social structure?', but… What kind of society… will best allow human beings to flourish?"

Paraphrasing Viktor Frankl:

"Humans find themselves only through creating meaning in the world… They do so by acting upon the world."



"Don't aim at success—the more you aim at it and make it a target, the more you are going to miss it. For success, like happiness, cannot be pursued; it must ensue, and it only does so as the unintended side-effect of one's dedication to a cause greater than oneself…"

https://www.ted.com/talks/viktor_frankl_youth_in_search_of_meaning

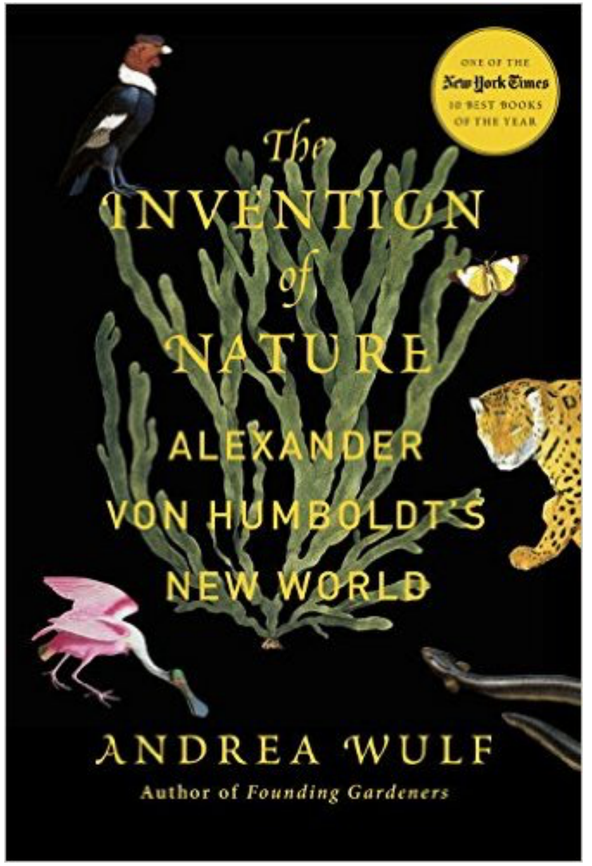
Have we lost sight of the things that matter?



“I’ve seen things you people wouldn’t believe.”

Can the **openness** of our scientific heritage help us?

Maths, objective observation and controlled experiments paved this path of reason across the western world. Scientists became citizens of their self-proclaimed 'republic of letters', an intellectual community that transcended national boundaries, religion and language. As their letters zigzagged across Europe and the Atlantic, scientific discoveries and new ideas spread. This 'republic of letters' was a country without borders, ruled by reason and not by monarchs.



Is our amateur (and open) ethos *still* one of the norms of the academy?

Declarations and policies are not enough



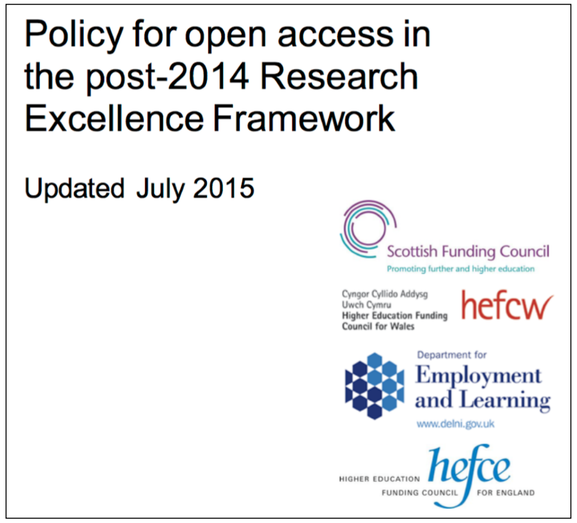
"The principle that the results of research that has been **publicly funded** should be **freely accessible** in the public domain is a compelling one, and **fundamentally unanswerable**."

Dame Janet Finch (2012)



"All scientific papers should be freely available by 2020…"

Commissioner Carlos Moedas (2016)



From April 2016: To be eligible for submission to the post-2014 REF, authors' outputs **must** have been deposited in an institutional or subject repository."

Good practices don't spread by themselves (or by exhortation, or by sanctions…)

Why was anaesthesia adopted more rapidly than antisepsis?

"**First**, one combatted a visible and immediate problem (pain); the other combatted an invisible problem (germs) whose effects wouldn't be manifest until well after the operation.

"**Second**, although both made life better for patients, only one made life better for doctors."

"People talking to people is still how the world's standards change."

In speaking I need to make a more explicit link between the 1st and 2nd lessons and the final comments about people talking to people.



ANNALS OF MEDICINE JULY 29, 2013 ISSUE

SLOW IDEAS

Some innovations spread fast. How do you speed the o

By Atul Gawande

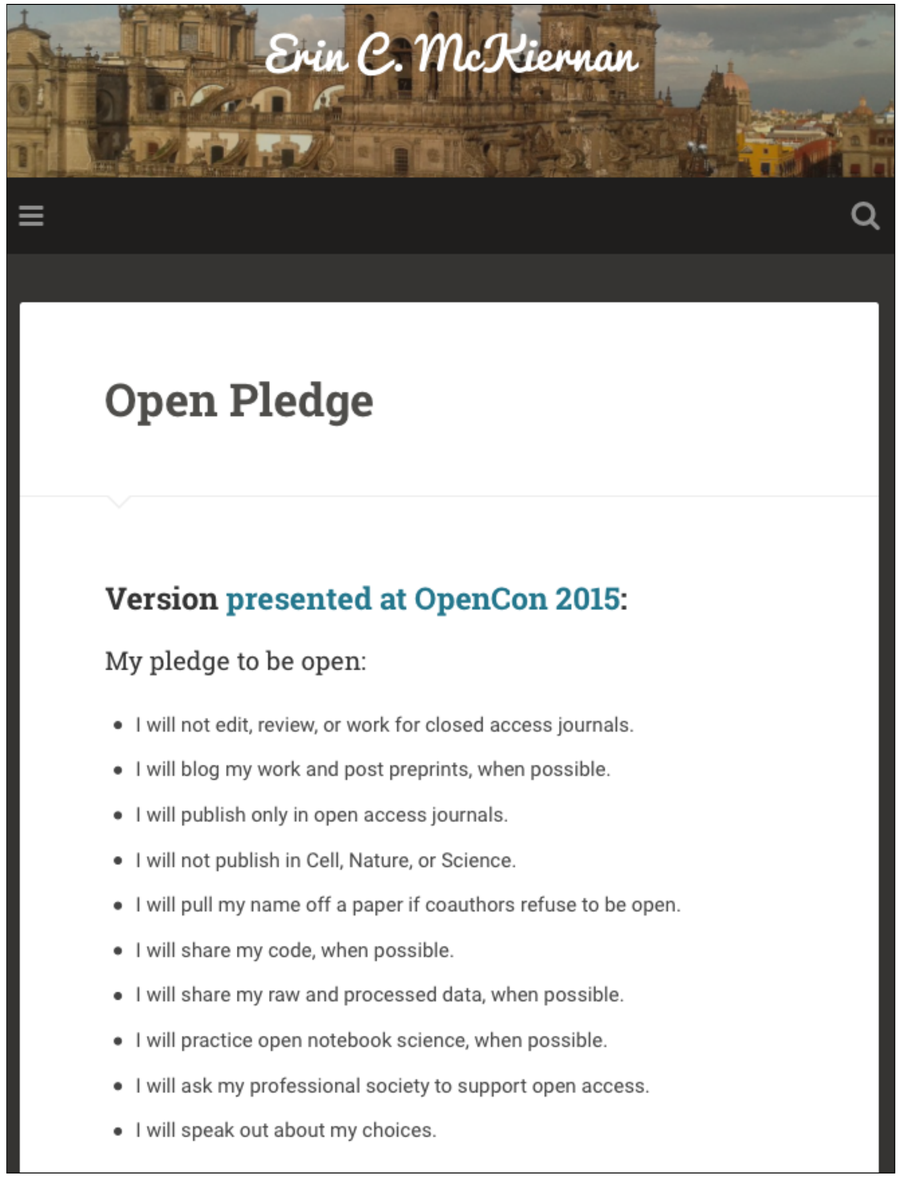
Why do some innovations spread so swiftly and others so slowly? Consider the very different trajectories of surgical anesthesia and antiseptics, both of which were discovered in the nineteenth century. The first public demonstration of anesthesia was in 1846. The Boston surgeon Henry Jacob Bigelow was approached by a local dentist named William Morton, who insisted that he had found a gas that could render the pain of ramatic claim. In nor tooth ating. Without surgeons learned speed. tients down as rashed, until they y. Nothing ever tried had made much difference. agreed to let Morton demonstrate his claim.

We yearn for frictionless, technological solutions. But people talking to people is still the way that norms and standards change.

ILLUSTRATION BY HARRY CAMPBELL

http://www.newyorker.com/magazine/2013/07/29/slow-ideas

Brave souls in the next generation can help…



https://emckiernan.wordpress.com/pledge/



Alexandra Elbakyan

Leaders and institutions have to do their bit…

Evaluating how we evaluate

Ronald D. Vale
Department of Cellular and Molecular Pharmacology and the Howard Hughes Medical Institute, University of California, San Francisco, San Francisco, CA 94158

ABSTRACT Evaluation of scientific work underlies the process of career advancement in academic science, with publications being a fundamental metric. Many aspects of the evaluation

Vale, R. D. (2012) *Mol Biol Cell* **23**, 3285–3289.

Researcher assessment at UMC Utrecht

1. Research, publications, grants
2. Managerial responsibilities & academic duties
3. Mentoring & teaching
4. Clinical work (if applicable)
5. Entrepreneurship & community outreach



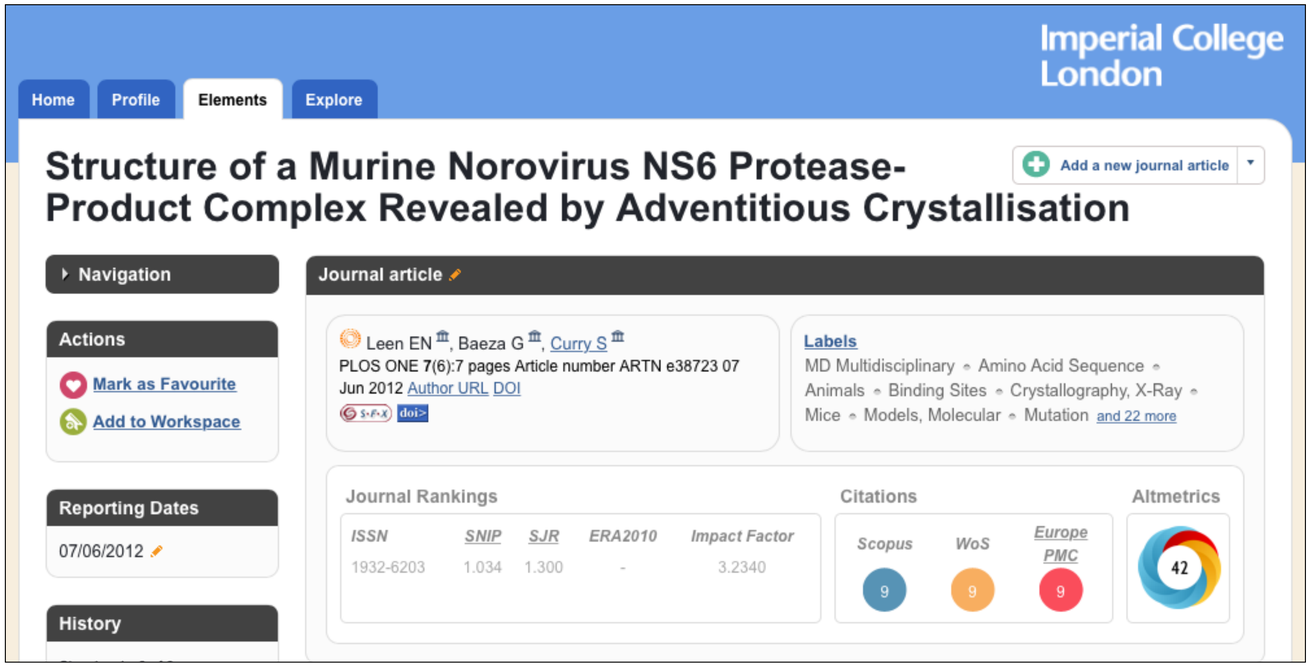
Fewer numbers, better science

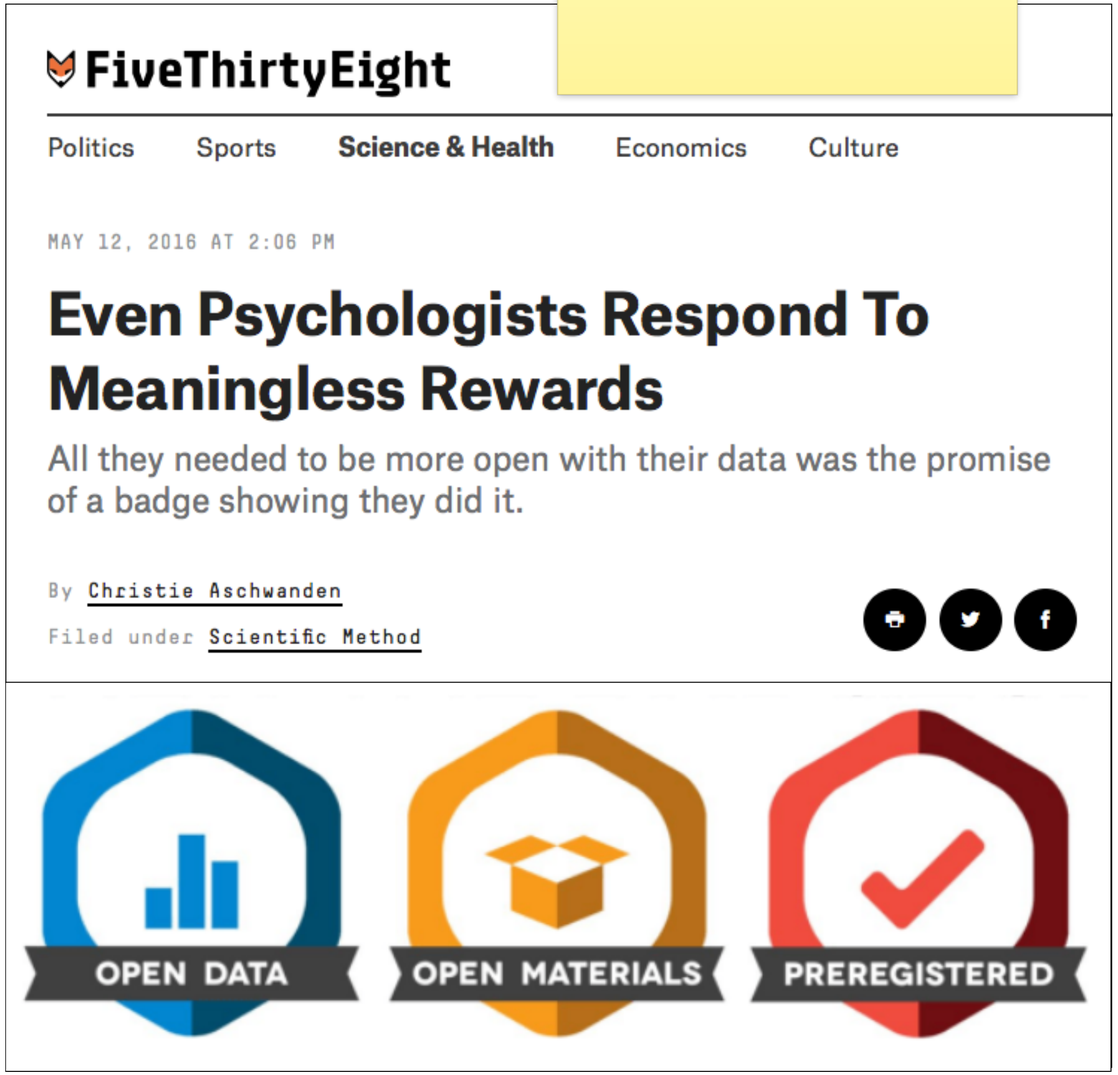
Scientific quality is hard to define, and numbers are easy to look at. But bibliometrics are warping science — encouraging quantity over quality. Leaders at two research institutions describe how they do things differently.

http://www.nature.com/news/fewer-numbers-better-science-1.20858

Feedback and rewards can help

Need to be clear about this 2nd bit





Don't forget the little steps

We need to talk about open science as a good in itself

Peer review and scientific publishing
Occam's corner

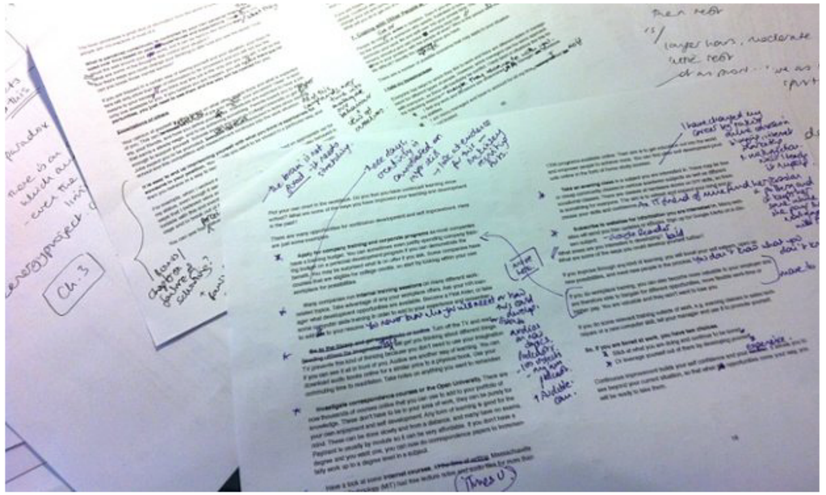
Peer review, preprints and the speed of science

Peer review is often claimed to be the guarantor of the trustworthiness of scientific papers, but it is a troubled process. Preprints offer a way out

Stephen Curry
@Stephen_Curry

Monday 7 September 2015 11.00 BST

Shares 1
Comments 14
Save for later



Subediting skills for writers Photograph: Joanna Penn/Flickr

A few weeks ago my collaborators and I submitted our latest paper to a scientific journal. We have been investigating how noroviruses subvert the molecular machinery of infected cells and have some interesting results. If it passes peer review, our paper could be published in three or four months' time. If it's rejected, we may have to re-work the manuscript before trying our luck with another journal. That will delay publication even further - it's not unheard of for papers to take a year or more to get out of the lab and into the world, even in the digital age.

Preprints: faster, better…
Largest possible audience (sharing & scrutiny)
Re-focus on the content, not the container
Fosters open peer review

We need to talk about open science as a good in itself

Science
Occam's corner

Zika virus initiative reveals deeper malady in scientific publishing

Stephen Curry

Moves to speed up the release of Zika virus research in response to the public health crisis highlight a systemic failure in scientific publishing. Help could be at hand at the ASAPbio meeting today in the USA

Contact author
@Stephen_Curry

Tuesday 16 February 2016 11.54 GMT

Shares 539 Comments 4

Save for later



Too far behind a screen - Zika scientists are set to benefit from the rapid release of research on the virus Photograph: Victor Moriyama/Getty Images

In response to the rapid spread of Zika virus across Central and South America, now declared to be an international public health emergency by the World Health Organisation, a consortium of research funders, institutes and publishers have committed to sharing data and results relevant to the crisis "as rapidly and openly as possible."

Data sharing (re-use & scrutiny benefits)
Better for changing the world



MAKING DATA INSTANTLY ACCESSIBLE

CONSEQUENCES OF INACTION OUR MISSION WHO WE ARE HOW YOU CAN HELP

DATA DOWNLOAD RESOURCES CONTACT US

LET'S MAKE A DIFFERENCE

Type here to search...

Wheat blast is a fearsome fungal disease of wheat. It was first discovered in Paraná State of Brazil in 1985. It spread rapidly to other South American countries such as Colombia, Bolivia, Paraguay, and Argentina, where it infects up to 3 million hectares and causes serious crop losses. Wheat blast was also detected in Kentucky, USA, in 2011.

Wheat blast is caused by a fungus known as *Magnaporthe oryzae* although scientists are still debating its exact identity. There is a risk that wheat blast could expand beyond South America and threaten food security in wheat growing areas in Asia and Africa.

RECENT POSTS

- Wheat Blast in Bangladesh
  APRIL 4, 2016

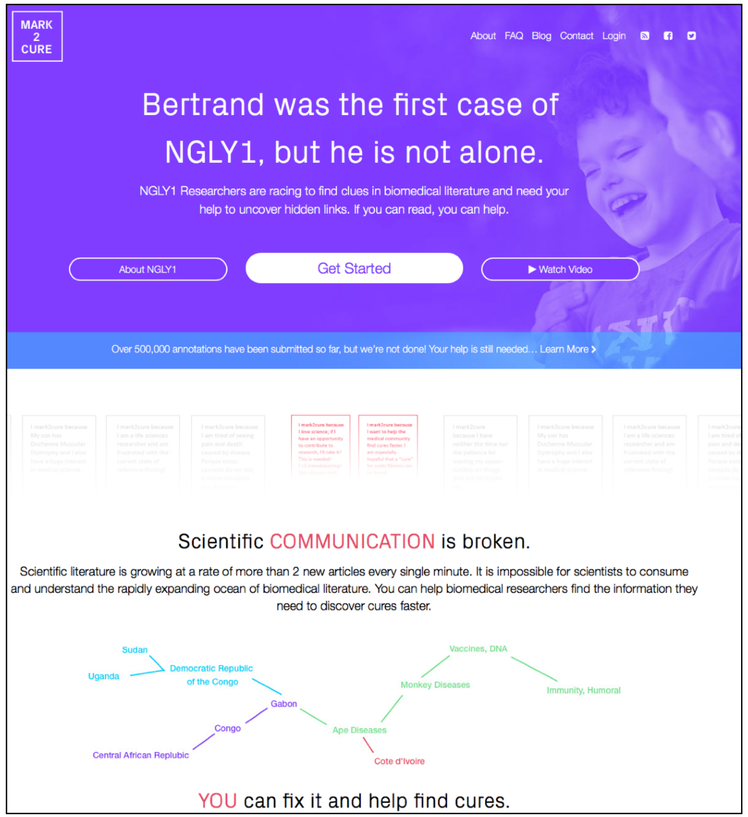
WHEAT BLAST IN NEWS

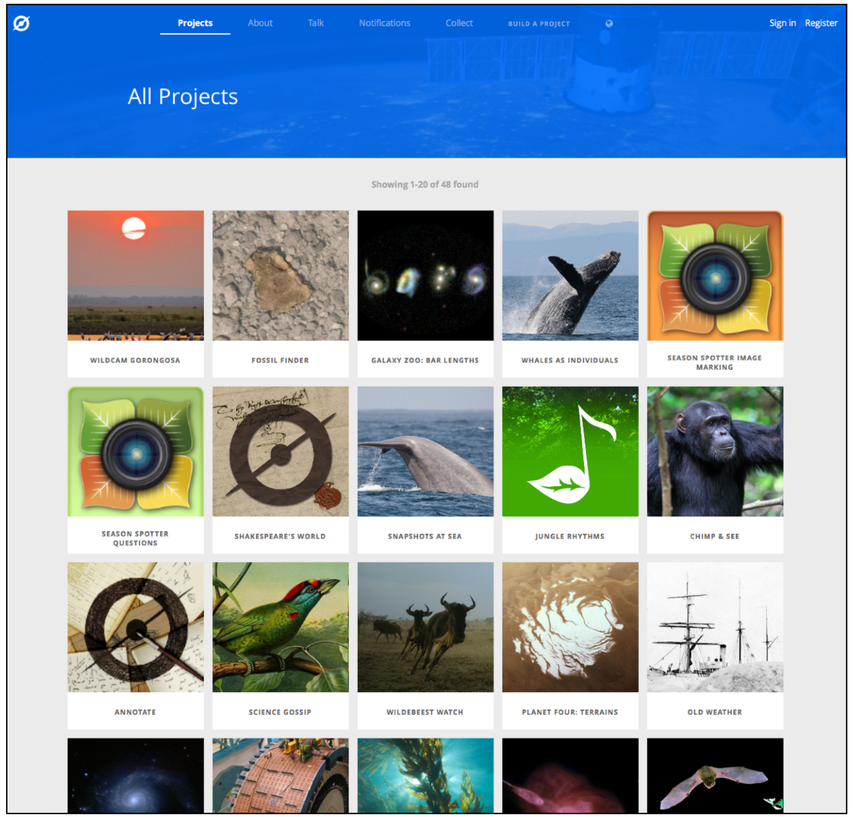
The Daily Star - 'Wheat Blast' threatens yield in Bangladesh

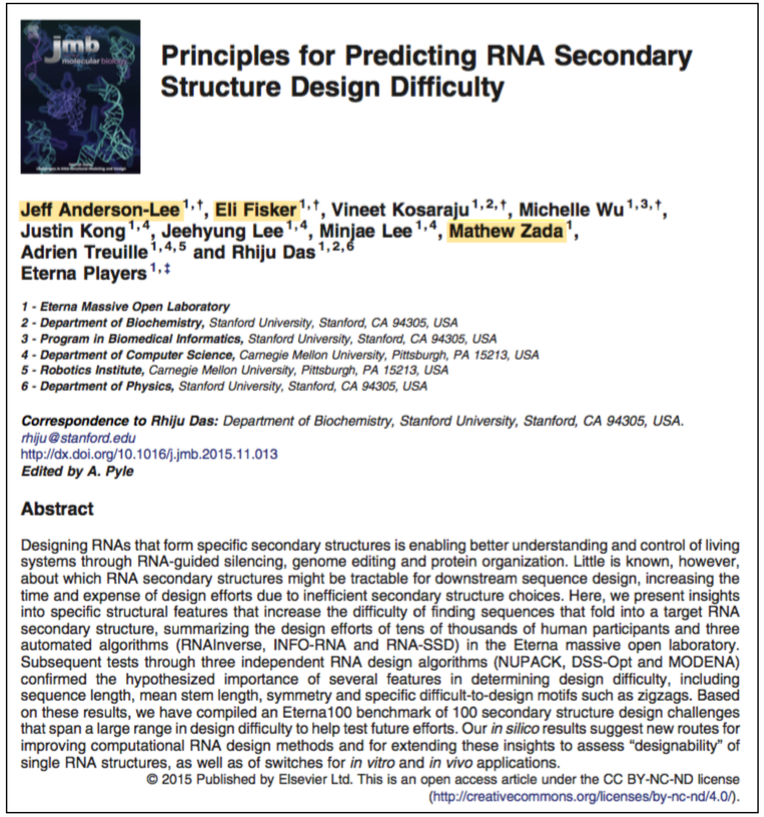
YouTube - nTV News

Centre for Strategic & International Studies - Severe, Climate Change-driven Wheat Fungus Found in Bangladesh

We need to talk about open science as a good in itself







Principles for Predicting RNA Secondary Structure Design Difficulty

Jeff Anderson-Lee[1,†], **Eli Fisker**[1,†], **Vineet Kosaraju**[1,2,†], **Michelle Wu**[1,3,†], **Justin Kong**[1,4], **Jeehyung Lee**[1,4], **Minjae Lee**[1,4], **Mathew Zada**[1], **Adrien Treuille**[1,4,5] and **Rhiju Das**[1,2,6]
Eterna Players[1,‡]

*1 - **Eterna Massive Open Laboratory***
*2 - **Department of Biochemistry,** Stanford University, Stanford, CA 94305, USA*
*3 - **Program in Biomedical Informatics,** Stanford University, Stanford, CA 94305, USA*
*4 - **Department of Computer Science,** Carnegie Mellon University, Pittsburgh, PA 15213, USA*
*5 - **Robotics Institute,** Carnegie Mellon University, Pittsburgh, PA 15213, USA*
*6 - **Department of Physics,** Stanford University, Stanford, CA 94305, USA*

***Correspondence to Rhiju Das:** Department of Biochemistry, Stanford University, Stanford, CA 94305, USA.*
rhiju@stanford.edu
http://dx.doi.org/10.1016/j.jmb.2015.11.013
Edited by A. Pyle

Abstract

Designing RNAs that form specific secondary structures is enabling better understanding and control of living systems through RNA-guided silencing, genome editing and protein organization. Little is known, however, about which RNA secondary structures might be tractable for downstream sequence design, increasing the time and expense of design efforts due to inefficient secondary structure choices. Here, we present insights into specific structural features that increase the difficulty of finding sequences that fold into a target RNA secondary structure, summarizing the design efforts of tens of thousands of human participants and three automated algorithms (RNAInverse, INFO-RNA and RNA-SSD) in the Eterna massive open laboratory. Subsequent tests through three independent RNA design algorithms (NUPACK, DSS-Opt and MODENA) confirmed the hypothesized importance of several features in determining design difficulty, including sequence length, mean stem length, symmetry and specific difficult-to-design motifs such as zigzags. Based on these results, we have compiled an Eterna100 benchmark of 100 secondary structure design challenges that span a large range in design difficulty to help test future efforts. Our *in silico* results suggest new routes for improving computational RNA design methods and for extending these insights to assess "designability" of single RNA structures, as well as of switches for *in vitro* and *in vivo* applications.
© 2015 Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Citizen science teaches researchers about:
new (non-traditional) audiences & scientists

Communication + Participation = **Public Trust**

We have to go public. We have to be open.



“People in this country have had enough of experts.”

Michael Gove, MP



We have to go public. We have to be open.



theguardian
website of the year

home › science | UK | world | politics | sport | football | opinion | culture | busin | all

Science
Political science

Why science needs progressive voices more than ever

Amid the row over Brexit, the sector must loosen links to society's elite and speak up for those who have been marginalised

Scientists were among those who participated in the People's Climate March in New York and cities around the world in September 2014. Photograph: Jason DeCrow/AP

Alice Bell

Wednesday 6 July 2016 16.00 BST

Save for later | Shares 153 | Comments 29

Brexit has thrown British science into a mess. During this period of political upheaval, it might be tempting to duck the challenge of picking sides, and instead

"too often [public engagement initiatives] fail to build meaningful relationships between science and the public, preferring instead to act as fluffy PR agents for the scientific establishment. We badly need more projects […] that shares the benefits of expertise and lets people feel part of driving science and engineering."

Alice Bell

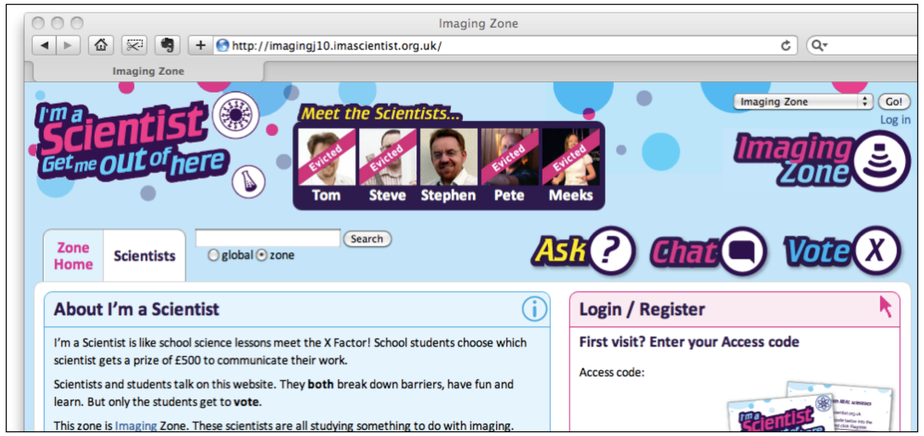
https://www.theguardian.com/science/political-science/2016/jul/06/why-science-needs-progressive-voices-more-than-ever

My science communication









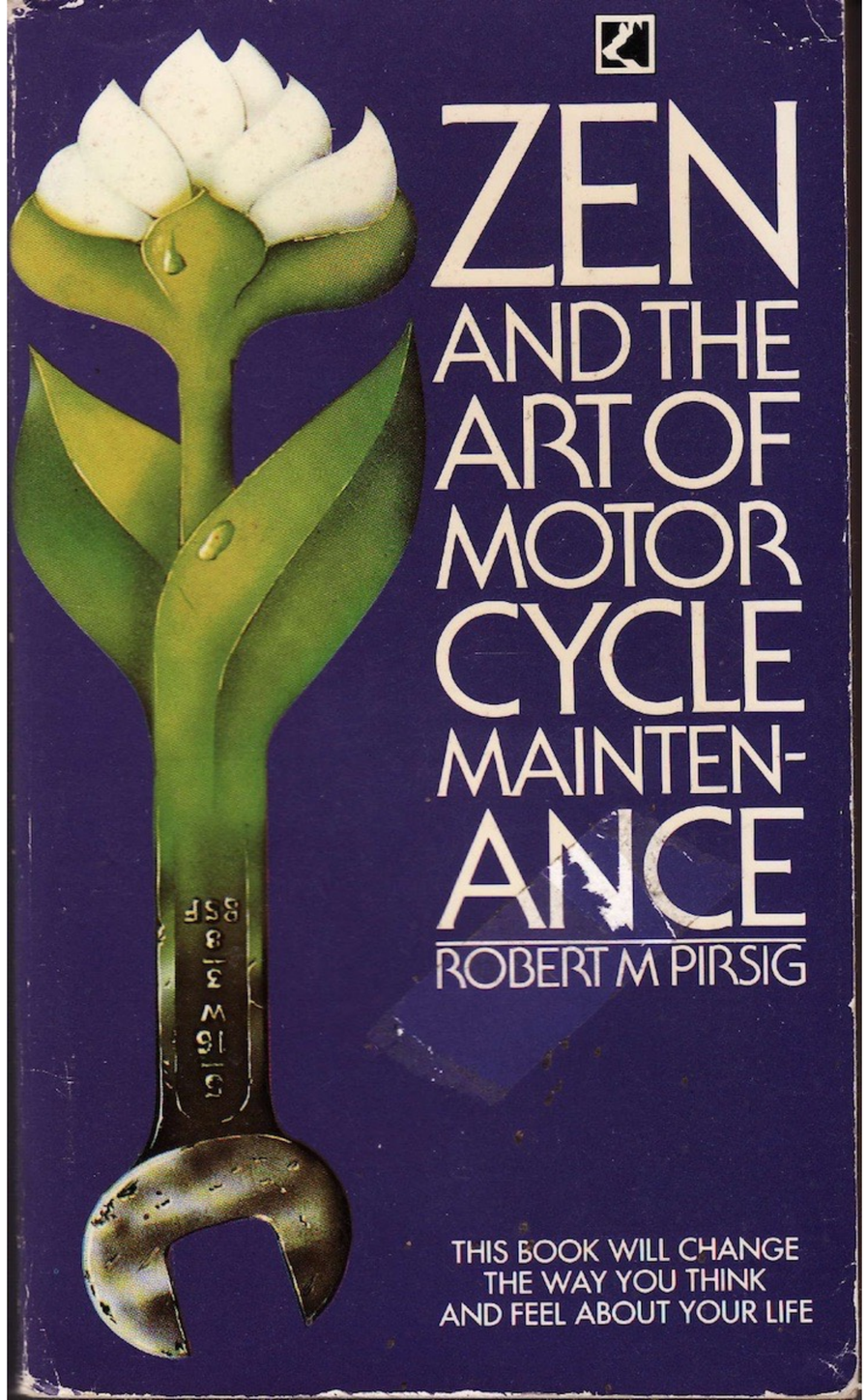


Public accountability: being a scientific citizen, not just a scientist

Understanding & improving the business of science

Find your own path





Thank you

Being open may change the way you **think** and **feel** about your life in research