Hacking the Academy

Why Science Needs Civil Disobedience and Open Source

Adriano Wanderlingh

OPEN·FIS - Spin Off UNIME

My Experience: The Paywall Barrier

Research Blocked by Cost

If you are lucky, your university pays. If not, knowledge is "Forbidden." High-cost conventions shift the burden from the individual to society, creating systemic inequality.

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> ACCESS DENIED
> ERROR 403: FORBIDDEN
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nature > commentary > article

MENU nature

Commentary | Published: 30 April 1992

The growing inaccessibility of science

Donald P. Hayes

Nature **356**, 739–740(1992) | Cite this article

1015 Accesses | **44** Citations | **27** Altmetric | Metrics

Access options

Rent or Buy article

Get time limited or full article access on ReadCube.

from $8.99

Rent or Buy

All prices are NET prices.

Subscribe to Journal

Get full journal access for 1 year

$199.00

only $3.83 per issue

Subscribe

All prices are NET prices.
VAT will be added later in the checkout.

The Broken Supply Chain

We pay twice: once to produce it, and once to read it.

Public Funds

Taxpayers & Grants fund the research.

Labor

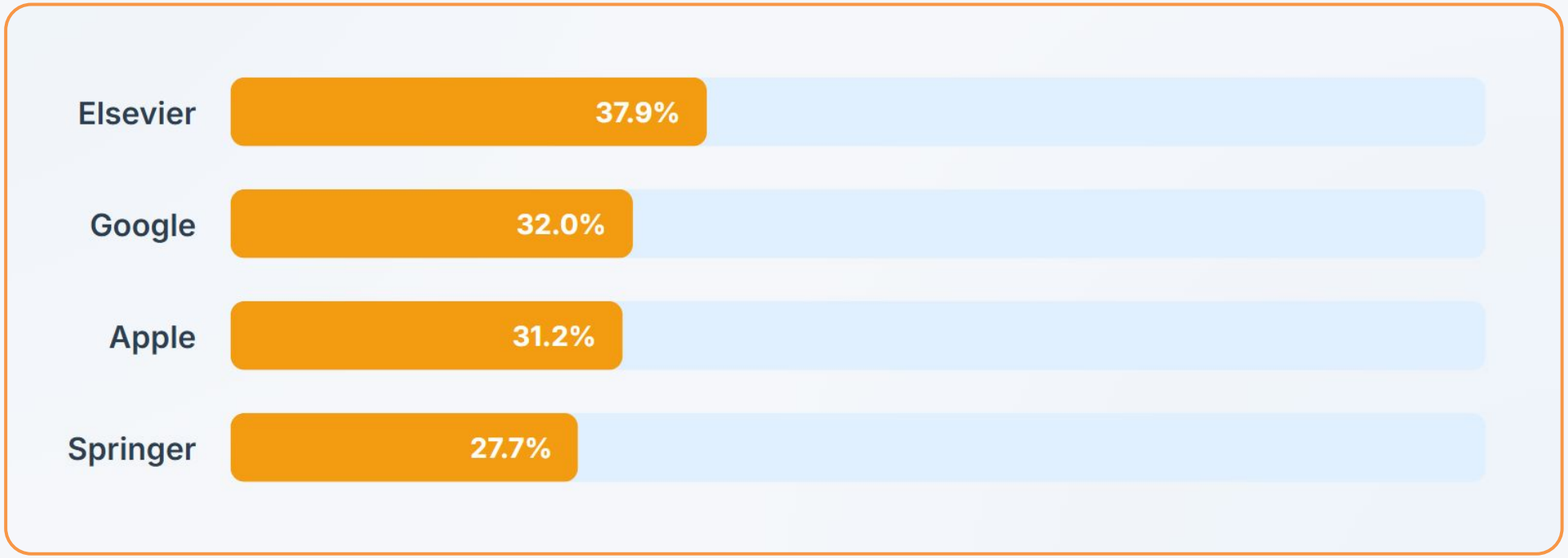
Scientists write & review the work.

Private Profit

Universities buy back access to their own work.

30-40% Profit Margins

Comparison of profit margins (2023/2024)



Publishers profit from a good that shouldn’t be a commodity

Aaron Swartz: The Guerilla Manifesto

“ There is no justice in following unjust laws. ”

“ But sharing isn’t immoral - is a moral imperative. ”

GUERILLA OPEN ACCESS MANIFESTO

Information is power. But like all power, there are those who want to keep it for themselves. The world's entire scientific and cultural heritage, published over centuries in books and journals, is increasingly being digitized and locked up by a handful of private corporations. Want to read the papers featuring the most famous results of the sciences? You'll need to send enormous amounts to publishers like Reed Elsevier.

There are those struggling to change this. The Open Access Movement has fought valiantly to ensure that scientists do not sign their copyrights away but instead ensure their work is published on the Internet, under terms that allow anyone to access it. But even under the best scenarios, their work will only apply to things published in the future. Everything up until now will have been lost.

That is too high a price to pay. Forcing academics to pay money to read the work of their colleagues? Scanning entire libraries but only allowing the folks at Google to read them? Providing scientific articles to those at elite universities in the First World, but not to children in the Global South? It's outrageous and unacceptable.

"I agree," many say, "but what can we do? The companies hold the copyrights, they make enormous amounts of money by charging for access, and it's perfectly legal — there's nothing we can do to stop them." But there is something we can, something that's already being done: we can fight back.

Those with access to these resources – students, librarians, scientists – you have been given a privilege. You get to feed at this banquet of knowledge while the rest of the world is locked out. But you need not – indeed, morally, you cannot – keep this privilege for yourselves. You have a duty to share it with the world. And you have: trading passwords with colleagues, filling download requests for friends.

Meanwhile, those who have been locked out are not standing idly by. You have been sneaking through holes and climbing over fences, liberating the information locked up by the publishers and sharing them with your friends.

But all of this action goes on in the dark, hidden underground. It's called stealing or piracy, as if sharing a wealth of knowledge were the moral equivalent of plundering a ship and murdering its crew. But sharing isn't immoral — it's a moral imperative. Only those blinded by greed would refuse to let a friend make a copy.

Large corporations, of course, are blinded by greed. The laws under which they operate require it — their shareholders would revolt at anything less. And the politicians they have bought off back them, passing laws giving them the exclusive power to decide who can make copies.

There is no justice in following unjust laws. It's time to come into the light and, in the grand tradition of civil disobedience, declare our opposition to this private theft of public culture.

We need to take information, wherever it is stored, make our copies and share them with the world. We need to take stuff that's out of copyright and add it to the archive. We need to buy secret databases and put them on the Web. We need to download scientific journals and upload them to file sharing networks. We need to fight for Guerilla Open Access.

With enough of us, around the world, we'll not just send a strong message opposing the privatization of knowledge — we'll make it a thing of the past. Will you join us?

July 2008, Eremo, Italy

Aaron Swartz

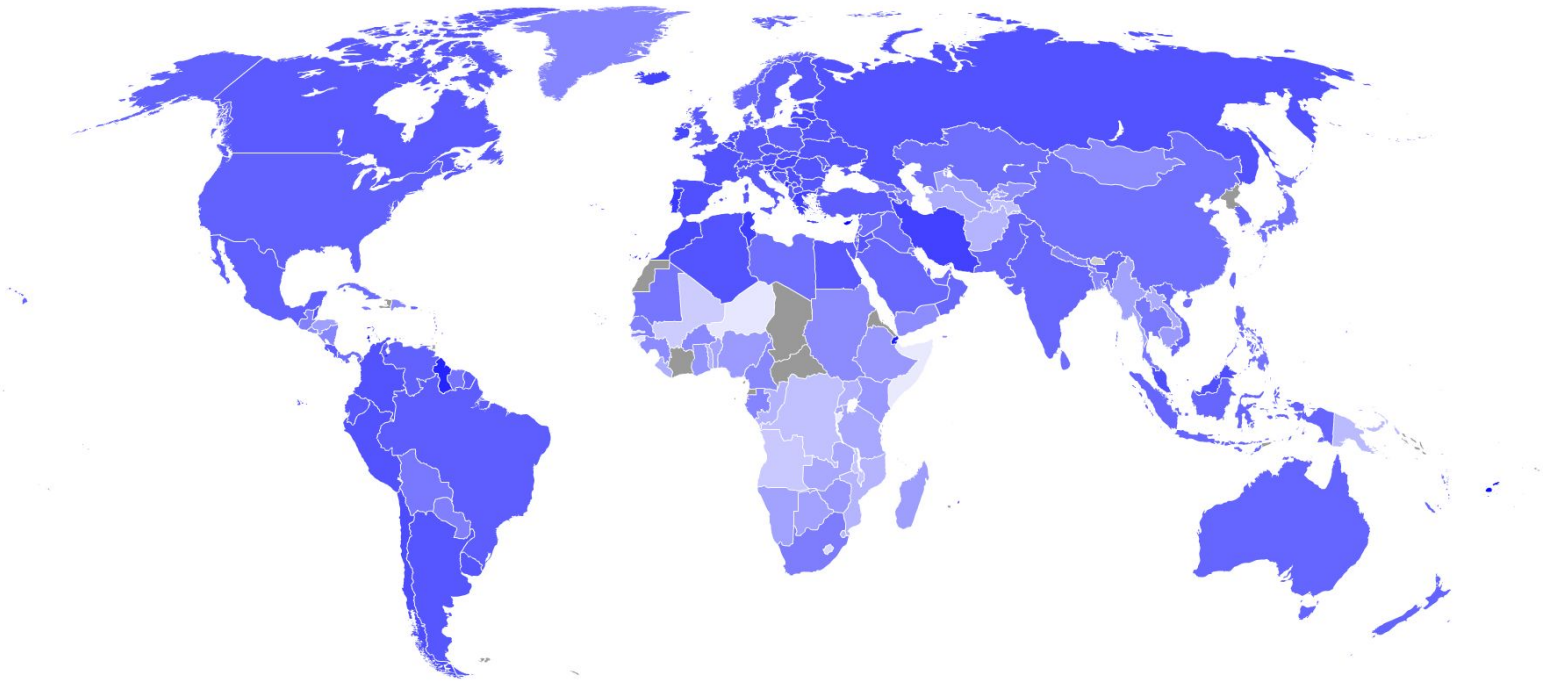
Alexandra Elbakyan

Infrastructure of Necessity

Alexandra built a tool that provides millions of papers daily to researchers worldwide.

For many, Sci-Hub isn't "piracy"; it is the only way to do their jobs.

“ To remove all barriers in the way of science ”



Who's downloading pirated papers? Everyone

But Sci-Hub is a fragile solution. It is illegal, domains go down, it is under constant attack. And above all: it gives us open access to PDFs, but not to the backbone

Bohannon, J., Science (2016)
data from September 2015 to February 2016

Tentative Solutions

Plan S Mandate: Publicly or privately funded research must be published immediately in compliant Open Access journals.

- Authors retain copyright; publications require open licenses.
- Publication fees must be covered by funders or universities.

Goal: Force subscription journals to switch to fully Open Access.

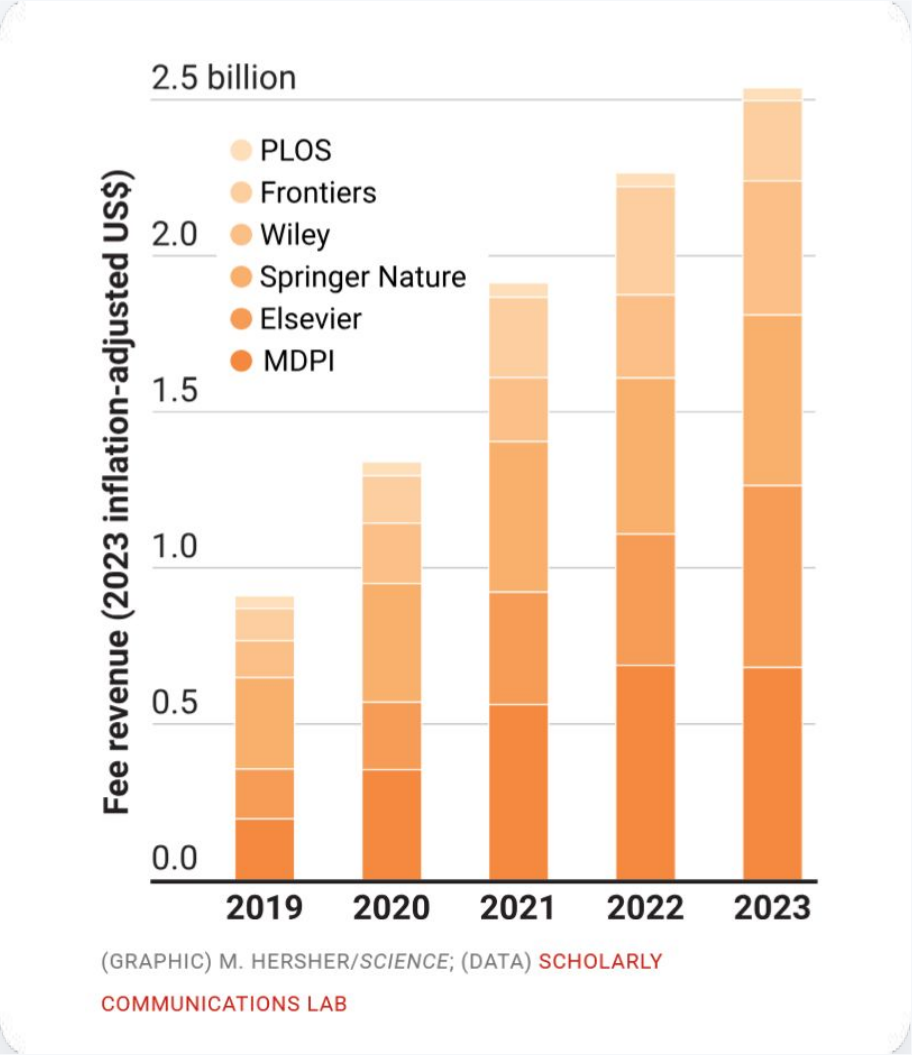
Reality: Most journals didn't flip. They retained subscriptions and formalized Article Processing Charges

From Paywall to Pay-to-Publish

Plan S

Making full & immediate
Open Access a reality

We fixed "Pay-to-Read" but now authors must pay **€5,000 - €10,000** to make their work open.
This cuts out independent researchers and the entire Global South.



Science’s Production Chain Issues

Proprietary Hardware

Expensive proprietary machinery. If the company fails, the science dies.

License Locked

"open" results obtained with restrictive software licenses that limit reproducibility.

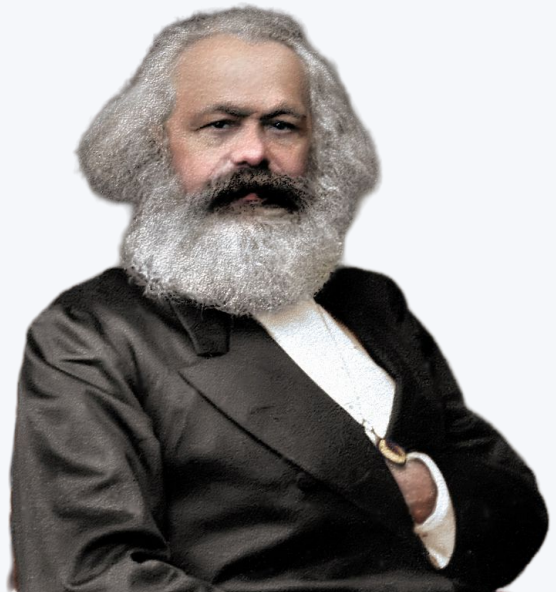
Closed Formats

proprietary file types hard to convert and maintain

Science’s Production Chain Issues

“ Scientists should take control of the means of production ”

Karl Marx, probably



If that wasn’t enough...

Why don't scientists spontaneously share Data and Code? Because the system only evaluates us on the number of papers (*Publish or Perish*).

The Impact Factor

It is often a measure of popularity, not of quality

Clickbait Science

Researchers are forced to write sensationalizing titles to please the ranking algorithm.

The Bias

Experiments that fail or yield no results, are not *impactful* enough for publication

The Replicability Crisis

Open access, freely available online

Essay

Why Most Published Research Findings Are False

John P. A. Ioannidis

Summary

There is increasing concern that most current published research findings are false. The probability that a research claim is true may depend on study power and bias, the number of other studies on the same question, and, importantly, the ratio of true to no relationships among the relationships probed in each scientific field. In this framework, a research finding is less likely to be true when the studies conducted in a field are smaller; when effect sizes are smaller; when there is a greater number and lesser preselection of tested relationships; where there is greater flexibility in designs, definitions, outcomes, and analytical modes; when there is greater financial and other interest and prejudice; and when more

factors that influence this problem and some corollaries thereof.

Modeling the Framework for False Positive Findings

Several methodologists have pointed out [9–11] that the high rate of nonreplication (lack of confirmation) of research discoveries is a consequence of the convenient, yet ill-founded strategy of claiming conclusive research findings solely on the basis of a single study assessed by formal statistical significance, typically for a *p*-value less than 0.05. Research is not most appropriately represented and summarized by *p*-values, but, unfortunately, there is a widespread notion that medical research articles

is characteristic of the field and can vary a lot depending on whether the field targets highly likely relationships or searches for only one or a few true relationships among thousands and millions of hypotheses that may be postulated. Let us also consider, for computational simplicity, circumscribed fields where either there is only one true relationship (among many that can be hypothesized) or the power is similar to find any of the several existing true relationships. The pre-study probability of a relationship being true is $R/(R+1)$. The probability of a study finding a true relationship reflects the power $1-\beta$ (one minus the Type II error rate). The probability of claiming a relationship when none truly exists reflects the Type I error

< 36% replication rate*

The Causes

- **p-hacking:** manipulating data to find patterns.
- **Publication Bias:** only positive results get published.
- **Low Power:** sample sizes too small to be reliable.

* it is not data from a single paper but a value eyeballed after a 5 mins ‘meta-analysis’

The Structural Solution: Open Science

Open Access

Free access to the paper. Results are a public good.

Open Data

Raw evidence readily available for reproduction.

Open Methods

Sharing code and workflows used to analyze data.

The Structural Solution: Open Science

Code: GitHub

Version control to track changes in the analysis.

Data: Zenodo

CERN-backed repository ensuring data is preserved

Speed: Preprints

bioRxiv / arXiv. speed up sharing and feedback.

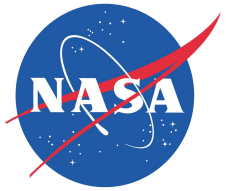
Open Science Policies

European Commission
Horizon Europe

Findable, Accessible, Interoperable, Reusable Data. Explicit funding and support for Zenodo

UNESCO
OS Recommendations

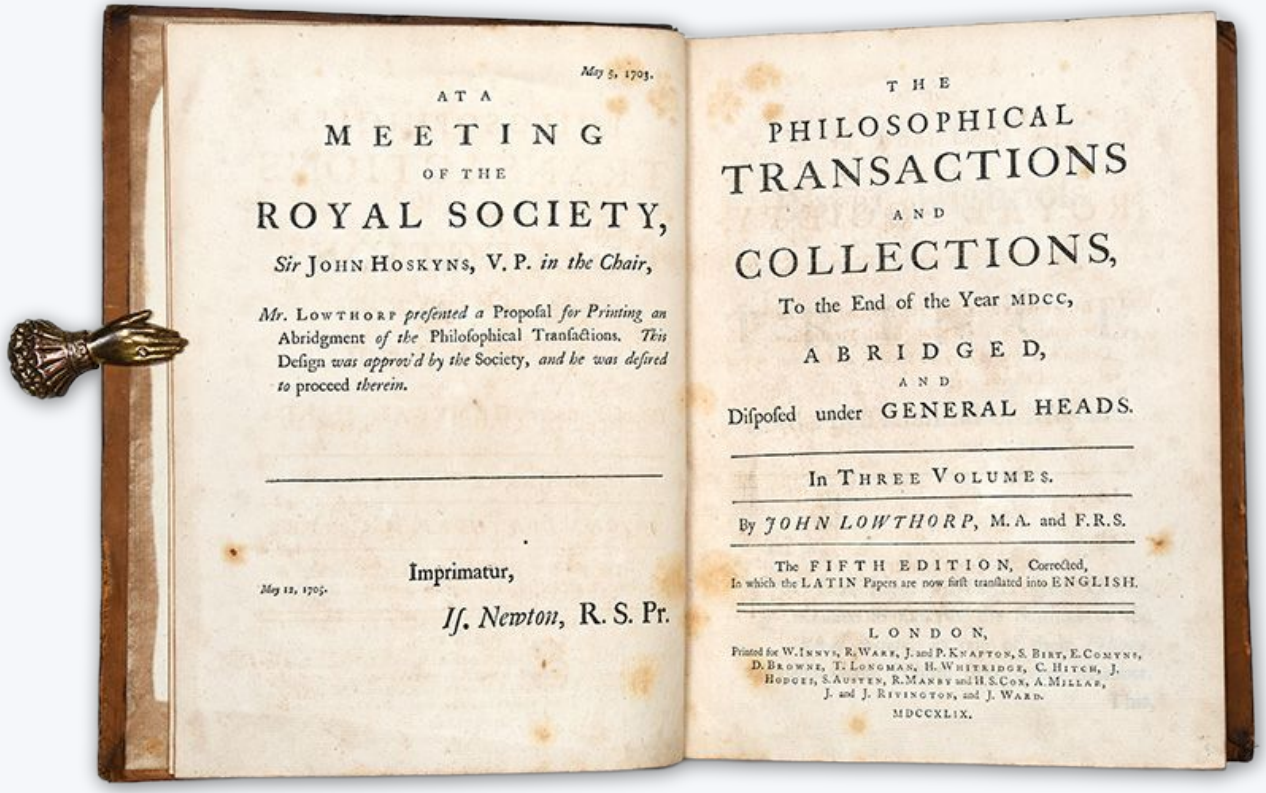
Pushes for an holistic approach, shifting focus from "Journal Access" to "Open Infrastructure."



NASA
Transform to Open Science

Mandates that code and data be open from the start of the project, not just at the end

We were here first



May 5, 1703.

AT A

MEETING

OF THE

ROYAL SOCIETY,

Sir JOHN HOSKYNS, V. P. *in the Chair,*

Mr. LOWTHORP *presented a* Propoſal *for Printing an* Abridgment *of the* Philoſophical Tranſactions. *This* Deſign *was approv'd by the* Society, *and he was deſired to* proceed *therein.*

Imprimatur,

May 12, 1705.

Iſ. Newton, R. S. Pr.

THE

PHILOSOPHICAL

TRANSACTIONS

AND

COLLECTIONS,

To the End of the Year MDCC,

ABRIDGED,

AND

Diſpoſed under GENERAL HEADS.

In THREE VOLUMES.

By *JOHN LOWTHORP,* M.A. and F.R.S.

The FIFTH EDITION, Corrected,
In which the LATIN Papers are now firſt tranſlated into ENGLISH.

LONDON,

Printed for W. INNYS, R. WARD, J. and P. KNAPTON, S. BIRT, E. COMYNS, D. BROWNE, T. LONGMAN, H. WHITRIDGE, C. HITCH, J. HODGES, S. AUSTEN, R. MANBY and H. S. COX, A. MILLAR, J. and J. RIVINGTON, and J. WARD.

MDCCXLIX.

Scientists were the original open source community

Lately, we got lost.

We allowed commercial entities to build walls around our conversation. We didn't lose the technology; we lost the focus and credibility.

From Black Box to Glass Box

Open Access to PDFs is not enough. If the instruments are proprietary, the data is locked inside a "Black Box" we cannot audit.

We must transition from passive consumers of technology to active **Makers** of our own tools.

The New Standard

“An article is advertising, not scholarship. The actual scholarship is the full software environment, code and data, that produced the result.”

John Claerbout, probably

git merge science --into open-source

Let’s reintegrate the "Science" branch in the Open Source movement.