Scientific and Scholarly Misconduct

Waseda University, SILS,
Science, Technology and Society (LE202)

Science in action

Most of the science we study in school is what we can call textbook science.

Definition (Textbook science)

Textbook science consists of fairly well-established facts and of theories that have been tested numerous times.

When we read about scientific discoveries in the *news*, however, we are often reading about new experiments or studies that have not been reproduced, or ideas that have not been subjected to thorough testing. This *science in action* often seems quite different from our image of science as drawn from formal presentations of the nature of science or the kind of science that we study in school.

Our formal ideas about science and scientific methods often neglect the actual social processes involved in the production of scientific knowledge.

Studying individual scientific misconduct

There is probably a long history of scholarly misconduct, but it is difficult to really prove this for earlier periods, because (1) our evidence for the details of ancient and medieval scholars is often not detailed, and (2) their standards may not be the same as ours.

- For example, Ptolemy (2nd c. CE), *Optics*, gives a table of refractions that is second differences; Isaac Newton, *Optics* (1704), gave a misleading account of his optical experiments.

There were a number of famous cases of scientific fraud in the early 20th century – for example, the Piltdown Man as the "missing link," or Sir Cyril Burt's twin studies showing that IQ is entirely inherited.

Starting from the 1980s and 90s, the scientific community began to devote scholarly attention to misconduct – there were a number high profile cases at prestigious institutions, public debate about the issue, and standards for evaluation and punishments.

The Piltdown Gang, John Cooke, 1915

Standard Forms of Misconduct

Fabrication: Creating data or sources essentially out of nothing.

Falsification: Altering existing data or results. This can range from slightly moving a data point to make results look better (considered fraud by scientists) to more extensive manipulation. It might involve manipulating images (ex., "blot splicing and dicing").

Plagiarism: Presenting someone else's work as your own, or failing to properly cite one's sources in a way that might cause such an impression. This includes copying boilerplate text or reusing images without proper citation. Self-plagiarism (publishing the same material in different places without citation) is also considered misconduct in some circumstances.

The Schön scandal

In 1997, Jan Hendrik Schön completed a PhD at Konstanz and went to Bell Labs as a postdoc under Bertram Batlogg, studying electrical conduction in organic crystals. Bell was then bought by Lucent Technologies, a telecommunications equipment company.

Schön came under pressure at Bell to produce high impact work and became extraordinarily prolific, producing an average of *1 paper every 8 days* from 1998 to mid–2001. His early work was published with Batlogg, but he branched out in his collaborations, and "results," such as changing the conductivity of organic materials, and achieving high-temp superconductivity (high-Tc) – publishing in prestigious journals like *Science* and *Nature*.

He was regarded as an experimental genius, receiving numerous awards and prizes in physics. While all this was going on, the dotcom stock market boom collapsed, and the 9/11 attack kicked off the US "War on Terror."

Cover of the December 2001 issue of *Science*, announcing Schön's invention of a *single-molecule transistor* as the scientific "Breakthrough of the Year."

(This turned out to be one of the many irreproducible results that Schön announced.)

Discovery and scandal

Although no one could reproduce Schön's results, for some time no one *publicly* doubted him. He was trusted – or at least not publicly doubted – because of his institution and his mentors.

Outside pressure began to build up and a number of researchers, such as Julia Hsu and Lynn Loo, noticed duplications in his publications. Still, Schön continued to try to publish new papers. In 2002, Bell Labs established an external investigation, which found 16 counts of misconduct. Schön was immediately fired, and his PhD was revoked, even though it was not found to contain misconduct. The report exonerated Schön's co-authors, but it criticized them for not sufficiently confirming his results.

Schön seemed not to understand the severity of what he had done, believing that he could return to work in science in Germany, and complaining that nearly all of his papers were retracted, not just those for which misconduct could be proven.

Obokata and STAP cells

In 2006, Shinya Yamanaka 山中 伸弥 showed that *pluripotent* stem cells could be *induced* in adult cells (iPS cells), using genetic techniques. This raised the possibility that it might be possible to induce pluripotency using simpler techniques – then called stimulus-triggered acquisition of pluripotency (STAP).

A number of researchers such as Charles and Martin Vacanti, at Harvard Medical School, sought to produce STAP cells. After taking a PhD from Waseda University in 2011, Haruko Obokata, 小保方 晴子, began to work with Vacanti and others on STAP cells.

In 2014, two papers were published in *Nature* by Obokata and coauthors, such as Vacanti, T. Wakayama, Y. Sasai, that announced the production of STAP cells using fairly simple, stress-based techniques. A number of labs reported initial success in reproducing the STAP cell phenomena; editorials hailed the discovery and explained how it would lead to advances in medicine.

A media frenzy

After the papers were published, there was a massive media reaction.

Following a report on the BBC, there was an NHK report, which focused on all sorts of irrelevant matters – such as Obokata's age and gender, the fact that she wore a *kappōgi* (かっぽう着) instead of a lab coat in her RIKEN lab, that there were moomin characters painted on her lab equipment, what she did in her spare time, and so on.

The Japanese media focused almost exclusively on Obokata herself, with little attention to her coauthors, or to her research supervisors.

Doubts and scandal

Soon, however, a number of doubts began to be expressed about the STAP methods. A number of researchers and labs reported being unable to reproduce the reported method. Those who had initially reported success recanted. A number of serious theoretical difficulties were noted with the phenomena described in Obokata's papers.

Some "netizens" noted plagiarism in the published papers and major plagiarisms in Obokata's Waseda PhD dissertation. There were also some problems with the paper that indicated either incompetence or fraud, or both.

RIKEN started an investigation. The media turned against Obokata, but completely ignored the complicity of her coauthors and superiors. She defended herself at a press conference with the help of a lawyer, although she was not accused of breaking the law.

Social resolution

There was still uncertainty about whether or not the STAP phenomena was real. Obokata and a number of her coauthors, particularly C. Vacanti, claimed that the phenomena was real. Because of the difficulty involved in determining the scientific facts, people began to look for extra-scientific grounds on which to judge the situation.

RIKEN carried out an investigation and concluded that Obokata had falsified her lab reports in order to obtain her results, stating that that she had engaged in "research misconduct," falsifying data on two occasions. Obokata agreed to retract the *Nature* articles. RIKEN scientists reported that Obokata's STAP cells came from embryonic stem cell *contamination*. Most tragically, one of Obokata's supervisors and a co-author of the papers, committed suicide by hanging himself in the RIKEN building.

Gino and behavioral science

Francesca Gino was a Harvard Business School (HBS) professor of Behavioral Science, who was very well connected and highly regarded. She had co-authored some almost 140 papers, written popular books, and was highly paid for corporate talks and seminars.

Around 2020, a graduate student named Zoé Ziani noticed problems with some of Gino's published work and tried to raise the alarm. Ziani was ignored within the field, so she took her concerns to Data Colada (Uri Simonsohn, Leif Nelson, and Joseph Simmon). Data Colada carried out statistical research on a number of Gino's papers and identified four cases that they considered to be fraudulent. They took their concerns to the HBS administration, and an investigation committee was struck.

- Most famously, a 2012 study found that signing forms at the start reduces dishonesty. So, this was a paper about honesty.

Report and resolution

Harvard investigated the situation for 18 months, during which they produced a 1,300 page report, which agreed with the findings of Data Colada that there was strong evidence of fraud. When the report was finished, in 2021, Data Colada published their blog post about the four papers. (The full Harvard report was not released until 2024.)

Harvard found that Gino committed "misconduct intentionally, knowingly, or recklessly." It dismissed her claim that the misconduct was carried out by a malicious rival or assistant. She was put on leave, stripped of tenure, and eventually fired.

Gino sued Harvard and Data Colada for $25,000,000USD, but this was dismissed by a federal judge. Gino's more than 140 co-authors established a project called the Many Co-Authors Project in order to reevaluate the data used in her papers.

Individual and structural issues

We tend to focus on *individual* aspects of misconduct:

- Ambition and desire for fame, power, and status, may be personal motivations.
- Some scientists may believe that they already know what the outcome of an experiment or study "should" be.

There are also structural features of the social organization:

- There can be career pressure to make discoveries and publish. Juniors may feel social pressure from seniors. There may be a culture of minor malpractice that younger scholars imitate.
- The values of scientific work may become more aligned with business needs. There may be pressures to meet certain targets, or keep costs down.
- The increasing specialization of science, and its trust based system, makes detection of misconduct difficult.

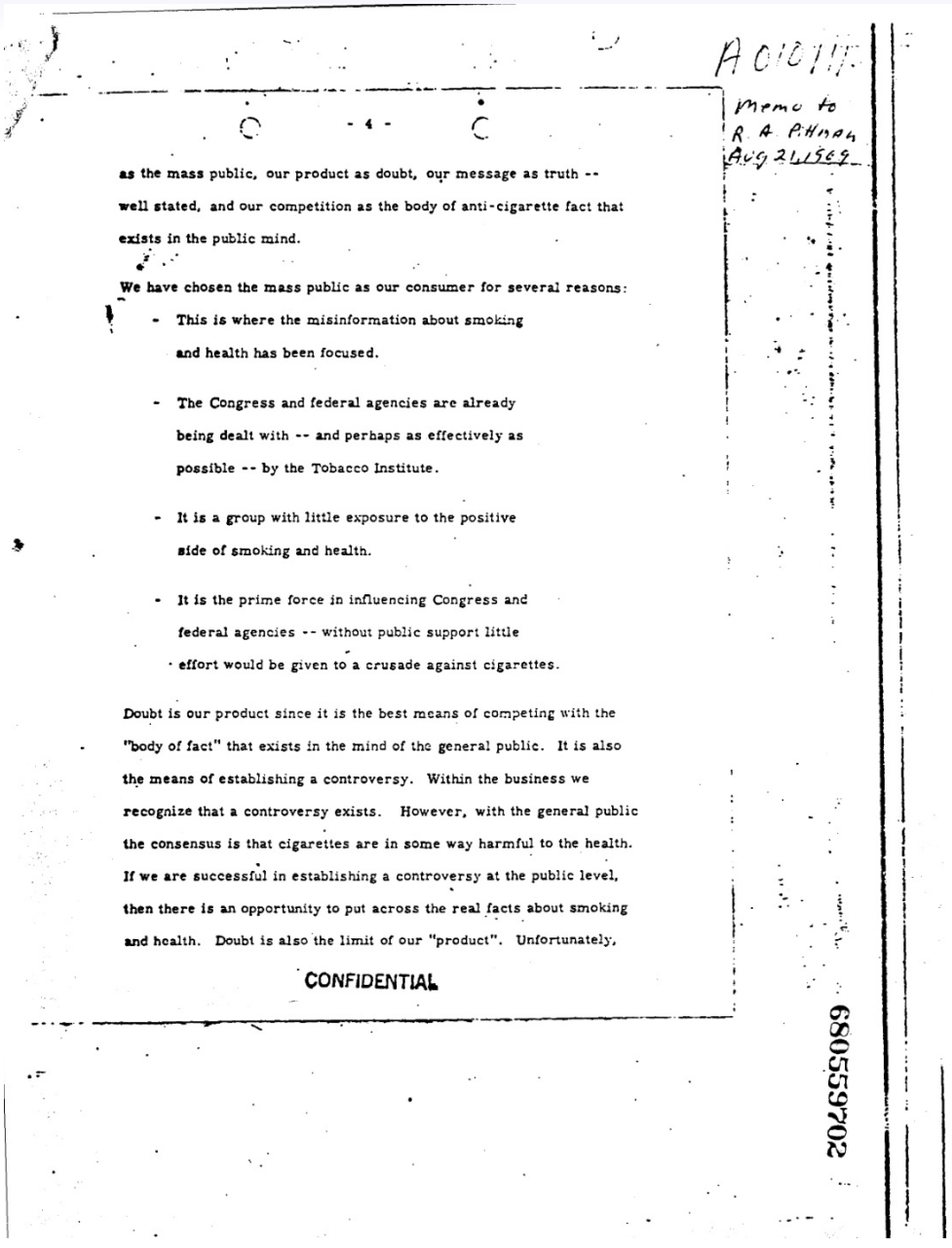
Organized scientific misconduct

Corporations have systematically used the *social mechanisms of science* to both promote their products, and to create doubt that their products might lead to any harms. That is, the seek to imply that

(a) there are *scientific reasons* to doubt certain known or reported health or environmental hazards, and

(b) that there are *scientific reasons* to believe that their products are beneficial, when the evidence may be slight or disputed.

They do this both to shape public opinion in regards to their products, but also to combat proposed regulation that they consider to be detrimental to their profit. These strategies – sometimes called manufacturing uncertainty – are often carried out by specialized public relations (PR) firms, consultants and the scientists that they employ as *experts*.



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Memo to R A Pitman Aug 21 1969

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as the mass public, our product as doubt, our message as truth -- well stated, and our competition as the body of anti-cigarette fact that exists in the public mind.

We have chosen the mass public as our consumer for several reasons:

- This is where the misinformation about smoking and health has been focused.
- The Congress and federal agencies are already being dealt with -- and perhaps as effectively as possible -- by the Tobacco Institute.
- It is a group with little exposure to the positive side of smoking and health.
- It is the prime force in influencing Congress and federal agencies -- without public support little effort would be given to a crusade against cigarettes.

Doubt is our product since it is the best means of competing with the "body of fact" that exists in the mind of the general public. It is also the means of establishing a controversy. Within the business we recognize that a controversy exists. However, with the general public the consensus is that cigarettes are in some way harmful to the health. If we are successful in establishing a controversy at the public level, then there is an opportunity to put across the real facts about smoking and health. Doubt is also the limit of our "product". Unfortunately,

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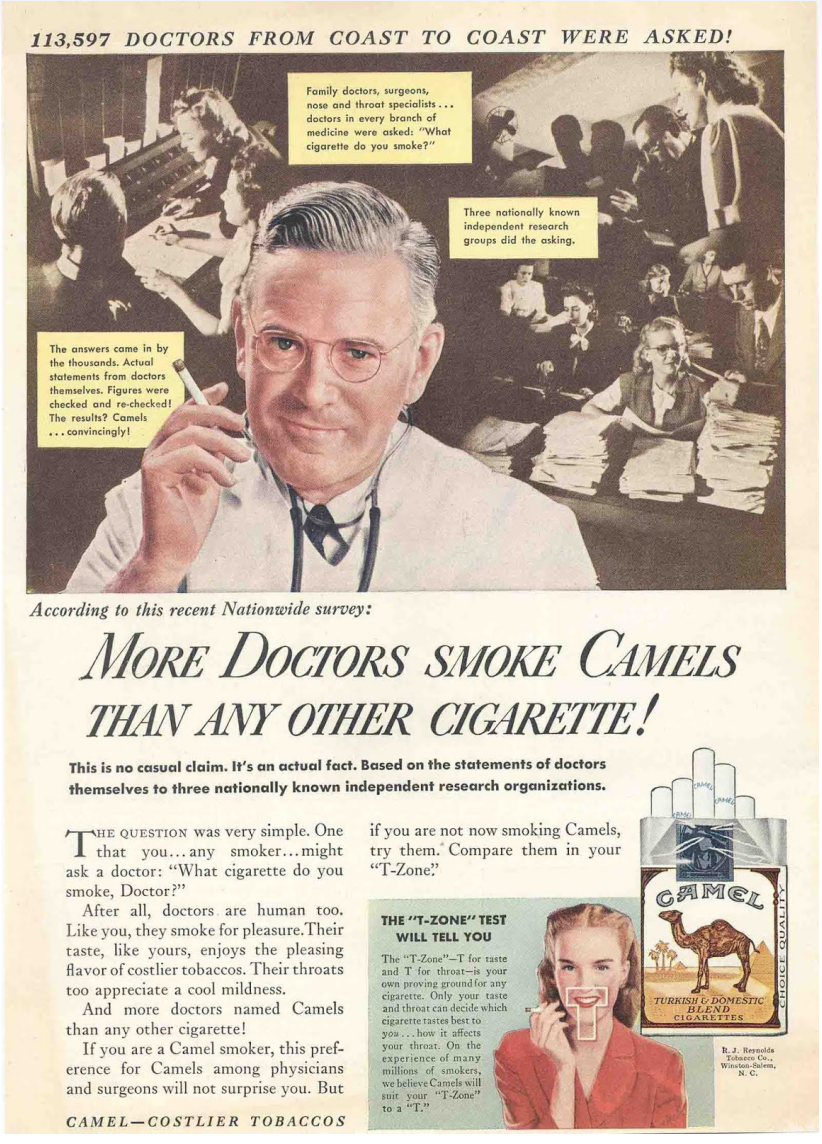
An infamous internal industry memo of 1969, in which a tobacco executive writes that "doubt is our product," and argues that the industry needs to create doubt about the health risks of tobacco.

(This page comes from the discovery of one of the court cases in the 1990s.)

The Big Tobacco playbook

In the 1950s, there was growing evidence that smoking tobacco leads to lung cancer. The tobacco industry, advised by PR firms like Hill & Knowlton, launched a *counter-campaign*. The core idea was to create *scientific doubt* in order to prevent or delay regulation and litigation – a strategy now known as flooding the zone.

The industry channeled its efforts through law firms and seemingly independent institutions like The Advancement of Sound Science Coalition (TASSC) and the Center for Indoor Air Research (CIAR). They funded a $45mUSD initiative, directed by Frederick Seitz (a physicist), to generate data and cultivate expert witnesses who would defend tobacco in court. These organizations, with academic scientists in leadership, seemed to be independent and provided cover while promoting the industry's agenda and selectively funding studies that created doubt without direct attribution to Big Tobacco.



Tobacco advertisements depicting medical and scientific experts

Confusion and lawsuits

Through PR programs, the industry cultivated media relationships, paid for product placement in movies, and encouraged what they called "balanced reporting," pointing to the many industry-funded counter-arguments in the scientific liturature.

It took decades of effort for scientists and MDs to tip public opinion against smoking and the tobacco industry, and it was not until the 1990s that tobacco firms were finally found guilty in courts of conspiracy to commit fraud under the RICO (Racketeer Influenced and Corrupt Organizations) statute.

A 1998 issue of *Time* magazine

Big Oil and global warming

The fossil fuel industry actively engaged in manufacturing doubt about global warming to safeguard its financial interests and to delay regulation. This strategy involved disputing conclusions that might necessitate regulation, often through PR campaigns dressed up in a veneer of scientific discourse.

Key individuals and organizations – sometimes the very same ones used by Big Tobacco – applied these strategies to hedge off environmental and health concerns: acid rain, the ozone hole, global warming (climate change), and so on. Companies like ExxonMobil, Shell, and Koch Industries have been significant funders and proponents of these campaigns, influencing public perception and policy making. Think tanks, like the Marshall Institute and the CO2 Coalition, are funded by Big Oil, and promote research that denies or downplays global warming.

Big Oil's playbook

By attacking the scientific consensus around global warming, and the work of individual scientists, the fossil fuel industry was able to produce confusion among journalists and the general public about what was understood to be the facts of the matter.

The industry hired PR firms such as Exponent, Gradient, ChemRisk, and Ramboll Environ, who employed toxicologists, epidemiologists, and biostatisticians to publish papers showing that petroleum products are not very harmful. They pressured and threatened journal editors to not publish papers contrary to their narrative.

They promoted transparency of data, so that their scientists could use different statistical methods to reanalyze the data of published results so as to cast doubt on the results.

- Ex: Goodyear Tire hired experts to argue that benzene exposure is not a cause of leukemia.

Big Pharma

- The majority of medications are brought to market by a small number of large multinational pharmaceutical companies, which have profit as their primary, or only, motive.
- They receive public money for much of the research that they use, but they obtain patent protections on the drugs they make – focusing on profitable drugs and markets.
- They engage in price gouging, and some companies buy the rights to certain drugs and then raise the prices. (Ex., Martin Shkeli, in the US +5000%.)
- The burden of proof to show effectiveness and safety is often quite low (they do not need to show the results of all trials), and many companies have had drugs taken off the market, or been fined for breeching safety protocols.

Some scientific misconduct by pharmaceutical companies

Here are just a few examples:

- In the 90s, Purdue Pharma produced a time-released oxycodone (OxyContin, an opioid) and promoted the product by misrepresenting the medical literature, inventing the concept of "pseudoaddiction," ghost managing medical studies, and hiring experts to promote their narrative.
- Endo Pharmaceutical marketed its Opana ER (oxymorphone) as "crush resistant," but failed to disclose its own studies which showed that the drug could be crushed and injected.
- GlaxoSmithKline suppressed safety data for its drug Paxil (paroxetine, an SSRI).
- Merck selectively reported safety information for Vioxx (an anti-inflammatory).
- Ranbaxy was fined $500m for data falsification.

ADDICTION RARE IN PATIENTS TREATED WITH NARCOTICS

To the Editor: Recently, we examined our current files to determine the incidence of narcotic addiction in 39,946 hospitalized medical patients[1] who were monitored consecutively. Although there were 11,882 patients who received at least one narcotic preparation, there were only four cases of reasonably well documented addiction in patients who had no history of addiction. The addiction was considered major in only one instance. The drugs implicated were meperidine in two patients,[2] Percodan in one, and hydromorphone in one. We conclude that despite widespread use of narcotic drugs in hospitals, the development of addiction is rare in medical patients with no history of addiction.

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1. Jick H, Miettinen OS, Shapiro S, Lewis GP, Siskind Y, Slone D. Comprehensive drug surveillance. JAMA. 1970; 213:1455-60.
2. Miller RR, Jick H. Clinical effects of meperidine in hospitalized medical patients. J Clin Pharmacol. 1978; 18:180-8.

Purdue and other pharmaceutical companies build up an argument that opioids are not additive for people who are in pain based on a five-sentence letter-to-the-editor in a medical journal. This was not a peer-reviewed paper, and the conditions under which patients received medication was not specified.

New England Journal of Medicine (1980).

Pharma publication tactics

Pharmaceutical companies use various strategies to publish scientific papers promoting their narratives:

- They employ various experts and labs to give them control over different aspects of the research, analysis, and writing process – known as ghost management.
- They develop close relationships, often involving payments or perquisites (perks), with the editors of certain journals – which gives the industry a set of known friendly journals.
- They keep lists of possible referees that are known to be friendly to industry interest, which can be suggested to journals along with submitted papers. This is a way of generating fake reviews.

Crisis in scholarly and scientific publication

All of the issues that we have discussed involve various ways of exploiting the scientific publication process. We can think of these as various methods of gaming the system, which in many journals and databases is now highly automated:

- authorship manipulation,
- review manipulation, and
- pay-to-play (P2P) publications.

Because of the growing use of online portals for publication, many of these tactics can be automated and scaled up. The use of AI agents will probably only increase these trends.

This growing issue of fraud, malpractice, and gaming the system has led to more and more papers being officially retracted by the journals that have published them. Lists of retracted papers are collected on databases such as retractionwatch.org.

Authorship manipulation

Forged or fictional co-authorship involves the ascription of individuals as authors on academic papers who did not contribute to the research or are entirely made-up. For example:

- An individual's name may sometimes be added to a paper as a sort of favor or gift. This is known by various terms such as gift or honorary authorship.
    - Groups of academics who may put everyone's names on all papers, as a form of co-authorship ring.
- Sometimes one individual does the actual writing, but then another individuals name is stated as the author – known as ghost authorship.
- Occasionally, a paper may be published without the full, final consent of all of the authors involved.

Review and reception manipulation

The processes of review both before and after publication, as well as a paper's statistics in academic databases can be manipulated in various ways. Some examples of these are:

- Some academics can be depended on to referee papers that are in the publication process – both positively and negatively. These fake or biased reviews can be used by authors and editors to approve certain papers, or by editors to reject certain papers (using biased reviewers).
- Groups of researchers may form review rings, in which they favorably referee each other's work, so as to guarantee publication.
    - There have been some cases of journal portals being hacked to add positive reviews, author names, etc.
- A group scholars can agree (perhaps informally) to cite each others work to increase their citation counts – known as a citation ring.

Pay-to-play publications

Probably the most egregious form of publishing malpractice involves businesses that charge fees for written work, publication, and editorialships – P2P services.

- Predatory journals charge authors to publish papers; vanity presses charge authors to publish books. (These are cataloged on beallislist.net, etc.) Predatory journals sometimes also sell editorship positions.
  - Some predatory journals have been hacked by cyber criminals – leading to hacked journals.
- Companies known as paper mills sell written papers to students and academics. At the highest level, they may sell author slots on papers that are already in press.
- There are also companies that facilitate buying reviews and citations.

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An elite Russian paper mill

Sting operations

A number of scholars and scientists have pulled off various hoaxes as a way of showing the problems that they find in the publication process.

- In 1996, the physicist Alan Sokal published a paper in *Social Text* arguing that the theory of quantum gravity is a purely social and linguistic construction – this kicked off the so-called Science Wars.
- In 2010, a group of scientist gamed the system to make a non-existent individual, Ike Antkare, the 21st most cited scientist on Google Scholar.
- In 2025, Zen Faulkes, biologist, published a collection of 42 fake papers titled *Stinging the Predators*, which provided a large sample of different types of fraudulent and hoax papers.

To test the gullibility of journalists, J. Bohannon and colleagues designed and published a methodologically flawed study showing that high-cocoa chocolate leads to weight loss, and then promoted this study to the media. There were news stories all over the world reporting this idea.

This "sting" was considered controversial, because many media outlets did not correct the error. (Many people still believe this "fact" is true.)

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Chocolate with high Cocoa content as a weight-loss accelerator

ORIGINAL

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Abstract

Background: Although the focus of scientific studies on the beneficial properties of chocolate with a high cocoa content has increased in recent years, studies determining its importance for weight regulation, in particular within the context of a controlled dietary measure, have rarely been conducted.

Methodology: In a study consisting of several weeks, we divided men and women between the ages of 19-67 into three groups. One group was instructed to keep a low-carb diet and to consume an additional daily serving of 42 grams of chocolate with 81% cocoa content (chocolate group). Another group was instructed to follow the same low-carb diet as the chocolate group, but without the chocolate intervention (low-carb group). In addition, we asked a third group to eat at their own discretion, with unrestricted choice of food. At the beginning of the study, all participants received extensive medical advice and were thoroughly briefed on their respective diet. At the beginning and the end of the study, each participant gave a blood sample. Their weight, BMI, and waist-to-hip ratio were determined and noted. In addition to that, we evaluated the Giessen Subjective Complaints List. During the study, participants were encouraged to weigh themselves on a daily basis, assess the quality of their sleep as well as their mental state, and to use urine test strips.

Result: Subjects of the chocolate intervention group experienced the easiest and most successful weight loss. Even though the measurable effect of this diet occurred with a delay, the weight reduction of this group exceeded the results of the low-carb group by 10% after only three weeks ($p = 0.04$). While the weight cycling effect already occurred after a few weeks in the low-carb group, with resulting weight gain in the last fifth of the observation period, the chocolate group experienced a steady increase in weight loss. This is confirmed by the evaluation of the ketone reduction. Initially, ke-

Replication crisis

- In 2005, J.P.A. Ioannidis published a statistical study of medical papers called "Why Most Published Research Findings Are False," which argued that only 3% of meta-analyses are not methodologically flawed.
- Starting from around 2010, there began to be a growing concern about certain ways of collecting, analyzing and reporting data that were being used to produce results, especially in fields like medicine, nutritional science, psychology, and economics. A number of prominent findings *could not be reproduced*.
- It was observed that positive or and unusual results were favored by a *publication bias*.
- A number of projects were founded specifically to try to reproduce significant studies. In one meta-study on psycology, fewer than half of the tested studies could be reproduced.

Structural problems with scientific publication

- Individuals, and organizations, have incentives to publish any work, *even questionable work*.
  - Individuals are motivated to publish any work that will advance their careers.
  - Organizations are motivated to publish work that improves their profit, or improves the social capital of their brand or their industry.
- The scientific coding of *true/false* gets confused with that of *profit/loss* and *news/not-news*, which come from the market or media.

	+	−
Science	true	false
Market	profit	loss
Media	news	not-news

- The quality of science collapses when it becomes a commodity.

Final Remarks

- We looked at number of well-known cases of individual scientific misconduct, looking for patterns of individual behavior and systematic pressures.
- We examined the systematic use of scientific misconduct by governments and business as a means of generating epistemic authority or doubt, in order to sway public opinion in their favor.
- We examined a number of serious and growing problems in scholarly and scientific publication.

- All of this should cast doubt on earlier claims that there are special norms operating amongst technoscientists, as a social group.