PAPER MILLS

One in a series of A3 discussion primers about tricky topics in research integrity

What is a paper mill?

Paper mills are malevolent companies that generate and sell manuscripts to researchers. They prey on the perverse incentive structures of academia. Many researchers are under immense pressure to publish, so a place of authorship on an accepted paper is a commodity for which some desperate researchers are willing to pay.

The quality of paper mill papers can vary. In some cases the data are fraudulent and entirely untrustworthy. Paper mills are seriously harmful.

Had you heard about paper mills prior to this discussion? If so, do you remember how you first heard about them? If not, what's your initial reaction?

A toxic business model

Paper mills operate in a variety of ways. So, a "paper mill" is not really a single business model, but a family of business models that treat research manuscripts and authorship places as commodities. A 2022 report by the Committee on Publication Ethics and STM describes some paper mill operations as *"sizable and highly professional."* [1] The graphic at the top right of this page represents one possible model, based on the literature.
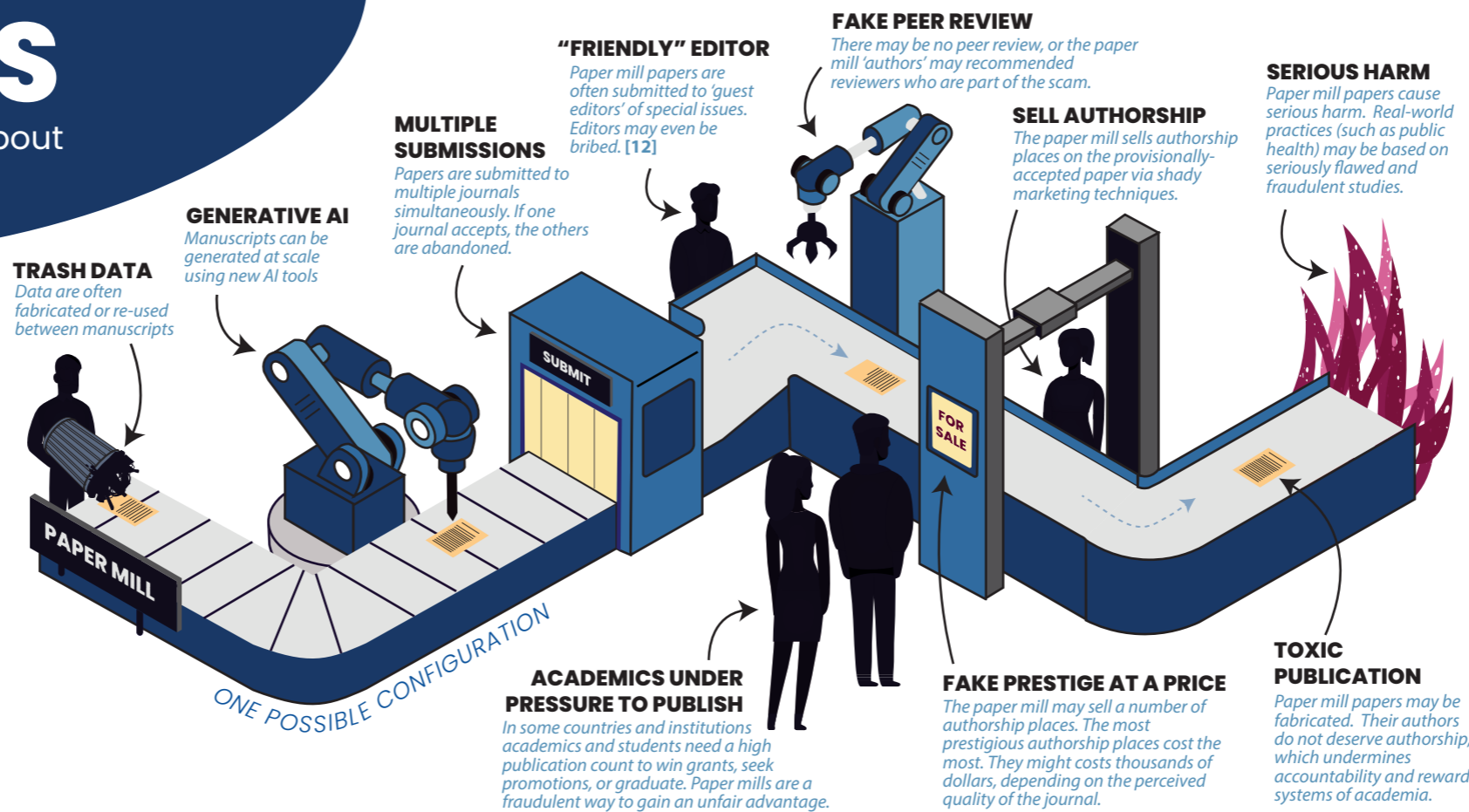
Papers are usually sold after they have been provisionally accepted, but some mills may sell 'papers to order'. Authorship places are advertised on websites and social media. Some advertisements may be vague and masquerade as author editing services; other advertisements are brazen, and include the paper's title, the journal in which the paper will be published, and the price for each authorship position. *"Prices range from hundreds to thousands of US dollars depending on the research area and the journals' prestige."* [2]

Read: "Paper mills: A novel form of publishing malpractice affecting psychology" [3]. What did you learn? How does it make you feel?

What's the size of the problem?

How many papers do you think are written by paper mills

One in every ____ papers was generated by a paper mill.

No one is quite certain what that answer is, although recent research has suggested an alarmingly high prevalence. Read reference [4]. Was your guess close?

TRASH DATA
Data are often fabricated or re-used between manuscripts

GENERATIVE AI
Manuscripts can be generated at scale using new AI tools

MULTIPLE SUBMISSIONS
Papers are submitted to multiple journals simultaneously. If one journal accepts, the others are abandoned.

"FRIENDLY" EDITOR
Paper mill papers are often submitted to 'guest editors' of special issues. Editors may even be bribed. [12]

FAKE PEER REVIEW
There may be no peer review, or the paper mill 'authors' may recommended reviewers who are part of the scam.

SELL AUTHORSHIP
The paper mill sells authorship places on the provisionally-accepted paper via shady marketing techniques.

SERIOUS HARM
Paper mill papers cause serious harm. Real-world practices (such as public health) may be based on seriously flawed and fraudulent studies.

PAPER MILL

SUBMIT

FOR SALE

ONE POSSIBLE CONFIGURATION

ACADEMICS UNDER PRESSURE TO PUBLISH
In some countries and institutions academics and students need a high publication count to win grants, seek promotions, or graduate. Paper mills are a fraudulent way to gain an unfair advantage.

FAKE PRESTIGE AT A PRICE
The paper mill may sell a number of authorship places. The most prestigious authorship places cost the most. They might costs thousands of dollars, depending on the perceived quality of the journal.

TOXIC PUBLICATION
Paper mill papers may be fabricated. Their authors do not deserve authorship, which undermines accountability and reward systems of academia.

How can we spot them?

The following indicators are not sufficient for identifying a paper mill publication, but they may well be indicative:

- [ ] *Authors change between acceptance and publication*
- [ ] *Authors use non-institutional email addresses*
- [ ] *Figures contain duplications, or are 'too clean'*
- [ ] *Figures appear in other papers*
- [ ] *Missing ethics approvals*
- [ ] *Structural similarity to known paper mill papers*

Are you familiar with emerging AI tools for identifying image manipulation? [5]

Some fraudulent papers are very hard to detect. Within disciplines, meta-researchers have found specialised methods for identifying patterns of problems. Read, for example, Ref [6] about the "Seek & Blastn" tool for identifying fabricated nucleotide sequences.

Are you aware of any other methods for identifying papers that may come from paper mills? You may like to look up the "Problematic Paper Screener". [7]

Are we susceptible?

One clear contributor to the paper mill problem is the incentive structure of academia. Some researchers are under considerable pressure to boost their publication and citation metrics. [1] There is clearly a link between: (a) issues of research quality and integrity, and (b) issues of researcher incentives and assessment.

What does our institution value in terms of researcher promotion and assessment? Is our culture susceptible to perverse incentives relating to bad research practices, or even paper mills? What can we do to promote a healthy culture? (You may like to have a look at 'DORA'. [8])

Systematic fraud

If we're talking about paper mills then, as Jennifer Byrne put it, *"we need to talk about systematic fraud."* [9]

There's a comon view that research fraud is only committed by '**a few bad apples**', or that it is limited to certain countries or cultures. That assumption, however, is very doubtful. An investigation by a publisher identified thousands of fake papers involving authors from more than 70 countries.[1] A 2022 survey by Gopalakrishna, et al. of researchers in the Netherlands found that 1 in 12 admitted to having fabricated or falsified research at least once in the past three years. Shocking? [10]

How often have you discussed research fraud with your colleagues? How prevalent do you think it may be in your discipline?

So, what do we do?

In a blog post of Nov 2023, Dorothy Bishop called for a new teaching requirement for research students: Defence Against the Dark Arts. [11] Essentially, this would be research training with a focus on fraud detection and fraud busting. Bishop quotes Snape from Harry Potter: "*Your defences must ...be as flexible and inventive as the arts you seek to undo.*"

Read Bishop's blog post. [11] Do we equip our researchers with 'defence against the dark arts?' What do you think? What can we do at our institution?

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