



Paper mills: A novel form of publishing malpractice affecting psychology.

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We first describe the phenomenon of the academic paper mill, a kind of large-scale fraud in which authors pay to have work published in reputable journals. We give examples of some known paper mills and discuss ‘red flags’ that characterise their outputs. Most of the early examples were in biomedical and computational sciences and so paper mills are less familiar to many psychologists. In the next section, we describe a broker company/paper mill, *Tanu.pro*, discovered by the first author, which was identified by the use of fake email addresses. This paper mill placed six outputs in the *Journal of Community Psychology*, a reputable journal from a mainstream publisher. We look in detail at these papers and describe the features that confirm that malpractice was involved in publication. In five cases there was circumstantial evidence of tampering with the peer review process coupled with lack of editorial oversight. These papers have now been retracted. In a final section, we discuss the need for editors of psychology journals to be aware of potential targeting by paper mills and recommend editorial procedures to counteract these.

Keywords: Fraud, Publication, Editing, Peer Review, Open Science, Integrity, Paper mills

Introduction

In psychology, much attention has been paid to the so-called ‘reproducibility crisis’, which is seen as having many causes, including inadequate training of researchers and a distorted incentive structure that prioritises striking results over strong methodology (Munafò et al., 2017). Fraud is generally regarded as rare: there have been a few noteworthy cases of high-profile fraudulent psychologists (see, e.g., Pelosi, 2019; Stroebe et al., 2012), but in general, these appear to be individual bad actors, rather than part of any organised system. They are detected either by whistleblowers, or because their results appear too good to be true (see, e.g., Marcus and Oransky, 2018; Pelosi, 2019; Simonsohn, 2013).

In the past decade, academic publishers have become alarmed at the emergence of large-scale production of fake material by what have been termed “paper mills”: organisations that sell authorship of publications that are placed in legitimate journals, frequently with violation of the peer review process (COPE and STM, 2022). Initially, these operations were seen principally in biomedical and computing science, but it is clear that they are extending their reach and that psychology is not immune.

In this article, we first describe the characteristics of

paper mills in a range of disciplines, noting a number of “red flags” for identifying their products. We then move to a detailed analysis of six articles from one paper mill, *Tanu.pro*, which were published in a reputable psychology journal. In the last section, we consider approaches that may be used to detect and counteract paper mill activity.

The rise of academic paper mills

Paper mills come in different forms, but typically involve plagiarism, fabrication or falsification in academic articles (Else and Van Noorden, 2021; McCook, 2016) and/or corruption of the peer review process. An early description of paper mills was provided in an investigation by the journal *Science*, which described Chinese agencies offering papers for sale in the area of biomedicine (Hvistendahl, 2013). A few years later, Byrne and Labbé (2017) showed how the field of genetics was being polluted by plausible-looking papers that were generated at scale using templates that altered the details of genes and phenotypes from article to article. Other paper mills have been discovered in technical areas such as computer science, where papers can be generated algorithmically using artificial intelligence (AI). Meaningless articles can either be generated from scratch, or by using AI to change words from le-

gitimate papers to avoid plagiarism checks, sometimes with unintentionally hilarious consequences (Cabanac and Labbé, 2021).

In microbiology, medicine and crystallography, paper mills have been discovered by scholars, research integrity experts, and anonymous sleuths via analysis of images and figure manipulation. For example, in more than 600 articles from a paper mill known as “Tadpole”, there are suspicious similarities of background within the same Western blot panel or between panels from different articles authored by different scholars (Bik, 2020). Bimler (2022), also known by the pseudonym *Smut Clyde*, reported duplicated crystal-determination figures and recycled cell figures in at least 800 papers in crystallography and chemistry journals.

Academic publishers are increasingly concerned by the rise of paper mills, which have led to mass retractions of papers once the operation is exposed (Retraction Watch, 2022a, 2022b; Royal Society of Chemistry, 2021). According to a recent joint study by the Committee on Publication Ethics (COPE) and the International Association of Scientific, Technical and Medical Publishers, “journals see up to 2 per cent of papers submitted that are identified as potential fake papers” (COPE and STM, 2022).

This raises the question of how paper mills succeed in publishing articles in legitimate journals. First, paper mills corrupt the peer review process by recommending peer reviewers who usually mimic the identity of legitimate scholars (Day, 2022; Oransky, 2014). Second, in some cases there is evidence of suspicious collaboration between paper mills and journals or editors (Bishop, 2023). Paper mills are also attracted to hijacked journals: these are created by fake publishers to mimic legitimate journals by using the same ISSN and title as a real journal. They offer fast publication in exchange for a fee (Abalkina, 2023). Third, paper mills can penetrate journals where there is an ineffective editorial process (Seifert, 2021).

"Red flags"

There is no single formula used by those operating paper mills. Indeed, as soon as a particular technique is discovered and publicised, the paper mill operators will change strategy, making it hard to keep up. Nevertheless, we can identify some “red flags” which are either diagnostic of a paper mill, or increase suspicion that one is operating.

1. Authorships for sale

The most blatant evidence of paper mill operation is when a website is soliciting for business. Some papers are openly advertised on Facebook or similar out-

lets. Abalkina (2023) detected more than 450 advertisements of co-authorship for sale by a Russian-based multidisciplinary paper mill calling itself “International publisher LLC”. Hundreds more advertisements were detected by a sleuth, Nick Wise (Else, 2023). The price of a co-authorship slot depends on the position in the authors’ list, the impact factor of the journal (COPE and STM, 2022), and the role of the corresponding author. Prices ranged from 180 to 5,000 euros in a Russian-based paper mill (Abalkina, 2023) and from 1,600 to 26,300 US dollars in a paper mill associated with China (Hvistendahl, 2013). Paper mills use different business models to sell co-authorship slots. Some offer co-authorship slots in already accepted articles (COPE and STM, 2022) or those that have already passed a first round of peer review, with additional author slots for sale. Some others offer topics with co-authorship slots for sale and order ghostwriters to write the paper only after the slots have been sold. Perron et al. (2021) demonstrated how a Russia-based paper mill searched for a ghost-writer on a freelancer website to write a manuscript after selling several co-authorship slots to scholars affiliated with Russia and China.

2. Unusual patterns of collaboration

Online advertisements for authorship slots are visible to scholars in a wide range of countries, institutions, and disciplines. The resulting article may have suspicious collaboration patterns where we see surprisingly international and diverse author affiliations and/or authors from different disciplines with specializations that may not correspond to the topic of the paper. Of course, international and multidisciplinary teams of authors are often legitimate, but sometimes it is reasonable to ask the authors how they came to collaborate and what role each of them played.

3. Fake email addresses

Paper mills may submit articles using fake email addresses. Red flags can include the following features. First, paper mills may create one-time use emails, available from commercial providers, for communication with journals (Clyde, 2020). A consequence is that if readers and editors attempt to contact the authors regarding possible misconduct, their messages go directly to the paper mill instead. Second, the email addresses may be unrelated to the name or affiliation of the corresponding author (Bik, 2022). Third, we may see rule-based patterns of email names across articles. For example, in the case of the crystallography paper mill, 48.5 per cent of corresponding emails contained numbers 11, 12, 22, 66, and 666 after the name (Bimler, 2022). Another paper mill created fake co-author names with

affiliation and email of a college in Burundi (Clyde, 2022). These suspicious patterns are paper mill specific, but they allow one to find other fraudulent articles from the network or provide further evidence of a paper mill origin. Seifert (2021) wrote about his experience as editor of a pharmacology journal that had become infested by papermill articles. He noted that the corresponding authors never used institutional email addresses, and often the email address had little relation to the name of the corresponding author. He gave short shrift to the argument that some institutions do not provide academic email addresses, and noted that his journal would no longer accept submissions without a valid email address from an academic or pharmaceutical organization. Note however, that, we describe below a paper mill that registered fake emails mimicking university names, so this strategy to ban commercial emails might not fully solve the problem of preventing submissions from paper mills.

4. "Special issues" with little oversight of editors

From a publisher's perspective, a special issue of a journal may be an attractive way to increase submissions for minimal outlay. Academic editors may be invited to suggest such special issues, and then given free rein to handle acceptance and rejection of papers. This has become a notorious route for papermill products to be published (Bishop, 2023; COPE and STM, 2022).

5. Anomalies in the peer review process

One weakness exploited by paper mills is the difficulty in finding peer reviewers for articles. In some cases, authors are asked to recommend peer reviewers, and this provides an opportunity for unscrupulous operators to direct editors to fake reviewers. Publishers are able to detect violation of peer review by verification of reviewer's identity and by the analysis of reviewers' texts. Day (2022), a data analyst at SAGE Publications, analyzed duplication in referee comments in order to detect peer review fraud and identify manuscripts that were produced by paper mills. He found an interconnected cluster of referees who were recommended by authors and who produced duplicated comments. The accounts of these peer reviewers were most likely controlled by a paper mill. In our analysis below, we also show the similarities between reviewers' comments for different papers originating from *Tanu.pro*, noting also that the reviewers did not appear to have a legitimate online academic presence.

6. Inappropriate citations

There is a market for citations as well as for authorship. A strong signal of a paper mill output is when

material is cited that has little to do with the topic of the article, especially if the same citations are found frequently in other questionable papers. Indeed, one way of tracking down paper mill products is to identify an article that is frequently cited in inappropriate contexts and then trace other articles that cite the same work. A related issue is when paper mill articles cite unreliable sources. In our analysis below, we demonstrate that some articles from the paper mill cite unreliable journals whose editorial board included the fake peer reviewers.

7. Plagiarised and falsified content of articles

Articles originating from paper mills often are affected by various forms of academic misconduct: plagiarism (McCook, 2016), and fabrication and falsification of images, data, and results (Bik et al., 2016; Byrne, 2022; Christopher, 2018; Van der Heyden, 2021). Paper mills are oriented to the maximization of revenues with the reduction of costs (Byrne, 2022). They reduce costs by relying on plagiarised or fabricated data, images, and other results in areas where large funds would be needed to conduct legitimate research, for example, in medicine, microbiology, crystallography, etc. One way of diagnosing plagiarised texts is by "tortured phrases". Where plagiarised material is used, the text may be run through a synonym generator to avoid being detected by plagiarism checks. This, however, can misfire, when standard phrases are changed. For instance "sulphuric acid" may become "sulphuric corrosive", or "credible Bayes" may become "gullible Bayes" (Cabanac et al., 2021). A considerable challenge for academic integrity is AI-generated papers via platforms such as SciGen and MathGen (Cabanac and Labbé, 2021). It is just a question of time before scholars and paper mills will start to use the newly-released ChatGPT to write articles. On one hand, ChatGPT will lower the costs to paper mills of creating AI-generated text. On the other hand, ChatGPT would allow scholars to generate their own fake content without the need for paper mills. There are real concerns that such articles could flood journals and be difficult to detect.

8. Incoherent text

Often, it can be difficult to work out what a paper mill article is saying. Of course, that can be true for legitimate but poorly-written scientific texts, especially in highly technical areas. Paper mill products, however, will often use technical language to look impressive, but those who know the area will judge them to be nonsensical.

9. *Unfeasibly short article processing times*

There is no hard-and-fast cutoff that indicates that an article has not been peer-reviewed, but if an editor shows a consistent pattern of rapid turnaround, this may be suspicious. Bishop (2023) found abnormally fast editorial turn-around times characterised many articles in special issues of the publisher Hindawi.

10. *Common templates*

Common templates in articles with non-overlapping authors are another feature that, while not diagnostic of paper-mill production, are commonly seen in paper mill articles. Such common templates can be found in the structure of a article, similar formatting and identical fonts, and colors in figures (Byrne and Labbé, 2017; Byrne and Christopher, 2020; Cabanac and Labbé, 2021; Else and Van Noorden, 2021; COPE and STM, 2022).

***Tanu.pro*: an example of a paper mill in psychology**

There is a rising concern about paper mills in Eastern Europe and post-Soviet countries, with companies registered in Latvia (COPE and STM, 2022) and Russia (Abalkina, 2023). Bastian Michel, editor of European Constitutional Law Review drew the attention of the first author to suspicious articles coming from that part of the world and to a comment on Pubpeer about such an article with unusual e-mails. The first author conducted a search for articles published with email addresses with unusual domain names where the country of the domain did not correspond to the country of author affiliation, or the name of the university in the email did not correspond to the affiliation. These domain names were then used as a search query in the full text search in *Dimensions* in order to identify other articles with unusual email addresses. The analysis of these articles revealed other suspicious domain names. The snowball method made it possible to detect 35 suspicious domain names in more than 1,100 articles (as of January 2023). There is evidence that these articles were submitted by a broker company/paper mill in one of the post-Soviet countries. It was named *Tanu.pro* after the most used domain name of emails @tanu.pro).

Analysis of suspected paper mill papers in JOCP

The *Tanu.pro* articles cover a range of disciplines, including psychology. Six of them were published in the *Journal of Community Psychology*, although they were retracted in January 2023 after we drew attention to them in a preprint. The journal is published by Wiley and at the time of writing (February 2023) reports a 2021 impact factor of 2.297 on its website. Here we

present evidence that these six articles are indicative of a paper mill that targets psychology journals with weak editorial practices. The analysis was facilitated by the fact that the journal openly publishes peer review reports. The second author, a psychologist, scrutinised the text of these papers, and, where available, the referee reports and editorial correspondence on Publons. The first author also analysed reference lists, submission data of the peer reviews and the profiles of reviewers on Publons. Table 1 summarises information regarding peer review for five of the six papers identified as having questionable email addresses for the corresponding author. Paper 6, by Shmelev et al. (2021; doi: 10.1002/JCOP.22597) was by an author with an academic address in Russia, and a correspondence email at domain@unesp.co.uk. An ORCID identifier was provided for the first author, but, as with the other five papers, it contained no information.

Table 1

Characteristics of suspect papers: For papers 1-5 Publons review records were available.

	1	2	3	4	5	6
Author	Bubnov et al.	Demidov	Lyzhin et al.	Maslova et al.	Mukhitov et al.	Shmelev et al.
DOI*	10.1002/JCOP.22683	10.1002/JCOP.22684	10.1002/JCOP.22664	10.1002/JCOP.22533	10.1002/JCOP.22707	10.1002/JCOP.22597
Publication date	10-Aug-21	06-Aug-21	09-Jul-21	19-Feb-21	16-Sept-21	15-May-21
ORCID	0000-0002-9278-1064	0000-0001-7134-3236	0000-0002-0013-1540	None	0000-0001-5291-6166	0000-0003-1264-8456
ORCID content	No	No	No	-	No	No
Email domain	@unesp.co.uk	@ubogazici.in	@murdoch.in	@kpi.com.de	@uoel.uk	@unesp.co.uk
Authors country	Russian Federation	Russian Federation	Russian Federation	Russian Federation	Kazakhstan	Russian Federation
Empirical study	Unclear; very vague	No; essay style	Yes	No; impenetrable	Analysis of public data	Yes
Citations	Cited problematic papers, predatory journals	Cited problematic papers	Cited predatory journals, problematic papers	Cited predatory journals	Cited predatory journals, problematic papers	Cited predatory journals, problematic papers
Reviewer 1	Miroslava Harinek	Elena Overman	Sam Beckles	Anonymous	Georgina Smith	-
Academic affiliation	None	Polytechnic U. of Timisoara	None	-	U. of the Sunshine Coast	-
Publications on WOS	None	None	None	-	None	-
Reviewer 2	Ryan Paxton	Leon Holmes	Tony Higgins	Anonymous	Eric Leitmeir	-
Academic affiliation	None	U. of Sonora	Western Kentucky U.	-	U. of West Bohemia	-
Publications on WOS	None	None	None	-	None	-
Submission dates:						
Reviewer 1, review 1	30.06.2021	12.07.2021	02.06.2021	19.01.2021	22.07.2021	-
Reviewer 2, review 1	01.07.2021	12.07.2021	03.06.2021	19.01.2021	22.07.2021	-
Reviewer 1, review 2	13.07.2021	19.07.2021	22.06.2021	03.02.2021	06.08.2021	-
Reviewer 2, review 2	13.07.2021	n/a	22.06.2021	03.02.2021	06.08.2021	-
Reviewer requests:						
Changes to abstract	1	2	2	1	-	-
Change keywords	1	1+2	-	1	-	-
Add aims/ objectives	1	2	-	2	1	-
Correct typos	1 + 2	2	1	2	1	-
Revise conclusions	2	2	2	-	2	-
Expand reference list	2	2	1	1	1 + 2	-
Reformat paragraphs	-	-	1	2	1	-

*For direct link to Publons reviews, use <https://publons.com/publon/> with the DOI.

All six papers had serious flaws; we judged that none would be published if proper peer review and editorial scrutiny had taken place. Only two of the six papers (3 and 6) reported new empirical data: In both cases the material was presented in a disorganised way, not following conventional uses of sections for Methods and Results, making it hard to follow what was done. No ethical approval was cited: We checked the Instructions for Authors, and it is true that a requirement for ethical approval is required only for medical studies. However, one might expect that paper 6, which was an intervention study requiring substantial investment of time by participants, should have had ethics scrutiny. Disorganised structure, making it difficult to work out what was done, also characterised the paper (5) that presented analysis of existing archival data. The least comprehensible was paper 4, which appeared to be a postmodern analysis of self-identity: It can be hard to distinguish genuine academic articles in postmodernism from hoaxes (Sokal and Bricmont, 1998). There was no indication of any competence in experimental design or data analysis by the authors of the data-based papers, although statistical tests were reported. Citations of other work in the papers were also flawed. Papers 1, 2, 3, 5, and 6 cited papers from a venue where some of the suspicious identities of peer reviewers were included in the editorial board. Papers 1, 3, 5, and 6 included citations to predatory journals. Turning to the peer review, we find that where information was provided about reviewer names on Publons, in no case was there information about the named person on the institutional website, and no evidence that they had any publications on Web of Science or Publons. Most reviews started by just reiterating some aspect of the content of the paper, but did not engage with it in a serious way. In addition, there were similarities between the reviews of the papers, all of which gave trivial, though typically vague, recommendations for minor changes, sometimes using identical wording. For instance, reviewers would state that the references were too old, and so the author should “refresh” the reference list; this same word was used across reviews. Recommendations for other changes were too imprecise to be useful, such as the reviewer asking the author to “improve the conclusions”. Furthermore, in the majority of cases, both reviews for a paper were submitted on the same day. In order to test if the same-day submission pattern is an anomaly or the lack of the difference in peer review submission is driven by the strict peer review policy of the journal, the first author randomly selected ten from 284 papers published in the *Journal of Community Psychology* in 2021 and indexed in Web of Science. She then compared the submission dates of reviews by the

first and the second reviewer. None of the pairs of reviews was submitted on the same date. The range of submission dates difference varies from 7 to 232 days with a mean of 50.9 days. Thus, the same-day submission pattern in the sample of the *Tanu.pro* papers may be another hint of peer review violation. The open review system adopted by *Journal of Community Psychology* allowed us to read correspondence with the editor, confirming that the Editor-in-Chief, Michael B. Blank, personally dealt with nearly all submissions to the journal, including these six. Given the obvious deficits of the six papers and the associated reviews, it was puzzling that they had been accepted. One possibility was that the editor had not noticed the problems with the papers. Authors are required to suggest reviewers, and a busy editor might delegate the initial stages of processing a paper to a secretary, without considering the content; it is possible to allocate reviewers, and then ask authors for revisions on the basis of their responses. A second option was that the editor had knowingly accepted these papers, despite their glaring unsuitability, which would suggest he was complicit in the paper mill. This seemed unlikely for two reasons. First, it had potential to seriously damage the journal, and second, the evidence of distortion of the peer review system was available on Publons; had the editor been wanting to hide this, he could have chosen not to make these reviews open.

To distinguish these options, we submitted a paper that described the evidence that six papers in *Journal of Community Psychology* came from a paper mill. This ‘stress test’ indicated that the editor did read at least some of the papers submitted to his journal, because the article was desk-rejected by the editor, Michael B. Blank, with a single comment: “This is a weak paper based on a cursory review of six publications”. This was an unexpected outcome: We had anticipated that if the editor had read our paper, he would have rejected it, but that he might then have given some explanation as to how these papers came to be published in the journal. In effect, his response amounted to denial that there was anything wrong with the six papers, and a failure to engage with a serious problem affecting the journal.

Discussion and Conclusions

Psychology journals are not immune to targeting by paper mills. Difficulties in obtaining peer reviewers have led many journals, including the *Journal of Community Psychology*, to ask authors to recommend peer reviewers. This creates a crack in the defences of a journal against fraud, if it is combined with lack of editorial oversight. This case illustrates the benefits of open peer review in detecting fraud. The combination of weak

articles with strange author email addresses suggests that something has gone wrong with the publication process, but the evidence is compelling when one has the reviewer reports available. These indicate problems with the credentials of the reviewers, and reveal superficial reviews that fail to engage with the content of articles, with similar comments duplicated across articles and with similar or identical dates of review submission. Taken together, this is circumstantial evidence that the reviews were fabricated. One way of tackling fraud is to follow up leads that emerge when articles are confirmed to have come from paper mills. Our analysis showed that six papers originating from *Tanu.pro* were the result of fraud, and they were subsequently retracted. We recommend that publishers should be pro-active in investigating other papers with the odd email domains from *Tanu.pro*. These are available on a spreadsheet: [10.6084/m9.figshare.22083425](https://doi.org/10.6084/m9.figshare.22083425). Publishers should also take the initiative in investigating articles that have been flagged on the website PubPeer for having spurious citations, irrelevant content, tortured phrases, or machine-generated or plagiarised text.

Once academic fraud becomes common enough to be problematic, institutions and publishers might benefit from the use of stress tests, where those with knowledge of how the fraud works try to break into systems to test their integrity. This is not, to our knowledge, common practice in academic publishing, although there are some cases where hoaxers have succeeded in publishing worthless material, in order to demonstrate lax standards by editors and/or peer reviewers. The most famous of these is by Sokal (1996), who was subsequently emulated by James Lindsay, Helen Pluckrose, and Peter Boghossian (Mounk, 2018). Hoaxes serve the function of highlighting where academia is going astray, but they may be deemed unethical as they involve deception and they take up the time of editors and reviewers. The current paper aimed to achieve a similar function, but using content that is genuine and makes a novel contribution to the field.

One may ask whether the publication of material from paper mills matters, if the published articles are of low quality and unlikely to have any influence. After all, the six articles featured here are very different from those from the genetics paper mills discovered by Byrne and Labbé (2017). The latter were hard to distinguish from genuine articles, and could be used to inform drug development studies, and would feature in meta-analyses, poisoning the well of scientific knowledge. In contrast, the articles evaluated here, insofar as they are intelligible, had major flaws in design, analysis and argument, and were unlikely to be taken seriously. Nevertheless, harm is done by publishing these papers.

First, one has to consider why authors do business with paper mills. It is because, in a highly competitive academic market, it gives them an advantage. This is unfair on honest individuals who compete against them. Although there is a move in many countries away from evaluating academic researchers by metrics such as article counts or H-index, these have been widely used internationally (e.g. Teixeira da Silva, 2017). Many countries still adopt metrics-oriented evaluation of research output without adequate control. In Russia, for example, the nationwide requirements for publications in journals indexed in Web of Science or Scopus have been accompanied with introduction of effective contracts, new promotion requirements, and financial bonuses for publications (Denisova-Schmidt, 2021; Guba, 2022), fuelling questionable research practices. In China, promotion in hospitals is linked to the number of publications (Schneider, 2020). There is also plenty of informal evidence on social media of individuals who have benefited from activities such as citation-stacking (e.g. Magazinov, 2022). Second, if paper mill articles get included in a journal, then it also does a disservice to authors who submit their genuine work to the journal in good faith. Once it is recognised that there is weak or absent editorial scrutiny of the publication process, the journal will suffer reputational damage. The quality of articles is often judged by the company they keep. Just as authors may benefit from publishing in a journal with a high impact factor, they will suffer if their work appears in a journal with a high notoriety factor – regardless of the quality of the published paper. Once again, it is honest academics who suffer from the behaviour of the dishonest. Third, five out of these six articles have been already cited according to Google Scholar and these citations spread the influence of articles of problematic quality. Finally, public trust in science depends on adoption of the highest standards of integrity. Merton (1942), who thought that fraud was virtually absent in science, noted that trust in scientific authority by the general public depended on the adherence of scientists to a particular set of norms, including disinterestedness. Academic publishing needs to embody those norms, or trust in science will be damaged.

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Author Contributions

As this is an atypical paper, we describe in narrative format how the paper came into being. Anna Abalkina identified the suspect paper mill outputs in the *Journal of Community Psychology* in the course of a larger investigation of paper mills. Dorothy Bishop offered to evaluate the content of these, and confirmed that the papers were not of publication standard and that the peer reviews were superficial. Dorothy Bishop proposed the idea of a short paper describing the findings, and wrote a first draft. Anna Abalkina analyzed the reference lists, peer reviews and added substantial additional content to the initial draft and revision, in particular to the introduction, and to the sections on the rise of academic paper mills, ‘red flags’ of paper mills and *Tanu.pro* and to Table 1.

Open Science Practices



This article earned the Open Data badge for making the data openly available. The entire editorial process, including the open reviews, is published in the online supplement.

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