Publish or Perish: Pressures on Academia in Technology Development

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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With the proliferation of fake news, widespread distrust in vaccines, and university presidents forced to step down, it can be hard to know what information to trust. Dr. Robert Malone, a vaccine expert, spread unfounded claims about the COVID-19 vaccine (Alba, 2022). The president of Stanford University was forced to resign after evidence of manipulated data in peer reviewed journals was discovered (Bidarian, 2023). Peer review can serve as essential quality control, but even some peer reviewed research has proved to be flawed or worse. Academic researchers, publishers, professional societies, and companies compete to protect or reform the status quo in university research.

About 1.3 million journal articles were published in 2006 in an ever-rising number of journals. Even in the top scientific journals, only 45 percent of papers are cited within 5 years of their publication (Rawat & Meena, 2014). Most university faculty members are under extraordinary pressure to publish. According to Miller et al. (2011), 94 percent of academics agree that they "feel pressure to publish articles in peer reviewed journals." Pressure to produce publications has "led to [a] rise in unethical practices." Surveys report that 15 percent of biomedical scientists admit they have engaged in scientific misconduct (e.g. plagiarism, fraud, data manipulation) in the past three years (Rawat & Meena, 2014; Tijdink et al., 2014). Tenure standards and publication pressures can compromise research integrity.

Literature Review

Academia has created a culture around conducting research. Since the rapid technology boom starting in the 1990s, this culture has faced "serious challenges in dealing with research misconduct and detrimental research practices in the current environment" (Committee, 2017). So, what has become of this academic environment? Academics have been defined by 3 main identities: a teacher, a researcher, and an academic (Rosewell & Ashwin, 2019). These identities

spin together a multidimensional character who values “academic freedom, intellectual stimulation, and a sense of a calling” (Rosewell & Ashwin, 2019). While the character is unique to the individual, the collective defines the academic culture where one values personal contribution, notoriety, and participation in scientific discovery (Rosewell & Ashwin, 2019).

To protect this unique environment of discovery, universities designed tenure. Tenure is an indefinite appointment to an academic position, where the individual is free to “pursue research and innovation and draw evidence-based conclusions free from corporate or political pressure” (AAUP, 2006a). It is intended to provide faculty with academic freedom (AAUP, 2006b). This protection promotes the “free inquiry, free expression, and open dissent” which AAUP, or American Association of University Professors, contends are “critical for student learning and the advancement of knowledge” (AAUP, 2006a). Universities also benefit from ensuring a stable commitment from their tenured faculty, as they pursue long-term projects and relationships (AAUP, 2006a). Securing tenure is based on various metrics, traditionally relating to scientific contributions, such as publications (Rice et al., 2020).

Publishing original research in peer reviewed journals is essential to both the advancement of academic careers and the advancement of knowledge. Authors push the boundaries of knowledge and “strive to be understood, quoted, and, above all, read by large numbers” (Vedder, 2021). Publishing provides authors an opportunity to share their findings while receiving credit and visibility for their work (Scientific Data, n.d.). The gold standard for publication is peer reviewed work, where experts in the research area confirm the paper’s validity and novelty, defending against misconduct (Wiley Author Services, n.d.). Publications have the added incentive of boosting authors’ h-index, which reflects a publication’s “productivity and impact” (Jenkins, n.d.-a). Journals also have metrics for their notability like the

Journal Impact Factor, a reflection of the citation frequency of papers in that journal (Jenkins, n.d.-b). These metrics also contribute to the prestige of those who publish in such journals (Jenkins, n.d.-b).

Academia does not operate isolated within publications and lecture halls. There is an ecosystem of academics connected to governments, companies, and business ventures. Federal grants fund research in universities, where researchers in return share their work with the public (Satell, 2016). These grants are often prestigious and highly sought after, resulting in research proposals catering to the perceived interest of the review board (Conix et al., 2021). Obtaining external funding can kickstart an academic's career while failing to secure funding can impede it (Conix et al., 2021). Conversely, companies can opt to partner directly with academics to take part in the discovery process (Satell, 2016). Companies may also monitor fundamental research publications in academia to find their next big idea (Satell, 2016). Researchers within industry also occasionally publish in the same peer reviewed journals that their academic counterparts do, linking academic culture and standards to industry (Kinney et al., 2004).

Tenure's Failure to Protect Academic Freedom

The offering of tenure positions intends to protect the creation of knowledge and the efforts fueling that work, but the trials faculty endure contradict this goal. The University of Virginia (UVA) for example states in its tenure procedure that "the award of tenure safeguard[s] the University's intellectual standards, academic integrity, and academic freedom" (UVA, 2011). Specifically regarding research, UVA broadly notes that the candidate must have "a body of original research… sufficient in quality and quantity" that leads "to the beginning of a national reputation in the candidate's field" (UVA, 2011). However, the judgment of this "quality and quantity" is left to "external evaluations" and the "independent judgment" from "the appropriate

faculty unit" (UVA, 2011). Today on the surface, tenure does defend faculty from "being disciplined, dismissed or silenced when their work risks offending powerful interests, including business or government interests" as defined by the AAUP (AAUP, 2006a). However, below the surface, AAUP staff member Hans-Joerg Tiede speaks for many academics exposing that "tenure was not designed as a merit badge for research-intensive faculty, [but] that is what it has quite frequently become" (Tiede, 2023). This is especially worrisome when those who judge research's quality are seeking only badge-worthy work.

Upon studying the criteria used for tenure across institutions, ~68% of institutions required grant funding as a criterion, a trend noticed by faculty (Rice et al., 2020). Psychology academics Dr. Gallup and Svare lamented how this funding is often driven not by the faculty's interest but rather by the best "return on the investment" (Gallup & Svare, 2016). They recount the academic attitude where "1) your work is only important to the extent that it brings in extramural support and 2) the purpose of doing research is to secure funding" (Gallup & Svare, 2016). Bluntly, they warn "that [this approach] undercuts academic freedom and stifles creativity, but it also is equivalent to letting the bureaucrats who hold the purse strings in Washington dictate your priorities and define what is important" directly undermining the protections tenure offers (Gallup & Svare, 2016). In an opinion piece, a team of philosophy academics exposed how peer reviewed project funding, a widely adopted and trusted system for awarding grants, is "not a very reliable or valid method for evaluating research proposals" yet "research careers can be made or broken by grant applications" (Conix et al., 2021).

Nobel laureate Peter Higgs, a now emeritus university professor, has seen this shift in academic culture firsthand (Aitkenhead, 2013). He published under 10 papers during his tenure but contributed "groundbreaking work" (Aitkenhead, 2013). In today's culture he believes…

> *"I wouldn't get an academic job. It's as simple as that. I don't think I would be regarded as productive enough"* (Aitkenhead, 2013).

On one occasion, he recounts being asked by his department for "a list of recent publications" to which he responded, "none" (Aitkenhead, 2013). Unfortunately, he is not alone. Yanick Fratantonio, a previous professor, left the tenure track due to a lack of freedom to pursue one's research interests noting that "not many papers, which leads to not many grants, … which leads to less free time" to pursue those interests (Fratantonio, 2020). He also expresses frustration with how tenure granting bodies present publishing as something only "*worth it* to write papers for the mere sake of publishing papers and padding our CVs, and not because we truly believe it's worth doing so to share our knowledge with the community in the most effective way" (Fratantonio, 2020). Dr. Gallup and Svare warn that "we may reach the point where faculty members' obituaries will read along the lines of, 'Professor X didn't leave much of an intellectual legacy, but he/she sure brought in a lot of grant money'" (Gallup & Svare, 2016).

Publication as a Means-to-an-End

The intended purpose of publishing is undermined by publishing companies' businesslike approach and academia's metric-based incentivization of publication. Professor emeritus Richard Vedder shared in a Forbes opinion piece his experience with academics shifting away from sharing information in a way accessible to a more general audience. He writes that in contrast to writers in the "popular press" academics "rejoice in their obscurity amongst the broader public" to identify themselves as a part of a "narrow group of academics" (Vedder, 2021). The published works of academics are drifting further from information dissemination and closer to "using big words or flaunting their knowledge" to gain status (Vedder, 2021).

Academics Dr. Becker and Lukka note that “publications are, on the one hand, a means for communicating research results and, on the other hand, measurable items of performance” (Becker & Lukka, 2023). They interviewed groups of varying level academics asking if publishing is in mind before the project begins. One participant responded with a resounding yes because if you can’t “publish in international journal then there’s no reason to do research like that, it is worthless” (Becker & Lukka, 2023). Academics can be desperate to publish, and they are at the mercy of the publishers and their reviewers. In that same interview, one senior professor said “if the reviewer wants them to write ‘deine Oma stinkt aus dem Hals’ [‘your grandmother has bad breath’], they would write it” (Becker & Lukka, 2023).

Problems in publishing do not end at those submitting their work. There exist journals called predatory journals, characterized by deceptive tactics “putting profit over trustworthy and dependable science” (Elmore & Weston, 2020). These journals look to exploit the effects of publishing pressure, using tactics like “accepting articles quickly” and “citing fake or non-existent impact factors” (Predatory Reports, n.d.). Predatory Reports is an organization maintaining a list of these journals by sharing “a free and open list of predatory publishers and journals, helping researchers and organizations identify publications that lack a reliable peer review process” (Predatory Reports, n.d.). Looking back to the interviews from Becker and Lukka, these journals target academic papers, “incentivizing… an avalanche of substandard incremental papers” (Becker & Lukka, 2023).

Editors of various journals have highlighted where the publishing system in academia has failed. One journal is *Marketing Theory* which “[attracts] a large number of high-quality submissions” with a track record of promoting “alternative” and “unorthodox” papers (Preece et al., 2023). In a commentary piece, *Marketing Theory* editors expressed feeling a “dominant logic

of academic valuation" that pushes "editors, review boards and authors alike" to become more "instrumental" (Preece et al., 2023). The editors feel "pressurized to increase our standing on the list, monitor our citation index and use strategies to achieve a higher profile" (Preece et al., 2023). Hauntingly, the editors are aware of the impact of this pressure, resulting in a shift from "its early years [where] authors were likely to be really committed to Marketing Theory's core mission – to provide alternative and critical perspectives on marketing theory – now it is often used more strategically as a target for academic promotion and recognition" (Preece et al., 2023).

Editors of *mBio* and *Infection and Immunity* also shared in an editorial their viewpoints on both the scientific and cultural issues in the scientific community they serve. Concern over the effectiveness of peer review is most noticeable. They share that "as the pool of qualified peer reviewers is inadequate to meet demand, the critical role of peer review in screening and correcting manuscripts prior to publication cannot properly function"(Casadevall & Fang, 2012). With peer review failing, the editors acknowledge that "scientists have always comforted themselves with the thought that science is self-correcting" but note that the new speed of knowledge sharing "means that incorrect information can have a profound impact before any corrective process can take place" (Casadevall & Fang, 2012).

Specifically, regarding peer review, now retired *British Medical Journal* editor Richard Smith notes that "when something is peer reviewed it is in some sense blessed"(Smith, 2006). Peer review is a flawed standard due to troubles defining "who is a peer" and "what is review" (Smith, 2006). Smith points out that a peer is maybe "somebody in the same discipline" or "is probably a direct competitor" (Smith, 2006). He perceives reviews as "somebody saying 'The paper looks all right to me', which is sadly what peer review sometimes seems to be" where in-depth reviews are "vanishingly rare"(Smith, 2006). Smith shares an anecdote about a fellow

editor, Robbie Fox of the *Lancet,* who "joked that the *Lancet* had a system of throwing a pile of papers down the stairs and publishing those that reached the bottom" (Smith, 2006). While academia relies on peer review to maintain quality research, their trust may be placed in the wrong hands.

Impact of Status Quo Outside of Academia

It is important to note that academia does not operate as a standalone entity. The workforce for R&D-driven industries is trained within the academic status quo, allowing their bad habits to permeate into industry.

Daniel Hook, the managing director of a company called Digital Science, has seen direct interplays between these ecosystems firsthand through partnerships. He knows that "generally more is asked of researchers in a private partnership" (Satell, 2016). He also notes that "there are also often milestones" that will "determine whether funding continues" for academic partners (Satell, 2016). Lynda Chin is one of these academic partners and has witnessed the unique pressures of partnership where the team will "need to constantly make decisions about time and resources, taking into account not only probability of success, but also opportunity cost"(Satell, 2016). She goes on to suggest that industry and academic partnerships "work hard to integrate two different cultures"(Satell, 2016).

With industry looking to academia directly through partnerships or indirectly through monitoring, we see success stories like Nobel laureate Katalin Karikó who brought her academic expertise to BioNTech, creating successful mRNA vaccine technology against COVID-19 (Gristwood, 2023). She fled academia when she "struggled to secure funding" (Gristwood, 2023). However, not all COVID-19 research ended in success. The company Surgisphere compiled a massive dataset of patient records during the pandemic that was later cited in 2

articles that were retracted for validity issues (Piller, 2021). *Science* reported that many papers still “inappropriately cited one of the disgraced studies” even after their retraction (Piller, 2021). The impact of these false studies goes beyond research. Renee Hoch an editor of the journal *PLOS ONE*, which published papers citing the retracted papers warns that “where the retracted work has clinical implications, this can result in direct risks to patients” due to the rapid sharing of information (Piller, 2021).

In cancer research at Duke University Hospital, Dr. Potti wanted to tell patients “I'm not just a cancer doctor, I'm here to treat your particular cancer” but this claim sold to 112 cancer patients was built from faulty data (“Deception at Duke,” 2012). The data had been “manipulated” yet was advertised to give hope to patients (“Deception at Duke,” 2012). Dr. Potti insists he was “not aware that false or 'improper' information had been included in the research” though others insist that “it simply couldn’t be random” (“Deception at Duke,” 2012). The widower of one of these hopeful patients feels he has “to blame Potti and anyone else associated with him who knowingly promoted a false counterfeit clinical trial exploiting human beings” ” (“Deception at Duke,” 2012).

Not all fraudulent studies are stopped before moving to industry. In the case of Cassava and their Alzheimer’s drug *Simufilam*, questions only surfaced when clinical trials were ongoing (Piller, 2023). A biochemist who helped the academic Hoau-Yan Wang during the early years of the drug’s development noted that Wang’s “record of research is ‘abhorrent’” and that the fact it is being used to support clinical trials makes Wang’s record “doubly sickening” (Piller, 2023). Fellow neuroscientist researchers suspected fraud in the studies leading to the drug’s development, eventually petitioning the FDA to investigate further (Piller, 2022). In this petition they express concern that “no other lab has confirmed Cassava's research” and that “detailed

analysis" of published data "shows a series of anomalies that are suggestive of systematic data manipulation and misrepresentation" (Thomas, 2021).

A Note on Those Dismantling the Status Quo

While many work constrained by academia's status quo, there are those who disrupt and dismantle it. They do so by drawing attention to and reprimanding those participating in deceitful practices.

Organizations like Retraction Watch operate with the goal "to promote transparency and integrity in science and scientific publishing, and to disseminate best practices and increase efficiency in science" specifically through housing a database of paper retractions (Retraction Watch, 2015). By publicizing the retraction of journal articles, they spread awareness of when papers are taken down so researchers can quickly search for papers of interest and more easily decern their validity. Retraction Watch co-founder Ivan Oransky said, "they [the people] want science to be and do better, and they are frustrated by how uninterested most people in academia — and certainly in publishing — are in correcting the record" (Johnson, 2024). Thus, Retraction Watch has taken correcting the record into its own hands.

Beyond non-profit organizations, US government entities like the Office of Research Integrity (ORI) also provide an authoritative figure that battles research misconduct. The ORI specifically oversees projects that have received funding from the Public Health Service (PHS) (Office of Research Integrity, n.d.). For an investigation to be initiated, typically "the institution must notify ORI if it determines that an investigation is warranted" (Office of Research Integrity, n.d.). As an authoritative figure, they can authorize the "suspension or termination of PHS grants" among other actions, but they must "refer the matter to the appropriate office" for criminal prosecution (Office of Research Integrity, n.d.).

The effort to identify malpractice resulting from the status quo in academia has also spread from organized groups to dedicated individuals. Elisabeth Bik is one of these, a microbiologist who has helped retract 1,133 articles and firmly believes “science should be about finding the truth” (Johnson, 2024). Bik was also involved with exposing manipulated data in publications from Standford’s now ex-president, Marc Tessier-Lavigne where she found these alterations were “not irrelevant, buffed up areas, but areas representing experiments” sharing the distinction is “a very big one” (Baker, 2022).

Academics themselves are cognizant of this culture. Promisingly, young faculty members are speaking out against the harmful aspects of the academic status quo (Singh, 2021). In a commentary paper, a young faculty member proposes a new way of promotion where evaluation is “goal-oriented and not solely based on publication metrics” (Singh, 2021). The young faculty said shortly and clearly that “it is high time that we as an academic community stem this rat race and get the focus back where it should be – quality research” (Singh, 2021).

Conclusion

Academia has many scientists looking to change the world for the better. Creating a culture that enables them to pursue discoveries that will reshape our future can only benefit society. Reform will come from many levels and will require synergy between many parties; some will sacrifice the current status quo before they can reap the rewards of a healthier academic culture. We see the self-serving agenda that bogs down selfless research. However, creating a system that rewards academics while maintaining the integral nature of scientific discovery can redirect academics away from malpractice. Reform from parties surrounding academia from re-evaluating peer review and grant awarding processes will systematically reshape academia. Further analysis will be needed to pinpoint the best place to start this reform.

However, for now, with newfound understanding, small changes across all involved parties will begin academia's culture shift.

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