

## Absurdities, Ironies, Hyper-Production and Artificial Bogeymen

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The journal *Nature* recently published an article titled *Is ChatGPT making scientists hyper-productive?* [1]. The article starts with the claim that “Large language models are transforming scientific writing and publishing. But the productivity boost that these tools bring could have a downside.” The implied causality is that increased production of science papers can be attributed to artificial intelligence (AI) and large language models (LLMs) [2]. The article is not unique. There has been an uptick of papers about how increased production of papers is leading to a publication overload and sloppy science. Like the *Nature* article, many view this as a ‘modern’ ailment.

Increasing science production is not new. Understanding it in context starts with Derek de Solla Price [3]. Price showed that exponential growth has characterized science production since the 1600’s (Figure 1a). The pace of growth can be expressed as the time it takes for the number of science products to double. Price showed that, up to the time of his analysis, a doubling time of 15-20 years had been maintained for centuries.

Scientists can feel swamped by the number of papers published per year. The feeling of overloaded comes from the ‘immediacy’ of science: 80 to 90% of all existing publications at the end of a working scientists’ career will have been produced over the lifetime of that career. It’s a mistake to view this as a ‘modern’ ailment driven by a ‘modern’ cause. Price showed that, by measures of growth or immediacy, “Science has always been modern; it has always been exploding into the population, always on the brink of its expansive revolution. Scientists have always felt themselves to be awash in a sea of scientific literature that augments in each decade as much as in all times before” [3].

The above highlights a freeze-frame error. Isolating a time frame, in a long running growth trend, can lead to the thought that an impetus for growth, over that time, needs to be isolated. We could pick any time window on the growth curve, see what developments occurred in that window (call them X), and ask questions akin to that posed by *Nature*: Is X making scientists hyper-productive? The questions neglect the inertia of increased production. Future scientists coming into the system become aware of this inertia if they want to stay in science. It becomes part of their education and training, with the view that producing more can only be a good thing.

In 1963, Price felt production was leveling off, “The new era shows all the familiar syndromes of saturation”, as he felt had to: “It is clear that we cannot go up another two orders of magnitude as we have climbed the last five. If we did, we should have two scientists for every man, woman, child, and dog in the population. Rather, exponential growth eventually reaches some limit, at which the process must slacken and stop before reaching absurdity” [3]. History proved him wrong (Figure 1b). Growth has continued with the doubling time Price found had been operative for centuries [4]. Science production has remained on a trajectory toward the absurd from the time of Price to this day.

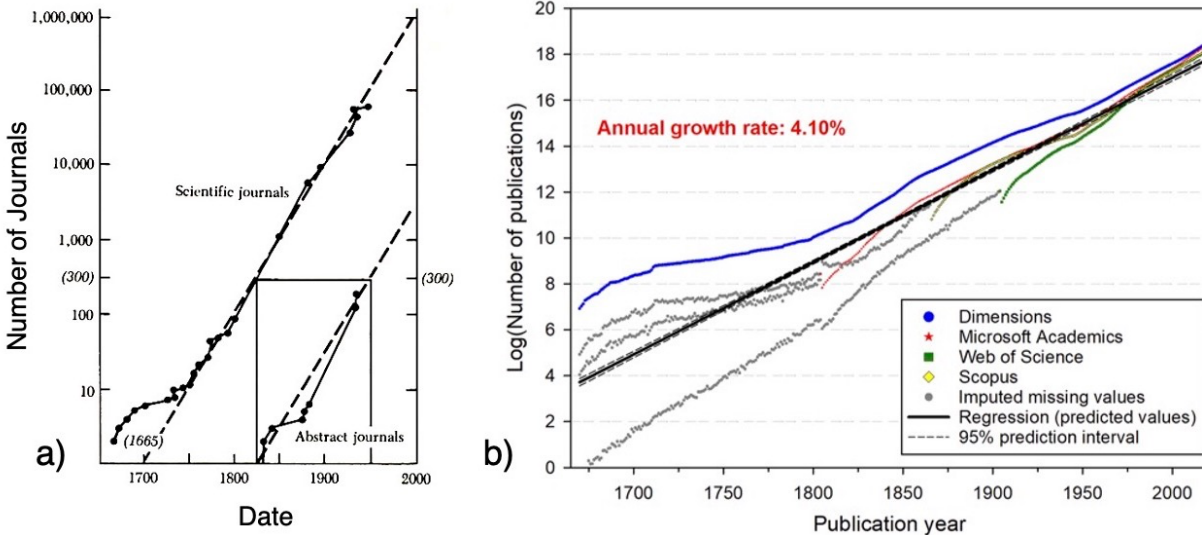


Figure 1: a) Growth of journals [3]. b) Growth of published science papers (natural log scale) [4].

Production remaining on a path to absurdity cannot be attributed to AI or LLMs. The trajectory extends back beyond the advent of those technologies. Publication overload is what science has been moving toward for centuries and it has arrived (*"All the nightmares came today"*). Placing blame on an artificial bogeyman neglects the bigger picture and diverts from a community wide self-examination. If production is moving toward the absurd, then a question for all of us involved in science is 'how do we approach it?'

Thomas Nagel wrote an article on absurdity that contained a rebuttal to Albert Camus [5]. Nagel noted that if, per Camus, there is no reason to believe, when confronted by the absurd, that anything matters, then that doesn't matter either, and we can approach the absurd with irony instead of heroism or despair. Maybe illuminating some ironies, associated with ever increasing production, can lead to self-examination. Or not. In the realm of the absurd that wouldn't matter either. So, might as well give it a shot [6].

There's no lack of irony in *Nature* telling scientists that there are downsides to using ChatGPT to polish a manuscript but none in having *Nature* do it for you [7]. *Springer Nature* advertises this service with a question: "Do you spend a long time agonizing over your manuscript drafts?" They go on say: "Finishing manuscript drafts and communicating research in complicated papers can be time-consuming. Nature Research Editing Service can save you time ..." The service comes with a fee, as does publishing in any of the growing number of journals that carry the *Nature* name [8].

For-profit publishers encourage and facilitate enhanced production. They now sense a community worry about overproduction, so they create diversions (artificial bogeymen, villainous others) to protect the company brand (before AI it was predatory journals). They may be hypocritical, but exclusive blame cannot be laid at their door. Drug dealers may not be nice, but they're not the cause of addiction [9]. I don't begrudge *Springer* for making money. They do so because they can. A reason they can is because the line of scientists

queued up to help them make money, while maximizing their own symbolic capital, hasn't grown any shorter over the years. Now there's also que to help them protect the brand.

For-profit publishers have called our predatory journals as a cause of unhealthy production [10]. The articles doing so are often written by scientists and tend toward hyperbole: "Predatory journals are a global threat" [11], "Predatory journals are a known scourge of science" [12]. It may feel heroic to fight a 'threat to humanity.' It's ironic to do so while chalking up another publication and helping for-profit publishers divert responsibility.

An irony Price may have appreciated relates to a field he helped create. Starting from Price, the number of studies that apply scientific analysis to the growth of science has grown. The science of science is a growing science. Given its continued exponential increase, scientists who study science production are tracking the path to absurdity and helping to pave the road by publishing papers on it.

The doubling time of science allows for a generational irony [13]. A senior generation can watch production 'explode' over their careers and blame an overly productive younger generation. That generation can blame the senior generation for the elevated level of production required for a science career. If either group took the time to read Price's book, they would see the fallacy they are falling into. An added irony is that both generations may not take that time because it would be time taken away from doing science.

It would be absurd if scientists felt the problem with hyper-production is that it slows down their own production. And yet, a recent paper claims that publication overload can "lead to researchers duplicating work, rediscovering previously published ideas, or, worse, perpetuating mistakes" [14]. The first two are replication and confirmation – foundations of science. Unless all published ideas are correct (history shows otherwise), then what's the problem with duplication or rediscovery? The reason offered is that they are "inefficient uses of always-limited resources" [14]. That resonates with *Springer Nature* telling scientists that time spent on drafts is time wasted [15]. Valuing efficiency over multiple layers of quality control is a corporate view of science – ironic coming from a paper published by a scientific union but, then again, that union gave up its publishing to a for-profit company some time ago [16]. As to 'mistakes', the authors are unclear on how overload leads to their propagation. That's particularly ironic given the claim that "The vast majority of these papers represent high-quality contributions to our understanding of the world." How the authors know that (i.e., the quality evaluation used) is left unstated [17].

Scientists value Occam's Razor: All else being equal, favor the simpler hypothesis. Amongst all the proposed ways to deal with publication overload, including - you guessed it - the use of AI [14], it's rare to see the hypothesis that overload will ease if scientists publish less [18, 19]. If you are an academic scientist, try this at your next faculty meeting: Raise your hand and say, 'You know what, we should publish less.' Your colleagues may not appreciate your comment, until you tell them it's ironic.

If you try the experiment above, your department chair or, if you're a real troublemaker, your dean may ask you 'Why would anyone whose job it is to produce more things, and

who finds personal pleasure and reward in doing so, ever choose to produce less?' Why indeed? An answer might be that cutting back on personal rewards can maximize the well-being of a broader community. That's one view that can guide action. An alternate view is that the best way to maximize the well-being of a community is to maximize your personal rewards – others will strive do the same and forces within the community will select the best of the lot, which will maximize community value. As a guiding principle, that alternate view falls under Neoliberalism. That sets the table for another irony ...

Many scientists and academics consider knowledge to be a community good versus a good to profit from. And yet, that same group adopts the traits of ideal neoliberal workers who compete to produce papers (a commodity) in journals (the more prestigious, the greater the value), who advertise the papers in hyped press releases, who comply with requests from university administrators to produce more papers and more research grants to rise-up the academic ladder [20] That irony is hard to see. It requires a confession of complicity as opposed to a pointing of fingers at the 'others' who ruin it for the rest of us [21]. It's an irony born of a tension between ethics in principle and ethics in action. Science and academia are not unique in being professions where ethical values can be sacrificed for the practicality of getting ahead in the game.

Articles on overproduction often miss the ethical issues. If for-profit publishers vanished, the community ethics that propped them up would not. Ethical values are influenced by the skills one acquires in a profession. In the Swiftian spirit, we can compare professional science development with a thought exercise from a moral philosopher [22]. Consider a burglar who has become skilled at their profession and provides support for their family while not partaking in crimes that cause bodily harm. If one now decides to pull the burglar aside for a lesson in ethics, one might want to consider if this isn't the equivalent of reading Aristotle to your dog. There is a hoity toity thought that just wanting to be a scientist means your ethical values are already exemplary. No need for anything more in one's training, beyond being told 'don't plagiarize' [23]. If that's all there is to it, then each new generation will come into the expectation of increased production and the growth curve will be maintained [13]. But why worry about personal or community ethics at all when it's easier to blame propped-up villains (artificial or otherwise).

The tendency to seek a villain, for any ill science may experience, is its own irony. Seeking a culprit assumes science is a machine made up of interacting components - if the machine is malfunctioning, then we should isolate a faulty component. Price, who was influenced by systems science, may have seen the flaw of applying a reductionist view to a system that has evolved - a system that is organic, not mechanistic. The parts that constitute an organic system are not fixed components and they do not merely 'interact' with each other – they alter each other in irreversible ways. Remove one thing and something else appears to serve an inherent function or need. Along its evolution path, various factors, that Price did not foresee, appeared and allowed science production to maintain exponential growth. It's a mistake to claim that any are the cause of increasing production. It's a bigger mistake to think that removing any of them will restore the system to a past state.

Science production has arrived at a point it was directing itself toward for centuries [24]. We find ourselves where we have arrived and ask ourselves ‘what happened, how did we get here and who is to blame?’ That’s an irony not unique to science production. So, where do we go now? Will it be absurdity, or will it be something different?

In 1963, Price thought science production was saturating. He saw it as positive: “Saturation seldom implies death, but rather that we have the beginning of new and exciting tactics for science.” From 1963 to the present, growth has continued. Inertia can be difficult to fight, perhaps impossible. Some will benefit from it and seek to maintain it. Others may just go with the flow. This makes a quote particularly salient: “If we expect to discourse in scientific style about science, and to plan accordingly, we shall have to call this approaching period New Science, or Stable Saturation; if we have no such hopes, we must call it senility” [3]. That leaves us with the Kantian question: What can we reasonably hope for?

Since I’m name-dropping philosophers (to help get this essay published, ideally in *Nature*), we could also recall a letter from Ludwig Wittgenstein to a colleague [25]: “Congratulations to your Ph.D.! And now: may you make good use of it! By that I mean: may you not cheat either yourself or your students. Because, unless I’m very much mistaken, that’s what will be expected from you. And it will be very difficult not to do it, and perhaps impossible; and in this case: may you have the strength to quit.” Quit need not mean leave altogether. It could mean quit playing along [26].

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*Photo by Gilbert Garcin*

## Notes and References

- [1] *Nature*, 2024, v627, pp16-17. <https://www.nature.com/articles/d41586-024-00592-w>
- [2] The title of the article reminded me of Betteridge's law: "This story is a great demonstration of my maxim that any headline which ends in a question mark can be answered by the word "no." The reason why journalists use that style of headline is that they know the story is probably bullshit, and don't actually have the sources and facts to back it up, but still want to run it." (Betteridge, I., 2009, TechCrunch: Irresponsible journalism, *Technovia*, Feb 23.). A variant, known as Hinchliffe's rule, states that "If the title of a scholarly article is a yes-no question, the answer is 'no'." (Holderness, 2014, Feedback, *New Scientist*, 223/2982, 16 August, 48). When an article in the mode of "Is X the cause of Y?" fails to support the suggested causality, any critique can be deflected via the claim "We are just asking questions". The questions posed by articles written in that mode are often disingenuous.
- [3] de Solla Price, Derek J., 1963, *Little Science, Big Science*, New York: Columbia University Press.
- [4] Bornmann, L., Haunschild, R., & Mutz, R., 2021, *Humanities and Social Science Communications*, <https://doi.org/10.1057/s41599-021-00903-w>.
- [5] Nagel, T., 1971, The Absurd, *The Journal of Philosophy*, v68, no20, pp716-727, <https://www.jstor.org/stable/2024942?origin=JSTOR-pdf>.
- [6] If one prefers a heroic approach, it reads as 'Here is my solution to over-production, you can thank me later.' This essay references a few papers that take that stance. The despair-based approach is an extreme critique of science: 'It's too late, burn it down and start all over again.' These approaches do not generate a level of self-examination needed for action (resistance is action). Readers of the heroic approach will not see themselves as part of what the hero is fighting against (that's a big ask). The idea that science is heading toward a demise will not be easily entertained from the get-go. Maybe some irony can get more of us involved in science to see that 'this is going too far, and I need to stop going along with it.'
- [7] <https://authorservices.springernature.com/go/sn/>
- [8] <https://www.nature.com/siteindex>
- [9] <https://futureu.education/uncategorized/commentary-fasting-failure-and-addiction-in-metrified-academia/>
- [10] There is no shortage of irony here. Large publishing companies bemoan the tactics of 'predatory journals' while at the same time actively using the same tactics (see for example: <https://bjoern.brembs.net/2019/12/elsevier-now-officially-a-predatory-publisher/> and <https://mindmatters.ai/2022/01/will-the-real-predatory-journal-please-stand-up/>).
- [11] <https://www.nature.com/articles/d41586-019-03759-y>
- [12] <https://www.nature.com/articles/d41586-023-02553-1>

[13] The time to train a new generation of scientists, from high school to undergraduate to PhD to a postdoctoral position, is close to the doubling time of science production. The production background, which sets expectations, that one generation experiences will be different than the generation before. If a senior generation asks a new generation ‘What is causing you to be hyper-productive?’, the new generation may be dumbfounded by the question: ‘Cause? Hyper-productive? What are you talking about? I am just producing at the expected level.’ The training time also provides a time scale over which production could be decelerated. The coincidence of that time scale and the production doubling time highlights a reality of curbing increased production. It’s heroic to think it could happen fast.

[14] <https://eos.org/opinions/how-to-address-publication-overload-in-environmental-science>

[15] What *Nature* tells us is unnecessarily time-consuming is critical to producing science of quality vs quantity. Agonizing over a draft allows a scientist to be self-critical and ask themselves if a draft can become a paper of value versus one that can get published. It’s ironic to think that scientists, who feel a publication overload, will no longer waste time agonizing over drafts and will have strategic help to publish more papers faster.

[16] <https://royalsocietypublishing.org/doi/full/10.1098/rsos.230207>

[17] Publishing companies will tell you *The Sign of Quality*® is that a paper was published in one of their journals. That means it was reviewed by two referees. If one referee didn’t like it, then the publishers have spin-off journals they can send the paper to so they don’t lose out on publication fees <https://onlinelibrary.wiley.com/doi/10.1002/leap.1422>. If it was only publishing companies who bought into the idea that quality demands publishing in big name (for-profit) journals, then this idea would never have gained traction, and all the spin-off journals would not survive. They are surviving just fine. The irony has not escaped me that I have published in spin-off journals that are part of *Nature Portfolio*. The first step in addiction therapy is to admit addiction [9].

[18] The article that proposed ways AI could help scientists navigate publication overload was aimed at environmental science [14]. One might imagine that if any group could see that ‘dealing with’ continued exponential growth is palliative care, it would be environmental scientists. Ironically, not. The article accepted unlimited growth. It did not consider that scientists publishing too much contributes to overload. Academic publishing companies would heartily agree that an idea like that is absurd.

[19] Although it’s rare that an article would even suggest that scientists publishing less could ease publication overload, it’s not altogether absent. An example can be found in a blog article that is well worth a read: <https://dynamicceology.wordpress.com/2024/04/29/the-state-of-academic-publishing-in-3-graphs-5-trends-and-4-thoughts/>. It’s no surprise that the article appears on a blog versus the pages of *Nature* or *AGU EOS*. The idea that those journals would publish such an article would be absurd. It would get someone fired for going against company policy. Just as *Nature* has grown to *Nature Portfolio* since Springer took charge [8], the number of AGU Journals has increased since Wiley & Sons took over publishing for the American Geophysical Union (<https://agupubs.onlinelibrary.wiley.com>).



- [20] <https://www.timeshighereducation.com/opinion/modern-universities-are-not-neoliberal-many-academics-are>
- [21] <https://futureu.education/higher-ed/raging-against-the-mythical-figure-who-keeps-us-down/>
- [22] <https://www.firstthings.com/blogs/firstthoughts/2010/11/aldasair-macintyre-on-money>
- [23] Classes on ethics and community norms within science aren't filling the books of universities (teaching entrepreneurship, on the other hand, is on the rise). Meanwhile, the backdrop against which scientists will make ethical decisions between community health versus personal gain is changing rapidly (<https://www.youtube.com/watch?v=3tEx-KW0T6I>). Some in the science community see the need for training that addresses ethics in the current world ([https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=4365779](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4365779)). Maybe universities will catch up but, in an age where university leaders are as profit driven as academic publishers, I wouldn't bet on it (<https://zenodo.org/records/10787330>).
- [24] *A facta bruta* can be hard to see from within a system. The social system of science has been defined by increasing production for centuries. The downsides were foreseen some time ago (Ravetz, Jerome R., 1979, *Scientific Knowledge and Its Social Problems*, Oxford: Oxford Univ. Press). We now ask what forces have caused production to reach the point of overload. Maybe we have the question wrong (that might explain why published papers calling out unhealthy production of published papers are having little effect). The issue may be less about driving forces and more about a lack of damping forces. If the majority plays along, doesn't act against inertia, is it a surprise we wind up where we do. As an exercise, we can return to the question of 'why do for-profit publishing companies make such large profits?' If our tendency is to seek answers in new strategies the companies implement to maintain profits, then we get diverted and miss the ironic answer: 'because they can.'
- [25] Wittgenstein in Cambridge: letters and documents, 1911-1951, edited by Brian McGuinness, Blackwell Publishing, 1995.
- [26] There are parallels between Price and Wittgenstein. Price foresaw that continued exponential production would lead to absurdity and potential senility. He may have been surprised to see it continue. I can imagine him wondering "Don't you all see where this is going?" Wittgenstein foresaw that anyone entering academia would feel pressures from university administrators that would stretch their ethical values. He may not have been surprised that the pressures escalated as universities adopted corporate models of operations starting in the 1980's. What may have surprised him is the lack of resistance to the escalations. I can imagine him wondering "Don't you all see where this is going?" The other connection between Price and Wittgenstein is that the value of a science paper changed with the increase of management and corporate models in academia. Price did not anticipate that the value of a paper would shift from communication and priority to a means of metrifying productivity that would be used by management to evaluate the worth of faculty. In effect, papers became a commodity. That administrators would cheat research and scholarship by making it a bean to count would not have surprised Wittgenstein, nor would the fact that some groups (e.g., academic publishers) would see profits to be made from that shift.