Junk, herein, sensu lato, refers to an object of low quality, little worth, and reduced value, but that is still usable, which is why junk represents a risk, but also an opportunity. This paradox can be observed in other fields of science, where a negative and/or unhealthy aspect ironically also can impart a positive outcome. For example, despite several negative factors associated with ‘junk food’, the biggest being its nutritionally poor content (Shimul et al., 2021), the speed with which it can be prepared, the ease with which it can be ordered, and the satisfaction imparted by these factors, alongside its possibly “addictive” taste, ironically also confer it a “positive value”, or appreciation. Separately, ‘junk’ noncoding RNA, including transposable elements, which is transcribed from noncoding genes, have important evolutionary functions (Lee et al., 2019). Finally, physical trash or junk, typically

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objects of divestment, can become objects of commodification, through recycling or reuse, giving the perception of “value”, even to an object that would normally be discarded (Ahirwar & Tripathi, 2021). And therein lies the risk of junk science, namely, perceived risks and automatic assumptions of uselessness, but also practical benefits, including the commodification of rubbish information or ‘pseudoscience’, thereby extending influence and effect beyond mere perceptions.

There are practical consequences if junk science is used or relied on by scientists, academic institutions, educational or health policy makers, or elements of society, including pro- and anti-science elements, whose cognitive biases may use or abuse junk science to their advantage. The fallibility of forensic evidence can reduce its reliability in a court of law (Garrett et al., 2021). Disinformation and misinformation caused by the mass consumption of false or misleading science, and thus an incorrect understanding of the benefits-to-risk ratio, can lead to science skepticism, such as vaccine hesitancy (Vulpe, 2020).

It is as critical to be able to understand the sources of junk science as it is to appreciate its modes of dissemination and persistence. Thus, junk science is defined as much by what it is as by what it is not. Therefore, as equally as “good” science might be defined following an appreciation of a collection of factors, such as the origin (author, procedure), product (published paper), process (peer review, editorial handling, proof development), management (peer reviewers, editors, publisher, proof department), and branding or marketing (metrics, indexing, social media, altmetrics), the loss of quality and trust arises when there is corruption or tampering with one or more of these processes, or the revelation that they might be false. This is somewhat like a pyramid scheme, when false or superficial value is assigned to any one of these elements, thus creating hyperinflated or unrealistic value for products with truly limited or non-existent value, such as performance metrics, that would then breed a culture of unhealthy competition that develops into exploitative and predatory behavior (Teixeira da Silva et al., 2019).

When such abuses occur at a system-wide scale, and become institutionalized, there is motivation to cheat because false rewards become entangled with, and equivalent to, real rewards, allowing veritable science to be as praised, used and rewarded as junk science or pseudoscience. At that junction in science’s evolution, which is where we may currently be heading in science’s history, fake elements such as fake authors, peer review and editorial standards, metrics and indexing, and padded by claims of ethical working parameters, flood the system. Since there are limited counter-preventive measures, such as retractions, which can be pseudo-remediative measures given their reputational destructive nature, the flood of fraud and fake will be hard to stop. Essentially, anything that can be faked will be faked, undermining all current principles of academic publishing’s credibility, as is exemplified by the paper mill industry (Rivera & Teixeira da Silva, 2021). The global publishing industry is now faced with this reality posed by an overwhelming flood of fraud, fake papers and paper mill-derived research, and has entered a crisis (COPE & STM, 2022).

We are in an age of manipulated and manipulative information, sometimes referred to as “fake news”. When such information is derived from sources that are scientifically disreputable, the entire fabric of society that relies on science-based
decisions disintegrates, and society itself – like science – collapses, or artificially props itself on false values. While, in principle, it is easy to side with and align with the open science and replication movements determined to remove bad, junk or pseudoscience (O’Brien et al., 2021), it is important to keep in mind that there may be biased, socio-political, and philanthropically financed motivations. It is currently difficult to appreciate what the neo-status quo, which is attempting to discredit and replace the current status quo, will look like in a few years’ time once science’s inevitable collapse takes place.

Here, a new and compact definition of junk science is proposed: the cumulative mass of nonsense, fabricated, unethical, manipulated, or otherwise dishonest “science”, causing a critical limit to be reached, rendering the entire production process and product both useless and worthless. As one example, paper mill-tainted journals. At that point, a journal or publisher may reach “junk” status, and any impression that it tries to create that it is either ethically, academically or scholarly valid, is not only untrue, it may be deceptive and/or predatory (Teixeira da Silva et al., 2021).

**Author’s Contributions** The author contributed to all aspects of the paper.

**Declarations**

**Conflicts of Interest** The author declares no conflicts of interest.

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