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On the value of pseudoscience and its philosophical study

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Abstract
In philosophy of science, the pseudosciences (like cryptozoology, homeopathy, Flat-Earth Theory, anti-vaccination activism, etc.) have been treated mainly negatively. They are viewed not simply as false, but even dangerous, since they try to mimic our best scientific theories, thus gaining respect and trust from the public, without the appropriate credentials. As a result, philosophers have traditionally put considerable effort into demarcating genuine sciences and scientific theories from pseudoscience. Since these general attempts at demarcation have repeatedly been shown to break down, the present paper takes a different and somewhat more positive approach to the study of pseudoscience. My main point is not that we should embrace and accept the pseudosciences as they are, but rather that there are indeed valuable and important lessons inherent in the study of pseudoscience and the different sections of the paper list at least six of them. By showing, through numerous examples, how (the study of) pseudoscience can teach us something about science, ourselves, and society, it makes the case that as philosophers, we should devote more time and energy to engaging with such beliefs and theories to help remedy their harmful effects.

Keywords: pseudoscience, values, fringe science, Karl Popper, cryptozoology, Paul Feyerabend, demarcation

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1. Introduction

If taken in the most general way, pseudoscience and pseudoscientific theories have two major characteristics: They are *dangerous* and *persistent*. The pseudosciences are dangerous because they can easily lead to public health crises (like AIDS denialism or anti-vaccination campaigns) or contribute to false and misleading beliefs about the fundamental structure of the world (like Flat-Earth Theory). Consequently, they could also undermine public trust in genuine scientific theories. But they are persistent and seem to resist most attempts of refutation and criticism. Already more than 150 years ago, the British mathematician, logician, and famous popularizer of science Augustus De Morgan published his weekly columns about what he called "pseudomaths," published later as the two-volume work *A Budget of Paradoxes* (1872) – and ever since, scholars and scientists have developed countless strategies to ridicule, debunk, or simply criticize pseudoscience on all accounts. But the phenomena of pseudoscience or pseudo-theories just don't seem to go away; interest and faith in them rekindles from time to time, and usually to a greater extent than before. We've all heard about the disturbingly high numbers of believers in Flat-Earth theory, astrology, creationism, spiritualism, or, most recently during the Covid pandemic, anti-vaccination.[1]

On the other hand, in the 20th century, philosophy of science devoted decades to finding universal, strict, necessary and sufficient criteria that would demarcate science from pseudoscience once and for all (Fasce 2017). When it became more and more obvious to philosophers—officially due to the work of Thomas Kuhn (1962), but owing much to sociologists and historians of science—that the *one* method of science is rather a myth, due to the countless concepts, takes, nuances, and biases involved, it became easier to accept Larry Laudan's (1983) notorious verdict about the "demise of the demarcation problem." Although new and refined versions of demarcation are on the table again (see the studies in Pigliucci and Boudry 2013), mainly as multi-criteria systems that provide enough flexibility for local, in-situ, case-by-case practical demarcation (see, for example, Thagard 1978, Bunge 1983, and recently Mahner 2013), it is hard to see at present how many features a given theory should exhibit to count meaningfully as a science.

Be that as it may, the philosophy of demarcation is flourishing, with many open questions and discussions (for a state-of-affairs analysis, see Pigliucci (2024); Bárdos and Tuboly (2025)). In this paper, however, instead of the traditional negative approach to demarcating science and pseudoscience, which rejects everything that falls into the latter category, I would like to pose a different, though not entirely unrelated, question and explore a somewhat underrated topic. *If* we accept that it is at least tremendously hard to come up with a suitable demarcation criterion and thus to solve the demarcation problem in its old and new forms, and *if* we accept that pseudoscience is indeed persistent (for whatever reason and thus we cannot avoid confronting different pseudoscientific theories), *then* perhaps we could ask the question what value they and their philosophical study have for us. If we cannot get rid of pseudoscience, even if we are able to say why it is wrong, then what can we learn from it? What value can we gain from discussing it? Is there any value in pseudoscience and in the study of pseudoscience?[2]

In the following sections of this paper, I will differentiate at least six reasons for why the study of pseudosciences is valuable. As these reasons and values fall under two headings, we can thus distinguish between two kinds of benefits here: (A) Values and benefits to be gained from the (philosophical) *study of* pseudoscience, and (B) values and benefits accruing to science from the *pseudosciences themselves* (this point is taken up in more detail in Section 8).[3] After discussing the historical context for the more positive attitude taken here (Section 2), we will see first in Section 3 that pseudoscience (or science denial in general) has an educational and methodological value, because it mirrors the weaknesses of our theories and the public understanding (and even expectations) of science (A-type Value). Secondly, in Section 4, I describe how certain types of pseudoscience can

[1] One survey from 2021 put the number of Flat-Earth believers in the United States to 10% in the adult population, and 9% thought that Covid-vaccination comes with microchips. See https://carsey.unh.edu/publication/conspiracy-vs-science-survey-us-public-beliefs (retrieved May 20, 2025).
[2] I would like to emphasize that it is not my intention to argue that *all* pseudoscientific theories and activities are useful, play a positive role, or have something valuable to offer us. Scientific racism, for example, is a typical example that would resist such a generalized view about the value of pseudoscience. Just as is the case with science and demarcation in general, perhaps the study of pseudoscience also needs a more contextualized, local, and *in situ* analysis to filter out the less obvious counterexamples and account for them later.
[3] I am grateful to one of the referees for pushing me further on this point, and for suggesting this phrasing.

motivate people to get closer to actual science and could thus function as a sort of “gateway drug” to science. Their value lies in closely mimicking science, which can be turned to the advantage of actual scientific practice (B-type Value). In Section 5, one underappreciated idea of Karl Popper will be discussed, namely that metaphysics—and with it fringe or pseudoscience—has a stimulatory value: By pushing hard against the boundaries of science, metaphysicians and pseudoscientists keep certain ideas on the table, which could provide motivation, inspiration, and food for thought for scientists (B-type Value).

As a fourth value, Section 6 will discuss Laura Gradowski’s recent idea that fringe theories could foster an important proliferation of epistemic virtues. Fringe theories make us tolerant of and open to new possibilities, thus exhibiting one of the driving forces of science: imaginative innovation (A-type Value). Based on these virtues, it could be argued that the study of pseudoscience has a further cognitive value. Relying on another idea by Popper, it will be shown that a gradual conception of the science-pseudoscience distinction is possible. By taking a closer look at how the pseudosciences could be divided and relate to each other, we can develop a new theory of demarcation (A-type Value). Finally, in Section 7, a social value of pseudoscience will be described, based on Michael Gordin’s recent books on the subject, namely that pseudoscience also teaches us something about our society: As long as there is a growing tendency to produce and consume mimicked scientific theories, there is an inclination towards science as well (B-type Value). Section 8 discusses a few possible critical points and arguments that could be made against the views presented in this paper.

2. Some historical context

Some of the arguments and perspectives advanced in this paper have been defended previously by others in more indirect and perhaps less systematic ways. On a more abstract and philosophical level, Paul Feyerabend is perhaps the most important figure in this regard. Feyerabend is very much known as an epistemological anarchist or a relativist-pluralist who denied the supremacy—or in fact, the very existence—of the scientific method, and who publicly defended numerous claims of various pseudoscientists. For reporting positively about astrology, witchcraft, voodoo, traditional Chinese medicine, and the like, Feyerabend was rejected by much of the scientific community as “the worst enemy of science” (*Nature*, vol. 374, p. 837, April 27, 1995). Nonetheless, Ian James Kidd (2016) has recently argued that Feyerabend did not commit himself to the truth of the relevant pseudoscientific statements, and when he seemed to make a positive argument in *their* favor *against* science, it was the gesture of a benevolent critic who was concerned with the health and integrity of the discipline. Kidd’s aim was “to argue that there was an epistemic rationale for those defences [of pseudoscience] and that, once this is put in place, their purpose emerges as far more conservative and far less radical than both friends and foes of Feyerabend might expect” (2016, 468). He claims that

> those defences were, in fact, principled defences of the epistemic integrity of science that took the form of critical challenges to failures by members of the scientific establishment to exercise the epistemic virtues that are definitive and constitutive of the cognitive and cultural authority of science. (Kidd 2016, 468)

Perhaps the aim of Feyerabend's positive engagement with pseudoscience was mainly to annoy scientists into doing a better job. As he noted in a famous polemic against a dense declaration by 186 scientists that astrology is bogus, the problem was—among others—"the religious tone of the document, the illiteracy of the 'arguments' and the authoritarian manner in which the arguments are being presented" (Feyerabend 1978, 91). According to Feyerabend, science could, and should, do better. He pointed out the shortcomings of science (or the "epistemic vices" of scientists, as Kidd (2016, 473) puts it) by examining how science reacts to pseudoscience. Apparently, there is a lesson to be learned about science from engagement with pseudoscience. As David Munchin (2019, 472) has written regarding Feyerabend's similarly positive points about theology, "they are relative to present-day natural science, and are designed as motivators for science, not flattery for theology."[4]

Beyond Feyerabend, there is one general attempt from the "pseudoscience-debunking genre" as well. In his book on *Pseudoscience and the Paranormal*, psychologist Terence Hines (1988) differentiated four reasons for studying pseudosciences instead of just dismissing it as nonsense. First, he wrote, they might turn out to be true, and hence they add something to the store of our scientific knowledge. Secondly, if a pseudoscientific claim turns out to be false, then "the scientific community, which is heavily supported by the public through taxes, has a responsibility to inform the public" (Hines 1988, 14) to nourish informed social decisions. Third, studying pseudoscience and its adherents might teach us something about our psychological life; namely, why we believe at all in claims that are not just false, but have been shown to be false repeatedly. Finally, if left to their own devices, pseudoscientific theories might cause real, existential danger.

These are good reasons to take pseudoscience seriously, devote more time to understanding its claims and underlying assumptions, and analyze all the motives that lead to their acceptance. I will not debate the fourth point, which, in fact, serves as a motivation for this paper, as mentioned above, namely how we can utilize the dangerous presence of the pseudosciences for something good. The third point is a psychological one, and I am not about to consider psychology here—my arguments are based on or stem from the philosophy and sociology of science. That is, by studying pseudoscience, we could learn a lot not just about the atypical psychological wiring of pseudoscience believers, but also about our scientific theories and (un)successful methods to teach and promote science. The second point is a communicational one, and should be a genuine concern of science communicators, namely, how to inform the public about the false and misleading character of certain pseudoscientific ideas, without the so-called boomerang effect, that is, strengthening the belief or interest of the public in these refuted ideas. I will, however, take up the first point in Section 6.

Given Feyerabend and Hines' cases, there are at least two historically established approaches to pseudoscience that emphasizes the importance of serious engagement, instead of mere criticism or ridicule. That said, it is our responsibility to present our case as clearly and transparently as possible and to consider various possible objections—these will be discussed in Section 8.

3. Educational-methodological reflection

[4] K. Brad Wray (2021) has also emphasized the epistemic value of false theories for Feyerabend, especially in the context of the latter's *principle of proliferation* of theories.

Science and scientific theories are often analyzed and explained internally; that is, they are assessed from the viewpoint of scientific values, merits, and their role in social and intellectual life. But one might argue that we can learn something about science when we take a step back and look at scientific theories and practices from the viewpoint of pseudoscience. This was indeed suggested a long time ago by Philipp Kitcher. He has argued, in his book on scientific creationism, that "ironically, philosophers of science owe the Creationists a debt":

> For the scientific Creationists have constructed a glorious fake, which we can use to illustrate the differences between science and pseudoscience. By examining their scientific pretensions, I have tried to convey a sense of the nature and methods of science. (Kitcher 1982, 5)

Creationism is wrong about different issues on various levels; it is a pseudoscience, or at best a flagrantly bad scientific theory (Laudan 1982). But to see how and where it goes wrong, one must define its scientific counterpart (in this case, evolutionary biology) in the most precise terms and the most transparent way. This is an educational-practical task that makes explicit the "nature and methods of science", as Kitcher says. By engaging with creationism, we can thus learn something about science itself and could also transfer this knowledge to the public. For Kitcher, creationism is an *abuse of science*, where both the *abuser* and the *victim* are equally important. Therefore, there is an intimate relation between science (at least *this* particular one) and pseudoscience, and by approaching them together, we can learn about both.

As one Hungarian skeptic, the chemist-turned-historian Mihály Beck (1977, 120) put it, pseudoscience is like a "distorting mirror in which the researcher's errors—both methodological and character flaws—are caricatured." That is, pseudoscience enlarges the potential and actual failures and blind spots of science; as they become more vivid and visible, scientists get yet another chance to correct and rectify them. This has obvious advantages for science, although one would hope for a better option than learning the hard way.

One example of this process is the infamous anti-science strategy of the tobacco lobby, which were copied by many others in the second half of the 20th century (including deniers of the ozone hole, acid rain, and nowadays climate change). Naomi Oreskes and Erik M. Conway (2011) have shown—alongside many other scholars—that the tobacco lobby explicitly and intentionally designed a new strategy to create doubt about the scientific findings regarding the unhealthy effects of smoking. The public was told that despite the negative data, there was not yet enough evidence to assert a strong correlation between smoking and various types of cancer. As the available data was both insufficient and ambiguous, there was no reason to introduce new smoking behaviors or rush to conclusions.

These lobbyists became the "merchants of doubt," and their strategy worked for decades in the context of tobacco. And it is still working with climate change, because, at least in a certain sense, what else can be more scientific (certainly in the public's eye) than skepticism, data fetishism, and evidence-gathering. The mongering of scientific values has found its market. The lobbyists thus created doubt, and it worked "in part because we have an *erroneous view* of science" (Oreskes and Conway 2011, 267, emphasis added). As Oreskes and Conway explain, "we think that science provides certainty, so if we lack certainty, we think the science must be faulty or incomplete." But that is an old myth, and decades of research into the history, philosophy, and sociology of science have shown that instead of certainty and unshakeable facts, science "only provides the consensus of experts, based on the organized accumulation and scrutiny of evidence" (Oreskes and Conway 2011, 268).

Therefore, by engaging with the historical case of the tobacco lobby and its later emulators, we can learn something about science and how it is often presented to the public: People still too easily fall into the trap of oversimplified science (for further takes on the tobacco lobby business and strategy, see Michaels (2008)). These types of pseudoscientific endeavors (or science denialism, as Sven Ove Hansson (2017) has called it) recognize and utilize, or rather abuse, the weak points of science (taken broadly, including communication about science), enabling them to position and present themselves as better or more rational alternatives to the original scientific theory. One might even say that pseudoscience, or at least a significant part of it, is like a parasite: theories that live on a host theory and get their food from or at the expense of their host.[5] That is, until we are able to repair the weak point(s) of a given scientific theory or practice, its pseudoscientific counterpart will be able to cling to it. In other words, we have to study pseudoscientific theories in order to learn about the misrepresentations of our own theories.

Another major element in the public's understanding of science (one often misused or abused by pseudoscientists) is the relation between science and scientists. Science has undergone substantial changes in the last century. While it may be possible to attribute the discovery of gravitation, relativity, or evolution to one particular individual, it is much more difficult and occasionally impossible to identify a single person who made possible the landing on the Moon, or who confirmed the existence of gravitational waves or the Higgs boson. Science is being transformed into an even more large-scale *communal activity*, with tens or hundreds or thousands of scholars integrated into one big international research group and contributing to it (see Frazzetto 2004, and references therein).[6] Nonetheless, the history of science is often presented as a history of great men or major individual breakthroughs.

Related to these issues of individualism vs. communalism, sociologists Harry Collins, Andrew Bartlett, and Luis Reyes-Galindo (2017) have gone into some detail (after initial fieldwork among fringe scientists) to describe the epistemologically relevant social and institutional features that capture the gist of fringe science. They have prepared a list of fringe characterizations that include such as elements as norm violation, oblique orientation, counterfeit, revolutionary intent, opposition, and, most importantly and interestingly, "pathological individualism" supported by anti-consensualism (for more on fringe science, see Section 6). They quote a leader of a fringe group, who says that "instead of trying to play the consensus game … we're going to be like everything

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[5] This is very much related to the problem of why and how pseudoscience mimics science – on this point, see the detailed study of Blancke, Boudry, and Pigliucci (2016); cf. with Boudry (2022).

[6] As one referee pointed out, some scholars argue that science has *always* been a more-or-less communal activity (for example, Longino 2002). Be that as it may, international collaborations consisting of hundreds or even thousands of researchers – which now appear to be the norm in certain fields, like high-energy physics – are a relatively new phenomenon. Furthermore, it is easier for the public to associate *one name* with the laws of gravitation, evolution, or relativity (even though they were obviously the product of a certain *Zeitgeist*, and there were predecessors to all these ideas), than with the discovery of gravitational waves or the scientific and technological achievement of sending humans to the Moon. On the other hand, as another referee pointed out, the communal and collaborative aspect of science may vary from discipline to discipline, and from field to field in each discipline. Thus, theoretical physics is much more collaborative than the history of science, and social psychology is more collaborative than qualitative sociology or even experimental philosophy.

else: in [the] arts, could you imagine if everyone paints the same? … Consensus is not only wrong, but detrimental and dangerous. It keeps us from true scientific progress" (quoted in Collins, Bartlett, Reyes-Galindo 2017, 427-428).

The attractiveness of fringe sciences for those who are interested in the deep and often hidden mechanisms of science is exactly this individualism and anti-collectivism. Fringe sciences are able to abuse the public misconception of science: They often exhibit and propagate an "idealised, a-social, model of science" by relying on critical thinking and rejecting any authoritarian and externally imposed consensus. Strangely, say Collins, Bartlett and Reyes-Galindo, the a-social, individualist and innovation-driven model of science resonates quite well with a picture of science propagated mainly by scientists themselves, which has also been the main target of social studies of science for decades. Thus, yet again, by checking and analyzing how fringe or pseudoscientific groups work, we can learn something about the public perception of science, and could improve the communication, and at a certain level, even the practice of science.

4. Pseudoscience as a gateway drug

Some forms of pseudoscience do not teach us anything about the flaws of science, but instead rely on certain scientific methodologies and could thus serve as a springboard or a gateway drug to more serious scientific endeavors. One such example is cryptozoology.

The Franco-Belgian zoologist Bernard Heuvelmans, one of the fathers of cryptozoology, defined the field in the mid-20th century as "the science of hidden animals" (Heuvelmans 2010). These animals—typical examples include the Yeti, Bigfoot (or Sasquatch), the Loch Ness Monster, the Loveland Frog, Mokele-mbebme, the Jersey Devil, or different sea serpents—are unknown to science but believed to exist by people living in the respective area, and they are subject of traditional ethnoknowledge that manifests itself in stories, legends, sightings, and the like. However, these indirect sources—often called "circumstantial evidence" or "witness evidence"—are not sufficient for professional zoologists to accept and describe them in a scholarly, taxonomic manner. According to Heuvelmans, it is, therefore, necessary for the cryptozoologist to assemble a wide range of indirect sources and collect as much information as possible about the given entity. This should be done as carefully as possible, by filtering out potential biases or unreliable accounts and checking whether there is any plausible non-zoological explanation for the phenomenon in question.

In the 1980s, cryptozoologists tried to move the field into scientific acceptance, creating an international organization, the *International Society of Cryptozoology* (which, however, ceased to exist in 1998) and a peer-reviewed journal, *Cryptozoology* (which ran from 1982 to 1996 and was resurrected in 2012 as the *Journal of Cryptozoology*). Part of this effort to mature the field was the introduction of the neologism "cryptid," a collective name for the organisms that are the subject of cryptozoological research.

Although cryptozoologists search for specific, rare, and unique entities, their efforts could be seen as a somewhat systematic form of knowledge-seeking, at least in the sense of Naomi Oreskes (2019). She names three fields (homeopathy, creationism, and climate change denialism) that she considers "facsimile sciences." They "take on the behaviors, costumes, accessories of institutionally validated sciences, including their systematic character" (Oreskes 2019, 884). Consequently, they mimic scientific behavior and patterns and perform their activities in a way that is similar to science (which Gordin (2023) calls the "establishment sciences"). For Oreskes, systematicity is exemplified through built-in institutional guarantees like peer-reviewed journals and associations, such cognitive practices as argumentation, the collection of data and evidence, and so on.[7] Cryptozoologists often publish papers in peer-reviewed journals, construct arguments based on skeptical premises, collect evidence and evaluate it, and come up with hypotheses for discussion. They are engaged in organized forms of research, with textbooks, educational syllabi, conferences, proceedings, and research facilities. Although Oreskes (2019, 897) specifically discusses other facsimile sciences like climate change denialism, it is also true of cryptozoology that it "lays out an argument, offers evidence for it, provides counter-arguments to mainstream science, and supports its claims with tables, graphs, and illustrations." It does not really matter at this point whether these arguments are good and convincing, whether the evidence is as reliable as in the mature sciences, or whether all is in order; what matters is the intention and the practice.

One might ask, of course, why bother at all with cryptozoology? Take *curiosity*, for example, which is an essential non-epistemic value or motivation for the production of scientific knowledge. You need to be curious to do science properly; and your curiosity needs to be fed somehow to maintain it.[8] Cryptozoology is an accessible and intriguing subject that can engage even people—and thus raise their curiosity—who might not otherwise have an interest in science and research. It can be a way to introduce people to scientific concepts such as critical thinking, skepticism, and evidence-based reasoning. As fringe scientist Henry Bauer (2002, xxi) argues in his preface to a major and comprehensive guide to cryptozoology, the quests for Loch Ness monsters and yetis "offer a way of getting students interested in science"—and, one could add, the public as well. Because of the mysteries around these alleged creatures, people are motivated to engage in actual field research: In "trying to get to the bottom of [the mysteries], we find ourselves learning about science along the way" (ibid.). People learn about the tricks, errors, and triumphs of science, and they acquire new information about how to make observations, form expectations and come up with predictions. Some fringe activities could serve as models of proto-scientific practices.

After all, with the right approach, fringe science could function as a gateway drug that opens the door to more traditional science. Pursuing cryptozoology involves conducting experiments, observation, data collection, analysis, critical and even ecological thinking, and care about the environment. It could be argued that if established scientific bodies were able to regulate certain activities, then perhaps much of pseudoscience could

[7] Oreskes (2019) paper is a reply to Paul Hoyningen-Huene's book on *Systematicity*. However, Varga (2021) has argued that Oreskes uses a different definition and approach from Hoyningen-Huene, and that her examples about systematic facsimile sciences thus may not add up. If that is the case, cryptozoology may also not be systematic in Hoyningen-Huene's sense, but that does not need to concern us here—because even if Oreskes's measures for systematicity are not sufficient, they indeed seem to be systematic on certain level, and that is enough for our purposes.

[8] "Curiosity" as such is less discussed in philosophy of science, especially in contrast to concepts like reliability, trust, dogmatism, innovation, or even "pursuitworthiness," which has recently earned a significant amount of attention. Curiosity is known to elude precise definitions and strict disciplinary boundaries across philosophy, cognitive science, and psychology. See, for example, Pennock (2019), who draws together the cognitive and moral sides of curiosity in the practice and institute of science, and also Engel (2018), who wavers between taking curiosity as an epistemic vice or virtue; cf. Inan (2022) as a general reference work. See also De Cruz (2024), who discusses awe and wonder: something that many could experience in the context of such fearful, terrifying, but somehow yet respectful creatures as most cryptids.

be controlled. If scientists kept one eye on related fringe activities, they might be able to put all the accumulated first-person data and reports to use for more "paradigmatic" research, not to mention the financial and human resources involved in pseudoscience (see next section).

In fact, this is also the picture that many cryptozoologists have about themselves. The "Mission Statement" of the *International Cryptozoology Museum* states the following:

> [R]ealizing that cryptozoology is a "gateway science" for many young people's future interest in biology, zoology, wildlife studies, paleoanthropology, paleontology, anthropology, ecology, marine sciences, and conservation, the International Cryptozoology Museum is filling a needed educational, scientific, and natural history niche in learning.[9]

This view of cryptozoology as a "gateway science" to more traditional sciences is attributed to Loren Coleman, a television personality and one of the most well-known American cryptozoologists. In fact, in their skeptical, cryptozoology-debunking monograph, Daniel Loxton and Donald R. Prothero (2013, 331) have defended the value-laden view of cryptozoology, noting that the "cryptozoology literature may as easily and as often become a 'gateway drug' for science literacy" for various reasons.

Nonetheless, if science were to support the development of professional associations and peer-reviewed journals for such activities, it would still run the risk of letting unscientific practices enter through the backdoor. That is indeed a possibility, which is why the extremes of cryptozoology (which are enmeshed with conspiracy theories and creationist-religious dogmas) should be kept at arm's length. However, submitting them to the control of science might come with more benefits than risks (see Loxton and Prothero 2013, 332-336).

One could argue that cryptozoology, by engaging with the everyday mysteries of our world, upholds all those practices that make possible new discoveries and promotes some kind of commitment to a better future, to the conservation of biodiversity, and to taking care of our environment. It is not necessarily about truth, but about us and our relation to the known and unknown.

As such, Loxton (one of the authors of the aforementioned book) claims that certain statements of cryptozoology might still turn out to be true (recall Hines's first point about engaging with pseudoscience from Section 1). First, even though something may be seriously unlikely (like the existence of Bigfoot, given the current laws of biology and mathematical models about its needs and environmental effects), it is not impossible. Secondly, yet again nicely resonating with Hines' points, "research into popular mysteries and paranormal beliefs provides a public good" (Loxton 2013, 331). Thirdly, and perhaps this is the most interesting point, Loxton (ibid.; see also Section 5 below) thinks that "research into unconventional topics, such as the existence of Bigfoot, provides a barometer of the health of academic freedom."

There is a lot to discuss and learn about the psychology of why people believe in monsters and mysterious creatures, and how our cultural and social beliefs and settings influence and shape our perceptions (Meurger and Gagnon 1988). A recent example might be cephalopods, especially the giant squid (a notorious

[9] See https://cryptozoologymuseum.com/about-icm/ (Retrieved on November 7, 2024).

giant of the seas, captured dead in the late 19th century, and photographed alive in its natural environment only in the 2000s), which were analyzed in various cultural contexts and historical periods (Latva 2024). As a result, the descriptions and historical depictions of cryptids could serve as a window to our past and cultural patterns.

And this is an important point. One of the main motivations for natural scientists to keep cryptozoology close is that it could aid actual scientific discovery by providing accidental data and evidence. But that requires some kind of openness to and scrutiny of cryptozoological practices. For one of the most common skeptical objections to cryptozoology is that it relies too heavily on anecdotal eyewitness accounts and local folk knowledge systems. The skeptics call attention to the well-known unreliability of eyewitness testimony, how easily we can be fooled by our senses, and how our preconceived cultural expectations can significantly influence perceptions. Because of that, many would argue, such testimonial accounts should be excluded from science where possible, or at least not treated as *evidence*, at best taking them into account as some form of external *motivation* to pursue a certain line of research. As Loxton and Prothero (2013, 16) write, "unlike highly industrialized culture, which has very specific ideas of what is reality and what is myth, native cultures can be much less rigid and literal. Thus, when investigators go to a remote region and inquire about a legendary animal, such as the Yeti, they cannot determine whether the animal is literally or mythically real."

However, this kind of skeptical critique of eyewitness accounts seems somewhat premature and oversimplified (which Loxton and Prothero also admit in the last chapter of their book). As the zoologist Charles Paxton (2009) has pointed out, a good number of rare natural phenomena were initially identified solely on the basis of such cryptozoological eyewitness accounts. In zoology, eyewitness accounts have been used to determine the appearance of certain extinct species such as the dodo.[10]

Another interesting example is provided by situations where scholars took seriously the available cryptozoological records. After a systematic analysis of the typologies of sea monsters, environmental scientist Robert France (2020, 2022) has argued that these historical anecdotes record the non-lethal entanglement of marine animals in various types of fishing gear. In other words, it is not that the witnesses did not see what they saw, or did not see it well. By examining the cryptozoological record, we can obtain historical data that would not otherwise be available, which can provide useful information for researchers about past socio-ecological environments and conditions. While sea monsters may not exist in the form depicted on medieval and early modern maps, for example, we can learn something we would not otherwise have known by taking these accounts seriously. In addition, we cannot rule out the possibility that some accounts of sea monsters relate to previously unknown species of existing animals such as pinnipeds (see, e.g., Woodley, Naish, and Shanahan 2008).

As more and more local communities become involved in ecological and conservation projects (just think of the rise of citizen science projects), the role of circumstantial and testimonial evidence in discovering new species is becoming clear. A good example is the mythical rain-sneezing creature described by local tribes in Myanmar, which led to the discovery of a new species of snub-nosed monkey (*Rhinopithecus strykeri*) in 2010 (Geissmann et al. 2011). Many more such cases could be cited, highlighting the role of eyewitness testimony in producing natural history knowledge, which is often crucial, not least because the human and material resources

[10] For a general overview, see https://tetzoo.com/blog/2020/7/11/dodo-in-life (retrieved on November 7, 2024).

of institutional science are finite. Understood in this way, cryptozoology, as a fringe form of ethnozoology, can have a useful role in the pursuit of biological *discovery* (see Rossi 2016).

5. Pseudoscience as research-stimulation

As is well-known, the demarcation problem within philosophy of science emerged explicitly with Karl Popper's *Logic of Scientific Discovery* (1959/2002, originally published in German in 1934 as *Logik der Forschung*—the English translation is a longer, slightly reworked version). But it is less-known that when Popper (1963/1969, 255) first thought of the "demarcation problem" in 1919, it concerned the line between empirical-scientific statements and those of metaphysics. This question did not really change in his first *Erkenntnis* paper (Popper 1933/2002, 314) or in Popper's 1934 German version of *Logic of Scientific Discovery*. In those works, he posed questions regarding "the barriers which separate science from metaphysical speculation," to identify "a suitable distinguishing mark of the empirical, non-metaphysical, character of a theoretical system" (1959/2002, 11), or a "criterion which would enable us to distinguish between the empirical sciences on the one hand, and mathematics and logic and well as 'metaphysical' systems on the other" (1959/2002, 11).

Consequently, Popper's original project was an epistemological one that originated with Hume and Kant (as he says) and therefore concerned perennial philosophical problems. It took center stage, however, with the logical positivists, when part of the Vienna Circle proposed a detailed criticism of metaphysics and thus its demarcation from empirical science. Suffice it to note that traditional pseudosciences like phrenology, mesmerism, flat-earth theory, or anti-vaccination—which already spread widely in the 19th century—were not really discussed by the Circle. Parapsychology or psychic phenomena were a different matter, however, and Moritz Schlick and Hans Hahn joined an investigation committee that aimed to catch out psychics and spiritualists through empirical-scientific investigations. Later, Rudolf Carnap reconstructed the heated debates about pseudoscience with Otto Neurath, another member of the Circle, as follows:

> Neurath, for example, reproached Hahn because he was not only theoretically interested, as I was, in parapsychological investigations, but took active part in séances in an attempt to introduce stricter scientific methods of experimentation (without success, unfortunately). Neurath pointed out that such séances served chiefly to strengthen supernaturalism and thereby to weaken political progress. We in turn defended the right to examine objectively and scientifically all processes or alleged processes without regard for the question of whether other people use or misuse the results. (Carnap 1963, 23.)

Despite all their theoretical and philosophical inquiries into the nature and methods of science, when members of the Circle faced an actual pseudoscientific phenomenon and theory, they opted for an honest, engaging, and critical empirical investigation, sparing neither time nor energy (Hahn, for example, participated in the 4th

International Parapsychology Congress in Athens in 1930 and in numerous experiments concerning psychical seances; see Mulacz 2017).[11]

In the context of metaphysics, however, which posed a more nuanced and important threat for the positivists, they were more radical. As common knowledge has it, they came up with a verificationist theory of meaning and meaningfulness, arguing—most notably Rudolf Carnap (1932/1959)—that metaphysics does not conform to the standards and criteria of empirical science. Because its statements are not verifiable, metaphysics is meaningless, i.e., it does not have any cognitive significance or meaning. It is less known, however, that Carnap reserved a very important emotive and everyday role for metaphysics (inspired by Dilthey and Nietzsche) as an expression of one's attitude towards life and matters within it (about the new take on Carnap's metaphysics, see Damböck 2024). Be that as it may, Carnap viewed metaphysics as having little relevance *within* science—its role remained purely practical and existential.

Popper, however, was much more flexible and understanding of metaphysics and metaphysical speculation. He disagreed with the Circle, because after demarcating metaphysics from science, he did not want to "assert that metaphysics has no value for empirical science" (Popper 1959/2002, 16). Instead, he went on to argue in detail that metaphysical theories contribute in various ways to the development of science. They can provide problems for scientists to work on, aid research, or keep old problems on the surface until they reach the level of empirical integration. "I am inclined to think," Popper (1959/2002, 16) wrote, "that scientific discovery is impossible without faith in ideas which are of a purely speculative kind, and sometimes even quite hazy; a faith which is completely unwarranted from the point of view of science, and which, to that extent, is 'metaphysical.'" Later, he offered the following example for this point:

> [M]ost of our scientific theories originate in myths. The Copernican system, for example, was inspired by a Neo-Platonic worship of the light of the Sun who had to occupy the 'centre' because of his nobility. This indicates how myths may develop testable components. They may, in the course of discussion, become fruitful and important for science. (Popper 1963/1969, 257)

Further examples include the ancient theory of atomism—which surfaced in and around science from time to time and became testable only in the 20th century—and the corpuscular theory of light (Popper 1959/2002, 277-278). Because of this, such metaphysical ideas were not "non-sensical gibberish," as Carnap (1963/1969, 257) argued, but played an important role.

What happened here is basically that Popper identified some of the epistemic and non-epistemic functions of metaphysical theories. Since the 1950s, however, he started to talk about 'pseudoscience' instead of 'metaphysics.' In his famous 1953 lecture, published as "Science: Conjectures and Refutation," he reconsidered his occupation with science in 1919 (mentioned above) and retrospectively found that it was about pseudoscience: "The problem which troubled me at the time was neither, 'When is a theory true?' nor, 'When is a theory acceptable?' My problem was different. I *wished to distinguish between science and pseudo-science*"

[11] Note also that Kurt Gödel was very much interested and deeply involved in parapsychology, psychic seances, as well as in questions of daemonology. As a starting point, see Lethen (2021).

(Popper 1957/1969, 33, original emphasis). This suggests two things. One, perhaps less plausible, reading is that Popper identified metaphysics with pseudoscience after all, and that, if metaphysics had both an epistemic and a non-epistemic role in scientific activity, this might apply to pseudoscience as well. A perhaps weaker reading or idea would be to simply say that even if there are differences between metaphysics and pseudoscience, pseudoscience could be viewed in a similar light as metaphysics, namely as a practice that offers various possible epistemic and non-epistemic values and merits.[12] Seen from this angle, it could assist, direct, and even organize actual empirical research (its epistemic role), and could motivate research and consolidate people's moral, religious, and ideological motives that could then be transformed into science in time (its non-epistemic role).

While some skepticism about Popper's view is in order (see below), there are good historical examples when pseudoscientific theories were at hand to push someone in relevant and fruitful empirical directions and kept certain topics above the waves of history. During the 1960s, for example, revolutionary new ideas in quantum mechanics emerged in a completely unexpected place and form. In his 2011 book, *How the Hippies Saved Physics,* American physicist and science historian David Kaiser presents a detailed account of the changes that the interpretations of quantum theories went through in the 1960s and 1970s (especially in relation to Bell's Theorem) and the role that the hippie era, the counterculture, and New Age philosophy played in this. It all started with a group of young hippies who combined their passion for physics with their curiosity about the workings of the human mind and psyche. In the statistical processes of quantum mechanics, they saw the imprint of human freedom, and in eerie physical remote effects, proof that the mind can intervene in the processes of the natural, physical world. Several people had already suggested the existence of a special relationship between quantum reality and mystical human consciousness, among them the Hungarian-born Nobel Prize-winning American physicist Eugene Wigner, who saw in the collapse of the wave function, the measurement problem, and many other quantum-puzzles the workings of human consciousness. While John von Neumann also supported Wigner's interpretation, which at the time was considered extravagant and outside the mainstream, the Californian hippies were the first to push things consistently (in part with Wigner's support), claiming that through our awareness, we are not just passive observers of experiments, but active participants and shapers of nature.

Although they were dismissed by the mainstream physics community for a long time, this changed later, with quantum interpretations slowly spreading around the borderlands of science, in obscure papers, in the Jacuzzis of life coaches who organized extravagant workshops, among spoon-bending parapsychologists and self-help millionaires. By the 1980s, all the foundational questions of the quantum had become an unavoidable part of mainstream theoretical and experimental physics. One of the institutional signs of this was the award of the

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[12] One of the referees suggested that Popper did not identify metaphysics and pseudoscience, and thus we should not do so here either. In a certain sense, this may very well be the case, as Popper proffered a tripartite differentiation between science, metaphysics, and pseudoscience. On the other hand, it is not at all obvious whether there might be much of a difference between metaphysics and pseudoscience, for two reasons: First, Popper regarded Freudian psychoanalysis as pseudoscientific because it was untestable, in the sense that no possible tests were supposed to function as possible falsifiers, and from this viewpoint, Hegelian metaphysics was no better (given Popper's notoriously harsh criticism of Hegel's philosophy in the second volume of *Open Society*, one would be surprised if Popper did not regard it as pseudoscientific as well, in spite of what we may think about the difference between Hegelian dialectics and homeopathy). On the other hand, Popper admitted that metaphysics was occasionally useful and even contained a gist of truth, something that he accepted even in the context of psychoanalysis.

2022 Nobel Prize to John Clauser, who first carried out the necessary experimental proofs and was himself a member of this hippie group. But perhaps more interesting for the public were financial transactions conducted using unbreakable coding, which happened for the first time in Vienna in 2004 and again in Geneva in 2007. The source of the concept of quantum unbreakability was a theorem that the hippies interpreted, analyzed and successfully brought into the mainstream, thus eventually gaining enduring recognition (see Kaiser 2011).

What this example shows is that pseudoscientific ideas (like parapsychology, spiritualism, interest and faith in psychic phenomena) could indeed function as motivation for pursuing certain inquiries, questions, and interpretations that would otherwise be suppressed by the conservative scientific mainstream. Consequently, it is worthwhile to study how spiritualism, religious thinking, and teleological assumptions (like the Gaia hypothesis) contributed to the development of the conservation movement, ecological thinking, and efforts to protect biodiversity.[13]

In a sense, it is an open question how to separate metaphysics from pseudoscience, especially with such matters as spiritualism. While most scholars are familiar with the traditional narrative of how logical empiricism eliminated metaphysics from Anglophone philosophy for decades, and how certain Australasian philosophers of mind and American logicians (like Kripke and Lewis) brought it back eventually, the status of metaphysics has always been contested, even within logical positivism.[14] In his long review of Imre Lakatos' posthumously published selected writings, Ian Hacking (1979, 384-385) has claimed that Popper envisaged a tripartite division of science, metaphysics, and pseudoscience, where "metaphysics is the earnest speculation that can some day lead to positive science," whereas the logical positivists pitted science against metaphysics and pseudoscience, and Lakatos harnessed science and metaphysics together against pseudoscience. Things are less straightforward than most received histories had it.

If Popper indeed accepted science, rejected pseudoscience, and quarantined metaphysics for the time being, he also admitted that even such a metaphysical theory as psychoanalysis could have an important practical purpose. "I personally do not doubt," Popper (1957/1969, 37) wrote about the theories of Freud and the psychologist Alfred Adler, "that much of what they say is of considerable importance, and may well play its part one day in a psychological science which is testable."

Furthermore, 'being scientific' and 'being true' are not coextensive terms. Popper (1957/1969, 33) added that "science often errs, and that pseudo-science may happen to stumble on the truth." Later, he also added that psychoanalysis is "an interesting psychological metaphysics (and no doubt there is some truth in it, as there is so often in metaphysical ideas)" (Popper 1974, 985). Even if something cannot be falsified, we cannot exclude the possibility that it is still true for some reason, and thus we cannot declare it to be meaningless. Moreover, such theories could have practical applicability and relevance.

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[13] It is a different question, though, how some of these approaches and ideas that later prompted important scientific clarifications initially also prepared the ground for certain unscientific or antiscientific views.

[14] About the difficulties of accounting for metaphysics, it is enough to point the reader to Philipp Frank, a prominent logical positivist, successor of Einstein in Prague, and teacher of Thomas Kuhn at Harvard, who propagated a much more pragmatic and sociological view of metaphysics in the U.S. during the 1940s and 1950s (see Frank 2021 and Tuboly 2021).

This is a remarkable point, and Popper (1963/1969, 258) was "forced to stress" it repeatedly, as his position was often taken to be a sharp theory of meaning that rejects—in line with logical positivism—all metaphysical and pseudoscientific theories as meaningless and thus entirely useless. "I thus felt that if a theory is found to be non-scientific, or 'metaphysical' (as we might say), it is not thereby found to be unimportant, or insignificant, or 'meaningless', or 'nonsensical'" (Popper 1957/1969, 38).

6. Proliferation of epistemic virtues and cognitive ramifications

While Popper commented mainly on metaphysical issues that were not formulated with scientific precision or that developed on the more philosophical side of research, there are people who think that interesting and important things happen on the edges of science as well. Recently, Laura Gradowski (ms.) has written a long paper and a PhD dissertation (2022) about fringe theories, in which she shows how one might relate epistemically to such issues.

She identifies a very general and commonly shared negative and intolerant epistemic attitude towards fringe theories, listing and discussing various skeptics and scientific debunkers who were rather dismissive of *any* fringe theories (like Martin Gardner, Carl Sagan, and recently Neil deGrasse Tyson). Fringe theories are usually ideas that arise within the matrix of scientific considerations, but rather than embracing them, the scientific consensus often explicitly rejects and ridicules both these theories and their defenders.

Gradowski focuses on Thomas Kuhn's famous "essential tension" and frames it within current debates about legitimate and illegitimate scientific dissent. Kuhn (1959/1977) showed that there are two fundamental forces within science that are in constant conflict with each other and pull research in different directions: One is conservatism or traditionalism, which aims to secure the already achieved results, consensus, and minute work within an accepted framework. The other is innovation and the predilection for imaginative renewal that crosses boundaries, overthrows the consensus, and creatively searches for new paths and frameworks.[15]

Fringe theories are obviously located on the innovative edges of science, not respecting any hard-won consensus or down-to-earth approaches. Gradowski (ms., p. 2) sums up this tension: "do our protective and conservative instincts to dismiss and suppress fringe theories come into conflict with our interests in the expedient uptake of innovations that can be gained through theory change?". She obviously thinks that the answer is yes, and argues for the "significant epistemic payoffs" of fringe theories. In her paper, she lists theories that were previously rejected as absurd, comic, silly, out-of-range, unscientific, blatantly false, or even dangerous, but in time became not just accepted, but part of the mainstream consensus. Examples include the theory of meteorites, giant squids, milky seas, germ theory, continental drift, the Garcia effect, and many others. There is a well-established and historically proven path from fringe to mainstream.

For Gradowksi (ms., p. 3), the value of fringe theories is that they are "invitations, indeed, often requests, for more open and imaginative scientific inquiry." They promote various epistemic values such as innovation, openness, freshness, even critical thinking, and thus contribute seriously to open scientific discourse. Of course,

[15] For more on this topic, see Collins, Bartlett, and Reyes-Galindo (2017) and Gordin (2023), originally published in 2021 as "On the Fringe: Where Science Meets Pseudoscience," and Wertheim (2011).

a lot depends on how we actually define fringe science and distinguish it from blatantly false pseudoscience, but an overtly anti-fringe attitude might bring serious "epistemological harm."

One might also try to channel back these epistemic values into the very problem of science vs. pseudoscience, or into the demarcation issue, and see how they affect it. In fact, pseudoscience could have quite a direct impact on how we think about the demarcation problem and eventually try to solve it. Not surprisingly, if we take a closer look at the pseudoscientific literature and what it can offer us, we might be able to come up with better solutions and finer ideas. In that sense, pseudoscience has a cognitive value by shaping our demarcation project itself – it comes with certain cognitive ramifications for our problem and epistemic situation.

Popper's idea about the reciprocal relation between science and metaphysics again connects his views to contemporary issues in an interesting way. Popper spoke about "degrees of testability" already in *The Logic of Scientific Discovery* (1959/2002, Ch. 6), and later, in *Conjectures and Refutations*, he wrote that certain theories have more precise formulations, so that more precise numerical predictions can be deduced from them. "This indicates," says Popper (1963/1969, 257), "that the criterion of demarcation cannot be an absolutely sharp one, but will itself have degrees. There will be well-testable theories, hardly testable theories, and non-testable theories," where the latter "may be described as metaphysical." In 1974, he formulated the point as follows: "Any demarcation in my sense *must* be rough. … For the transition between metaphysics and science is not a sharp one: what was a metaphysical idea yesterday can become a testable scientific theory tomorrow; and this happens frequently" (Popper 1974, 981, original emphasis).

For Popper, there was thus a continuum between scientific (well-testable) and non-scientific (non-testable), that is, pseudoscientific theories. Rather than painting a black-or-white picture, he allowed for a more fine-grained view of the transition and borderline areas. The idea was taken up by others later; in a lecture delivered in 1973—which remained unpublished for decades—Imre Lakatos tried to reformulate the aims and dimensions of the demarcation problem:

> The demarcation problem may be formulated in the following terms: what distinguishes science from pseudoscience? This is an extreme way of putting it, since the more general problem, called the Generalized Demarcation Problem, is really the problem of the appraisal of scientific theories, and attempts to answer the question: when is one theory better than another? We are, naturally, assuming a *continuous scale* whereby the value zero corresponds to a pseudo-scientific theory and positive values to theories considered scientific *in a higher or lesser degree*. (Lakatos 1973/1999, 20, emphasis added)

More recently, the idea re-emerged with David B. Resnik (2000), who developed a so-called pragmatist approach to demarcation. He argues that the distinction between science and pseudoscience (or non-science) "depends, in part, on specific practical concerns," and is utilized in the "context of making practical decisions and choices" (2000, 258). Consequently, there may be various degrees to which one idea or theory is acceptable in a certain context. According to Resnik, we are dealing with a highly *variable* and *permanently changing* problem of the sciences, with possible *transitory stages* before an idea descends to the level of pseudoscience. This also illustrates that not every theory or belief that is dismissed from science immediately and automatically becomes pseudoscientific.

In a more practical context, Resnik and Kevin C. Elliott (2023) have argued that a strict demarcation (between illegitimate and legitimate value influences) misses important aspects of how science is done and used in policymaking, courtrooms, and laboratories. For them, there is no strict line dividing good from bad science, but a *scale* on which each theory and practice must be situated individually. "In practical contexts," they write,

> the important question is often "is this experimental finding, analysis, model, or study good enough science?" In a court of law, for example [...], a judge must decide whether a research study performed by a professional scientist is good enough (e.g., unbiased, supported by data, reproducible) to admit into evidence. In drug regulation [...], a government advisory committee must decide whether a study published in a scientific journal is good enough to use in deciding whether to approve a drug for marketing. (Resnik and Elliott 2023, 264)

A very narrow pursuit of the ultimate criterion would either run into serious difficulties, or require ad hoc adjustments to account rationally for the usability of a particular piece of research in a practical context (like a court of law). According to Resnik and Elliott (2023, 264), "Gradation poses problems for using necessary and sufficient conditions to define science, because questions about gradation call for nuanced answers based on degrees of conformity to certain standards."

One could thus argue that science and pseudoscience are not binary, after all, but constitute a diverse terrain that involves various gradations and overlaps. These diverse categories underscore the complexity of evaluating scientific claims and theories. It would be worthwhile to take a look at the different categories and denominations that are introduced by practicing scientists, usually based on personal experiences in their own fields, typically in physics and medicine. In a stricter interpretation, they can be read as "typical scientist/skeptic rationalist accounts of mistaken and irrational science and of pseudoscience" (Collins, Bartlett, and Reyes-Galindo 2017, 413), which are presented in a fundamentally naive way that lacks serious sociological or philosophical analysis.[16]

7. Pseudoscience as a reflection of society

A final, even more indirect, and perhaps somewhat ironic value of pseudoscience is a general, sociological one: The acceptance of pseudoscientific or fringe theories could serve as an indicator of society's interest in and sensitivity to science.

[16] The relevant categories and labels on such a scale would be "bad science" (Goldacre 2010), "junk science" (Agin 2006), "fraud science" (Goldacre 2012), "fringe science" (Gordin 2023), "pathological science" (Langmuir 1989), "heretical science" (Sturrock 1988), and "voodoo science" (Park 2000). It is important to emphasize that these terms not only have different meanings but also differ on a meta-level in their implications and range of application. Thus, there is more work to be done and more to be learned here.

Michael Gordin has recently called attention to the fact that "pseudoscience" is a negative, critical category, which is always ascribed to others' beliefs, not used for oneself. "In that sense," says Gordin (2013, xix), "there is no such thing as pseudoscience, just disagreements about what the right science is." We do not have to go that far, of course, but there is something to the idea that there is a strong relationship between science and pseudoscience, and that pseudoscience is not (just) about ignorance and denial: Faking, mimicking, and engaging in pseudoscience obviously aims in a sense for science. Gordin goes on to say that

> the reason [pseudoscientists] engage in these activities is not because they are anti-science, but because they are for it. Pseudoscience is the shadow of science: it is the reflection of the scientific community. The higher the status of science, the sharper the shadow and the more robust the fringe. (Gordin 2023, 100-101)

As science advances, pseudoscience will follow, suggesting a strong, internal, perhaps even essential relation between the two. There is no pseudoscience without science, of course, but apparently Gordin thinks that there is no science without pseudoscience either. "Credit in science is allocated for priority (being first) and for being more correct than your competitors investigating the same questions. There will always be winners and losers. If the losers persist, they can and will get shunted to the fringe" (Gordin 2023, 79). Controversy is inevitable in science, because every new scientific hypothesis, assumption, experiment, and result must and will be tested and debated by others. As Popper famously said, science is about conjectures and refutations, and in such scenarios, some will emerge as winners, while others will end up on the losing (the dark) side, where theories can be "branded as ignominious and take up residence on the fringes of knowledge" (Gordin 2023, 80). Gordin's analysis seems to imply that as science advances, pseudoscience will follow, clinging to the sciences, finding their weaknesses (see Section 2 above), and providing its own, (in a sense) more attractive alternatives.

There does not seem to be any systematic and comprehensive survey of the history of pseudoscience that examines its origins, sources, emergence, and targets, or identifies the various correlations between the history of science and its pseudo counterparts. There are, of course, countless volumes on particular theories, like phrenology (van Wyhe 2004), flat-earth theory (Garwood 2008), anti-vaccination (Berman 2020), parapsychology (Collins and Pinch 1982), psychic phenomena (Noakes 2019), and so on. Some volumes focus on specific periods, such as early modern thought (McKnight 1992), the 19th-century United States (Wrobel 1987), the Victorian era (Lyons 2009), or the Renaissance (Vickers 1986), to name but a few. But none of them provide a systematic and comprehensive answer (positive or critical) to Gordin's assumption.

However, it might be worth toying with the idea for a moment. Perhaps two major upheavals may help to explain the emergence of pseudoscience in the modern era. One is obviously the second half, or rather the end, of the 19th century. With the development of evolutionary theory (Fichman 2002), statistics (Mackenzie 1981), mathematics (Flood, Rice and Wilson 2011), electromagnetic theory (Buchwald 1988), mathematical physics (Warwick 2003), and new forms of communication via underwater cables (Hunt 2021), the Victorian era created a new atmosphere where science could prevail. But even as these great achievements were reshaping our understanding of the world and our perception of our immediate surroundings, pseudoscience also emerged, from phrenology to various psychic and spiritualistic tendencies about the mind.[17] The two developments happened seemingly in parallel, or simultaneously.

In the interwar period, science suffered various setbacks, with many people believing that the never-before-seen brutality of World War I was either caused by or at least related to science's involvement in the development of lethal weaponry. This gave rise to an age of irrationalism, spiritualism, and romanticism, which could be taken as a counterargument to the thesis of parallel development: With the decline of science, pseudoscience was on the rise between the two world wars. But suffice it to say here that according to Paul Forman's (1971) infamous thesis, the broader acceptance of quantum mechanics was very much correlated with a new age of anti-mechanistic, anti-causal spiritualism (see Section 4). On the other hand, one could interpret those decades as the period when science got back on track and found meaning and significance in countless new discoveries in biology, physics, chemistry, medicine, and even logic. As a result, many scholars were more tolerant and open to alternative views during those turbulent times, when the foundations of science were questioned and viewed more skeptically and philosophically. That might also explain the more tolerant attitude of Schlick, Hahn, or the famous physicists Hans Thirring to parapsychology and psychic phenomena: If science needed to be rebuilt, it had to be investigated and exhaustively tested whether any events and entities that were previously considered non-scientific or nonsense might be real after all (see Section 4). Thus, the interwar period could be characterized as a rather "exploratory" phase for both science and pseudoscience.

If that is correct, then science, quite obviously, found its way again for a while during and shortly after the Second World War. As the Allies' victory was very much linked to new physical and technological knowledge and skills, the number of applicants for university science courses skyrocketed following the war. Where previously, only a few students enrolled to study physics (and most of them were very much practically oriented experimentalists), after the war, numerous departments had to be established to keep up with the growing number of students (Kaiser 2011).

With the rise of the so-called "atomic age," the United States not only saw a surge in fear (especially during the heydays of McCarthyism, which did not spare philosophy of science; see the classic study of Reisch 2005), but also a new optimism towards science's ability to solve real-world problems. In parallel, ufology (Eghigian 2024), Scientology (Westbrook 2022), Immanuel Velikovsky, and catastrophism (Gordin 2012) also entered the scene, reaching numbers of people that were rarely matched by science. Unsurprisingly, figures such as Martin Gardner were able to make a name for themselves (with good reason, of course) during the 1950s by collecting and criticizing, *in the name of science*, all the available and rapidly spreading pseudo and fringe theories (see Gardner 1957).

Thus, à la Gordin, science produces its own counterbalance in the form of rejected knowledge, which then turns into pseudoscience that aims to have a say in worldly matters. "The only way to eliminate pseudoscience," he says, "is to get rid of science, and nobody wants that" (Gordin 2013, 101). Correspondingly, if there were no pseudoscience, then we should be concerned because it would mean that no one cares about science anymore either. If science matters and is worth it, people will try to mimic, fake, imitate, copy, and abuse

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[17] As Noakes (2019) have shown, most of the investigators of psychic phenomena were actually well-known and respected physicists.

it. In that sense, the *existence* of pseudoscience mirrors (or socially reflects) the *pursuitworthiness* and *legitimacy* of science.

8. Possible objections and replies

In this last section, I will review some possible objections to the approach and questions presented in this paper.

(A) *Are we talking about the value of pseudoscience or the value of taking a step back to study it? Because the former would pose a serious threat to all scientific activities aimed at debunking pseudoscience and revealing its irrationality, meaninglessness, or danger.*

The title of this paper reflects the duality inherent in the discussion, namely that both pseudoscience itself and the study of it could have some value. However, my claim is not that *each and every* pseudoscientific theory and activity is valuable, but simply that some instances of pseudoscience can be useful for science. It would be a long-term empirical project to enumerate, categorize, and eventually taxonomize all cases that indeed have or could have some value. Section 7, however, was about the value inherent in the existence of pseudoscience, namely the social value of caring about science (however indirect that might be). Likewise, in Section 5 (and in parts of Section 6), fringe or pseudoscience *in itself* was shown to be somewhat valuable because its existence challenges us to revise old orthodoxies and dogmas, makes us more tolerant, or brings to our attention possible alternative lines of research or forgotten views. In that sense—despite all the dangers associated with saying it out loud—there is a *certain* value in the existence of *certain* types of pseudoscience.

In other cases, it is the act of studying pseudoscience that provides valuable insights, revelations, and information. Studying and analyzing the workings of specific ideas (like the strategy of the tobacco lobby or the communication and meta-reflections of fringe sciences outlined in Section 3) gives us new knowledge about the defects of science, enabling us to prevent them from being abused. It might even be more *economical* to identify any defects that could be misused by going through a few very influential pseudoscientific theories, instead of combing through all the various scientific theories and fields to find their weak points. Likewise, by studying pseudoscience, we might arrive at a better understanding of the problem of demarcation and what kind of suggestions and proposals would be able to capture the actual science-pseudoscience relation (part of Section 6).

(B) *Isn't it dangerous and backward-looking to open certain disciplines or even the entire institutional system of science to such pursuits as cryptozoology? By being more open to them, won't we end up treating them as equal parts of science?*

I have no intention to equate cryptozoology with biology, zoology, or any other empirical-observational disciplines. The point was not that the practices of cryptozoology are equal to those of science, or that we eventually need to accept cryptozoology as a legitimate science in its current form. There *are* differences between zoology and field biology on the one hand, and cryptozoology on the other, even though it is not always evident what those differences are, or how to make a principled distinction between a *scientific* and a *pseudoscientific* field (Laudan 1983, Bárdos and Tuboly 2025).

The goal in Section 4 was to show that some forms of pseudoscience, especially cryptozoology—where this ideal of being useful for mainstream science has been established and propagated for decades—have a certain *utility value*. While scientists might be unhappy about cryptozoology being presented to the youth—and to the public in general—as a positive, beneficial activity, the outcome could be useful and significant for all. The reward might be greater scientific literacy and a better understanding of scientific concepts, procedures, and phases of the scientific edifice. It all depends, of course, on how these practices could be monitored and regulated to avoid any outlandish claims or political-ideological commitments that *actually do* pose some kind of threat. However, this has no bearing on the question whether these fringe activities could bring laypeople closer to the sciences. Thus, the idea is not to treat cryptozoology and other pseudoscientific fields as equal parts of the sciences, but as a way to tap into people's natural curiosity and access new ideas.

(C) *It is one thing to argue that pseudoscience has a certain value, but shouldn't we rather focus on distinguishing it from science, that is, on pursuing the old demarcation project instead of encouraging charlatans and quacks?*

We should distinguish between the desirability and the feasibility of the demarcation project. It is certainly one of the most important tasks of philosophy of science, or science in general, to provide a reliable, working, and principled demarcation criterion. This paper did not seek to question the significance of this project. However, given all the reasons discussed in the literature (see Bárdos and Tuboly 2025), pursuing the demarcation project is not an easy task, perhaps even an impossible one.[18] The aim of this paper is to contribute to the search for alternative approaches and new ways of dealing with pseudoscience. Of course, no pseudoscientist should be encouraged to continue their activities because they are valuable; but it is true that the *existence* of these activities could serve our purposes—against the intentions of pseudoscientists, of course—namely, to promote engagement with science. As Feyerabend said (see Section 2), scientists often could and should do better, and if studying pseudoscience contribute to *doing better*, it is worth it.

In fact, Miriam Schleifer McCormick has recently argued, referring to John Stuart Mill's famous *On Liberty*, that

> [t]o not engage with others' views, even when we are quite sure they are false, can lead to us missing out on truth; we should be aware of our fallibility. Even if we are certain that a belief is true, Mill says if we don't engage with others "it will be held as a dead dogma, not a living truth." We come to understand our reasons for the belief better through engagement. Further, such engagement can help legitimize collective decisions. (Schleifer McCormick 2023, 3)[19]

Engaging with "fringe beliefs," says Schleifer McCormick (2023, 5), "exhibits care, and can also lead to a reduction of harm." Even if there is no "obligation" to do so, it is surely a valuable endeavor. The right circumstances for this

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[18] It is also a problem that most demarcation problems started from the definition of "science" and gave a picture of "pseudoscience" after that. But, as Maarten Boudry (2022, 85) has emphasized, "it may even be easier to circumscribe pseudoscience than to define science", thus there is even more space for alternative approaches. In a similar vein, Boudry, for example, has developed a "naturalized approach", differentiating numerous versions of demarcations (a related project he pursued already in Boudry 2013).

[19] Not surprisingly, perhaps, Feyerabend's pluralism was also highly influenced by Mill's *On Liberty* (see Lloyd 1997).

engagement have to be determined, of course, but this paper is not about the *how* but only the *why* (for more on the how, see McCormick 2023).

(D) Is it necessary to harness pseudoscience for our tasks and aims—why don't we just strive for better science education, which would obviously be less dangerous?

Improving science education is always a safe route, and no one can argue against its importance. But there are a few caveats. First, science education is a long-term project, and some of our problems require immediate attention. The methodological value of pseudoscience might lie in the fact that by studying it, we can find out which weaknesses of the sciences they might exploit and how, enabling us to quickly develop new strategies for mitigating them. On the other hand, to be effective, science education needs to include data about both science and pseudoscience, so that in a sense, the study of pseudoscience is logically prior to the study of science itself, or at least should take place in parallel. While educators deploy new, innovative ways to teach young people about science, philosophers of science (or pseudoscience) can help them out by providing their take on alternative theories (see, for example, Matthews (2019) about demarcation, education, and feng shui).

Another motivation to study pseudoscience is *inoculation*. This idea is based on a medical analogy: vaccines contain a weakened version of the respective virus to stimulate an immune response and the creation of antibodies, which then enables the immune system to defeat the real virus should it attack. Science inoculation works in a similar way: It introduces people to a given pseudoscientific theory in a controlled environment, so that when they later face an irrational idea or a pseudoscientific conception, their 'cognitive immune system' will identify it as such and respond adequately. The hope is that people will be prepared, immunized, and thus more resilient to misinformation.

Although inoculation is anything but new, it faces various challenges (to what degree and form should the environment be controlled, how active one shall be in the experiment during the 'vaccination,' whether 'shots' shall be repeated as in the case of seasonal flu vaccines or not, etc.). The concept was first proposed by William J. McGuire in the early 1960s. Although initially, it did not deal with pseudoscience, but with certain clichés ("cultural truisms"), it has more recently been used in the context of climate change beliefs, social media, trust in intelligence agencies, concerns about public speaking, efficiency in physical activity, court tactics, and the selection of tourist destinations (Compton 2020; Green, McShane and Swinbourne 2022).

Although there are no studies yet about the envisioned positive effects of inoculation on pseudoscientific beliefs, the biggest challenge would certainly be to determine the appropriate level of exposure to them. One study formulated this problem as follows:

> An annual flu shot is made with weakened versions of the anticipated most virulent strains of the upcoming flu season …. The flu is weakened to the degree that it is strong enough to motivate the body's immune system (e.g., the production of antibodies), but not so strong that it overwhelms. Such is the approach with persuasion inoculation. A persuasion inoculation is made with weakened versions of the anticipated persuasive challenges. These challenges are weakened to the degree that they are strong enough to motivate the mind's defense system (e.g., refutations of the counterarguments, like "mental antibodies") but not so strong that they overwhelm it. (Compton et al. 2021, 3)

This is indeed a delicate matter. On the one hand, the theory to be inoculated against must be strong enough to stimulate engagement with it and prompt an interest in refuting it. On the other hand, the pseudoscientific theory shouldn't be too strong, and its points and arguments should not be too precise, convincing, and engaging, because otherwise, people might end up being convinced by it.[20]

For such cases, philosophy could perhaps provide a nuanced perspective that is abstract enough to avoid dangerous levels of engagement, but concrete and stratified enough that it bears important fruits for practical tasks as well. Thus, there might be good reasons to break with the traditional negative and purely demarcating approaches to the science-pseudoscience relation. As this paper aimed to show, various examples and stories could be enlisted to discuss the value, advantages, and positive morals that the pseudosciences and their (philosophical) study might have in store for us. Although I was only able to scratch the surface here, there are indeed perspectives that make it possible to turn the dangerous and bothersome character of pseudoscience into something more positive. By adopting these, we can learn something about science, society, and ourselves and thereby advance all of them together in their interconnectedness.

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[20] An interesting and telling case at hand is Harry Collins and Trevor Pinch's study of parapsychology. They conducted numerous interviews and fieldworks among skeptical theoretical physicists and parapsychologists in different laboratories during the 1970s. They have noted that "our beliefs tended to change as a function of the nature of the latest period of prolonged exposure to scientists … we could change our beliefs and perceptions by exposing ourselves to the appropriate influence for long enough" (1982, 23). That is, if one aims to understand something (in this case parapsychology, or any other pseudoscientific theory), then understanding requires a certain amount of concrete and deep engagement with the subject, but that carries with it the danger that over time one will see the others' reasons *as good reasons* and thus fall prey to the theory.

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