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Statements, actions, and pseudoscience

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Suite à la réponse de Sven Ove Hansson à mon analyse critique de sa définition de la pseudoscience (Debray, 2023), et ayant par ailleurs proposé des améliorations aboutissant finalement à des lignes de démarcation différentes, cette nouvelle réponse explore les points de convergence et de divergence entre les deux propositions. Je me concentre sur la principale différence - l'unité d'analyse de la pseudoscience, sujet de la définition - inscrite dans un cadre théorique laissant la possibilité d'aborder les questions de « fausse science » séparément et de distinguer différentes formes de contrefaçon.

Following Sven Ove Hansson's response to my critique of his definition of pseudoscience (Debray, 2023), and since I have elsewhere proposed improvements to his definition that ultimately lead to different boundaries, this response highlights the points of agreement and disagreement between our proposals. I focus on the main difference – the suitable unit of analysis and the definition's subject – a choice grounded in a theoretical framework that lets us consider distinct issues related to "false, fake, pseudo-science" separately and distinguish different forms of counterfeit.

Mots clés : pseudoscience, démarcations, définitions, mauvaise conduite scientifique, non-fiabilité.
Key words: pseudoscience, demarcations, definitions, scientific misconduct, unreliability.

1. Introduction

Sven Ove Hansson is correct in noting that our approaches to philosophical research on pseudo-science coincide in many ways. One broad area of agreement is our shared view that pseudoscience[1] can be understood not merely as a negative concept opposed to science but as a distinct object with its own characteristics. The notion of pseudoscientificity, despite its prior conceptual vagueness, reflects a specific mode of distancing from science, characterized by *significant unreliability*—rather than, for instance, a lack of fruitfulness, as Hansson rightly pointed out in his earlier work (Hansson, 2013, pp. 66–67). This shared foundation provides a basis for exploring the differences between our proposals.

My previous contribution (Debray, 2023a) focused on the strengths and limitations of Hansson's approach and his most recent definition. Hansson's demarcationist approach offers a new opportunity to move forward on the distinction between science and pseudoscience: a definition grounded on epistemic or methodological features, especially a criterion of unreliability. This approach—based on a definition (vs mono- and multi-criteria proposals)—has the potential to bring closure to the issue of pseudoscience in philosophy, not by abandoning the term, which would risk reducing it to

1 *The terms "pseudo-science" and "pseudoscience" are often used interchangeably, with the latter being more prevalent in contemporary literature. However, the distinction is not merely stylistic; they may carry different meanings. While "pseudo-science" is a broad term encompassing all things that deviate from legitimate science (yet possess scientific pretensions), "pseudosciences" refers to a specific subset. In this paper, "pseudo-science" is a vague term that includes various things, such as false and fake science, pseudo-empirical* methods, *pseudoscientific* theories, decisions, *and so forth. My point is that "pseudo-science" is not a single identifiable thing. In contrast, pseudoscientific behaviors, for example, are concrete and may share enough similarities to be defined.*

an emotive label, but by achieving a deeper understanding. This would, in turn, redirect the debate toward issues of greater philosophical significance. I also highlighted two significant limitations concerning his third criterion: "It [a pseudoscientific statement] is part of a doctrine whose major proponents try to create the impression that it represents the most reliable knowledge on its subject matter (the criterion of deviant doctrine)". The first limitation is that this condition excludes statements that are part of a doctrine whose major proponents do *not* try to create the impression that it represents *the most* reliable knowledge on its subject matter, yet still seem to fall under the category of pseudoscience. The second limitation is that the definition does not differentiate cases of scientific misconduct, such as fraud or research distorted by commercial interests, political values, or other external influences, which may warrant separate consideration. My concern lies with the exclusion of cases presented as "an alternative to good or mainstream science," as "at least just as reliable," or "less reliable but because the phenomena would not be sufficiently studied," and so on. A significant part of pseudo-science appears to rest on ill-founded alternative narratives and explanations that do not necessarily claim epistemic superiority. Alternatives can be a sign of a normal functioning of science and research process. At other times, they reflect communicative strategies at the very heart of the distinction between "science and its counterfeit" (Laudan, 1983, p. 111). Clarifying these cases would be more prudent than relegating them to a gray area. As for the second limitation, Hansson's answer is clear: the definition includes cases of scientific fraud, and this is as it should be. In earlier works (Hansson, 2008, 2009, 2015), scientific fraud is presented as particularly instructive, and its inclusion within the definition was initially considered problematic at first glance[2]. I have taken this point seriously (Debray, 2023a, section 6). Therefore, I return here to the importance of distinguishing between different forms of counterfeit.

I have introduced an alternative definition of the notion of pseudoscienticity (Debray, 2021, 2022a, 2023b) elsewhere aimed at refining Hansson's (2013), in particular by clarifying his criterion of *unreliability*. I aimed to preserve the core elements of his definition while refining some aspects: clarifying the relationship between pseudoscience and the scientific domain in a broad sense, improving our understanding of the unreliability specific to pseudoscientific cases, and better accounting for the communicative and organizational dimensions involved in these practices (Debray, 2023a, p. 21). They reveal different philosophical perspectives on pseudoscience. Without revisiting the definitions in full, it is helpful to outline the key points of convergence and divergence between our two proposals. This response offers insights into several key issues of a work still in progress: the question of the most suitable unit of analysis, the possibility of addressing demarcation issues separately, and the question of the scope and applicability of the definitions.

2. Units of analysis for pseudoscience

Redefining pseudoscience aims to replace a vague and imprecise notion with a more accurate one. This requires carefully considering the object to be defined. While "pseudoscience" might be the initial target, it is sometimes more practical to take an indirect route, such as defining "pseudoscientific disciplines." Hansson refers to this as the *primary definiendum* in his tutorial "How to define" (2006). I also align with Monton (2013) in emphasizing the importance of identifying the category of reality to which the object of definition belongs[3]. Ideally, a definition of pseudoscientificity should be based on a *minimal constitutive* unit of pseudosciences. From this perspective, the choice of the *primary definiendum* is by no means self-evident and cannot be chosen at random; it already provides information about the object to define, if not crucial information.

One of the key distinctions between my proposal and Hansson's lies in the chosen unit of analysis. Hansson's definitions (2009, 2013) primarily focus on disciplines, doctrines, and statements. In "Disciplines, Doctrines, and Deviant Science" Hansson (2020) responds to Kåre Letrud (2019), who has suggested grounding the definition in *epistemic disciplines*: pseudosciences are not disciplines *per se*, and this reminder is important[4]. According to Hansson,

2 *For instance: « An immediate problem with the definition based on (1) and (2) is that it is too wide. There are phenomena that satisfy both criteria but are yet not commonly called pseudoscientific. One of the clearest examples of this is fraud in science. This is a practice that has a high degree of scientific pretense and yet does not comply with science, thus it satisfies both our criteria (1) and (2). Nevertheless, fraud in otherwise legitimate branches of science is seldom if ever called "pseudoscience". (…) The example of fraud is particularly instructive. Fraud is not in general associated with a deviant or unorthodox doctrine. To the contrary, the fraudulent scientist is anxious to present results that are in conformity with the predictions of established scientific theories. Deviations from these would lead to a much higher risk of disclosure. This would give us reason to replace (2) » (Hansson, 2015, p. 207).*

3 *Different types of objects can be the subject of a delimitation, but a definition requires thinking about the nature of pseudoscience. Bradley Monton explicitly asks the question: "What sort of thing is pseudoscience?". More precisely, in the context of an analysis of pseudoscience in the form of a definition of the type "X is pseudoscience if and only if", "what category of reality does X fall into?" (Monton, 2013, p. 471).*

4 *In* Philosophy of Biology, *Elliott R. Sober (2000) has already warned us of the "dangers of anachronism", but the idea that pseudoscience refers to* disciplines *persists—in frequently asked (and probably poorly formulated) questions such as "Is psychoanalysis a pseudoscience?" and in* approximate *definitions. For instance, the French Wikipedia page says that pseudoscience "is a discipline that is presented in scientific guise, but which has neither the scientific approach*

they are *doctrines*, and statements that are the subject of his final definition (from 2013) are constitutive components of these doctrines.

However, as Philip Kitcher (1993) rightly points out in a short passage from *The Advancement of Science: Science without Legend, Objectivity without Illusions* dealing with creationists, the category of pseudosciences cannot be fully understood through propositional content or logical characteristics alone, and doctrines.

> The primary division is a psychological one between *scientists* and *pseudo-scientists*. The behavior of creation scientists indicates a kind of inflexibility, deafness, or blindness. They make an objection to some facet of evolutionary biology. Darwin's defenders respond by suggesting that the objection is misformulated, that it does not attack what Darwinists claim, that it rests on false assumptions, or that it is logically fallacious. How do creation scientists reply? Typically, *by reiterating the argument*. Anyone who has followed exchanges in this controversy or has read the transcripts of a series of debates sees that there is no adaptation to any of the principal criticisms. One important example among many is the creationist use of the second law of thermodynamics. For nearly twenty years, the major exponents of creation science have been declaring that the second law of thermodynamics is incompatible with the evolution of life. Creationists have been in the presence of people who have given lengthy critiques of their objection and there is substantial evidence that their eyes have wandered over some of the pages on which such critiques have been printed. How has their thinking adapted to these critiques? Apparently not at all, for they make no replies to them and continue to present their ideas in exactly the same ways. There are limits to proper tolerance. (Kitcher, 1993, pp. 195–196)

In this context, pseudoscience lies in systematically ignoring criticism and perpetuating errors without reformulation. Pseudoscience arise because there are limits that must not be crossed for rational research. The limit is not only about defending an incorrect doctrine. It is the "deafness" and "blindness" (above) to criticism that makes creationist behavior *pseudoscientific*. What is at stake here is not a theory or a discipline that can evolve but what individuals *do* in the face of these theories. Here, irrationality is characterized by behavior. Kitcher also emphasizes the psychological dimension of pseudosciences: "The primary division between scientists and pseudoscientists is psychological (…) The category of pseudoscientists is a psychological category (…) Pseudoscientists are those whose psychological lives are configured in a particular way. Pseudoscience is exactly what these people do" (Kitcher, 1993, p. 196).

The idea that pseudoscience is based on *attitudes* is not new. However, attitude has a psychological dimension, as Kitcher points out. This dimension further complicates the initial issue. To overcome this difficulty and define pseudoscience, I proposed shifting the focus from attitudes to actions and decisions made in specific contexts[5]. These provide a more concrete basis for determining when a practice becomes pseudoscientific. Honest scientists revise their errors once it is identified. In contrast, pseudoscientists persist in error despite the availability of corrective mechanisms—whether concerning the substance of their claims or the way they defend them. These behavior patterns—resulting to the moment when constructive dialogue is broken—can be identified through analyses of communicative situations, as Kitcher illustrates: "Anyone who has followed exchanges in this controversy or has read the transcripts of a series of debates sees that there is no adaptation to any of the principal criticisms" (Kitcher, 1993, p. 195).

Building on this insight, I have argued that *actions* and *decision-making*, as fundamental units of scientific practices are also a central *definiendum* for pseudoscientificity. A decision represents the culmination of a deliberative process leading to an action—presenting results, expressing an opinion, choosing a methodology, and so on. To assess whether behavior is rational or irrational, legitimate or illegitimate, it is essential to analyze the goals, the decision itself, and the resulting action as an integrated whole. This approach extends beyond analyzing statements, disciplines, or outcomes —it means asking the question: what happens when the people accused of pseudoscience do what they do? How does this differ from what happens when scientists do what they do?

By focusing the analysis on decision-making, we integrate not only the outcomes but also how this outcome is achieved, i.e., a decision-making *process*, its *context,* and its *ingredients*, such as agents and values. Decisions, whether they involve presenting results, falsifying data, or selecting research topics, should not be divorced from the circumstances in which they occur[6]. This framework brings together previously disparate crucial components—agents, actions, processes, and values—into a single definition.

nor scientific recognition" ('Pseudoscience', 2024, Accessed in 2024-10-28). In Section 4, I suggest to re-formulate those questions.

5 Studying behaviors does not necessarily mean turning to psychology. Philosophical discussions often focus on attitudes, whether scientific or irrational, but it is behaviors—as observable reactions—that is of interest here.

6 For instance, religious belief is not science, but neither is it pseudoscience, although it can be under certain circumstances. We can then learn from these circumstances.

While Hansson's approach focuses on statements and doctrines—aligned with traditional demarcation criteria such as verifiability and falsifiability—I advocate redefining pseudosciences through the lens of decision-making and actions, which better capture the nature of the boundary crossed. Pseudosciences are primarily behavioral, and decision-making is a minimal unit of these behaviors. The notion of pseudoscientificity is directly related to *how agents make decisions and behave in specific epistemic contexts* and only indirectly to statements and disciplines. Ultimately, pseudosciences arise from choices (vs. unintentional errors) that violate specific scientific norms, resulting in unreliable practices that cannot *at all* be trusted.

3. Towards a systematic and analytical treatment of different issues

Addressing the epistemic contexts and norms in which decisions are made has led me to propose a complete definition of pseudoscience and a preliminary definition of epistemically unacceptable forms of science, which defines a particular subtype, the most epistemically problematic. This leads to a clear distinction between pseudoscience and other forms of deviance in science, offering two perspectives on pseudoscience. Here is a reminder of our two proposals.

> **Hansson's definition**: A statement is pseudoscientific if and only if it satisfies the following three criteria:
>
> (1) It pertains to an issue within the domains of science in the broad sense (the criterion of the scientific domain.
>
> (2) It suffers from such a severe lack of reliability that it cannot at all be trusted (the criterion of unreliability).
>
> (3) It is part of a doctrine whose major proponents try to create the impression that it represents the most reliable knowledge on its subject matter (the criterion of deviant doctrine). (Hansson, 2013, pp. 70–71)
>
> **Alternative definition**[7]: Decision-making is pseudoscientific if and only if:
>
> (1) It is made by an agent acting outside of the domain of science in the broad sense (*the criterion of roles responsibilities*)
>
> (1') (Variation for the second definition: it is made by an agent acting within the domain of science in the broad sense).
>
> (2) It is presented as scientific (*the criterion of scientific pretense*).
>
> (3) the values involved play a direct role in the process and its outcomes (*the criterion of substituting values for evidence*).
>
> (4) This direct role occurs at the time of interpreting, establishing, or communicating results (*the criterion of deviant behavior*)
>
> (5) The direct influence of values is recognized but not corrected (*the criterion of resistance to correction*).

In a nutshell, these definitions I have introduced—of pseudoscience and a subtype of epistemically unacceptable forms of science—stem from a demarcation approach grounded in the legitimate and illegitimate roles of values, evidence, and agents in scientific practices and decisions. The first criterion differentiates pseudosciences from other unacceptable forms of scientific practices. Without the second criterion, the definition risks including religious or belief-based practices that do not inherently "conflict with (good) science" (Hansson, 1996, 2015, p. 208). The other three criteria aim to understand better the *type* of *unreliability* that characterizes those cases, which suffer from such a severe lack of reliability that they cannot at all be trusted despite the diversity of fields of study and the heterogeneity of scientific activity. Without the third criterion, we would include situations in which the values held by individuals—which are inevitable—do not affect the reasoning process. Without the fourth, we would lose sight of the times when values should be limited. The absence of the last criterion would result in the inclusion of accidental errors, and this criterion (more) broadly helps to consider the dynamic and iterative nature of scientific activity. In other words, the last two criteria exclude errors that have been or are being revised and cases where the values used by the agents in the scientific process do not threaten the *objectivity* of the research (Reiss & Sprenger, 2020). Returning to some theoretical aspects of the terms of my proposal helps to understand our potential divergence on *scientific fraud* or other misconducts.

3.1 Defining significant unreliability beyond disciplinary boundaries

Conditions (3), (4), and (5) engage with the role of values in decision-making at an epistemic level; that is, we are interested in the detrimental effects of values on the scientific process, on the acquisition of knowledge, and on the

7 *See Heinzman and Debray (forthcoming) for a more recent version of the first condition: "(1) it is made outside the norms of the context of science, the latter involving specific responsibilities in order to reach reliable knowledge (responsibility criterion); on the other hand, "decision-making leads to an unacceptable form of science if the first condition (1) is replaced by condition (1'), i.e. if and only if (1') the action violates general and minimal common norms that must be respected in the epistemic context of science".*

achievement of epistemic goals—social dimensions are set aside, as the distinction between science and pseudoscience lies fundamentally in the realm of rationality. While it is widely acknowledged that cognitive, ethical, political, or economic values are involved in science (decisions and practices), the critical discourse focuses on *when* these values intervene and *how* they operate. When values act as "stand-alone reasons to motivate our choices" or "act much the same way as evidence normally does, providing warrant or reasons to accept a claim" as Heather Douglas notes (2009, p. 96), they become problematic and compromise scientific objectivity—an issue I denoted as the *substitution of values for evidence criterion* (criterion 3).

A distinction between a direct and indirect role of values in scientific decisions does not fully resolve the broader, more intricate question of legitimate versus illegitimate influences of values in science[8]. That is, this distinction alone does not allow us to understand in what way dubious practices, or a whole range of deviant or more or less reliable statements and practices, are legitimate or illegitimate. Several reasons have already been identified: transparency, honesty of scientists and researchers, opacity of conscience, and internalization of beliefs and biases (Elliott, 2011, 2017). In addition, the question of legitimacy is not solely an epistemic one. One element of a reply is that we can often conclude from actual epistemic actions that values have had an impact (see examples in section 4).

The distinction remains instructive for cases that "suffer from such a severe lack of reliability that it cannot at all be trusted" (Hansson's second condition), i.e., a particular subset whose unreliability is *patently evident for epistemic and methodological reasons*. The direct role of values appears (epistemically) acceptable at the beginning of the research, sometimes at other stages (these points are under discussion), but definitely *not* during reasoning itself, i.e., during the epistemic phase and the communication of results (criterion) 4). Thus, while reliability (field-specific) must be assessed at the level of statements within their disciplinary contexts, extreme unreliability (transdisciplinary) is a more severe issue that does not depend on the epistemic standards of specific fields. Instead, it can be understood as a general failure affecting the reliability and legitimacy of scientific inquiry.

This kind of characterization puts the problem of *wishful thinking* and confirmation bias typical of pseudosciences at the heart of the definition. By incorporating the role of values into the definitions, we gain critical insight into *why* these practices are epistemically objectionable and how some forms of science devolve into counterfeit modes of inquiry rooted in the misuse of values in research practices[9]. From a more didactical point of view, this characterization also has the advantage of making values more visible (or even discussing them openly), as they would otherwise operate in the shadows if left unexamined.

The central concern then emerges when a misuse of values is identified and does not lead to a correction (section 2). Hansson is right to emphasize, in his reply, the "imperviousness" of pseudoscience to "the usual self-correcting mechanisms in science" and to regard its "durability" as a defining characteristic. I have retained Hansson's (2020) phrasing of "resistance to correction" to show that this point was central to his work, although he did not explore a more systematic analysis of this resistance. I propose to approach this through the study of communicative situations. Evidence of this refusal to correct might be observed when pseudoscientific arguments remain unchanged despite recurrent, well-founded objections, thereby marking the point at which dialogue is actually broken.

3.2 Contexts, agents, and norms in defining pseudoscientific practices

Although there is an undeniable link between pseudoscience and science, it is difficult to define the exact nature of this relationship. The first criteria of our proposals relate to the domain of science (in the broad sense) and have a common goal: clarifying this relationship. For Hansson, it is a matter of *circumscribing the domain to which the statement refers*, whereas, in my proposal, it is a matter of identifying *the status under which an agent acts* and the *norms* specific to epistemic contexts.

Organizational and communication-related aspects, though not directly presented in this way, also appear in Hansson's definitional work, with terms such as "conflicts with science" "main proponents" "creating the impression" or "trying to create the impression." These terms imply modes of organization and communication. My proposal seeks to make

8 *I refer here to the discussions on what Bennett Holman and Torsten Wilholt have dubbed* The New Demarcation Problem *(Holman & Wilholt, 2022), see for example: Hilligardt (2022), John (2021), Koskinen, I. & Rolin (2022), Reutlinger (2022), Wagner (2022). I have further mentioned five demarcationist strategies that rather capture different demarcation issues (2023b).*

9 *The alternative definition of* pseudosciences *forms part of a broader typology encompassing non-scientific, para-scientific, and unscientific activities. A closer examination of the different types of values involved (commercial, religious, political, etc.) and their roles enables a more nuanced differentiation of unacceptable forms of science into distinct subtypes: research corrupted by commercial or industrial interests, research tainted by political agendas, research influenced by religious motives, and practices deemed illegitimate for being epistemically unacceptable, morally unacceptable, or both. This typology allows for distinctions such as morally unacceptable yet epistemically sound practices, or those that are epistemically deficient to the point of 'complete unreliability' (per definition). Hopefully, the same conceptual tools could be applied across multiple issues, enabling a systematic approach to delineate and categorize various deviations from* "real science" *(Laudan, 1983).*

those dimensions explicit, integrating them into the definition via the criterion of resistance to correction (condition 5) and the first two criteria. It is within these interstices—between conditions 1, 2, and 5—that clarifications or misinterpretations emerge, as well as communicative or organizational strategies (dual discursive strategy, manipulation of titles, and degrees of belief[10]).

The criterion of responsibility (condition 1) indicates the points of divergence in our respective conceptions. My first condition is that the decision is made by an agent acting outside the scientific domain (in a broad sense). The agent acts within the scientific domain in its alternative version (1'). This shows that the fuzzy notion of "pseudo-science" is fragmented into several components: pseudosciences on the one hand and particular forms of epistemically unacceptable science on the other, i.e., objects that share common characteristics but differ in their epistemic context. I refer here to Douglas's concept of *role responsibilities* (Douglas, 2009, pp. 71–73), to MacIntyre's definition of what a practice is[11], and I take a consequentialist stance.

Scientists and researchers have special obligations in addition to the rules that everyone else must follow. Job-related obligations imposed on researchers do not solve the issue of pseudo-science. However, a few core obligations—limited in number and consensual, namely, honest communication of data, open discussion, and peer evaluation of others' work (Douglas, 2009, p. 72) – contribute to the fact that science can be a reliable enterprise. These obligations are shared across fields, whether in biology, physics, or humanities. These rules are one of the few things that do not vary despite ideal conceptions of what science is or should be. They are norms to be respected, chosen, and constructed, yet they are also *constitutive norms* – general conditions of science, even if they are not the only ones. Without honest communication of results among researchers, collective and critical evaluation, and interactive engagement, science cannot operate reliably or perhaps cannot function at all. In the case of pseudoscience and epistemically unacceptable forms of science, these obligations are disregarded. Yet researchers and scientists, unlike people outside the domain of science in a broad sense, are bound by them. Failure to meet these obligations, therefore, has different *consequences* depending on the individual or agent's context and role. For instance, under which status the individual is choosing to act? A researcher might state: 'As a researcher, this is what I am claiming' or 'I am a researcher, but what I am about to claim is my personal belief' or 'I am acting here as a spokesperson for an industry, not as a researcher' and so on. Such distinctions are modifications of the epistemic context in which the agent is acting. These modify the obligations to respect. In sum, pseudosciences and some cases of epistemically unacceptable forms of science arise from the *same kind of unreliability* (criteria 3-4 and 5) but within different *epistemic contexts* (criteria 1-1' and 2).

From this perspective, *scientific fraud* and other forms of *false science* are indeed distinguished from *pseudoscience*. There is an essential reason for this, as Hansson rightly pointed out in his previous answer (« It is important to distinguish between these various forms of deviation, not least since they require quite different forms of countermeasures »).

3.3 Studying unreliability in scientific and non-scientific practices

Such a proposal focuses not upon "the" line but upon *lines* that allow us to understand the various forms through which science can be illegitimately distorted beyond inconclusive practices and scientific errors whose existence is a normal component of science. Altering the object of the definition by replacing "a pseudoscientific statement" with "a pseudoscientific action-decision" changes our understanding of pseudo-, false, and fake science. While "pseudo-science" as a general notion may be vague and problematic, *pseudosciences*, as concrete practices, could be distinctly characterized and studied systematically. My broader proposal, therefore, has been to advocate for the possibility of *an autonomous conceptualization of pseudoscience*.

Once the boundaries of pseudoscience have been defined and the notion has been clarified, it becomes easier to study a continuum of *more or less reliable* behaviors and practices that are not, for all that, pseudoscience. Here, the focus is not so much on the definition itself but on the tools that facilitated the establishment of this definition: analyzing practices, values, agents, epistemic contexts, evidence, justificatory discourses, and different stages of the research process. The goal is to explore the intermediate zone between typical non-problematic cases, identify the key dimensions of this space, and authentically and operationally identify situations in which different practices, different actors, and different interests are contextually intertwined. The broader programmatic objective is to systematize the core elements involved in studying *unreliability* in scientific and non-scientific practices related to epistemic domains. This opens up possibilities for application in specific fields or inquiries to better understand the diversity of practices and deviations through analyzing decision-making processes, actions, and

10 *I distinguish here* irrational belief *(opinion does not imply the reality of an object, nor necessarily the affirmation of that reality, nor the affirmation of a consensus), from* belief held to be true*, and from belief held to be* scientific *and publicly presented as such.*

11 *In* After virtue*, Alasdair MacIntyre stresses the normative dimension of practices: "To enter into a practice is to accept the authority of those standards and the inadequacy of my own performance as judged by them. It is to subject my own attitudes, choices, preferences and tastes to the standards which currently and partially define the practice" (MacIntyre, 2013, p. 190).*

communicative situations—especially for practices and decisions taken at the interface between science and society (Debray, 2022b). In short, depending on the question, there are different lines of demarcation, various demarcation issues, and different goals and strategies.

4. Identifying pseudoscience

The philosophical study of pseudoscience faces a fundamental obstacle: "Pseudoscience is not a real thing (…) Yet pseudoscience is also real"[12] (Gordin, 2023). The heterogeneity of scientific activity—in terms of methods, aims, and fields of study—implies diverse ways of distancing from it. Despite the apparent heterogeneity of the objects typically designated as "pseudosciences" proposing a definition requires identifying the characteristics *x*, *y*, and *z* that all these objects share, and only these objects. Such a proposal can either incorporate this heterogeneity into the definition or argue that these common characteristics are sufficiently identifiable and significant to recognize these objects. A third major difference between Hansson's proposal (2013) and mine, therefore, lies in the question of the applicability of definitions and, more broadly, in the possibility of identifying pseudoscience without being an expert in the relevant field. Whereas Hansson claims that it is imperative to be an expert to assess the reliability of a statement or theory, I maintain that it is possible to identify pseudoscientific behaviors by observing external elements independently of in-depth expertise in the field concerned. Of course, both approaches can complement each other.

4.1 Tracing the boundaries: what to look for?

My proposal is to examine actions and decisions. An adequate formulation of the question would be: do decisions, actions, and communication situations surrounding *x* give rise to pseudoscientific behaviors? Then, conditions of the definition (see section 3) require attention to: the agents involved, the type of responsibilities assumed by the agents, the norms they agree to follow in engaging in a particular activity, the status under which they choose to act, the (epistemically) acceptable or unacceptable roles of values in the research process, and their behavior in the face of evidence and criticism.

Hansson is correct: one must be an expert in the relevant field to assess the *reliability of a statement*, referring to specialized literature and epistemic criteria specific to each domain, which is constantly evolving. The consequence is: "a reformulation of the question in terms of reliable knowledge or epistemic warrant leaves most of the work undone. We are not told what type of data or investigations to look for, or what types of strengths and weaknesses we should look for in the psychoanalytical literature" (Hansson, 2013, p. 73). My attempt was then to clarify what to look for.

In concrete terms, the first two criteria involve observing the agent's role, such as *how they present themselves*—individuals or collectives—and what *they claim to produce* (along with the context of production), which can be examined through their discourse and published materials. For example, in a co-conducted qualitative study (Desmoulins & Debray, 2022), we have focused to *titles to speak* (Boltanski, 1973; Tavernier, 2004), self-descriptions, and *reasons for existence*[13] in the "About" "Who are we?" and "Team" website sections of thirteen influential French think tanks. Norms and values appear clearly in these sections (cognitive, ethical, social). For instance, while some explicitly presented themselves as research institutes producing *scientific* or academic content, others did so only partially or not at all (criteria 1 and 2).

Criteria (3) and (4) mean concretely examining justifications provided by individuals—whether through discourse, actions, or publications—and the *stages* of research processes to verify that values do not unjustifiably replace evidence during critical phases, such as the epistemic stage or the communication of results. For instance, before the French National Health Authority issued its decision to end reimbursement for homeopathy[14], various actors and stakeholders joined forces to invite the public to sign a petition—their actions were part of a planned advertising campaign, and although the actual cost of the campaign was not disclosed, its funding by Boiron, Lehning, and Weleda, as well as its organized nature, was not hidden. One of the campaign's leading websites (www.monhomeomonchoix.fr) contained an example of a scientific claim (fulfilling criterion 2): "*Homeopathy works, science says so*" (in the section "'*Homeopathy, Proof by Facts – See the Evidence*"). Such a statement prompts an examination of the evidence provided (conditions 3 and 4). This assertion relied on a meta-analysis (Mathie et al., 2014) to claim that homeopathy has a proven effect despite the study itself emphasizing the uncertainty and limited reliability of the results. This misinterpretation illustrates how values can substitute for evidence by

12 See also Hansson (2023) and Debray (2024). My point in the previous section was to say that the term in this sentence does not refer to the same thing.

13 The so-called "Pacte" law invites French companies to ask themselves about their "raison d'être" and their "mission". The sections 'About us', 'Who we are' and 'Team' are all texts that inevitably evoke their working methods, epistemological positions and ethical commitments (Desmoulins & Debray, 2022).

14 An essential detail in this case is that, in France, homeopaths must be physicians, although they may collaborate with non-physician supporters of homeopathy. I thank Sven Ove Hansson for highlighting this example, which illustrates how much my proposal incorporates epistemic and normative context in assessing behavior status. Here, the same action—claiming that homeopathy is proven by facts—would be pseudoscientific in one context (France) but an unacceptable form of science beyond French law. As previously noted, both arise from the same kind of unreliability but occur in different contexts and epistemic communities. These labels are not immutable, as the question of status involves dimensions beyond the purely epistemic.

comparing the original evidence, the results of a cited study, and how the results were subsequently communicated. Regarding criterion (5), the focus shifts to identifying the persistence of false or biased positions despite clear evidence of error. From a methodological standpoint, this entails an examination of the *evolution of discourses* (e.g., omissions or delays in publishing corrections, retractions, or engaging in critical interactions).

4.2 What does it change?

This proposal has focused on refining Hansson's unreliability criterion by grounding it in croncrete failure that can be identified (with qualitative investigations), to make the definitions operational. In a nutshell, this proposal calls for *epistemic*, *methodological*, *organizational,* and *communicational* aspects to be considered *simultaneously* to examine an object and determine whether it is dubious, epistemically unacceptable, or pseudoscientific. Here, pseudoscience imply a conceptual relationship understood not about science but about other types of error and deviant practices. In his proposal, Hansson encourages us to consider the theoretical relevance of the definition separately from its immediate applicability and to focus instead on the specific features of each field. On the contrary, my proposal aims to show that the unreliability of practices (scientific or non-scientific) can, in part, be assessed by descriptive analyses of practices, thus offering a more direct and systematic approach to the specific identification of pseudoscience. I don't deny that there are several levels of difficulty—mainly due to the transparency of justifications and relationships (section 3)—and that complex cases require more systematic investigation. My attempt was only to indicate where to look and defend the possibility of systematizing this approach with pertinent investigative procedures for qualitative studies.

The criteria that ensure scientificity and reliability are not necessarily of the same nature as the mechanisms that produce pseudoscience. If pseudoscience is a specific action which can be observed in a dialogue, then we can, at least in theory, recognize these cases so unreliable that it is entirely impossible to trust them without being a specialist in the field. Hansson would agree that many, if not most, cases of pseudoscience have characteristics that serve as warning signs and should make non-experts suspicious (see, for example, the list of mistakes committed in pseudosciences that he added after presenting his definition). And, in other contexts (interdisciplinarity, public decision-makers, didactic and public understanding of science, etc.), a philosophically grounded and applicable definition of pseudoscience may be helpful.

5. Conclusion

Our two proposals diverge on three main points: the most suitable unit of analysis (section 2), the relationship between pseudosciences and other deviant practices (section 3), and the specific criteria of unreliability pertinent to these practices (section 4). Similarly to Hansson, I do not dismiss the possibility that the definitions could be further refined, particularly in light of their application in various contexts and to assess the relevance and utility of the proposal. My ambition was to provide a less fluid framework for discussions of scientific deviance and to achieve a reasoned and operational demarcation of pseudoscience. The removal of the first criterion, which establishes a theoretical distinction between false, fake science and pseudoscience, would result in the inability to differentiate between pseudosciences and other unacceptable forms of science, as well as an inability to understand and study the differences and consequences (which might be important in the context of assessing scientific integrity). Defining pseudoscience requires overcoming at least three obstacles: 1° finding a way of defining pseudoscience without a precise definition of science – which is currently lacking and perhaps impossible to formulate (Laudan, 1983); 2° determining the conditions to be met for a definition to be satisfactory; 3° choosing a suitable primary *definiendum*.

Several points of convergence were also highlighted in this response: the importance of doctrinal elements and their persistence, the rejection of disciplines as adequate units of analysis (to avoid the dangers of anachronism), the need to treat the question of the definition of science separately from the notion of pseudoscientificity, the intermediate stage of science "in the broad sense" (encompassing different disciplines and different types of knowledge). Defining pseudosciences is different from the traditional problem of demarcation, although it is not entirely disconnected from it. The tendency to present things in an overly binary way and to hope for a clear-cut demarcation, potentially based on a single criterion, contributes to confusion and fosters inadequate hopes.

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