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A contextualist solution to the demarcation problem

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Abstract—In this paper, after presenting three challenges that any knowledge-based demarcation between science and non-science should meet, namely, the skeptical, triviality, and mimicry challenges, I show how a recent contender in epistemology, *viz.*, presuppositional epistemic contextualism, allows these challenges to be met, hence pointing toward a novel solution to the perennial demarcation problem.

Conceiving of scientific knowledge from the vantage point of contextualism forces us to consider science as being first and foremost a distinctive epistemological context, which has the peculiarity of coming with a very high degree of stringency for the truth conditions of putative knowledge attributions. The fact that science imposes particularly stringent norms on knowledge is measured by the extension of the set of counterpossibilities that science is (i) in the business of eliminating on the basis of available evidence and (ii) ready to take seriously (insofar as they are consistent with the scientific community's pragmatic presuppositions at a given time and place).

Keywords - Demarcation problem - Science - Pseudoscience - Scientific knowledge - Epistemological contextualism

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A contextualist solution to the demarcation problem

“All epistemology begins in fear - fear that the world is too labyrinthine to be threaded by reason; fear that the senses are too feeble and the intellect too frail; fear that memory fades, even between adjacent steps of a mathematical demonstration; fear that authority and convention blind; fear that God may keep secrets or demons deceive.”

Daston & Galison (2007, p. 372)

Introduction

The “problem of demarcation,” which concerns how one distinguishes, or should distinguish, between scientific and (diverse forms of) non-scientific endeavors, certainly counts among the most recurrent and vexing issues in philosophy of science. Even if it is as old as the field itself—different sources trace it back to different origins, being in Aristotle or, a bit later, in Popper—and despite the fact that it has attracted a large amount of attention and energy over the years, the current doxa has it that the problem has not yet received a clear solution. There appears to be an obvious reason for this: science is an extremely complex thing that is as internally heterogeneous as it is constantly changing and reshaping over time, in addition to being highly permeable to external influences of a cultural, sociological, or even ideological nature. Accordingly, it proves very challenging, if not perhaps simply impossible, to precisely pinpoint the very defining features that would allow a line to be unambiguously drawn between what counts and does not count as scientific.

Although this may appear to be a bleak diagnosis, there is room for optimism. Moving beyond the influential attempt to recast the entire problem as a pseudo-problem not worthy of philosophical scrutiny (Laudan 1983), progress has recently been made, if not in solving the problem itself, then at least in mapping the conceptual spaces on both sides of the demarcation, to the effect that we now have a better view of what exactly is at stake (and why the problem is so difficult to solve, if it can be at all). While some lines of research have emphasized the sociological (e.g., Longino 1990) or psychological (e.g., Shadish & Fuller 1994) aspects of science that may be exploited to demarcate it from non-science, most efforts have concentrated on some of its (supposedly typical) epistemological characteristics. In this line of research, and after having mostly converged on the idea that mono-criterial approaches (e.g., Popper 1962; Lakatos 1970; Kuhn 1974) are too rigid to plausibly delineate science in all of its internal and historical variations, multi-criterial strategies have recently emerged (e.g., Kitcher 1982; Mahner 2007) that have attracted new venues of investigation (Fernandez-Beanato 2020). Even though these approaches obviously diverge from author to author in their minute details, they share the advantage of having a very high degree of flexibility in being able to deal with most of the borderline cases that classic, mono-criterial approaches have failed to handle.

The present paper is meant to serve as a novel contribution to this perennial endeavor of demarcating, from a primarily epistemological point of view, science from (diverse forms of) non-science. As will become clear, this proposal is novel in the sense that, contrary to the aforementioned families of approaches, it does not in itself ultimately amount to an exercise of philosophy of science, drawing inspiration from insights by (famous) philosophers of science relative to what would count as essential ingredients of archetypal science (e.g., refutability, cumulative progress, fecundity, reproducibility, or systematicity). Rather, it initially takes the side road of exploiting recent epistemological tools to enable a fresh look at the problem of demarcation. As such, the present paper is (for now) a stand-alone piece that intends to pave the way to further connections between the fields of epistemology and philosophy of science, which have, at least when it comes to the demarcation problem, rarely—and quite oddly to be frank—been put into constructive contact.

In a nutshell, this paper primarily seeks to exploit the rich resources of a recent contender in epistemology, viz., the contextualist take on knowledge attributions, in the context of the

demarcation problem. Such an endeavor is by no means gratuitous. It naturally arises from the recognition that epistemological contextualism is tailor-made for addressing issues that plague most attempts at solving the demarcation problem. As such, it constitutes a welcome reservoir of tools for developing a new line of investigation that, given the preliminary results emphasized here, certainly deserves further attention from philosophers of science.

That said, this paper has the following structure. Assuming that science is first and foremost in the business of producing knowledge (Section 1), I first frame three general challenges that any knowledge-based demarcation should meet, that is, the skeptical (Section 2.1), triviality (Section 2.2), and mimicry (Section 2.3) challenges. I then present the core tenets of epistemological contextualism (Section 3.1), describe the insightful manner in which it meets the skeptical challenge (Section 3.2), and finally settle on a recent, operational account of the view, namely, “presuppositional epistemic contextualism” (Section 3.3). With this tool at hand, I will then be in a position to indicate how science may be construed as a distinctive endeavor in terms of the way in which it produces knowledge (Section 4.1). By adopting a contextualist perspective with respect to the triviality and mimicry challenges, I ultimately show how science may be demarcated from other knowledge-producing activities (Section 4.2), as well as from various forms of pseudoscience (Section 4.3), hence paving the way toward a novel solution to the demarcation problem.

1. Science as a “community of knowledge”

As a point of departure, focusing on the very core of the epistemological aspect of science, let us consider science—singular, such that the entire field is abstracted from any particular discipline—as being primarily a matter of *knowledge*. This is certainly a very basic common denominator across scientific fields that scientists and laymen alike would be ready to concede. In accordance with its very etymology—from the Latin *scientia* (“the knowledge of things”)—science aims to produce knowledge, be it about the natural world (e.g., astrophysics, organic chemistry, or entomology), about human beings (e.g., cognitive psychology or anthropology), about our social lives (e.g., sociology or economics), or about our constructs, artifactual (e.g., engineering) or cultural (e.g., religious or art studies).

In and of itself, the fact that science is a knowledge-based activity is hardly a useful lever to demarcate science from non-scientific activities. For one thing, there are many existing human endeavors that we would be prone to consider as producing knowledge without conceiving of them as instances of science. Without question, our lives as cognitive beings trying to cope with our environment are literally full of moments of rational inquiry that aim at getting some facts right, or as right as possible, without entering into the difficult business of doing science. Humans are continually mundanely looking for their missing keys, trying to figure out who just robbed a bank, investigating political corruption, or attempting to determine whether other human beings are fond of them. All of these “fact-finding activities” (Hansson 2018), while certainly engaging in some sort of knowledge production, are not intuitively counted among those highly specialized scientific disciplines that constitute together, at their very core, a *distinctive* “community of knowledge” (Hansson 2013).

Although the production of knowledge is not a sufficient condition for science, considering it a necessary one already allows the elimination of some non-scientific endeavors—those that do not (intend to) produce knowledge—from the territory of human scientific activities. In particular, and to mention here but a few, activities based on entertainment (cinema), performance (sport), faith (religion), creativity (music), or power (military) will be, from the very outset, on the other side of the demarcation with respect to their knowledge-based scientific counterparts (cinema studies, sport science, religious studies, musicology, and military science, respectively).

That said, it is indeed surprising that attempts in the philosophy of science literature at addressing the problem of demarcation from such a knowledge-based starting point are rare. More common are proposals based on weaker surrogates such as “epistemically warranted beliefs” or “reliability” (Fuller 1985; Hansson 2013). I suspect such proposals are motivated by a willingness to avoid having to dive into the muddled waters of the theory of knowledge. However, because

this is precisely, to some extent, what I plan do to in this paper, these types of precautions are not necessary here.

2. The challenges of a knowledge-based demarcation

Demarcating science from other non-scientific endeavors from a knowledge-based perspective requires addressing a number of challenges, the successive completion of which will allow some specific features of *scientific* knowledge to be pinpointed. These challenges are presented in this section. In subsequent sections, it will be shown how a contextualist take on knowledge allows these challenges to be addressed.

2.1. The skeptical challenge

The first challenge that needs to be addressed is the *skeptical problem*. In brief, this challenge is about vindicating the claim that knowledge is *possible*. Addressing this problem is obviously a prerequisite step for a knowledge-based demarcation to even get off the ground, by making it possible to distinguish between those endeavors that produce knowledge (including science) and those that simply do not¹. The skeptical problem is certainly as old as epistemology itself, and it is quite standard nowadays to distinguish between different epistemological views (including, as we will see shortly, contextualism) in terms of how they deal with this central problem.

Here is a canonical way to frame the problem. Consider p as being a very basic claim whose truth is not very controversial, such as, to borrow a traditional example, “I have two hands.” Let us then consider q as being, by contrast, an outlandish claim whose falsity (or truth) cannot really be ascertained, such as, again in the spirit of paying tribute to a common usage, “I am a brain in a vat.” p and q are such that $p \rightarrow \text{non-}q$ or, equivalently, $q \rightarrow \text{non-}p$. If I have two hands, I am not a brain in a vat. And, if I am a brain in a vat, I do not have two hands. This being settled, the skeptical problem can be rendered vivid through the following (apparent) paradox, taking the form of three claims that all seem true in spite of their being mutually inconsistent.

[common-sense claim] I know that p .

[closure claim] If I know that p , I know that $\text{non-}q$.

[skeptical claim] I do not know that $\text{non-}q$.

It certainly seems true that I know that I have two hands (I am actually using them both to type these words on my keyboard). It certainly seems true that I do not know that I am not a brain in a vat (for such a possibility has been carefully designed in such a way that no evidence to the contrary will ever be available to me). And it certainly seems true that, if I know that I have two hands, then I must know that I am not a brain in a vat (for the very fact that I have two hands entails that I am not a brain in a vat). The issue is that these three claims cannot all be true despite the fact that they all really *seem* to be true.

The conceptual space of knowledge can be roughly mapped with respect to the one of these three claims that we are ready to discard. Epistemologists with a skeptical affinity will deny the common-sense claim, to the effect that no knowledge of anything is ever attainable (Unger 1975). By contrast, “common-sense” epistemologists will prefer the common-sense claim over the skeptical one, arguing that the former is more reasonable than the latter (Moore 1939). And finally, different theories of knowledge are articulated around a rejection of closure, leading to the (perhaps) surprising result that knowledge of certain things is possible in spite of the fact that it is held as true that we do not know that we are not all brains in vats (see, e.g., the counterfactual theory of knowledge in Nozick 1981).

¹ Note that knowledge will only be considered here as “first-order knowledge,” that is, knowledge of worldly things, broadly conceived. Hence, endeavors that fall short of producing this type of knowledge (for instance—and perhaps—philosophy itself; Beebe 2018) and/or that produce “second-order knowledge” (that is, knowledge about putative “items” of knowledge such as views, beliefs, and theories) will *ipso facto* be considered non-scientific.

As shown in Section 3.2, epistemological contextualism actually takes another path to securing the possibility of knowledge by keeping the three claims (mostly) untouched². The very fact that, under the perspective of contextualism, knowledge is possible—as encoded into the common-sense claim—even though not *any* type of knowledge actually is—as the skeptical claim indicates—will be a key component in securing an important tenet of scientific knowledge, to which philosophers of science are usually committed nowadays, namely, that scientific knowledge is intrinsically *fallible*.

2.2. The triviality challenge

Supposing for the moment that the skeptical challenge can be dealt with (in a non-skeptical way), to the effect that knowledge actually is possible, all that this indicates for the time being is that some dividing line *might* be drawn between knowledge-producing and non-knowledge-producing activities. However, as touched on above, science certainly does not have a monopoly on knowledge insofar as other fact-finding endeavors may also rightfully claim to yield knowledge. Common sense certainly counts among such endeavors; in spite of the fact that the statement “I know that I have two hands” may be true, we would certainly not consider it to be scientific.

This immediately suggests a second challenge that faces any knowledge-based demarcation between science and non-science. Under the *triviality challenge*, it is incumbent on the proposal that it allow for distinguishing between scientific and non-scientific knowledge. More particularly, along the line of the linguistic intuition we have that scientific knowledge, if existing at all, is somewhat refined, precise, or sophisticated, it matters that our solution to the demarcation problem does not trivialize scientific knowledge by conflating it with any other type of knowledge, including common sense or mundane knowledge. It is certainly not complacent to conceive of scientific knowledge as some type of “elite knowledge,” insofar as, at least at present, most of what intuitively counts as proper instances of it—say, that black holes radiate entropy or that continents drift—requires a degree of convergence of cognitive and instrumental effort, most of the time spanning several years or decades of group inquiry, that does not have any comparable counterpart in any other knowledge-producing activity.

2.3. The mimicry challenge

Of course, supposing that scientific knowledge exists in a way that can be distinguished from non-scientific knowledge cannot constitute the entire story. It would be far off target to consider that any solution to the demarcation problem that simply allows for drawing a line between science and, say, common sense and journalism, could do the trick. To be sure, one of the initial *raison d'être* of the demarcation problem since its inception has been to separate science from those activities that falsely *pretend* to be science, *viz.*, pseudosciences. Accordingly, the solution that I offer here should manage to meet what may be dubbed the *mimicry challenge*, *i.e.*, the challenge of providing a means to demarcate genuine science (*e.g.*, particle physics, zoology, or social psychology) from its poor ersatz (*e.g.*, radiesthesia or astrology) in terms related to the ways in which these disciplines produce knowledge.

Note that, as such, any proposal—including the one put forward in this paper—that meets both the triviality and mimicry challenges, by first demarcating science from non-science and then separating genuine science from pseudoscience, will somehow manage to kill two birds with one stone. Following Boudry (2013), it will indeed amount to solving both the problems of “territorial”

² Actually, the closure claim will be considered as true only under certain conditions, *i.e.*, when “context” is actually held fixed, hence the expression “mostly” in parentheses.

and “normative” demarcation, being tied to the place that science occupies within human knowledge and to what distinguishes between genuine and false knowledge, respectively³.

Given the above exposition of what a solution to the demarcation problem should look like, the contextualist take on knowledge can be introduced and one of its most interesting features highlighted, namely, the way in which it elegantly overcomes the skeptical challenge. The way in which a particular version of contextualism allows for the challenges of triviality and mimicry to be met, and as such constitutes the basis for a novel solution to the demarcation problem, is addressed in Section 4.

3. Epistemological contextualism

3.1. Context and knowledge attributions

Even though one can find early roots of epistemological contextualism (EC) in the second half of the 20th century, the full articulation of this view is relatively recent (Cohen 1988; Lewis 1996). In a nutshell, at least in its semantic—rather than inferential (Pritchard 2002)—version that I focus on here, EC is a view according to which, in contrast with the opposite view of invariantism, knowledge attributions do not express complete propositions in themselves. Rather, it is only with respect to given contexts, which fix more or less stringent truth conditions on these attributions, that they express complete propositions susceptible to being ascribed truth values. As such, EC considers the verb “to know” as context-sensitive, on the same model as indexical words such as “tall,” “flat,” or “everyone,” which (perhaps controversially) do not have a fixed meaning outside of a given context of utterance.

Let us consider, as a way of illustration, the sentence “The Earth is spherical.” It could be argued that this sentence fails to express a proposition in and of itself—and hence fails to have a definite truth value—without further specification concerning the context of utterance. In the mundane context of everyday conversation, where the standards of application of the predicate “spherical” are rather lax, one can reasonably consider this sentence as expressing a true proposition. However, in the context of, say, a professional geophysics conference, where the norms of usage of predicates pertaining to the geometrical form of planets are far more stringent, this sentence may express a blatantly false proposition, for there is *in this context* a significant difference to be made between a sphere and an irregularly shaped ellipsoid. As can be appreciated via this mundane illustration, “context” acts as an umbrella term that covers a wide range of so-called “contextual” factors that may influence the meaning and truth value of statements, factors that include stakes, practical goals, interests, or, as I will insist upon later in this paper, the salience of possibilities of error.

It is the core feature of EC that the context-sensitivity of sentences such as “I am currently writing this paper” (which expresses a true proposition in my present context and a different, false proposition in yours), as well as, as we just saw, “the Earth is spherical,” is similarly at play in knowledge attributions taking the generic form of “*x* knows that *p*.” To put it differently, EC considers “knows” as a linguistic expression whose meaning is, as in the case of “tall,” “spherical,” or “currently,” partly fixed by contextual factors.

A canonical example in support of such an idea is one that contrasts both the following scenarios relative to a common epistemic situation (inspired by DeRose (1992)’s initial formulation, but here taken from Blome-Tillmann (2014):

- (i) Hannah and her wife Sarah are driving home on a Friday afternoon. They plan to stop at the bank on the way home to deposit their paychecks. It is not important that they do so, as they have no

³ Note that the solution proposed in this paper will not be applied to what could have been dubbed the “error challenge,” which concerns demarcating between genuine science and “bad” science, which is understood, not as pseudoscience, but as the exercise of fraud, mistakes, shortcomings, or other deviant behaviors that may occur *within* science itself. Tackling this issue will have to wait for another occasion.

impending bills. But as they drive past the bank, they notice that the lines inside are very long, as they often are on Friday afternoons. Realizing that it isn't very important that their paychecks are deposited right away, Hannah says "I know the bank will be open tomorrow, since I was there just two weeks ago on Saturday morning. So we can deposit our paychecks tomorrow morning."

(ii) Hannah and her wife Sarah are driving home on a Friday afternoon. They plan to stop at the bank on the way home to deposit their paychecks. Since they have an impending bill coming due, and very little in their account, it is very important that they deposit their paychecks by Saturday. Hannah notes that she was in the bank two weeks before on a Saturday morning, and it was open. But, as Sarah points out, banks do change their hours. Hannah says "I guess you're right. I don't know that the bank will be open tomorrow." (p. 12)

In the face of these scenarios and in contrast with what epistemological invariantism would hold, EC proponents are committed to the idea that, in spite of her being in exactly the same epistemic situation—for she formulates her knowledge attributions based on the very same evidential basis—Hannah speaks truly in both situations. In scenario (i), she is indeed right to say she knows the bank will be open because the stakes are low and do not put much pressure on the truth conditions of her claim. But Hannah is also right to claim that she does not know the bank will be open tomorrow in (ii) because, in this scenario, the high-stakes context forces her to take very seriously the possibility that the bank will not in fact be open (a fact that Sarah incidentally renders explicitly vivid in her mind).

On the model of this canonical illustration, EC takes it as its core tenet that knowledge attributions cannot be given any truth value (nor any meaning for that matter) outside of a given context that partly fixes their truth conditions, which can be, as we just saw, more or less lax or stringent.

3.2. Contextualism and the skeptical challenge

In Section 2.1, the skeptical challenge was framed by rendering vivid the fact that the following set of statements is inconsistent (with p standing for "I have two hands" and q standing for "I am a brain in a vat").

[common-sense claim] I know that p .

[closure claim] If I know that p , I know that non- q .

[skeptical claim] I do not know that non- q .

Given what has just been said of EC, it should now be clear how this view manages to escape this apparent paradox. In a nutshell, it does so in exactly the same way that it reconciles the apparently contradictory knowledge claims made by Hannah on her way to the bank in both scenarios (i) and (ii). Between these two scenarios, there is indeed a shift in the relevant context and therefore in the stringency of the truth conditions under which the knowledge claims can actually be said to be true or false.

In a first context—e.g., a mundane, everyday context—it is certainly perfectly legitimate to consider as true that I know that I have two hands, given the low stakes involved or the fact that the possibilities that I may be wrong about this are more than far-fetched. But in more stringent contexts, say in an epistemology seminar where the teacher—Sarah again in this case—consistently draws attention to (quite paranoid) possibilities that humans are perhaps brains in vats or are constantly deceived in what they justifiably believe by an almighty evil genius, it also appears as true that I do not know *anything at all* (and, in particular, I do not know that I am not a brain in a vat). In this type of skeptical context indeed, the truth conditions of any knowledge attribution are simply too stringent for these attributions to ever be true⁴. The core difference between the two contexts envisioned here, the mundane and skeptical ones, lies in the presence of (the contextual factor) Sarah, who consistently draws attention to—or more rightly, as shown in

⁴ Such an observation is what led Lewis (1996) to conclude that epistemology, being such a context, "destroys" knowledge (not *tout court*, but within the bounds of such a specific context that is epistemology; see DeRose 2000).

Section 3.3, forces us to take seriously—possibilities that are relevant in the latter but are totally out of place in the former.

That said, one may recast the skeptical challenge by rendering vivid the implicit *shift in context* that occurs therein according to EC, by using the subscripts “m” and “s” to specify the contexts within which the different occurrences of “know” need to be considered (“m” standing for “mundane” and “s” for “skeptical”).

[common-sense claim] I know_m that *p*.

[closure claim] If I know_m that *p*, I know_s that non-*q*.

[skeptical claim] I do not know_s that non-*q*.

In this form, while both the common-sense and skeptical claims can be held as true, the apparent inconsistency disappears because closure, given the contextual shift between the antecedent and consequent, is simply false (but would have been true if the context had been held fixed, in line with what is intuitively expected). EC therefore holds, as other “relevant alternative” theories of knowledge, that one can be perfectly entitled to know some things without ever being able to know that we do not actually live in skeptical scenarios (those which epistemologists make their living pondering).

Of course, such a resolution of the skeptical challenge requires that EC come up with an error theory that accounts for the fact that we intuitively tend to consider such a challenge as paradoxical even though it actually is not. While there is certainly more to say about this (see, e.g., Blome-Tillmann 2008), it is enough for the purpose of the present paper to resort to Lewis’ own contention that we human beings are simply unaware of possible contextual shifts that are relevant to correctly assessing knowledge attributions, a fact that may incidentally explain, as shown in Section 4.2, why we tend to have difficulties in clearly pinpointing a demarcation between scientific and non-scientific knowledge claims.

3.3. Amended Lewis-style contextualism and the possibilities of being wrong

Now that EC has been broadly characterized and motivated, it is time to delineate an operational account of this view to apply it to the demarcation problem as it has been globally framed in Sections 1 and 2. A good point of departure is Lewis’ own initial approach that ties the semantics of knowledge to the way in which one’s evidence manages to eliminate relevant counterpossibilities (Lewis 1996). In brief, Lewis’ view is that “*x* knows_C that *p*” if and only if *x*’s evidence allows for eliminating all the $\neg p$ -worlds that cannot be properly ignored in C⁵. Such a view is augmented by what Lewis takes to be (contextualist) epistemology’s main target, namely, a set of rules that specify which $\neg p$ -worlds are deemed relevant—i.e., those that *x* cannot “properly ignore” and must therefore eliminate thanks to her evidence—in a given context. One of these rules, the “Rule of Attention,” is of particular interest here. It specifies that a $\neg p$ -world that is “attended to” by *x* in C is *ipso facto* relevant and cannot be properly ignored in C. In Lewis’ own phrasing (1996, p. 559): “No matter how far-fetched a certain possibility may be, no matter how properly we might have ignored it in some other context, if in *this* context we are not in fact ignoring it but attending to it, then for us now it is a relevant alternative.”

Consider again Hannah and Sarah on their way to the bank. According to Lewis’ account that I have just sketched, Hannah’s knowledge claims come out as true in both scenarios (i) and (ii). In the former context but not in the latter, the counterpossibility that the bank will be closed on Saturday can indeed be properly ignored (and so, *per impossibile*, does not have to be eliminated by Hannah’s evidence for her claim to be true), for—among other things—it is not attended to without Sarah rendering it salient (“You know, banks do change their hours.”). Lewis’ view similarly applies to the skeptical challenge, where the counterpossibility that we are all brains in vats cannot be properly ignored (nor of course eliminated by anyone’s evidence) only in those skeptical contexts in which it is attended to (often thanks to a diligent epistemology teacher).

⁵ Sticking to the previous convention, “knows_C” indicates “knows in context C.”

This last point renders vivid what has been rightfully criticized as one of the main flaws in Lewis' account of EC (see, e.g., Bach 2005), namely, that it might render knowledge highly unstable, if not merely impossible to reach, because any casual mention of a far-fetched skeptical counterpossibility is sufficient to satisfy the Rule of Attention and, therefore, to “destroy” knowledge. If you are right in claiming now that you know_m that you have two hands, just attend an epistemology class (or have a five-minute discussion with a friend who has), and you will immediately switch to a new context in which you can no longer properly ignore the counterpossibility that you are a brain in a vat (a counterpossibility that your evidence cannot, of course, eliminate), to the effect that you do not know_s that you have two hands. If this turns out to be the case—and Lewis' theory seems to entail it—then epistemology would be very harmful indeed, especially for those people—scientists among many others—who are willing to seriously engage in (stable) knowledge-producing activities⁶.

Optimistically, ways to overcome this problem have recently been developed. In his *Knowledge and Presuppositions* (2014), Blome-Tillmann proposes replacing Lewis' very permissive idea that one cannot properly ignore what one simply attends to with the following more restrictive principle: *x* cannot properly ignore a $\neg p$ -world as soon as *x* is not only attending to it but also, and more importantly, “taking it seriously.” More particularly, the idea that relevant counterpossibilities are those that are “taken seriously” is formally captured via Stalnaker's notion of “pragmatic presuppositions”: a given $\neg p$ -world cannot be properly ignored (and hence must be eliminated by *x*'s evidence for *x* to truthfully claim that she knows that *p*) if and only if it is compatible with *x*'s pragmatic presuppositions, that is (roughly speaking), if and only if the counterpossibility in question is consistent with what *x* takes to be globally accepted—often implicitly and perhaps subconsciously—given the context⁷. In its “simple” version, Blome-Tillmann's presuppositional epistemic contextualism (hereafter PEC) is then the following (p. 34):

“*x* satisfies ‘knows *p*’ in context *C* $\rightarrow$ *x*'s evidence eliminates all $\neg p$ -worlds that are compatible with what is pragmatically presupposed in *C*.”

This is the version of EC that I now bring back to philosophy of science to shed new light on the demarcation problem⁸.

4. A contextualist solution to the demarcation problem

Now that both our hammer—Blome-Tillmann's simple version of PEC—and our nail—a knowledge-based demarcation between science and non-science—are in place, time is ripe to do some construction work. After describing the general view that emerges when epistemological contextualism encounters the demarcation problem, namely, that what makes science *science* is

⁶ The very fact that I added the “m” and “s” subscripts here already points toward what could have been Lewis' response to this caveat, namely, that knowledge is never “destroyed” or impossible *as such*, but is only “destroyed” in contexts that we may easily dismiss as too paranoiac. Independent of whether Lewis himself would agree with such a response, it remains that his initial account makes any counterpossibility, however far-fetched, too easy to suddenly become relevant (and hence force a shift in context).

⁷ Following Blome-Tillmann (2014, p. 26 and p. 23), a finer-grained analysis of this idea is as follows: *x* pragmatically presupposes *p* in *C* if and only if *x* is disposed to behave, in her use of language, as if she believes *p* to be common ground in *C*, and *p* is common ground in a group *G* if and only if all members accept (for the purpose of the conversation) that *p*, and all believe that everyone accepts that *p*, and all believe that everyone believes that all accept that *p*, etc.

⁸ Some side remarks: (i) PEC is, as such, a meta-theory of knowledge. It does not consist *per se* of a thorough analysis of what knowledge is or is supposed to be and is actually consistent with many (first-order) theories of knowledge. (ii) Although I am mostly interested here in the Rule of Attention and one of its recent amendments, other rules are active and implicit in (P)EC; however, these rules will not be discussed here. (iii) Although PEC is a factive (meta)theory, it does not make truth a necessary condition for knowledge, a feature that makes it amenable to a fallibilist take on science.

first and foremost that science is a very specific *context* for judging knowledge attributions, I show in the subsequent sections how PEC allows for the triviality and mimicry challenges to be solved, hence paving the way for a novel solution to the demarcation problem.

4.1. Scientific knowledge is a matter of context

As touched on in Section 1, any knowledge-based demarcation takes it as a point of departure that science is at its very roots—and to borrow again from Hansson’s terminology—a distinctive “community of knowledge.” Capturing such an idea from the contextualist perspective introduced in Section 3.3 essentially amounts to adopting a double line of thought. First, what makes science a *community* of knowledge is intimately related to the fact that scientists as a social group share common pragmatic presuppositions. These presuppositions are what fixes the relevant counterpossibilities that scientists have to eliminate for their claims to count as knowledge, on the basis of the evidence they have managed to gather up to a given point in time. Second, what makes such a community *distinctive* is that these pragmatic presuppositions are of a particularly strict and narrow nature, to the effect that a plethora of counterpossibilities to any knowledge claim are to be taken seriously or, equivalently, deemed relevant to face elimination by the evidence.

This double idea translates into the view that *science is first and foremost an epistemological context*, which has the peculiarity of coming with a very high degree of stringency with respect to the truth conditions of the knowledge attributions that are produced therein. Given this perspective, science is therefore the knowledge-producing activity that envisions or “takes seriously” the largest set of possibilities of errors and takes as its core business to methodically eliminate these. As such and at a very high level of generality, science is a context more stringent than that of everyday conversation—you can know_m that the Earth is spherical without knowing_{sc} that it is spherical—but less stringent than epistemology or skepticism—for you can know_{sc} that continents drift without actually knowing_s that they do⁹.

Note that considering scientificity as essentially being tied to a matter of context fixes the *locus* of demarcation on a different epistemological unit than where it is typically thought to apply. Under the contextualist perspective embraced here, it makes no sense to consider *statements*—e.g., “the Earth is flat”—as being scientific or non-scientific. The same goes for *theories* and *models* (or *series* of theories and models). As shown more clearly in Section 4.3, something like “flat-Earth theory” (if there is a sense in thinking that there is such a thing) is not scientific or pseudoscientific *per se*. Within a scientific context, it simply does not constitute knowledge at all (or it fails to produce true knowledge attributions) because it fails to eliminate a large number of counterpossibilities (including the one in which the Earth is an irregularly shaped ellipsoid) that cannot be ignored (for they have to be “taken seriously” within this context because they are consistent with the pragmatic presuppositions that are globally shared therein). It is only with respect to a laxer context, which one is then entitled to dub “pseudoscientific,” that “flat Earth theory” could controversially be considered as producing true knowledge claims, for *within this laxer context* some counterpossibilities that the evidence cannot eliminate are (illegitimately) ignored¹⁰. As such, pseudoscientists simply do not live up to the standards of the context they claim to operate within. Accordingly and by extension, the epithet “scientific” can also be indirectly applied to an epistemic *attitude*, which consists in paying attention to, or taking seriously, possibilities of error that have been identified by the corresponding community of knowledge.

That said, let us now turn to the way in which PEC allows for accommodating the triviality and mimicry challenges, taking for granted the fact that, as previously indicated in Section 3.2, it already circumvents the skeptical challenge by securing, through a relaxing of the closure condition, the very possibility of knowledge.

⁹ Here, the subscript “sc” indicates “scientific.”

¹⁰ As a result, and as I argue in Section 3.3, no knowledge, even contextual, is actually produced in such deficient contexts.

4.2. Scientific knowledge vs. the triviality challenge

As a reminder, the triviality challenge involves making sense of the intuition that science is a somewhat refined or sophisticated cognitive enterprise, which should not be too easily conflated with other knowledge-producing activities (without pretending that science and these activities do not have epistemological features in common). As such, the triviality challenge concerns drawing a line between scientific and non-scientific forms of knowledge.

It turns out that PEC does have the resources to meet this challenge, by providing (coarse-grained and relative) metrics of the degree of “sophistication” of a given knowledge-producing endeavor, in light of which science can be said to score particularly high. From the viewpoint of PEC, a dividing line can indeed be drawn between knowledge-producing activities in terms of the degree of stringency of the context under which they operate. Even though some contextual factors can be difficult to compare, the one that principally matters here, *i.e.*, sensitivity to the possibility of error, is in principle amenable to such a comparison, at least in a coarse-grained way. Distinguishing between scientific and non-scientific contexts can actually be achieved through an ordering relationship between the sets of the counterpossibilities of knowledge attributions that cannot be properly ignored, that is, those that clash with what is pragmatically presupposed in the context under appreciation. In a nutshell, a given context C_1 will be more sophisticated than a context C_2 if, in C_1 , one cannot properly ignore counterpossibilities that (are analogous to counterpossibilities that) can be properly ignored in C_2 .

To illustrate this line of thought, let us consider three contexts to see how they can be ordered in terms of such a construal of the idea of “sophistication.”

(i) *Low stringency*. Hannah casually asks her friend Sarah what time it is. Sarah looks at her watch and readily responds, “It is 10:15 a.m.” Hannah thinks, “I know that it is 10:15 a.m.”

(ii) *Medium stringency*. Hannah, who has been called to act as a juror on a murder trial, listens to the prosecutor (Sarah)’s main argument. “Our witness, who is—as I may remind you—the victim’s spouse, has declared having heard a gunshot at 10:15 a.m., which is compatible with the victim’s time of death as established by the coroner. This testimony is backed up by the recordings of the surveillance cameras, which clearly show the defendant entering the premises at 10:12 a.m. and then quickly leaving at 10:20 a.m. In addition, the fingerprints on the gun later found by the police next to the body explicitly incriminate the defendant. I rest my case.” Hannah then thinks, “I know that the murder took place at 10:15 a.m.”

(iii) *High stringency*. Hannah, who is a nuclear physicist at the International Bureau of Weights and Measures in Paris, is part of the team of scientists responsible for calculating the (real-time) Coordinated Universal Time (UTC)¹¹. She and her team determine UTC time by calculating a weighted average (with respect to the known performances of clocks) of all of the contributions coming from more than 80 “timing labs” around the world, based on their own atomic clocks or other types of standards (be they cesium clocks, hydrogen masers, or other devices exploiting the properties of rubidium, ytterbium, or strontium). These contributions are synchronized via Global Positioning System signaling using an international network of satellites having their own atomic clocks on board. While performing her daily duties, Hannah has a look at the “Master Clock” that keeps track of the result of all of this machinery and she sees it indicating that it is 10:15:00 (a.m.). She thinks, “I know that it is 10:15 a.m.”

In each of these three scenarios, a case can be made that Hannah’s knowledge claims are true. In case (i)—the mundane context—she can certainly be entitled to know_m that it is 10:15 a.m., provided that her evidence allows her to eliminate some relevant counterpossibilities (say, that it is actually 10:30 a.m. and that Sarah’s watch is broken without her noticing it). Obviously, in such a context, Hannah does not have to engage in the difficult and useless business of eliminating possibilities of error that she is fully entitled *not* to take seriously, for example, that it is 10:45 a.m. and Sarah, who is a dear friend, is voluntarily lying to her, or that it is actually 10:15:23 (a.m.), a

¹¹ The procedure described here for calculating an international standard of time is not entirely faithful to what is actually the case. However, because the procedure has been simplified for the sake of exposition, it only strengthens the point being made.

time that Sarah's watch cannot reflect because it is a simple mechanical clock that is physically incapable of tracking UTC time.

In scenario (ii)—the “criminal case” context (with the corresponding subscript “c”)—Hannah is also entitled to know_c that the murder took place at 10:15 a.m. Relevant counterpossibilities have indeed been accounted for by what appears to be a thorough investigation. Because, in this context, it is consistent with the pragmatic presuppositions that the witness, who may have an interest in the victim's death, may lie or be imprecise about the exact timing of the gunshot—the timing of which crucially matters here—such a possibility has to be accounted for and readily eliminated (for example, given the camera recordings combined with the fact that the person seen in the recordings is the one who apparently carried the gun last). As is already apparent at this point, knowing_c is more demanding—or associated with a more sophisticated context—than knowing_m because the former can only be obtained if counterpossibilities have been considered and duly eliminated (e.g., the witness is lying) that did not need to be taken seriously in the latter, mundane context (where the witness is a dear friend and there is no clear reason why she would lie). Of course, even in this more stringent context, some counterpossibilities can again be properly ignored, for example, the one involving the lack of perfect synchronicity between the witness' watch and the precise UTC time (which is such that no evidence whatsoever could allow for eliminating the possibility that the murder actually took place at, say, 10:15:11 (a.m.)).

Of course, Hannah's knowledge_{sc} attribution is true in case (iii). What matters here for the purpose of mitigating the triviality challenge is that the entire machinery that underpins her claim has been carefully designed such that it tracks and eliminates many counterpossibilities that would have been properly ignored in the criminal, and *a fortiori*, mundane contexts. Consequently, it appears that a scientific context is “sophisticated” in such a way that it takes far less presuppositions as common ground in comparison with laxer, non-scientific contexts, to the effect that producing true knowledge claims becomes a more challenging task, namely, that of eliminating possibilities of error that need not be taken seriously elsewhere.

At this point, the following objection could possibly arise: the proposed solution to the triviality challenge unavoidably makes the demarcation between scientific and non-scientific forms of knowledge blurry rather than clear-cut. As a response, it could be argued that, as in the case of current multi-criterial approaches, the demarcation being blurry actually counts as an advantage of this view rather than one of its inherent flaws. It is indeed only by taking seriously the existence of a certain continuity between scientific and non-scientific forms of knowledge that side-stepping Laudan's deflationary stance becomes a plausible strategy. But more importantly, as encapsulated in Lewis' error theory that is part of (P)EC, human beings are simply not efficient at correctly tracking contextual shifts when it comes to evaluating knowledge attributions. It is then no wonder that we may have difficulty in appreciating exactly when and where we should start to consider our knowledge claims as being true or false under the conditions of a mundane, criminal, journalistic, or scientific context, especially when there are important overlaps or commonalities between them.

4.3. Scientific knowledge vs. the mimicry challenge

As we just saw, through the variation of the possible degrees of sophistication—understood as measures of the stringency of the truth conditions—of epistemic contexts, PEC offers a useful means for distinguishing between scientific and non-scientific activities that aim to produce knowledge. However, it can actually do more than that by addressing, in a novel way, the mimicry challenge, that is, the notoriously difficult task of demarcating science from *pseudoscience*.

From the outset, it is worth pointing out that “pseudoscience” is, as its name indicates, a relational concept. Its usage is indeed dependent on the very pre-existence of something called “science” (Hecht 2018). As such, pseudoscience only exists when and where there is an independently pre-established scientific context, partly delineated by communal pragmatic presuppositions.

In addition, note that “pseudoscience” is, as much as “science,” an umbrella term that encapsulates a wide variety of distinct activities or endeavors that evolve over time. This partly

explains why it is so difficult, if not merely out of reach, to clearly define what pseudoscience is. Yet, recent philosophical analyses of the notion (e.g., Hansson 2009, 2013) have rendered vivid the fact that both of the following interdependent tenets commonly underlie the vast array of forms and variations of pseudosciences.

- (i) Pseudosciences unwarrantedly pretend to be scientific. They (wrongly) claim to produce scientific knowledge (or a form of knowledge enjoying a comparable degree of legitimacy).
- (ii) Pseudosciences encapsulate “defense mechanisms” or “immunizing strategies” (Boudry & Braeckman 2011) that help them conceal the unwarranted nature of their pretension to be scientific.

Both of these ingredients, which capture the lowest common denominator of pseudosciences in all their diversity, are indicative of a general double-standard fallacy that can be reconfigured into the PEC perspective as follows.

- (i) *Context rigidification*—By claiming that they produce scientific (or science-like) knowledge, pseudoscientists themselves fix the stringency of the truth-conditions of their putative knowledge claims at a level of sophistication that is (similar to) that of science. In short, pseudoscientists operate, by their own admission, within a scientific context.
- (ii) *Immunization*—Through their usage of immunizing strategies, pseudoscientists ignore counterpossibilities that they should not properly ignore because these counterpossibilities are consistent with the pragmatic possibilities of their own (rigidified) context. And, of course, ignoring a relevant counterpossibility amounts to *not* eliminating it.

Accordingly, because they have set up standards of stringency that they cannot but fail to uphold, pseudoscientists simply do not produce knowledge at all.

Take again “flat Earth theory” (or the claim that “the Earth is flat”). As such, this is not a pseudoscientific (or scientific) theory (or claim) *per se*. It only becomes pseudoscientific *relative to* a pre-existing and particularly sophisticated scientific context that is so stringent that the “theory” can actually be defended *only* with the help of immunizing techniques whose usage is inconsistent with the pragmatic presuppositions of this very context. To put it differently, producing true knowledge claims from “flat Earth theory” would require distancing oneself from an established scientific context in which relevant counterpossibilities have already been tracked and identified, something that would *de facto* render the putative theory “unscientific.”

Again, it appears that being scientific or pseudoscientific is first and foremost a matter of context and, by extension, of attitude toward what is taken as common ground in a given context. Such a consequence of PEC as applied to the demarcation problem is actually in line with the idea that there is no pseudoscience as such, here under the form of a body of true knowledge_{psc} claims extracted from so-called pseudoscientific “theories.” Rather, pseudoscience is just what pseudoscientists—being people with a pseudoscientific attitude—do (Kitcher 2007), typically when they make use of “a persistent pattern of evasions and excuses” (Boudry 2022, p. 93) as soon as they are facing what the context within which they operate requires them to do, that is, *eliminate*—rather than ignore—relevant counterpossibilities.

The solution advanced here is also fully in line with a historically defensible approach concerning the tension between science and pseudoscience, for example, as advocated by Sober through his forceful warning against the “danger of anachronism” (1993). According to Sober, despite the fact that today’s phrenologists could legitimately be considered pseudoscientists, it is arguable that 19th-century phrenologists were genuine scientists. “Their ideas were false, but it is anachronistic to expect them to have known_{sc21} what we know_{sc21} now” (Sober 1993, p. 23; the subscript “sc21,” standing for “21st-century science,” is of course mine). Under the PEC perspective, it turns out that a case can be made, in line with Sober’s view, that 19th-century phrenologists did know_{sc19} things that they did not know_{sc21}. Relative to their own epistemic context (C_{sc19}) indeed, either they were able to eliminate counterpossibilities based on their evidential basis or they were allowed to properly ignore them and, as such, they acted as

scientists. However, relative to the current epistemic context (C_{sc21}), continuing to advocate phrenology requires adopting a pseudoscientific attitude of immunization against counterpossibilities that can *no longer* be properly ignored. Because scientists have successfully tracked and identified possibilities of being wrong between the 19th and 21st centuries, hence rendering C_{sc21} a more stringent context than C_{sc19} , it is no wonder that what was once a genuine knowledge_{sc19}-producing activity has not necessarily remained so *while remaining essentially the same*. Of course, the same line of reasoning applies to flat-Earth theory, alchemy, creationism, and the like, which are pseudoscientific nowadays relative to C_{sc21} .

Let us close this section by highlighting what certainly appears to be an intriguing irony, whose essence can again be interestingly captured via the PEC machinery. It is indeed a component of certain pseudoscientists' arsenal of rhetorical strategies to displace the charge of their own double-standard fallacy onto the shoulders of scientists themselves. Such a move is particularly striking when pseudoscientists resort to skeptical scenarios—those which epistemologists like to ponder—in order to (unwarrantedly) undermine scientific knowledge. Consider creationists, who claim that the devil has deceitfully planted false evidence in favor of evolutionary theory (Morris 1963), or defenders of alternative medicines, who claim that there is a massive cover up of contrary evidence by pharmaceutical companies (Oliver & Wood 2014). What these pseudoscientists commonly aim at is a rigidification of the scientific context into a skeptical one, similar to that previously discussed in Section 3.2, with respect to which no knowledge attribution can ever be true, for there is then no counterpossibility whatsoever—no matter how far-fetched or paranoid, on the model of the brain-in-a-vat hypothesis—that can be properly ignored. As it appears, such a strategy is nothing more than a deficient attempt at artificially narrowing the set of pragmatic presuppositions of the scientific community to raise the stringency of the truth conditions to a level that can only be found in an epistemology class, where knowledge_s—but of course not knowledge_{sc}—collapses. Such an observation should forcefully draw the attention of science defenders to Hansson's "third commandment" (out of a decalogue; Hansson 2020, p. 9): "[I]t is essential not to fall into the trap of accepting [self-defeating] infallibility as an ideal for science," which could only (but impossibly) be upheld by conceiving the task of science as being the methodic elimination of *all* counterpossibilities, including the ones that involve conspiracies or demons tinkering with the evidence. "Let your paranoid fantasies rip," Lewis (1996, p. 549) would say, "—CIA plots, hallucinogens in the tap water, conspiracies to deceive [...]—and soon you find that uneliminated possibilities of error are everywhere. Those possibilities of error are far-fetched, of course, but possibilities all the same. They bite into even our most everyday knowledge. We never have infallible knowledge," be it knowledge_m, knowledge_c, or even, of course, knowledge_{sc}.

Conclusions

I opened this paper with Daston and Galison's claim that the human pursuit of knowledge is a "history of intellectual fear, of errors anxiously anticipated and precautions taken" (2007, p. 372). Although, of course, some of these errors will forever be out of our reach (e.g., "God's secrets" or "demons' deceptions"), it is a defining feature of the entire enterprise, and science certainly is an important part of it in this respect, to identify and eliminate as much of these sources of error as possible, in the spirit of producing the most adequate discourse on reality. "Errors notoriously proliferate," Daston and Galison add (2007, p. 377), but "so do the strategies for blocking them." In this paper, I hope I have shown that a contextualist perspective on scientific knowledge pays tribute to this idea by including it as an essential part of the *definiens* of science and, as such, by exploiting it as a means to demarcate science from other types of discourse.

The main line of thought of this paper is indeed the following: in a very Popperian spirit, what makes science *science* intimately has to do with its relentless ruthlessness toward (relevant) possibilities of being wrong. As we have seen, it appears that science is a collective human endeavor that converges toward the elimination of the widest possible set of such possibilities of error, "widest" being understood as being consistent with the narrowest (though not empty) set of pragmatic presuppositions of the scientific community at a given time and place. Of course, the fact that science is an open-ended, dynamic, and changing human enterprise is here to be appreciated to its fullest extent: scientists' pragmatic presuppositions are not set in stone (as I think historians of science have convincingly shown), to the effect that what counts as scientific, non-scientific, or pseudoscientific irremediably varies from context to context, depending on the

counterpossibilities identified, taken seriously, and hence engrained in some rigidified, more sophisticated set of norms to evaluate putative knowledge attributions. As such, a contextualist take on scientific knowledge captures scientific progress only in a negative light. Science is not in the business of accumulating knowledge over time. Rather, what it does accumulate is relevant counterpossibilities, which make true knowledge attributions increasingly challenging—but also increasingly rewarding—to come by.

Science is not sport or cinema, for it has a claim to knowledge. Science is not common sense or journalism, for it has a claim to true knowledge attributions that are evaluated against stricter norms. Science is not radiesthesia or phrenology because it strives, at least in principle, not to disorderly shy away from the stringency of these norms. Finally, science is also not epistemology, for these norms, though strict, are still commensurate with our finite human condition.

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