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Loki's Wager and Laudan's Error

On Genuine and Territorial Demarcation

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Is the demarcation problem dead, or are the rumors of its demise greatly exaggerated? The answer depends on whom you ask. Some philosophers of science have voiced the opinion that the demarcation project has been something of an embarrassment to their discipline and that terms like "pseudoscience" and "nonscience" should be erased from our philosophical vocabulary, wedded as they are to a naïve conception of science and its borderlines. Nowadays philosophy of science has recovered somewhat from this backlash against demarcation. In the wake of a growing consensus that there is no silver bullet to separate science from nonscience, philosophers have shifted their attention to more sophisticated ways of characterizing science and distinguishing it from different shades of nonscience (Nickles 2006; Hansson 2008, 2009; Pigliucci 2010).

The major trouble with the demarcation project, as I argue in this chapter, is that it has traditionally been the banner of two distinct but often conflated intellectual projects, only one of which is pressing and worth pursuing. The genuine demarcation problem as I see it—the one with real teeth—deals with distinguishing bona fide science from pseudoscience. The second brand of demarcationism concerns the territorial boundaries separating science from such epistemic endeavors as philosophy, history, metaphysics, and even everyday reasoning.

I argue that the territorial problem has little epistemic import, suffers from

additional categorization problems, and consequently neither calls nor allows for anything more than a pragmatic and rough-and-ready solution. The normative demarcation project, by contrast, although it too has resisted a simple solution (i.e., a small set of necessary and sufficient conditions), is eminently worthy of philosophical attention, not only because it carries real epistemic import and practical urgency, but also because—fortunately—it happens to be a tractable problem. I discuss how both "demarcation" projects relate to one another and how they have often gotten mixed up. In particular, some have rashly proclaimed the death of the normative problem by performing an autopsy on the territorial problem (e.g., Laudan 1983), while others have tried to rescue the former by inadvertently resuscitating the latter (e.g., Pennock 2011).

Normative and Territorial Demarcation

To retrace the sources of confusion over the nature of the demarcation problem, it is instructive to go back to its most famous formulation. In his attempt to tackle the problem of induction, Popper initially introduced the principle of falsifiability as a neutral and territorial touchstone to separate science from other forms of knowledge. Thus, in the *Logic of Scientific Discovery* ([1959] 2002), originally published in German in 1934, he describes his falsifiability criterion as a way to distinguish "between the empirical sciences on the one hand, and mathematics and logic as well as 'metaphysical systems' on the other" (Popper [1959] 2002, 11). Obviously Popper does not dismiss logic and mathematics, but neither does he reject metaphysics outright. Indeed, he takes issue with the "derogatory evaluation" of metaphysics by the logical positivists, who famously equated it with meaningless twaddle.

In his later writings, however, the criterion of falsifiability takes on a more normative dimension. In *Conjectures and Refutations*, Popper ([1963] 2002) writes that he was troubled by the unfalsifiable character of psychoanalytic doctrines propounded by Sigmund Freud and Alfred Adler, and of certain versions of Marxist theory, comparing them unfavorably with the empirical boldness of Albert Einstein's theory of general relativity. But even so, Popper grants that psychoanalysis may contain valuable insights, even if it has not achieved scientific status (yet): "I personally do not doubt that much of what they say is of considerable importance, and may well play its part one day in a psychological science which is testable" (it isn't, and it didn't) (Popper [1963] 2002, 49).

Although falsificationism was initially framed in neutral and territorial terms, most of its proponents have followed the lead of the later Popper, wielding his yardstick to beat bad science and "pseudoscience" (an intrinsically pejorative term, Nickles 2006; see also Nickles, chapter 6, in this volume). This normative demarcation, like many other philosophical distinctions, does not yield to a simple solution (viz. one silver bullet to put an end to all nonsense), but as I argue below, that hardly means the problem is insoluble. Not only is the normative demarcation project alive and kicking (witness this volume), despite repeated assertions to the contrary, but Popper's virtue of empirical riskiness is still a key to solving the problem.

Still, what about Popper's territorial ambitions? The problem that initially puzzled him was how to distinguish science from domains of knowledge that, though valuable in their own right, belong to a different epistemic domain. What is the proper realm of science, and where exactly do we cross the border to philosophy or metaphysics, or even everyday reasoning? Territorial demarcation issues such as these, however, should be kept apart from the normative demarcation problem. Whereas territorial demarcation is concerned with a classification of knowledge, or a division of labor between different disciplines, and not with epistemic warrant per se (unless one holds that philosophy or metaphysics cannot offer knowledge at all), normative demarcation adjudicates between theories or practices we should rationally accept and those to which we should not grant any credence.

Even if the territorial borders are untraceable, as I think they are, this need not affect normative demarcation project. Before returning to the latter problem, let me gesture at some of the reasons why I think the territorial brand of demarcationism is philosophically sterile. On the one hand, there is often no way to disentangle philosophical elements from scientific theories and arguments. In philosophy, abstract reasoning and logic take the foreground, whereas in science, the emphasis is on empirical data and hypothesis testing. But scientific theories invariably rest upon certain philosophical underpinnings, and science without abstract reasoning and logical inferences is just stamp-collecting. As Daniel Dennett succinctly put it, "there is no such thing as philosophy-free science; there is only science whose philosophical baggage is taken on board without examination" (Dennett 1996, 21). On the other hand, good philosophical theories should be maximally informed by the relevant scientific knowledge and often derive support from scientific findings (philosophy of mind from neuroscience, philosophy of science from cognitive psychology and sociology, etc.).[1] In more and more contemporary philo-

sophical discussions, logical reasoning and empirical evidence are so inextricably intertwined as to make demarcation efforts pointless and unrewarding. In light of this entangled relation, philosophers in the tradition of naturalism, which has been gaining influence over the past decades, maintain that philosophy and science are cut from the same cloth (e.g., Laudan 1990; Haack 2007). This approach does not see one discipline as prior to or wholly distinct from the other, but considers both as interdependent and continuous.[2]

In a similar vein, naturalistic epistemologists have argued that science is continuous with everyday reasoning. Modern science is a highly complex and differentiated social endeavor, but the practice of hypothesis testing and ampliative reasoning underlying science is already apparent in everyday reasoning (e.g., tracking animals, fixing a car). None of the characteristic features of modern science—the use of sophisticated technical equipment, formalization and mathematical tools, the system of peer review and public presentations, the years of formal training and practice—detach scientific reasoning from everyday knowledge acquisition. The complex institutional organization and systematic methodology of science can be seen as a highly refined and sophisticated extension of everyday reasoning, reflecting a heightened awareness of human cognitive foibles and a preoccupation with difficult, cutting-edge questions of a more theoretical nature.

In sum, though it may certainly be convenient for pragmatic purposes to distinguish science from philosophy or everyday reasoning, (i) such territorial demarcation carries nothing like the epistemic weight attached to the demarcation between science and pseudoscience, and (ii) unlike the latter project, territorial demarcation is complicated by the problems of interdependence and continuity.

The Demarcation of What?

Even if territorial demarcation is fruitless, as I think it is, this does not affect the viability of the normative demarcation between science and pseudoscience. In his (in)famous obituary of "the" demarcation project, however, Larry Laudan conflates the two kinds of demarcation, dismissing the concept of pseudoscience by dwelling on complications pertaining to territorial demarcation. Laudan (1983, 118) starts off by describing the demarcation project as an effort to "identify those *epistemic* or *methodological* features which mark off science from other sorts of belief," suggesting a neutral distinction between types of beliefs. But he then challenges the demarcation criterion

of "well-testedness"—a clearly normative criterion—by listing several forms of knowledge that, although certainly well tested in his view, belong to "conventionally nonscientific fields" (Laudan 1983, 123) (e.g., singular historical claims, military strategies, literary theory, etc.). Laudan makes much of this perceived problem, and for the territorial demarcationist it may be troublesome indeed, but it is hardly what keeps the philosopher of pseudoscience awake at night. Laudan seems to assume that the two projects form a package deal, alternately shifting from the former to the latter and ~~seeing~~ all of the associated problems as equally damaging to a single "demarcation project." This attitude is apparent in his way of dealing with past demarcation attempts. First, Laudan dismisses Popper's falsificationism as a "toothless wonder" because it accords scientific status to falsifiable but blatantly false claims, such as the claim that the earth is six thousand years old. Because it fails to perform the "critical stable-cleaning chores for which it was originally intended" (1983, 122), according to Laudan, it is a "disaster." In fact, the problem is rather trivial and can be remedied even within a falsificationist framework. To give the Popperian demarcation criterion some teeth, we need only require that, in addition to it being falsifiable, a theory must have survived repeated attempts at falsification (the Popperian notion of "corroboration"). The fact that young-earth creationism is technically "scientific" for a strict Popperian, in the sense that it is at least open to falsification, even though having been conclusively falsified, is a semantic nonissue. As we saw, however, the criterion of "well-testedness," the next shot in Laudan's historical review of demarcationism, finds no mercy with him either, this time precisely because it would count as scientific such—*dixit* Laudan—patently nonscientific claims as "Bacon did not write the plays attributed to Shakespeare." But obviously a demarcation project that would *succeed* in excluding such well-tested, historical claims from science would inevitably be another of those "toothless wonder[s]" (122) that Laudan decries in the first place (one wonders how Laudan recognizes a patently nonscientific claim, if he does not believe in any form of demarcationism). By demanding that the demarcation problem both is and is not normatively discriminating, Laudan wants to have his cake and eat it too.

Science and the Supernatural

In recent years, some philosophers and scientists have countered religious pseudoscience by wielding a demarcation criterion that is a confusing blend

of territorial and normative elements. According to this principle of "methodological naturalism," science is inherently limited to providing natural explanations for the natural world, and it does not (nor can) traffic in supernatural claims. By this standard, theories like Intelligent Design (ID) creationism are immediately ruled out ~~as pseudoscience~~ because of their covert or open reliance on supernatural causes. For example, in an official booklet of the National Academy of Sciences (1998, 124), we learn that

> because science is limited to explaining the natural world by means of natural processes, it cannot use supernatural causation in its explanations. Similarly, science is precluded from making statements about supernatural forces because these are outside its provenance.

Although it is primarily directed against pseudoscience, this natural/supernatural distinction also has territorial overtones. It exorcises questions about a broader picture of the world (e.g., Does God play any role in the universe? Is evolution blind or goal directed?) from science and relegates them to the domain of philosophy (Pennock 1999, 2011; Sober 2010).

Robert Pennock, in a paper defending methodological naturalism as a "ground rule" and "ballpark definition" of science ~~(see also Fales, chapter 13, in this volume)~~, starts out with rightly rebuking Laudan's view that the demarcation project is dead (see also Pigliucci, chapter 1, in this volume): "to hold that there is no difference between science and pseudo-science is to abandon any claim of insight into the analysis of knowledge or questions about distinguishing the real from the deceptive" (Pennock 2011, 195). Pennock gives a number of solid arguments for the viability of normative demarcation, but his defense of methodological naturalism quickly slips into territorial waters. This can be gleaned from Pennock's claim that science remains "scrupulously neutral" on the existence of supernatural entities (Pennock 2011, 188). God may well exist, but science has no business with him.

The appeal of methodological naturalism as a territorial demarcation is twofold. On the one hand, it gets rid of pseudosciences such as creationism and ID theory in one fell swoop. On the other hand, it makes science metaphysically innocuous, safeguarding a special domain for supernatural speculation where science is impotent, and thus establishing a modus vivendi between science and religion.[3] Alas, the solution suffers from several problems.

First, it provides a disservice to both science and philosophy. By strug-

gling over the proper borderlines of science, this solution fuels the common misconception that only "science" possesses epistemic authority, whereas metaphysical questions, traditionally the trade of philosophers, are a matter of idle speculation only, which, interesting though it may be, can be safely ignored in scientific matters.

Second, given that the very concept of the supernatural is notoriously ~~vague and elusive,~~ it is ill advised to erect any form of demarcation on its shoulders. To give substance to such a territorial demarcation claim, one needs to come up with a coherent and nontrivial definition of natural versus supernatural that does not already *presuppose* the demarcation between science and nonscience. Pennock, for his part, argues that anyone who thinks that supernatural hypotheses may have testable consequences has "illegitimately [assumed] naturalized notions of the key terms or other naturalized background assumptions" (Pennock 2011, 189). But Pennock simply equates testability and naturalness and leaves us with a circular and self-serving definition of supernatural as that which is beyond scientific investigation by definition: "if we could apply natural knowledge to understand supernatural powers, then, by definition, they would not be supernatural" (Pennock 1999, 290; see also Pennock 2011; Boudry et al. 2010a; Tanona 2010). Such a definitional shortcut would not even recognize most religious miracle stories as supernatural, nor would it be helpful in dealing with typical pseudosciences. For example, if the claims of extrasensory perception (ESP) and telepathy were borne out, would we be dealing with supernatural phenomena or just elusive and poorly understood natural ones? Do aliens use advanced technology or spooky spiritual powers, as ufologists sometimes suggest? Whom do we consult to settle such matters? I argue that we need not make up our minds about these questions before deciding whether parapsychology or ufology are pseudoscientific (see below).

Third, if supernatural forces were operating in the natural world, producing tangible empirical ~~consequences,~~ as many theists maintain, nothing would prevent scientists from empirically investigating those.[4] As I have argued elsewhere (Boudry, Blancke, and Braeckman 2010a), narrowing down the scope of science by excluding all supernatural claims from its purview is unfeasible and historically inaccurate, given that many such claims have in fact been subjected to empirical investigations (e.g., the healing power of intercessory prayer, clairvoyance, communication with angels). Upon any nontrivial definition of the term "supernatural," I see no sound reason why

supernatural phenomena would be intrinsically beyond the pale of science (see Fales, chapter 13, in this volume).

Fourth, and most important for this chapter, the territorial move bypasses the real reason for the dismal epistemic status of ID creationism, which is that it exhibits more general telltale signs of pseudoscience: ID theorists refuse to flesh out their design hypothesis and use convenient immunizations that make the theory impervious to criticism; the concepts devised by ID advocates suffer from equivocations that turn their central argument into a moving target; the theory is too vague to allow for specific predictions and to achieve any form of genuine explanatory unification; ID proponents refuse to get into the details of the mechanism and method used by the designer; the bulk of ID literature consists of purely negative arguments against evolution, with the sole purpose of distorting science and sowing doubt; and so on.

The label "supernatural" is a red herring in this context because the kinds of problems listed above are neither exclusive nor intrinsic to supernatural hypotheses. In fact, all of them should sound familiar to anyone who has wandered into the strange hinterlands of science before (Fishman 2009). In the next section, I give examples of perfectly naturalistic doctrines that are guilty of precisely the same sins (particularly regarding testability and immunization), which shows that the proponents of "methodological naturalism" as a weapon against ID creationism are barking up the wrong tree.

The Revenge of Demarcationism

How does science secure epistemic warrant? No matter how we fill in the details, it should be clear that many things can go wrong in many different ways. It should come as no surprise, then, that the category of *pseudo*science (or bad science) is heterogeneous, resisting explication in terms of necessary and sufficient conditions (Nickles 2006, 194). In the skeptical literature, the term "pseudoscience" refers to nonscience posing or masquerading as genuine science. To capture this intuitive conception, Hansson (2009; see also Hansson, chapter 4, in this volume) offers the following helpful characterization of pseudoscience:

1. It pertains to an issue within the domains of science (in the wide sense).
2. It is not epistemically warranted.
3. It is part of a doctrine whose major proponents try to create the impression that it is epistemically warranted.

What is valuable about Hansson's approach is that it brackets our justifications for belief in real science and focuses on the general characterization of pseudoscience first. Despite the conceptual heterogeneity of "pseudoscience," Hansson's provision (2009, 240) that its proponents "try to create the impression that [their theory] is epistemically warranted" gives us good reason to expect some shared characteristics. In the absence of the epistemic warrant that genuine science accrues, pseudosciences are confronted with the problem of surviving the day when prophecy fails and of creating a spurious *impression* of epistemic warrant. Bona fide science is not confronted with that problem. If you have nature on your side, so to speak, you can afford to be receptive to her judgment, which is precisely what we value—among other things—in successful scientific theories. In order to survive the stern judgment of nature and the onslaught of critical arguments, however, pseudoscientists are forced to systematically evade falsification and turn apparent refutations into spurious confirmations.

This is the reason why, despite the glaring problems with his naïve falsificationism, Popper was right to champion empirical boldness as a cardinal scientific virtue. For Popper, however, particularly in his later years, the falsifiability of a theory is purely a function of its logical properties and consequence relations (Hansson 2008). But ever since the seminal work of Pierre Duhem, we know that scientific theories are tested in bundles and never in isolation. A theory is not falsifiable until it is conjoined with background assumptions, initial conditions, and auxiliary hypotheses. Depending on how we interpret Popper's logical criterion in light of these problems, it is either too restrictive, classifying some of our best theories as nonscientific, or too permissive, allowing some of the worst theories in currency (e.g., astrology) to be recognized as science (Kitcher 1982). Popper's disciple Imre Lakatos realized that every scientific "research programme" is protected against falsification by a host of auxiliary hypotheses. It is simply not true, generally speaking, that scientists abandon a theory as soon as they have witnessed an anomalous observation. Instead, they have ~~at their disposal~~ various ways of tweaking and adjusting auxiliary hypotheses to preserve their central hypothesis, some of which ways seem quite respectable.

Still, even after taking into account Duhem's problem of underdetermination and the complexities of science's historical development, the virtue of empirical boldness in science emerges unscathed. In particular, we still need *some* restrictions on the amount of gerrymandering that we can allow in the face of apparent refutations (Leplin 1975). One of the hallmarks of pseudosci-

ence, as Kitcher (1982, 48) succinctly puts it, is that it has "too cozy a relationship with auxiliary hypotheses," applying its problem-solving strategies with "claims that can be 'tested' only in their applications," in other words, that are purely ad hoc and not independently testable.

True enough, contrary to Popper's ~~stringent~~ falsificationist ideals, scientists do not just abandon their theory the moment they encounter a single apparent falsification. But no theorist can remain comfortable when running slap up against reality time and again. People may believe crazy things on flimsy grounds, but they will not buy into anything at any price (Boudry and Braeckman 2012). A superficial ring of plausibility is a psychological sine qua non for every successful pseudoscience. Such an impression of epistemic warrant is generally created by (i) minimized risk of refutation, (ii) phony appearance of empirical boldness, or (iii) opportunities for "confirmations" without actual threat of refutation. Strategies for pulling off such sleights of mind recur across the pseudoscientific domain. I present a rough typology—a tentative "*nosology* of human thought," as David Stove (1991, 187) puts it—that I have discussed in more detail elsewhere (Boudry and Braeckman 2011, 2012).

Multiple Endpoints and Moving Targets

By using conceptual equivocations and what psychologists have labeled "multiple endpoints" (i.e., multiple ways in which a claim may be borne out), pseudoscientists create an asymmetry between observations capable of confirming and those that could refute a given hypothesis. In the case of conceptual equivocation, which is pervasive in astrology and doomsday predictions, one begins by endorsing a bold and strong interpretation of a claim but, when threatened with falsification, switches to a weaker and broader interpretation. In fact, typical psychic pronouncements are amenable both to a specific interpretation and a range of broader and more metaphorical ones (e.g. "a father~~ly~~ figure stands behind you"). Equivocations are also found in the creationist's notion of biblical "kinds," a concept that, according to Philip Kitcher (1982, 155), is "[tailored] to suit the needs of the moment" to preserve the claim that evolution between kinds is impossible. The latter-day heirs of creationism have applied the same bait-and-switch strategy in their argument that some biological systems are "irreducibly complex," equivocating between a sound but trivial and an interesting but false version of the concept (Boudry et al. 2010b).

Shadowy Retreats

A related way to steer clear of unwelcome evidence and criticism is to remain as vague and noncommittal about one's hypothesis as possible. ID creationists steadfastly refuse to reveal anything about the mechanisms and procedures used by the alleged designer, insisting that his motives are inscrutable and that the whole affair is beyond human comprehension (this, of course, being a traditional cop-out for theists). Note that this stalemate does not derive from the supernatural character of the hypothesis, as there is nothing that prevents ID creationists from fleshing out their design hypothesis in such a way that it actually yields specific predictions (Boudry and Leuridan 2011). Pseudoscientific beliefs in general are often indeterminate and mysterious (e.g., healing crystals), which ensures that they are inaccessible to normal epistemic evaluation (Sperber 1990), and that contradictions and adverse evidence will go largely unnoticed to believers.

Conspiracy Thinking

Conspiracy thinking is a doubly convenient strategy of immunization and spurious confirmation. On the one hand, conspiracy theorists present any anomaly in the received view of some historical event as evidence of something secretive and sinister going on (Keeley 1999). On the other hand, anomalies for their own hypothesis can be explained away as being exactly what would be *predicted* on the conspiracy view. Evil conspirators, after all, can be expected to spread forged evidence and disinformation to throw us off the scent. Moreover, the very existence of critical dissenters of the conspiracy view can be construed as further evidence for the belief system. In Freudian psychoanalysis, for instance, which exhibits the same epistemic structure as a conspiracy theory (Crews 1986; Boudry and Buekens 2011), critics are suspected of being motivated by unconscious resistance and defense mechanisms, exactly as predicted by the theory.

Invisible Escape Clauses

Many pseudoscientists appear to make bold empirical statements, but when push comes to shove, they resort to special escape clauses and get-out-of-jail-free cards to forestall falsification, thus dashing expectations initially engen-

dered by their statements. Parapsychology is ~~notoriously~~ abundant with such escape clauses. Examples include the idea that the presence of inquisitive minds tends to disturb psychic phenomena, known as "negative psi vibration" or "catapsi" (for a skeptical discussion, see Humphrey 1996; Wiseman 2010), or the argument that psi is "actively evasive" because its primary function is to "induce a sense of mystery and wonder" (Kennedy 2003, 67). Again, in a full-blown pseudoscience, such escape clauses are sufficiently vague and noncommittal to be conveniently ignored as long as they are not needed. By qualifying apparent falsifications with such moves while accepting confirmations at face value, again an asymmetry is created between what can confirm and refute a theory.

As should be clear by now, I think it is the resort to such ad hoc maneuvers and the refusal to flesh out one's hypothesis that makes a theory like ID creationism pseudoscientific, not the appeal to a "supernatural" cause per se (whatever that may mean). As Fishman (2009, 826) wrote, it is certainly possible for supernaturalists to resort to "*ad hoc* explanations for the absence of evidence or disconfirming evidence for the supernatural," but exactly the same strategy is open to defenders of mundane and perfectly natural claims. The more general and underlying problem is that "continued ad hoc rationalization of repeated bouts of contrary evidence betrays a commitment to preserve a desired hypothesis at all cost" (Fishman 2009, 826).

Further Problems with Falsificationism

Laudan levels one strenuous objection against demarcationism that directly concerns the normative version of the problem, and we should now be able to put it to rest. According to Laudan, the charge of unfalsifiability against creationism "egregiously confuses doctrines with the proponents of those doctrines" (1982, 17). Because it foists off unresponsiveness to falsification on the theory itself, the argument conflates ad hominem and ad argumentum. If creationists, astrologers, or Freudians are unmoved by repeated falsifications of their doctrines, this reveals something about their psychological makeup, but it does not impinge on the falsifiability of their doctrines. Laudan's complaint was echoed by Philip Quinn (1996), Adolf Grünbaum (2008), Edward Erwin (1996), and a number of other philosophers, and ironically it is firmly within the tradition of Popper's strictly logicist analysis of propositions and their observational implications.

But if Popper's logicist approach is ill equipped to deal with real-life examples of genuine science, as has been shown by Duhem, Quine, Kuhn, and others, a fortiori it must fail in the swamps of pseudoscience. In many interesting cases, among which the ones Popper himself discussed (e.g., Freudian psychoanalysis, astrology), there is typically no procedure for separating the theory-in-itself from the cognitive and methodological behavior of its defenders (Cioffi 1998; see also Cioffi, chapter 17, in this volume). The upshot of this problem is that the philosopher of pseudoscience has no choice but to get involved in the sociology of the discipline at large, and the psychology of those who are engaged in it. Kitcher even goes as far as suggesting that the category of pseudoscience is "derivatively psychological," in the sense that "pseudoscience is just what [pseudoscientists] do" (1993, 196). I think the truth lies somewhere in between. For example, when a parapsychologist attributes a failed experiment to the disturbing vibes of skeptical observers, it is not clear whether this is just methodological misdemeanor on the part of the parapsychologist, or whether it follows from his adherence to a standard tenet of parapsychology (the "catapsi" effect). When an ID creationist juggles with an ambiguous concept like "kind" or "irreducible complexity," there is no way of telling where the proper theory ends and where the obfuscations by its defenders begin. No one has come up with a general procedure to settle such matters.[5]

In many cases, immunizing strategies have such a cozy relationship with a pseudoscientific doctrine that they are at least *provoked* by it. For some parapsychologists, the elusive and shy nature of psi is one of the central tenets of the doctrine, so that the practice of cherry picking experiments with positive outcomes can be given a sensible theoretical rationalization. To take another example, Freudian psychoanalysis uses a host of methodological principles and concepts to inflate the inferential possibilities of psychoanalytic interpretation, the cumulative effect of which is that it is hard to imagine *any* form of human behavior that would be at odds with the theory (this was Popper's correct intuition). But the use of such methodological licenses and conceptual wildcards is no accidental quirk of some psychoanalyst interpreters: it simply reflects Freud's division of the mind into unobservable and antagonistic entities, and his rich account of the purposeful mental interactions between those systems (negation, substitution, condensation, reaction formation, inversion, repression, etc.) (Cioffi 1998; see also Cioffi, chapter 17, in this volume; Boudry and Buekens 2011).[6]

The problem with Laudan's and Günbaum's approach is that, although

nothing in Freudian psychoanalysis or parapsychology strictly *dictates* such fallacious forms of reasoning, their pervasiveness becomes intelligible only when we consider the belief system in which they are embedded. In short, the entanglement of theory and psychology forces us to widen our scope beyond the propositional content and logical structure of pseudosciences.

Setting Out the Borders

Although I have argued that Laudan is wrong and that the normative demarcation problem is tractable, this does not mean no borderline cases exist. In particular, epistemic warrant is not constant over time, so theories may move in and out of the domain of science as new evidence accumulates and conceptual progress is made (Hansson 2009; see also Ruse, chapter 12, in this volume). A twilight zone does exist, with theories that are neither scientific nor quite pseudoscientific, but we can readily come up with clear instances of both kinds, which is all that is needed for the viability of the normative demarcation project (Pigliucci 2010). By contrast, I have argued that, in most interesting cases, demarcating science and philosophy or science and everyday reasoning is like distinguishing the flour and sugar in a piece of cake (maybe feasible, but not very rewarding). The ~~mutual~~ interdependence and continuity that complicates territorial demarcation, making it a largely unfruitful endeavor, is completely absent from normative demarcation. No genuine science depends on pseudoscience for its justification.[7] In fact, there are analogous normative problems in each of the "territories" neighboring science that I think deserve more attention than the territorial demarcation per se: which theories deserve to be called good philosophy, and which are merely vacuous pseudophilosophy? How to distinguish rigorous mathematics from pseudomathematical verbiage? What is the difference between insightful hermeneutics and pseudohermeneutics?

Indeed, the normative demarcation criterion arguably cuts across territorial borders, with, for example, pseudosciences and pseudohistory exhibiting shared features that make them more similar to one another than to, respectively, bona fide science and good historiography. The normative demarcation question in historical science concerns whether and how we can distinguish bona fide historiography from what David Aaronovitch (2010) has termed "voodoo history," such as unsubstantiated conspiracy theories about major historical events. The cavalier approach to empirical evidence among conspiracy theorists and their systematic use of ad hoc explanations bear uncanny

resemblances to the strategies of "pseudoscientists." To the extent that one views history as part of science broadly construed, the received account of the Holocaust deserves to be called "scientific," whereas Holocaust negationism certainly does not. Although the methodological differences between experimental and historical sciences make for fascinating philosophical discussions (Cleland 2002; see also Cleland and Brindell, chapter 10, in this volume), it seems that what distinguishes nuclear physics from cold fusion theory, and Second World War history from Holocaust denial, is an epistemic issue of an altogether different order.

The same can be maintained when it comes to philosophy. For example, conceptual equivocation is as pernicious in philosophy as it is in science, and the self-protective rationale is exactly the same (Law 2011). The philosopher André Kukla has complained about the systematic vacillation in the social constructivist literature between strong and weak versions of a claim, coining the terms "switcheroos" and "reverse-switcheroos" to describe these "philosophical sins" (Kukla 2000, x). Nicholas Shackel has similarly analyzed the strategy of equivocation in postmodernist philosophy:

> Having it both ways is essential to the appeal of postmodernism, for it is precisely by apparently speaking simultaneously of two different concepts with the same word that the appearance of giving a profound but subtle analysis of a taken-for-granted concept is created. (Shackel 2005, 304)

These discussions illustrate that philosophers are facing a normative demarcation task in their own discipline. Indeed, the fuzzy borders between philosophy and science, and the commonalities of their respective pseudo-counterparts, further downplay the territorial demarcation problem. Philosophers and scientists alike should join efforts to separate the wheat from the chaff in both domains rather than staking their own territorial borders. As Massimo Pigliucci writes, one of the most fruitful interactions between science and philosophy consist of the "joint defense against the assault from pseudoscientific quarters" (2008, 11).

Conclusion

In this chapter, I have expressed little confidence in the viability of the territorial demarcation problem, and even less interest in solving it. Not only is there no clear-cut way to disentangle epistemic domains like science and

philosophy, but such a distinction carries little epistemic weight. The demarcation problem that deserves our attention is the one between science and pseudoscience (and the analogous ones between philosophy and pseudophilosophy and between history and pseudohistory). Separating the wheat from the chaff in these disciplines is a problem with both epistemic import and practical urgency, particularly in the face of relentless attempts by various people—practitioners of alternative medicine, creationists of different stripes, parapsychologists—to claim scientific respectability. Naïve falsificationism has been widely (and wisely) abandoned in philosophy of science, but the value of bold theorizing, broadly construed as hospitability to critical evaluation, remains intact both in science and philosophy. Instead of hankering for a silver bullet of demarcation, desirable though such a tool would be, we have no choice but to get down in the trenches and engage ourselves with the claims and arguments of pseudoscientists, scrutinizing their doctrines carefully and pointing out specific fallacies.

ID creationism invokes supernatural entities and is guilty of a host of pseudoscientific sins, but the two issues should not be conflated. Because we have become so accustomed to supernaturalists falling for the pseudoscience trap, and because we have grown weary of creationist hypotheses that, when push comes to shove, boil down to "God did it and his ways are mysterious," we can hardly imagine any other supernatural hypothesis to be viable (the prospects, admittedly, are extremely bleak). But even if all current theories with property X happen to be pseudoscientific, this does not mean that talk of X is off limits. In this case, it may simply tell us a great deal about the (contingent) absence of evidence for supernatural phenomena and about the widespread psychological attachment to the supernatural in spite of this absence.

The appropriate way of dealing with a supernaturalist pseudoscience like ID creationism is not to relegate it to a domain where science has no authority, but to confront the conceptual and empirical problems of the theory head on. In that respect, Laudan is completely on the mark when he writes that "our focus should be squarely on the empirical and conceptual credentials for claims about the world" (1983, 125). But Laudan (as well as Popper) was wide of the mark when he reduced the demarcation job to evaluating the propositional content of the theory. In the murky hinterland of science, such a neat distinction between the theory-as-such and the way it is handled by its advocates is invariably hard to come by. Pseudoscience is too messy to be analyzed on the level of the theory-in-itself, and demarcationists need more refined instruments of analysis.

Thomas Paine once wrote that "it is error only, and not truth, that shrinks from inquiry." Because pseudoscience is propagated in the face of reason and empirical evidence (otherwise it would presumably be epistemically warranted), it engages in systematic attempts to dodge falsification and criticism, to give a spurious appearance of empirical boldness that is always belatedly disappointed, and to twist apparent falsifications into confirmations. If a theoretical endeavor pretends to be science while it exhibits these and other epistemic sins to a sufficiently egregious extent, don't we need *some* word to capture it and distinguish it from bona fide science? If Laudan thinks that "pseudoscience" is just a "hollow phrase" (1983, 125), does he have a better term in store?

In Norse mythology, the trickster god Loki once made a bet with the dwarfs, on the condition that, should he lose, the dwarfs would cut off his head. Sure enough, Loki lost his bet, and the dwarfs came to collect his precious head. But Loki protested that, while they had every right to take his head, the dwarfs should not touch any part of his neck. All the parties involved discussed the matter: some parts obviously belonged to the neck, and others were clearly part of Loki's head, but still other parts were disputable. Agreement was never reached, and Loki ended up keeping both head and neck. In argumentation theory, Loki's Wager is known as the unreasonable insistence that some term cannot be defined and therefore cannot be subject of discussion. In this chapter, I hope to have shown that denunciating the normative demarcation project is an instance of Loki's Wager, while quarreling with territorial demarcation is not.

NOTES

1. Quine famously tried to dissolve the analytic/synthetic distinction on which many would want to erect the boundaries between science and philosophy. But one need not buy into Quine's argument to question territorial demarcation.

2 .There are different ways of partitioning this broader domain of knowledge. The German word *Wissenschaft* encompasses both the natural sciences and historical disciplines, whereas "science" is usually taken to refer more narrowly to the natural sciences. The more expansive domain of "empirically informed knowledge" that encompasses both science and philosophy was coined "scientia" by the philosopher of science William Whewell.

3. Not all those who defend methodological naturalism are friendly for religion. Pigliucci

(2011) for example argues that supernaturalism is incoherent and hence "not even wrong," which is hardly a cause of comfort to the religious.

4. Of course, it is true that God is nowhere to be found in science textbooks and in the technical literature, and modern scientists clearly eschew supernatural explanations. There is good inductive ground for doing so because appeals to the supernatural have always turned out to be premature in the past, and the scientific naturalization of the world has been relentless and one-directional. The mistake of territorialists is to retrospectively translate the contingent outcome of scientific progress into self-imposed methodological strictures.

5. This often leads to the seemingly contradictory claim that Freudian psychoanalysis is both unfalsifiable and falsified: to the extent that we can isolate specific hypotheses and disentangle them from the rest of Freudian doctrine, such hypotheses may be falsified.

6. Notoriously, the conception of a deceitful and manipulative unconscious gives rise to a form of conspiracy theorizing, in which any form of contrary evidence can be interpreted as arising from unconscious resistance to psychoanalytic insights (even the "hostility" of critics).

7. Pseudoscience often feeds on real science, if only as a template to imitate. Also note that I do not deny that pseudoscientists may make serendipitous discoveries.

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