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Varieties of naturalism in logic

'Naturalism' is a term so notorious for its murkiness that entire anthologies have been devoted largely to the task of pinning down its meaning – and for all that, nothing near consensus has been reached. Agreement is elusive even on how the available options are best taxonomized. One general tendency is to distinguish 'ontological' or 'metaphysical' versions – those that recognize only 'physical' or 'material' or 'scientific' items, eschewing, for example, angels or abstracta – from 'epistemological' or 'methodological' versions – those that recognize only 'empirical' or 'scientific' ways of finding out about the world, eschewing, for example, revelation – but these broad categories contain multitudes. So the task of explicating the current state of naturalism about logic is unusually daunting.

Under these circumstances, and given my own limited repertoire, what follows is necessarily selective. The plan is to begin (in §I) with a few preliminaries: first, on how I'm understanding 'naturalism', in conversation with Timothy Williamson's resistance to the label, and second, on the specific topic within the subject of

'philosophy of logic' on which I intend to focus. §II lays out the classical Quinean approach to logic in compare and contrast with my own neo-Quinean, second-philosophical version, with a nod toward Wittgenstein. Finally (in §III), I examine a sampling of contemporary positions as alternative candidates for a naturalistic account of logic.

I. Preliminaries

Years ago, my efforts in the philosophy of mathematics under the familiar label 'naturalism' were so often met with objections of the form – 'but that can't be naturalism because naturalism is …' – that I ended up coining a new term, figuring I'd then be free to stipulate what I meant by it. The result has been a particularly austere meta-philosophical approach called 'Second Philosophy', carried out by a highly idealized inquirer called the 'Second Philosopher'.[1] It seemed fair to regard this as a version of naturalism because the Second Philosopher's starting point is broadly empirical: she begins from perception and observation, proceeds to generalization, theory formation, and confirmation, always circling back to assess and, if necessary, revise previously held beliefs as she goes; her single-minded motive is to understand the world and our place in it; she's assumed to have unlimited time, resources, energy, and curiosity. Along the way, she develops tentative, fallible positions when confronted with what we think of as traditionally philosophical

[1] See, e.g., [2007], [2011], [2014a], [2014b], [2017], [2022a].

questions. So, for example, as she proceeds, she relies on simple patterns of inference; to take a mundane example, if she knows a coin is either a dime or a half dollar, and she learns it's not a dime, she concludes that it must be a half dollar. Always vigilant, she asks herself what grounds she has for this conclusion, for taking this inference to be reliable. Thus, by straightforward steps, she arrives at what we think of as philosophy of logic.

Following her on this line of investigation is a topic for next section – for now, let me try to locate Second Philosophy a bit more precisely among the welter of naturalisms by engaging with the views of Timothy Williamson (especially as Williamson's philosophy of logic is among the examples in §III). The text I have in mind comes from a fascinating and revealing exchange between Williamson and Alex Rosenberg in Matthew Haug's anthology, *The Armchair or the Laboratory*.[2] Williamson sets his goal this way:

> In *The Philosophy of Philosophy*, I defended a view of philosophy as much less different in aims and methods from other forms of intellectual inquiry than its self-images usually suggest. Some commentators treated this anti-exceptionalism about philosophy as a form of *naturalism*, and wondered why I did not characterize it explicitly as such. I will explain why not. (Williamson [2014], p. 29)[3]

To a first approximation, he characterizes naturalism like this:

> There is only the natural world, and the best way to find out about it is by the scientific method. (p. 29)

Though Williamson doesn't put it this way, he sketches here a combination of metaphysical naturalism and methodological naturalism.

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[2] Williamson [2014] and Rosenberg [2014] in Haug [2014].

[3] Unaccompanied page references in this section are to Williamson [2014].

He goes on to probe first the key metaphysical term, 'natural world', then the key methodological term, 'scientific method'.

The fundamental problem with metaphysical naturalism – there is only the spatiotemporal world or there is only the causal nexus or some such stipulation – is that it attempts to circumscribe what is essentially, crucially, an ongoing and open-ended process: for example, science has come to posit items without well-defined location in spacetime or position in the causal nexus, and there's no predicting where future evidence will lead.[4] Any attempt to legislate boundaries ('there is only … ') would potentially impede scientific progress. Noting simply that –

> The best current scientific theories will probably be superseded by future scientific developments in various respects. (p. 29)

– Williamson proposes an alternative characterization:

> There is only whatever the scientific method eventually discovers, and (unsurprisingly) the best way to find out about it is the scientific method' (p. 29).

To this he objects 'that there [may be] things only discoverable by nonscientific means, or not discoverable at all' (p. 29).

In fact, I think this goes too easy on Williamson's naturalistic opponent. Williamson is right, of course, that there might be aspects of the world invisible to science; in fact, given the obvious limitations of human cognition, there's every reason to believe that there are such – and even that the worldly structures that make our current quantum mechanics so predictively successful may, sadly, be

[4] I've argued that the Second Philosopher may even come to admit abstracta (see below).

among them. But the deeper problem is that the methodological naturalist's 'scientific method' is no more determinate than the metaphysical naturalist's 'natural world'. The inadequacy of general characterizations like 'abduction' or 'inference to the best explanation' or Williamson's 'hypothetic-deductive method' (p. 30) has long been a hobby horse of mine. This case is rehearsed briefly below (in §II) in connection with Quine's holism, but for now, one observation: Perrin's experiments in the early 20th century confirming the existence of molecules can be understood as also demonstrating that observation isn't the only reliable way of detecting entities, thus expanding the scope of recognized 'scientific method'.

In these ways, it seems to me that traditional declarations of naturalistic principle are, if anything, worse off than Williamson allows. My own opinion is that a naturalistic philosopher shouldn't – indeed, for the reasons cited, can't – be in the business of crafting manifestos about what 'naturalism' is; rather, she should simply be confronting traditionally philosophical questions in the ordinary course of her investigations, as the Second Philosopher, described above, came to confront questions in the philosophy of logic. This oblique approach – describe the Second Philosopher and show the reader how she proceeds – is what Bas van Fraassen would call a 'stance', not a doctrine,[5] and a stance is judged only by its fruits.

In this connection, Barry Stroud writes of the 'transparency' of naturalism: 'you always have to look right through the term

[5] Van Fraassen agrees (see [2022c], p. 51).

['naturalism' or 'second philosophy'] to see in each case what it is meant to stand for' (ibid.). This is my way of being a naturalist. When the Second Philosopher is confronted by Descartes or a theologian or a QAnon advocate – all of whom claim to have their own distinctive ways of finding things out – she doesn't say 'That's unscientific', she says 'That's interesting. What kind of evidence do you have? How is it supposed to work?'. Of course, she's unlikely to come away from these particular encounters with any new methods, but she will have examined each proposal fairly, in its granular detail, before finding it wanting.

Oddly enough, so far, this sounds closer to the anti-naturalist Williamson than to the pro-naturalist Rosenberg, who apparently exemplifies the doctrinal approach that Williamson and I both reject:

> Naturalism is the philosophical theory that treats science as our most reliable source of knowledge and scientific method as the most effective route to knowledge. (Rosenberg [2014], p. 32)

Williamson reacts predictably, charging that Rosenberg

> leave[s] it unclear what he means by 'science' or 'scientific method', even though it is crucial for what he is committing himself to as a 'naturalist'. (p. 36)

So where does Williamson himself end up?

> Still, I sympathize with one motive behind naturalism, the aspiration to think in a scientific spirit. It's a vague phrase, but one might start to explain it by emphasizing values like curiosity, honesty, accuracy, precision, and rigor. What matters isn't paying lip-service to those qualities – that's easy – but actually exemplifying them in practice – the hard part. (pp. 30-31)

Idealized as she is, the Second Philosopher would clearly exemplify those virtues, whether or not she'd bother to state them.

Williamson's sharpest objection to naturalism is that it can't account for the mathematics that science obviously needs – and on this point, Rosenberg agrees, regarding it as an important open problem. As I mentioned, the challenge of giving a naturalistic account of mathematics is what got me into this discussion in the first place, and I've written at considerable length elsewhere about how that challenge might be met.[6] So, for example, my concerns about Quine's naturalism, including the anti-holistic line sketched in §II, originated in the context of the philosophy of mathematics. The positive account begins in *Naturalism in Mathematics* with an examination of the methods actually used to defend fundamental axioms of set theory and a means/ends analysis of the efficacy of those methods in pursuit of important goals internal to mathematics. (A case against Gödel's Axiom of Constructibility (V=L) is offered as proof of concept.) With that much in place, *Defending the Axioms* goes to describe the corresponding metaphysics and epistemology. This isn't the place to rehearse these matters in any detail, but it is worth asking where an exemplar of Williamson's scientific spirit comes down on the question of mathematics.

Departing from Rosenberg's naturalism, Williamson suggests that methods of empirical science are all very good, in their place, but

> the default assumption must be that the practitioners of a well-established discipline know what they are doing, and use the available methods most appropriate for answering its questions. (p. 31)

[6] See, e.g., [1997] and [2011].

Unsurprisingly, the well-established discipline Williamson has in mind is mathematics. Exactly how a non-empirical discipline qualifies as 'well-established' in the relevant sense isn't made explicit, but for what it's worth, the Second Philosopher's special treatment of mathematics results from the way it grew out of science and continues to intertwine with science.[7] If this were also Williamson's motivation, a path that seems open to him, his quarrel might only be with naturalisms like Rosenberg's, naturalisms that attempt to limit the progress of inquiry in advance. In his initial embrace of pure mathematics,[8] Williamson would be as much a naturalist as the Second Philosopher.

But our topic here is the philosophy of logic. One last preliminary, this time about the type of question I propose to address under that rubric. I make no attempt, here or elsewhere, to delimit what counts as 'logic'. Instead, my practice has been to focus on ordinary, straightforward inferences that anyone would count as 'logical' – like the one above about the coin – and to inquire as to their status: what makes them reliable (when they are)? Obviously, many philosophers of logic, including those discussed in §3, pursue more ambitious projects of various descriptions.[9] For purposes of

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[7] This move won't apply to other non-empirical disciplines, no matter how well-established.

[8] I don't imagine that Williamson would sign on to all the second-philosophical elaborations sketched above!

[9] For what it's worth, much of what others consider 'logic' seems to me closer to arithmetic – e.g., formulas and proofs of length n for every finite n (see [2002d], [2022e]) – and from there, mathematical logic ascends into the higher reaches of infinitary mathematics (see [2011]). To my mind, these are very different undertakings, requiring distinct naturalistic analyses, however they might be labeled.

comparison, then, my plan here is to explore the areas of overlap, in particular, the areas where each of these philosophers addresses primitive inferences like that of the coin.

With these preliminaries in place, we come to the main topic: varieties of naturalism about logic.

II. Two naturalistic accounts: Quine and the Second Philosopher

These days, perhaps the best-known naturalistic approach to logic is due to Quine:[10]

> A self-contained theory which we can check with experience includes, in point of fact, not only its various theoretical hypotheses of so-called natural science but also such portions of logic … as it makes use of. (Quine [1954], p. 121)

Logic, like everything else, is subject to revision in light of evidence:

> Revision even of the logical law of the excluded middle has been proposed as a means of simplifying quantum mechanics; and what difference is there in principle between such a shift and the shift whereby Kepler succeeded Ptolemy, or Einstein Newton, or Darwin Aristotle? (Quine [1951], p. 43)

On this familiar picture, logic resides at the center of the web of belief, the whole of which is confirmed by sense experience at the periphery. Traditional distinctions between a priori and a posteriori, between necessity and contingency, between analytic and synthetic, all collapse.

The Second Philosopher's fundamental disagreement here is with Quine's holism. The case of Perrin's experiments mentioned earlier

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[10] I stick with the classic Quine of the 1950s: Quine [1951], [1954], [1955]. The story may have changed by Quine [1990], where logic appears exempt from falsification (see, e.g., p. 14).

illustrates the problem.[11] Atomic theory was introduced by Dalton in the early 19th century and gradually grew into a powerful, empirically successful account of chemical combination. At the famous Karlsruhe Conference in 1860, Cannizzaro gave convincing calculations of atomic weights, which led to determination of valence and the periodic table. By 1900, atomic theory had moved into physics proper with the kinetic theory of gases, which produced measurements of molecular size, velocity, frequency of collision. At that point, atomic theory enjoyed all the Quinean theoretical virtues:

> The benefits … credited to the molecular doctrine may be divided into five. One is simplicity … Another is familiarity of principal … A third is scope … A fourth is fecundity … The fifth goes without saying: such testable consequences of the theory as have been tested have turned out well. (Quine [1955], p. 247)

For that matter, it met the standards of other general accounts of scientific confirmation, like abduction, hypothetico-deductive reasoning, or inference to the best explanation. Despite all that, many in the scientific community continued to regard it as a useful fiction (Ostwald, Poincaré), and most of the others (including Perrin and Einstein) granted that these reservations were legitimate. It wasn't enough for atoms to fall within the quantifiers of the best available, highly confirmed, scientific theory.

Perrin's experiments carried the day. They did so not because they instantiated any general form of argument but because they fit the detailed structure of the particular question at hand.[12] Atomic

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[11] For a more complete telling of this story, see [1997], pp. 135-143, and [2007], pp. 404-407.

[12] This point plays a leading role in the discussion of Perrin in §II of [2022c].

theory at that time naturally had its blind spots and shortcomings, as all scientific theories do, but the most troublesome objections were two. The first of these was predictable: atoms weren't observable; available evidence displayed only what was purportedly the smoothed-out, collective behavior of vast numbers of individuals. The second objection concerned what was hypothesized to underlie that group behavior, namely the random walk. This was not only odd, it implied that the laws of classical thermodynamics – laws overwhelmingly confirmed, in every observed case – were only probabilistically true. What Perrin did, building on work of Einstein, was to track a manifestation – 'a faithful reflection' (Perrin [1913], p. 105) – of the controversial random walk at a scale observable with a microscope. Molecules weren't observed, but they were detected.

Among other things, this case shows that broad characterizations like 'confirmed by its place in the holistic web of belief' (and the others listed earlier) don't match actual science, and the Second Philosopher, at least, sees the matters as the scientist does.[13] So, in particular, our goal of understanding the reliability of logic can't be achieved simply by noting that it lies at the center of the web.

Instead, the Second Philosopher sets out to discover what specific aspects of the world account for the apparent reliability of

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[13] This isn't to say that there can be no controversy over scientific methods, but those controversies are raised and settled in ordinary scientific terms.

concluding that the aforementioned coin must be a half dollar.[14,15] Obviously, the particular properties of this particular object don't matter. What does matter is that it's a fairly stable individual, with fairly stable properties – that's enough. Or consider: Jane is taller than June, so June isn't the tallest (that is, someone is taller than June). Or again: a blue triangle is triangular. These don't depend on Jane or June or tallness, blueness, or triangularity, but on objects (of any sort), their properties (of any sort), and the relations (of any sort) between them. In this way, the Second Philosopher isolates what I've called KF-structure:[16] objects that enjoy and fail to enjoy properties, that stand and fail to stand in relations, where some situations involving these objects stand as ground to other situations as consequent.[17] This much structure

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[14] It's not clear that this question even makes sense from Quine's holistic perspective. See Quine [1960], p. 161: 'The quest of a simplest, clearest overall pattern of canonical notation is not to be distinguished from a quest of ultimate categories, a limning of the most general traits of reality'. If regimenting our theory in the simplest logical form – first-order logic – is how we 'limn reality', then there's no alternative perspective on the world that would allow us to ask what it is that makes first-order logic work so well.

[15] Again, no criterion of logicality is presupposed here. The Second Philosopher's approach to logic is described in more detail in [2007], Part III, summarized in [2014b], and compared with Wittgenstein's views, earlier and later, in [2014a].

[16] KF stands for Kant-Frege, for (some of) Kant's forms of judgment, as improved by Frege's innovations. (See [2007], §III.2, [2014a], chapter 3.)

[17] I use the archaic terms ground/consequent in the sense of Kant's pure category – they also turn up in Frege (see [1880/1], p. 37) – not intending to engage the contemporary debates over grounding. Kant's example is: 'if there is perfect justice, then obstinate evil will be punished' (A73/B98). 'I have the key' and 'if I have the key, then I can open the door' jointly ground 'I can open the door'; the premise of our coin inference grounds its conclusion. But 'the moon is made of legos' doesn't ground '2+2=4', despite the truth of the corresponding material conditional.

validates a rudimentary logic of classical inferences involving conjunction, disjunction, negation, and quantification.[18]

So far so good. Common sense reports that much of our world does, in fact, exhibit the requisite KF-structure, but the Second Philosopher isn't content to stop there; common sense is a reasonable starting point, but it has its limitations and, on closer examination, often needs correction. In this case, happily, common sense is borne out: for example, the space occupied by an ordinary physical object like a coin typically contains molecules of a different sort from those of the surrounding air, more densely packed and tightly organized, held together by forces that keep them moving as a group and resisting penetration.[19] Eddington and Sellars,[20] each in his own way, would object that the commonsense coin is distinct from the Second Philosopher's swarm of molecules because the commonsense coin is homogeneous substance and the swarm is mostly empty space. But it isn't clear to me that, for example, Austin's Plain Man has any pre-theoretic belief about why his fingers don't pass through the coin when he picks it up, and even if he does, why wouldn't he be

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[18] E.g., the Demorgan laws, distributive laws, double negation, universal instantiation, etc. This is phrased in terms of inferences rather than laws because, as comes out in a moment, indeterminateness keeps rudimentary logic from validating any logical truths. The distinction between laws and inferences is often ignored in the text by referring to 'logic' without further specification.

[19] The Second Philosopher sees no reason to think that the unity of the cat molecules walking across the living room carpet rests on any aspect of human cognition.

[20] See Eddington [1928], pp. ix-xiii, Sellars [1962], pp. 26-27. For a bit more, see [2014b], pp. 219-223.

reasonable enough to change his mind in light of scientific progress?[21] We've learned something wonderfully surprising about coins!

Another charge lodged against the Second Philosopher at this point is that her scientific ratification of KF-structure was foreordained: if one starts out with commonsense confidence in relatively stable objects, with relatively stable properties, standing in relatively stable relations, with ground/consequent dependencies – the objection goes – then that's what one inevitably discovers. A student of quantum mechanics may well wish this were true, but we've been able to discover that the properties, and indeed the very identities, of subatomic particles don't fit the KF mold – so the Second Philosopher's check on the common sense was not automatic. And while we're in the neighborhood, notice that if the reliability of rudimentary logic rests on the presence of KF-structure, as the Second Philosopher believes, then that logic should be expected to fail where that presence is lacking – as in the case of quantum mechanics. And so it does.[22]

One immediate consequence is that the reliability of rudimentary logical inference isn't necessary: not only might it fail in imaginary scenarios[23] without KF-structure, it even fails in our own

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[21] More recently, in their aptly named *Every Thing Must Go* (Ladyman and Ross [2007]), Ladyman and Ross argue that 'naturalism' as they understand it dictates that neither the commonsense coin nor the swarm is real – roughly, there is only information. (More precisely, they advocate 'information-theoretic structural realism'.) For the Second Philosopher's condensed reaction, see footnote 9 on pp. 222-223 of [2014b].

[22] For example, when x is a particle, '(Px or P'x) and (Qx or Q'x)' doesn't imply '(Px and Qx) or (Px and Q'x) or (P'x and Qx) or (P'x and Q'x)'.

[23] I use this odd phrase in place of the standard term 'possible worlds' because the latter are often regarded more or less as models in the sense of

microworld. Of course, Quine rejects modality in general, and so in particular, rejects the necessity of logic, but with the exception of the gesture, quoted above, toward the possibility that classical logic might fail in the case of quantum mechanics, he doesn't directly address the question of which worldly conditions our contingent logic is contingent on.[24]

In this respect, and indeed in most others concerning logic, the Second Philosopher is closer to the late[25] Wittgenstein, who challenges us to imagine what our practices of inferring and calculating would be like if we lived in a world (as the Second Philosopher would put it) without KF-structure.[26] For both,[27] our logical practice rests on the tripod of natural reactions (for example, of salience or to training), goals and interests (for example, getting around in or finding out about the world), and – as is emphasized here – 'extremely general facts of nature: such facts as are hardly ever mentioned because of their great generality' (note after *PI*, §142).[28] Those familiar with Wittgenstein's antipathy to science might balk at the suggestion that he in any way resembles a figure as scientistic as the Second

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model theory, which come with KF-structure, and even full classical logic, built in. I attempt some such 'imaginary scenarios' in [2014a], pp. 20-25, as does Wittgenstein (see below).

[24] Recall footnote 12.

[25] I use this customary label for the author of *PI* and *RFM*, though the usual dichotomy between early Wittgenstein (*T*) and late (*PI*) is drastically over-simplified. (See, e.g., [202?a].)

[26] See, e.g., the odd nut-sharer at *RFM* I, §137.

[27] See [2014a], chapters 5-6.

[28] See also the oft-quoted *PPF*, §366.

Philosopher, but I've argued that the second-philosophy-friendly view of logic in *PI* and *RFM* is separable from this crude science-unfriendliness.[29] In the philosophy of logic, (I claim) the late Wittgenstein is naturalistic in doctrine, just not in affect.

The traditional epistemological virtue of logic, a priority, plays out somewhat similarly: Quine rejects the a priori/a posteriori distinction across the board;[30] the Second Philosophical focuses more narrowly and tells a more detailed story. Wondering how we manage to detect KF-structuring where it's present, she proceeds as a cognitive scientist and discovers, as the latest developmental psychology has it, that human infants do so quite early on, pre-linguistically. In fact, they share this ability with non-human animals (monkeys, fish, birds, etc.), most likely as a result of evolutionary pressures.[31] Given this primitive cognitive structure, it's not surprising that we find some simple logic inferences so obvious, and on the downside, that we find it difficult to conceptualize the microworld. So, is logic a priori? How one answers this question appears to depend on what one counts as 'knowing', that is, on one's epistemological theory: an externalist epistemologist might argue that the process by which we come to see those simple inferences as valid is reliable, and therefore, that we know; an internalist might insist that we must be

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[29] See [2014a], chapter 7.

[30] What actually matters to Quine is that no viable notion of a priority can do the jobs Carnap wants it to do, e.g., account for our knowledge of the mathematics in mathematized science.

[31] See [2007], §III.5, [2022b].

able to present reasons, which we often can't. The Second Philosopher leaves this question to the epistemologists, resting content with her understanding of the underlying facts of the case.[32]

Returning, finally, to the basics of KF-structure, it turns out contingency isn't its only notable feature; it also needn't be fully determinate. Is this loose hair included in the cat or not? Where exactly is the boundary of this mountain? And the indeterminateness goes beyond individuation of objects; it infects properties, too. There are tadpoles (larval stages, with gills and tails), and there are frogs (adults, tailless and air-breathing), but in the gray area between, there are also borderline cases. As a result, there are claims about the cat, the mountain, the amphibian without determinate truth value, and this indeterminateness works its way up into logical compounds: if (…) is indeterminate, so are not-(…) and ((…) and (--)) and so on. The result is that rudimentary logic validates no logical laws; any candidate[33] inherits indeterminateness from indeterminate constituents. As remarked earlier, many classical inferences nevertheless survive – because (we now see) assuming the premises determinately true often rules out most indeterminateness – but not all: for a trivial example, ((…) or not-(…)) doesn't follow from ((--) or not-(--)), despite the classical validity. Reductio ad absurdum is also problematic: if a contradiction follows from φ plus premises,

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[32] [2022b] argues that the epistemologist's question doesn't fall in the Second Philosopher's purview and even casts doubt that there's a fact of the matter (in footnote 103).

[33] At least, any candidate not involving the somewhat nebulous ground/consequent. See [2007], p. 230, footnote 18.

φ needn't be false, given those premises; it could just be indeterminate.

So, though rudimentary logic is simply and straightforwardly valid in many real-world situations, the various inferences these worldly facts generate don't make for a workable theory. The Second Philosopher reacts to this situation as any scientist would: she wonders if there might be relatively benign idealizations that preserve the best of her rudimentary account. Often enough, she's ignored friction or treated a planet as a perfect sphere or pretended the ocean is infinitely deep when these falsifications improved her descriptive and predictive abilities and presented only such drawbacks as could be avoided or minimized with care. In the present case, the obvious thought is to assume that all properties are fully determinate.[34] Like any scientific idealization, this might lead us astray if we invoke it willy-nilly (without friction, we can't walk), so care must be taken: for example, it might distort our moral thinking to suppose that there's a fact of the matter about exactly when the transition happens in cases like that of the tadpole becoming a frog.[35] Deployed with appropriate caution, the move to full determinateness validates the law of excluded middle, and with it all

[34] For a helpful summary of Quine's later discussions of bivalence, see Hylton [2007], pp. 259-263.

[35] Consider, e.g., the span between a fertilized egg and a near-term baby, and the property of personhood. If one believes that there must be an exact moment in this span when the change from non-person to person occurs, one might also believe that there's no good reason for it to happen at any particular intermediate point, and so that it must happen at the moment the egg is fertilized.

classical tautologies and valid inferences – except those involving 'if … , then …'.

All that's left is to replace the quirky ground/consequent relation with the truth-functional material conditional (again with appropriate care): the drawbacks are its so-called 'paradoxes'; the benefits are obvious. In this way, the Second Philosopher arrives at full classical logic. Many deviant logics reject one or the other of these idealizations, but none has so far has matched the simplicity, power, and scope of full classical logic.[36]

We have here two straightforwardly naturalistic accounts of logic. (Wittgenstein's purported naturalism is perhaps unstraightforward, as is his way.) Their methods are empirical, but in a rough sense, one approaches logic from a general overview of science (holism and the web), the other builds up from specifics (KF-structures and cognitive mechanisms). Both reject the traditional virtue of necessity and any philosophically useful version of a prioricity, and both regard deviant logics as practically inferior to classical first-order logic for most purposes. Let's now consider a few contemporary alternatives.

III. Three contemporaries: Warren, Williamson, Sher

1. Warren[37]

[36] For another way to retain classical logic, see Williamson's epistemicism in §III.2.

[37] My thanks to Professor Warren for his help with this section.

Channeling the 'scientific philosophy' of the positivists, Jared Warren mounts a spirited revival, proposes a new, improved version of conventionalism: the validity of a logical inference is fully explained by implicit linguistic conventions. So, for example, when the Plain Man reasons that the coin must be a half-dollar, he knows this on the basis of the premises because: he has learned English, and disjunctive syllogism is an implicit rule of English, and he's entitled to apply the rule even if he hasn't explicitly formulated it and may even be incapable of doing so. As Warren pursues his project, what stands out for our purposes is his insistence that, 'whatever we do, we remain within the bounds of basic scientific naturalism' (Warren [2020], p. 16).[38] The first question, then, is what he intends by 'basic scientific naturalism'.

The naturalism in play here is metaphysical, beginning with an ontological claim:

> A naturalistically acceptable explanation of some facts must not appeal to an independent realm of non-causal facts. (p. 18)

This is intended to disallow 'metaphysical weirdness' (p. 17), for example, 'the logical heaven of crystalline purity' (p. 18). Perhaps it follows that our epistemological account should involve no 'cognitive spookiness' (p. 17) or 'mysterious faculties of "pure reason"' (p. 19), but Warren makes this requirement explicit:

> A naturalistically acceptable explanation of some facts must not attribute to humans non-causal cognitive powers. (p. 18)

[38] Unaccompanied page references in this discussion of Warren's conventionalism are to his [2020].

In particular, Warren insists that 'somehow, someway, cognition arises from the embodied brain' (p. 19).

This exclusive focus on the metaphysical side of naturalism rules out divine inspiration and such but provides little positive guidance on what methods we should use for finding out about the world or why those methods are trustworthy. Still, Warren's actual practices provide clues as to what he takes to be proper procedure. In his discussion of linguistic rules, he draws on contemporary linguistics, including the distinction between competence and performance. Citing experimental results, he concludes:

> On this basis, in order to account for human linguistic *performance*, we should posit wholly syntactic rules of inference as part of human linguistic *competence*. (p. 28)

Here rules of inference run parallel to those of morphology and grammar. Still, he wonders, can their role 'be accounted for in wholly naturalistic terms' (p. 33)? His positive answer takes the form of a complex 'functionalist-dispositionalist' account of what it is to follow an inferential rule.[39] There doesn't appear to be anything weird or spooky in this.

Later, while explaining how logical particles get their meaning, Warren says he's just '*making explicit* what is already, in some sense, *implicit* in our practice of inferring' (p. 88).[40] A more self-consciously methodological passage along these same lines concerns the notion of entitlement central to the Plain Man's knowledge:

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[39] For a summary, see pp. 46-47.

[40] The echo of Brandom is deliberate.

> The notion of entitlement is, as I am understanding it, wholly compatible with basic scientific naturalism … It involves no metaphysical weirdness or cognitive spookiness. (p. 162)

Why not? Because

> The notion of an epistemic entitlement is an inchoate part of our epistemic theorizing.
>
> We are not merely taking our practices as they are on the surface, but nor are we significantly revising and altering them.
>
> My approach is somewhere *between* an analysis and an explication. (ibid.)

It would have been good to hear more about the workings of this intermediate point, but perhaps it can be seen as of a piece with ordinary empirical theorizing about human behaviors and practices.

Finally, taking a synoptic view in the book's closing pages, Warren engages in a remarkable stretch of meta-reflections.[41] In particular, he endorses a staunch factualism about metasemantics (there are facts of the matter about how words get their meanings), combined with 'non-factualism about many other areas of philosophy' like 'heavyweight metaphysics of the kind the Vienna Circle abhorred' (p. 338). These metasemantic facts are located as a special case of the scientific realism discussed above, though with a caveat:

> The factual branches of philosophy are somewhat akin to branches of science, though they differ from science in various ways. In science … we have rigid constraints on our theories in the form of experimental predictions and other direct causal anchors. In philosophy there are constraints, too, but … they are more nebulous. (p. 338)

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[41] The concluding chapter begins with the acknowledgement that his 'deflationary instincts threaten to destroy the foundation upon which [his] conventionalist cathedral has been built' (p. 334) and includes striking analyses of the psychology (and even the morality) of his opponents, plus some unusually poetic descriptions of his own dark nights of the soul (e.g., p. 348).

If philosophy differs from science 'in various ways', one wonders, how does our confidence in the reliability of the latter carry over to the former?

Warren's answer moves to a higher level of generality, where he argues directly for his conventionalist account as a whole:

> Conventionalism should be accepted because it is the best explanation of everything that needs to be explained in logic … This is related to a standard form of non-deductive reasoning, called *abduction* or *inference to the best explanation* (IBE) … Explanations are judged according to various theoretical virtues: simplicity, non-ad hoc-ness, generality and explanatory scope, coherence with established facts, coherence with well established theories, fruitfulness, precision, intuitiveness, *et cetera*. (p. 339)

Viewed from this great height, Warren sees the method of (good) philosophy and that of science as not only 'akin' but indistinguishable. I've indicated above why I think IBE and its cousins don't in fact describe the method of science, but we do have here a clear statement of the methodological side of Warren's naturalism.

Given this understanding of Warren's naturalism and his functionalist-dispositionalist account of the role of implicit inferential rules, the final piece to his conventionalist account of validity is the notion of 'full explanation'. One key clarification:

> Conventionalists are not committed to thinking linguistic conventions are themselves explanatorily brute! (p. 10, footnote 25)

> If the psychological facts are fully explained in terms of the biological facts, and the biological facts in terms of the chemical facts, which are explained in terms of the physical facts, then the psychological facts too can be explained in terms of the physical facts (or the chemical facts). There are many complete explanations, because the middlemen can be cut out of the picture. (p. 13)

This is where the Second Philosopher's account of logic comes in. She doesn't believe that logical validity is fully explained in terms of linguistic rules – she attributes logical abilities to prelinguistic infants and nonhuman animals[42] – but even if she were to grant Warren this point, she would hold that there's a deeper explanation to be had. She asks, why is the coin inference reliable? Warren answers, because we're speaking English and English has certain conventional rules. Unlike Warren, she then asks, why does English have these rules?[43] After some investigation, she concludes that we have them because of some very general facts about the world – which are then reflected in some very general facts about our cognition, and then in some very general facts about our language – so in the end, those very general facts about the world are what make the inference reliable. And this explanation is more realist than conventionalist.[44]

Obviously, Warren would reject this. It often seems he thinks any form of logical realism must involve the kind of 'heavyweight metaphysics' that he and the logical positivists abhor (a sentiment I share), but the Second Philosopher offers an alternative, a naturalized metaphysics understood through ordinary scientific

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[42] Warren touches briefly on the logical abilities of animals on p. 49.

[43] A Carnapian might say that the linguistic rules that validate logic are the rules of the linguistic framework, chosen for pragmatic, not theoretical reasons, and thus not subject to the sort of explanatory investigation the Second Philosopher undertakes within the framework. But Warren's linguistic rules are of a piece with empirical linguistics, part of the ordinary theoretical practice conducted within the linguistic framework.

[44] This is essentially the second-philosophical concern about explanations of logical validity in terms of analyticity: at a deeper level, there's a non-conventional reason why we have these meanings rather than those (see [2007], pp. 205-206).

inquiry. By cutting himself off from deeper explanations at this point, it seems to me that Warren is robbing himself of the very tools – from developmental psychology, psycholinguistics, and much more – that are necessary to address his metasemantic question of how our words get their meanings. But I leave the matter here and commend the reader to their own exploration and assessment of Warren's version of naturalism in the philosophy of logic.

2. Williamson[45]

With his take on naturalism (discussed in §I) as background, consider Williamson's thoughts on the particular case of logic. In 'Logic, metalogic and neutrality' (Williamson [2014]), he argues that logic isn't metaphysically neutral, that alternative logics often disagree over substantive matters of fact – a position he sums up by classifying logic as a *science*. In 'Semantic paradoxes and abductive methodology' (Williamson [2017]), he makes the case for classical logic over its competitors, for example, over intuitionistic logic.[46] For our purposes, the question is: in what sense is this case 'scientific' – first, in its understanding of what logical claims say, then, in the evidence it provides that the laws of classical logic are the ones that are true?

So, first, the content of logical claims. Reverting, yet again, to our coin example, Williamson would formalize and ask, why is HDc a

[45] My thanks to Professor Williamson for illuminating exchanges on §I and this section, especially for saving me from one significant misstep.

[46] Extensions like modal logic are more expressive than classical logic but don't compete with it.

logical consequence of $Dc \vee HDc$ and $\neg Dc$? His answer, as I understand it, is this: the inference in question is valid because

$$\forall P \forall Q \forall x(((Px \vee Qx) \wedge \neg Px) \rightarrow Qx)$$

is simply true of the world. Roughly speaking, this is a formal counterpart to the Second Philosopher's observation that the reliability of the coin inference doesn't depend on the coin or its properties, but simply on the fact that the coin is well individuated and its properties fairly stable, in other words, on the fact that this is a KF-structure. Having investigated those conditions and their prevalence, she comes to believe that Williamson goes too far if his quantifiers implicitly include, say, subatomic particles and their properties, or, in general, any situation that isn't KF-structured. (Williamson does acknowledge the possibility that classical logic breaks down in the microworld, but only to point out that no viable quantum logic has yet been proposed, not to consider possible limits to his own quantifiers.[47]) In any case, so far, I don't see that these small divergences between the Second Philosopher and Williamson in any way challenge the broadly naturalistic credentials of his account.

At this point, Williamson goes on to address a topic that my second-philosophical treatment has neglected: the assessment of explicit inference rules. A first thought is to require simply that our chosen rules be sound and incomplete for the robust worldly semantics just described, but Williamson resists the move to

[47] See Williamson [2014], p. 212, [2017], p. 338. In practice, quantum mechanics proceeds perfectly well with pure mathematical models that satisfy classical logic.

metatheory.[48] After all, we're imagining there's an unresolved debate between the classical logician and the intuitionist over which inference rules are correct, so the proper execution of metalogic, in particular, is unsettled.[49] Instead, Williamson proposes that we consider various well-established scientific theories – from physics, chemistry, astronomy – and explore what consequences can be drawn from them using a given set of inference rules, drawing out in this way a distinctive batch of implications for each of our candidate logics. These batches are simply collections of scientific claims, so – and this is the key – they can be judged by ordinary scientific standards:[50] 'Thus the evaluation of logics is continuous with the evaluation of scientific theories, just as Quine suggested' (Williamson [2017], p. 334).

Okay, so, what are these ordinary scientific methods? Williamson's answer is straightforward: abduction.

> Scientific theories are compared with respect to how well they fit the evidence, of course, but also with respect to virtues such as strength, simplicity, elegance, and unifying power … The abductive methodology is the best science provides, and we should use it (Williamson [2017], pp. 334-335).

Spelling this out for the case of inference rules, Williamson requires that they not imply everything (consistency with the evidence) and

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[48] See Williamson [2017], p. 332.

[49] In Williamson [2014], pp. 218-219, he points out that the completeness of first-order intuitionistic logic is provable in a classical metatheory but not provable, indeed highly implausible, in an intuitionistic metatheory.

[50] Williamson points out that this approach 'need not displace the ideal … of soundness and completeness … Rather, it may be a means to achieving that ideal when it is unclear what rules of logic we should reason by' (Williamson [2017], p. 334).

that their predictions, the collection of scientific claims they help generate, be confirmed (fit with the evidence). He goes on to clarify how the other theoretical virtues play out in this context (especially 'strength') and to conclude that

> Once we assess logics abductively, it is obvious that classical logic has a head start on its rivals, none of which can match its combination of simplicity and strength. (Williamson [2017], p. 337)

Of course, this doesn't preclude the possibility that a rival will one day surpass classical logic, by innovation or by the accumulation of new evidence, but Williamson figures that this hasn't happened so far, and I agree.

The Second Philosopher's disagreement comes, of course, with the adoption of blanket abduction, which she regards as too crude an analysis of scientific method – and this time its dangers become apparent. Because classical logic works so well in physics, chemistry, astronomy, and the rest, Williamson concludes, abductively, that it must be literally true. This includes LEM, so all objects and properties have precise boundaries. This means that Borderline Joe is either definitely bald or definitely not bald – obviously a counterintuitive result. Undeterred, Williamson accepts this conclusion, explaining that vagueness is an epistemological phenomenon, not a metaphysical one; there's a fact of the matter about Joe's baldness, we just can't know it (Williamson [1994]). Whatever we may think about the plausibility of this bold move, there's nothing obviously unnaturalistic in Williamson's defense and development of his 'epistemicism'.

As we've seen (in §II), the Second Philosopher conducts a more nuanced study of scientific method, with attention both to cases like atomic theory, where participation in the best explanation isn't enough to establish literal truth, and to cases deliberately simplified or idealized to the point of literal but effective falsity. Faced with failure of bivalence for Borderline Joe, she opts for the powerful, largely benign idealization of full determinateness.[51] This strikes me as a more reasonable defense of the classical law of excluded middle than what epistemicism provides.

In sum, then, Williamson's proceedings here aren't fully second-philosophical (no great surprise), but, as Warren's case demonstrates, there's more than one way to be a naturalist. His disagreement with the Second Philosopher over abduction, which leads to divergences downstream on bivalence and the rest, strikes me as an intramural debate between naturalists over the proper analysis of scientific method. So, despite his protestations against Rosenberg-style naturalism in §I, Williamson's philosophy of logic in the scientific spirit emerges as broadly naturalistic.

3. Gila Sher[52]

So far, we've considered an avowed naturalist of a minimal metaphysical variety with a conventionalist philosophy of logic

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[51] As noted in §II, the Second Philosopher also adopts the material conditional as a powerful and largely benign idealization of the ground/consequent relation. Here, too, Williamson sees not idealization but literal truth: in Williamson [2020], he argues that the material conditional is the best analysis of natural language 'if's.

[52] My thanks to Professor Sher for her help with this section.

(Warren), and an advocate of 'the scientific spirit', explicitly distinct from a strict, Rosenbergian-style naturalism, with an account of logic surprisingly close to the Second Philosopher's (Williamson). Continuing in the progression, our final example is explicitly and emphatically not a naturalist of any stripe but with an understanding of logic that looks nearly identical to the second-philosophical story. It's worth tracing how this happens.

The philosopher I have in mind here is Gila Sher.[53] Like the Second Philosopher, Sher begins her investigation of logic with ordinary observation:

> Consider the students in one of my graduate seminars … Each individual student in the class has many features … being identical to himself/herself and … being a student in the class. (Sher [2016], p. 83)

She goes on to note that one individual has both the properties of being a first-year student and of being a woman, that they all bear the relation studying-in-the-same-class-as with one another, and that, taken together, they number 17 – remarking that 'We do not need more than plain common sense to make these observations' (ibid.).

Continuing from here, she notes that in general there are dependencies between certain situations involving objects, their properties, and their interrelations – perhaps, for example, at Professor Sher's institution, any situation with a first-year student is one with a student who has not yet passed their qualifying exams. Some of these dependencies are what Sher calls 'formal', that is, they

[53] Especially Sher [2016] and [2020]. See also Sher [202?] and my [202?b].

remain in force no matter what individuals,[54] properties, or relations are substituted; for example, any situation with an individual who is both a first-year student and a woman is also a situation with an individual who is a first-year student. Or, as the Second Philosopher has noted, if a coin is either a dime or a half-dollar, and it's not a dime, then it must be a half-dollar – this also doesn't depend on the particular coin or its particular properties.

Given how closely Sher's account of the worldly grounding of logic tracks the second-philosophical story, it's surprising how emphatically she disavows any trace of what she sees as naturalism, as in this characteristic passage

> Philosophy's … standing is … different from what radical naturalists take it to be. Philosophy is not transmuted into a branch of empirical science, be it psychology, neurology, sociology, or any other science; nor is its role limited to giving a helping hand to these sciences. (Sher [2016], p. 29)

She advocates 'a new … genuinely philosophical as distinct from scientific … methodology' (Sher [2020], p. 232).[55] The question for us is whether this anti-empirical theme infiltrates her account of logical inference in a form antithetical to Second Philosophy, undercutting our apparent agreement there. I consider first two points at which this appears to happen but, on closer inspection, doesn't, then identify the point where our fundamental disagreement actually does emerge.[56]

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[54] Technically, these substitutions are one-to-one and onto functions from the domain of individuals to itself.

[55] See also Sher [202?] where she distances herself from the Second Philosopher in particular.

[56] For a related discussion, see the exchange, Sher [202?] and my [202?b].

One obvious difference: Sher's text seems to presuppose that the world's properties and relations are bivalent, generating a classical logic, while my own KF-structures aren't so well behaved. In fact, her main text is potentially misleading on this point, as she notes explicitly in more than one footnote. The first of these reads:

> A clarificatory note: in this essay I talk as if all branches of knowledge are bivalent. But this is intended just for the sake of simplification. (Sher [2016], p. 95, footnote 39)[57]

In fact, Sher takes the bivalence of the world's properties and relations to be an open question. Like the Second Philosopher – and here's the key point – she adopts standard predicate logic only for the sake of simplicity (as she characterizes what I'd call idealization). So there's no disagreement here on the status of LEM.

Then there's Contingency, a conspicuous feature of KF-structure and the resulting logic. Sher emphasizes that logical laws – because their correctness is unaffected by wholesale substitution of their non-logical parts – enjoy

> especially strong modal force – stronger than … the physical, biological, and other laws governing reality. (Sher [2016], p. 317).

The Second Philosopher agrees with this comparative judgment, but she can't help noticing that the definition of 'formal' – with its one-to-one substitution of individuals – presupposes the presence of KF-structure. What about situations like quantum mechanics, where KF-structure is absent and even rudimentary logic fails? To this point, Sher writes:

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[57] See also p. 233, footnote 116, and p. 275, footnote 38.

> If … the formal behavior of objects on one scale (say, the microscopic scale) turns out to be governed by different laws than those governing objects on another scale (say, the macroscopic scale), then veridicality considerations will lead us to admit two logics, each for a limited domain. (Sher [2016], p. 337)

Of course, we have no 'formal' (KF-based) logic for the microworld, but Sher's point is simply that[58]

> on each level, the logical laws will be necessary in the sense that they will have a larger counterfactual scope than physical laws.

The Second Philosopher certainly agrees that our macro-level logic is depends on less of worldly structure than the laws of classical physics, so again, any disagreement here is only apparent.

As I understand it, the point at which Sher and the Second Philosopher truly part ways can be traced to what seems a trivial difference in their commonsense observations of those students in her seminar. Recall the inference that any situation with an individual who is both a first-year student and a woman is also a situation with an individual who is a first-year student. Sher's observation is that this remains true for any substitution of individuals and properties; the Second Philosopher's is that the reliability of the inference didn't depend on the particular objects or properties involved, which comes to the same. Sher elaborates: the formal law is both pre—logical and pre-mathematical, that is, it grounds both the 'logical

[58] Private communication, quoted with permission.

theorem' $\forall x((Px \wedge Qx) \rightarrow Px)$ and 'the mathematical (set-theoretic) theorem' $(A \cap B \subseteq A)$.[59]

So far, all is harmony, but how should we understand the subject matter of the original, pre-theoretic formal law? The Second Philosopher has a ready answer: it's a fact about KF-structure, concerning just objects and their properties, relations, and dependencies. Sher and the Second Philosopher agree that number properties are among these – there are four shoes on the floor of the closet – and even that those shoes are two pairs. Where they differ is over the nature of the two pairs: the Second Philosopher sees this as just another property of the KF-structure on the floor of the closet – a property of the shoes, that they are two pairs – but Sher sees a second-order property – a property not of the shoes, but of property 'pair of shoes'. This tiny difference has sweeping consequences. Where the Second Philosopher sees only logical structure – which includes simple arithmetical identities (2+2=4) but nothing more mathematical than that – Sher sees the first few layers of a towering mathematical reality: finite cardinality properties, infinite cardinality properties, properties of those properties, and so on.[60]

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[59] Here I paraphrase a sentence from the first paragraph of subsection C on p. 321 of Sher [2016] to avoid her example of LEM, for reasons discussed above.

[60] See Sher [2016], §8.4. Ironically, I once defended a view like this myself ([1990]), though I thought I needed an argument that the bearers of number properties were sets rather than something more modest, like KF-structure. Sadly, I called on an indispensability argument for this purpose.

As it turns out, Sher's goal for mathematics is 'a realism without either empiricism or Platonism' (Sher [2020], p. 232). In pursuit of that goal, she offers what seems to me a severely impoverished understanding of ordinary perception, which necessitates a separate faculty of 'intellect' to cognize the 'abstract' elements of reality.[61] Still, leaving mathematics aside, the fact remains that Sher's realism in the philosophy of logic closely aligns with the Second Philosopher's.

IV. Conclusion

After a look at 'naturalism' itself (in conversation with Williamson and Rosenberg) and a comparison of Quine and the Second Philosopher (with a nod to Wittgenstein), I've examined the naturalistic credentials of three contemporary philosophies of logic: an avowed naturalist with a decidedly un-second-philosophical account; a wary agnostic on naturalism whose 'scientific spirit' leads to a worldly position reminiscent of Second Philosopher's; and finally, oddly, a declared anti-naturalist whose position on logic is nearly indistinguishable from hers. One last point. However naturalistic these other accounts might be, the Second Philosopher's method remains distinctive: when common sense suggests that the world is structured into objects with properties, standing in relations, she consults physical science to double check, since common sense is often wrong; when she wonders how we come to know those worldly structures, she

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[61] See, e.g., Sher [2016], §5.3, [2020], p. 244.

employs developmental psychology, neuroscience, evolutionary theory, animal studies, and any other empirical investigation that sheds light. Perhaps one might be forgiven for thinking this openly scientific attitude is the true mark of naturalism.[62]

References

Eddington, A. S.

[1928] *The Nature of the Physical World*, (New York: Macmillan).

Frege, Gottlob

[1980/1] 'Boole's logical calculus and the concept-script', in *Posthumous Writings*, P. Long and R. White, trans., H. Hermes, F. Kambartel, and F. Kaulbach, eds., (Chicago: University of Chicago Press, 1979), pp. 9-52.

Haug, Matthew

[2014] *The Armchair* or *the Laboratory*, (New York: Routledge).

Hylton, Peter

[2007] *Quine*, (New York: Routledge).

Kant, Immanuel

[1781/7] *Critique of Pure Reason*, P. Guyer and A. Wood, trans. and eds., (Cambridge: Cambridge University Press 1997).

Ladyman, James, and Don Ross

[2007] *Every Thing Must Go*, (Oxford: Oxford University Press).

Maddy, Penelope

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[1990] *Realism in Mathematics*, (Oxford: Oxford University Press).

[1997] *Naturalism in Mathematics*, (Oxford: Oxford University Press).

[2007] *Second Philosophy*, (Oxford: Oxford University Press).

[2011] *Defending the Axioms*, (Oxford: Oxford University Press).

[2014a] *The Logical Must*, (New York: Oxford University Press).

[2014b] 'A second philosophy of logic', reprinted in [2022a], pp. 216-233.

[2017] *What Do Philosophers Do? – Skepticism and the Practice of Philosophy*, (New York: Oxford University Press).

[2022a] *A Plea for Natural Philosophy and Other Essays*, (New York: Oxford University Press).

[2022b] 'A plea for second philosophy', in [2022a], pp. 13-48.

[2022c] 'On the question of realism', in [2022a], pp. 49-90.

[2002d] 'Psychology and the a priori sciences', in [2002a], pp. 237-252.

[2022e] 'Enhanced if-thenism', in [2002a], pp. 262-293.

[202?a] 'Wittgenstein', to appear in G. Kemp and A. Khani, eds., *Wittgenstein and Other Philosophers*, (Routledge).

[202?b] 'Reply to Sher', to appear in S. Arbeiter and J. Kennedy, eds., *TBD*, (Berlin: Springer).

Perrin, Jean

[1913] *Atoms*, D. Hammick, trans., (New York: Van Nostrand, 1923).

Quine, W. V. O.

[1951] 'Two dogmas of empiricism', reprinted in his *From a Logical Point of View*, second edition, (Cambridge, MA: Harvard University Press, 1980), pp. 20-46.

[1954] 'Carnap and logical truth', reprinted in his *The Ways of Paradox*, revised edition, (Cambridge, MA: Harvard University Press, 1976), pp. 107-132.

[1955] 'Posits and reality', reprinted in his [1976], pp. 246-254.

[1960] *Word and Object*, (Cambridge, MA: MIT Press).

[1976] *The Ways of Paradox and Other Essays*, (Cambridge, MA: Harvard University Press).

[1990] *Pursuit of Truth*, (Cambridge, MA: Harvard University Press).

Rosenberg, Alex

[2014] 'Why I am a naturalist' and 'Can naturalism save the humanities?', in Haug [2014], pp. 32-35, 39-42.

Sellars, Wilfred

[1962] 'Philosophy and the scientific image of man', reprinted in his *Science, Perception and Reality*, (London: Routledge & Kegan Paul, 1963), pp. 1-40.

Sher, Gila

[2016] *Epistemic Friction*, (Oxford: Oxford University Press).

[2020] 'Quine vs. Quine: abstract knowledge and ontology', in F. Janssen-Lauret, ed., *Quine: Structure and Ontology*, (Oxford: Oxford University Press), pp. 230-252.

[202?] 'Logical realism: a tale of two theories', to appear in S. Arbeiter and J. Kennedy, *TBD*, (Berlin: Springer).

Stroud, Barry

[2009] 'That transparency of "naturalism"', reprinted in his *Philosophers Past and Present*, (Oxford: Oxford, 2011), pp. 240-255.

Warren, Jared

[2020] *Shadows of Syntax*, (New York: Oxford University Press).

Williamson, Timothy

[1994] *Vagueness*, (London: Routledge).

[2014] 'Logic, metalogic and neutrality', *Erkenntnis* 79, pp. 211-231.

[2014] 'What is naturalism?' and 'The unclarity of naturalism' in Haug [2014], pp. 29-31, 36-38.

[2017} 'Semantic paradoxes and abductive methodology', in B. Armour-Garb, ed., *Reflections on the Liar*, (Oxford: Oxford University Press), pp. 325-346.

[2020] *Suppose and Tell: the Semantics and Heuristics of Conditionals*, (Oxford: Oxford University Press).

Wittgenstein, Ludwig

[1921] *Tractatus Logico-Philosophicus*, C. K. Ogden, trans. (London: Routledge & Kegan Paul, 1922), D. Pears and B. McGuinnes, trans., (London: Routledge & Kegan Paul, 1961). (*T*)

[1933/44] *Remarks on the Foundations of Mathematics*, revised edition, G. E. M. Anscombe, trans., G. von Wright, R. Rhees, and G. E. M. Anscombe, eds., (Cambridge, MA: MIT Press, 1978). (*RFM*)

[1953] *Philosophical Investigations*, fourth edition, G. E. M. Anscombe, P. M. S. Hacker, and J. Schulte, trans., (Oxford: Blackwell, 2009). (*PI*)

[1946/49] *Philosophy of Psychology – A Fragment*, in his [1953], pp. 182-243. (*PPF*)