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ORIGINAL RESEARCH

Anti-exceptionalism about logic as tradition rejection

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Abstract
While anti-exceptionalism about logic (AEL) is now a popular topic within the philosophy of logic, there's still a lack of clarity over what the proposal amounts to. currently, it is most common to conceive of AEL as the proposal that logic is *continuous with the sciences*. Yet, as we show here, this conception of AEL is unhelpful due to both its lack of precision, and its distortion of the current debates. Rather, AEL is better understood as the *rejection of certain traditional properties* of logic. The picture that results is not of one singular position, but rather a cluster of often connected positions with distinct motivations, understood in terms of their rejection of clusters of the various traditional properties. In order to show the fruitfulness of this new conception of AEL, we distinguish between two prominent versions of the position, *metaphysical* and *epistemological* AEL, and show how the two positions need not stand or fall together.

Keywords Anti-exceptionalism about logic · Methodology of logic · Metaphysics of logic · Epistemology of logic · Logical predictivism

1 Anti-exceptionalism about logic

There has been considerable interest recently in the position known as anti-exceptionalism about logic (hereafter, AEL), the proposal that logic isn't special (da Costa & Arenhart, 2018; Martin & Hjortland, 2021; Payette & Wyatt, 2019; Read, 2019; Russell, 2015; Williamson, 2017; Woods, 2019). As has rightly been recognised by some, however, the position (or, at least, its articulations) at times can seem somewhat nebulous (Martin, 2021; Rossberg & Shapiro, 2021). While it's clear that

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anti-exceptionalists propose logic isn't exceptional in some sense, what isn't so clear is in what regard, exactly, logic isn't special.

Take, for example, the expression of the position most often quoted, from Hjortland (2017, p. 632):

> Logic isn't special. Its theories are continuous with science; its method continuous with scientific method. Logic isn't a priori, nor are its truths analytic truths. Logical theories are revisable, and if they are revised, they are revised on the same grounds as scientific theories. These are the tenets of anti-exceptionalism about logical theories.

According to Hjortland, AEL makes many claims about logic, including that its methods are continuous with the scientific method, that its theories are revisable on the same grounds as scientific theories, that its evidence is not a priori, and that its truths are not analytic. An expression of the position such as this raises more questions than it answers: What is it for a method to be *continuous* with another? Is there a unitary method by which all scientific theories are evidenced and revised according to? If not, which of the branches of science does logic's methodology most resemble? What is this method, exactly, and how is it exemplified within logic? Is logical evidence wholly a posteriori, or simply not wholly a priori, and can the same be said of the evidence used to justify theories in the recognised sciences? Further, what account of analyticity is at stake when it's proposed that logical truths are not analytic—epistemological analyticity, metaphysical analyticity, or so-called Frege analyticity (Boghossian, 1996)?

Such lack of clarity is detrimental to the debate over AEL, for it can easily lead to a misinterpretation of what the position *requires*. Firstly, it can lead us to confusing a particular proposal for an essential tenet of AEL, and subsequently treating a weakness of a particular embryonic example of the position as a damaging criticism of AEL itself. Secondly, it can lead us to interpreting the proposal as being far more radical and implausible than it really needs to be (or, indeed, more tame and innocuous than it is).

We're currently in danger of falling foul of both forms of misinterpretation in the debate. Firstly, it's reasonably common in the literature to treat logical abductivism, the proposal that logics are justified on the basis of their ability to better fit relevant data, and possess other theoretical virtues to a greater extent than competitors, as though it was a necessary component of AEL (da Costa & Arenhart, 2018; Hjortland, 2017; Read, 2019; Woods, 2019). However, as we shall see in Sect. 4, abductivism is not the only available account of theory choice in logic compatible with the tenets of AEL (cf. Martin, 2021; Russell, 2019), and thus even if we find significant problems with abductivism, this need not spell the end for AEL. Secondly, as we highlight in Sects. 2, 3, some within the debate treat AEL as either a version of, or consequence of, philosophical naturalism. Undoubtedly, this is due to the influence of Quine, and the similarity on the surface between his position on logic's epistemology and that of some contemporary anti-exceptionalists. However, as we emphasise in these sections, there's little motivation for committing most contemporary anti-exceptionalists to naturalism, and thus criticisms of AEL based upon the failure of naturalism can quite easily miss the mark.

The goal of this paper is to provide clarification over how to fruitfully understand AEL, with the aim of both minimising future occurrences of these potential misinterpretations, and ensuring that we don't overlook AEL's potential strengths on the basis of the failings of some of its current incarnations. In order to achieve this, we'll provide a new framework within which to understand AEL, in terms of the *rejection of the traditional properties of logic*. According to this *rejection-of-traditional-properties* account, AEL is not so much one position, but a cluster of often connected positions, united in their shared rejection of at least one of the traditional properties of logic. As we'll outline throughout the paper, this conception of AEL has multiple advantages, including that it allows us to recognise that not all of the proposals associated with AEL need stand or fall together, although because the motivations for logic's traditional properties are often connected, a rejection of one of these traditional properties can also often motivate a rejection of others.

As with any proposal for how to understand a widely discussed position, we run two risks. Firstly, that certain advocates of the position will charge us with having distorted their proposals or motivations, and thereby "missed the point", and secondly that we will end up categorising those not traditionally considered to be advocates of AEL as proponents. However, ultimately, any such concerns would be misplaced. Our interest here is not to reflect what avowed advocates *take to be* the defining features of the position, but rather to argue for what we consider to the most fruitful conception of the position, based upon its ability to facilitate progress in the debate.[1] Further, if our proposal, while being otherwise fruitful, requires us to acknowledge certain non-card carrying anti-exceptionalists as advocates of AEL, this is hardly a significant cost. After all, many of those *currently cited* as advocates of AEL, such as Maddy (2007) and Priest (2014, 2016), do not themselves use the term to denote their proposals. Further, present hesitancy over acknowledging oneself as an advocate of AEL could have as much to do with the ambiguity and connotations surrounding the position as a rejection of the spirit of the proposal. Those who end up counting as anti-exceptionalists (in some respect) according to our new framework may well end up being happy to sign up for their membership card. Of course, as with any proposal of this type, we leave ourselves open to the charge that our proposal is *not* the most fruitful way in which to understand AEL. Our goal is to convince sceptics otherwise.[2]

[1] Some would probably call what we are engaged in here *conceptual engineering* (Cappelen 2018).

[2] Let us briefly note here a concern raised by an anonymous reviewer, which we think may be shared by some readers. By proposing that AEL is more fruitfully understood in terms of the *rejection of logic's traditional properties*, rather than the *continuity of logic with the sciences*, we are calling into question the suitability of Hjortland's (2017) characterisation of the position. However, some may treat Hjortland's (2017) discussion as the initial introduction of AEL, on which grounds we ought to respect the spirit of the position as stated there, even if there are more plausible positions which could also be considered versions of AEL. We think this concern, though reasonable, is mistaken. Hjortland (2017) is *not* the attempt to introduce a new position, but rather an analysis of (a) position(s) already purportedly found in the literature (namely, in Maddy, 2002; Priest, 2014, 2016, Russel, 2015; Williamson 2017). Consequently, the expression of AEL in Hjortland (2017) should not be treated akin to a definition of the position, but rather an analysis of an existent position, and thus should (at least, partially) be evaluated on these terms. As we shall go on to see, one of our concerns with conceiving of AEL in terms of the *continuity of logic with the sciences* is that it fails to make adequate sense of these existent positions. Many thanks to an anonymous reviewer for raising this important point.

Our argument for the proposal runs as follows. In Sect. 2 we argue against the conception of AEL as the proposal that logic is continuous with the empirical sciences, and present in its place an account of AEL as the rejection of at least one of the traditional properties of logic. Here we also include an outline of some of these properties and highlight the benefits of conceiving of AEL in these terms. Section 3 then presents our main argument for the new framework, based on its ability to distinguish between two prominent but distinct anti-exceptionalist traditions, *metaphysical* AEL and *epistemological* AEL. While *metaphysical* AEL concentrates on proposing that logical theories have the same type of descriptive content as theories in other fields (including the sciences), *epistemological* AEL concentrates on denying logic the foundational epistemic status it has traditionally been assigned, contrasting logic with other areas of enquiry. While there are some who embrace both forms of anti-exceptionalism, particularly those who endorse a version of philosophical naturalism, each of these traditions naturally lead to the rejection of divergent clusters of the traditional properties of logic with distinct motivations. The benefit of our rejection-of-traditional-properties account of AEL is that it simultaneously explains why both positions are instances of AEL and why the positions are connected, due to the connections between the traditional properties of logic which each reject, while recognising their distinctiveness. Lastly, we highlight the importance of facilitating the distinction between metaphysical and epistemological AEL by showing that one need not be committed to metaphysical AEL in virtue of endorsing epistemological AEL, using what we take to be the most detailed anti-exceptionalist account of logic's epistemology currently available, *logical predictivism* (Martin & Hjortland, 2021). The need to evaluate these two forms of AEL independently further evidences the fruitfulness of the rejection-of-traditional-properties conception of AEL.

2 Anti-exceptionalism and the traditional properties of logic

What is the best way of understanding AEL's core proposals? Those who have written recently about AEL often simply describe the position as the proposal that logic is continuous with the empirical sciences (da Costa & Arenhart, 2018; Payette & Wyatt, 2019; Read, 2019; Woods, 2019), taking as their lead undoubtedly the first line of the often-quoted paragraph from Hjortland (2017). Further, it becomes apparent that certain criticisms of the position depend upon this particular conception of the anti-exceptionalist proposal. For example, Rossberg and Shapiro (2021) criticise AEL for being too vague, given both that every field of science is different from another in interesting ways, and that the notion of *continuity* operative in the conception is elusive. We agree with these concerns, but we think they are due to a misconception of the goals and content of AEL, rather than a problem with the proposal itself.

In this section we, firstly, outline some weaknesses of the *continuous with the empirical sciences* conception of AEL:

AEL as Continuity: Logic is continuous with the empirical sciences, and then proceed to present and highlight the benefits of an alternative conception of AEL in terms of the rejection of certain traditional properties of logic:

AEL as Tradition Rejection: Logic either fails to possess at least some of the properties traditionally assigned to it which were thought to make logic exceptional, or possesses them in an unexceptional fashion.

2.1 AEL as continuity with the sciences

How we conceive of the broad goals and theses of a proposal matter. Misconceiving a proposal's aims can lead us to wrongly criticise it for missing its target, and misinterpreting the main thrust of its theses can lead us to concentrating on the wrong elements of the proposal, missing its potential force. What we require is an appreciation of a proposal which is both specific enough to facilitate criticism of the proposal's theses, and ecumenical enough to see the woods through the trees, appreciating the general proposal's strengths. As we'll see, *AEL as Continuity* suffers weaknesses in both of these regards.

According to *AEL as Continuity*, anti-exceptionalists are committed to saying that logic is continuous with the sciences. Yet the characterisation as it stands is clearly incomplete, for it neither specifies *how* logic is supposed to be continuous with the sciences, nor *which* recognised sciences it is continuous with. Thus, if we are to be able to properly assess the proposal, we will first need to further interpret the position and determine the values of these variables. Two possible interpretations stand out: (i) a *strong* interpretation, in which logic is continuous with *all* of the sciences in *all* important methodological, ontological, and epistemic regards, and (ii) a *watered-down* interpretation, specifying only *certain* properties of the sciences, and only *certain* sciences, as being relevant to the anti-exceptionalist's proposal. Both have their shortcomings.[3]

Consider first the *strong* interpretation of *AEL as Continuity*. In this case, logic is continuous with *all* of the sciences in *all* important methodological, ontological, and epistemic regards. Firstly, interpreting AEL in this fashion simply places too demanding a requirement on the position. It commits the advocate to there being some core essence to scientific ontology, methodology and epistemology shared across all of the sciences, which logic itself could somehow then share in. Yet, not only does it seems wholly uncharitable to suggest that most (if any) anti-exceptionalists are committed to this proposal when there is no concrete evidence for it, but there's good reason to think that such a proposal is implausible. Firstly, current evidence from the philosophy of science counts against the proposal there is some core essence, whether made up of methodological, epistemological or ontological principles, shared by the sciences (Cleland, 2002; Dupré, 1993; Laudan, 1977; Ruphy, 2016). Not only do different fields adhere to different methodological norms, but these norms have changed over time. Thus, we have both synchronic and diachronic variation across the sciences. Secondly, there are multiple significant features of various scientific fields' methodologies which are not shared by logic. For instance, statistical methods

[3] Of course, there are two other available interpretations which sit between the *strong* and *watered-down* interpretation—(i) that logic is continuous with only *some* sciences but in *all* regards, and (ii) that logic is continuous with *all* of the recognised sciences but only in *some* regards—however for the sake of expediency we pass over these cases, given that the same considerations also demonstrate their shortcomings.

are rife across the physical, life and social sciences; yet, whilst these methods make use of logic, logicians themselves make no use of statistical methods in developing or assessing logical theories. Consequently, interpreting AEL in this fashion simply leads us to having to reject it out of hand.

Secondly, we actually have good reason to think most anti-exceptionalists reject the proposal that logic is similar to the sciences in all of these regards (even if all scientific fields themselves share these features). Requiring AEL to align logic in this way with the sciences simply reduces anti-exceptionalism to an extreme form of naturalism about logic. Yet, as has been made clear elsewhere (Martin & Hjortland *forthcoming*), while naturalism may be *one* motivation for becoming an anti-exceptionalist, one need not be a naturalist in order to be an anti-exceptionalist. For example, there's good reason to think that among others Priest (2008; 2016) admits that logic has its own peculiar sources of evidence with the logico-semantic paradoxes (Martin, 2021). Consequently, this strong interpretation of *AEL as Continuity* not only leads to too easy a dismissal of AEL without appreciating its potential strengths, but distorts the positions of multiple advocates of AEL.

Unfortunately, the *watered-down* interpretation of *AEL as Continuity*, specifying only *certain* properties of the sciences, and only *certain* sciences, as being relevant to the anti-exceptionalist's proposal is equally inadequate. Even if it were possible to specify what exactly these properties are, and which were the target sciences, there are three good reasons to think this proposal also misses the mark: (i) it gives the appearance of AEL lacking underlying principled motivations; (ii) it gives the impression that versions of AEL exist on a continuum, with more thorough going versions drawing greater connections between logic and the sciences; and, (iii) it doesn't fit well with the actual reasons supposed advocates of AEL give for their proposals.

Firstly, by specifying that AEL is only concerned with establishing logic's continuity with *certain* sciences on the basis of *certain* properties, we are left with the question of why only *these properties* and *these sciences*—what is the principle behind picking these particular restrictions? Sure, one can look at the current putative examples of AEL in the literature and simply include these proposals within the scope of the restriction. However, the picture of AEL that results from this process will be ultimately uninformative, neither instructing us whether a new proposal of continuity with the sciences ought to properly fall under the scope of AEL or not, nor explaining why *these* connections and not others are the current subject of debate. Not only does *AEL as Continuity* deliver a picture of AEL as a hodge podge of very loosely associated claims, but it provides very little guidance to researchers as to which possible continuities with the sciences we ought to be concentrating upon, and which are of particular importance to AEL.

Secondly, by emphasising the importance of logic's continuity with the sciences for AEL, *AEL as Continuity* suggests that success for AEL consists in establishing as much continuity with the relevant sciences as possible. Further, that we are able to establish a spectrum on which versions of AEL sit, on the basis of how much similarity they establish, with some being more fully (or, properly) anti-exceptionalist than others. Yet, having a conception of AEL with this connotation could be damaging, leading to the unjustified criticism of versions of AEL in the literature merely on the basis that they do not accommodate certain important features of the sciences (da Costa &

Arenhart, 2018). This criticism only makes sense if the primary goal of AEL is to draw as close a connection as possible between logic and the sciences. However, unless we have good reason to believe that this is indeed the theoretical goal of AEL, we will be likely to miss the existent strengths of its proposals by encouraging its positions to be become more and more extreme, by drawing a closer and closer connection between logic and science.

Lastly, there's good reason to think *AEL as Continuity* distorts the underlying motivations of AEL. After all, the conception suggests that anti-exceptionalists are primarily interested in proposing a similarity between logic and certain recognised sciences in some as of yet undetermined sense. Yet, this would entail that the measure of success for AEL was its ability to demonstrate these similarity relations. It's a surprise then that what we find in most (if not all) of those works often cited as instances of AEL (Maddy, 2007; Priest, 2014, 2016; Russell, 2015; Sher, 2016; Williamson, 2017) is *not* an outline of the relevant scientific properties and then an attempt to show their occurrence within logic, but rather a dissatisfaction with either certain historical assumptions about logic—such as logic's *apriority*, analyticity and foundational status—or certain historical theses about logic—such as *conventionalism* and Fregean *third-realmism*. If the measure of the theoretical strength of versions of AEL were their ability to provide detailed links between properties of logic and sciences, then we must admit they have failed. This should give us reason to doubt this is the underlying motivation of the position. Anti-exceptionalists are not waiting for philosophers of science to form a settled opinion of the nature of science before then seeking to evidence how these same principles hold of logic. Rather, the position often seems less a reaction to what we presently know about the properties of the sciences, and more a dissatisfaction with certain traditional accounts of the nature of logic.[4]

It is here that our own positive account of how best to understand AEL—*AEL as Tradition Rejection*—comes to the fore. Rather than conceiving of the position as primarily interested in drawing connections between logic and the sciences, instead its various instances share the concern of calling into question the traditional properties of logic which are supposed to make logic special as an area of enquiry. While in virtue of calling into question these putative exceptional properties of logic, it can sometimes *appear* that the anti-exceptionalist is concerned with drawing a connection between properties of logic and the sciences, in fact AEL is more concerned with *rejecting* the ways in which logic was traditionally thought to be exceptional than specifying detailed similarities between logic and the sciences.

In the remainder of this paper, we'll be concerned with providing an argument for understanding AEL in terms of *Tradition Rejection*, showing that it is a much more fruitful way to understand the proposal than *AEL as Continuity*. In order to achieve

[4] This doesn't mean that there are *no* potential advocates of either the strong or watered-down version *AEL as Continuity*, or that no one in the literature is exploring either option. For example, Wyatt & Payette (2018) and Payette & Wyatt (2019) seem plausible cases of attempts to explore possible methodological connections between logic and the natural sciences. However, our point here is that these are outlier cases, and further that identifying the whole of the AEL enterprise with these instances will likely lead to an unjustified rejection of AEL in totality. For a recent evaluation of Payette & Wyatt's (2019) attempt to draw connections between the explanatory practices of the chemical sciences and logic, see Martin (forthcoming).

this, however, we must first have a better sense of these traditional properties which AEL is putatively calling into question.

2.2 Logic's special properties

While there is no definitive list of properties which philosophers and logicians have agreed logic possesses, whether as an area of enquiry or as a subject matter, there are some properties which have played a prominent role in the articulation of logic, at least since Kant. Further, the historical consensus is that these properties of logic (at least in combination) make it special. That, unlike the laws of other domains of enquiry, for example, those of logic apply to all domains. While the laws of arithmetic only apply to numbers, and the laws of thermodynamics only to physical systems, the logical laws are wholly *general*, applying to all entities. To this extent, logic is not concerned with the particular identity of any object or property. Indeed, logic is not concerned with the content of propositions at all, but with their *form*. For this reason, logical laws are a priori, *analytic* and *necessary*, in not being responsive to the peculiarities of events within the actual world. Further, unlike most other laws, logic tells us not *what is the case*, but what *ought* to be the case. Particularly, it tells us not how we reason, but how we *ought* to reason—logic is a *normative* science.[5] As we shall go on to see, while other disciplines have also been considered to possess some of these properties, such as necessity and *apriority* in the case of mathematics, they have not traditionally been thought to possess their combination.

In order to make *AEL as Tradition Rejection* more concrete, and further help us articulate versions of the position later (in Sect. 3), it will be useful here to briefly outline some of these historically prevalent properties and the connections that have thought to hold between them:

Generality. Whereas the laws of other areas of enquiry have their specified domain of applicability, logical laws have unrestricted application, applying to all propositions. In other words, logical laws are the most general laws possible. While both the astrophysicist and mathematician are bound by the laws of logic when reasoning about their own unique subject matter, neither the specific laws of astrophysics nor mathematics constrain the logician's enquiry into the logical laws[6]:

> [The logical laws] are the most general laws, which prescribe universally the way in which one ought to think if one is to think at all. (Frege, 1974: xv)

> Thought is in essentials the same everywhere: it is not true that there are different kinds of laws of thought to suit the different kinds of objects thought about. (Frege 1974: iii)

[5] All of these properties can arguably be found in one instructive passage from Kant's *Jasche Logic*, where logic is defined as "a science a priori of the necessary laws of thought, not in regard to particular objects, however, but to all objects in general" (1992, p. 16).

[6] An interesting exception here is Frege, who thought that the laws of arithmetic held universally "with the widest domain of all" (1974: §14). Given Frege's additional commitment that logical laws are *defined* as the most general laws, it's no surprise that Frege proposes that arithmetical laws can be reduced to logical laws.

> [General logic] contains the absolutely necessary rules of thought without which there can be no employment whatsoever of the understanding. (Kant, 1999: A52/B76)[7]

Nor is the generality of logic a supposed mere accidental property of logic. It has been taken by some, such as Frege and Kant (MacFarlane, 2000, Ch. 4–5), as *the* defining feature of logic, so that if we were to discover a case in which a putative logical law does not hold, it cannot be a logical law. It would, then, be a category mistake to suggest that there are specific logics for particular domains of enquiry, for in that case "'logic' is no longer the name of a science concerned with the principles of inference common to all studies, but rather a name for any collection of rules in accordance with which we may argue in some context" (Kneale, 1956, p. 238). It is, consequently, no surprise that Frege made the case for the success of his own *Begriffsschrift* over Boole's algebraic treatment of logic on the basis that it could act as a *lingua characterica,* a universal language for science (van Heijenoort, 1967). This presumption over logic's generality can be found still in the work of contemporary logicians, such as Beall (2017, Sec. 3), who *defines* logic as the study of the correct *universal* closure relation for theories, with the correct logic being that which accurately captures the closure principles that hold for *all* theories. If some of these putative laws hold for only some theories, then they are *by definition* extra-logical.[8]

Formality. In virtue of its laws being of the utmost generality, they are not about any objects *in particular*. This has led both historical philosophers and contemporary logicians to state that logic is not concerned with the content of propositions, but rather with their *form*. While for Kant, Carnap and the early Wittgenstein, the formality of logic lay in its laws and concepts possessing no semantic content,[9] contemporary logicians are far more likely to conceive of logic's formality in terms of the invariance of all permutations of a domain of *logical concepts* (Sher, 1991). Indeed, the importance that is given to permutation invariance within contemporary logic is demonstrated by the fact that for some of these logicians, such as Gila Sher, the notion of *permutation invariance* is so fundamental to logic that we ought to explain the generality of logic *in terms of* its formality:

> The fact that biological, physical, psychological, historical...structures obey the general laws of formal structure [of which logic consists] explains the generality ("topic neutrality") of logic. (Sher 1996: 674-5)

[7] Note that what Kant calls "general logic", in contrast to "special logic", is what he considers to be logic proper; see Kant (1998: B ix, A61/B86, A598/B626; 1992: 13–14). On this distinction between "general" and "special" logic, see MacFarlane 2000: Ch. 4.

[8] For a further example of this tendency within contemporary logic to presume that logical laws must be the most general laws, see recent replies to Domain-Specific Logical Pluralism (DLP), the thesis that propositions can be sorted into discrete domains with their own (potentially divergent) governing logics. One common reply to DLP is simply that the thesis confuses logical and extra-logical principles, and that the correct logical theory (however weak it may be) is the intersection of these purported "domain-specific" logics (see Keefe 2018; Priest 2006a: Ch. 12). Of course, if this intersection turns out to be empty, one potential interesting consequence of this line of argument may be that the correct logic is the empty logic (cf. Beall & Restall 2006: 92).

[9] See MacFarlane (2000: Ch. 3), for whom we thank for much of the work to delineate the different senses given to the "formality" of logic throughout the history of philosophy.

Thus, for some contemporary logicians, at least, it appears that it is not logic's generality which is its defining feature, but rather its formality (understood as permutation invariance). This is in contrast to Kant, for whom logic is formal *because* it is general (MacFarlane, 2000, Ch. 4).

Foundational. Logic's purported generality traditionally has an important epistemic upshot. In virtue of applying to all other domains of enquiry, our investigation of the logical laws themselves cannot be informed by results from these other areas, for these results *presuppose* the logical laws. Consequently, logical justification (and, thus, knowledge) is foundational in a way that justification within other areas of enquiry is not. For example, while in mathematics we can presume the validity of logical inferences in order to establish mathematical results,[10] we cannot simultaneously use results from mathematics to inform our theories of validity without begging the question. The same point holds for the relationship between logic and the empirical sciences. In using rules of inference in order to draw empirical consequences from a theory and ultimately test its predictions, to then use empirical theories to test a logical theory would be to simply either presume its correctness or beg the question against the theory. Consequently, in virtue of logical laws being applicable to all areas of enquiry, logical justification is thereby basic in a way that other evidence is not—justification for claims within these other domains requires logic, without the inverse being true.

While not often explicitly stated,[11] the purported foundational status of logical justification is implicit within various famous philosophical arguments. Take, for example, Frege's case for logicism. While we are told that many arithmetical truths lack self-evidence and thus require proof (Frege, 1952, p. 164), in comparison the primitive logical laws are self-evident (Frege, 2013, p. xvii) and so require no further argument. Additionally, consider Haack's (1976) famous discussion of the justification of logic, in which it's decided that the only plausible form of evidence for a deductive theory is itself deductive, but that this cannot be achieved in a non-question begging fashion. In this case we find, again, the presumption that no results from other areas of enquiry can justify our logical theories.

Apriority. This foundational feature of logical justification draws out yet another historical feature of logic—it's *apriority*. No observable states of affairs directly demonstrate that a rule of inference is valid, or a principle true. Consequently, if empirical data were to inform our logical theories, we would need to *draw inferences* from this data to show how it provided evidence for particular logical principles. Yet, of course, in drawing such inferences from the data we would be inadvertently *using logic* in order to marshal empirical evidence for a logical theory. Thus, in requiring that the evidence for our logical theories must be *non-inferential*, this precludes the possibility that our evidence for our logical theories could be a posteriori. Given this, we are faced with two options: either our logical theories and beliefs are not justified, or they are justified a priori. Naturally, most philosophers have taken the latter option.

[10] In fact, it's a presumption of a putative informal proof being successful that a formal surrogate of the proof demonstrating its validity, articulated in a suitable formal logical language, is achievable (Azzouni 2009; Avigad 2020).

[11] Though, see Gödel's (1994, p. 125) insistence that logic is "a science prior to all others, which contains the ideas and principles underlying all sciences."

Two historically prevalent accounts of the epistemology of logic have arisen out of this joint epistemic foundationalism and apriority: *logical rationalism* and *logical semanticism* (Martin, 2021). Both positions agree that the justification for logical laws must be *non-inferential* and a priori, while disagreeing on the source of this *apriority*. According to logical rationalists, one comes to be justified in believing logical laws through some quasi-perceptual intellectual faculty, commonly known as *intuition* or *mental insight*, in which one simply *sees* that a particular logical law is true or that a particular inference is valid (BonJour, 1998). Such intuitions are now commonly conceived of by their advocates as being phenomenologically similar to perceptual states (Chudnoff, 2011), and thus able to represent states of affairs, providing us with evidence for the truth or falsity of their contents, including logical propositions:

> When you have an intuition that *A*, it *seems* to you that *A*… [understood as a] genuine kind of conscious episode. For example, when you first consider one of de Morgan's laws, often it neither seems true nor seems false; after a moment's reflection, however, something happens: it now just seems true. (Bealer, 1998: 207)

Consequently, we simply *non-perceptually see* that the relevant proposition is true, or inference valid. In this regard, for the rationalist, logical knowledge is similar to knowledge of other necessary truths, such as conceptual and mathematical truths (BonJour, 1998; Chudnoff, 2011).

In contrast, the *logical semanticist* denies the need to posit a novel cognitive faculty in order to accommodate logical knowledge. Instead, our knowledge of logical laws can be understood merely in terms of linguistic proficiency; that simply in virtue of understanding the meaning of the constituent terms of a logical law or inference, we automatically become justified in assenting to its truth or validity:

> If one knows what is the function of the words 'either', 'or', and 'not', then one can see that any proposition of the form 'Either p is true or p is not true' is valid. (Ayer, 1936, p. 79)

The appeal to some special connection between the meaning of certain terms within logical laws and their truth, or our knowledge of them, leads us onto another famous purported property of logic—its *analyticity*.

Analyticity. Historically, the analyticity of logical propositions has been important for those, such as the logical positivists, who were both sceptical of the existence of some special cognitive faculty providing direct rational insight into the truth of logical claims, and wished to be able to accommodate the putative *necessary* truth of logical (and, mathematical) laws without having to rely upon any dubious notion of metaphysical necessity (Carnap, 1963, p. 46). The *necessary* truth of logical laws ends up being a product of certain linguistic conventions, not of the way the world must be.

In wishing to answer both epistemic and metaphysical concerns, we see the historically two-sided nature of analyticity. While a proposition p is *epistemologically analytic* if one can automatically become justified in assenting to its truth (or falsity) simply in virtue of grasping the meaning of its constituent terms, a proposition is

metaphysically analytic if it is true (or false) *solely in virtue of* the meaning of their constituent parts (Boghossian, 1996). Historically, the epistemic analyticity of logical laws has been considered to be a consequence of their metaphysical analyticity (Ayer, 1936, p. 73), allowing analyticity to kill two birds with one stone. Not all advocates of the epistemological analyticity of the logical laws need be committed to their simultaneous metaphysical analyticity, however. As has been made clear by Boghossian (1996) and Williamson (2007, Ch. 3), one can coherently propose that the truth of putative analytic claims such as "All mammals are animals" are recognizable simply by suitably understanding the constituent terms, without having to admit that its truth is solely due to its meaning, and not wordly facts about mammals or animals. In contrast, modern advocates of logical semanticism, such as Boghossian (2000), seem primarily motivated into the position by a recognition of logic's foundationalism and a deep suspicion of intuition.

Necessity. As just mentioned, the putative metaphysical analyticity of logical laws played a significant explanatory role for the logical positivists in accommodating the perceived *necessity* of logical laws without grounding this necessity in anything like physical or metaphysical necessity. The presumption that logical laws are *necessarily* true, just as mathematical truths are, is prevalent throughout the historical and contemporary philosophical literature (Hale, 1999; Rumfitt, 2015, Ch. 3; Shieh, 2019).[12] It can be found in medieval expressions of logical consequence (Dutilh Novaes, 2020; Read, 1994), and in non-technical paraphrases of contemporary model-theoretic accounts of logical consequence, whereby a conclusion B is a logical consequence of some set of premises Σ if and only if *necessarily* if every member A of Σ is true, then B is true.[13]

What is not so clear, however, is what this presumed necessity consists in. Seemingly, some of the earliest appeals to the necessity of logic, such as in Kant, are a reinforcement of either the *upmost generality* of logic, or the constitutive role of logic in all reasoning. While *contingent* laws of the understanding, such as laws of geometry, are those "without which a certain determinate use of the understanding would not occur" (1992: 12), logical laws are "necessary laws of the understanding" because they are "those [laws] without which no use of the understanding would be possible at all" (1992, p. 12).[14] Further, modern accounts of the necessity of logical laws seem to be explicated in terms of the necessary truth-preservation of logically valid rules of inference, which itself is often accounted for in terms of truth-preservation across all substitution instances. Here, again, we have an interpretation of necessity at least heavily related to logic's putative generality. This account of logic's purported necessity is also explicitly found in the contemporary literature, such as in McFetridge's discussion of logic's necessity, which proposes that we equate the belief that a rule of inference is logically necessarily truth-preserving with our "preparedness to employ that mode

[12] There are some notable exceptions. As Shieh (2019) details in his recent book, both Frege and Russell rejected the necessity of logic.

[13] This paraphrasing of logical consequence is often expressed in terms of impossibility, rather than necessity, but this is wholly down to ease of expression rather than a substantial philosophical distinction.

[14] Note, elsewhere in *Jasche Logic* Kant (1992, p. 14) uses the terms *contingent* and *necessary laws* differently, to denote those laws which govern how we happen to think and how we ought to think, respectively. Thus, Kant is not consistent throughout in his use of the terms. However, in neither usage is the property of *necessity* a novel and distinct property of logical laws beyond their generality or normativity.

of inference in reasoning from any set of supposition whatsoever" (McFetridge, 1990, p. 153).[15] This is simply to admit that valid logical rules of inference hold with the upmost generality.[16] This apparent relationship between necessity and generality may go some way to explaining why Bertrand Russell was so content to replace talk of logic's necessity with simply talk of its *generality* (Shieh, 2019, p. 8).

This list is by no means meant to be exhaustive of those properties which have traditionally been considered to characterise logic—a complete discussion would also need to address logic's putative *normativity* (Steinberger, 2020), *topic neutrality* (Sher, 2016, Ch 10) and *self-evidence* (Shapiro, 2009), for example. Further, ultimately much more ought to be said about each of these putative properties of logic, their historical significance, and connection to one another. For our purposes here, however, this overview suffices to illustrate how *AEL as Tradition Rejection* conceives of AEL, and to motivate the proposal.

2.3 AEL as tradition rejection

According to *AEL as Tradition Rejection*, versions of AEL arise through either rejecting at least one of these traditional properties of logic, *or* proposing that while logic possesses these properties at least some of them are not exceptional to logic, but rather possessed by a multitude of fields. Conceiving of AEL in this fashion has two immediate consequences. Firstly, the position ends up becoming a *cluster of theses*, rather than one solitary claim about the similarity between logic and the sciences, depending on which properties are the focus of the claims. Secondly, AEL becomes a broad church, with multiple proposals not normally considered anti-exceptionalist being categorised as so here. For example, Etchemendy's (1983) denial that logic is *formal* in any special extent, in comparison to the subject matters of other fields, Harman's (1986) criticism of the position that logic plays a privileged normative role in evaluating reasoning, and Bueno & Shalkowski's (2009) proposal that logic's necessity should be explained in terms of a general and primitive form of modality, shared by all subject matters.

However, while these consequences may seem counterintuitive, the proposal brings several significant benefits. Firstly, *AEL as Tradition Rejection* removes any temptation to think that advocates of AEL ought to be drawing parallels between all of the sciences' properties and those of logic. Gone then are criticisms that a particular version of AEL doesn't go *far enough* in drawing such connections, due to uncontentious facts about sciences rather than independently well-motivated claims about logic itself.

Secondly, it actually goes a significant way to explaining *why* anti-exceptionalists have been interested in certain potential similarities to the sciences and not others. No anti-exceptionalist has been interested, for example, in showing how logic is engaged in the measurement of constants like the natural sciences are (Tal, 2020), or in analysing vast swaths of data, as in data science (Leonelli, 2020). While *AEL as Continuity* would need to try and explain away these omissions as ubiquitous oversights on the

[15] Cf. Leech (2015) & Sherratt (2003).

[16] Mixed, admittedly, with the presumption that logical rules of inference ought to play a significant role within our reasoning practices; one interpretation of the *normativity* of logic, another purported property of logic.

part of anti-exceptionalists, *AEL as Tradition Rejection* can instead explain why anti-exceptionalists are not interested in these potential connections, because they are irrelevant to the traditional properties of logic.

Thirdly, it recognises that not all versions of AEL stand or fall together. It is perfectly possible that logic could fail to have some of the properties which it has traditionally been considered to possess, while having others. This allows us to recognise possibilities that we may otherwise overlook. For example, the putative foundational status of logic and apriority are often treated as standing or falling together (Wright, 2018), so that if one proposes that logical evidence is not immediate (thereby rejecting its foundational status), one thereby also rejects the apriority of logical evidence. However, as we'll go onto show in Sect. 3.2, this need not be the case. One could still embrace the apriority of logic's evidence without admitting that the justification is non-inferential. At the same time, however, *AEL as Tradition Rejection* highlights that due to the justifications for these various traditional properties of logic often being connected, the rejection of one can have repercussions for one's endorsement of others. This will often lead to the rejection of certain *associated clusters* of properties.[17]

Lastly, the proposal removes certain concerns which could distract the community from seeing the value in the project. For example, AEL should not be identified with naturalism. While naturalism may be one route to rejecting certain traditional properties of logic, it is no means the only route. Further, it should alleviate the concern recently raised (Rossberg & Shapiro, 2021) that the anti-exceptionalist has misjudged their criticisms of the *exceptionalist* account of logic, for *there are no exceptionalist opponents* with which to disagree. According to *AEL as Tradition Rejection*, there is no requirement that all of the preconceptions about logic's distinguishing properties found in the historical and contemporary literature need be jointly held by a particular individual. Rather, the goal is simply to re-evaluate the accuracy of these traditional (and widely shared) presumptions.

Here are then some of the benefits of embracing *AEL as Tradition Rejection*. In the next section, we go into more detail on one of these benefits, showing how *AEL as Tradition Rejection* fruitfully distinguishes between two prevalent forms of AEL, each with their own motivations and each requiring the rejection of a certain subset of these traditional properties. It turns out that being able to clearly make this distinction is important, given that the two proposals do not stand or fall together, and thus require separate consideration.

3 Two varieties of AEL

Although there are important connections between the purported special properties of logic, they do not necessarily stand or fall as a package. In fact, as we will show in this section, variations of exceptionalism and anti-exceptionalism are characterized by a commitment to, or rejection of, different sets of these traditional properties. Given how different these properties are, it should come as no surprise that they have resulted in distinct strains of AEL. Here we go on to highlight two such distinct varieties of

[17] This is a point we touch on in greater detail in Sect. 3.

AEL, between *metaphysical* and *epistemological* AEL, which differ not only in terms of the traditional properties of logic they call into question, but in their underlying motivations.

3.1 Metaphysical AEL

One apparent exceptional feature of logical theories is their content or subject matter. Theories of physics are, by and large, about the physical world. So are theories of chemistry or biology. Economic theories can be about markets, consumers, or companies, while psychological theories can be about human cognition. But, what are logical theories *about*? In virtue of what, if anything, are claims about validity and consistency true? Claims about logic's formality, generality, necessity, and analyticity have traditionally been supported by metaphysical views about the nature of logic, which have typically set logical laws apart from those of other fields due to the exceptional nature of logical facts. In other words, logic is *metaphysically* exceptional.

First of all, it's worthwhile to note that some have denied that there are logical facts at all. Logic is simply not in the business of theorizing about properties or objects, and its claims do not express truths or falsities. From such a perspective, logic is certainly exceptional, but not because its laws are necessary or analytic—after all, they are not even true. *Noncognitivists* about logic, for example, hold that there are no logical facts, and therefore no fact of the matter as to whether logical laws are true or inferences valid. Thus, logic is clearly set apart from other disciplines in virtue of its lack of metaphysical content. Instead, logic is more comparable to ethics (Field, 2015; Resnik, 1985, 1999), another discipline where noncognitivst views have had some popularity. Indeed, if logic is merely a prescriptive doctrine of imperatives and recommendations on how to infer and organize beliefs, as both Field (2015) and Resnik (1985) suggest, the affinity with ethics looks more convincing.

While a thesis about logic's metaphysics, noncognitivsm about logic has immediate epistemological repercussions. As in noncognitivist meta-ethics, there would be *no knowledge about logic*, and logical disagreements could not obviously be accounted for by attributing conflicting beliefs to agents. While these observations are not in and themselves objections to noncognitivism about logic, any more than they are to forms of non-cognitivism about ethics, it seems likely that any form of noncognitivism about logic will have to result in a more thoroughgoing exceptionalism about logic, one that also involves claims about the exceptional nature of logic's epistemology.

Noncognitivism is not the only form of metaphysical exceptionalism. Even those who think that logic is *about* something—for instance validity, consistency, and provability—might suspect that the facts underpinning logical theories are substantially different from those underpinning the claims of other theories. One possibility is what we may call *logical normativism*, where logical facts identified as *normative facts* (Hanna, 2006; Leech, 2015). Such a position, again, draws similarities between logic and ethics, but on this occasion takes a cognitivist stance, with a separate domain of normative facts underpinning logical laws. Importantly, claims about validity or consistency become understood as claims about how an agent *ought* to infer or believe, and logic's metaphysical properties such as necessity and generality must be derived

from features of these normative facts, for instance the force and scope of the putative inferential norms.[18] While the normativist can account for the content of logical knowledge and disagreement in a more orthodox fashion than the noncognitivist, she nonetheless faces the challenge of explaining the nature of normative facts and the epistemology of logic more generally.

In contrast, *non-normative cognitivist* positions typically go some way towards closing the gap between the subject matter of logical theories and those of other fields.[19] Psychologism, for example, is an early example of a more thoroughgoing variation of metaphysical AEL. If logical claims are merely descriptive claims about human cognition, our reasoning modules and dispositions, we have not only rejected normativism in favour of non-normativism, but placed the subject matter of logic safely within the bounds of both the spatio-temporal and empirically discoverable. The result is that logical truths are contingent rather than necessary, synthetic rather than analytic, and their justification includes a posteriori evidence (Pelletier et al., 2008). A prominent example is Mill's philosophy of logic, which is in part an attempt at reconciling a psychologistic 'science of reasoning' with the prescriptive role of logical laws (Godden, 2005).

That project found its most famous critic in Frege and the *anti-psychologistic* arguments of *Grundlagen der Arithmetik*. Frege charges psychologism with having confused the justification of a logical law with the psychological explanation of our belief in it. The latter, he contends, cannot possibly ground justification of logic or mathematics, even at the level of basic logical laws or axioms. Frege's anti-psychologistic arguments ushered in a Platonist tradition in logic, distinguishing the realm of mind-independent logical (and mathematical) facts from both the realm of psychological facts and facts about the mind-independent spatio-temporal world, in an attempt to secure the *objectivity* of logical truths (Anderson, 2005).

This 'third realm' realism about logic does not align logical facts with the normative facts of ethics, but it nonetheless reintroduces a form of metaphysical exceptionalism for logic. Importantly, the subject matter of logic and mathematics (such as *thoughts*, *functions* and *numbers*) is separate from the subject matter of the sciences, being both non-spatio-temporal and causally inert (Burge, 1992).

But, while saving logic from the 'subjective' psychologism, Frege's third realm leads to another concern: how can we acquire knowledge about facts that are causally independent from our world? As Schechter (2010) has shown, embracing a 'third realm' realism about logical facts introduces an epistemological puzzle for logic analogous to the *Field-Benacerraf Problem* (Benacerraf, 1973; Field, 1989) in the philosophy of mathematics. The best option for the third-realm realist it seems, as Linnebo (2006: 546) proposes, is to insist that with this *metaphysical* exceptionalism comes a corresponding *epistemological* exceptionalism, a position he calls the *Natural Response*:

[18] Of course, these normative facts need not be restricted to facts about beliefs, but could extend to other doxastic states (e.g. *degrees of belief* or *disbelief*) and speech acts (e.g. *assertion* or *denial*).

[19] Non-normative theories are sometimes called *descriptive* theories of logic (Resnik 1985). However, given the above distinctions, a normativist logical theory can still be descriptive in the sense that it *describes* normative facts, as opposed to merely offering prescriptions or recommendations (as proposed by *non-cognitivist* proposals).

> By asking for a causal connection between the epistemic agent and the object of knowledge, Benacerraf treats platonistic mathematics much like physics and the other garden-variety empirical sciences. But mathematics is different. So philosophers have no right to subject it to epistemological standards that have their home in the domain of contingent empirical knowledge. Since mathematics does not purport to discover contingent empirical truths, it deserves to be treated differently.

Undeniably, then, the third realm pushes us towards an exceptionalist theory of logic's epistemology.

Much of twentieth century philosophy of logic has followed Frege both in endorsing the objectivity of logic and in the rejection of psychologism. But not everyone is keen to commit themselves to a metaphysical 'third realm' and its epistemological consequences. Most recent accounts of the subject matter of logic want to insist on some sort of objectivity for logical truths, but without taking on the metaphysical commitments of Frege's Platonism. The hope is that the metaphysics of logic can be reconciled with an epistemology that leaves the connection between the agent and the facts less mysterious.

One option is simply to reject Platonist realism about logic and instead consider logical facts to be matters of language or convention. As we have seen above, philosophers in the *logical positivist* tradition such as Ayer and Hahn defended positions where logical laws are true in virtue of the meaning of the involved logical expressions. In other words, they are *metaphysically* analytic. This proposal attempts to navigate the pitfalls of psychologism, while offering an epistemology of logic that can explain how agents acquire logical knowledge. In brief, if logical laws are true in virtue of language, ordinary speakers are already in a position to know them, merely in virtue of understanding the proposition. Metaphysical analyticity, therefore, (putatively) ensures epistemological analyticity.

These metalinguistic accounts of logic are also meant to have the benefit of saving logic's objectivity and even the necessity of its laws. For, on this picture, the conceptual or linguistic facts that ground logical facts are not taken to be psychologistic or dependent upon the whims of an individual. Rather, the laws of logic (*relative to a language*) are objective in the same regard as the laws of grammaticality for a language are objective (Warren, 2020). Thus, the only means for the laws of logic to change is for the language itself to change. Consequently, logic is afforded a measure of objectivity, albeit not the same forms of agent-independent objectivity guaranteed by Platonism.

While rejecting 'third-realm' realism, however, *logical conventionalism* itself leads towards a metaphysical exceptionalism for logic. For, logic and mathematics are sharply divided from the empirical sciences due to logico-mathematical laws being considered true *by convention*, or true *in virtue of meaning*. While conventionalism has long been out of favour, significantly due to Quine's (1936 & 1951) famous criticisms against conventionalism and metaphysical analyticity, recent attempts have been made to revitalise conventionalism by appealing to *implicit* conventions (Warren, 2020).

In contrast, a second reaction to Frege's metaphysics hangs on to a form of agent-independent realism, but, inspired by Bertrand Russell, seeks to locate logical facts

in the world: "logic is concerned with the real world just as truly as zoology, though with its more abstract and general features" (Russell, 1919: 169). This signals an anti-exceptionalist agenda to bridge the gap between logical facts and physical facts, between the natural sciences and logical theorizing. Logical laws are not laws about objective 'third realm' facts or about language, but laws about universal features of the world. Following Ricketts (2017, 54), we call this a *universalist* conception of logic:

> On the universalist conception of logic, the logical laws that mediate demonstrative inference are maximally general truths. That is, they are laws that generalize over all objects, properties, and relations; and their formulation requires only the topic-universal vocabulary needed to make statements on any topic whatsoever—for example, sign for conjunction and negation as well as quantifiers to express generality. […] On the universalist view, then, logic is thus a science in its own right, one that is directed at reality in the same way that physics is, but at reality's more general features.

Ricketts traces the universalist conception of logic to Frege and Russell, but it is developed more recently in Quine's (1986) *Philosophy of Logic* and the work of several contemporary philosophers. Sider (2013, pp. 115–6), for instance, cites Russell's view as a precursor to his own "joint-carving" realism for logic, while both Maddy (2002) and Sher (2016) describe similar views where logical truths are abstract truths about "our world":

> This is a brand of realism—logic reflects objective truths about the world—but without many of the features that typically accompany such realism: logical truth isn't necessary, but contingent on the presence of the requisite structures; logic doesn't describe a world of abstracta, but our own familiar physical world. (Maddy, 2002, pp. 30, 31)
>
> This leads to a view that, like Platonism, affirms the reality of abstract features, and like nominalism, has no need for a "second" reality. The reason for the latter is that the abstract features we have observed are features of objects and properties residing right here, in our world, and they hold of these objects (properties) right here as well, rather than in some other reality. (Sher, 2016, p. 84)

Williamson (2013, 2017) is another anti-exceptionalist who develops a version of universalism. For him, logical laws are merely unrestricted universal generalizations in a higher-order language. Take, for example, the law of excluded middle (LEM). The instance of LEM "Wellington is in Spain or it is not the case that Wellington is in Spain" is true, and is true in virtue of facts about Wellington and his location. However, it is also an instance of a logical truth in virtue of a being an instance of an unrestricted higher-order generalization over properties and objects, in this case the LEM: For every property X, and for every object x, object x either has property X or object x does not have property X. The same principle also applies to valid rules of inference, such as modus ponens. On this picture, the rule is ultimately a conditional higher order generalization: For all properties X, Y, and all objects x, y, whenever x has property X and (y has property Y if x has property X), y has property Y. The generality of logic's laws, therefore, is secured by the unrestricted domain of these claims.

While the universalist builds the *generality* of logic straight into the definition of logical laws, they tend to reject other purported special properties of logic. Firstly, since logical laws are not metalinguistic, logical truths are not taken to be *metaphysically analytic*. Secondly, while universalists often continue to admit that logic is *formal*, its formality is *no longer exceptional*, except perhaps in its degree. For example, for Williamson (2017), while logical laws are formal in the sense of not being about any particular type of objects and properties, logic is only unique in the degree of its formality here; laws in other fields similarly are not about any particular objects within a given domain of application. If logic possess greater formality here, it is only in virtue of its being wholly general.[20] This is sharp contrast to those, such as Carnap (1942, p. 242), for whom logic (and mathematics) is formal in contrast with other areas of research due to its signs not being "descriptive" but "logical", and its truth not being "factual" but "logical".

Thirdly, since logical laws are descriptions of the world, universalists also reject normativist interpretations of the laws; logical laws are not *especially* or *fundamentally* normative. Of course, this does not bar univeralists from ascribing indirect normative force to the logical laws. However, if they do have such force, it will not be a normative force peculiar to logical laws (Russell, 2017).[21] Finally, universalists often reject the claim that logical laws are *necessary* in any kind of special fashion. Maddy (2002, 2007) takes logical laws to be metaphysically contingent, although with a "lingering trace of necessity" because of logic's fundamental role in our thinking. Further, similarly to Bertrand Russell, Williamson (2017, p. 328) denies that postulating necessity of logic achieves anything beyond requiring that logic's laws be of the upmost generality.

Consequently, universalism shares with psychologism the rejection of logic's peculiarity in terms of its *metaphysical analyticity*, *normativity*, and *necessity*, while disagreeing with psychologism in maintaining that logic in special due to the *generality* of its laws (and, in the case of Sher, its *formality*).

3.2 Epistemological AEL: evidential and methodological

Debates about the exceptional subject matter of logic have a well-known epistemological counterpart. Logic is sometimes considered epistemologically privileged, in virtue of its basic laws being a priori justified, foundational, or self-evident. According to this way of thinking, it is the *justification* of logical laws that is exceptional. Correspondingly, there is an epistemological AEL characterized by the rejection of

[20] A similar picture holds of Sher (1996; 2016), although in this case generality is *explained in terms of* formality, itself conceived in terms of permutation invariance. As permutation invariance is a matter of *degrees*, so each field is formal to a greater or lesser degree. It just happens that logic's laws have the highest level of formality through the permutation invariance of its objects and properties of interest (Sher, 2021). Unsurprisingly, Sher (2021) makes a similar claim about logic's necessity—while its laws are *necessary*, they are necessary in the *same way* as laws of other fields, just to a *greater extent*, due to their greater formality.

[21] Again, Sher (2016) is an interesting case. While admitting that "the general source of logic's normativity is the same as that of other disciplines", it's then proposed that logic's normativity is "special" because it is universal, in virtue of logic being formal, and thus general (Sher 2016: 296). Whether these properties make logic's normativity *peculiar*, or merely alter its *degree* of applicability, we leave for elsewhere.

these purported peculiar epistemological properties of logic: apriority, epistemological analyticity, and foundationalism. Instead, it is held that the justificatory process in logical theorizing is less extraordinary than traditionally thought. However, as we will go on to argue in this section, there are actually different ways in which one can call into question the extraordinary nature of logic's justification, producing two different types of epistemological AEL: *evidential* and *methodological*.

It is arguably epistemological AEL, and not metaphysical AEL, that has become the focus of the contemporary debate. It is interesting, therefore, to note the extent to which the two views—and their exceptionalist counterparts—have been considered a package in the recent history of logic. In Frege's foundationalist programme, for example, his version of metaphysical AEL—third-realm realism—and a foundationalist epistemological exceptionalism run in parallel. Indeed, according to both Jeshion (2001) and Shapiro (2009), Frege is committed to aligning the metaphysical and epistemological features of logic: metaphysically, since basic logical laws are unprovable, they cannot be grounded in other propositions. Since they are nevertheless true, they must be self-standing. Epistemologically, since basic logical laws are unprovable, they must be self-evident. Frege's concept of self-evidence is notoriously contentious, and should at the very least not be confused with what is psychologically obvious. However, there is seemingly no available route to obtain logical knowledge for Frege other than through some *privileged unmediated access* to the propositions, whatever ultimate form this takes.

Conventionalism is another position in which a metaphysically exceptionalist view on logic is traditionally aligned with an epistemological exceptionalism—in particular, epistemological analyticity. Since logical laws are grounded in facts about linguistic conventions, knowledge of logic can be acquired through language competence. Again, the result is that logical facts are not only distinguished from non-metalinguistic facts, but in our possible means of having knowledge of these facts, through a priori evidence.

Correspondingly, metaphysical anti-exceptionalists have traditionally tended to reject epistemological exceptionalism. Psychologistic logicians, for instance, held that logical facts are knowable on the basis of empirical evidence about human cognition, and therefore reject logical evidence's apriority (Pelletier et al., 2008). Similarly, as universalists deny that logical laws are metalinguistic, this cuts off the possibility of logical knowledge via epistemological analyticity. What types of evidence, exactly, can inform our logical knowledge for universalists however is often unclear. For example, at least in the case of Maddy (2007) and Sher (2016) it's debatable whether any usual kind of empirical evidence could inform our logical theories, given how integral the structural features of the world that logic is concerned with are for our experience of it. Thus, while logic's epistemology is not exceptional in the way proposed by the logical conventionalist, it also seemingly shouldn't be aligned with that of the empirical sciences.

Compared with these views, it's notable that the most prominent advocate of epistemological AEL, Quine, is primarily motivated not by logic's subject matter or any other metaphysical concerns, but rather directly by epistemological considerations. According to Quine's (1951, 1986) *empirical holism*, all of our commitments (including those of logic and mathematics) face the tribunal of experience together, as a whole. This means that, firstly, all of our commitments are fundamentally supported

by the *same type of evidence*, empirical evidence, even those of logic. Secondly, when confronted with recalcitrant data, one is free to revise one's logical commitments just as one revises one's physical theories. While logical commitments are more central to our web of beliefs than other commitments, and thus we should be hesitant to revise our logical theory at the first opportunity, in the most severe cases, where no available revision to just our physical theories will be sufficient, it can be totally rational to revise our logical and mathematical theories on the basis of this recalcitrant empirical evidence.

This *empirical holism* is directly motivated by two epistemological factors. Firstly, by Quine's (1951) endorsement and extension of Duhem's (1954) *underdetermination thesis*, according to which singular claims cannot be empirically tested in isolation, as hypotheses must always be conjoined with background assumptions to entail empirical consequences. Quine extended Duhem's thesis in two important regards: (i) making our whole belief system the epistemic unit of evaluation and not just theories, and (ii) proposing that in virtue of constituting part of the theory being tested, logical and mathematical commitments were up for revision on the basis of new evidence, just like other commitments. Quine's (1986) second motivation was *epistemological naturalism*, according to which any evidential support for a proposition must ultimately derive from experience. Combined, these commitments entail that logic must be treated as methodologically and evidentially *continuous with the sciences*, with its laws being tested in exactly the same way as those of the other sciences, against available empirical evidence.

Importantly, therefore, there are two distinct elements to Quine's epistemological AEL, which while found combined in Quine's *empirical holism* need not be. Indeed, if considered separately, we come to realise that there are actually two distinct forms of epistemological AEL: *evidential*, which has to do with the *source* of the evidence for logic, and *methodological*, which has to do with the method of theory-choice in logic.

Firstly, Quine's naturalism commits him to *evidential AEL*, the view that logical theories, and thereby also its laws, are supported by the same forms of evidence as the sciences; in particular, *empirical* evidence. Thus, unlike the logical rationalist, who is content to appeal to a priori sources of evidence for logic, in the form of rational insight, Quine's commitment to *evidential AEL* requires the rejection of the apriority of logic's evidence. In contrast, Quine's confirmational holism commits him to *methodological* AEL, the view that the criteria for theory-choice in logic are unexceptional. In virtue of our commitments being evaluated together as a package, the means through which the various elments are evaluated and revised becomes homogeneous.

This distinction between *evidential* and *methodological AEL* becomes very useful, as it helps to differentiate the contemporary anti-exceptionalist from the Quinean naturalist. While the latter restricts both the *sources of evidence* relevant to justifying a logic, and the *process of theory choice* in logic, to those of the natural sciences, more recent champions of epistemological AEL, such as Priest (2014, 2016), Russell (2015), and Williamson (2017), tend to allow for a much broader range of evidence, including solutions to logico-semantic paradoxes, important mathematical results, and linguistic intuitions. This should come as no surprise, given the prevalence of the use of these forms of evidence within contemporary logical debates (Martin & Hjortland,

2021; Martin, 2021). One consequence of admitting these forms of evidence, however, is the recognition that logic has its own field-specific forms of evidence, including a priori evidence.

Yet, while these contemporary advocates of epistemological AEL rarely call into question the significant role that a priori evidence plays in justifying logical theories, they do call into question logic's *epistemic foundationalism*, aligning logic's *method of theory choice* with that of other fields. Whether or not logic differs from other fields in terms of its subject matter and the sources of evidence it recognises, it is *not* unique when it comes to the epistemic norms constraining theory choice more generally.

The most common version of this position in the literature at present is that theory-choice works by abduction, or *inference to the best explanation* (Priest 2015, Williamson, 2017).[22] Rival logical theories are comparatively assessed with respect to selection criteria familiar from the sciences: fit with the data, explanatory power, simplicity, unity with other theories, etc. The precise list of such criteria is no less disputed than it is in the sciences, and so is their individual formulation and internal weighting (Martin, 2021). What is crucial for our purposes, however, is that this *methodological AEL* does not commit one to *evidential AEL*. It could well turn out that abductive arguments are the central method of theory-choice in logic even if the data on which the abduction is performed is different in kind from other disciplines. A theory might for instance be evaluated with respect to fit with the data, even if the data itself originates in a solely a priori source. This was seemingly Bertrand Russell's (1957) view at one time.

Admittedly, then, one can coherently maintain that logic's *method of theory choice* is not extraordinary (thereby calling into question its *foundationalism*), while maintaining that logic has its own peculiar sources of a priori evidence (thereby continuing to maintain logic's *apriority*). The important question now for our purposes, however, is whether one can endorse a form of *epistemological AEL* without also rejecting the traditional properties of logic associated with *metaphysical AEL*?

4 Predictivism and the metaphysics of logic

While the previous section demonstrated how the *Tradition Rejection* conception of AEL allows us to effectively distinguish between two different prominent forms of anti-exceptionalism, we'll now proceed to demonstrate the *importance* of distinguishing between these two forms, by showing how in virtue of endorsing *methodological AEL* one need not therefore endorse *metaphysical AEL*. In order to do this, we'll show how what we take to be the most detailed and plausible version of *methodological AEL* available—logical predictivism (Martin & Hjortland, 2021)—is compatible with many of the metaphysical pictures of logic presented in Sect. 3.1, and subsequently does not mandate the rejection of those traditional properties of logic associated with *metaphysical AEL*. Thus, it is at least possible to endorse *methodological* AEL without

[22] Some distinguish between abduction and inference to the best explanation, but we'll set that complication aside here.

committing oneself to *metaphysical* AEL. We begin with a brief outline of logical predictivism.[23]

4.1 Logical predictivism

According to logical predictivism, logical theories are justified, and ultimately chosen, on the basis of their predictive success, explanatory power, and compatibility with other well-evidenced commitments. While logics can be theories of many different types of phenomena, such as belief revision (Hansson, 2017) and grammatical structures (Dalrymple, 2001), our concern here is with logics serving as theories of *validity*, conceived of as a property of arguments. In order to be capable of producing both predictions to be tested against suitable data, and fruitful explanations of the target phenomenon, these logical theories are not conceived of as simply sets of valid rules of inference or theorems, but rather are a cluster of definitions, laws and representation rules that provide the underlying semantics and syntax of the theory, as well as specifying how the theory connects to the phenomenon. Here's a toy example of classical propositional logic under such an account:

Theory A

Definition 1 : Let $\neg\phi$ be Boolean negation.

Definition 2 : Let $\phi \rightarrow \psi$ be Boolean material implication.

Representation Rule 1 : $\ulcorner$not $\phi\urcorner = \ulcorner\neg\phi\urcorner$.

Representation Rule 2 : $\ulcorner$if ϕ then $\psi\ \urcorner = \ulcorner\ \phi\ \rightarrow\ \psi\urcorner$

Law 1: For every valuation, all sentences are either true or false, and not both.

Law 2: An argument is valid iff, for every valuation v, if every premise is true in v, the conclusion is true in v.

According to predictivism, such theories are initially motivated by examples of arguments judged to be acceptable. These can either take the form of informal mathematical proofs, judged to be acceptable by mathematicians, or natural-language arguments, judged to be acceptable by certain "reliable reasoners".[24] For instance,

[23] Note, we are not *arguing* for logical predictivism here. Rather, we are using it as an example of methodological AEL in order to show that one can endorse methodological AEL without also endorsing metaphysical AEL. Logical predictivism serves our purposes well because it is the most detailed account of methodological AEL available. For evidence in favour of the proposal, see Martin & Hjortland (2021).

[24] This brings up interesting questions over whether we are warranted in assuming there are such reliable reasoners, and how we identify them. We'll sidestep these questions here; see Martin & Hjortland (2021) for more.

the logician might initially be motivated by the following informal proofs, considered acceptable by mathematicians:

Theorem 1

$$Assume\ x \in \mathbb{Z}.\ If\ x^2 - 4x + 7\ is\ even,\ then\ x\ is\ odd$$

Proof We prove our result indirectly. Suppose x is even, and let $x = 2k$ for some $k \in \mathbb{Z}$, so $x^2 - 4x + 7 = (2k)^2 - 4(2k) + 7$. Then, $(2k)^2 - 4(2k) + 7 = 4k^2 - 8k + 7 = 2(2k^2 - 4k + 3) - 1$, and so $x^2 - 4x + 7$ is odd. Thus, assuming x is even, $x^2 - 4x + 7$ is odd. □

Theorem 2 *For all $n \in \mathbb{Z}$. If $3n + 2$ is odd, then n is odd.*

Proof We prove our result indirectly. Suppose n is even, and so $n = 2k$ for some $k \in \mathbb{Z}$. Consequently, $3n + 2 = 3(2k) + 2 = 6k + 2 = 2(3k + 1)$. But, then $3n + 2$ is even, as $2(3k + 1) = 2j$ for some $j \in \mathbb{Z}$, where $j = 3k + 1$. So, if n is even, then $3n + 2$ is even. □

Having assumed that mathematicians' judgements are a reliable (though fallible) guide

as to which putative informal proofs are valid and which are invalid, the logician then wishes to provide an account of *why* these two proofs are valid. To do so, she first forms a general hypothesis that inferences found across multiple proofs may be valid for the same reasons, namely because they *share some underlying form*. Secondly, she then proposes a concrete hypothesis about the validity of the argument form which she believes the two proofs above exemplify:

Hypothesis 1

All arguments of the form

$$\frac{\text{If not } \psi \text{ then not } \varphi}{\text{If } \varphi \text{ then } \psi}$$

are valid.

This hypothesis itself, however, does not constitute an explanation of *why* the proofs are valid. All it offers is a generalisation which can be subsequently falsified. In order to *explain* why arguments of this form are valid (if they are, that is), she must propose a theory such as *Theory A* above, providing a set of rules dictating the behaviour of components of the argument and the consequence relation.

In the given case, the postulates within *Theory A* provide a possible explanation of why Hypothesis 1 is true, and thus why instances of contraposition are valid, by: (i) showing how the underlying form of these arguments ensures that whenever the premises are true so is the conclusion, using the theory's definitions, representation

rules and Law 1, and then subsequently (ii) using these results to show how the arguments are valid, in virtue of Law 2.

Now, importantly, while *Theory A* offers one possible explanation of the truth of Hypothesis 1, it is not the only theory that does so. There are infinitely many other theories that could. Consequently, *Theory A's* advocates need to find further reasons to prefer the theory over competitors. One of the main routes through which they do so is by making predictions on the basis of the theory's postulates. The possibility of further supporting her theory on the basis of such successful predictions is facilitated by two facts. Firstly, the postulates within her theory which putatively explained why the generalisation within Hypothesis 1 is true also ensures that other arguments are valid. In principle then, the theory can be tested against whether these further arguments are indeed valid. Secondly, given that in motivating her theory the logician assumes that mathematicians' judgements over the (un)acceptability of putative proofs are a reliable guide to their (in)validity, she can subsequently use the judgements of mathematicians to test the predictions resulting from her theory. If the predictions of her theory are correct, then she ought to be able to find instances of these forms of arguments within informal proofs.

Testing the theory has three stages. Firstly, one draws out the consequences of the theory's postulates. In the case of *Theory A*, this would include consequences such as:

Consequence 1

All arguments of the form

$$\phi$$

$$\underline{\phi \rightarrow \psi}$$

$$\psi$$

are valid.

Consequence 2

All arguments of the form

$$\varphi \rightarrow \psi$$

$$\underline{\varphi \rightarrow \neg\psi}$$

$$\neg\varphi$$

are valid.

Consequence 3

Not all arguments of the form

$$\varphi$$

$$\underline{\psi \rightarrow \varphi}$$

$$\psi$$

are valid.

Secondly, the consequences are then operationalised into concrete predictions in order to be tested. For instance, Consequence 1 would be operationalised as:

Prediction 1

Steps within informal proofs of the form

$$\varphi$$

$$\underline{\text{If } \varphi \text{ then } \psi}$$

$$\psi$$

are found acceptable by mathematicians.

And Consequence 3 would be operationalised as:

Prediction 2

Steps within informal proofs of the form

$$\varphi$$

$$\underline{\text{If } \psi \text{ then } \varphi}$$

$$\psi$$

are *not* found acceptable by mathematicians.

The final stage is then to test these predictions against further informal proofs, not yet used to motivate the theory. Consequently, the logician must at this point be engaged in considering various informal proofs, looking for instances of the forms of arguments within her predictions.[25] Further, given that some of her predictions cover what mathematicians do *not* find acceptable, she must also look at instances of

[25] Of course, one of the complications arising here is that the logician can be mistaken about whether an inference within an informal proof is of this relevant form; such is the reality of interpreting data.

"pseudo-proofs", where mathematicians judge inferential mistakes to have been made. Good examples of these will often be found in introductory textbooks. Ultimately, if the logician finds that mathematicians' judgements fit her theory's predictions, then the theory is further supported. Inversely, if the judgements consistently contradict its predictions, then the theory faces problems. The extent to which the theory if evidenced is dependent upon its success *relative to competitors*—whether the theory is more predictively successful than alternative available theories.

We have only offered up here a partial picture of *logical predictivism*. The account also details how theories can be preferred to others on the basis of their explanatory power, how our other independently well-evidenced commitments can inform our logical theory choice, and further how theories respond to recalcitrant data (Martin & Hjortland, 2021). For our present purposes, however, the important point is that according to predictivism logical theories are supported to a significant degree based upon the success of their predictions, which are tested using judgements about the acceptability of concrete arguments. The question is whether this picture of logic's methodology forces us to endorse *metaphysical AEL* or not.

4.2 The Source of Logic Undetermined

According to predictivism, logicians take the fact that mathematicians and other "reliable reasoners" accept particular informal proofs or natural-language arguments as reliable evidence for the validity of those arguments, which can then be used to test their theories via predictions. What, if anything, does this picture of logic's method of theory choice tell us about logic's metaphysics?

The answer is, very little. There are multiple ways in which we can interpret *why* these judgements are reliable indicators of an argument's validity, and indeed what the content of the "acceptability judgement" is, some of which lead us to reject the traditional properties of logic associated with *metaphysical AEL*, and some which do not. Each of the accounts of logic's metaphysics presented in Sect. 3.1 suggest a particular picture of how to interpret these judgements, yet without further commitments on our part there's nothing which privileges, or even *suggests*, one of these interpretations within the predictivist framework. To show this, let's consider how the use of "acceptability judgements" in evidencing a logical theory could be accommodated by various of the metaphysical accounts of logic.[26]

Psychologism and conventionalism are the most straightforward cases. According to psychologism, logical facts supervene upon facts about how we (as a community or species) tend to infer. Under this account, therefore, the acceptability judgements used to evidence a logical theory are most directly interpreted as judgements about how we (as members of the community or species) *tend to infer* when our cognitive facilitates

[26] We won't consider here *non-cognitivism* about logic, not because it cannot facilitate the use of judgements regarding a proof's or argument's acceptability, but rather because the position fails to accommodate too much of logic's methodology in other regards, and thus is off the table as a viable account of logic's metaphysics. We hope to talk about this elsewhere, but here we restrict ourselves to cognitivist accounts of logic.

are functioning normally.[27] The data informing our logical theories is, therefore, just those inferences generally accepted by the community or species (Pelletier et al., 2008). Further, the reliability of the evidence is underwritten by the fact that these individuals are members of the community whose cognitive faculties are functioning normally.[28]

In comparison, according to conventionalism logical facts supervene upon facts about our natural languages. Thus, the acceptability judgements would be interpreted as judgements about the inferential moves we, as language users, *can* or *ought* to make within our language, with the data informing our logical theories thereby being *linguistic judgements* (Warren, 2020: Ch. 6). Further, the reliability of this evidence would be underwritten by the individuals being competent language users, with recognition that some distinction would need to be made between simple and complex cases, whereby in the latter cases performance errors could occur even for very competent language users (Warren, 2020: Ch. 2 & 6).

The cases of normativism and universalism are slightly more complex, both due to some variation in the views of their advocates, and some opacity regarding how individuals have access to logical facts on these accounts. However, there are clear interpretations of both which are compatible with the picture of logical evidence offered by predictivism.

In the case of normativism, such a picture is offered by Hanna's (2006) proposal that logical facts are constituted of facts about what ought to be rationally inferred, which humans have access to in virtue of being rational agents (assuming their faculties are suitably functioning). Humans are inherently rational, and part of what constitutes this rationality is their ability to use logic. Indeed, humans possess a cognitive faculty whose role it is to represent logic, facilitating individuals reasoning in a rational fashion. On this account, therefore, the acceptability judgements should be understood as judgements about how we *ought to infer* given the norms of rationality; that is, what we are obliged to accept or reject given some background information. The data informing the logical theories would therefore be intuitions, similar to linguistic intuitions, produced by the *cognition faculty* which represents logic (Hanna, 2006: Ch. 6). Further, the reliability of these intuitions is assured by our possessing (in the main) properly functioning cognitive faculties, including the *cognition faculty* which represents logic, in virtue of being rational agents.

Finally, this brings us onto universalism, the position that logical truths are the most general truths about the world, often about the *structural* features of the world. If this picture of logic's metaphysics is to be accommodated within the predictivist framework, then we will need to admit that judgements about which inferences are acceptable or not somehow *reliably track* the structural features of the world (or, at least, our best theories of it). How though? Two divergent answers offer themselves, depending upon one's version of universalism.

[27] *Normality*, of course, does not imply *correctness* in any factive sense. There are simply norms constituted of the way the community or species thinks, and sometimes these are deviated from, whether due to performance constraints or cognitive constraints on an individual's part.

[28] How exactly we establish when an individual's cognitive faculties are functioning normally is unclear, but presumably we can do so to a decent degree. After all, that we can is presupposed by the field of clinical psychology.

According to the first picture, which is consistent with Williamson's (2017) work, *all of our knowledge* about the world potentially constitutes evidence for our logical theory, given that logical truths are just the most general truths about our world. In attempting to construct and evidence the best logical theory, therefore, it would make sense to enquire into the most general truths our best theories conform to. Of course, one way this could be done is to attempt to directly *extract* somehow these general truths from our best theories.[29] Another option, however, would be to enquire into the inferential moves which underwrite our knowledge of the world by looking at the inferential practices experts within our most successful fields of enquiry use. In other words, we select areas of enquiry which we deem to be most successful, in terms of the likely truth of their theories, and then enquire into the inferential moves which underwrite successful theories in these areas. Assuming this includes mathematics and the sciences, it would then make sense to use the judgement of practitioners in these areas as reliable guides to the inferential moves which are acceptable within these areas of research. In other words, the judgements of these "reliable reasoners" about which inferential moves are acceptable are reliable guides of validity in virtue of these judgements tracking the inferential moves which underpin our most successful mathematical and scientific theories, which themselves are our best guides to truths about the world.

Another option is offered up by Maddy's (2007) naturalistic account of logic. Logic, again, is about the most general structural features of world, with our best logical theories serving as idealisations of these facts (just as scientific theories are). Yet, here, the picture of why our judgements about the correctness of an inference are a reliable guide to these structural features are due to *evolutionary pressures* (Maddy, 2007: Part III). Given that we live in a world with just these structural features, it's no surprise that environmental pressures have led us to evolve cognitive machinery that results in us generally inferring in a fashion which tracks these structural features of the world. Further, given that mathematics is also a study of the structural features of the world (Maddy, 2007: Part IV), it's no surprise that mathematicians' ability to infer in accordance with the structural features of the world are more fine-tuned and practiced, and thus that their judgements regarding which inferential moves are acceptable are particularly reliable in tracking the structural features of the world. This, then, would partially explain why logicians have particularly privileged mathematicians' judgements about what is an acceptable inference within informal proofs as a reliable guide to validity.

It appears then that each of these metaphysical pictures of logic *can* be accommodated within the predictivist framework. This doesn't mean that each of these metaphysical pictures are equally plausible. There may be very good reasons for accepting one over the others, or for rejecting certain candidates outright. Further, there's no need to think that each will ultimately produce viable epistemologies, either because they make logical facts unknowable, or because they significantly distort the way that logicians actually go about their business. The important point is that, given that each are consistent with the predictivist framework, currently the *epistemological*

[29] For an example of a proposal along these lines, see Sider (2013: Ch. 10). While we think there's good reason to believe this potential approach isn't in keeping with the actual methodology of theory choice in logic, discussing this matter is beyond the present paper's scope.

anti-exceptionalist is not also required to endorse *metaphysical* AEL. While predictivism requires us to reject logic's epistemic foundationalism and further its epistemic analyticity, it is consistent with us continuing to maintain logic's metaphysical analyticity (if *conventionalism* is found to be true), and its necessity and normativity (if *normativism* is true).

That our picture of logic's methodology does not dictate our account of logic's metaphysics is perhaps not that surprising. There are multiple ways in which motivating evidence can be interpreted, consistent with many different metaphysical pictures. Further, we tend not to think that a detailed account of scientific methodologies will deliver us automatically with a metaphysical picture of the sciences, and similarly for mathematics. However, what our discussion in this section does emphasise is the importance of keeping *metaphysical* and *epistemological AEL* conceptually separate, which speaks in favour of the *Tradition Rejection* conception of AEL, which allows us to make clear sense of this distinction.

5 Conclusion

According to the picture of AEL painted here, what is often presented as a singular position with the goal of aligning logic with the sciences, is actually better understood as a cluster of positions, though admittedly sometimes connected. Further, not all of these positions need stand and fall together, though the success or failure of one of these positions can undoubtedly have repercussions for the other. Our hope is that this new framework for understanding AEL leads to both clarity over how to ultimately assess AEL, and more systematic evaluation of AEL's strengths and weaknesses. It would be a shame if the position were either too easily dismissed due to an implausibly strong interpretation of its proposals, or inversely watered down to the point at which it was innocuous.

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