LOGICAL NIHILISM

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'Ordinary language has no exact logic.' Strawson [73]

1 OUTLINING THE VIEW

The philosophy of logic has been dominated by the view that there is One True Logic. What is meant by 'One True Logic' is sometimes not made entirely clear — what is a *logic* and what is it for one of them to be *true*? Since the study of logic involves giving a theory of logical consequence for formal languages, the view must be that there is one true theory of logical consequence. In order for such a logic to be *true*, it must be capable of correct representation. What do logics represent? It is clear from the various uses of *applied* logic, they can represent many different sorts of phenomena. But for the purposes of traditional pure logic, though, theories of consequence are frequently taken to represent *natural language inference*.

As Beall and Restall [7] note:

> Logic, in the core tradition, involves the study of *formal languages*, of course, but the primary aim is to consider such languages as *interpreted*: languages which may be used either directly to make assertions or denials, or to analyse natural languages. Logic, whatever it is, must be a tool useful for the analysis of the inferential relationships between premises and conclusions expressed in arguments we actually employ. If a discipline does not manage this much, it cannot be *logic* in the traditional sense. (8)

If this is right, it means that logic is connected to inferential practice of natural language speakers. Now perhaps logical theorising is not an entirely *descriptive* enterprise and contains some element of normativity. But we think it is clearly true that a logic would have claims to be 'correct' only if it is constrained in some way by actual inferential practice. For the purposes of this paper, we will follow Beall and Restall (and others[1]) in holding this characterisation of logic as traditionally conceived.

Once we have pinned down our subject matter, we see a number of possible outcomes.

LOGICAL MONISM There's *exactly one* logical consequence relation that correctly represents natural language inference.

LOGICAL PLURALISM There's *more than one* logical consequence relation that correctly represents natural language inference.

LOGICAL NIHILISM There's *no* logical consequence relation that correctly represents natural language inference.

Much of the discussion in the philosophy of logic over the last decade has been devoted to the debate between logical monism and logical pluralism. But logical nihilism hasn't been given nearly as much attention, even though the view has historical roots and is philosophically defensible.

A clarification: there is another view which can rightly be called 'Logical Nihilism' which is *not* the view under consideration here. Mortensen [49] has argued that anything is possible based on a kind of thorough-going empiricism. On one reading, Mortensen

[1]Compare recent authors like Bueno and Colyvan [10], "The *aim* of logic is taken to be to provide an account of logical consequence that captures the intuitive notion of consequence found in natural language" (p. 168). Or Resnik [63], "As practitioners of inference we make specific inferences [...] As *logicians* we try to formulate a systematic account of this practice by producing various rules of inference and laws of logic by which we presume the practice to proceed. This aspect of our work as *logicians* is like the work of grammarians" (p. 179). Or consider Cook [15] "[A] logic is 'correct', or 'acceptable', etc., if and only if it is a correct (or acceptable, etc.) codification of logical consequence. The idea that the philosophically primary (but obviously not only) goal of logical theorizing is to provide a formal codification of logical consequence in natural language traces back (at least) to the work of Alfred Tarski" (p. 195).

believes everything is *logically* possible.[2] And if everything is possible, then for any argument from premises X to conclusion A there will be some possible case according to which X is satisfied, but A not. Thus, the logical consequence relation is empty. This view plausibly deserves the title 'Logical Nihilism',[3] and in fact has been defended under that name by Estrada-Gonzalez [23] and Russell [65]. So, I think it is worth distinguishing two types of logical nihilism:

LOGICAL NIHILISM 1 There's *no* logical consequence relation that correctly represents natural language inference; formal logics are inadequate to capture informal inference.

LOGICAL NIHILISM 2 There are no logical constraints on natural language inference; there are always counterexamples to any purportedly valid forms.

On the second view, there is a consequence relation (namely the *empty* one) which gets natural language inference 'right'. The focus of this paper is on logical nihilism in the first sense.

In what follows, I present and defend a number of arguments in favor of logical nihilism. The arguments are grouped into two main families: arguments from *diversity* (§2) and arguments from *expressive limitations* (§3). The arguments are often simple syllogisms, pointing to fundamental differences between natural languages and formal consequence relations. Many of the arguments involve familiar problems in the philosophy of logic. The arguments, taken individually, are interesting in their own right; they each highlight an important way in which the formal methods of logic can be seen to be inadequate to modeling natural language inference. But the arguments taken jointly are

[2]Another way of reading Mortensen is as arguing that real *broad* possibility outstrips pure *logical* possibility. In this case, then, there may be logically impossible scenarios that are not, *broadly* speaking, impossible. Mortensen would then not count as a logical nihilist in the sense above.

[3]Compare parallel disputes over the metaphysics of composition. Here *universalism* states that composition always occurs, whereas *nihilism* claims that the composition relation is basically empty. 'Emptyism' just doesn't have the same ring to it. And unfortunately, 'Noneism' — the most natural name for the view defended in this paper — is already taken.

more significant; by presenting all the arguments together, we can build something of a cumulative case for logical nihilism. Of course, if *any* of these arguments are sound then logical nihilism is correct. But the arguments reinforce one another, such that logical nihilism presents us with a unified view across a broad range of issues in philosophy of logic. I conclude (§4) by considering related philosophical issues and sketching a general outlook on logic and formal methods that is nihilist-friendly.

Before presenting these arguments, however, let me respond to an immediate worry. In presenting and endorsing arguments for a view, one ordinarily takes them as *good* arguments, where good arguments are (at the very least) valid arguments. But if there is no correct theory of logical consequence, then presumably there are no valid arguments either. Thus, one might suspect that any attempt to argue for logical nihilism undermines itself.

This worry could be serious if logical nihilism entailed that there were no valid arguments (as in Logical Nihilism 2). But notice that logical nihilism (of both sorts) is consistent with their being standards governing good inference in natural language. And Logical Nihilism 1 merely claims that there is no *formal theory* that perfectly captures these standards. And that's perfectly compatible with these arguments being formally valid in some regimented language that is adequate for more restricted purposes. It's also compatible with arguments conforming to inherently informal standards on good inferential practice. So the worry is ill-founded.

2 ARGUMENTS FROM DIVERSITY

The first batch of arguments for logical nihilism follow a simple recipe. The first ingredient is an argument for logical pluralism; this establishes that *no single* logic can be an adequate theory of inference. The second ingredient is a constraint on logical consequence that rails against logical pluralism — that is, a constraint that requires there be at most one *single* adequate theory of inference. Combine these two ingredients and stir; the result is logical nihilism. For if there cannot be one single correct theory, and any correct theory must not be plural, then there cannot be *any* correct theory at all. Fortunately for us, such ingredients are not hard to come by.

There are a number of types of logical pluralism that have been defended in the literature; I won't consider all of them. I will focus on on Beall and Restall's [6, 7] *case-based* pluralism, Lynch's [44] *domain-based* pluralism. I'll also briefly consider Varzi's [80] *logical relativism* and Russell's [64] *truth-bearer dependent* version of logical pluralism.[4]

2.1 AN ARGUMENT FROM NECESSITY

Beall and Restall [7] suggest that the notion of logical consequence may be analysed by the *Generalised Tarski Thesis* (GTT).

GTT An argument is valid$_x$ if and only if in every case$_x$ in which the premises are true, the conclusion is true.

Of course, we have yet to specify what sorts of *cases* are under consideration here. Logicians are frequently concerned with *models*, but the notion of consequence itself doesn't determine that models are the only possible option. Once this is granted, there is a straightforward argument to pluralism.

The idea is that settled core of logical consequence ('the intuitive or pre-theoretic notion' [6]) is given by GTT. An instance of GTT is obtained by a *specification of cases*$_x$ in GTT, and a specification of the relation of *being true in a case*. An instance of GTT is *admissible* if it satisfies the settled role of consequence, and if its judgments about consequence are

[4]There is also Eklund's [22] Carnapian language-relative approach; Shapiro's [71, 70] contextual approach, and Cook's [15] logic-as-modeling approach. Later I'll touch on some issues that directly relate to their motivations.

necessary, normative, and formal (in some sense or other). A *logic*, then, is an admissible instance of GTT.

Beall and Restall contend that there are at least two admissible instances of GTT. They defend this claim by appeal to the diverse purposes logic may be put to, each of which corresponds to a different kind of case. There are the complete and consistent cases of *classical* logic (i.e. *worlds*), the incomplete cases of *intuitionistic* logic (i.e. *constructions*), and the inconsistent (and/or incomplete) cases of *relevant* logic (i.e. *situations*). As a result, there is no single correct consequence relation, but many correct consequence relations relative to which kind of cases we intend.

Supposing we agree with Beall and Restall that there are a number of different ways of specifying the notion of a case, each with its own specification of truth-in-a-case, and hence a number of instances of GTT. We might still disagree that any one of these instances is *admissible* because the resulting consequence relations fail to be *necessary*. Clearly, it's a plausible constraint on logic that it must be *necessary*; an argument is valid whenever it is necessarily truth preserving. But on the surface, the necessity constraint appears to require us to look at *all* kinds of cases, if they really are genuine cases.

This is, in effect, a version of an objection to logical pluralism developed by Bueno and Shalkowski [11].

> Thus, on Beall and Restall's account, none of the major families of logics they consider satisfy the necessity constraint. By their own standard, none of these are logics at all. Only a very weak consequence relation survives this scrutiny, according to their accounting of the necessity constraint as quantification over all cases. Once the partisan spirit of logical monism is replaced with the open-minded embrace of cases suitable to alternative logics, no commonly promulgated consequence relation seems to satisfy the necessity constraint. Hence, according to their own accounting of the constraints on rela-

tions of logical consequence, there are no such relations. (p. 299f)

It is worth noting that there are actually two sorts of objections here, each resulting in a different form of logical nihilism. The first objection is that, on an absolutely general reading of necessity — necessity in the broadest possible sense — as quantifying over all cases of any type, no instance of GTT counts as admissible. And hence there are no logics; this is a form of Logical Nihilism 1.

On the other hand, we might instead specify a general notion of *case* as follows: c is a *case** iff c is a case$_x$ for some x. Similarly we can give a general specification of truth-in-a-case as follows: A is *true-in-a-case** iff c is a case$_x$ for some x and c represents A to be true-in-a-case$_x$. This seems to suffice for an instance of GTT. And indeed, this will constitute an admissible instance especially with regards to necessity (read again in the broadest sense). But, if we take seriously the vase range of cases which have been put forward by various logicians, it is doubtful the any substantive logical principles will survive.[5] This would lead to a situation close to Logical Nihilism 2. But even if we simple stick with the cases Beall and Restall have already admitted, it seems clear that the logic resulting from quantifying over all such cases is still going to be far too weak to adequately account for natural language inference.

I do not mean to suggest that Beall and Restall have nothing to say in response to this style of argument — indeed, they do ([7, p. 99]). Whether their response is ultimately successful I leave to the reader to decide. But I merely want to show that arguments for *case-based* pluralism might naturally be converted to an argument from diversity that attempts to establish logical nihilism.

[5]Similar arguments have been made by Read [61, p. 208f] and Priest [55, ch. 12].

2.2 AN ARGUMENT FROM TOPIC-NETURALITY

A similar sort of strategy equally applies to *domain-based* pluralists. Some pluralists about truth have suggested that there are viable forms of logical pluralism that sit naturally with their views. Pluralism about truth is the view that different domains of inquiry (e.g. science, mathematics, ethics, history, etc.) have different truth properties associated with them; so being true in one domain might consist in *corresponding* to a fact, whereas being true in a different domain might correspond to a kind of generalised *coherence*. Lynch [43, 44] has recently argued that, because truth properties in domains of inquiry are so vastly different, which inferences are valid (i.e. which inferences preserve these properties) can vary from domain to domain.[6] This is a domain-based logical pluralism.

However, many have contended that logical consequence must be *topic-neutral*. Indeed, we might agree with Sher [72] that "formality and necessity play the role of adequacy conditions: an adequate definition of logical consequence yields only consequences that are necessary and formal" (p. 654). That is, what arguments are valid can depend only on their *form*, and cannot depend on what the arguments are *about*. How to cash out this topic-neutrality constraint is somewhat controversial (see MacFarlane [45] for various proposals), but it seems clear that any domain-based logical pluralism will not meet such a constraint. Of course, one might accept that *within* a domain logical consequence does not depend on any further facts about the content of those propositions. But there is still the residual fact that which argument forms are valid and invalid will depend on the domain of inquiry one is in. The truth pluralist argues that any adequate theory of consequence must be domain-relative. By topic-neutrality, there can be no adequate theory of consequence. As a result, one can convert an argument for domain-based pluralism into an argument from diversity for logical nihilism.

[6] In Cotnoir [17], I outline general approach to validity motivated by this idea. See also Pedersen [52] for more motivations.

2.3 OTHER ARGUMENTS FROM DIVERSITY

Another strategy along the same lines applies to Varzi's [80] brand of logical pluralism. According to *logical relativism* the correct inferences depend crucially on what one takes to be logical — as opposed to the non-logical — vocabulary. Varzi advocates for a kind of skepticism about any objective criterion on where to draw the logical/non-logical divide.[7] Of course, one might be perfectly happy to accept that there are natural language consequence relations for each way of drawing the divide. Indeed, one might rather appeal to instead to 'meaning postulates' or 'semantic constraints' as (cf. Sagi [66]) for all vocabulary to generate semantic entailment relations. Formal semanticists often deliver such theories.

But there are general reasons why formal semantics does not deliver the *logic* of natural language. Glanzberg [30, §2.2] argues that such meaning postulates or semantic constraints will, at best, deliver analytic entailments which should not intuitively count as valid (e.g. "John cut the bread" lexically entails "The bread was cut with an instrument" because of constraints on the meaning of 'cut'). This seems to dictate against counting such semantic 'entailment' relations to be Logical Consequence proper. Glanzberg [30, §2.1] also argues that natural language semantics, whether in its neo-Davidsonian or type-theoretic guises, are primarily concerned with *absolute* semantics. That is, they give semantic clauses for sentences expressing the meanings that speakers actually understand those sentences to have. They do not give *relative* semantics, that is, semantic clauses that are generally specified over a range of models, which is precisely what is

[7] This was Tarski's [75] early view.

> But I also consider it to be quite possible that investigations will bring no positive results in this direction, so that we shall be compelled to regard such concepts as logical consequence as relative concepts.The fluctuation in the common usage of the concept of consequence would in part at least be quite naturally reflected in such a compulsory situation [of a relatively-defined concept of consequence]. (p. 420)

See also Etchemendy [24] and Dutilh-Novaes [20].

required in order to specify logical consequence.[8] The end result is that, if logic must be formal, then there is no logical consequence relation that is adequate to natural language.

At the risk of belaboring the point, allow me to give a final argument from diversity. Russell [64] argues that different views on the relata of the consequence relation (e.g. sentences, propositions, etc.) yield different consequence relations. If one takes sentences to be the relata of consequence, then contextual aspects of language can validate inferences which are intuitively invalid (e.g. "I am here now" is a logical truth in Kaplan's *LD*).[9] Alternatively, if one takes propositions to be the relata of consequence, then propositions can validate inferences which are intuitively invalid as well (e.g. "Hesperus is Hesperus" entails "Hesperus is Phosphorous"). Russell draws logical pluralism as her conclusion, but I'd contend that the arguments better support logical nihilism: both of these consequence relations deliver intuitively invalid validities. Of course, a nihilist need not reject that such semantic or metaphysical necessitation relations exist; it is just that they do not appear adequate to the role of logic as traditionally conceived.

The various available arguments from diversity are arguments on-the-cheap, as it were. They piggyback on arguments for logical pluralism, together with monist constraints about the concept of logical consequence. Monists may not be sympathetic to the underlying pluralistic motivations, and pluralists may not be sympathetic to the monistic reading of the constraints on logical consequence. Though I wouldn't expect monists or pluralists to agree, I think it is striking that logical nihilism can make sense of the motivations behind both lines of thought.

[8]Glanzberg's [30] rich and carefully argued paper is concerned with rejecting the view that natural language (a structure with a syntax and a semantics) determines a logical consequence relation. His position is very similar to logical nihilism of the sort I'm defending here, and he is probably one of the view's closest allies. But strictly speaking Glanzberg's view is compatible with logical monism and logical pluralism, since there could be one (or more) correct theory of natural language inference, even if it isn't possible to simply read such a thing off from natural language itself.

[9]Compare Zardini [91, 93] who argues that mid-argument context shifts invalidate standard inferences (e.g. "I am sitting" can fail to entail itself).

3 ARGUMENTS FROM EXPRESSIVE LIMITATIONS

The second class of arguments follows a different sort of recipe. It starts from a given phenomenon of natural language inferential practice, and argues that no formal language can exhibit that phenomena. Many arguments of this sort have been given in the past and recent literature. But again, I think it is worth putting them all in one place to display their cumulative weight. Every argument from expressive limitations needs to be refuted in order to defend against logical nihilism. And I hope to display just how difficult this task is.

3.1 THE ARGUMENT FROM SEMANTIC CLOSURE

The first argument from expressive limitations for logical nihilism appeals to considerations around semantic closure.

1. Natural languages are semantically closed.

2. No formal language is semantically closed.

3. So, no formal language is adequate to natural language.

The argument appeals to an alleged fundamental difference between formal languages (from which logical consequence relations are derived) and natural language. The idea is that natural languages are capable of representing their own semantics; we could express all the truths about English in English. But formal languages cannot generally be supplemented with semantic notions that apply to themselves on pain of triviality.

Consider premise 1. Many find it straightforwardly obvious that natural languages like English are semantically closed in the sense that we can use natural languages like English to talk about the semantic properties and relations of sentences of English. Scharp [68] argues that it is a fundamental presupposition of formal semantics that such a thing is possible. In attempting to give a complete theory of natural languages as a whole, couched in a given natural language, we must presuppose that that language can serve as a metalanguage for itself. Take the semantic property 'is true' as an example. Eklund [21] has argued that in order to be competent with the use of the English truth predicate, one must be willing to apply it to all sentences of the English language.

As for premise 2, there are a number of different ways of supporting this claim. Tarski showed clearly that the truth predicate could not be expressed in any formal language (of certain expressive richness) if the consequence relation was to be classical due to semantically 'rogue' sentences like the Liar sentence. This means that, at the very least, premise 2 is true with respect to classical formal languages.[10] This result has led many to reject that classical logic is the One True Logic.

But the well-known phenomenon of *revenge* plagues non-classical formal languages as well. The literature is predictably populated with articles that find inexpressible concepts for non-classical logics that purport to be semantically closed. Even absent a general recipe for finding a revenge paradox for every formal language, the sheer volume of failed attempts at semantic closure would justify a plausible pessimistic meta-induction:[11] if premise 2 has proven true for every formal language so far, then there's good reason to think the issue is systemic.

There are somewhat more general recipes for finding revenge problems even for non-classical approaches to paradox. Here is a basic one: we begin with three desiderata for any semantically closed formal language $\mathcal{L}$.

CHARACTERIZATION There is a property φ s.t. all and only 'rogue' sentences of $\mathcal{L}$ are φ.

SEMANTIC CLOSURE φ is expressible in $\mathcal{L}$; there is a name $\langle\alpha\rangle$ for every sentence α in $\mathcal{L}$.

REVENGE IMMUNITY No sentence attributing φ to a 'rogue' sentence is itself φ.

[10] See also Bacon [1] who argues that there can be no 'linguistic' theories of paradox based in a classical language due to revenge problems.

[11] Thanks to Cory Wright for suggesting this way of framing the issue.

Let Γ be the class of 'rogue' sentences. Now, [by SEMANTIC CLOSURE] construct the following sentence $\lambda : \varphi\langle\lambda\rangle$ — the sentence which says of itself that it is a rogue sentence. Now, it will typically be the case that λ is a paradigm case of a rogue sentence; $\lambda \in \Gamma$. So, [by CHARACTERIZATION], $\varphi\langle\lambda\rangle$ is true. But [by REVENGE IMMUNITY], $\varphi\langle\lambda\rangle \notin \Gamma$. Contradiction. One might object that this is merely a proof that, contrary to appearances, λ is not rogue. But then consider the sentence $\gamma : \varphi\langle\gamma\rangle \vee \neg T\langle\gamma\rangle$, where T is our truth predicate. If γ is not rogue, then it must fall under some other semantic category (i.e. true or false). But in either case, we get the standard Liar reasoning yielding a contradiction. So γ must be rogue. But since γ is an attribution of φ to a rogue sentence, we have a violation of REVENGE IMMUNITY. This is perhaps especially problematic since, if γ is rogue, that's precisely what one disjunct of γ says, and thus it should intuitively be true. The characterization of paradoxical sentences seems destined to break down.

There are, of course, a number of options for replying to a revenge charge like this. The first option is to reject that Characterization is a desiderata at all. Of course, the characterization constraint has two directions. One might reject the 'all' direction, and attempt to leave some paradoxical sentences uncharacterized. An immediate reply would be that one has thereby failed to give a complete account of the semantic paradoxes. On the other hand, one might reject the 'only' direction, and claim that we must throw out some babies (non-rogues) when throwing out the bathwater (rogues). Two immediate replies come to mind: first, this will result in a situation where being a 'rogue' sentence is not expressible in $\mathcal{L}$ (even if φ is); after all φ will apply to some non-rogues. Second, being a 'rogue' sentence appears not to be doing any work in the resulting theory, the characterization of paradoxes happens using φ.

One might opt for second response to revenge: reject Revenge Immunity — that is, accept that some attributions of φ are themselves 'rogue'. An immediate reply to this approach, however, is that since the theory itself includes attributions of φ to the paradoxical sentences, one's theory relies on exactly the problematic phenomenon. That is, one is forced to use rogue sentences in giving one's theory.

A third response to these revenge charges would be simply to reject Semantic Closure. This is Tarski's solution (for formal languages) in that he rejects any such φ is expressible. But again linguistic appearances suggest the contrary for natural languages, and so this will lead us to a version of logical nihilism.

Perhaps one might attempt to agree with Priest [53] that this merely shows semantic closure can be had only on pain of *inconsistency*; an implicit argument for dialetheism. But Beall [3] has outlined a general argument barring semantic closure for formal theories on pain of *triviality*. The rough idea is to classify 'rogue' sentences of a formal semantic theory (couched in a formal language together with its consequence relation) as *trivializer*-sentences: sentences that, relative to that language's consequence relation, yield the theory containing all sentences of the language. Then there can be no trivializer predicate for that theory characterizing all and only the trivializing sentences of the language. That's because a sentence which says of itself that it is a trivializer for the that very theory will be uncharacterized by that predicate. The upshot is that any formal language is either semantically incomplete, or absolutely inconsistent (i.e. trivial).

Another related issue for semantic closure is that there are very general reasons for thinking that the validity predicate for a logical consequence relation of a formal language will not expressible in the language itself. On reason for thinking this has been put forward by Field [25]. Gödel's second incompleteness theorem says that no sufficiently strong formal language can prove its own consistency. If we had semantic closure (including an adequate truth and validity predicates), we would be able to do just such a thing. After all, if we could show in a formal language that the validity relation was truth-preserving, we would be able to assert all the axioms of a logical theory to be true, and then be confident that by closing the theory under logical consequence we did not introduce any inconsistencies.

Beall and Murzi [5] have also argued that no validity predicate will to be expressible in any formal language (satisfying certain structural rules like *contraction* and *transitivity*) that contains it own truth predicate.[12] This is due to the fact that one can use such a validity predicate to construct variants of Curry's paradox. Now, it may be that by rejecting certain structural rules might allow one to express a validity predicate.[13] But even still, the resulting (non-contractive, or non-transitive) logical consequence relation will be highly non-standard, and one wonders whether such a logic could be adequate to natural language inference. The underlying worry is that by attempting to accommodate semantic closure in a formal language, we are required to weaken the logical consequence relation for that language to such a degree that it no longer resembles our patterns of natural language inference.

It is no accident that the literature regarding semantic closure continues to grow, for these issue are directly tied up with the adequacy of formal methods for giving an adequate treatment of natural language inference. It is worth saying that quite a lot of brilliant technical work has gone into these problems, and that the debate is far from settled. But logical nihilism is not outside the bounds of reason even considering the best work on these problems.

3.2 THE ARGUMENT FROM QUANTIFICATION

The second argument from expressive limitations trades on another limitation of formal languages to do with absolute generality.

1. Natural languages have absolutely unrestricted quantifiers.

[12] Related arguments first appeared in Whittle [86], and Shapiro [70]. See also Murzi [50]. For dissenting voices see Cook [16], Wansing and Priest [81].

[13] See e.g. Zardini [92], Weber [84].

2. No formal language has absolutely unrestricted quantifiers.

3. No formal language is adequate to natural language.

Each premise is, of course, controversial so let's look at the case for each.[14]

What evidence is there for premise 1? Certain uses of natural language quantification appear to require an unrestricted reading. For example, part of the main function of philosophical uses of quantification is to rule out the existence of certain objects: "The universal set does not exist" should not be true if the universal set does exist but we just can't quantify over it. Even the rejection of unrestricted quantification seems to presuppose the availability of unrestricted quantification; saying "one cannot quantify over absolutely everything" appears to presuppose that there is something that one cannot quantify over.[15] Additionally, McGee [47] argues that natural language universal quantification would be *unlearnable* if it weren't unrestricted.

There are also general reasons for accepting premise 2. Here is an argument that has been put forward repeatedly in the literature, based on two key claims.

ALL-IN-ONE Formal quantification involves quantification over sets (or at least domains that are set-like).

NO UNIVERSE There is no universal set (or set-like domain).

What reason is there for thinking that formal quantification involves quantification over sets? Grim [31] and Priest [54] have both provided arguments along these lines. In fact, Priest [54] has argued for a stronger claim, what he calls the 'Domain Principle', according to which all quantification (whether formal or not) involves sets.[16] Far and away, the best formal theory of natural language quantifiers is *Generalized Quantifier Theory*; and

[14]For good introductory discussions of these issues see Florio [27] and Rayo and Uzquiano [60, p. 1]. The following discussion is indebted to them in various ways.

[15]See Lewis [36] and Williamson [87].

[16]Priest himself rejects 'No Universe' for his preferred set theory; for discussion see below.

generalized quantifiers are relations between sets. However, whether this is required for any adequate theory of natural language quantification is controversial.

There are a few available lines of response. One might reject All-In-One, and suggest that plural quantifiers provide a counterexample to this claim (Boolos [8]).[17] It is, of course, relevant that plural quantification is isomorphic to second-order quantification over non-empty monadic predicates. And second-order quantification (at least on its standard semantics) intrinsically involves quantification over sets. Many have argued that plural quantifiers are no more innocent than higher-order quantifiers, or are at least 'set-like' in the relevant sense.[18]

To be sure these issues are complicated, and debate is ongoing. But there are many who simply do not see a way to preserve unrestricted quantification, and opt rather for an indefinitely extensible hierarchy of quantifiers.[19] Perhaps one might suggest a proof-theoretic approach to quantification without domains. Of course, there is the worry about the failure of any proof-theory to be complete with respect to higher-order models. A potential suggestion would be to give *rules* (schematic or proof-theoretic) for quantifiers that are *open-ended*, in the sense they govern the behavior of all possible extensions of the language (e.g. higher-order quantifiers) all at once.[20] But even on this proposal, it will still be true that no single formal language can achieve quantification over absolutely everything. At best, the view delivers a single concept of quantification which will be retained no matter how one's formal language is expanded to ever more inclusive domains.

Instead of rejecting All-in-One, one might instead reject No Universe and consider formal theories with set-like universal objects. In ordinary set theory, we reject a uni-

[17] See Uzquiano [79], Rayo [58].

[18] For example, Jané [34], Resnik [62], and more recently Linnebo [40].

[19] For example, one might utilize hyperplural quantification (Rayo [59]), which under certain assumptions, isomorphic to the type hierarchy (Rayo & Linnebo [39]). There are also modal approaches (Linnebo [38] and Studd [74]) which allow set-theoretic domains to be indefinitely extensible.

[20] For some defenders of this view, see Lavine [35], McGee [48], and Williamson [88].

versal set because it would have to be a member of itself. And for Russell-paradox related reasons, no set can be a member of itself. Class theory can have a universe of sets, but not a universe of classes since proper classes are not members of anything including other classes. Similarly, mereology has a universal object. Could one use mereological models for quantification? Uzquiano [78] shows that this method (supplemented with a some natural assumptions) can only recover quantification over sets up to certain types of limit cardinals; but if there are strongly inaccessible cardinals, then this quantification is not truly unrestricted.

Another option would be to appeal to alternative set theories. Paraconsistent set theories can non-trivially contain universal sets guaranteed to exist by Naïve Comprehension (Brady [9] and Weber [82, 83]). Such sets will be inconsistent, but in a paraconsistent setting we can have inconsistent sets (including the Russell set) non-trivially. So, in this case it appears we can have unrestricted quantification (Priest [56]). But even if this proposal looks promising, it comes with a similar cost — we lose a plausible form of restricted quantification.

Any adequate theory of restricted quantifiers requires the following:

MODUS PONENS All *A*s are *B*s, x is an *A*; hence x is a *B*.

WEAKENING Everything's a *B*; hence all *A*s are *B*s.

CONTRAPOSITION All *A*s are *B*s; hence all non-*B*s are non-*A*s.

That is, any theory that rejects the above principles will be inadequate to natural language inference. But any theory that accepts them reintroduces a form of *Ex Falso Quodlibet*.

$$\dfrac{\neg B \qquad \dfrac{\dfrac{B}{A \to B}}{\neg B \to \neg A}}{\neg A}$$

Here, on the assumption that B and $\neg B$, we can infer $\neg A$. But this is something that simply cannot be valid in a dialetheic setting, since it would entail the truth of (the negation of) every sentence whatsoever.[21]

There are set theories based in classical logic with a universal set: Quine's [57] *New Foundations*, and descendants (see Forster [28]). But Linnebo [37, p. 156f] notes, they are technically unappealing and lack a unified intuitive conception. More importantly, they have a universal set only by placing further restrictions on Comprehension, a limitation which Williamson [87, p. 425f] argues would also make any account of ordinary restricted quantification impossible.[22]

3.3 OTHER ARGUMENTS FROM EXPRESSIVE LIMITATIONS

Another key argument from expressive limitations appeals to an obvious phenomenon of natural language: vagueness. The philosophical literature on vagueness is enormous, and the number of theoretical options are too numerous to outline here. I want to highlight some views of vagueness that are broadly in line with the nihilist outlook on logic. One key player is, of course, Dummett who argued that the use of vague predicates in natural language is intrinsically inconsistent.

> What is in error is not the principles of reasoning involved, nor, as on our earlier diagnosis, the induction step. The induction step is correct, according to the rules of use governing vague predicates such as 'small': but these rules are themselves inconsistent, and hence the paradox. Our earlier model for the logic of vague expressions thus becomes useless: there can be no coherent such logic. (Dummett [19, p. 319f])

If there can be no coherent logic of vague expressions, but natural language contains vague expressions, then we have a straightforward argument to logical nihilism. More

[21] This problem is discussed, and some possible lines of response explored in Beall et al [4].
[22] See Weir [85, p. 340].

recently, Eklund [21] argued that languages with vague expressions are inconsistent languages. Ludwig and Ray [42] suggest that no sentence involving a vague term can be true.

Aside from these strong claims about the inconsistency or incoherence of natural language, however, one might want to contend there is still a mismatch between formal logics and natural language with how they treat vagueness. It's not outlandish to suggest no formal language, with its mathematical precision, could ever hope to perfectly represent natural language vagueness. Or one might agree with Sainsbury [67] and Tye [77] that any semantics for vague expressions would have to appeal to a similarly vague metalanguage.[23]

Hiding in the background to most formal approaches to vagueness is the ubiquitous revenge problem of *higher-order* vagueness. It may be that such problems inevitably render precise formal methods inadequate for the vague aspects of natural language inferences.[24]

There are probably other arguments from expressive limitations that can be made; I have simply pointed to three of the more difficult problems in philosophical logic: semantic closure, unrestricted quantification, and vagueness. And as emphasized, these problems are not new, and the debate over the correct treatment of such phenomena ongoing. Still the logical nihilist permits a unified perspective: the expressive resources of natural language and our best formal languages might not perfectly coincide, and that-might be because there are important and deep differences between natural language inference and logical consequence.

[23] See Cook [14] for discussion.

[24] Wright [90] contends that higher-order vagueness worries are pseudo-problems; it is a revenge problem that only arises for views which misunderstand first-order vagueness. The logical nihilist can afford sympathy to such claims.

4 RELATED ISSUES

An issue I've largely set aside is the fact that logic is taken to be normative. Perhaps this unreasonably privileges psycho-semantic facts about how we *in fact* infer, rather that how we *ought* to infer. On this conception, appeals to linguistic data and evidence for 'semantic intuitions' can appear irrelevant. The question of logic is: 'what is best inferential practice?'

But I want to stress that even if logical consequence is conceived as a fundamentally normative relation, there might well be arguments for logical nihilism. For example, we might contend that an *objective* normative relation would be metaphysically and epistemically strange. Roughly, we might apply Mackie's [46] arguments to logical consequence itself. This case is made strongly by Field [26]:

> Quite independent of logic, I think there are strong reasons for a kind of antirealism about epistemic normativity: basically, the same reasons that motivate antirealism about moral normativity, or about aesthetic goodness, extend to the epistemic case. (For instance, (i) the usual metaphysical (Humean) worry, that there seems no room for 'straightforward normative facts' on a naturalistic world-view; (ii) the associated epistemological worry that access to such facts is impossible; (iii) the worry that such normative facts are not only nonnaturalistic, but 'queer' in the sense that awareness of them is supposed to somehow motivate one to reason in a certain way all by itself.) (p. 354)

And if we have good reason to reject entities which are metaphysically or epistemically or motivationally strange, we would have good reason to reject logical consequence (qua objective and normative).[25]

[25]Field takes this to be an argument for pluralism (because of an underlying antirealist pluralism about epistemic norms), one might well think such considerations provide better reasons to be nihilist about logic.

If logical consequence is a subjective normative relation, then whether that relation holds would be relative either to our aims or our conventions. This view is called 'logical pragmatism' by Haack [32, p. 211]. Here, the aim of formal logic is not so much correct representation, but rather utility. But this view is not opposed to logical nihilism: it may well be that the best inferential practice for natural language users (i.e. the most useful) has no formal analogue. After all, semantic closure, unrestricted quantification, and vagueness are useful features of natural language. But here again what counts as 'best' in the pragmatic sense will depend in large part on what natural language is used for.[26]

In defending logical nihilism, do not intend to impugn any honorific status of natural language inference. This is over against so-called 'Inconsistency Theories' (with which logical nihilism has much in common) according to which natural language is *inconsistent* because of e.g. the truth predicate, or vague expressions.[27] Logical nihilists are free to disagree with the claim that natural languages are inconsistent, perhaps because they agree with Tarski [76, p. 349] that "the problem of consistency has no exact meaning with respect to this [natural] language" and only arises with the sufficiently precise formulation of a formal language. Some inconsistency theorists claim that natural language is *incoherent* or *meaningless* because it has no precise logic.[28] Here again, logical nihilists are free to disagree. We might well agree with Wright [89] that natural language inference can be unprincipled without being incoherent.

Nor am I impugning formal methods in the study of natural language, in philosophy, or elsewhere. As Glanzberg [30] rightly notes, the application of formal methods

[26]The comparison with morality is instructive: consider the relevance of *anti-theory* views in ethics (e.g. Clarke [13]) to logical nihilism, or even the similarities between *particularism* (e.g. Dancy [18]) and Hofweber's [33] view that we should give up the ideal of deductive inference as exceptionless and monotonic. Natural language inferences need not be exceptionless or monotonic, and often are not. But they might still be *generally* valid, in the sense that "Humans are bipeds" is generally true.

[27]E.g. Chihara [12], Eklund [21], and Ludwig [41].

[28]E.g. Scharp [68] who thinks defective concepts like 'truth' need to be replaced, or Patterson [51] who argues that we understand natural language using a false semantic theory, such that strictly speaking natural language sentences have no meanings.

has been one of the greatest successes in the study of natural languages of the last half-decade. The application of formal techniques to e.g. epistemology, metaphysics, perhaps virtually every area of philosophy, has likewise yielded significant progress. But we should be aware that formal languages serve a representational function, and — like modeling tools used in any science — their applications have limits.

This is something the early analytic pioneers of logic, Frege and Tarski, understood well. Consider Frege:

> I believe I can make the relationship of my Begriffschrift to ordinary language clearest if I compare it to that of the microscope to the eye. The latter, due to the range of its applicability, due to the exibility with which it is able to adapt to the most diverse circumstances, has a great superiority over the microscope. Considered as an optical instrument, it admittedly reveals many imperfections, which usually remain unnoticed only because of its intimate connection with mental life. But as soon as scientific purposes place great demands on sharpness of resolution, the eye turns out to be inadequate. The microscope, on the other hand, is perfectly suited for just such purposes, but precisely because of this is useless for all others. ([29, §V])

Formal languages require a significant degree of abstraction and idealization from natural language inference.[29] Only certain aspects of the model are intended to represent the phenomena being modeled. This perspective might even help to handle some of revenge problems involving semantic closure, absolute generality, vagueness, etc. Too-easy revenge appeals to artefacts of the model, and argues they are inexpressible in the model. But once we see the clear separation, we can see that there's no obligation for the theorist to take these burdens on.[30] The view of logic-as-modeling is sometimes billed as a form

[29]See especially Glanzberg [30, §IV], but also Cook [15, 14], Shapiro [69], and Scharp's [68] *metrological naturalism*.)

[30]This point is made clearly and forcefully in Beall [2] with respect to the semantic paradoxes. Cook [14] argues for a similar perspective with respect to vagueness.

of logical pluralism (e.g. Cook [15]). And while it is clear my sympathies lie with this view, a rather more drastic opinion of the limitations of formal methods inclines me to say that *no* formal language gets it right, rather than to say that *many* formal languages get it right more-or-less.

The nihilist accepts that there are no *correct* or completely general formal theories. But that needn't mean there aren't a lot of reasonably good, useful, and explanatory ones. In certain areas of inquiry, some of the more useful features of natural language are unnecessary, and may even be detrimental to the theoretical purposes at hand. Science and mathematics (both pure and applied), and even many areas of philosophy, require the kind of precision inherently informal languages cannot provide. Formal logic has its best application in areas where we can *regiment* our language and *revise* our practice. But we shouldn't forget that not all of our inquiry is like this: sometimes regimentation leaves us with an expressive loss, and sometimes revising our practice is not possible or even desirable. Logical nihilism reminds us to respect the differences between model and reality.[31]

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