The Nature of Logic, Part II: Philosophical Logic.

Lecture IV, *Anti-Exceptionalism about Logic*, 8th March.

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We ended last week with a quite compressed claim from Dummett (1978) about why we should never revise our logic in the face of some empirical claims. Rather, our choice of logic was the purview of a theory of meaning. This and other worries seemed to close the lid on Putnam's argument for quantum logic. At the very least, logic might not be empirical in the way Putnam understands. But is it thus analytic? *a priori*?

This week, we'll approach matters from a different angle. We'll look at an increasingly popular way of thinking about logic—so-called *Anti-Exceptionalism about Logic*. In a slogan, the thesis that logic is not special.

1. An Overview: Anti-Exceptionalism about Logic

1.1. Anti-exceptionalism is an increasingly popular and radical view about the nature of logic. The central idea is that logic is not special—logic is continuous with the natural sciences. The continuity with the natural sciences is taken to involve two claims, one about the *claims* and another about the *methodology* of logic.

(1) Claims of Logic: The claims of logic are fundamentally *of the same kind* as the claims of science.

(2) Methodology of Logic: The methodology of logic is fundamentally the methodology of science.

These need unpacking. Clearly, both the methodology and claims of logic and science differ in some substantive ways. A scientific claim will, e.g., tell us how hydrogen behaves. A logical claim will tell us that $\vdash p \supset p$ or that $p, p \supset q \vdash q$. Likewise, the methodology of science will involve, e.g., experiments and labs and submissions to regulatory bodies for ethical approval. Logic, in contrast, is chiefly concerned with *proof*.

1.2. The anti-exceptionalist does not deny these differences. The important point is that the claims and methodology of logic do not *fundamentally* differ from the claims and methodology of natural science. Logical claims are substantive (Williamson, 2007; 2013). Moreover, whilst the methodology of logic in part is concerned with proof, when it comes to assessing competing logical theories, anti-exceptionalist think that we ought to be guided by the *very same* theoretical virtues of theory selection found in the natural sciences like simplicity, elegance, low-cost, fit with the data, and explanatory power.

1.3. Typically, it is taken as an immediate upshot of anti-exceptionalism about logic that logic is not *a priori*, as science is not. Logical theories can be rejected on the basis of substantive *a posteriori* theorising. However, the *a posteriority* of logic does not immediately follow from the claim that logic is continuous with the sciences. Likewise, typically, it is taken that an upshot of anti-exceptionalism is that logic is not *analytic*, or indeed that logical truths are not necessary. But again, this does not obviously follow from logic simply being continuous with the sciences in its claims and methodology, see (Russell, 2015).

2. The Anti-Exceptionalist Methodology

2.1. The crucial idea for the anti-exceptionalist is that we assess logical theories against the very same theoretical virtues of theory selection in the natural sciences. As, Gillian Russell writes:

> The simplicity, elegance, fertility, low-cost, and explanatory power of an entire logical theory [plays] a part in the ... reasons for believing or not believing it ... logical laws like the law of excluded middle were given up or adopted as a part of an entire logical theory. The law did not receive an atomistic justification of its own ... except relative to some theory, say classical logic. (Russell, 2015: 800)

Note that anti-exceptionalism takes our judgements about competing logical theories to be guided by theoretical virtues. Thus, it is epistemically holistic in an important sense. We do not assess individual logical law, or logical claims, but rather whole logics. But what do we really mean when we say that we should chose our logics so that they are simple, elegant, fit with the data, or strong? First, let's talk about simplicity, elegance, and strength. Later, we'll return to what we might mean by *fit with the data*.

2.2. *Simplicity and elegance*. We should distinguish two notions of simplicity. First, *logical* or ideological simplicity. Generally, a theory is simple to the extent that it consists of structurally simple claims which posit little in the way of primitive notions. Second, *ontological* simplicity: a theory is ontologically simple to the extent that posits a small ontology. (Think $\vdash \exists y \exists x (y = x)$ is true in classical logic, but not in a free logic.)

2.3. *Strength*. We should want stronger, rather than weaker, theories in general. This consideration comes in two flavours. First of all, we should want our theories to be as logically strong as possible. Only then can we make substantial claims about what *follows* from our theory. However, comparative logical strength is often an inappropriate dimension to compare theories—we 'typically have to chose between mutually inconsistent but individually consistent theories, none of which entails any of the others' (Williamson, 2013b: 276). Rather, we are interested in the less formal notion of strength as *informativeness*.

2.4. It should be stressed that the anti-exceptionalist does not argue that we should accept some logic *simply because* it is simple or elegant, or strong. Rather, the point is that we have a variety of theoretical virtues, and adjudicating between two logical theories requires balancing out the extent to which the proposals satisfy them and, once taking all this in, making a judgement. This judgement is crucially defeasible.

2.5. The most ambitious application of anti-exceptionalism to date is found in (Williamson, 2013b). Here, Williamson argues that we should adopt so-called Simple Quantified Modal Logic (SQML), i.e., the combination of classical quantifier logic and S5 modal logic. Crucially, he argues for this using *abductive* arguments, appealing to the theoretical virtues discussed above. SQML is simpler, more elegant, and stronger, than the alternatives. Startlingly, SQML entails that necessarily everything necessarily exists—so-called necessitism.

3. What are Logical Theories about?

3.1. It's crucial to anti-exceptionalism that we apply the theoretical virtues to *logical theories*, not individual logical claims or logical laws. But what is a logical theory? what is it about? Anti-exceptionalists don't agree, see (Hjortland, 2017) for discussion. An influential view—taken by Williamson—is that logical theories are theories of unrestricted generalisation. Logical theories are sets of sentences which describe the most general aspects of the world—they are not specifically about anything, but chart how everything fits together in the most general way. This goes some way to explaining the applicability of logic to all sorts of disparate discourse: logic is about how everything at the most general level behaves.

3.2. More precisely, for Williamson, logical theories satisfy the following.

> ***Universal Generalisation***: The sentences of the theory are unrestricted universal generalisations.
>
> ***Universally Closed***: Such generalisations are universal closures of valid arguments.
>
> ***Non-Metalinguistic***: Logical theories are about *the world*, not about language or about concepts.

For example, if we think that double negation elimination, i.e., $\neg\neg A \vdash A$ is valid, then this should be included in our logical theory of how the world very generally fits together. To include it is to include the universal closure of the corresponding theorem in our theory: $\forall p(\neg\neg p \supset p)$. Logical theories are then full of claims like $\forall p(\neg\neg p \supset p)$ and we compare them according to their exemplification of the theoretical virtues.

3.2. There are problems with thinking of logical theories this way. First, we have the problem we discussed with Quine's approach: only if the deduction theorem holds for a logic, i.e., $\Gamma, \phi \vdash \psi$ iff $\Gamma \vdash \phi \supset \psi$, can we say include the corresponding theorem for every logically valid inference. Second, to get universal closures we need to have a prior distinctions between the logical and non-logical elements of the language: why quantify over '*A*', but not '$\supset$' and '$\neg$'? Williamson's answer: we don't need a 'once-and-for-all' account of logicality. That is to say, our choice over what we count as logical and what we do not in formulating our logical theories is 'part of the abductive package' (Hjortland, 2017: 637).

3.3. An alternative conception of logical theories is found in Graham Priest's work, see (Priest, 2016). Logical theories, for Priest, are theories of logical validity and valid inference:

> The central notion of logic is validity, and its behaviour is the main concern of logical theories. Giving an account of validity requires giving accounts of other notions, such as negation and conditionals. Moreover, a decent logical theory is no mere laundry list of which inferences are valid/invalid, but also provides an explanation of these facts. An explanation is liable to bring on other concepts, such as truth and meaning. A fully-fledged logical theory is therefore an ambitious project. (Priest, 2016)

This sharply differs from Williamson's conception of logical theories. For one, Priest's conception of a logical theory is restricted and consists of claims about 'all sentences, all negations, or all conditionals' and so on, not everything *tout court*. Priest's conception of logical theories is inflated: the aim is to not just say what is valid, but to explain why certain sentences follow from others. Finally, it is thoroughly metalinguistic: the claims in Priest's logical theories are claims about sentences and logical expressions.

3.4. Though Priest and Williamson disagree about the nature of logical theories, they do not disagree about how we assess such theories. For Williamson, since logical theories are about the world just as much as any other scientific theory, we assess them like any other: which is the simplest, strongest, most elegant theory? For Priest, though logical theories do not describe the world, we assess those theories in the same way as scientific theories, because that is how we should assess *any* theory:

> Given any theory, in science, metaphysics, ethics, logic, or anything else, we choose the theory which best meets those criteria which determine a good theory. (Priest, 2014: 217)

4. How does a logic *fit with the data*?

4.1. Since anti-exceptionalists take it that logic is continuous in its methodology and claims with science, anti-exceptionalists make the claim that our choice of logic should in part be sensitive to its *fit with the data*—it must be justified by the available evidence. But at first glance, this is a difficult claim to make sense of. What is the relevant evidence for a logical theory? How is this evidence supposed to *fit* with the theory?

4.2. Answering the first question will depend on how we are thinking about logical theories. On the Priest's view, logical theories are about notions like validity, inference, consistency, and so on. Priest takes our intuitions about natural language arguments to carry significant weight, see (Priest, 2016: 9–10). But, as Hjortland stress, the anti-exceptionalist is not limited to this:

> The evidence for a logical theory can come from a number of sources: from intuitions about validity or alethic modality, from mathematical theories and practice, from psychology of reasoning, from epistemic norms of rationality, and so on. (Hjortland, 2017: 644)

Crucially, this kind of evidence is defeasible and perhaps not all evidence is weighted equally the same. However, at least on Priest's conception of theories, there is a wealth of evidence to which we can appeal.

4.3. What is the relevant evidence if we accept Williamson's conception of logical theories? For Williamson, logical theories differ from the theories of the natural sciences only in their degree of generality. Thus, testing a logical theory operates fundamentally in much the same way as testing a physical theory. In discussing modal logic, he writes:

> We must begin the enquiry with some minimal capacity to assess simple modal claims correctly in particular cases, just as we need some minimal capacity to assess simple claims about the physical world correctly in particular cases before we can start doing scientific physics. (Williamson, 2013b: 425)

Of course, a logical theory operates at too high a level of generality to explain specific matters. However, for Williamson, this sets no barrier for testing a logical theory against data in a sufficiently general sense:

> ... a logical law can still articulate and generalize a pattern in the data. For example, we find no case in which a material conditional is necessary, and so is its antecedent, but its consequent is not. The corresponding axiom schema, known as K, is a principle of every normal modal logic. In a modest way, it explains the pattern in the modal data by bringing it under a universal law. The explanation is appropriately non-causal because the explanandum is uncaused ... [However] ... What matters is the search for universal laws to order, unify, and generalise what we already know. (Williamson, 2013b: 425–6)

This sort of defence of the use of data will, of course, not convince any sceptic who claims that we do not have access to a sufficiently reliable capacity for assessing whether, say if $p \wedge q$ holds, the q also holds. But *this* kind of scepticism is too strong to be a serious worry.

4.4. Given the evidence, how should we understand the notion of the evidence *fitting* with the data? Initially, a serious worry looms: it is natural to say that some evidence confirms a theory if the theory is consistent with the data; but consistency is precisely one of the logical notions which is being examined by the *logical* theory. Indeed, many classic accounts of evidential confirmation presuppose some background logical consequence relation, see (Hjortland, 2017: 645). However, as we stressed when talking about Quine, this only suggests that we can't attempt to revise our logic *all at once*:

> The abductive criteria of fit with the evidence is not logic neutral ... An abductive argument for a logical theory will inevitably presuppose some laws of logic, but this is not incompatible with revision of logic. All the laws of logic cannot be subject to revision simultaneously, nor is that a requirement. The anti-exceptionalist only needs to hold that no law of logic will be beyond revision (Hjortland, 2017: 645)

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