

# Modal Logic as Methodology

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In *Modal Logic as Metaphysics*, Timothy Williamson develops a case for necessitism, the theory that necessarily everything necessarily exists. Williamson's arguments are primarily contrastive—he contends that a modal logic with necessitist theorems is stronger, simpler, less ad hoc, and supports more true generalizations about metaphysical modality than its contingentist rivals. But Williamson does not present his work as *just* a sustained objection to contingentism. As he makes clear in the afterword, Williamson also wants to change the way we do modal metaphysics.

The prevailing approach to metaphysics is best described as an *intuition-driven methodology*. Theories are stated as clearly as possible in any language (typically a combination of English and first-order logic). Their entailments are identified, and intuitions are cited as evidence for or against particular claims of the theories. The goal is to identify the theory that carries the balance of intuitive support. As Lewis describes it: “(when) all the tricky arguments and distinctions and counterexamples have been discovered, presumably we still face the question of which prices are worth paying, which theories are on balance credible, which are the unacceptably counterintuitive consequences and which are the acceptably counterintuitive ones... And if all is indeed said and done, there will be no hope of discovering still further arguments to settle our differences.”<sup>1</sup>

If we use the intuition-driven methodology, then necessitists fight an uphill battle. The theory vindicates some intuitions—for example, that we can refer to merely possible objects.<sup>2</sup> But it predicts that one pervasive intuition is wildly mistaken—namely, that objects like the life-sized butter statue of Elvis Presley at the 1997 Iowa State Fair could have failed to exist. When the costs have been tallied, the strength of intuitions about contingent

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<sup>1</sup> Lewis (1983).

<sup>2</sup> Williamson develops the intuitive case for mere possibilia in Williamson (1998) and Williamson (2002).

existence may very well be enough to swamp any other considerations. Indeed, the intuition-driven methodology explains why the incredulous stare has long been taken as a serious objection to other modal theories.

Williamson thinks we must do better than this simplistic price-tallying. In the natural sciences, our goal is to discover simple, strong and elegant systems that enable us to formulate precise, testable hypotheses, which are then verified. A potential counterexample to a theory must be framed in the language of the theory. Even highly counterintuitive consequences might be accepted if they follow from an otherwise well-confirmed system. Williamson thinks metaphysicians should follow suit. Modal theories ought to be stated in a precise formal language, and we ought to search for strong, accurate generalizations in that language. We shouldn't test a theory against our intuitions until we've properly formulated the theory and the alleged data. For Williamson, the goal of modal metaphysics is to identify the best modal logic, where the logic is understood as a system of precisely stated, strong and accurate generalizations about modal reality. Call this the *logic-driven methodology*.

I have little to say here about particular defenses Williamson offers for necessitism. Instead, I am interested in whether the logic-driven methodology gives us a viable strategy for developing and comparing theories. I argue that it does not, because it arbitrarily restricts the evidence that we are allowed to use in evaluating a theory. In Section 1, I describe Williamson's logic-driven methodology more precisely and briefly describe how Williamson uses it to defend necessitism. In Section 2, I defend a principle that I call *Evidence Inclusion*: the appropriate methodology for metaphysics should not arbitrarily exclude potential evidence for or against a theory. In Section 3, I describe an essentialist argument for contingentism and show how, given the logic-driven methodology, the essentialist's potential evidence must be excluded. In Section 4, I argue that this exclusion is arbitrary, and so the logic-driven methodology is flawed. This is an important result, since Williamson's case for necessitism depends on the success of the logic-driven methodology.

### 1. Williamson's Method at Work

Here is how Williamson describes his method: "We fixed interpretations of the modal operators, as expressing metaphysical possibility and necessity, and of the quantifiers, as unrestricted, in accord with the ambitions of metaphysics. Modal logic in this form aims to discover which generalizations in such terms are true... At least in this area of philosophical logic, our task is not to justify principles that already play a fundamental role in our thinking. Rather, it is in a scientific spirit to build and test theories that codify putatively true generalizations of the sort at issue, to find out which are true."<sup>3</sup>

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<sup>3</sup> Williamson (2013), 423.

In Chapter 3, Williamson outlines this system more explicitly. We can distinguish three steps in the logic-driven methodology.

**Step 1: Choose a modal logic, S, and a corresponding semantics to investigate.**

We begin by specifying a logic because we want our resulting metaphysics to have specific, testable theorems and because we want to clearly display the consequence relations we are assuming. As Williamson writes, “for modal logic as metaphysics to be pursued by the methodology prevalent in some areas of contemporary metaphysics would be a disaster. For it would involve abandoning its chief advantage: its strongly though not purely formal character. Some metaphysical theories are so informal that it is quite unclear what they entail. Whenever an opponent claims to draw false consequences from them, a proponent has the option of denying that they really follow. Sometimes metaphysicians seem to reserve the right to make up their theory’s consequence relation as they go along.”<sup>4</sup>

Williamson makes some metaphysical assumptions that narrow the field of logics we entertain. He assumes that necessity and possibility should be expressed with modal operators—so our logics need apparatus for reasoning with  $\Box$  and  $\Diamond$ . And he reserves quantifiers for the sense of being that he thinks is most relevant to metaphysics.<sup>5</sup> There is little defense of these assumptions in the book, but there is also little reason to think contingentists would disagree.

Once we’ve specified a logic, we need to investigate the theorems that are metaphysically important.

**Step 2: Identify potential metaphysically universal theorems of S.**

For Williamson, the theorems of interest to metaphysics are characterized by broad universality. The universal generalization of a first order formula  $\alpha$  is the result of:

- (i) substituting distinct new individual variables for distinct new individual constants throughout  $\alpha$ ;
- (ii) substituting distinct n-place predicate variables for distinct non-logical n-place atoms predicates throughout  $\alpha$ ; and
- (iii) prefixing the result with universal quantifiers on all of its free variables (including the predicate variables).<sup>6</sup>

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<sup>4</sup> Williamson (2013), 428. See also Williamson (2007).

<sup>5</sup> Note that Williamson refuses to use “existence” in the book. When I use “existence” here it is in the same sense as Williamson’s “being”. See Williamson (2013), 19.

<sup>6</sup> Williamson (2013), 131.

For example, we express “Necessarily, if Butter Elvis is butter, then it exists” as:

$$\Box(B(e) \rightarrow \exists y y = e). \quad (1)$$

The universalization of (1) is:

$$\forall X \forall x \Box(X(x) \rightarrow \exists y y = x). \quad (2)$$

We want to identify the “sufficiently general” purported truths of S. Statements about Butter Elvis’s modal status are too specific to form the basis for a simple, strong modal theory. But general statements about necessity and contingency—statements that apply to everything without exception—have an appropriate law-like character. Williamson writes, “The aim is to prescind from more specific subject matters...to investigate the more general structure of metaphysical modality. Thus we are not concerned to specify a particular intended interpretation of the language (i.e. one that fixes distinct meanings for predicates other than identity).”<sup>7</sup> So we hold the interpretations of the quantifiers, modal operators, truth-functional connectives, and identity fixed for methodological purposes, while particular interpretations of predicates and constants are not relevant to judging the system. We’ll return to the assumption in Section 3.

Once we’ve identified universally general theorems of S, we ask if they are *metaphysically* universal. A formula  $\alpha$  is metaphysically universal if and only if the universalization of  $\alpha$  is true on its (full) intended interpretation.<sup>8</sup> Williamson insists that “Metaphysically universal generalizations of logic are the structural core of metaphysics.”<sup>9</sup>

We can make this thought more precise by distinguishing ways that a metaphysical truth might contribute to the success of a theory. Compare the Butter Elvis claim in (1) with its universalization in (2). If true, (1) is a data point confirming the generalization expressed by (2) and any theory which contains (2). But, if true, (2) could be a *structurally beneficial* truth of a theory. Structurally beneficial truths contribute to a theory’s simplicity, strength and elegance. These features, in turn, are further evidence of a theory’s truth. The particular structural desiderata are vague but not hopelessly so. Simplicity is a reflection of the number and complexity of a system’s axioms, rules and model theory. Strength is determined by its ability to predict potential metaphysical truths. Elegance is determined by how ad hoc its axioms, rules and semantics are and the extent to which the system treats like cases alike across first order and higher order applications.

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<sup>7</sup> Williamson (2013), 92–93.

<sup>8</sup> Williamson (2013), 131.

<sup>9</sup> Williamson (2013), 226.

Metaphysically universal theorems are the structural core of the best modal logic. So which logic contains the metaphysically universal theorems?

**Step 3: Determine whether S is sound and complete for metaphysical universality.**

A system *S* is sound for metaphysical universality if and only if every theorem of *S* is metaphysically universal and complete if and only if every metaphysically universal formula of the language is a theorem of *S*.<sup>10</sup> Williamson calls the uniquely correct logic for metaphysical modality *MU*; it is whichever system is sound and complete for metaphysical universality. On the logic-driven approach, the goal of modal metaphysics is to discover which system is *MU*.

At this step, considerations from our intuitions about metaphysical modality are brought to bear in evaluating the logic. We might examine the proposed system piecemeal, looking for metaphysically non-universal theorems of *S* or metaphysically universal truths missing from *S*'s theorems. We'd then decide on a case-by-case basis whether worries about problematic formulas can be argued away.<sup>11</sup>

Williamson prefers a more top-down approach. He proposes a candidate for *MU*, defends its simplicity, strength and elegance, and then argues that its most controversial consequence—the necessary existence of everything—withstands scrutiny. To develop his case, Williamson identifies structural defects of contingentist logics. Many contingentists have to put seemingly ad hoc restrictions on their model theory; necessitists don't (Chapter 4). Necessitists straightforwardly predict the metaphysical universality of being constraints like (2); many contingentists can't (Chapter 4). Necessitists straightforwardly predict the metaphysical universality of plausible higher-order comprehension principles; contingentists can't (Chapter 6). Higher-order necessitist modal logic with plural quantification can formulate metaphysical hypotheses that contingentist systems cannot express (Chapter 7). At the conclusion of the book we are meant to agree that quantified necessitist *S5* with identity and plural quantification is the best candidate for *MU*.

## 2. The Methodology of Methodology

Williamson's case for necessitism relies on the logic-driven methodology. Has he discovered a better way to do modal metaphysics? To answer this, we have to consider reasons we might have for favoring one methodology over another. For example, we might let scientific continuity guide our choice, preferring a methodology that more closely resembles the scientific

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<sup>10</sup> Williamson (2013), 95.

<sup>11</sup> Williamson (2013), 115.

method over one that does not. Williamson's defense of the logic-driven methodology assumes a principle like this. Figuring out how to apply this constraint will require having an account of what characterizes the scientific method and why it is so successful. Williamson focuses on the abductive nature of the scientific method in his comparisons.

But there are other constraints we might adopt. Here is one I favor:

Evidence Inclusion: Do not arbitrarily exclude potential evidence for or against a theory's truth.

More bluntly, don't adopt a methodology that is arbitrarily biased. Sometimes we have good reason to exclude potential evidence. A theoretical physicist working out the best version of general relativity should not be concerned with commonsense intuitions about presentness (though a philosopher of physics might be). Evidence must be precisely formulated in order to be relevant to a theory like GR. We should, however, criticize a physicist who ignored evidence from our best theory of quantum gravity, because this potential evidence is formulated at the correct level of precision.

Evidence Inclusion is a plausible constraint and is even easier to apply than a scientific continuity constraint, since it doesn't require taking any kind of controversial stand on what the scientific method is. But the logic-driven methodology surveyed in Section 2 fails by its lights, because it forces us to arbitrarily exclude certain kinds of evidence for contingentism. To see why, we must first survey potential evidence for contingentism and see how it is handled on Williamson's approach.

### 3. Potential Evidence for Contingentism

One informal route to contingentism is via essentialism. Consider an argument that a contingentist might offer:

**Physicalist Defense:** Sensible necessitism requires that there be contingently non-physical objects.<sup>12</sup> But I am a hardcore physicalist—I think that necessarily every object is physical. Further I think hardcore physicalism is a strong and elegant hypothesis in metaphysics. Hardcore physicalism confers a structural benefit on theories in which it appears. It also unites investigations in metaphysics directly with those of our most successful natural sciences. And it avoids the epistemological difficulties of theories which postulate non-physical objects.

Now suppose our physicalist agreed with Williamson that this informal argument was pseudo-scientific. Suppose he tried to make his contingentism

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<sup>12</sup> Insensible necessitists might think the necessary existents are necessarily physical. In this case, Kennedy and Monroe's merely possible child is out there, somewhere...

more respectable by situating it within a modal logic before defending its merits. He needs a contingentist logic. Suppose he chooses as his starting point an old favorite: S5 with a free quantification theory, identity, no domain constraint, and variable domain semantics. He should make sure that purported metaphysically universal truths turn up as theorems of his logic—these will be relevant to determining whether his system is MU.

He thinks hardcore physicalism expresses an important truth of metaphysics:

$$(HP) \quad \Box \forall x Px.$$

But that formula is not sufficiently general to count as metaphysically universal—it has an interpreted non-logical predicate  $P$ . He might try to isolate its universalized analogue and see if he could find a logic with *that* as a theorem. The universalized analogue of (HP) is  $\forall X \Box \forall x Xx$ . But that formula is crazy—he would not want to adopt any logic that has as a theorem that all objects have every property essentially! He could perhaps look for a logic that has  $\exists X \Box \forall x Xx$  as a theorem. He believes this, but even if he found a logic with it as a theorem, it wouldn't convey the structural benefit of hardcore physicalism, since the essential property could be anything.

Our physicalist is at an impasse. (HP) is not sufficiently general to qualify as a candidate metaphysically universal theorem of any system. *A fortiori* it cannot be one of metaphysically universal theorems that gets counted as a structural benefit of a system. So the principle that drives his contingentism turns out to be irrelevant to assessing the strength of his overall theory. Put another way, our physicalist might concede that necessitist S5 with identity and plural quantification is a stronger, simpler, and more elegant theory than Kripke-inspired contingentist logic. But he might think that contingentist S5 *plus* (HP) is an even better mix than either of the other two options, because it is much stronger and only slightly less simple and elegant. Unfortunately, he is not allowed to put this system forward as a candidate. So potential evidence for contingentism is excluded.

Of course our physicalist can still criticize necessitists for denying (HP) and its instances. Williamson might contend that even though a principle like (HP) cannot qualify as a metaphysically universal theorem, if we are sufficiently committed to its truth, it will have the proper effect on our theory choice. We will reject any necessitist theory that is incompatible with it. But this response ignores the contingentist's claim that (HP) is a structural benefit of his theory. Moreover if this is how the problem is answered, it is hard to see what is innovative about logic-driven methodology. We weigh the consequences of a sloppier logic against the intuitiveness of a particular non-logical metaphysical principle, and we choose to preserve the principle

in spite of the logic. This is, in effect, how the debates about actualism have proceeded for the last fifty years. Williamson means to propose an antidote to this way of doing metaphysics.

Note that we need not assume that the best objections to necessitism will come from hardcore physicalists. The problem arises for anyone who thinks a particular essentialist principle conveys a structural benefit on their theory and thus serves as evidence of their theory's truth. For example, someone might believe there is a structural benefit to assuming the far more innocuous principle that all concrete objects are essentially concrete.<sup>13</sup> The lesson is the same: Williamson forces us to focus on the metaphysically universal principles when judging the structural benefits of a proposed system. Principles that appeal to particular properties are never metaphysically universal. So those principles can never confer a structural advantage on one's theory.

Is there any good reason to think particular essentialist principles are not potential structural benefits of a modal theory? Or is Williamson arbitrarily excluding potential evidence for contingentism?

#### 4. The Exclusion is Arbitrary

Suppose the physicalist decided to follow the spirit of Williamson's logic-driven methodology but relax Step 2 and introduce (HP) directly as an axiom of his logic. He starts with the Kripke-inspired system mentioned above.<sup>14</sup> He adds to it a further "axiom", (HP). He treats *P* as an interpreted predicate of the logic, meant to express the property of *being physical*. And he adds a function to his semantics that takes every member of every world-relative sub-domain and places it in the extension of *P* at that world. (Formally, this function behaves like identity. But we assume *being physical* is an irreducible property, distinct from *being self-identical*.)

Our contingentist then argues that his system is MU, on a broader understanding of metaphysical universality—his system has all and only the true generalizations of modal metaphysics as its theorems. His system isn't as simple as necessitist S5. But he insists this defect is more than outweighed by the strength of his essentialist principle and the successful hypotheses it generates across a wide span of issues in metaphysics.

Is the HP system too sloppy or informal to count as a properly scientific theory of modality? Throughout the book, Williamson criticizes opponents for making up their consequence relations as they go along. And there is some basis for this complaint; historically few contingentists have been explicit about the modal logic that underwrites their reasoning. But our

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<sup>13</sup> Hayaki (2006) argues that necessitism's inability to accommodate essentialist principles is a systematic defect of the theory.

<sup>14</sup> Or whatever the best contingentist option is.

physicalist in this example is just as explicit about his logic as the necessitist is. So he can't be criticized for informality.

Treating a principle like (HP) as an axiom of *logic* is strange. One might object to including the principle on the grounds that properly logical axioms do not fix interpretations for particular predicates (other than identity). This objection will persuade someone who thinks truths of logic must be necessary, a priori, analytic and metaphysically neutral truths. (HP) doesn't seem analytic. It is definitely not neutral.

But Williamson insists we shouldn't put such restrictions on what counts as a logic. He writes, "The word 'logic' may suggest all sorts of constraints: for example, that truths of logic should be necessary, or that they should be a priori, or that they should be analytic. The present approach is much simpler. We want a theory of metaphysical modality that consists of all sufficiently general truths about it. Such a truth does not lose its interest for metaphysics by being contingent, or a posteriori, or synthetic and so should not be excluded from our theory on those grounds."<sup>15</sup> So he cannot exclude the physicalist axiom because it does not cohere to the narrow definition of what qualifies a formula to be logical. Statements of interest to the logico-metaphysical project are characterized just by their "sufficient generality".

One might instead object that (HP) is too specific or too ad hoc to be an interesting structural principle of metaphysics. But this only begs the question against many contingentists—these are philosophers who think that broad essentialist claims are not only true, but are key assumptions of our best overall theories of the world. Indeed, such a claim flies in the face of a long history of philosophical work attempting to identify interesting, general essentialist principles and apply them to intractable puzzles. There is much to complain about in essentialist projects, but it is absurd to claim that principles like (HP) are too specific to count as the proper subject matter of metaphysics.

Once we've relaxed assumptions about what makes a formula "logical", there is no principled reason to exclude essentialist statements like (HP) from one's quantified modal logic. But now Williamson's methodology is undermined. He thinks we can determine whether a system is MU by examining the universally general theorems of the system. But there very well may be principles which are not universally general (in Williamson's sense) but are importantly relevant to our assessment of a theory. Indeed, only someone already inclined toward necessitism would think that essentialist claims couldn't be the "structural core of metaphysics".

Williamson's methodology in *Modal Logic as Metaphysics* is innovative, but objectionably biased. Contingentists, necessitists, and modal skeptics owe us precisely formulated theories with clear entailments. But there are

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<sup>15</sup> Williamson (2013), 92.

many levels of generality at which these debates can proceed. We should not think our final modal metaphysics will resemble a traditional quantified modal logic in its level of generality. And we shouldn't rule contingentism out until the evidence for the view has been properly evaluated.<sup>16</sup>

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<sup>16</sup> Thanks to Sam Newlands, Michael Rea, Jeff Speaks, and Tim Williamson for helpful comments on early drafts.