

MODAL DISPOSITIONALISM

A Thesis

by

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ABSTRACT

Let a modal truth be any truth that is about modal entities, such as essences, abilities, or dispositional properties, or that contains modal expressions such as: possibly, necessarily, may, must, could, would, can, and so on. Examples of modal truths include: It is *impossible* that I jump to the moon; *Necessarily*, God exists; Lea has the *ability* to brighten one's day; *Were* I hungrier, I *would* make more noodles.

That there are modal truths is largely uncontroversial. What feature of reality *grounds* the truth of modal propositions, what *makes* them true, is considerably controversial, however. Modal dispositionalism is a theory about what makes at least some modal propositions true. It maintains that irreducibly modal dispositions are what make (at least some) modal propositions true.

In my thesis, I more fully develop modal dispositionalism and so show it to be a potentially viable theory of modality. In particular, I improve on already extant formulations of the theory, position it as a Neo-Aristotelian view with advantages over its close contemporary cousins, and make explicit certain of its ontologically heavy consequences.

If successful, my discussion demonstrates that modal dispositionalism is a realist, actualist, non-reductive account of modality. Additionally, it is shown that a basic formulation of modal dispositionalism, MD, is committed to the existence of either an actual infinity of contingent beings or to at least one necessary being. A reformulation of MD is shown to avoid commitment to an actual infinity of contingent beings and to validate two necessary axioms for S5.

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1. INTRODUCTION

In everyday discourse, we speak of possibilities, potentialities, dispositions, etc. For example, consider the following, ordinary claims: I could eat a peanut-butter sandwich for breakfast, rather than an omelet. My coffee cup could potentially chip, should I drop it. My phone is disposed to connect automatically to my wireless network. I can prevent my phone from so doing. My bookshelf can hold more than 50 pounds without breaking. Now, consider the following, respective paraphrases of these claims: There is *the possibility* that I eat a peanut-butter sandwich for breakfast, rather than an omelet. My coffee cup has *the potential* to chip, should I drop it. My phone has *the disposition* to connect automatically to my wireless network. I have *the ability* to prevent my phone from so doing. My bookshelf has *the capacity* to hold more than 50 pounds without breaking. Although these paraphrases are perhaps somewhat more stilted than their counterparts, the English language nonetheless permits their formation.

All of these sentences are modal truths, insofar as they refer to possibilities, dispositions, capacities, etc. More generally, the broad category of modality includes: necessities, possibilities, counterfactuals, dispositional properties, powers, essences, and “anything that is expressed by modal expressions in the linguist’s sense: *can, must, may, would* and so on.”¹ That they are true is largely uncontroversial.² Indeed, that there are many modal

¹ Barbara Vetter, “Recent Work: Modality Without Possible Worlds,” *Analysis Reviews* 71, no. 4 (2011): 743.

²My apparent ascription of truth to sentences should not be taken as an endorsement of the view that sentences are bearers of truth (which would indeed be controversial). Here, I use “sentence” (alt. “statement”) and “proposition” synonymously for considerations of brevity. Such apparent ascriptions of truth to sentences can be freely reformulated to apparently ascribe truth to

statements that are true is widely accepted. However, that which *grounds* the truth of a modal statements (if a ground is even needed), what portion of reality *makes* a modal truth true, is a matter of considerable controversy. To introduce a contemporary term of art, the relevant question that various modal theorists seek to answer is, "What are the *truthmakers* of modal statements?" Minimally stated, truthmakers are those things which make some truth true. It is an open question whether or not all truths have a truthmaker, but that some do is relatively uncontroversial. The proposition <There exists a glacier in Glacier Bay National Park> is presumably made true by the glacier, a concrete object, which is in Glacier Bay National Park. Alternatively, some have held that truthmakers are states-of-affairs, and so the truthmaker of the above statement is the state-of-affairs *a glacier existing in Glacier Bay National Park*, of which the glacier is a part.³

In part, modal dispositionalism is a theory about what sort of entity plays the role of truthmaker for modal statements. Insofar as it holds that there are truthmakers for at least some modal statements, it maintains there are at least some modal truths and so is a realism about modal truths. Dispositionalists contend that the truthmakers for modal truths are dispositions of concrete objects. These dispositions are grounded by irreducibly modal, dispositional properties or complexes thereof (or, in some cases, *just are* the dispositional properties.⁴). Perhaps unsurprisingly, these dispositional properties or property complexes are had by the concrete object to which the disposition belongs.

propositions. E.g. "All of the propositions expressed by these sentences are modal truths."

³That is, the *concrete object*, the glacier, is a part of the state-of-affairs if states-of-affairs are concrete.

⁴ Eg., in the case of quantum particles. Presumably, one may hold that all dispositions are identical to one or more dispositional properties. This conclusion may be reached because of mereological commitments or consideration of theoretical qualitative parsimony, for example.

Further, the dispositional properties cause the manifestation of the disposition.

In my thesis, I more fully develop modal dispositionalism and so show it to be a viable theory of modality. In particular, I improve on already extant formulations of the theory, position it as a Neo-Aristotelian view with advantages over its close contemporary cousins, and make explicit certain of its ontologically heavy consequences.

In section 2, I present preliminary remarks on the nature of my thesis, namely, the development of a theory of truthmakers for modal truths. An initial formulation of modal dispositionalism is given. This formulation is as follows:

(MD): State-of-affairs *S* is possible iff there is at least one actual disposition *d*, the manifestation of which is (or includes) *S*,

To round off the survey, I go on to present oft-touted advantages of modal dispositionalism over two popular competing, modal truthmaker theories, Robert Adams's actualist ersatzism and David Lewis's nonactualist concretism. I also discuss the features of modal dispositionalism that are attractive to its adherents. Section 2, then, is primarily a clarification of the sort of theory that modal dispositionalism is intended to be, as well as a statement of presuppositions that significantly shape the thesis.

Having laid the necessary foundation, I go on in section 3 to discuss Aristotle's theory of modality as found in the *Metaphysics*. Discussion is supplemented by examination of Aristotle's theory of change in the *Physics*. Aristotle's theory is very much a historical predecessor of modal dispositionalism and my discussion makes plain some of the central mutual commitments. Aristotle's view and modal dispositionalism are both realisms about modality as well as forms of actualism, where actualism is the thesis that

all that is, exists, or is actual. Moreover, both theories affirm a biconditional relationship between possibility and causal capabilities (broadly construed).

Also in section 3, I expound more fully on modal dispositionalism by discussing the nature of dispositions. I consider paradigms of dispositions such as fragility and present how the modal dispositionalist takes the truth of necessities and possibilities to be grounded. In so doing, I make clear that modal dispositionalism is in fact a form of realism about modality, a form of actualism, and a theory that grounds modal truths in causally efficacious entities.

Having more thoroughly examined modal dispositionalism, I proceed to refine it in section 4. In particular, I argue that a common formulation of principle MD needs to be modified for two reasons: (1) The formulation requires an infinite number of contingent beings, and this seems like an unduly heavy, ontological commitment of the theory. (2) It does not validate axiom T or K, which are needed for S5. I suggest a revision of MD according to which existence is a necessary and sufficient condition for possibility. This reformulation is as follows:

(MD*) State-of-affairs S is possible iff either S is actual, or there is at least one actual disposition d , the manifestation of which is (or includes) S .

I formalize MD*, define necessity, and show that MD* validates K and T. I finish section 4 by presenting an argument that draws support from MD and MD* and whose conclusion is that there is at least one necessary being. I take this to be a metaphysically heavy claim and so one relevant to weighing the merits of modal dispositionalism.

2. ENTER MODAL DISPOSITIONALISM

2.1 Dispositions and an Initial Formulation of Modal Dispositionalism

It is not clear that all dispositionalists admit dispositions into their ontology as distinct from dispositional properties. At times, it seems as if mention of dispositions is merely a heuristic device, analogous to the frequent use of “possible worlds” by philosophers who clearly do not endorse an ontology that includes maximally consistent sets of states-of-affairs, propositions, or concrete worlds other than our own. For instance, Contessa (2010), though himself not a dispositionalist, makes no mention of dispositions when he says, “Dispositionalists roughly maintain that, if some object has a dispositional property or a power whose manifestation includes p , then it is possible that p .”⁵ Barbara Vetter, a prominent dispositionalist, speaking of those who share her view, states, “But at bottom, their metaphysics is not going to contain possible worlds or irreducible necessities. It contains, rather, irreducible dispositions.”⁶ But she goes on to say in a footnote that

“[t]he claim is not that every disposition is irreducible. A glass’s fragility, for instance, can presumably be reduced to properties of the glass’s constituents and relations between them.”⁷

Again, making no mention of dispositions, dispositionalist Chad Vance describes the theory thus: “for any unactualized metaphysical possibility, S , S is possible (ultimately) in virtue of some *actual* dispositional property of some

⁵ Gabriele Contessa, “Modal Truthmakers and Two Varieties of Actualism,” *Synthese* 174 (2010): 342.

⁶ Barbara Vetter, “Can’t Without Possible Worlds: Semantics for Anti-Humeans,” *Philosophers Imprint* 13, no. 16 (2013): 2.

⁷ *Ibid.*

actual object.”⁸ Regardless of whether dispositions are a distinct ontological category or a convenient fiction, dispositionalists unanimously claim that modal truths are ultimately grounded in irreducibly modal, dispositional entities, whether tropes, universals, substances, etc. As this is the case, dispositionalism is also a realism about modality *simpliciter*. That is, it does not attempt to reduce the modal to the nonmodal. I formulate modal dispositionalism as follows:

(MD) State-of-affairs *S* is possible iff there is at least one actual disposition *d*, the manifestation of which is (or includes) *S*.⁹

As an illustration of the above account, consider the true modal proposition <I could have eaten a peanut-butter sandwich for breakfast>. The contention is that there is a possible state-of-affairs, *my eating a peanut-butter sandwich*.¹⁰ On dispositionalism, what makes this state-of-affairs possible is my ability to bring it about. Or more accurately, it is my disposition¹¹ that is ontologically supported by one or more of my dispositional properties, which could manifest as my bringing it about. On dispositionalism, then, something is metaphysically possible iff it could be *causally* brought into existence. This point is crucial to discussion in section 4, where I argue that dispositionalists are committed to a heavy metaphysical thesis.

⁸ Chad Vance, “In Defense of the New Actualism: Dispositional Modal Truthmakers and the Branching Conception of Possibility,” (PhD thesis, University of Colorado, 2013), 106.

⁹ This is a modified version of Borghini and Williams (2008). I have added the qualifier, “at least one,” in order to allow for overdetermination of modal truths, as modal dispositionalists, including Borghini and Williams themselves, do not seem to rule it out in principle. Andrea Borghini and Neil E Williams, “A Dispositionalist Theory of Possibility,” *Dialectica* 62, no. 1 (2008): 26.

¹⁰ Whether the modal dispositionalist must include states-of-affairs in her ontology is taken up in the following section.

¹¹ In the remainder of this thesis, I largely adopt the dispositionalist convention of using the term “disposition.” Although, as noted above, it is at times unclear whether dispositionalists believe the term takes a referent.

2.2 Competing Views and Modal Dispositionalism's Attraction

Of course, dispositionalism is but one account of modal truthmakers. In recent decades, two competing, modal truthmaker theories have enjoyed predominance. They are what I will call *actualist ersatzism* and *non-actualist concretism*. Like dispositionalism, both views are realisms about modal truths in that they maintain that modal truths have truthmakers. A prominent defender of actualist ersatzism is Robert Adams, who roughly maintains that modal propositions are made true by certain sets of propositions.¹² Adams defines a "world-story" as a consistent set of propositions that is *total* in that it contains, for every proposition p , either p or its negation. He further defines the "actual world" as the world-story that contains all and only true propositions and calls it the "true story."¹³ According to Adams, the proposition <The election debate could have had genuine rules> is true because the proposition <The election debate has genuine rules> is true in at least one world-story. The account is actualist about modal truthmakers, in that it maintains they are actual, and so is like dispositionalism in this respect.

Non-actualist concretism is maintained by David Lewis, who suggests that modal truths are made true by concrete entities outside of the actual world. By stipulation, to be a concretist about modal truthmakers is to hold that modal truths are made true by concrete entities.¹⁴ According to Lewis, the proposition <I have the ability to become a pineapple famer> is true because at least one of

¹² That Adams account is a truthmaker theory about modal propositions is not entirely clear.

¹³ Robert Adams, "Theories of Actuality," *Noûs*, 8 (1974).

¹⁴ Though, presumably, not always *essentially* concrete entities. See Bernard Linsky and Edward N. Zalta, "In Defense of the Simplest Quantified Modal Logic," *Philosophical Perspectives* 8 (1994): 431-458. or Timothy Williamson, "The Necessary Framework of Objects," *Topoi* 19 (2000): 201-208.

my counterparts, a concrete individual relevantly similar to myself, is a pineapple farmer in some concrete world other than my own. Dispositionalism is only loosely like Lewis's view, because it grounds the truth of modal propositions in dispositions or properties that are ontologically dependent on concretia that bear them.

Given the successes of these competing views, what are the merits of dispositionalism that lead some to prefer it? When surveying recent dispositionalist literature, one finds two common answers that can be succinctly stated: (1) On dispositionalism, modal truths are not simply accidents as they are on the other two views. (2) Dispositionalism is quantitatively and qualitatively more parsimonious.

Regarding (1), dispositionalists object that its competitors make all modal truths into mere accidents by grounding them in entities entirely extrinsic to the concrete, actual world. On Adams's view, for example, <Possibly, I eat a peanut-butter sandwich for breakfast> is true if and only if one of the possible worlds contains a proposition representing me as eating a peanut-butter sandwich. <Necessarily, Joe Hisaishi¹⁵ is a person> is true just in case he is represented as being such in all possible worlds. The problem is that this *de re* truth is in no way grounded by Joe Hisaishi or his essence (if there are such things), but rather by representational entities. This seems flatly wrong. The problem becomes more pronounced when one considers that propositions are generally taken to be causally impotent. Lewis's counterpart theory fares no better, as the truthmakers of modal truths are about as extrinsic as they come, found in worlds that are both causally and spatiotemporally isolated from one another. Dispositionalism,

¹⁵ Note, Joe Hisaishi is an actual person. He is also a great composer.

in contrast, grounds modal truths in actual, causally efficacious entities. Hence, we find Barbara Vetter saying, “I believe that this, the actual world abounds . . . in modal properties possessed by individual objects. I have no need to outsource modality to other possible worlds.”¹⁶

Contention (2) is straightforward enough. Adams’s view posits entities of a very different sort, i.e. maximally consistent sets of propositions, in order to ground modal truths. Lewis’s view introduces a very large number of concrete worlds and he says as much, “My realism about possible worlds is merely quantitatively, not qualitatively, unparsimonious.”¹⁷ In contrast, modal dispositionalism is often taken by its proponents as a helpful offshoot of their dispositionalism *simpliciter*, which already includes all the entities needed to do the work of modal truthmakers.¹⁸ As dispositionalists see it, truthmaking requires causal potency, an already familiar and arguably primitive notion, and dispositionalism *simpliciter* supplies causally potent entities. Hence, Borghini and Williams write, “as far as we are concerned, dispositions are something we need in our ontology anyway, and we are not alone. A well-rounded account of worldly phenomena that does not include dispositions (or disposition-like entities) is bound to fail. And if that is the case, why bother going outside that framework to deal with possibility, if the dispositions can deal with it

¹⁶ Barbara Vetter, “Can’ Without Possible Worlds,” 2.

¹⁷ David Lewis, *Counterfactuals*, (Oxford: Blackwell Publishing, 1973), 87.

¹⁸ Here, I use “dispositionalism *simpliciter*” synonymously with what the Stanford Encyclopedia of Philosophy calls “dispositional monism” or “causal theory of properties.” I take it to be the view that, “the essence of a property *P* is wholly constituted by the nomic or causal roles *P* plays—for short, theoretical roles.” Sunggho Choi and Michael Fara. “Dispositions,” *Stanford Encyclopedia of Philosophy* (Spring 2012 edition), ed. Edward N. Zalta, <http://plato.stanford.edu/entries/dispositions/>.

themselves?"¹⁹

As we have seen, dispositionalism is an *actualism* about modal truthmakers. Furthermore, it specifies modal truthmakers as *causal entities*, dispositions that are either grounded by or identical with dispositional (causal) properties. Dispositionalists take these features to give their theory an edge over its competitors for the reasons listed above, typically with special deference to the theory's ontological parsimony in both quantity and kind of constituents.

Whatever one's final assay of the theory, however, I argue that it is precisely the dispositionalist's actualism and view towards grounding metaphysical possibility in causal entities that commits her to the ontologically heavy thesis found in section 4, MHC. Before arguing for this latter point, however, I first expound upon MD and argue that its common origin with powers theories of modality is found in the thought of Aristotle.

¹⁹ Borghini and Williams, "A Dispositionalist Theory . . .," 33.

3. MODAL DISPOSITIONALISM AS NEO-ARISTOTELIAN THEORY OF MODALITY

In this section, I argue that modal dispositionalism is a neo-Aristotelian theory of modality insofar as it shares the following features with Aristotle's theory of modality (henceforth, AM) that is developed primarily in *Metaphysics IX*. Both MD and AM are (1) truthmaker theories about modal propositions that (2) define necessity in terms of possibility, and (3) posit irreducibly modal, disposition-like entities as truthmakers.²⁰

This section is intended to contribute to the better understanding of modal dispositionalism both through direct examination and by providing close comparison with the thought of Aristotle, in which it finds its philosophic heritage. As features (1)-(3) are central to both MD and AM, I take it that exacting discussion of these features will better illumine exactly where MD and AM overlap, as well as provide a better understanding of each theory as distinct theory. An additional upshot of this comparison is that modal dispositionalism's relation to powers theories of modality, a genus of which modal dispositionalism is a species, should likewise be made clearer.

In section 3.1, I very briefly discuss modal dispositionalism's place among its contemporary cousins. In section 3.2.1, I demonstrate exactly how MD has features (1) and (2). This section is very much an expansion of the groundwork laid in section 2. In section 3.2.2 and 3.2.3, I argue that Aristotle endorses a biconditional relationship between possibility and potencies that is very similar

²⁰ From (1) and (2), it follows that both MD and AM are also (4) forms of actualism, (again, the thesis that everything that is, exists, or is actual) and (5) non-reductive accounts of modality. These latter points come for free, so to speak, once the former points are established and so are not extensively elaborated upon.

to MD. This biconditional (AM) also possesses features (1) and (2). In section 3.3.1 - 3.3.3, I examine the nature of dispositional properties,²¹ entities central to MD. I conclude that they are multi-track and irreducibly modal in nature, and so have feature (3). In section 3.3.4, I argue that Aristotle conceives of potencies (*dunameis*) as multi-track and irreducibly modal in nature, and so as having feature (3). I conclude that MD is a neo-Aristotelian theory of modality.

3.1 An Absence of Aristotle in Neo-Aristotelian Theories of Modality

In the past decade, a number of philosopher's have put forward theories of modality that appeal either to powers, potentialities, causal capabilities, or dispositions to define the possibility operator. These philosopher's take these entities to be irreducibly modal in nature. Let the class of entities just listed be denominated as 'powers.' Such powers theorists, then, include but are not limited to: Barbara Vetter, Jonathan D. Jacobs, Alexander Pruss, Bryan Leftow, Andrea Borghini, and Neil E. Williams. While their respective definitions of possibility differ from one another in their detailed formulations, all of the above philosophers' theories share a common proposal. Letting p be a variable ranging over propositions, the common proposal can be roughly characterized through the following biconditional:

(PB): $\diamond p$ iff there exist powers to bring it about that p .²²

As suggested, this statement of the common proposal is inexact in its characterization of the respective theories of the above philosophers. To quickly see the way in which it is shared by each theory, it is perhaps best to examine

²¹ Again, I use "disposition" and "dispositional property" synonymously.

²² (PB) for "Proposed Biconditional".

partial formulations of their individual theories:

“[S]ome proposition or truth T is possible just in case there is some actually instantiated property (or property complex) that is a power for some other property (or property complex) that would be a truthmaker for T.” (Jacobs 2010, pg. 236)

“It is possible that p if and only if something has (or some things have) an iterated potentiality for it to be the case that p.” (Vetter, forthcoming)

“... it is causally possible that P = df.

a. it is, was, will be or timelessly-is the case that P, or

b. something has (or timelessly-has, or some things jointly have or timelessly-have) the power and opportunity to bring it about that P, ...”

(Leftow 2012, pg. 352)

“... a proposition p is possible₀ if and only if p is true. Then for $i > 0$, say that p is possible _{i} if there exists (timelessly, in the past, present or future) an actual item A (past, present, future or timeless) that has the causal capability for bringing it about that p is possible _{$i-1$} , ...” (Pruss 2011, pg. 213).

“State-of-affairs S is possible iff there is some actual disposition d whose manifestation is (or includes) S .” (Williams and Borghini 2008, pg. 26)

As noted in the previous section, MD is the view put forward by Williams and Borghini, and is a version of a powers theory of modality. From their writings, it is clear that all of these philosophers intend to state either *what it is* for a proposition or state-of-affairs to be possible, or what entities play the role of modal truthmakers, when they issue the above definitions and biconditionals.

For example, Brian Leftow's definition of possibility is an Aristotelian definition in that it states *what it is* for a proposition to be causally possible. The biconditional supplied by Williams and Borghini is intended to identify dispositions as the truthmakers for propositions of the form <It is possible that *S* obtains> where *S* is a state-of-affairs. The right hand side of each biconditional is intended to be more than extensionally adequate in picking out all possible propositions or states-of-affairs.

The relationship posited in (PB) between causally potent entities (be they dispositions, powers, capabilities, etc.) and possibility is largely the same as that posited by Aristotle. The Aristotelian heritage of their respective views is a fact explicitly noted by many, if not all, of the above powers theorists. For example, modal dispositionalist Barbara Vetter notes that on her view of dispositions, entities that are integral to her view of modality, "may well be the more traditional approach applied by Aristotle and his followers to the related notion of *dynamis*."²³ Alexander Pruss explicitly labels his view of modality the Aristotelian-Leibnizian view, and devotes several pages to Aristotle's view as it specifically relates to his (Pruss's) overall project.²⁴ Jonathan Jacobs offers his own detailed view of modality and suggests it can successfully be situated within a systematic metaphysics, concluding, "It is time for us to return to our philosophical home in a metaphysics of substances and powers – the metaphysics of Aristotle, whose yoke is easy and whose burden is light."²⁵

While powers theorists recognize their theories include ideas once

²³ Barbara Vetter, "Dispositions Without Conditionals," *Mind* 123, (2014): 131.

²⁴ Alexander Pruss, *Actuality, Possibility, and Worlds* (New York: The Continuum International Publishing Group, 2011).

²⁵ Jonathan Jacobs, "A Powers Theory of Modality—Or, How I Learned to Stop Worrying and Reject Possible Worlds," *Philosophical Studies* 151 (2010): 246.

proposed by Aristotle, there is seldom extended discussion of exactly *how* these ideas are Aristotelian. That is, powers theorists seldom examine Aristotle's work on modality in any great detail, let alone provide side-by-side comparison of their respective views with his. Of course, this is hardly a strike against the work of powers theorists. It is simply not their project to exegete Aristotle's texts, and there are others who have taken up the task. Indeed, Aristotle scholars have amassed a tremendous literature on his views on modality as well as a panoply of other topics.

While a comparison with Aristotle's works is not essential to the development of a powers theory of modality, I suggest that it has the potential to bolster it by making explicit the central commitments that all of the different powers theories share with their intellectual predecessor, Aristotle. In this way, much of what unifies the different powers theories, including modal dispositionalism, can be made clearer. Additionally, a close comparison with Aristotle's views may suggest needed revisions to current formulations of powers theories. As there appears to be no comparison of this sort, the beginning of one is provided in this section.

3.2 MD and AM as Truthmaker Theories

3.2.1 Modal Dispositionalism as Truthmaker Theory

As noted in the previous section, modal dispositionalism is a truthmaker theory about modal truths. More specifically, the modal dispositionalist puts forward a theory about what makes propositions about possibilities and

necessities true.²⁶ The modal dispositionalist's account of modal truthmakers begins by providing a positive account of possibility. Recall:

(MD): A state-of-affairs *S* is possible iff there exists a disposition *d* whose manifestation is or includes *S*.²⁷

In this section, I briefly expound on MD, explaining how it is a claim about the truthmakers for modal claims and noting what features are essential to modal dispositionalism.

First, consider the left side of the biconditional, MD. It seems to refer to a state-of-affairs. On one conception of states-of-affairs, they are proposition-like entities in that they are abstract and represent the world as being a particular way. Examples are *Josh's being a Masters student* and *Elephants having stampeded through A&M's campus*. The former state affairs *obtains*. The latter does not obtain. Alternatively, states-of-affairs can be taken to be concrete entities, sometimes called Davidsonian states-of-affairs.

The modal dispositionalist need not be committed to one view of states-of-affairs over another. Indeed, talk of states-of-affairs could be seen as a placeholder for whatever ultimate constituents of reality there are. For example, powers-theorist Alexander Pruss notes that every declarative sentence has a corresponding participial nominalization.²⁸ To "Rufus is a dog" corresponds "Rufus being a dog." To "There are philosophers" corresponds "There being philosophers." The modal dispositionalist can remain almost entirely neutral as

²⁶ Of course, in the process of providing truthmakers for propositions about possibility and necessity, they will also provide insight into the truthmakers for counterfactuals so long as there is in fact a connection between these modal notions.

²⁷ Andrea Borghini and Neil E. Williams, "A Dispositional Theory of Possibility." *Dialectica* 62, no. 1 (2008).

²⁸ Alexander Pruss, *Actuality, Possibility, and Worlds*, (New York: The Continuum International Publishing Group, 2011), 6.

to what kind of objects participial nominalizations refer. For example, what kind of object “Rufus being a dog” denotes, whether it is ultimately a complex “of substances and their attributes, or of events, or a fact in a world that is all that is the case”,²⁹ is a matter on which the modal dispositionalist need not come down hard.

Modal dispositionalists are serious actualists, however, and so cannot take participial nominalizations as referring to non-existent objects.³⁰ Talk of some state-of-affairs *S* that has not obtained will be construed as referring to either an actual, platonic state-of-affairs that has not obtained or else as fictional discourse. On the latter option, “*S* is possible” is presumably shorthand for something like, “There could be something that satisfies the concept (or description) expressed by “*S*”.”

I now turn to how the biconditional is to be understood. Begin by considering the following proposition:

- (1) It is possible that K-pop be the most-popular music genre.

Let *S* be the state-of-affairs *K-pop being the most-popular music genre*. I take it that (1) is equivalent to the proposition <It is possible that *S* obtains.>.³¹ On MD, it is possible that *S* obtains if and only if:

- (2) There is a disposition *d* whose manifestation is or includes *S*.

The nature of dispositions will be explored further in section 3.3. For now, it is sufficient to note that (2), for the modal dispositionalist, is to be taken as a genuine existential claim about an entity, *d*. That is, ‘*d*’ denotes an entity. The

²⁹ Ibid.

³⁰ Gabriella Contessa calls powers theories “hardcore actualism.” Gabriele Contessa, “Modal Truthmakers and Two Varieties of Actualism.” *Synthese* 174 (2010): 341.

³¹ I will use “<*s*>” as shorthand for the proposition expressed by *s*, where *s* is a sentence.

modal dispositionalist is a realist about dispositional entities.

In offering MD, it is important to note that the modal dispositionalist is intending to provide more than just an extensionally adequate semantics for necessity and possibility. It is not intended *merely* to correctly pick out the genuinely possible states-of-affairs. Instead, it is intended to state what *makes* a state-of-affairs possible. Shifting focus from states-of-affairs to propositions of the form, <State-of-affairs *S* is possible>, MD is intended to provide what makes such propositions true. The entity in the world that makes a proposition true is that proposition's *truthmaker*. For example, <There is an ice-cube in my coffee> is made true by the ice-cube in my coffee, or depending on one's ontology, by the state-of-affairs *the ice-cube being in my coffee*. That <There is a horse in the pasture> is made true by each horse that is in the pasture, or by the appropriate states-of-affairs involving horses in the pasture. The relation of *making true* is typically held to be entailment. That is, truthmakers entail the propositions they make true simply by existing. The modal dispositionalist seems to endorse truthmaker theory, according to which at least some true propositions are made true by some actual entity.³² They need not endorse truthmaker maximalism, according to which *all* true propositions are made true by an entity, however.

Having provided a positive account of possibility, and on the assumption that necessity can be defined as that which is not possibly not the case, we may then provide a corresponding conditional for necessity:

(MD_N): A state-of-affairs *S* is necessary iff there is no disposition *d* whose manifestation is or includes *S* not obtaining.

³² See, for instance, Chad Vance, "In Defense of the New Actualism: Dispositional Modal Truthmakers and the Branching Conception of Possibility," (PhD thesis, University of Colorado, 2013).

Following David Yate’s formal convention, we can provide a close translation of MD and MD_N in predicate logic. First, let ϕ be a variable for a disposition. Next, Rather than include a variable for a state-of-affairs, it is more convenient (for reasons that will become clearer in section 4.2) if we instead let p be a variable for any proposition of the form, <State-of-affairs S obtains>.³³ Let $\exists\phi[p]\phi$ stand for <there is a disposition that brings about p >. We may then formulate as follows:

$$(\text{MD}_{\text{FORMAL}}): \diamond p \equiv \exists\phi[p]\phi$$

$$(\text{MD}_{\text{N-FORMAL}}): \Box p \equiv \neg\exists\phi[\neg p]\phi$$

Having further explicated MD, I now turn to showing how MD is implicitly endorsed by Aristotle.

3.2.2 Aristotle on Possibility, Potency, and AM as Truthmaker Theory

In the *Metaphysics*, especially in *Metaphysics IX*, Aristotle endorses a particular relationship between possibility and potency (*dunamis*).³⁴ In this section, I argue that Aristotle is committed to a biconditional relationship between potency (*dunamis*) and possibility and that this biconditional is best understood as a truthmaker theory of modal claims. This biconditional is very much like MD and can be formulated thusly:

(AM) A state-of-affairs S is possible iff there is a potency p to bring it about that S .

³³ Again, it is open to the modal dispositionalist to paraphrase “state-of-affairs” talk in a way that makes explicit their preferred ontology. I keep with “state-of-affairs” talk to remain true to Borghini and Williams’ formulation, as they are the representative of modal dispositionalism I have (somewhat arbitrarily) chosen.

³⁴ I include the equivalent Greek term used by Aristotle when the term has a technical meaning or when it aids in clarity.

Consider first the left-hand side of the biconditional. AM is not intended to suggest that Aristotle would countenance states-of-affairs in his ontology. As with MD, the interpretation of AM is flexible enough to accommodate an interpretation that takes the convenient locution “state-of-affairs *S*” to be shorthand for picking out substances and their attributes, arguably the only types of entities admitted into Aristotle’s ontology. For example, “*Mary being angry* is possible . . .” can be taken as shorthand for “It is possible that Mary exemplify the immanent universal anger . . .”. As to the right-hand side, I explore the nature of potencies (*dunameis*) more thoroughly section 3.3.4. Here, I present only minimal characterization of potencies as needed to support the primary argument that Aristotle affirms AM and counts it as a modal truthmaker theory.

While *Metaphysics IX* contains the primary discussion of AM, *Metaphysics V.12* provides important insight into understanding this discussion. In particular, *Metaphysics V.12* provides insight into Aristotle’s distinct concepts of *dunamis* and possibility. We are told that a *dunamis* is a potency or capacity to change another or to be changed, and that it is something *in* concrete objects:

“[A *dunamis* is] the principle of process and change, either in another thing or in the same thing *qua* other. The art, for instance, of building is not present in what is built, whereas with the art of medicine, it may, since it is a potentiality [*dunamis*], be present in the person being healed, but not *qua* a person being healed. So what is a principle of change or process in this way is said to be a potentiality [*dunamis*], whether in something else or in the thing itself *qua* something else.”³⁵

³⁵ (*Metaphysics Book V.12 1019a*) Aristotle, *Metaphysics*, Translated by Hugh Lawson-Tancred

Aristotle goes on to provide several senses of possibility, saying:

“. . . the possible, is when the contrary is not necessarily false. For example, it is possible that a man should be seated, because it is not necessarily false that he should not be seated. Hence the term possible means in one sense (as has been stated), whatever is not necessarily false; and in another sense, whatever is true; and in still another, whatever may be true.”³⁶

The first sense defines the possible as that which is not necessarily not the case. This is unlikely to be the sense of possibility found in AM and affirmed in *Book IX*, however. This is because in endorsing AM in *Book IX*, Aristotle provides a positive account of possibility, and so it is necessity that is to be negatively defined in terms of possibility, not the other way around. For example, if one accepts the modest assumption that necessity can be defined as that which is *not possibly not* the case, then from AM, we get:

(AM-Necessity) A state-of-affairs necessarily obtains iff there exists no
potency to bring it about that S not obtain.

It seems, then, that the relevant sense of possibility is either “whatever is true” or “whatever may be true.” While Aristotle’s more developed theory of modality may accommodate the former sense (“whatever is true”), it is clear that the right-hand side of AM only accommodates the latter.³⁷ The “may” of “may be true” is presumably not to be understood as the epistemic operator “for all we know.” Rather, “whatever may be true” is plausibly understood as

(London: Penguin Group, 1998).

³⁶ (*Metaphysics Book V.12 1019b*) Ibid.

³⁷ I argue for this further in the next section.

“whatever can become true”, or, in other words, “whatever can be brought about.”

So then, a state-of-affairs is possible in the sense that it can be brought about, i.e. be made to obtain.³⁸ A potency is a thing that is characterized *at least* by its function, i.e. as that which is responsible for change, whether that change be in the entity that possesses the potency or in another entity. Given these simple understandings of potency and possibility, it seems clear that AM is intended to state what the truthmakers are for possibility claims. For given the understanding of possibility, AM can be rephrased to read, “A state-of-affairs *S* can be brought about iff there exists a potency *p* to bring it about that *S*.” Further, given the definition of potency, *p* is that which is responsible for bringing *S* about. In other words, the very nature of *p* necessitates that <if *p* exists, then *p* is responsible for bringing about *S*>. This is just to say that <*p* exists> entails that <state-of-affairs *S* can be brought about.>. It follows from the definition of a truthmaker that *p* is the truthmaker for this proposition.

Thus far, I have provided textual support that Aristotle makes a distinction between claims about that which is possible (*dunatos*) and claims about potency (*dunamis*). I have also suggested that *if* Aristotle endorses the biconditional AM, *then* Aristotle has a truthmaker theory about modal propositions, as AM just is such a theory. In the next sub-section, I argue that in *Metaphysics IX*, Aristotle implicitly endorses AM by endorsing two conditionals whose conjunction is equivalent to AM.

³⁸ This sentence is not purported to contain a definition of possibility, but only a synonymous paraphrase of possibility. Hence, the phrase “simple *understandings*” and not “simple *definitions*” is used below in the same paragraph.

3.2.3 Aristotle's Affirmation of AM in *Metaphysics IX*

In *Metaphysics Book IX.3*, Aristotle argues against the position of the Megarians, who maintain “that a thing has a potency (*dunamis*) for acting only when it is acting, and that when it is not acting it does not have this potency.”³⁹ According to the Megaric school of thought, a potency exists only when it is being exercised. So, “for example, one who is not building does not have the power of building, but only one who is building when he is building; and it is the same in other cases.”⁴⁰ In this way, the Megarians reject Aristotle's distinction between potentiality and actuality.

In response, Aristotle offers three reductiones ad absurdum of their position. As his third reductio, Aristotle contends that the Megarian view, were it true, would do away with motion and generation altogether. He writes,

“Again, if that which is deprived of potency (*dunamis*) is incapable (*adunatos*), that which is not happening will be impossible (*adunatos*) of happening; but he who says of that which is impossible (*adunatos*) of happening that it is or will be will say what is untrue; for this is what impossible (*adunatos*) meant. Therefore these views do away with both movement and becoming.”⁴¹

³⁹ (*Metaphysics IX.3* 1046b). Thomas Aquinas, *Commentary on the Metaphysics of Aristotle*, Translated by John P. Rowan, (Library of Living Catholic Thought. (no publication date provided)).

⁴⁰ Ibid.

⁴¹ (*Metaphysics* 1047a 11-14). This translation is adopted with modification from Aristotle, *Complete Works of Aristotle*, Translated by W.D. Ross and edited by Jonathan Barnes, (Princeton University Press, 1984). Whereas the 1984 translation renders the second *adunatos* as “incapable” I translate it as impossible, for reasons discussed. I also translate *dunamis* as potency, for consistency.

Adunatos can be translated as either “incapable” or “impossible”, or as one of several close correlates. For example, John P. Rowan translates the last “*adunatos*” as “impossible or incapable,” Hugh Lawson-Tancred as “lack of capacity.”⁴² Where Aristotle writes “that which is deprived of potentiality is *adunatos*”, it appears that “*adunatos*” can be rightly translated as “incapable”. This is because Aristotle appears to simply be offering a statement of the role of *dunamis* as put forward in *Book V*, i.e. that which is responsible for change. He is saying in this quote that anything that lacks a potency for some particular change is incapable of undergoing that change.

Admittedly, it is not clear what distinction, if any, the above translators wish to draw between impossibility and incapability. Regardless, I maintain that the second and third instances of “*adunatos*”, found above, are rightly understood as Aristotle’s notion of possibility as found in *Book V*, i.e. that which is able to be brought about by some means or another. Demonstrating that these instances of “*adunatos*” are rightly understood as “possibility” is significant towards demonstrating Aristotle’s implicit endorsement of AM. For if “possibility” is the correct translation of these instances, then Aristotle seems to be endorsing the following conditional:

(AM-1) If there is no potency p to bring about state-of-affairs S , then it is not possible that S obtain.

This, of course, is logically equivalent to:

(AM-1*) If it is possible that S obtain, then there is a potency p to bring

⁴²Thomas Aquinas, *Commentary on the Metaphysics of Aristotle*, Translated by John P. Rowan, (Library of Living Catholic Thought. (no publication date provided)); Aristotle, *Metaphysics*, Translated by Hugh Lawson-Tancred, (London: Penguin Group, 1998).

about state-of-affairs *S*.

AM-1* is the left-to-right direction of AM, and its conjunction with AM-2* (below) is logically equivalent with AM.

What reason, then, is there to think that *adunatos* ought to be understood as *Book V*'s impossibility? Recall from the last section that Aristotle offered three senses of possibility (*dunatos*): (1) whatever is not necessarily false; (2) whatever is true; and (3) whatever may be true. (1) was rejected for reasons given in the last section. (2) does not countenance the element of change or motion present in Aristotle's discussion, and so is likewise inadequate. By process of elimination, we arrive at the conclusion that the relevant sense of possibility is sense (3). On the assumptions that Aristotle's list of the senses of possibility is exhaustive in *Book V* and that impossibility is definable in terms of possibility, then *adunatos* expresses the notion of impossibility found in *Book V*. So, Aristotle affirms AM-1*.

Aristotle appears to straightforwardly affirm the left-to-right direction of AM, as well, when he says,

“a thing has a potency [for doing something] if there is nothing impossible in its having the actuality of that of which it is said to have the potency. I mean for instance, if a thing is capable of sitting and it is open to it to sit, there will be nothing impossible in its actually sitting.”⁴³

The first sentence expresses a general formula and the second sentence is an instance of that formula. Again, translating to talk of states-of-affairs, the formula certainly appears to be:

⁴³ (*Metaphysics IX.3 1047a24*) This translation is adopted with modification from Aristotle, *Complete Works of Aristotle*, Translated by W.D. Ross and edited by Jonathan Barnes, (Princeton University Press, 1984).

(AM-2) If there is a potency p to bring about state-of-affairs S , then it is not impossible that S obtain.

This, of course, is equivalent to:

(AM-2*) If there is a potency p to bring about state-of-affairs S , then it is possible that S obtain.

The conjunction of AM-1* and AM-2* is logically equivalent to AM.

Therefore, Aristotle implicitly endorses AM insofar as he explicitly endorses conditionals AM-1 and AM-2. Having demonstrated this latter point, I now turn to specifying the nature of dispositions and potencies, the modal truthmakers on MD and AM, respectively.

3.3 Dispositions as Modal Truthmakers

As we have seen, according to MD, dispositions are the truthmakers for modal claims. Proponents of MD, then, are realists about dispositional properties. That is, they maintain that dispositional properties exist. Dispositional properties are essentially and irreducibly modal. So then, insofar as MD accounts for the truth of modal claims by appeal to irreducibly modal entities, MD is a non-reductive account of modality. In the next three sections, I expound on the nature of dispositional properties.

3.3.1 Disposition Talk is Talk about Dispositional Properties

When providing explanations of what goes on in the world, we often use dispositional concepts. For instance, one may explain the breaking of a vase by suggesting that the vase broke *because* it was fragile and was struck. The zoologist might explain the behavior of an alligator saying, "The alligator

became angry *because* it is irascible." The physicist may suggest that the electron jumped valence levels *because* it is charged.

Realists about dispositional properties often point to more-or-less ordinary explanations of the above sort in order to try and establish a *prima facie* case that individuals are committed to the existence of dispositional properties.⁴⁴ These dispositionalists often suggest that people seem to ascribe dispositional properties both to individual entities and to kinds of substances. As further examples, take "This vase is fragile," "This metal is malleable," "Alligators are irascible," "Trees are flammable," etc. According to the dispositionalists, such statements have equivalent paraphrases that make the ascription of dispositional properties more evident. For example, "The vase *has the disposition* to break when struck," "The metal *has the disposition* to bend when force is applied to it," "Alligators *have the disposition* to be angry when provoked," "Trees *have the disposition* to burn when sufficiently heated."

Contra dispositionalists, other theorists offer alternative paraphrases that seem to rid the above expressions of any terms that might be taken to denote dispositions, thereby ridding one who affirms the truth of these expressions of any commitment to dispositional properties. These theorists propose what has come to be called the conditional analysis of dispositions, according to which putative dispositions ascriptions are *really* just shorthand for conditionals of a certain form. Notable defenders of some form of the conditional analysis have been Ryle, Wittgenstein, and Carnap.⁴⁵ Ryle (1949) offers the most basic

⁴⁴ See, for instance, Stephen Mumford's extensive treatment of the conditional analysis in Ch. 3 of Stephen Mumford, *Dispositions*, (New York: Oxford University Press Inc., 1998): 36-64.

⁴⁵ G. Ryle, *The Concept of Mind*, (London, Hutchinson, 1949); Ludwig Wittgenstein, *The Blue and Brown Books*, (United States: Harper & Row, 1958); Rudolph Carnap, *Die Physikalische Sprache als*

conditional analysis according to which disposition ascriptions are to be analyzed as follows: Where D is a disposition, E a test condition, and G a confirming reaction, x is D =_{df} if x is E -ed, then x will G .⁴⁶

Whether any of the above paraphrases is accurate is controversial⁴⁷, and any argument to the effect that they are accurate would fall squarely within the philosophy of language. The details of such a discussion need not detain us here. It is sufficient to note that when dispositionalists assert “This vase is fragile,” they intend to communicate more than the conditional, “If this vase were struck, then this vase would break.” They additionally intend to communicate that there exists a dispositional property. Note, this is consistent with the dispositionalist affirming that the existence of a dispositional property entails a counterfactual about its bearer, as we shall see in the next section.

3.3.2 Dispositions as Multi-Track and Modal Entities

Some natural properties have causal roles. Dispositional essentialists think that at least some properties have their causal roles essentially, and so are irreducibly modal. Contrary to dispositional essentialists, categoricists maintain that properties have no essential (non-trivial) modal character.⁴⁸ Modal dispositionalists are dispositional essentialists, and so maintain that certain

Universalsprache der Wissenschaft, Translated by M. Black (London: Kegan Paul, 1934).

⁴⁶ G. Ryle, *The Concept of Mind*, (London, Hutchinson, 1949).

⁴⁷ C.B. Martin, “Dispositions and Conditionals,” *The Philosophical Quarterly* 44, no. 174 (1994): 1-8 is perhaps *the* touchstone text for criticism of the conditional analysis of disposition ascriptions. For a recent defense of the conditional analysis, see Gabriele Contessa, “Dispositions and Interferences,” *Philosophical Studies* 165, no. 2 (2012).

⁴⁸ For a brief, helpful survey of the debate between dispositional essentialists and categoricists, see the opening section of David Yates, “The Essence of Dispositional Essentialism,” *Philosophy and Phenomenological Research*, no. 87, Issue 1 (2013).

properties are irreducibly modal. To begin to understand what it is to be irreducibly modal, consider that a dispositional property's essential modal nature is most commonly expressed as a counterfactual conditional whose antecedent is its stimulus condition and whose consequent is its manifestation. There is dispute as to the specific relation between the dispositional property and its corresponding counterfactual conditional even among realists about dispositions,⁴⁹ but realists widely agree that dispositions somehow entail counterfactual conditionals and that these conditionals best describe the nature of their corresponding disposition.⁵⁰ Minimally, a property is a dispositional property only if it entails one or more counterfactual conditionals.

Take as an example the paradigm dispositional property, fragility.⁵¹ If an object *x* possesses the dispositional property fragility, not only do we say it is fragile but we can rightly infer the true counterfactual conditional that "if *x* were struck, then *x* would break", where being struck is the stimulus condition of fragility and breaking its manifestation. But upon reflection, it becomes clear that fragility, like many other commonly ascribed dispositions, has multiple stimulus conditions as well as multiple manifestations. For instance, a jar of salsa that is fragile in virtue of having the dispositional property, fragility, would break were it dropped, or thrown against a wall, or submitted to extreme

⁴⁹ J. Hawthorne & D. Manley, "Stephen Mumford. Dispositions," *Nous* 39, no. 1 (2005): 180, ". . . Mumford argues that the reductive project is bound to fail but that, nevertheless, one can distinguish dispositional from categorical ascriptions by the fact that a certain kind of counterfactual is a priori entailed by the former."

⁵⁰ Though, see Barbara Vetter, "'Can' Without Possible Worlds: Semantics for Anti-Humeans," *Philosopher's Imprint* 13, no. 16 (2013).

⁵¹ Of course, those who hold to a sparse view of properties, or who take fragility to be non-natural and deny the existence of such non-natural properties, will take this "paradigm" example to be more aptly described as a "toy" example. This is fine, as not much hinges on this particular example.

temperature changes, or exposed to the appropriate pure tone, etc. Moreover, its fragility may be manifested in a variety of ways, i.e. by shattering, splintering, cracking, buckling, splitting down the middle, etc. As this is the case, a single counterfactual conditional is not capable of adequately capturing fragility's qualitative nature. Fragility is a so-called multi-track disposition. Call a disposition that is not adequately characterized by a single counterfactual conditional because it yields various manifestations or manifests under various stimulus conditions a multi-track disposition.

I take it as relatively straightforward that any multi-track disposition is thickly-charactered.⁵² An entity is thickly or multiply-charactered just in case it has more than one non-formal attribute, where an attribute is the entity that characterizes an entity (i.e. "attribute" is neutral between property theories).⁵³ Under various, qualitatively diverse circumstances or upon subjugation to various events, depending on what one takes the sort of stimulus condition to be, the disposition yields a manifestation. If it yields multiple, qualitatively diverse manifestations then so much the thicker, for then not only is it *such that* it "responds" to many (perhaps infinitely many) qualitatively diverse stimuli, but it is also *such that* it produces/brings about its qualitatively diverse manifestations. A *single* multi-track disposition can make many (perhaps

⁵²The term "thickly-charactered" and its definition are borrowed from several of Robert Garcia's works in the metaphysics of property theory. See, for example, Robert Garcia, "Tropes as Character Grounders: Modifier Tropes and Module Tropes," (not currently in publication), wherein Garcia uses the term "thickly-charactered" and close correlates, and extensively develops the concept of thick-character. See also Robert Garcia, "Two Ways to Particularize a Property," (not currently in publication) where the terms "thick", "thickening", etc. are used to described the character of tropes.

⁵³ "Multiply-charactered" and its definition are likewise borrowed from Robert Garcia. Ibid. (see footnote 52).

infinitely many) logically distinct counterfactual conditionals, with qualitatively diverse stimulus conditions as their respective antecedents, true. For example, where x is a bearer of fragility, fragility makes true the propositions: <If x were thrown against the wall, x would break>; <if x were dropped, x would crack>; <if x were smashed with a hammer, x would shatter>; etc. Many other putative dispositions appear to be multi-track, e.g. flammability, irascibility, solubility, etc. Flammability seems to be a multi-track disposition whose stimulus condition is qualitatively variable but whose manifestation remains the same. That it exists seems to entail a host of counterfactual conditionals about its bearer, x : <If x were exposed to the sun, then x would ignite>, <if x were simultaneously exposed to polystyrene and benzene, then x would ignite>, <if x were stuck with a red-hot poker, then x would ignite>, <if x were rubbed across a rough surface, then x would ignite>, etc.

An obvious upshot of there being multi-track dispositional properties is that a single property of this sort can serve as a truthmaker for multiple possibility claims (and so, by extension, necessity claims). For example, given the above multi-track characterization of fragility, the possession of fragility by an entity x would presumably make true the proposition <possibly, x breaks>, <possibly, x shatters>, etc.

A modal dispositionalist need not maintain that there are multi-track dispositional properties, however. For it may be that the only dispositional properties are those whose stimulus conditions and manifestation are neither qualitatively nor quantitatively diverse. These properties would have fully determinate stimulus conditions and manifestations. Different dispositions of this sort would have quantities (in the case of dispositional properties belonging to

physical concretia) and relata that were unique to themselves, as part of their stimulus conditions and manifestations. For example, disposition d is such that if its bearer were to receive a consistent 95J/s over .657 seconds, then it would manifest 76J/s over .785s. Of course, this is a toy example, as there are likely many more determinate features of the stimulus and manifestation that would likely be needed to ensure lack of diversity. Were the stimulus conditions and manifestations so fully determinate as to be time-indexed, for example, then it seems each dispositional property would make at most one proposition true.

3.3.3 Dispositions as Irreducibly Modal Entities

So then, dispositional properties entail one or more counterfactual conditionals about the entities that bear them. The reason dispositional properties entail these counterfactual conditionals about their bearers is because they *cause* the events expressed in the consequents of the conditionals. They cause the events because it is simply their nature to do so. Their modal nature is not due to any further physical or ontological structure (i.e. further properties), but is taken to be a brute fact about them. (Compare: in virtue of what is a triangle a three-sided figure?) That fragility causes a response in its bearer under certain circumstances is simply because fragility *just is* the sort of thing that brings about that response under those circumstances.

Indeed, dispositional properties are largely defined functionally as the entities that cause their bearers to manifest certain events. Stephen Mumford seems to endorse something like the following definition of a dispositional property:

[D_{fM}] P is a dispositional property =_{df} P is a property had by some entity

x , and P is a cause of x R -ing if x is S -ed in conditions C .⁵⁴

Or, consider David Lewis's definition of a dispositional property:

(LD) x is disposed to give response R to stimulus S if and only if, for some intrinsic property B possessed by x , if x were exposed to S and were to retain B for an appropriate interval, x 's being B would be an x -complete cause of x being R .⁵⁵

According to Lewis, an object possesses a disposition just in case that object is such that it would manifest the response when exposed to the appropriate stimulus condition. Moreover, x 's intrinsic property B is all that is needed for x to manifest response R ; x 's other intrinsic properties do not causally contribute to the manifestation of R . This latter point is captured by Lewis's use of "x-complete cause". Though not himself a dispositionalist, Lewis's definition can be gladly adopted by dispositionalists so long as they resist his analysis of causation. This is because Lewis's ultimate analysis excludes primitively modal entities. Instead, the dispositionalist needs to maintain that some disposition d causes some response R in condition S if and only if d 's nature is such that it would cause R were it in condition S , and further that d 's nature is irreducibly modal.

In this section, I have simply explained how dispositional properties are multi-track and irreducibly modal in nature. In the next section, I argue that Aristotle understands potencies (*dunameis*) to have these same features.

⁵⁴ Stephen Mumford, *Dispositions*, (New York: Oxford University Press Inc., 1998): 135.

⁵⁵ David Lewis, "Finkish dispositions," *The Philosophical Quarterly*, no. 4 (1997).

3.3.4 Aristotle's Truthmakers – Potencies as Multi-Track and Irreducibly Modal

Aristotle appears to endorse AM as a truthmaker theory about modal truths. The entities that play the role of truthmaker are potencies (*dunameis*). In this section, I primarily examine *Metaphysics IX.2 and IX.5*, and argue that Aristotle's potencies, like the dispositions of the modal dispositionalists, are multi-track and irreducibly modal in nature.

That an entity is irreducibly modal entails that it has modal features.⁵⁶ One begins to see what the modal features of potencies are upon consideration of Aristotle's account of change in the *Physics*. The role potencies play in the process of change reveals that they have stimulus conditions and manifestations, and so seem to entail counterfactuals about their bearers.

In *Physic I.7*, Aristotle tells us that change involves three entities: matter, a positive form, and a privative form. "anything involved in "becoming" is always complex: there is what comes into being [for example, one "educated"]; and there is, in what undergoes such a change, a double aspect, namely, the persistent being (for example, a "man") and an opposite (for example, the "uneducated").⁵⁷ In *Physics III.2*, we find that it is the entity that conveys the positive form that is counted as responsible for the change, "a mover always conveys a definite form, such as a primary being or a quality or a quantity, and it is in terms of this fundamental factor, the form, that the movement which the mover imparts is to be construed."⁵⁸ The entity that conveys the forms has the

⁵⁶ Of course, it further entails that these features are themselves irreducibly modal.

⁵⁷ *Physics* 190b10-15. Aristotle, *Aristotle's Physics*, Translated by Richard Hope, (United States of America: The University of Nebraska Press, 1961).

⁵⁸ *Physics* 202a10-12. Ibid.

potency to do so, but this potency only affects the change when there exists a reciprocal potency in the patient (the entity being affected).⁵⁹ For instance, the active potency of an electron *to charge* other electrons can only be expressed where there exists within the patient electron the passive potency *to be charged*.

What this means, then, is that both active and passive potencies are such that they react under certain stimulus conditions, i.e. the presence of their reciprocal potency. Moreover, they jointly manifest a change at least within the bearer of the passive potency. If this is so, then each potency will entail a subjunctive conditional in the same way as do dispositional properties. Indeed, potency just seems to be a particular species of the disposition genus.

Aristotle's treatment of potencies in *Metaphysics IX.2* and *IX.4* make it clear that reciprocal partner potencies are not always sufficient stimulus conditions for a potency to manifest, however. His treatment further reveals that his potencies are multi-track, in that they yield various manifestations under various stimulus conditions. If this is so, then Aristotle's potencies will serve as truthmakers for multiple modal truths, again, in the same way as do dispositional properties.

Consider, then, *Metaphysics IX.2*. There, Aristotle draws the distinction between rational and non-rational potencies. This distinction is relatively straightforward, as rational potencies are simply those that belong exclusively to rational beings *qua* rational beings. For example, Socrates has the potency to break things, to warm things, and to engage in philosophy. The former potencies are non-rational, as they can also be possessed by non-rational things like rocks, fire, etc. The latter capacity is a rational capacity.

⁵⁹ (*Metaphysics IX.1*, 1046a11-13).

Rational potencies, we are told, are “capable of contrary effects, but one non-rational power produces one effect.”⁶⁰ For example, a doctor may choose to exercise his rational medical art (i.e. type of potency), but this art may manifest in either the healing or the harm of the individual patient. Additionally, in *IX.4*, we are told that which contrary change is manifested by a rational potency depends on the desire of the bearer of that rational potency. “Therefore everything which has a rational potentiality (*dunamis*), when it desires that for which it has a potentiality (*dunamis*) and in the circumstances in which it has it, must do this.”⁶¹ Hence, a single potency manifests under multiple stimulus conditions. For Aristotle, what individuates a rational capacity is not the manifestation and stimulus conditions, then, but the common rational understanding of each of the contrary forms.

Aristotle provides little defense of the claim that non-rational dispositions are single-track dispositions. However, it may be thought that his views on causation, if true, lend support to his claim.⁶² The thought is that potencies are that which ultimately bring about changes, and so they are plausibly individuated in the same way that changes are individuated. Moreover, if it is not by the changes they bring about that non-rational potencies are individuated, then it is not clear what could individuate them. Aristotle tells us that numerically distinct changes are of the same species when the property they

⁶⁰ (*Metaphysics* 1046b5-6). Aristotle, *Complete Works of Aristotle*, Translated by W.D. Ross and edited by Jonathan Barnes, (Princeton University Press, 1984).

⁶¹ (*Metaphysics* 1048a13-14). *Ibid.*

⁶² Stephen Makin proposes such a defense in Stephen Makin, “Aristotle on Modality, How Many Ways Can a Capacity Be Exercised?” *Proceedings of the Aristoterlian Society, Supplementary Volumes*, no. 74 (2000): 151-152.

bring about in their patient is not further determinable.⁶³ For example, a rock becoming a determinate shade of green, a piece of bread turning that same shade of green, and a leaf turning that same shade of green are all instances of the same event species. Individuating non-rational potencies in this way, however, seems to allow for non-rational potencies to have multiple-manifestations. While a single potency may produce the same property within multiple individuals, there is more to a manifestation than the form that is transferred. While Aristotle focuses on the transferred form in his account of change, the *state-of-affairs* that is brought about in numerically distinct transfers of the same property species will be qualitatively different. For instance, *a rock turning forest green, a loaf of bread turning forest green, and a leaf turning forest green* are qualitatively different states-of-affairs despite them all containing the transfer of the form, forest green. But then, non-rational potencies have multiple manifestations (and possibly stimulus conditions) and so are multi-track. They too will entail multiple counterfactual conditionals.

As with dispositional properties, it is in virtue of their *irreducibly* modal nature that potencies entail subjunctive conditionals about their bearers. Aristotle maintains that potencies are irreducibly modal entities. An argument for this claim can be stated as a simple syllogism:

- (1) If Aristotle believes that modal facts about potencies are reducible to facts about their non-modal features, then this claim is found in his writings. [premise]
- (2) The claim is not found in his writings. [premise]

⁶³ (*Physics* 227b 7-12). Aristotle, *Aristotle's Physics*, Translated by Richard Hope, (United States of America: The University of Nebraska Press, 1961).

(3) Aristotle does not believe modal facts about potencies are reducible to facts about their non-modal features. [modus tollens, 1,2]

(4) If Aristotle does not believe modal facts about potencies are reducible to facts about their non-modal features, this is because he believes it is the nature of potencies that they are irreducibly modal. [premise]

(5) Aristotle believes it is the nature of potencies that they are irreducibly modal. [modus ponens 3,4]

That premise (1) is true is evidenced by the fact that Aristotle wrote extensively about potencies, not only in the *Metaphysics* but also throughout a number of his writings, particularly those on natural science.⁶⁴ Given his large treatment of the subject, one would expect that he would at least minimally state how the modal features of potencies are to be reduced if he thought this possible. To my knowledge, there is no such explication.

Instead, in support of premise (4), one finds Aristotle supplying what appear to be definitions of potencies that characterize them as primitively modal entities. (Premise (4) effectively says that Aristotle does not remain uncommitted as to whether or not potencies are irreducibly modal.) After expounding on potencies at length within the *Physics* and further in the *Metaphysics*, Aristotle summarizes his view of potencies of all sorts in *Metaphysics IX.8*,

“ . . . I mean by potentiality not only that definite kind which is said to be a principle of change in another thing or in the thing itself regarded as other, but in general of every principle of movement or of rest. For nature also is in the same genus as potentiality; for it is a principle of movement

⁶⁴ For a helpful overview of the role of potencies in Aristotle's work on natural science, see Istvan Bodnar, "Aristotle's Natural Philosophy," In *The Stanford Encyclopedia of Philosophy* (Spring 2012 Edition), ed. Edward N. Zalta (ed.), (Nov. 2014).

–not, however, in something else but in the thing itself *qua* itself.”⁶⁵

In summarizing the nature of potencies *simpliciter*, Aristotle chooses to characterize them as those things that bring about change. He does not go on to suggest that these things bring about change in virtue of possessing some further physical structure, or any other non-modal feature. He also does not suggest that this *might* be the case—that, for all we know, further explanations of how potencies bring about change will one day be available. Instead, he rests with defining potencies functionally.

Aristotle’s description of nature in this passage is consistent with his descriptions found throughout the *Physics*. For example, in *Physics II*, Aristotle tells us how artifacts possess principles of change,

“they [artifacts] do not have implanted within themselves any tendency to change; nevertheless, in so far as they happen to consist of stone or earth or a composite material, they do have such a beginning of movement and rest, but only in this respect. But even this circumstance gives evidence that the nature of a thing is in some sense the factor which initiates movement and rest within that thing in which it is itself immediately, not incidentally, present.”⁶⁶

Why is it possible that artifacts undergo changes of various sorts? Aristotle is content to terminate his answer to this question with an appeal to natures, that which initiates movement and rest within a thing. No further explanation with appeal to further non-modal features is offered. As Istvan

⁶⁵ (*Metaphysics XI.8* 1049b5-10). Aristotle, *Complete Works of Aristotle*, Translated by W.D. Ross and edited by Jonathan Barnes, (Princeton University Press, 1984).

⁶⁶ (*Physics II* 192b 18-23 approx.). Aristotle, *Aristotle’s Physics*, Translated by Richard Hope, (United States of America: The University of Nebraska Press, 1961).

Bodnar notes, “natures – beside the active and passive potentialities – are ultimate grounds in causal explanations.”⁶⁷

These examples are but a few of many passages that describe potencies as being modal in nature. Moreover, there are no passages that suggest the modal character of potencies might be accounted for by non-modal features. Taken together, these facts suggest that premise (5) is true.

3.4 Summary of Modal Dispositionalism’s Aristotelian Heritage

In this section, I aimed to show that MD is a neo-Aristotelian theory of modality in that both MD and AM are (1) truthmaker theories about modal propositions that (2) define necessity in terms of possibility, and (3) posit irreducibly modal, disposition-like entities as truthmakers. I did so by drawing from the views of prominent modal dispositionalists and by directly examining source texts of Aristotle. In so doing, I hope to have also made explicit part of the common, philosophic heritage shared by powers theorists.

⁶⁷ Istvan Bodnar, "Aristotle's Natural Philosophy," In *The Stanford Encyclopedia of Philosophy* (Spring 2012 Edition), ed. Edward N. Zalta (ed.), (Nov. 2014).

4. TOWARDS EVALUATING MODAL DISPOSITIONALISM: CONSEQUENCES AND MODIFICATIONS

4.1 The Actual Causal Connection Argument for MHC

In this section, it is argued that modal dispositionalists are committed to MHC (below). A few revisions to MD are suggested in the process.

(MHC): There exists an actual infinity of contingent objects.

MD commits the dispositionalist to the view that every metaphysical possibility is causally “connected” with the actual world, directly or indirectly.⁶⁸ Call this view the actual causal connection view, ACC.⁶⁹ This is because MD, when correctly paraphrased, just is the view that for any state-of-affairs S , S is possible iff it is or would be the *effect* (i.e. manifestation or part thereof) of some *cause* (i.e. disposition). Moreover, as every actual state-of-affairs is possible, it follows that every actual state-of-affairs is a causal manifestation (or part thereof) of some disposition d that belongs to some concrete entity x . If dispositionalists are committed to ACC, then dispositionalists are committed to MHC. Towards making ACC and its entailment of MHC clear, I suggest the

⁶⁸ This brief, convenient way of stating ACC is not intended to communicate that dispositionalists are committed to merely possible entities, ala Meinongianism. Indeed, Borghini and Williams more accurately express the opinion of dispositionalists in saying, “. . . it is recognized that when dispositions are manifested, the dispositions (or more correctly the dispositional properties that support them) stand in a causal relation to the manifestations. But when the dispositions are unmanifested, there is no relation at all, and so no mystery regarding what the relation is to. Thinking of unmanifested dispositions as relations to some mysterious non-existent manifestation might be one way of characterizing dispositions, but it is not one we endorse (nor does anyone else as best as we can tell). For this reason, we are not burdened with Meinongian entities.”

⁶⁹ ACC is largely based on an argument presented in Chad Vance, “In Defense of the New Actualism,” 105-109. There, Vance argues that, on dispositionalism, modality takes a branching structure such that every possible state-of-affairs is metaphysically grounded by a “causal property” in the actual world.

following two scenarios for consideration:

Case 1: Suppose today is Christmas morning and I wake to find a lump of coal in my stocking. Suppose further that it is true that <The lump of coal could burst into flames>. On MD, what makes it true that <The lump of coal could burst into flames> is the lump's disposition (presumably) to ignite. Now, imagine that it is in fact the case that my coal ignites. The actual state-of-affairs *my lump of coal igniting*, *S*, is made possible by the coal's disposition to ignite (the manifestation of which just is *S*, in this case). This disposition is itself causal in nature because it is either identical to or caused by irreducible causal properties. On MD, the state-of-affairs *my lump of coal igniting* either contains the disposition to ignite (it must if causes are coincident with their effects) or it minimally was caused by it, in which case there is also a more inclusive situation comprising *S* and the disposition. In either case, *S* is metaphysically possible because it *could be* causally brought about by something *actual* (in this imagined case, it is in fact.).

However, it would seem that not every metaphysically possible state-of-affairs is capable of being immediately brought about by some causally efficacious entity.⁷⁰ Some metaphysically possible states-of-affairs are more distant from actual states-of-affairs than others.

Case 2: Imagine that my lump of coal does not actually ignite (but that it still has the disposition to do so) and that I leave it unattended in my stocking until New Year's Eve. Clearly enough, on Christmas day, it is metaphysically possible that at some time before New Year's Eve I drop the coal on my sweater and get black streaks on it. This state-of-affairs just described is possible because

⁷⁰ Unless directly actualized by God, presumably.

I and the coal and whatever else have the requisite dispositions, the manifestation of which just is or includes me dropping coal on my sweater and getting black streaks on it. Before this possible state-of-affairs is available to be causally manifested, however, other possible states-of-affairs must first be manifested. For example, in order to have dropped the coal on my sweater, I must have first lifted the coal out of the stocking. For that state-of-affairs to manifest, I must have first extended my arm into the stocking. Prior still, I must have lifted the stocking down from the mantle, and so on. Of course, there are alternative chains of states-of-affairs that would make available the obtaining of *my dropping the coal on my sweater*. What is important, however, is that any chain of possible states-of-affairs that obtains, thereby enabling *my dropping the coal on my sweater* to obtain, will ultimately include a state-of-affairs that either contains or is directly caused by one or more of my *actual* causal dispositions. The simple chain just mentioned can be listed chronologically: *My possessing the relevant dispositions(actually) > my lifting the stocking down from the mantle > my extending my arm into the stocking > My dropping the coal on my sweater*.

My dropping the coal on my sweater seems to be a genuinely possible state-of-affairs. Moreover, it seems genuinely possible regardless of whether or not it actually obtains. Suppose it does not obtain, nor does any state-of-affairs containing a disposition whose manifestation is or includes *my dropping the coal on my sweater*. It follows on MD that this state-of-affairs is not possible. This suggests that MD needs to be modified to accommodate states-of-affairs that are more distant from actuality, yet still genuinely possible. Here, it may be beneficial to examine Alexander Pruss's initial formulation of possibility. Although Pruss does not mention dispositions in the following description of

modal truthmakers, his formulation is helpful in that it makes explicit the relevant causal connectedness of these more “distant” states-of-affairs.⁷¹:

“It is possible that s if and only if either s , or there is something that has the causal capability to make it be that s , or there is something that has the causal capability to make it be that there is something that has the causal capability to make it be that s , or ... And we can summarize this by saying that a non-actual state-of-affairs is made possible by something capable of initiating a chain of causes leading up to that state-of-affairs.”⁷²

Iterated possibilities can be accommodated by modifying MD as follows:

(MD⁺): State-of-affairs S is possible iff there is at least one actual disposition d , the manifestation of which is (or includes) S , or some disposition d_1 whose manifestation is or includes a state-of-affairs S_2 that includes a disposition d_2 , the manifestation of which is or includes S , or . . .

The states-of-affairs *my lump of coal igniting* and *my dropping the coal on my sweater* have no unique features that would prevent Case 1 and Case 2 from being properly generalized. Case 1 can be generalized to all metaphysical possibilities that are immediately actualizable as a manifestation or part of a manifestation of a causal disposition. Case 2 can be generalized to all metaphysical possibilities that are not directly actualizable but that are genuine possibilities nonetheless. As this is the case, it seems that ACC is true on both

⁷¹ As it turns out, Pruss does endorse an Aristotelian understanding of properties, whereby there are at least some that have irreducible, causal properties.

⁷² Alexander Pruss, *Actuality, Possibility, and Worlds* (New York: The Continuum International Publishing Group, 2011), 213.

MD and MD⁺.⁷³

How does endorsing ACC commit dispositionalists (those who endorse MD) to MHC, the claim that there exists a past infinity of contingent objects? To see how, begin with the plausible assumption that whatever is actual is also possible. This is *not* to modify MD, adding another condition to the right-hand side of the biconditional. Rather, it is just to say that all actual things are also possible things. But if this is so, then it follows that every actual state-of-affairs *S* is also possible. From the left to right direction of MD, it then follows that every actual state-of-affairs *S*, whether one that obtained 10 minutes ago or 10 million years ago, is such that it either is or is part of the manifestation of some disposition *d*.

Now, consider the state-of-affairs *S* of *d being G* where *d* is a disposition and *G* an essential feature of *d*, i.e. *d* could not lack *G* and exist. On MD, *S* is the manifestation or part of the manifestation of some disposition. But *S* is not the manifestation of *d*, for that would imply that *d* causes itself to be *G*, and this is absurd.⁷⁴ To see this, recall that *d* could not exist and fail to be *G*. So long as manifestations take place over a finite interval of time, it follows that were *d* to manifest *d's being G*, *d* would cause itself to *come into* existence.⁷⁵ This is absurd and so disposition *d* does not manifest *S*. But then, MD requires there be another temporally prior disposition *d** whose manifestation is or includes *S*, and there

⁷³ In the following discussion, I will continue to argue for the implications of MD, and not MD⁺. This is simply because the addendum found in MD⁺ is not crucial to the following arguments and because MD is the theory proposed by actual modal dispositionalist Borghini and Williams.

⁷⁴ Recall from discussion in section 3.3.3 that dispositions cause their manifestations.

⁷⁵ If the disposition is timeless, this argument for a infinite *past* regress would fail. It seems plausible that an argument for an infinite number of dispositions could be constructed through slight modification of the above. This argument need not assume that manifestations take place over a finite interval of time, and so is consistent with them being timeless.

is then a further state-of-affairs S^* of d^* 's being G^* , where G^* is an essential feature of d^* . By parity of reasoning, MD requires that S^* be the manifestation or part of the manifestation of some distinct disposition d' . From here, it is easy to see how an infinite past regress of *dispositions and states-of-affairs* follows.

Note, this argument for MHC is independent of whether or not the modal dispositionalist countenances the existence of states-of-affairs. Recall from section 3.2.1 that the modal dispositionalist is not committed to the existence of states-of-affairs, for what is essential to the theory is what truthmakers are posited for modal truths. So long as the connection between possibility and causal efficacy is preserved, not even a more radical reformulation of MD would free the modal dispositionalist from commitment to an infinite number of existents. For example, consider an ontology according to which there exist only concrete particulars. On such an ontology, the intuitive connection between causal efficacy and possibility underlying MD could perhaps best be preserved via a revision like the following: MD': Concrete particular c is possibly F iff there exists a concrete particular c^* disposed to bring it about that c is F , where " F " should of course not be taken to pick out an abstract property but nonetheless " F " is a true predicate of c . Concrete particular c^* must pick out an entity distinct from c on the assumption that an entity cannot bring about its own existence. But then, by parity of the above reasoning, MD' will require there be a further entity c' responsible for bringing about c^* , and an infinite regress follows. So, even on a quasi-modal dispositionalism that countenances only concrete particulars, it follows that there is an infinite number of *concrete objects*.⁷⁶

⁷⁶ Of course, that there are an infinite number of concrete particulars also follows on the

At this point, it is clear that as it stands, MD requires an infinite number of contingent dispositions to serve as modal truthmakers and ground the possibility of an infinite number of contingent states-of-affairs.⁷⁷ Thus, MD requires the truth of MHC. Some may take the commitment to MHC to weigh against the ontological parsimony touted by dispositionalists. Others may take commitment to MHC to be a reductio of MD if they view an actual infinity to be metaphysically impossible.⁷⁸ One way to avoid this consequence is by modifying MD to read as follows:

(MD*) State-of-affairs *S* is possible iff either *S* is actual, or there is at least one actual disposition *d*, the manifestation of which is (or includes) *S*.

This formulation obviates the need for an infinite number of dispositions by deeming a state-of-affairs possible so long as it is actual. This sufficient condition for metaphysical possibility makes MD* consistent with there being actual states-of-affairs that are not the manifestation of any disposition. These states-of-affairs may be eternal, timeless, or brought about by some entity other than dispositions.

The modal dispositionalist can avoid commitment to one metaphysically heavy consequence by opting for MD* over MD. Section 4.3, however, contains

assumption that dispositions must be had by some concrete object (e.g. are immanent universals, tropes had by a bare particular, tropes necessarily dependent on other tropes, etc.).

⁷⁷ At least, this is the case so long as it can never be that a state-of-affairs *S*₁ containing disposition *d* is the manifestation of distinct disposition *d*₂, AND state-of-affairs *S*₂ containing *d*₂ be the manifestation of *d*. This is a plausible assumption.

⁷⁸ A discussion of why one might take an actual infinite to be metaphysically impossible would extend beyond the scope of this paper. For helpful discussion see William Lane Craig and James D. Sinclair, "The Kalam Cosmological Argument," in *The Blackwell Companion to Natural Theology*, ed. by William Lane Craig and J.P. Moreland (Blackwell Publishing Ltd., 2009) 103-125.

an argument that draws support from both MD and MD* and that has a distinct, metaphysically heavy conclusion. First, however, another reason for adopting MD* over MD is given.

4.2 Adopting MD* for Formal Adequacy

In section 4.1, I suggested that one ought to prefer MD* over MD, as MD entails that there are an infinite number of contingent entities and that this is an unduly heavy consequence. Another reason to prefer MD* over MD is that, unlike MD*, MD does not validate axiom (K) or (T) and so is formally inadequate. Axiom (K) and (T) are both included in S5, which many take to be the correct system for metaphysical modality. Following the work of David Yates, I now show that MD does not validate (K) or (T). Subsequently, I show that MD* validates both (K) and (T).⁷⁹

Towards showing the inadequacy of MD, begin by considering any analytic truth. Yates's example is as good as any other. He has us consider an arithmetical truth, $\langle 2+2=4 \rangle$. Presumably, there is no disposition whose manifestation is or includes the state-of-affairs *the sum of 2 and 2 being 4*. As this is so, no disposition makes true the proposition $\langle 2+2=4 \rangle$. It may well be that all dispositions' manifestations are consistent with the state-of-affairs of *the sum of 2 and 2 being 4*. Consistency with this state-of-affairs, of course, is not the same as

⁷⁹ The formal demonstration in this section is adopted with only minor modification from David Yates, "Dispositionalism and the Modal Operators," *Philosophy and Phenomenological Research*, no. 89, Issue 1 (2014, forthcoming). The discussion of dispositions and counterfactual dependence is my own. I also include intermediate derivations that Yates leaves implicit in his work, and present the derivation in list form to streamline the argument for adopting MD*. Moreover, I arrived at MD* independently from Yates, guided by the common understanding of possibility, according to which that which is actual is also possible. Yates's argument is a very nice complement to my own, found in the previous section.

bringing this state-of-affairs about. This becomes especially apparent when one recalls that dispositions are supposed to bring about their respective manifestations in the sense that they cause them. Surely, nothing causes $\langle 2+2=4 \rangle$ to be true. While the relation between cause and effect may be more than counterfactual dependence, it is nonetheless plausible that the following conditional holds between a cause C and effect E .

C causes E only if:

- i. C occurs.
- ii. E occurs.
- iii. Had C not occurred, E would not have occurred.

When C is a disposition manifesting and E a corresponding state-of-affairs obtaining, then the counterfactual iii is presumably made true by the primitively modal disposition. It seems, however, that the state-of-affairs *the sum of 2 and 2 being 4* in no way counterfactually depends on the manifesting of a disposition.

Again, it seems that no disposition entails the truth of $\langle 2+2=4 \rangle$. By parity of reasoning, no disposition is responsible for the falsity of $\langle \neg(2+2=4) \rangle$. These statements can be formalized using the notation introduced in section 3.2.1. Let p be a variable for any proposition of the form, $\langle \text{State-of-affairs } S \text{ obtains} \rangle$.⁸⁰ Let $\exists\phi[p]\phi$ stand for $\langle \text{there is a disposition that brings about } p \rangle$. Recall that:

$$(\text{MD}_{\text{FORMAL}}): \diamond p \equiv \exists\phi[p]\phi$$

$$(\text{MD}_{\text{N-FORMAL}}): \Box p \equiv \neg\exists\phi[\neg p]\phi$$

⁸⁰ Again, it is open to the modal dispositionalist to paraphrase “state-of-affairs” talk in a way that makes explicit their preferred ontology. I keep with “state-of-affairs” talk to remain true to Borghini and Williams’ formulation, as they are the representative of modal dispositionalism I have (somewhat arbitrarily) chosen.

The above discussion demonstrates premises 1 and 2. The following derivation is a point of reference for the derivations that are to follow.

Derivation A:

- | | |
|---------------------------------------|---|
| 1. $\neg\exists\phi[2+2=4]\phi$ | Premise (above discussion) |
| 2. $\neg\exists\phi[\neg(2+2=4)]\phi$ | Premise (above discussion) |
| 3. $\neg\Diamond(2+2=4)$ | Definition MD_{FORMAL} , 1 |
| 4. $\Box(2+2=4)$ | Definition $MD_{\text{N-FORMAL}}$, 2 |
| 5. $\neg\neg\Box\neg(2+2=4)$ | Interdefinability of modal operators, 3 |
| 6. $\Box\neg(2+2=4)$ | 5 |

The proposition, $\langle\neg(2+2=4)\rangle$, is a counterexample to Axiom (T): $\Box p \rightarrow p$.

The following derivation shows that (T) is invalid.

Derivation B:

- | | |
|----------------------------------|--------------|
| 7. $2+2=4$ | Premise |
| 8. $\Box\neg(2+2=4)$ | 6 |
| 9. $\neg(2+2=4)$ | (T) Axiom, 8 |
| 10. $(2+2=4) \ \& \ \neg(2+2=4)$ | 7, 9 |

Let $p = \langle 2+2=4 \rangle$. Let $q = \langle \text{Josh is an MA student} \rangle$, a contingent proposition. (K): $\Box(p \rightarrow q) \rightarrow (\Box p \rightarrow \Box q)$. The following derivation shows that (K) is invalid.

Derivation C:

11. $\neg\exists\phi[p \ \& \ \neg q]\phi$	Premise (above discussion)
12. $\exists\phi[\neg q]\phi$	Premise
13. $\neg\exists\phi[\neg(p \rightarrow q)]\phi$	11
14. $\Box(p \rightarrow q)$	Definition $MD_{N-FORMAL}$, 13
15. $\Box p$	4
16. $\Box p \rightarrow \Box q$	(K) Axiom, 14
17. $\Box q$	15, 16
18. $\Diamond\neg q$	Definition MD_{FORMAL} 12
19. $\neg\Box\neg\neg q$	18
20. $\neg\Box q$	19
21. $\Box q \ \& \ \neg\Box q$	17, 20

Premise 11 is true, because the truth of its negation would require there be a disposition to bring it about that $\langle 2+2=4 \rangle$. There is no such disposition.

Premise 13 is true given the definition of a contingent proposition.

Using the same notation as with MD, MD^* can be formulated thus:

(MD^*_{FORMAL}) : $\Diamond p \equiv p \vee \exists\phi[p]\phi$

$(MD^*_{N-FORMAL})$: $\Box p \equiv p \ \& \ \neg\exists\phi[\neg p]\phi$

Recall that (T): $\Box p \rightarrow p$. ($T_{CONTRAPOSITIVE}$): $p \rightarrow \Diamond p$. The following derivation shows that (T) follows from MD^* .

Derivation D:

22.	$(p \vee \exists \phi[p]\phi) \rightarrow \diamond p$	MD^*_{FORMAL} , right to left
23.	p	Assumption of conditional proof
24.	$p \vee \exists \phi[p]\phi$	23
25.	$\diamond p$	22, 24
26.	$p \rightarrow \diamond p$	Conditional Proof 23-25

Recall that (K): $\Box(p \rightarrow q) \rightarrow (\Box p \rightarrow \Box q)$. The below derivation shows that (K) follows from MD^* . Before providing the derivation, I elaborate on the justification of one of the premises.

Derivation E:

Line 34 is justified as follows: The conjunction of 28 and 30 entails the truth of $\langle p \rangle$ and $\langle p \rightarrow q \rangle$, as well as that there are no dispositions that can bring about the falsity of $\langle p \rangle$ and no dispositions that can bring about the falsity of $\langle p \rightarrow q \rangle$. $\langle p \rangle$ and $\langle p \rightarrow q \rangle$ jointly entail $\langle q \rangle$. The disposition quantified over in 34, however, is such that it could bring about the falsity of q . If this disposition were to manifest, it would bring it about that either $\langle p \rangle$ or $\langle p \rightarrow q \rangle$ were false. Line 34 reflects this.

27.	$\Box(p \rightarrow q)$	Assumption of conditional proof
28.	$(p \rightarrow q) \ \& \ \neg \exists \phi[\neg(p \rightarrow q)]\phi$	Definition $MD^*_{\text{N-FORMAL}}$, 27
29.	$\Box p$	Assumption of conditional proof
30.	$p \ \& \ \neg \exists \phi[\neg p]\phi$	Definition $MD^*_{\text{N-FORMAL}}$, 29
31.	$(p \rightarrow q)$	28
32.	p	30

33.	$\exists\phi[\neg q]\phi$	Assumption of indirect proof
34.	$\neg p \vee \neg(p \rightarrow q)$	*Defended Above*, 33
35.	$\neg(p \& (p \rightarrow q))$	34
36.	$p \& (p \rightarrow q)$	31, 32
37.	$[p \& (p \rightarrow q)] \& \neg[p \& (p \rightarrow q)]$	35, 36
38.	$\neg\exists\phi[\neg q]\phi$	Indirect proof 33-37
39.	q	31, 32
40.	$q \& \neg\exists\phi[\neg q]\phi$	38, 39
41.	$\Box q$	MD* _{N-FORMAL} , 40
42.	$\Box p \rightarrow \Box q$	Conditional proof 29-41
43.	$\Box(p \rightarrow q) \rightarrow (\Box p \rightarrow \Box q)$	Conditional proof 27-42

4.3 An Argument for a Necessary Being

The modal dispositionalist can avoid commitment to one metaphysically heavy consequence by opting for MD* over MD. This section, however, contains an argument for the existence of a necessary being that draws support from both MD and MD*. Let a necessary being be one that exists either eternally or timelessly and that is such that nothing can bring about its non-existence. It seems appropriate to deem commitment to the existence of such a being as metaphysically heavy. This argument, unlike the argument from ACC, however, turns out not to be incumbent upon the modal dispositionalist.

The argument:⁸¹

⁸¹ This argument is largely based on the objection Cameron (2008) poses to dispositionalism. He contends that the theory cannot supply truthmakers to broad modal truths, and so is deficient.

(P1) If the proposition <It is possible that none of the actual contingent beings existed> is true, then its truthmaker is the disposition of at least one necessary being.

(P2) If the proposition's truthmaker is the disposition of at least one necessary being, then at least one necessary being exists.

(P3) The proposition <It is possible that none of the actual contingent beings existed> is true.

(P4) The proposition's truthmaker is the disposition of at least one necessary being. By (P1) and (P3).

(P5) At least one necessary being exists. By (P2) and (P4).

(P1) is clearly the most controversial thesis. Why think it is true on modal dispositionalism? To begin, the antecedent, (P3), is a "highly intuitive possibility."⁸² This intuitive plausibility may be due to the fact that it certainly seems true that <if for every contingent entity x , x could fail to exist, then possibly all of the contingent beings fail to exist. That is, it seems very likely to be true. What of the consequent? According to MD*, a state-of-affairs S that is absent any of the actual contingent beings is possible iff either S , or if there is at least one disposition d , the manifestation of which is S . Dispositionalists are unlikely to posit that S does not admit of further metaphysical grounding, and so will look for the relevant disposition, d .⁸³ Clearly, d could not belong to any of the non-existent contingent objects, as there are none (*pace* Meinongianism). Moreover, dispositions are possessed by and are ontologically dependent on

He explicitly proposes the proposition found in (P1) as one resistant to dispositional truthmakers. Ross Cameron, "Truthmakers and Modality," *Synthese*, 164, (2008).

⁸² *Ibid.*, 273.

⁸³ Further, most dispositionalists are truthmaker maximalists, whereby all truths require a truthmaker, so the true proposition needs a truthmaker in order to be so.

their individual bearers; they are not ontologically independent entities.

Disposition d , then, must be had by at least one necessary being. The consequent appears to be true and so the conditional (P1) as well.

It might be objected that negative existentials do not require truthmakers, and so while (P1)'s antecedent is true, its consequent is false, thereby yielding (P1) false. It is not clear, however, that the modal dispositionalists can avail herself of such a response. This is because the modal dispositionalist is already committed to truthmakers for at least some negative existentials. Recall from section 3.3.2 that dispositions entail counterfactual conditionals, and so are truthmakers for these conditionals. For example, <This vase would break were it struck> is entailed by the disposition, fragility, possessed by the glass. But <This vase would break were it struck> entails that <there is no mischievous sorcerer who would prevent the vase from breaking were it struck>.⁸⁴ This latter proposition is a negative existential, and is ultimately entailed by the existence of fragility. Fragility is its truthmaker.⁸⁵ The modal dispositionalist, then, needs to provide a principled reason to deny that the negative existential <It is possible that none of the actual contingent beings existed> has a truthmaker. Perhaps this can be done.

That (P2) is true is uncontroversial. (P4) and (P5) follow logically from preceding premises. But is this argument likely to persuade the modal dispositionalist that she is committed to the existence of at least one necessary

⁸⁴ The sorcerer example is from David Lewis, "Finkish dispositions," *The Philosophical Quarterly*, no. 4 (1997) and it is discussed relative to truthmaker theory in Trenton Merricks, *Truth and Ontology* (Oxford: Oxford University Press, 2007), 41-43, 159-160.

⁸⁵ For more extensive discussion of truthmakers for subjunctive conditionals, see Trenton Merricks, *Truth and Ontology*, (2007), 158-166.

being? Contessa (2010) would likely think not.⁸⁶ He rightly points out that it is open to the dispositionalist to accept (P1) as true by denying the veracity of (P3), thereby making the material conditional true. He admits that (P3) would likely be true if (P5) were true, but further argues that the truth of (P3) cannot be established independently of (P5). If this is so, then the argument is massively question begging. To the objection that (P3) is conceivable and so at least possible, he claims that conceivability is not a reliable guide to metaphysical possibility, and that the dispositionalist has a better means to determine that which is possible, namely a theory of modal truthmakers. So long as the dispositionalist is willing to deny the truth of (P3), her dispositionalism will not commit her to the existence of at least one necessary being by this argument.

A full response to Contessa's suggestions would extend beyond the scope of this thesis. For now, I simply note that the joint denial of both (P3) and (P5) seems highly implausible. For if it is false that <It is possible that none of the actual contingent beings existed>, then it follows that <Necessarily, there are contingent beings>. This latter proposition has bizarre consequences, as noted by Alexander Pruss.⁸⁷ Moreover, it is not at all clear how the truth of this proposition could be ontologically grounded by any contingent beings. It appears that it must be taken as brute by the one who also denies (P5). Finally, in direct support of (P3), the following conditional certainly seems true, <If for every contingent being x , x could have failed to exist, then *all* of the contingent

⁸⁶ Contessa, "Modal Truthmakers . . .," (2010), of course, does not respond to an instance of the specific argument I give above. Rather, he defends dispositionalism against Cameron, "Truthmakers and Modality," (2008)'s objections.

⁸⁷ For a discussion of some of the bizarre consequences that make this denial implausible, see Alexander Pruss, *Actuality, Possibility, and Worlds*, (New York: The Continuum International Publishing Group, 2011): 217-218.

beings could have failed to exist.> The antecedent of this conditional is surely true, given that to be a contingent being *just is* to be such that one could fail to exist.

5. CONCLUSIONS

In this work, I have delineated the contours of modal dispositionalism, demonstrating how it is a realist, actualist, non-reductive account of modality that grounds the truth of possibilities in irreducibly modal entities. I have further argued for its philosophic heritage in the thought of Aristotle, an ancestry that it shares with other theories of modality that are of the powers theory genus. Additionally, I have argued that the basic formulation of modal dispositionalism, MD, is committed to the existence of either an actual infinity of contingent beings or to at least one necessary being (MHC). In the process of so arguing, I have also suggested reformulations of MD that avoid direct commitment to the first disjunct of MHC, and that validate two necessary axioms for S5. Through this work, I recommend modal dispositionalism to the reader for serious consideration.

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