Canadian Journal of Philosophy (2022), 52: 6, 622–635
doi:10.1017/can.2023.2

ARTICLE

Potentialism and S5

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Abstract
Modal potentialism as proposed by Barbara Vetter (2015) is the view that every possibility is grounded in something having a potentiality. Drawing from work by Jessica Leech (2017), Samuel Kimpton-Nye (2021) argues that potentialists can have an S5 modal logic. I present a novel argument to the conclusion that the most straightforward way of spelling out modal potentialism cannot validate an S5 modal logic. Then I will propose a slightly tweaked version of modal potentialism that can validate an S5 modal logic and still does justice to the core claim of potentialism.

Keywords: Potentialism; modal dispositionalism; modal logic; contingentism

1. Introduction

The basic idea of modal potentialism as it is proposed by Barbara Vetter (2015) is that it is possible that *p* just in case something has a potentiality to be such that *p*. The basic idea needs some refinement: Multiple things can jointly have a potentiality that none of them has on its own. Furthermore, the most plausible variant of potentialism has it that some propositions are possible in virtue of potentialities of things that no longer exist or have lost the relevant potentiality. It also seems plausible to accept that some possibilities are not directly grounded in a potentiality, but in some thing's potentiality to acquire a further potentiality. It is possible that I skilfully play the theremin, not because I have the potentiality to immediately do so when presented with such an instrument (I don't), but because I have the potentiality to acquire the potentiality to do so by practising. Following Vetter, let us say that in such a case I have an iterated potentiality to skilfully play the theremin.

After these clarifications, the core claim of potentialism can be spelled out as follows:

> **Potentialism:** It is possible that *p* if and only if some things have, had, or will have an iterated or noniterated[1] potentiality for it to be the case that *p*.

The problem that will be discussed in this paper can be introduced by means of the following example: Vetter is plausibly such that possibly nothing has a potentiality for her to exist. From this, it seems to follow that possibly it is not possible that Vetter exists. This would be a violation of the modal axiom *B*, which says that whatever is actually the case is necessarily possible. Therefore potentialists cannot have an S5 modal logic, or so the argument goes.

Why is it worth investigating whether there is a way for the potentialist to have an S5 modal logic? S5 is technically simple insofar as it allows to ignore accessibility relations when modelled in a

[1]In what follows I will use 'potentiality' indiscriminately for both iterated and noniterated potentiality unless indicated otherwise.

standard world-semantics. It also does justice to the plausible idea that there is a maximally wide sense of possibility such that what is possible in this sense does not depend on which possibilities are realised. This (or a similar) idea is also notably endorsed by Timothy Williamson, who holds that what is metaphysically possible "does not depend on the contingencies of one's situation" (1999, 255). Furthermore, there already is an ongoing discussion concerning the relation between potentialism and S5 (see Vetter 2015, 213; Kimpton-Nye 2021) in which the question how exactly potentialism can be made to yield an S5 modal logic is (for reasons to be given below) not satisfyingly answered.

I will assume in what follows that some objects (like, e.g., Vetter) possibly do not exist. The option of denying this claim and opting for necessitism—i.e, the claim that necessarily everything is necessarily something—will be ignored in what follows. Although it has its defenders, maybe most prominently Williamson (see 2000, 2013), necessitism seems to not sit well with the spirit of potentialism. Necessitists typically think that there are various extraordinary objects like a plethora of grandchildren of Wittgenstein who will always be nonconcrete. One of the main selling points of potentialism is that it, to put it with Vetter, promises to "anchor possibilities" in "just the ordinary objects of this, the actual, world, with which we are in regular epistemic contact" (2015, 11).

Before I turn to discussing the argument sketched above in more detail in section 2, I will discuss a thesis concerning the dependence of potentialities on the objects they are about. The claim that some actual thing is such that possibly nothing has a potentiality for it to exist is central to the argument to be discussed. It seems justified by the idea that things are needed to constitute the potentialities that are about them. This dependence claim will be discussed in what follows.

A precursor of the problem to be discussed in this paper, which also crucially concerns the dependence of potentialities on the objects they are about, has been developed by Jessica Leech (2017). If Vetter possibly does not exist, then, according to potentialism, some object has a potentiality for Vetter to not exist. Leech asks which object can have a potentiality for Vetter to not exist. It cannot be Vetter herself, because, so Leech, "to manifest it she would have to never have existed, and something that doesn't exist cannot manifest any property" (2017, 461).

This raises the question how any thing can have a Vetter-concerning potentiality when Vetter does not exist yet. It seems that Vetter is needed for something to have a potentiality for her to not exist. To put it with Leech, she is needed to "contribute to or constitute what this potentiality is for" (2017, 461–62).

The following principle seems to be standing in the background of these considerations:

> **Dependence**: Necessarily (and at every time *t*), if something has a potentiality concerning *o* (at *t*), then *o* exists (at *t*).

Not everyone accepts **Dependence**. One radical view that violates **Dependence** is that necessarily every object necessarily can be singled out even if it does not exist. If Vetter could necessarily be singled out, there would be no need for her to constitute potentialities about her. One prominent instance of this view is Alvin Plantinga's claim that necessarily, for every object, necessarily there is an individual haecceity that allows to single out, or track this object (see, e.g., Plantinga 1983, 1974). I set this view aside in what follows, for it does not fit the potentialist's actualist inclinations better than simply adopting necessitism and its tenability is far from uncontroversial.[2]

One might think, however, that **Dependence** is too strong even after this radical proposal is set apart. Take the following case as it is described by Williamson:

> Imagine a factory where knives are assembled by a machine which fits together a blade from one belt and a handle from another. The blades are uniform in shape; so are the handles. The machine actually fitted blade B to handle H to form a knife K and blade B* to handle H* to

[2]See, e.g., Williamson (2013, ch. 6) and Fine (1985) for arguments against Plantinga's view.

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> form a knife K*. However, if the blade belt had been delayed by one second, the machine would have fitted blade B to handle H*, to form a knife distinct from K, K* and anything else actually in space and time. Perhaps there is only one merely possible knife that could have been formed from B and H* in just such circumstances. If so, our description "possible knife that would have been assembled from blade B and handle H* had the blade belt been delayed by one second" uniquely identifies a merely possible inhabitant of space and time. (2013, 21)

In such a case, it might be plausible to claim that the spare handle and the spare blade jointly have the potentiality for the merely possible knife to cut some bread, although the merely possible knife does not exist. Still, this seems to be an exceptional case where we can directly provide a sufficient condition for the existence of a merely possible object (blade B and handle H* are put together). Things seem to stand differently with respect to Vetter's possible nonexistence. As Leech rightly remarks, "sufficiency of origin claims in such cases [like the one concerning Vetter's existence] are very implausible" (2017, 462). Not only can "two particular gametes (…) create more than one individual in the future"(462), it is also an incidental feature of the discussed example that it concerns the existence of a person (or even an organism). It seems hard to defend the claim that there necessarily are sufficient conditions for the existence of every actually existing entity. For this reason, I will ignore potential counterexamples to **Dependence** in what follows (but see some remarks in the next section).

If we accept **Dependence**, then we get the result that Vetter contributes to the potentiality that Vetter does not exist, although she herself does not possess this potentiality (for no object can possess a potentiality to never have existed). We hence get the following situation: an object *a* can have a potentiality for an object *b* to not exist to which *b* contributes (or that *b* helps to constitute), although *a* and *b* do not jointly have the potentiality for *b* not to exist. This requires a novel approach to the extrinsic/intrinsic distinction for potentialities. Vetter's original account of the distinction has it that *a* possesses the extrinsic potentiality to be such that *b* does not exist in virtue of an intrinsic joint potentiality of *a* and some further objects *xx* to be such that *b* does not exist (see Vetter 2015, 31). However, for the joint potentiality to not be extrinsic, *b would* have to be among the *xx*. Assuming this, however, contradicts the assumption that nothing can have a potentiality to not exist (see also Kimpton-Nye [2018, 127] for discussion of this point).

At this point, the distinction between the objects that *constitute* a potentiality and the objects that *possess* a potentiality should be clarified. The possessors of a potentiality will be assumed to also help to constitute it, but as the previous paragraph has shown, not all objects that help to constitute a potentiality (for it to be the case) that *p* are such that they are possessors of an (individual or joint) potentiality that *p*. Differently put, I will assume that the objects that possess a given potentiality are a (proper or improper) subplurality of the objects that constitute it. If one accepts a notion of *aboutness* that allows to say which objects a proposition $\langle p \rangle$ (the proposition expressed by "*p*") is about, then the following working definition of what it is for some objects to fully constitute a potentiality is available: the set of objects that together fully constitute a potentiality that *p* are the union of the set of objects that possess this potentiality and the set of objects $\langle p \rangle$ is about. For an object to help to constitute a potentiality is for it to be among a plurality of objects that fully constitute the potentiality.

Revisiting the extrinsic/intrinsic distinction, a natural proposal seems to be the following: The *xx* possess an intrinsic potentiality that *p* just in case the *xx possess and fully constitute* a potentiality that *p*. If further objects beyond those among the possessors *xx* are needed to (fully) constitute the potentiality, then it is extrinsic. Given that no object can possess a potentiality to never have existed, this yields the result that if *b* is needed to constitute the potentiality that *b* never has existed, then this potentiality is not possessed intrinsically by any objects.

Against the backdrop of these clarifications, I will discuss an argument to the conclusion that the *B*-axiom and the 5-axiom characteristic of S5 fail to hold. In this paper, I will grant the potentialist

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that the logic for metaphysical modality their proposal yields is normal and includes the *T*-axiom and the 4-axiom.[3]

2. The argument against S5

Kimpton-Nye (2021) defends the claim that potentialism can validate S5. To do so, he (among other things) rebuts two arguments against this claim. These arguments are shown to fail in Kimpton-Nye (2021). Kimpton-Nye uses this result to defend the claim that potentialists can have an S5 modal logic. I show that a modified version of one of the argument Kimpton-Nye rebuts is immune to his criticism. I will start by presenting Kimpton-Nye's argument and his response, because this allows us to see why the modified argument I will present afterwards is immune to his response. The relation of my argument to Kimpton-Nye's is as follows: although I agree with Kimpton-Nye that potentialists can have an S5 modal logic, we disagree about how they can achieve this aim. Getting an S5 modal logic is not as easy as Kimpton-Nye (and presumably Vetter) think and it requires tweaking the way we understand modal formulas in potentialist terms (as will be discussed in section 3).

Here is Kimpton-Nye's argument, which I dub '**Counterfactual Argument**':[4]

(i) Vetter exists. (Assumption)
(ii) It is possible that Vetter doesn't (never has, never will) exist. (Assumption)
(iii) If Vetter had not existed, there would have been no potentiality for Vetter's existence. (From **Dependence**)
(iv) If there were no potentiality for Vetter's existence and Vetter didn't exist, then it would not have been possible that Vetter exists. (From **Potentialism**)
(v) If Vetter had not existed, it would not have been possible that Vetter exists. (From [iii] and [iv])
(vi) It is not necessarily possible that Vetter exists. (From [ii] and [v])
(Conclusion) Vetter exists and it is not necessarily possible that Vetter exists. (From [i] and [vi])

(Conclusion) immediately provides us with the result that the *B*-axiom fails. The *B*-axiom is an axiom of the system S5. It says that whatever is the case is necessarily possible. A counterexample to the *B*-axiom is a proposition that is true without being necessarily possible. (Conclusion) says that the proposition that Vetter exists constitutes such a counterexample.

Using the *T*-axiom, which says that everything that is the case is possibly the case, we can also conclude that possibly Vetter exists and that it is not necessarily possible that Vetter exists. This gives us a counterexample against the 5-axiom.

According to Kimpton-Nye, the crucial step in this argument is the inference from (ii) and (v) to (vi). He suggests that "the purported counterexample to S5 can be resisted so long as we deny that the counterfactual *if [Vetter] had not existed, it would not have been possible that [Vetter] exists* implies that it is not necessarily possible that [Vetter] exists, and so long as we resist the temptation to think about modality in terms of possible worlds" (Kimpton-Nye 2021, 354; emphasis in the original). Given (ii), this requires an account of counterfactuals that allows for counterfactuals that are true, have a possible antecedent, and have an impossible consequent. Kimpton-Nye readily admits that the possible-world account of counterfactuals presented (in slightly different forms) by Robert Stalnaker (1968) and David Lewis (1973) does not allow this. Still, he maintains that the potentialist who avoids to think of modality in terms of possible world could perhaps give "(v) and its ilk […] an epistemic (or anti-realist) reading" (Kimpton-Nye 2021, 352) that allows to uphold (ii) and (v) whilst denying (vi).

[3]For Vetter's discussions and defence of the *T*-axiom, see Vetter (2015, sec. 5.7.4). For the 4-axiom see Vetter (2015, sec. 5.9).
[4]See Kimpton-Nye (2021, 350–51). I kept the names of the premises and changed the example to align it with Leech's.

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There is no need to decide in this context how plausible this response to the **Counterfactual Argument** is, because it is of no help in dealing with the following novel, structurally similar argument. The following argument modifies the **Counterfactual Argument** by substituting counterfactual conditionals with strict conditionals. Please note that the premises and intermediate conclusions that occur in both the previous and the following argument have kept their names. When they changed, I indicated this by using capital letters. Here is the **Strict Argument**:

(i) Vetter exists. (Assumption)
(ii) It is possible that Vetter doesn't (never has, never will) exist. (Assumption)
(III) Necessarily, if Vetter does not exist, then there is no potentiality for Vetter's existence. (from **Dependence**)
(IV) Necessarily, if there is no potentiality for Vetter's existence, then it is not possible that Vetter exists. (From **Potentialism**)
(V) Necessarily, if Vetter does not exist, then it is not possible that Vetter exists. (From [III] and [IV])
(vi) It is not necessarily possible that Vetter exists. (From [ii] and [V])
(Conclusion) Vetter exists and it is not necessarily possible that Vetter exists. (From [i] and [vi])

The argument is valid in every normal modal logic (i.e, in every modal logic that contains every propositional tautology, every instance of the *K*-axiom, and that is closed under modus ponens and the necessitation rule), as I will show in an appendix. Given the validity of the argument, there is no way to accept (ii) and (V) and to deny (vi) without denying that the logic of metaphysical modality is normal. S5 is a normal modal logic, so denying this amounts to giving up that potentialism validates S5.

Premises (i) and (ii) seem to be beyond doubt, given that the potentialist wishes to deny the thesis that everything necessarily exists. As already indicated, I will ignore the option of subscribing to necessitism for the purpose of this paper.

If **Dependence** is accepted, then (III) cannot be denied: The proposition that Vetter does not exist clearly is a proposition concerning Vetter. **Dependence** says that necessarily, nothing can have a potentiality for a proposition about Vetter to be true if Vetter does not exist.

At this point, some potentialists who aim at rescuing S5 might wish to revisit **Dependence**, for there are not many other premises left to deny. However, (ii) and (III) could be combined and weakened to

(II*) Possibly, Vetter does not exist and there is no potentiality for Vetter's existence.

If you insist that possibly something can have a potentiality for Vetter to exist although Vetter does not exist, then the possibility you envisage will be one including many actual objects like, e.g., Vetter's parents. The defender of (II*) can grant you this possibility and still uphold that possibly evolution took a completely different path after a small change in the primordial soup, leading to a world without Vetter in which nothing has a potentiality for her existence.[5] This would be enough to establish (II*). (II*) and (IV) yield: Possibly, Vetter does not exist and it is not possible that Vetter exists. This directly yields the result that it is possibly not possible that Vetter exists, which is equivalent to (vi). This shows that counterexamples against **Dependence** do not help to undermine the force of the argument. What would be needed is an argument to the conclusion that (II*) fails.

The only remaining premise is (IV). Premise (IV) is crucial for **Strict Argument** and it also plays an indispensable role in the weakened argument discussed in the last paragraph. Prima facie, it seems hard to deny: **Potentialism** is not meant to be a claim about the actual relation between potentiality

[5]This remark is inspired by Leech's rhetorical question "Surely there's no hope of finding a sufficient origin for Vetter in the primordial soup, or in the moments after the Big Bang?" (2017, 462).

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and possibility; it is meant to be a modally robust claim about possibility and potentiality that allows to account for possibility in terms of potentiality. It seems hence plausible to assume that potentialists will wish to hold that necessarily it is possible that *p* just in case some things have a potentiality that *p*.

Nevertheless, I will argue in the next section that premise (IV) can be denied while **Potentialism** can be upheld.

3. Hyperactualist potentialism

Before I argue that there is a way for the potentialist to deny premise (IV) and uphold **Potentialism**, I would like to mention that there are arguments parallel to **Strict Argument** that target other actualist proposals in the metaphysics of modality. In particular, David Armstrong accepts that his combinatorial theory of possibilities does not validate an S5 modal logic, because he holds that the actually existing states of affairs that are needed to account for some possibilities do not necessarily exist (see 1989, 62–63). Some of the possible worlds that can be constructed from the material of the actual world are impoverished and, from their perspective, certain possibilities do not exist. More recently, Trevor Teitel (2019) has argued that essentialists who wish to ground metaphysical modality in the essences of contingently existing objects arrive at a logic for metaphysical modality that does not include the axioms 4 (which says that whatever is necessary is necessarily necessary) and *B*. The problem he points to is that it is a contingent matter which objects there are to ground necessities in.[6]

There are also extant proposals in the literature on how Armstrongian combinatorialists and essentialists can save an S5 modal logic. Henry Taylor (2019) has recently made the case that combinatorialists can motivate making use of actual entities when answering the question which possibilities there are at nonactual worlds and I have argued in Werner (2021) that essentialists can uphold that truths are necessarily necessary although it is not the case that necessarily there are some objects to which their truth is essential. I should mention that the argument discussed in the last section and the proposal for a reading of potentialism that validates an S5 modal logic have many parallels to the exchange between Teitel and me.

My case for an S5-friendly potentialism will proceed as follows: I will start by presenting what I take to be the most straightforward way to apply the core idea of potentialism to generate the potentialist readings of modal formulas (section 3.a). This reading will generate counterexamples to the *B*-axiom, as the argument discussed in the last section predicts. Afterwards, I will present my tweaked proposal for a potentialist reading of modal formulas, argue that it allows to resist the **Strict Argument**, and make a positive case that it validates an S5 modal logic (section 3.b). Finally, I will argue that this proposal is consistent with **Potentialism** given that it is accepted that it is a contingent matter which propositions there are (section 3.c).

3.a The ordinary reading

For the following discussion, I will use '*xx*' as a plural objectual variable and '◆' as a binary connective that takes a plural objectual variable as its first argument (notated as its subscript) and a sentence as its second argument such that '$\blacklozenge_{xx}p$' is interpreted as 'the *xx* have (had or will have) an iterated or noniterated potentiality that *p*.'

With this notation in place, I turn to the following question: What is the potentialist reading of a modal formula? The most straightforward way to apply **Potentialism** seems to suggest the following two-step procedure: in the first step, use the duality between possibility and necessity to transform the modal formula Φ into an equivalent formula that does not involve any necessity-

[6]The reason that potentialists and Armstrongian combinatorialists only have problems with the 5-axiom and the *B*-axiom, whereas essentialists also have trouble with the 4-axiom is due to potentialism and combinatorialism being possibility-first accounts and essentialism being a necessity-first account. Roughly and picturesquely put, essentialists are in danger of losing necessities across modal space, whereas combinatorialists and potentialists are in danger of losing possibilities.

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operators. In a second step, replace every possibility-operator with an instance of the schema '$\exists\chi\chi\blacklozenge_{\chi\chi}$' such that the plural variable that replaces the schematic '$\chi\chi$' does not occur in Φ and is not used in more than one instances of the schema.[7] For example, this yields

$$(\Box\Diamond)\ \neg\exists xx\blacklozenge_{xx}\neg\exists yy\blacklozenge_{yy}p$$

as the potentialist reading of '$\Box\Diamond p$.' The steps can also be reversed to arrive at a modal formula by replacing instances of '$\exists\chi\chi\blacklozenge_{\chi\chi}$' with '$\Diamond$.'

Let p stand for the true proposition that Vetter exists. Assume that Vetter possibly not exists. This gives us $\Diamond\neg p$. According to **Dependence**, we get the result that possibly nothing has a potentiality for Vetter to exist. This yields $\Diamond\neg\exists xx\blacklozenge_{xx}p$. Using the procedure just introduced, we can substitute '$\exists xx\blacklozenge_{xx}$' with '$\Diamond$' to receive $\Diamond\neg\Diamond p$. We assumed p, so we get $p\wedge\neg\Box\Diamond p$, which is equivalent to $\neg(p\rightarrow\Box\Diamond p)$. The introduced procedure leads to the result that there is a counterexample to the *B*-axiom, as the conclusion of **Strict Argument** says.

3.b The hyperactualist reading

This subsection presents a further way to generate the potentialist reading of a modal formula. It has two significant differences to the ordinary reading presented in section 3.a. First and foremost, the quantifiers that are introduced during the translation of a modal formula Φ into a potentialist formula Φ' will be assumed to range over the objects that exist at the context of evaluation of Φ'. Given that we wish to actually evaluate modal and potentialist formulas, this is tantamount to assuming that the quantifiers introduced during the translation quantify over the actual objects. Let '$\exists_0$' stand for a an *embedding resistant quantifier* that is such that if it occurs in a formula Φ, then it quantifies over the objects that exist at the context of evaluation of Φ, independent of whether the quantifier is embedded under any modal, potentialist, or other intensional operators. For example, if actually evaluated, '$\Diamond\exists_0 xFx$' says that possibly an actual object is F (and is hence equivalent to '$\exists x\Diamond Fx$'). In contrast, '$\Diamond\exists xFx$' says that possibly there is an object that is F. To give a potentialist example, '$\exists_0 xx\blacklozenge_{xx}\exists_0 yy\blacklozenge_{yy}p$' says that some (actual) objects have a potentiality for some of the actual objects to have the potentiality that p. In contrast, '$\exists xx\blacklozenge_{xx}\exists yy\blacklozenge_{yy}p$' says that there are some objects that have the potentiality for there to be some objects that have the potentiality that p. What the embedding resistant quantifier does can be expressed using many Vlach store-and-retrieve operators $\uparrow_n$ and $\downarrow_n$ as they are described by Fabrice Correia (2007). Metaphorically speaking, $\uparrow_n$ stores the world of evaluation at the nth position of a list and $\downarrow_n$ retrieves the world stored at the nth position of the list. Differently put, $\downarrow_n$ exempts what follows it from the scope of the modal operators that occur after the previous occurrence of $\uparrow_n$.[8] Now we can make the quantifiers in a potentialist formula Φ embedding resistant by (i) putting an instance of '$\uparrow_1$' at the beginning of the formula (which stores the context at which Φ is evaluated) and (ii) replacing every instance of '$\exists\chi\chi$' with '$\uparrow_2\downarrow_1\exists\chi\chi\downarrow_2$.' Whenever we come to an existential quantifier, we store the modal cotext at which we are at position 2, briefly go to the world at which Φ is evaluated (which we stored at position 1), do the quantification, and retrieve the context we stored at position 2.

It should be noted that for my aim, it is only relevant that the actual objects are quantified over in embedded contexts, not that no further objects are quantified over. Hence, a salient alternative to quantifying over the actual objects in every context (as I suggest) is to cumulatively quantify over the actual objects together with further objects that one encounters as one moves through modal space. This idea has been made precise by Teitel in the context of the reduction of modality to essence (see Teitel 2019, sec. 4.4), who calls it a "cumulative reduction." The resulting cumulative picture would

[7]To achieve a unique translation, one can stipulate a canonical ordering of the plural variables and use the variables in the canonical order, leaving out variables already occurring in Φ.

[8]See Williamson (2010, 685) for a similar gloss and Vlach (1973) for the introduction of these operators.

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be less attractive, however. In addition to potential qualms concerning quantification over non-actual objects, the cumulative picture is unnecessarily contextual, for it does not allow to uniformly resolve the meaning of the $\Diamond$-operator. What a $\Diamond$-operator means would be dependent on the number of further modal operators it is embedded in.[9]

The second difference to the ordinary reading is that quantification over objects that (fully) constitute a potentiality will take place—not only over those who possess the potentiality. In the first section, I introduced the distinction between the objects that possess a potentiality and those that constitute it. I assumed that the objects that possess a potentiality also help to constitute it, but not vice versa. To reiterate the motivating example: Vetter helps to (and is needed to) constitute the potentiality for her to not exists, but she does not possess it. Let '$\blacklozenge^{+}_{xx}p$' say that the *xx* constitute the potentiality that *p*. This means that (a) some *yy* among the *xx* are such that they possess the potentiality that *p* and that (b) the other objects among the *xx* (if there are any) are further objects needed to constitute the potentiality. Plausibly it is necessary that '$\exists xx\blacklozenge^{+}_{xx}p$' holds just in case '$\exists xx\blacklozenge_{xx}p$' holds (necessarily, every possessed potentiality is constituted). Still, the subtle difference between the objects that constitute and those that possess a disposition will be relevant in what follows.

With this notation in place, I provide the following method for giving the hyperactualist reading of a modal formula Φ: in the first step, use the duality between possibility and necessity to transform the modal formula Φ into an equivalent formula that does not involve any necessity-operators. In a second step, replace every possibility-operator with an instance of the schema '$\exists_0\chi\chi\blacklozenge^{+}_{\chi\chi}$' such that no plural variable that instantiates the schematic plural variable '$\chi\chi$' occurs in Φ and is used in more than one instances of the schema. For example, this yields

$$(@\Box\Diamond)\neg\exists_0 xx\blacklozenge^{+}_{xx}\neg\exists_0 yy\blacklozenge^{+}_{yy}p$$

as the potentialist reading of '$\Box\Diamond p$.' In words, according to the hyperactualist reading, for a truth to actually be necessarily possible is for there to not be any (actual) objects that constitute a potentiality for no actual objects to constitute a potentiality that *p*.

Given the hyperactualist reading, the claim that potentialism validates the 5-axiom can hence be put as follows: If some *xx* constitute a potentiality that *p*, then no *yy* constitute a potentiality that none of the actual objects constitute a potentiality that *p*. It is this feature of the hyperactualist reading that allows to deny premise (IV) of **Strict Argument**. Only what the actual objects are like and which potentialities there are for them to be different is relevant to what is necessarily possible. This leaves open that a proposition is necessarily possible although possibly there are no objects that have a potentiality for it to be true.

However, this only shows that premise (IV) of **Strict Argument** can be denied by proponents of the hyperactualist reading. A positive argument to the conclusion that $\neg\exists_0 xx\blacklozenge^{+}_{xx}\neg\exists_0 yy\blacklozenge^{+}_{yy}p$ holds for all possible *p* is still lacking. Such an argument is needed to justify the claim that potentialism yields an S5 modal logic when the hyperactualist reading is assumed.

Whether potentialism yields an S5 modal logic depends on metaphysical assumptions that go beyond the question how potentialism is spelled out (a point that is also acknowledged in Vetter (2015, 213). The hyperactualist reading guarantees an S5 modal logic when combined with two reasonable auxiliary assumptions, or so I will argue.

Here are two assumptions that are sufficient for the present aim:

> **Triviality Thesis:** Nothing has a potentiality at some point in time *t* for the state of the world at any $t' \leq t$ (i.e, at any point in time t' before or identical to *t*) to be different from what it is like at t'.

[9]See Teitel (2019, 63–64) and Werner (2021, 1293) for similar points concerning essence.

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Stability Thesis: Necessarily, if at t some things have a potentiality that p, then at every time $t' < t$ some objects have a potentiality that p.

Talk about the state of the world at a time (as it occurs in the **Triviality Thesis**) is often used in philosophy (see, e.g., van Inwagen [1975] for a prominent example). As usual, I understand it such that the state of the world at t does not include truths about the future of t (e.g., being such that there will be someone walking on the moon in two hundred years is not part of the state of the world in 1768). I also understand the state of the world at t as only concerning objects that are present at t. Here is why this might be important: Vetter suggests accepting strong eternalism—the thesis that "it is always true that everything is always something" (2015, 293). According to the strong eternalist, in 1800 Vetter already existed. Still, potentialists should like to allow that later than 1800 something had a potentiality for Vetter to not exist.

The **Triviality Thesis** is argued for by Vetter, who argues that "we have no potentialities for the past to have been different, though we have potentialities for the past to have been just as it was" (2015, 189) and it is defended by Kimpton-Nye (2021, 355).

The potentialist has to accept the **Stability Thesis** if they wish to uphold that whatever is possible at some point in time has always been possible (a claim that is forcefully defended in Dorr and Goodman [2020]). More specific to potentialism, Kimpton-Nye argues that if objects in the past did not have an iterated potentiality for the further potentiality P to come into existence, then it would be "a mystery why P should just pop into existence" (2021, 355).[10]

Now, if there is a first moment of the universe, then the **Triviality Thesis** yields that nothing ever has a potentiality for the state of the world at the beginning of time to be different. Accordingly, given **Potentialism**, the state of the world at the beginning of time is necessary.[11] If there is no first moment of the universe, then we still get the result that necessarily, the state of the world is identical to the actual state of the world up to some branching point in the past. Here is why: the **Triviality Thesis** gives us that at no time t does anything have a potentiality for the state of the world to be different at any time $t' < t$. Consequently, there never is a potentiality for the entire history of the world to be different from actuality, there are only potentialities for the world to be different from a point of departure onwards. This is compatible with no time being such that the state of the world at this time is necessary, there might be no earliest possible point of departure. Still, there necessarily is a point of departure.

How does this give us $(@\Box\Diamond)$? Here the **Stability Thesis** comes into play. It guarantees that if some things have a potentiality that p at some point in time t, then at every $t' < t$, something has a potentiality that p.[12] Together with the claim that nothing has a potentiality to change the state of the world at all times in the past, we get the result that nothing has a potentiality to remove all potentialities that p. This is exactly what we need to get $(@\Box\Diamond)$.[13] It is an interesting disanalogy to the dialectics with respect to essentialism that no essentialist principles akin to the **Triviality Thesis** and the **Stability Thesis** have been discussed. The main reason for this disanalogy seems to be that it is generally accepted that essences are immutable and necessary, whereas it is widely held that things can change their potentialities.

[10]Kimpton-Nye takes the objects in the past to be the object that exist at the beginning of the universe. I will show that commitment to there being a beginning of the universe can be avoided.

[11]The claim that there is such a necessary state of the world at the beginning of time is tentatively endorsed by Vetter (2015, 212–13) and defended by Kimpton-Nye (2021, sec. 6), who calls it the "NEC-story."

[12]Here I follow Vetter in assuming strong eternalism, which gives us the result that all objects needed to constitute present potentialities always existed. It might be debated whether strong eternalism is compatible with the spirit of potentialism and whether potentialists can do without it, a question that cannot be settled in the context of this paper (see Vetter [2015, sec. 7.9] for some discussion).

[13]Interestingly, if we believe that there is a first moment in time such that nothing ever has a potentiality to change that state of the world at this point in time, we get the stronger claim $\exists yy\neg\exists xx\Diamond^{+}_{xx}\neg\Diamond^{+}_{yy}p$, i.e., the claim that we can provide objects that cannot fail to constitute a potentiality that p.

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At this point, some clarification is in order. Someone might object that clearly some objects *xx* have a potentiality for any objects *yy* that actually constitute the potentiality that Vetter exists to not constitute this potentiality. They might hold that the *xx* have a potentiality for some among the *yy* to not exist and that if the *yy* did not all exist, then they would not constitute the potentiality that Vetter exists. This objection can be rebutted by clarifying that for some objects to be such that they do not constitute a given potentiality, they have to be a certain way, namely such that they do not constitute the given potentiality (and that for to be a certain way they have to exist). '$\neg\exists_0 xx\blacklozenge^+_{xx}\neg\exists_0 yy\blacklozenge^+_{yy}p$' is to be read as saying that nothing has a potentiality for every plurality of actual objects to be a certain way—namely such that the objects among it fail to constitute the given potentiality.[14] This can be motivated by arguing (as I will in the next subsection) that the objects needed to constitute a potentiality that *p* are also needed for the proposition that *p* to exist. The intended reading of '$\neg\exists_0 xx\blacklozenge^+_{xx}\neg\exists_0 yy\blacklozenge^+_{yy}p$' yields that no possible proposition can be turned into an impossible proposition, which gives us a legitimate reading of the claim that the possible cannot be impossible.

It should be clear by now why it is a central ingredient of the hyperactualist reading that quantification over all objects that constitute a potentiality takes place (i.e, why I used the $\blacklozenge^+$-operator rather than the $\blacklozenge$-operator). To elucidate this by means of an example, assume once more that Vetter necessarily helps to constitute, but never possesses the potentiality for her to never have existed. Plausibly there are some objects that have a potentiality for this potentiality to never be possessed by ensuring that Vetter never comes into existence. However, there is no potentiality for changing the objects in every plurality that constitutes the potentiality that Vetter does not exist (and that hence includes Vetter) in a way that it does not constitute this potentiality any more.

This shows that there are independently plausible assumptions endorsed by Vetter and other defenders of potentialism that, when added to the hyperactualist reading, guarantee that the logic of metaphysical modality is S5.[15]

What is the dialectical relevance of the hyperactualist reading and the result that it enables the potentialist to defend an S5-modal logic? One might think that just presenting some way to transform modal formulas into potentialist formulas that can lead to a picture on which S5 is validated does not show much. To make the hyperactualist reading dialectically relevant, it has to be shown that it is compatible with both the spirit of potentialism and with the core claim of potentialism. If this is shown, then the hyperactualist reading becomes an attractive option for those potentialists who wish to uphold that the modal logic is S5.

The hyperactualist reading seems to be in line with the actualist spirit of potentialism. It allows to translate every modal formula into a formula about actual objects and the potentialities they have. Figuratively speaking, no looking past actuality is needed to account for modality.

However, it seems prima facie questionable whether the hyperactualist reading is consistent with the modal robustness of the core claim of potentialism. In the next subsection, I will argue that it is, given the assumption of higher-order contingentism. I will furthermore show that assuming higher-order contingentism is plausible in the given dialectical context.

3.c Hyperactualism and higher-order contingentism

I take potentialism to be a modally robust thesis about potentiality and possibility. Plausibly, if it holds, then it necessarily holds.[16] One might take this to give rise to the following objection. The

[14]A similar move is often made with respect to the essences of contingently existing things. Socrates cannot fail to be a person. Still, it is possible that Socrates does not exist and necessarily, every thing that is a person exists.

[15]This is not to say, however, that the assumptions are beyond doubt. The **Triviality Thesis**, for instance, might have the problem that it leads to the unwelcome result that every truth is necessary when combined with determinism and further auxiliary assumptions (see Vetter and Busse [2022] for discussion). Accordingly, the assumptions should be counted as a further commitment that the potentialist incurs when they wish to uphold an S5 modal logic.

[16]For the analogous claim with respect to essence see Teitel (2019, 46).

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modal robustness of potentialism forces us to accept: for every proposition $\langle p \rangle$ (i.e, the proposition that p), necessarily, it is possible that p *just* in case some things have a potentiality that p. If we allow for quantification into sentence-position, this can be put more formally as follows:

$$(\Box Pot)\ \forall p \Box(\Diamond p \leftrightarrow \exists_{xx} \blacklozenge_{xx} p)$$

The hyperactualist reading of potentialism does not validate $(\Box Pot)$. According to the hyperactualist reading, there possibly not being any objects that have a potentiality for Vetter to not exist is consistent with Vetter necessarily possibly not existing. The reason is that according to the hyperactualist reading, the necessary possibility of a proposition has to do with the question which potentialities there are for actual objects to have different potentialities, not with the question which objects might fail to exist. Consequently, so the objection goes, the hyperactualist reading of potentialism fails to yield the modal robustness of potentialism.

In the remainder of this section, I will address this objection. I will argue that if higher-order contingentism is assumed, then the modal robustness of potentialism can be combined with giving up $(\Box Pot)$. Higher-order contingentism is the thesis that some properties and propositions contingently exist (see, e.g., Fritz and Goodman 2016; Stalnaker 2011; Adams 1981).[17] A consideration in support of higher-order contingentism is analogous to the consideration that supports **Dependence**: propositions about (or properties concerning) objects depend for their existence on these objects; the objects are, to speak with Leech, needed to contribute to or constitute the proposition/property (see Leech 2017, 461f; and section 1 of this paper). This consideration is surely defeasible (and it is famously opposed by Plantinga [1983]), but those who like the spirit of potentialism and wish to locate modality in actual objects will likely also feel drawn to the idea that there cannot be a proposition about, say, Vetter if Vetter does not exist.

Higher-order contingentists should distinguish between a *de re* and a *de dicto* reading of the modally robust core claim of potentialism. According to the *de re* reading, every proposition $\langle p \rangle$ is necessarily such that it is possible iff something has a potentiality that p. According to the *de dicto* reading, necessarily, every proposition $\langle p \rangle$ is possible iff there is a potentiality that p. $(\Box Pot)$ expresses the biconditional that results from the *de re* reading of the robustness of the core claim of potentialism. The *de dicto* version, in contrast, can be put as follows:

$$(\Box \forall Pot)\ \Box \forall p(\Diamond p \leftrightarrow \exists_{xx} \blacklozenge_{xx} p)$$

Higher-order contingentists hold that it is a contingent matter which semantic values for sentences there are. Accordingly, there is room for higher-order contingentists to hold that $(\Box Pot)$ fails whereas $(\Box \forall Pot)$ holds. An analogous structure arises with respect to the reduction of modality to essence and the distinction between a *de re* and a *de dicto* reading of essentialism plays a crucial role in my response to Teitel (2019) in Werner (2021).

In the remainder of this section, I will argue for two claims. First, I will argue that the combination of higher-order contingentism and the hyperactualist reading of potentialism validates $(\Box \forall Pot)$. Second, I will argue that, given higher-order contingentism, $(\Box \forall Pot)$ is the more plausible reading of the robustness of the core claim of potentialism than $(\Box Pot)$. This will establish that the combination of higher-order contingentism and the hyperactualist reading of potentialism can do justice to the robustness of the core claim of potentialism.

In what follows, I will argue that the hyperactualist reading validates $(\Box \forall Pot)$. To argue that the hyperactualist reading validates $(\Box \forall Pot)$, it has to be shown that necessarily, the possible propositions that exist are exactly those for which some things have a potentiality to be true.

[17] A more cautious formulation would be that higher-order contingentists take it to be contingent which semantic values there are for higher-order quantifiers to quantify over. This formulation avoids commitment to propositions and properties as first-order entities. For reasons of simplicity, I will continue talking in terms of propositions and properties.

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If you believe that it is a contingent truth that $\langle p \rangle$ exists, then you will plausibly take $\langle p \rangle$ to exist only if the objects $\langle p \rangle$ is about exist. At this point, the following *coordination-assumption* is needed: Necessarily, the objects that a possible proposition $\langle p \rangle$ is about exist if and only if some objects constitute a potentiality that *p*. From the considerations in the last section, we get that (given the necessity of the **Triviality Thesis** and the **Stability Thesis**) necessarily, if some objects constitute a potentiality that *p*, then necessarily, if these objects exist then they constitute a potentiality that *p*. We additionally need the claim that necessarily, the objects that constitute a potentiality that *p* exist if and only if the objects $\langle p \rangle$ is about exist. This is supported by the observation that the motivations for higher-order contingentism and for Leech's claim that, e.g., Vetter is needed for there to be potentialities for Vetter are analogous. As already mentioned above, both are based on considerations akin to **Dependence**. The objects $\langle p \rangle$ is about plausibly just are the objects that have to be added to objects that *possess* the potentiality that *p* to arrive at objects that *constitute* the potentiality that *p*.[18]

The next step is to argue that $(\Box\forall Pot)$ is the more plausible reading of the robustness of the core claim of potentialism than $(\Box Pot)$. We can formalise **Potentialism** as

$$\forall p(\exists xx\blacklozenge_{xx}p \leftrightarrow \Diamond p)$$

This should be read as the thesis that the possible propositions are those that are such that something has a potentiality for them to be true. If one takes **Potentialism** to be necessarily true, then one gets the claim that necessarily, the possible propositions are those that are such that something has a potentiality for them to be true. This just is the *de dicto* reading of the robustness of **Potentialism**. Taking **Potentialism** to be modally robust gives one $(\Box\forall Pot)$, but it does not give one $(\Box Pot)$.

Higher-order contingentism allows for upholding $(\Box\forall Pot)$ and denying $(\Box Pot)$. An opponent could try to argue that a higher-order contingentist who subscribes to $(\Box\forall Pot)$ should also accept $(\Box Pot)$. This would amount to demand that worlds in which propositions do not exist should still provide material concerning the modal status of these propositions. I find it hard to see why this should be a reasonable demand. To ultimately evaluate whether it is, a picturesque view of the structure of modal space that higher-order contingentism gives rise to might be helpful.

Higher-order contingentism yields the result that every world spans its own modal space, which worlds (possible or impossible) there are at the space spanned at *w* depends on which propositions there are at *w*. This becomes particularly clear if we take the (possible or impossible) worlds in the modal space spanned by *w* to be identical to classes of propositions that exist in *w*. $(\Box\forall Pot)$ demands that which of these worlds are possible from the perspective of *w* depends on the potentialities of the objects that exist in *w*.[19] Let *v* be a world that is in the modal space spanned by *w*, but that itself spans a modal space that does not include *w* (e.g., because in *w* there exists a proposition about Vetter and in *v* this proposition does not exist). $(\Box Pot)$ would demand that material from *v* allows to classify *w* as possible or impossible, although *w* is not in the modal space spanned by *v*. Metaphorically speaking, it requires *v* to make judgements about worlds of which it cannot know. $(\Box\forall Pot)$ only demands that the material we find at each world allows to classify the worlds in its own space.

This sketch hopefully helps clarify why the higher-order contingentist has a point in denying $(\Box Pot)$. To still insist on $(\Box Pot)$ would surely require further argument. I therefore conclude that the

[18]Note that this line of thought is also underwritten by the working-definition of what it is for objects to be constitutive of a potentiality given in the first section.

[19]The notion of a world *w* being possible from the perspective of a further world *v* can be made precise as follows: Let '[*w*]' stand for the proposition that is true at *w* and false at every other world. Now we can take *w* to be possible from the perspective of *v* iff '$\Diamond$[*w*]' is evaluated as true at *v*.

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combination of higher-order contingentism and the hyperactualist reading of potentialism can be reasonably claimed to do justice to the modal robustness of the core claim of potentialism.

Some might see the resulting situation as follows: both the ordinary reading and the hyperactualist reading are faithful to potentialism. One might argue that unless I provide independent compelling reasons for adopting an S5 modal logic, the simpler ordinary reading should be preferred. A general response goes as follows: given the initial plausibility of S5 (mentioned and discussed above), it is worthwhile to investigate whether there is a way for potentialism to yield an S5 modal logic. This paper shows there is such a way. A more example-driven response goes as follows: if the world developed such that Vetter's parents never met and Vetter never came into existence, it would have still been possible in a metaphysically relevant sense that they did meet and that Vetter came into existence. The ordinary reading does not allow for this possibility, because without Vetter there were no Vetter-concerning possibilities. The hyperactualist reading gives us the desired possibility of Vetter's existence in a world without Vetter. This is enough to warrant interest in it.

4. Conclusion

In this paper, I have shown that potentialists can have an S5 modal logic, although they cannot have it as easily as Vetter and Kimpton-Nye hold. I have presented a novel argument against the claim that potentialism is compatible with an S5-modal logic. I have then distinguished two readings of potentialism. The first reading is susceptible to the argument. The second reading allows to deny a crucial premise of the argument and it affords a way to be a potentialist and to hold that the logic of metaphysical modality is S5.

Taking a step back, this paper might be read as an advertisement for those who sympathise with contingentism, actualism, and an S5-modal logic to be uncompromising with respect to their contingentism and their actualism. They should not limit their contingentism to individuals, but extend it to properties and propositions. They should not limit their actualism to noniterated modalities, but embrace what I called hyperactualism. The hyperactualist assumes that even when it comes to evaluating a complex modal formula in which modal operators embed further modal operators, the truth of this formula only depends on actual objects and what they are like.

Acknowledgments. I wish to thank Vera Hoffmann-Kolss, Lisa Vogt, Tobias Wilsch, the members of the Neuchâtel Research Colloquium, and the members of the *eidos*-colloquium at the University of Geneva for their very helpful feedback. Referees of this journal provided me with excellent comments that led to significant improvements of this paper.

Supplementary materials. To view supplementary material for this article, please visit http://doi.org/10.1017/can.2023.2.

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Cite this article: Werner, J. 2022. Potentialism and S5. *Canadian Journal of Philosophy* 52: 622–635, doi:10.1017/can.2023.2