Potentiality, modality, and time

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Abstract: Barbara Vetter's project in *Potentiality* is to articulate and defend a dispositionalist theory of modality based on potentialities. My focus is on the metaphysics of her positive theory. I consider one of Vetter's main targets, David Lewis's theory of possible worlds, and use it to distinguish what I call "*de re* first" approaches from "*de dicto* first" approaches. This way of framing the disagreement helps shed light on what their respective accounts can intuitively accomplish. In particular, I introduce objections to Vetter's requirement that the grounds of *de dicto* modal truths must be routed through time. I also suggest an alternative *de dicto* first approach that Vetter does not consider, one which does not come saddled with Lewis's ontology or with Vetter's issues with *de dicto* modal truths. Rather, on incompatibilism, modality is grounded on second-order relations between (non-potentialist) properties, e.g. incompatibility or entailment. Defenders of *de dicto* first approaches, including incompatibilism, can better account for such *de dicto* modal truths, thus undermining some of the intuitive appeal of Vetter's theory.

Keywords: potentiality; modality; dispositions; possible worlds; properties; incompatibility.

> "Possible chicken means actual egg – plus actual sitting hen, or incubator, or what not".
> William James, *Pragmatism*

1. *Introduction to the project*

Barbara Vetter's project in *Potentiality* (2015) is to articulate and defend a dispositionalist theory of modality based on potentialities. Potentialities are properties of individual objects often expressed by terms in English such as "fragility" (the potentiality to break) and "irascibility" (the potentiality to get angry). Some potentialities are classified as dispositions; but whereas dispositional ascriptions are context-sensitive and vague – features of language, not the world – potentialities are properties belonging to the underlying metaphys-

ics. Vetter argues forcefully that potentiality is the more basic theoretical no-
tion, one that encompasses not only cases of dispositions, but also abilities and
powers. For Vetter, potentialities are (i) individuated by their manifestations
alone, and are (ii) linked to possibility. So whereas defenders of what she calls
the "standard conception" of dispositions typically base their theories of mo-
dality on counterfactual conditionals, Vetter bases hers on actual potentialities
of concrete individuals.

Vetter's defense of a potentiality-based modal theory is truly impressive. In
the course of developing this theory, she provides a novel logic and linguistic
semantics, something that few other defenders of modal theories even attempt.
I will have relatively little to say about these tasks. My focus will be on the
metaphysics of her positive theory.

I will say more about Vetter's theory of modality after further introducing
her notion of potentiality. I will consider one of Vetter's main targets, Lewis's
(1986) theory of possible worlds, and use it to distinguish what I call "*de re*
first" approaches from "*de dicto* first" approaches. This way of framing the
disagreement helps shed light on what their respective accounts can intuitively
accomplish. In particular, I will introduce objections to Vetter's theory's re-
quirement that the grounds of *de dicto* modal truths must be routed through
time.[1] I also suggest an alternative *de dicto* first approach that Vetter does not
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ing incompatibilism, can better account for such *de dicto* modal truths, thus
undermining some of the intuitive appeal of Vetter's theory.

2. *Potentiality and modality*

This section introduces the various pieces required to understand the role
of potentialities in Vetter's theory of modality, which is based on the following
principle:

POSSIBILITY: It is possible that $p =_{df}$ Something has an iterated potentiality for it to
be the case that p.[2]

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[1]   Note that following Vetter, I will make free use of grounding talk, in addition to the more tra-
ditional notion of reduction; see her 1.6.
[2]   For similar ideas, see especially Borghini and Williams (2008), Contessa (2010), and Pruss
(2002).

Potentialities come in degrees. Consider the disposition term "fragility", which is context-sensitive. In normal circumstances, we would consider a champagne glass to be fragile, and to be more fragile than a tumbler. Both in turn would be more fragile than a diamond, which is ordinarily not considered fragile at all. And between the tumbler and the diamond are cases where it is not clear whether we should say the object in question is fragile or not – that is, there will be vagueness in the cut-off point between fragile and non-fragile. But for Vetter, the source of context-sensitivity and vagueness is tied to language rather than the world. Metaphysically speaking, the champagne glass, tumbler, and diamond all share the potentiality to break, but they each possess this potentiality to a differing degree.

Potentialities may be possessed to the *maximal* degree. In such cases, if something has the potentiality to F, then it must F (and thus lacks the potentiality not to F). A massive object always attracts other massive objects – it could not do otherwise. Conversely, potentialities may be possessed to a very low degree. Anything that can break thereby has the potentiality to break, unlikely though this may be.

There are joint, extrinsic, and iterated potentialities. So far, we have only considered cases where an individual object has the potentiality to F. Vetter holds that we should also accept cases where some objects jointly have the potentiality to F. An example she uses throughout is of a key and the door that it unlocks. The key alone has the potentiality to open locks of a certain shape; the door alone has the potentiality to be opened by keys of a certain shape. Together, they have the potentiality to stand in the relation of opening – that is, they have the potentiality for the key to open the door. For another example, the people in a crowd have the potentiality to stampede, though no single one of them does alone. The manifestation of joint potentialities falls into one of three categories: a relation between individuals, a plural property, or an individual property.

Intrinsic potentialities are properties that are intrinsic to their bearers; likewise, intrinsic joint potentialities concern only the plurality of objects that possess them. In contrast, extrinsic potentialities concern objects extrinsic to their bearers. For instance, the key has an extrinsic potentiality to open a particular door. (However, interestingly enough, the key also has an intrinsic potentiality to open doors whose locks have a particular shape.) Vetter is liberal about the existence of extrinsic potentialities. She argues that anytime some objects possess a joint potentiality, each individual object possesses a corresponding extrinsic potentiality.[3]

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[3]   She also holds that any time an object possesses an extrinsic potentiality, the object together with other objects have a corresponding joint potentiality.

There are iterated potentialities: potentialities to acquire potentialities (which may themselves be potentialities to acquire potentialities, etc.). The addition of iterated potentialities allows the theory to extend its "reach", as Vetter puts it. Consider her case of the possibility that she plays the violin. Vetter currently does not have the ability to play the violin, but has the ability to learn how to play the violin; thus, she has an iterated ability to play the violin. This is a twice-iterated potentiality, in contrast with the once-iterated potentialities we have thus far been considering. Furthermore, some violin teacher has an ability to enter into a joint potentiality with Vetter for Vetter to learn to play the violin. This is a three-times iterated potentiality.

We now have enough theory in place to understand Vetter's modal principle POSSIBILITY. The basic picture is this. If p is possible, then there will be some objects which jointly have an (n-)iterated intrinsic potentiality for p.[4] The p in question may express a relation between the objects or an individual property of one of the objects. But as noted, any joint potentiality can be expressed as an extrinsic potentiality of an individual object, and thus POSSIBILITY should be extensionally adequate.

We have arrived at a theory of modality that locates the source of possibility claims in the properties of actually existing, concrete individuals, which will be appealing to many. Furthermore, what's possible has to do with the actual history of the universe and the different ways it could have unfolded. For something to have the potentiality to be such that p, that manifestation must lie in that thing's present or possible future. Vetter writes (2015: 186): "it is true of me now that I was once a child, but it would be odd to say that I now have a potentiality to have been a child". Thus, she holds that potentiality is "forward-looking" in time. I will discuss unintuitive consequences of the interaction of potentiality and time in section 4. But first, I'd like to consider some consequences of Vetter's theory of modality as contrasted with one of its main rivals, possible worlds theory.

3.   De re *first vs.* de dicto *first modality*

Vetter acknowledges opponents on two sides when it comes to modal theorizing: the possible worlds theorist and the traditional dispositionalist. On the one hand, she argues against dispositionalist theories of modality that begin with a purported link between dispositions and counterfactual conditionals.

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[4]   Notice that p is a proposition rather than a property. Vetter holds that this is an innocent construction for expressing manifestations, e.g. the potentiality for the door to open versus the potentiality that the door opens. See Vetter (2015: 104).

On the other hand, she argues against possible worlds theory, most notably modal realism as defended by Lewis (1986). In the remainder of this paper, I will argue that Vetter's view faces deeper problems than she recognizes. Furthermore, such problems are avoided not only by Lewis's view, but by another view that bases modality in actually existing properties. That there is conceptual space for this view is made clear by classifying views as "*de re* first" or "*de dicto* first"; the former ground all modal facts in *de re* modality, the latter in *de dicto* modality. This classification will be explained and explored in this section.

As Vetter notes, potentiality and dispositionality are among a cluster of related modal notions which include essence, counterfactuality, causation, and possibility (and its dual, necessity). She classifies potentiality as a "localized modality", as potentialities are properties of individuals, and should be construed formally as a predicate operator. In contrast, she classifies possibility as a "non-localized modality", one which need not concern particular individuals. Here, she is thinking of possibility construed formally as a one-place sentential operator.[5] Vetter differentiates her localized/non-localized distinction from the more familiar *de re*/*de dicto* distinction; while the latter applies to sentences, the former is "straightforwardly metaphysical" (3, footnote 3).[6] Furthermore, there are cases of *de re* possibility (or necessity) claims that are not potentiality (or essence, the dual of potentiality) claims.[7]

Nonetheless, in proceeding, I will frame the debate between Vetter and relevant opponents in terms of whether they are "*de re* first" or "*de dicto* first" views. While it is true that the *de re*/*de dicto* distinction is typically applied to sentences (or propositions), it is now generally understood by metaphysicians to capture a difference in the world as well: *de re* modality concerns the modal properties of particular individuals, whereas *de dicto* modality concerns purely general possibilities or necessities.[8] Potentialities are *de re* modal properties, even if not all *de re* modal claims correspond to potentiality claims.

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[5]   See her sections 1.1-2 for discussion. I will not take a stand on the proper formalism for expressing various modal notions (though Vetter does a thorough job of arguing that potentiality should be formalized as a predicate operator in her chapter 5). What matters is that Vetter rejects the well-known possible worlds framework for understanding the metaphysical basis of modal claims. Note that she is fine with using possible worlds talk for instrumental purposes; see her chapter 3.

[6]   A *de re* modal claim, when formalized in terms of sentential operators, is one where a modal operator either has a free variable or a name in its scope.

[7]   Vetter offers two examples: (i) while it is *de re* possible that she not exist, she does not thereby have a potentiality to not exist (such a possibility being instead grounded in potentialities of her parents) (194); and (ii) while it is necessary that Socrates belongs to his singleton set, it is not essential to him (3fn3).

[8]   See Nelson (2019) for an explanation of the more traditional syntactic or semantic distinctions, as well as the metaphysical one.

Lewis's modal realism is a *de dicto* first view. His concrete possible worlds ground possibility claims via this biconditional: It's possible that *p* if and only if there exists a possible world in which *p*. But this is only the start of a systematic reduction of the notion of possibility. The biconditional straightforwardly holds for *de dicto* modal claims – but Lewis also needs a way to make sense of *de re* modal claims, since individuals are worldbound on his view. His solution is counterpart theory. According to counterpart theory, a *de re* modal claim like "I could have had a sister" are true in virtue of my having a counterpart in some world that has a sister. This counterpart is relevantly similar to me, where what counts as relevantly similar is supplied by context. *De re* modality is thus reduced to *de dicto* modality on Lewis's view.

Vetter, in turn, wants to base possibility in the dispositional properties of actually existing objects. The right-hand side of POSSIBILITY is a *de re* modal claim; it is hence easy to see how Vetter accounts for *de re* possibility claims. But there aren't many places in her book where Vetter explicitly, directly addresses the question of how to ground *de dicto* possibility claims. In her section 6.2, she briefly considers three cases of *de dicto* possibilities (202):

(1)   It is possible that there is a woman president of the US.
(2)   It is possible that there be a human space station on Mars.
(3)   It is possible that humans should have three legs instead of two.

POSSIBILITY requires a witness for any possibility claim: for *p* to be possible, some individual in the history of the world (past to present) must have an iterated potentiality for it to be case that *p*. Any woman who at any point had the potentiality to be president of the US is thereby is a witness for (1). A witness for (2) is any engineer who at any point had the potentiality to be among a team that builds a human space station on Mars; this potentiality will be extrinsic and based on a joint potentiality of the entire team. The tricky case is (3). To find a witness, says Vetter, we have to look at our pre-human ancestors, who had an iterated potentiality to have offspring that is human. If such pre-human ancestors also had an iterated potentiality to have offspring that is human and three-legged, then we have found witnesses for (3). Thus, Vetter's theory locates the source of this *de dicto* possibility in the *de re* by "rewinding" time and looking at the potentialities of our ancestors. Similar considerations hold for the possibility of there being talking donkeys, unicorns, etc.

These cases highlight the intuitive appeal of Vetter's view, especially in comparison with Lewis's view. For her, all possibilities require a basis in the actually-instantiated potentialities of past- or presently-existing individuals. This should be appealing to those who are suspicious of the existence of other possible worlds. But modal realism is not the only possible worlds theory. There are other

de dicto first approaches that accept possible worlds as actually-existing abstract objects. For instance, Vetter discusses Stalnaker's (1976; 2003) view on which possible worlds are properties that the world could have instantiated.[9] According to Stalnaker, *p* is possible just in case if some world-property were instantiated, then *p* would be true. Vetter argues that her own theory is preferable because it locates the source of modality at a lower level (2015: 265): "[T]he world [...] has a potentiality to be such that I am sitting. However, the world has that potentiality in virtue of *my* having the potentiality to be sitting, not vice versa".

But someone sympathetic to the idea of world properties is also free to locate the source of modality at a lower level. The fact that some world property *w* could be instantiated need not be a brute fact; it may be grounded in the co-instantiability of the more local properties involved. Importantly, this need not require potentialities at all. The incompatibilist posits primitive incompatibilities between certain properties, so that what's possible or not comes down to whether or not the properties involved are compatible. This does not require positing primitive incompatibilities between any two properties that are incompatible – some properties may be derivatively incompatible in virtue of their relations to other properties. For instance, being a square circle is an uninstantiable property in virtue of the incompatibility of the properties of being square and being circular. Incompatibilism requires a story of how derivatively incompatible properties are related to primitively incompatible properties, but this story may be filled out in different ways.[10]

Incompatibility is one of a cluster of notions relating properties and relations. Two properties are compatible just in case they are not incompatible. And entailment between properties may be defined as so: P entails Q just in case P is incompatible with not-Q. As such, the choice of incompatibility as the modal primitive is arbitrary. The incompatibilist could equally well take compatibility or entailment as her primitive modal notion and define the other notions accordingly.[11] I will appeal to any of these notions when discussing the basis of modal truths according to the incompatibilist.

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[9]   Since Stalnaker's theory appeals only to properties that *could* be instantiated rather than those that cannot, it is not a reductive theory of modality – but neither is Vetter's theory.

[10]   Defenders of versions of incompatibilism include Jubien (2007; 2009), Lycan (1994), and Wang (2013). Bigelow and Pargetter (1990) and Forrest (1986a, 1986b) defend views closely related to incompatibilism, though they prefer to avoid primitive modality.

[11]   One may wonder whether these are really primitive modal notions. After all, property P entails property Q iff necessarily, if object x instantiates P, then x instantiates Q. Doesn't this show that the notion of entailment between properties is analyzable in terms of possibility and necessity, so that incompatibilism collapses into a modalist view? This objection gets the direction of dependence the wrong way around: the incompatibilist insists that the right-hand side of the biconditional is explained by the left-hand side.

Notice that I am counting incompatibilism as a *de dicto* first approach to modality, despite the fact that it crucially appeals to properties. This is because the source of modality is not the instantiation of modal properties by actual, existing objects, but rather, the modal relations between the properties themselves. And as long as the incompatibilist posits primitive incompatibilities between only general properties, it is primarily about *de dicto* modality. Of course, the incompatibilist also requires an account of *de re* modality. She is free to posit primitive incompatibilities between individual-involving properties, resulting in neither a *de re* nor *de dicto* first approach to modality, or to appeal to something like counterpart theory.[12]

4. *Potentiality and time*

I argue in the remainder of this section that a theory like incompatibilism has an advantage over Vetter's theory: unlike Vetter's theory, it intuitively accounts for *de dicto* modal claims that (i) should not or (ii) cannot depend upon past or present individuals. I do not consider the problem cases presented below to be counterexamples to Vetter's theory; after all, she is willing to bite the bullet about various consequences of her view. Rather, I take them to undermine a crucial selling point of her theory: its intuitive attractiveness. Vetter emphasizes her theory's intuitive appeal at various points in her book – and I agree that it has this appeal when it comes to some *de re* modal truths.[13] But if her theory loses its intuitive appeal when it comes to certain *de dicto* modal truths, then she cannot claim a clear advantage over her *de dicto* first rivals.

First, there are cases of *de dicto* modal claims that should not depend upon past or present individuals. For Vetter, the basis of any modal claim is fundamentally diachronic, specifically, is past- or present-involving.[14] But there are cases that do not seem to involve time at all. Consider the sorts of cases that motivate incompatibilism in the first place. Jubien's (2009: 92) examples include: (i) the property of being square entails the property of having linear sides; (ii) the property of being yellow entails the property of being colored; and (iii) the property of being a spouse entails the property of being married; and (iv) the property of being a horse entails being an animal. These are

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the basis for the following modal truths: (i) necessarily, all squares have linear sides; (ii) necessarily, all yellow things are colored; (iii) necessarily, all spouses are married; and (iv) necessarily, all horses are animals. Thus, the source of the necessity of all squares having linear sides is located in an entailment relation between the property of being a square and the property of having linear sides, and so on for the rest.

There may, of course, be disagreement over whether the incompatibilist is correct about the basis of these modal truths. One may consider these examples as mere analyticities (though I do not). To sidestep this possible distraction, let's focus on an example inspired by Wang (2013):

(4)   Necessarily, no negatively charged objects are positively charged.

For the incompatibilist, the source of this truth is an incompatibility relation between the property of being negatively charged and the property of being positively charged. But Vetter must say that the source is past- or present-involving. For Vetter, necessity is defined as the dual of possibility (203):

NECESSITY: It is necessary that $p =df$ It is not possible that not-p.

This works out to the view that it is necessary that p iff nothing has an iterated potentiality to be such that not-p. In this case, nothing in the history of the universe has an iterated potentiality to be such that something is both negatively and positively charged. But why should that be the case, since this does not involve a logical impossibility?[15]

It may be helpful to approach the question from the other direction. Recall from above that potentialities may be possessed to the maximal degree. Thus, something that is maximally fragile must shatter. This only allows us to attribute necessary properties to an individual, that is, make the following *de re* modal claim: x must be fragile. Vetter may try to find a way to get from *de re* attributions of necessity to *de dicto* necessity claims. Perhaps she could say in the case of (4) that anything that is negatively charged must possess the potentiality to be non-positively charged to the maximal degree. This will get her: All negatively charged objects are necessarily not positively charged. But this is still only a *de re* modal predication rather than a *de dicto* claim.

For another example along these lines, consider what the incompatibilist would say about *de dicto* possibilities such as: "There could exist a red square". For the incompatibilist, this is true in virtue of the compatibility of the property of being red and the property of being square. There is no need to say of

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[15]   One may replace this example with their favorite example of incompatible but non-logically-contradictory properties, such as being red and being blue, as needed.

any actually existing thing that it has the potentiality to be such that there is a red square. For Vetter, any presently-existing red square serves as the witness for this claim. But before there were any red squares, there were still objects that had an iterated potentiality to be such that there is a red square. Presumably, the "best" witness would be some object that along with other objects had the joint potentiality to produce a red square. All this may sound fine. However, Wang (2015b) points to another kind of case: consider the apparent possibility that a glass appears *ex nihilo*. There is no logical impossibility, and hence, according to many, no metaphysical impossibility involved in this supposition. Vetter must either deny that such a case is possible, or try to find a plausible witness. I don't think that she would go for the latter; what would be witness be? One might be tempted to say that the witness would be the world. However, in her section 7.4, Vetter argues that even if the world is a bearer of potentialities, it bears potentialities in virtue of the potentialities of "smaller" individuals, e.g. a subregion of the world. But the potentialities in a subregion can only guarantee that there is no glass appearing *ex nihilo* in that region, rather than globally.[16]

I turn now to cases of *de dicto* modal claims that cannot depend upon past or present individuals. Consider the apparent possibility (also discussed in Wang 2015b) that a glass always exists in a universe with no beginning, or more simply:

(5)   It's possible for there to be an object that always exists in a universe with no beginning.

For Vetter, such an object is not possible; in fact, such a universe is not possible. For non-actual possibilities must have their basis in past or present actual objects, and no actual object has a potentiality for an object to have always existed in a universe with no beginning. (Note: Vetter does assume that the universe actually has a beginning, but even if she didn't, there would still not be any object in our past that could be the basis of the truth of (4).)

Vetter discusses similar cases as potential counterexamples, but writes (290): "The intuition that there could always have been different objects is, I believe, not at the centre of our modal intuitions, and like many philosophical intuitions it may well be theory-driven. The very same temporal asymmetry was shown to explain a modal principle that is, I believe, more central and accepted by many philosophers: the necessity of origin. Indeed, this further consequence of temporal asymmetry can be seen as another application of the necessity of origin. It is the origin of the universe itself, in precisely the objects

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[16]   Thanks to an anonymous referee for pressing me on this point.

which originally constituted it, that is necessary on the present view". I will not review Vetter's reasons in favor of the necessity of origins (204-6), as I think that the resulting view is still problematic (as explained below). Eternal glasses are outlandish, but universes with different origins or no origins are not.

In her section 7.9, Vetter recognizes that the necessity of the origin of the universe is a controversial thesis, but aims to assuage some worries by arguing that this does not imply the necessity of actuality. The worry that Vetter addresses goes something like this: if the beginning of the universe is necessary – that is, the first total state of the universe is necessary – and if the laws of nature are deterministic, then all following states will also be necessary. But Vetter points out that her view is not committed to this. It may be that there is only one possible future at a time when taking into account the state of the total universe. However, POSSIBILITY allows for individuals in a subregion of the universe to ground different possible futures in virtue of their joint iterated potentialities – it's just that those potentialities will be frustrated by the potentialities of individuals outside that subregion.

This is effectively the reasoning behind Vetter's denial that metaphysical modality just is nomic modality. In her section 7.8, Vetter favors a "best systems" account of the laws of nature (though she also thinks other theories of laws are compatible with her metaphysics).[17] The laws of nature will be the best systematization of the distribution of fundamental properties, including potentialities. Even if one thinks that all fundamental properties are potentialities, different systematizations are possible depending on which potentialities are instantiated by actual, concrete objects. As I think a thorough treatment of this interesting idea deserves more space than I can give it here, I will simply accept Vetter's reasoning. My focus is on the unintuitive consequence that remains: Vetter cannot accept the possibility that the universe had a different origin or no origin at all. And this will limit what she regards as nomically possible.

In summary, (4) and (5) reveal that there is something lacking in Vetter's *de re* first approach compared to a *de dicto* first approach, because of the inappropriate involvement of time on Vetter's theory. The worry for Vetter with the first kind of case is that dispositionality is a diachronic notion, and is thus ill-suited to account for synchronic modal truths. The second kind of case reveals that there are possibilities that do seem to concern the past or present, but do not seem to concern *our* past or present. In contrast, *de dicto*

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[17] For a best systems account that takes the fundamental properties to be potentiality-like (specifically, powers), see Demarest (2017). Demarest (2015) contains an overview of the relevant theories of laws of nature.

first approaches say that such cases are possible just in case there are possible worlds in which they are actual (Lewis), or just in case the properties involved are compatible with each other.

5. *Concluding remarks*

In this paper, I have aimed to provide a concise summary of Vetter's theory of modality along with some critical remarks. I have argued that although Vetter's theory has intuitive plausibility in many cases of *de re* modal claims, it is counterintuitive in at least some cases of *de dicto* possibilities. On this front, competitors who have a *de dicto* first approach to modality fare better. This undermines the intuitive plausibility that Vetter claims for her view.

I end with a suggestion. Vetter may wish to consider adopting a hybrid view on which potentialities account for some modal truths, while primitive incompatibilities account for others. This would allow her to locate the source of modality in properties, which would still be an attractive alternative to Lewis's modal realism for many. But she could not say that the properties of actual, concrete objects account for all modal truths (since in some cases, the properties themselves and the relations between them would serve as the basis). Still, this may be a better path forward for Vetter than to bite the bullet.

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