Article:
Bueno, O and Shalkowski, SA (2015) Modalism and theoretical virtues: Toward an epistemology of modality. Philosophical Studies, 172 (3). pp. 671-689. ISSN: 0031-8116

https://doi.org/10.1007/s11098-014-0327-7

Modalism and Theoretical Virtues: Toward an Epistemology of Modality[1]

Otávio Bueno
Department of Philosophy
University of Miami
Coral Gables, FL 33124-4670, USA
e-mail: otaviobueno@me.com

Scott A. Shalkowski
Department of Philosophy
University of Leeds
Leeds LS2 9JT, UK
e-mail: s.shalkowski@leeds.ac.uk

ABSTRACT

According to modalism, modality is primitive. In this paper, we examine the implications of this view for modal epistemology, and articulate a modalist account of modal knowledge. First, we discuss a theoretical utility argument used by David Lewis in support of his claim that there is a plurality of concrete worlds. We reject this argument, and show how to dispense with possible worlds altogether. We proceed to account for modal knowledge in modalist terms.

Keywords: Modalism, Theoretical Virtues, Modal Epistemology, Modality, David Lewis, Necessity, Possibility.

1. INTRODUCTION

Modalism is the philosophical view according to which modality is primitive. Due to the influences of W.V. Quine's quasi-eliminativism for modality and David Lewis's influential reductive account of modality, modalism has been given relatively little development as an actual theory of modality, particularly where modal knowledge is concerned. In this paper, rather than providing a comprehensive defense of modalism, we examine its implications for modal epistemology, and develop a modalist account of modal knowledge.

In the last several years, the epistemology of modality has enjoyed renewed interest. Four main views, in particular, have been developed: (a) a conceivability approach based on two-dimensional semantics (Chalmers [2002]); (b) an approach that takes counterfactuals as the basis for the understanding of modality (Williamson [2007]); (c) an essentialist view that invokes knowledge of essence (i.e., knowledge of what it is to be a kind of thing) to obtain knowledge of what is necessary and what is possible (Lowe [2012]); (d) an understanding-based approach that identifies a suitable modal extension principle to account for modal knowledge (Peacocke [1999]). For the most part, these views are broadly rationalist in nature.[2]

Roca-Royes has raised serious objections to the rationalist program (Roca-Royes [2010] and [2011]), and Jenkins [2010] defends the view that the senses ground our concepts, which in turn constrain what is

[1] Our thanks go to David Chalmers, Bob Fischer, Bob Hale, Sonia Roca-Royes, and Anand Vaidya for thoughtful comments on an earlier version of this work. Thanks are also due to an anonymous reviewer for *Philosophical Studies* for insightful and helpful comments.

[2] Williamson [2007], however, tries to eliminate the a priori / a posteriori distinction, the keeping of which some might think to be crucial for rationalism.

conceivable. Nevertheless, the recent literature has no empiricist-friendly approach to the epistemology of modality that does not rely on conceivability. In this paper we sketch just such an approach.[3]

As a motivation for this view, we start by examining a key argument used by Lewis—the theoretical utility argument—to reject modalism (as part of his reductive account of modality) and to defend his claim that there is a plurality of concrete worlds. After resisting this argument, we sketch a strategy for dispensing with possible worlds altogether. This paves the way for the development of an account of modal knowledge within a framework of primitive modality.

2. THE ARGUMENT FROM THEORETICAL UTILITY

Without doubt, the most central and general argument regarding warranted belief in the plurality of worlds is the argument from the theoretical utility of postulating that plurality (Lewis [1986], p. vii, pp. 3-5, and Divers [2002], p. 151). Crucially, for this argument to have the requisite force to support realism about the plurality, theoretical utility must be a truth-indicative feature of some portion of a theory. There is little doubt that postulating the plurality of worlds is useful (Lewis [1986], pp. 1-69), meaning that the worlds are by no means idle in Lewis's theory. Lewis insists that this theoretical productivity provides adequate grounds for genuinely believing in the plurality. As he stresses:

> I begin [...] by reviewing the many ways in which systematic philosophy goes more easily if we may presuppose modal realism in our analyses. *I take this to be a good reason to think that modal realism is true, just as the utility of set theory in mathematics is a good reason to believe that there are sets*. Then I state some tenets of the kind of modal realism I favour. (Lewis [1986], p. vii; italics added.)

Note that both an analogy with mathematics and the theoretical utility argument are at work at once and it would be natural to intertwine the analogy with considerations of utility, if considerations of utility were the driving forces in producing mathematics as we know it. We set aside any concern whether utility really is taken by mathematicians to be their good reason to believe in mathematical objects. We note only that Lewis assumes both that it is and that reasoning of the very same sort will support his plurality thesis. He requires, then, that some truth-indicating character of theoretical utility is an important feature of the case for the plurality thesis.

Divers reconstructs the theoretical utility argument as follows:

> (P1) If an ontological hypothesis has eminent utility (i.e. sufficient net utility and greater net utility than its rivals) then that gives us good reason to believe that it is true.
> (P2) Such reason for believing an ontological hypothesis is warranting (i.e. given that the theory is true, having grounds of eminent utility is sufficient for knowing that the theory is true).
> (P3) GR [genuine modal realism] has eminent utility.
> Therefore,
> (C) We (are in position to) know that GR [genuine modal realism] is true. (Divers [2002], p. 151)

Lewis seems to argue in the fashion captured by Divers, since he writes:

> If we want the theoretical benefits that talk of *possibilia* brings, the most straightforward way to gain honest title to them is to accept such talk as the literal truth. It is my view that the price is right, if less spectacularly so than in the mathematical realm. The benefits are worth their ontological cost. Modal realism is fruitful; that gives us good reason to believe that it is true. (Lewis [1986], p. 4)

If a theory possesses more utility than its rivals, and if this greater utility is an indicator of truth, then that theory is our best with respect to truth. We could, of course, construct weaker theories that do not quantify

[3] We would like to thank an anonymous reviewer for the help in situating our work in the larger philosophical landscape of modal epistemology.

over possible worlds, but we would then allegedly lose simplicity, theoretical unification, explanatory power, or expressiveness (Lewis [1986], pp. 136-191). To do so is to settle for a theory with less utility and, thus, fewer grounds for belief. Since the Divers reconstruction is valid, the premises demand scrutiny.

Though the second premise claims that theoretical utility provides warrant sufficient for knowledge, the more fundamental issue is whether theoretical utility and its constituent theoretical virtues are even so much as truth-indicative virtues. Thus, critical focus should be on the first premise and on the relevant utility that a theory might have.

Were 'utility' typically intended to mean (in this context) typical reasons to think a theory (increasingly) likely to be true, there would be little point in Lewis, or Divers on his behalf, formulating any argument in terms of utility. There would be little point because the case mounted in favour of the theory would simply be relatively straightforward premises about how things are leading to a conclusion about how (further) things are. The premises would be about reality, and they would be less likely were the theory false and a competitor true, assuming that the premises count in favor of the theory in preference to the competitor.

To illustrate, consider David, the cook, who might adduce evidence that someone ate breakfast this morning in his kitchen by reminding himself and others that he had thoroughly cleaned the kitchen last night, having cleaned the counter tops and put away all of the dishes. He might then proceed to show that there are now, at midday, dirty dishes on the countertop, along with toast crumbs, a dirty frying pan, and eggshells on the stovetop.

In contrast, here is what David would not do. He would not exhibit his *theory* about his kitchen. He would not draw attention to his *representation* of the kitchen, noting its elegance and simplicity, how his theory permits him to unify other theories into a more comprehensive theory and to explain ever so much more than can other theories, or how the language of his theory permits many more fine-grained distinctions than do others with much cruder languages.

'Utility' usually indicates something rather more pragmatic and indeed there may well be many such grounds one might have for embracing one theory rather than another, for choosing one research programme over others, etc. How, though, to get from the greater ability to "do stuff" with a theory and its truth? The fundamental problem with all arguments from utility is the link between pragmatic and epistemic concerns (see van Fraassen [1980], Chapter 2). Our contention is that the pragmatic concerns, if used for epistemic purposes, are either question begging or otiose. Consider one of the more common theoretical virtues sometimes said to favour one theory over others: simplicity. In most cases, and especially when considering fundamental metaphysics, whether reality is simple along some interesting parameter *is precisely the issue to be resolved*! Are there many worlds or one world plus platonic properties and propositions? Does reality have non-modal qualities only, does it have some mixture of non-modal and irreducibly modal qualities, or is the apparently non-modal ultimately modal in character? We are typically trying to find out along which parameters reality is simple. So, we are not in a position to invoke the simplicity of reality to select among various theories. If we were justified in believing a metaphysical *ex cathedra* statement about the simplicity of reality, then the simplicity of a theory would be a recommendation of one theory over others. Since the modal realist is trying to provide a justification for the plurality of worlds, and its attending account of properties and propositions, rather than invoking an *ex cathedra* statement about reality, citing relative simplicity begs the crucial question against competitors.

Similar observations pertain to other theoretical virtues. Consider unification. Of course, if what are thought to be diverse phenomena really are merely manifestations of one underlying phenomenon, then a theory saying they are diverse is wrong. This underlying reality permits an appropriately unifying theory to explain correctly more than any competitor that treats the unified phenomena as different with distinct explanations. Once again, this argument is any use only if we have independent reasons to believe that reality is, in the relevant way(s), unified. Simply to assume that it is, without any additional reason, begs the question against those theories that do not presuppose such unification. If appeals to theoretical unification do not beg the question in this way, they involve a peculiar attention to theories—

representations—and not attention to what really interests us: how things are. As with appeals to simplicity, appeals to unification either beg the question or are a distraction from the point at issue.

Lastly, consider expressive power. If there are many differences in reality, then a theory formulated in a language that permits us to express these differences will take us closer to the truth than one that forces us to be blind to them. We need, however, to know already whether there are such differences in order to invoke the expressive power of a theory as a reason to believe it (more likely) to be true.

So, the general character of arguments from theoretical virtues to truth reveals them to be failures. They depend upon illicit metaphysical assumptions, and they ignore the point of doing the difficult work of theory construction and ushering relevant evidence on its behalf. In the following section we prove that reference to possible worlds is, in fact, dispensable from our modal theories.

3. THE ELIMINATION OF WORLDS

Dropping the assumption that there is a plurality of worlds costs us nothing, save artifacts of the framework built around the supposition of that plurality. This is to say that the supposition is an unnecessary addition to any prior modal theory we might have and might wish to systematize when we move from merely implicit assumption to explicit theory.

The proof that the supposition is dispensable is a proof that possible worlds theory (PW) is *conservative* with respect to modal claims that do not explicitly involve possible worlds.[4] Such a theory is *m-conservative*. PW is *m*-conservative if and only if it is consistent with every internally consistent set of modal claims saying nothing about the existence or structure of possible worlds. From this it follows that PW is *m*-conservative if and only if for any modal assertion A (that does not involve possible worlds) and any body M of such assertions, A follows from M + PW only if it follows from M alone. Thus, if PW is *m*-conservative, we are entitled to use possible worlds talk to facilitate inferences involving modal claims, but without being committed to the existence of such worlds. All talk of possible worlds may, ultimately, be discharged.

The proof is as follows. First, two definitions:

(1) Within PW, the following valuations, v, for a modal language hold:

$$v(\Diamond\alpha) = 1 \text{ iff } \exists w\, v(\alpha_w) = 1$$
$$v(\Box\alpha) = 1 \text{ iff } \forall w\, v(\alpha_w) = 1$$

where the right-hand quantifiers range over possible worlds, and ‘α’ is free from any modal operators. These truth-conditions have been stated in the metalanguage of the modal language under consideration. But they have obvious object language counterparts, namely:

$$\Diamond\alpha \leftrightarrow \exists w\, \alpha_w$$
$$\Box\alpha \leftrightarrow \forall w\, \alpha_w.$$

These object-language axiom schemas characterize PW here.

(2) PW is *m-conservative* iff for every consistent set M of modal claims, there is a model of M + PW; in other words, for every set M of modal claims, if M is consistent, so is M+PW, assuming the model-theoretic notion of consistency and that the extensional connectives and quantifiers of the language are treated in the usual way.

We can now state and prove the following result:

Theorem: PW is *m*-conservative iff for every set M of modal claims and every modal claim α, if α is a logical consequence of M+PW, then α is a logical consequence of M alone.

[4] This approach is inspired by Hartry Field’s nominalist view about mathematics (see Field [1989]).

Proof: The left to right implication goes as follows. Suppose that PW is *m*-conservative and that α is not a consequence of M. We show that, in this case, α is not a consequence of M+PW. Now, since α is not a consequence of M, there is a model of M (let us call it 'Mod') according to which $v_{Mod}(\alpha)=0$. However, since PW is *m*-conservative, given the model Mod of M, there is a model of M+PW. Let us call such a model 'Mod*'. We show that $v_{Mod*}(\alpha) = 0$. Indeed, since α is a modal claim, either it is of the form $\Diamond\beta$ or of the form $\Box\beta$. If α is of the form $\Diamond\beta$, we have that $v_{Mod*}(\alpha) = v_{Mod*}(\Diamond\beta) = v_{Mod*}(\exists w\ \beta_w)$. But $v_{Mod}(\alpha) = v_{Mod*}(\alpha)$, since PW is a conservative extension of M, and $v_{Mod}(\alpha) = 0$. Therefore, $v_{Mod*}(\alpha) = 0$. If α is of the form $\Box\beta$, it is treated similarly. Thus, α is not a consequence of M+PW.

The right to left implication goes as follows. Suppose that PW is not *m*-conservative. We show that for some M and some α, α is a consequence of M + PW, but α is not a consequence of M. Since PW is not *m*-conservative, there is a consistent set M of modal claims such that there is no model of M + PW. Since M is consistent, there is a model of M. Let us call it 'Mod'. Let α be a modal sentence such that that $v_{Mod}(\alpha) = 0$. Thus, α is not a consequence of M. But α is a consequence of M + PW, since there is no model of M + PW in which $v(\alpha) = 0$. This concludes the proof.

Note that possible worlds theory is *m*-conservative since given an arbitrary consistent set of modal claims that say nothing about the existence or structure of possible worlds, adding sentences that refer to possible worlds to that set will not generate an inconsistent set, given that the initial set of modal claims say nothing about worlds whatsoever. The only possibility of *introducing* an inconsistency is if the possible worlds theory itself were inconsistent, in which case it cannot be *m*-conservative.

This argument clearly establishes the *dispensability* of possible worlds in the analysis of modal discourse. Given the dispensability of possible worlds, there is no need to assert the truth of possible worlds talk to give an account of modal talk. Consequently, possible worlds are not needed to assert what is possible (or necessary), and as opposed to what goes on in the modal realist picture, there is no conflation of pragmatic and epistemic reasons here. The expressive virtues of possible worlds theories are *expressive* virtues and their metaphysical significance is illusory.

It is a confusion to try to undermine *m*-conservativeness by applying possible worlds theory to claims involving possible worlds and deriving some new modal claim (free from possible worlds) that could not be derived from other modal claims alone. This is analogous to what would be a mistaken objection to Hartry Field's claim that mathematics is conservative (Field [1989]). On his view, a mathematical theory is conservative if and only if it is consistent with every internally consistent body of claims about the physical world (i.e., nominalistic claims that make no reference to mathematical objects). Field argues that consistent mathematical theories are conservative because when applied to a body of nominalistic claims, no new nominalistic conclusion is obtained that could not be obtained without the mathematics. The confusion in his case would be to try to undermine the conservativeness of mathematics by showing that if we apply a mathematical theory to some *mathematical claims* we obtain some new nominalistic claim (that does not refer to mathematical objects) that cannot be obtained from other nominalistic claims alone. In Field's case, mathematical theories need to be applied to *nominalistic* claims rather than to mathematical ones. He does not question that the application of mathematical theories to other mathematical claims can generate novel consequences. At issue is only the application of mathematics to nominalistic claims. Similarly, in the case of modality, we do not question that the application of possible worlds theory to claims involving *possible worlds* will generate novel conclusions. At issue is only the application of possible worlds theory to *modal claims* that do not involve reference to worlds. No new modal conclusions can be obtained from such applications.

In the previous section we argued that the general forms of the argument from theoretical utility fail for Lewis's purposes. In this section, we have directly undercut the key premise of the indispensability form of that argument by demonstrating that reference to possible worlds is dispensable relative to modal talk.

4. MODALISM: AN EPISTEMOLOGY OF MODALITY

Having argued both that the main argument in favor of the metaphysics of the most promising reductive account of modality is misconceived, and that reference to and quantification over worlds are unnecessary in our modal reasoning, we begin to develop modalism by providing an account of modal knowledge in modalist terms. Having no special modalist ontology, we have no specific problems regarding the knowledge of some privileged objects that constitute modal reality. We need only to justify the philosophical claim that we are epistemically warranted in making at least many of the modal claims many are minded to make.

Modalism comes in various guises. An early development of the position, in response to Lewis, was Kit Fine's (see the postscript to Prior and Fine [1977]). Some versions take consistency to be co-extensive with possibility. This is a natural home for all who reject all substantive essentialist theses (Field [1991]). Modalists need not, however, resist essentialist lessons. Some are primitive essentialists. For them the essential is more fundamental than the modal (Fine [1994], Lowe [1998], [2008*a*], and [2008*b*]). Yet others are primitive modalists. For them the modal is more fundamental than the essential (Forbes [1985] and [1989]). Finally, some modalists remain neutral about this option (Shalkowski [1994], and Bueno and Shalkowski [2009] and [2013]).

We begin our modal epistemology with the quite minimal assumption that if a set of claims is *in*consistent, then it is *im*possible for those claims to be jointly satisfied. This assumption is neutral between various modalist theories. Its converse—equivalent to the claim that any consistent set of claims is possibly jointly satisfied—*prima facie* is not so neutral. The latter closes off essentialist options, whether modalist or otherwise. All we say here regarding modal epistemology is congenial to both the anti-essentialist and the essentialist.

4.1. Possibility

Our approach to understanding modal knowledge is to give a rational reconstruction—a Just So account—of the genealogy of modal knowledge. The idea is to dispel the mystery by showing how one (better, perhaps: how one's ancestors collectively) might proceed in stages from what is not *modal* knowledge to what is. To address the prospects of modal knowledge, we begin the outline of a modalist epistemology with what is perhaps the easiest case. We rely on a very basic epistemological principle:

(E1) The stronger the claim, the stronger the grounds required for rational belief in that claim.

From (E1), another epistemological principle immediately follows:

(E2) Any grounds sufficient for rational belief in a claim are sufficient for rational belief in a weaker claim entailed by the stronger claim.

We treat relative weakness informally. One claim is weaker than another when it is easier to make it true, when it is less specific, when it requires fewer commitments regarding how things are. Warrant for a claim of a given strength will automatically be warrant for that claim minus some of its commitments regarding how things are. That the one entails the other insures that the commitments of the weaker are a subset of the stronger, so no different warrant is required, as it might be were the weaker not entailed by the stronger. Since the philosophical problem before us is *modal* knowledge and not any general problem about knowledge, we assume that we possess some knowledge expressible in non-modal terms. Any claim, P, is stronger than and entails its corresponding possibility claim, $\Diamond P$, so by (E2), our grounds for knowing P suffice for knowing $\Diamond P$. From a very elementary *epistemic* principle, we obtain the basis for some modal knowledge.

Having discussed how one can come to know possibility claims from actuality claims, we now account for our knowledge of $\Diamond P$ when not-P. The central idea is to invoke the modal properties of the relevant objects to support our modal claims about those objects. It is possible that the table breaks, even though it is unbroken, because it is breakable. While this appears to be an explanatory circle far too small to be of any use at all, the table is breakable because it is composed of wood. We know various things about objects made of wood. We have reasonably sophisticated theories of wood and *its* constituents. That theory articulates knowledge about physical and chemical bonds and their strengths, etc. It is part of that theory that nothing about the table provides any credence to the claim that the table is unbreakable. There are no bonds than which nothing can be stronger. There are no things composed of other things that are indestructible, etc. It is certainly fair to query the basis for our underlying physical theory, but theories of a host of things provides support for the modal claim about the table, based on various characteristics of it and/or its components. Claims about the relative strengths of bonds and of both internal and external forces suffice to warrant a belief that your standard wooden table is breakable. This is so, even if the table before us is the first ever to be constructed and no one has ever witnessed a table before, much less one that has broken.[5] This background knowledge of bonds and forces, while articulated with mathematical precision that has no modal appearances, its significance is clearly modal. If there were no implicit modal import contained in that theory, it would be no value at all when determining whether to construct a table from feathers, wood, or steel. There would be no useful information to litigate cases when table manufacturers produce tables that, as a matter of fact, break on a regular basis. Only because there is implicit but clearly understood modal import to our underlying theories are we warranted in thinking that "they" should have known that had they used different materials, their products would have performed differently. So, modalizing about ordinary things is ultimately informed by our knowledge of modal properties for either them or their constituents.

We must distinguish ordinary modal knowledge, such as knowledge of the breakability of tables or of chemical bonds, from extraordinary modal knowledge, such as knowledge of whether the world is fundamentally modal in nature. Lacking knowledge of the latter kind in no way precludes knowledge of the former. The account we offer provides a strategy for explaining ordinary modal knowledge by engaging with the relevant, and uncontroversial, modal properties of the objects under consideration. While we may pursue the question of the underlying fundamental nature of reality, if we like, it has no bearing on whether we are entitled to claims about possibility about a wide range of ordinary, non-fundamental objects. After all, the deep philosophical question regarding modality is not about whether tables are breakable or not, it concerns whether their breakability is ultimately a matter of some foundational modal characteristics of reality or not. No serious party thinks that if reality is fundamentally categorical and not modal then tables are, after all, indestructible! Ordinary modal knowledge is not hostage to some final verdict about the ultimate nature of reality. It is not clear that we have the resources to settle these questions sufficiently for modal *knowledge* anyway, so this is just as well and as it should be.

We should also note that talk of properties is just a way of speaking, with some generality, about features of objects. There is no need yet to treat such talk as reifying. Our talk—which is ordinary talk—of properties is ultimately just a convenience. It is a way of referring to the particular composition of the objects under consideration, and to the way such objects change in light of various interactions with other objects. We are not here introducing extra ontology. Whether an ontology of properties is correct and whether properties are universals, tropes, or something else are topics beyond the demands of accounting for modal knowledge within a modalist framework.

On our account, what grounds modal knowledge is ultimately our knowledge of the relevant modal properties of the objects under consideration. Conceivability plays no role on our proposal, in contrast with Chalmers [2002] and Jenkins [2010]. Chalmers [2002], in particular, distinguishes different kinds of conceivability, each a matter of three distinctions: primary or secondary intensions, positive or negative conceivability, and *prima facie* or ideal conceivability. In a nutshell, primary conceivability deals with the actual; secondary conceivability deals with the counterfactual. We say that a situation is primarily conceivable as long as it is conceivable that that situation is actually the case. In contrast, we say that a situation is secondarily conceivable just in case that situation conceivably might have been the case

[5] Thus, ours is not a similarity account of modal knowledge.

(Chalmers [2002], p. 157). Moreover, we say that a situation is negatively conceivable when that situation is not ruled out *a priori*. In contrast, we say that a situation is positively conceivable as long as we can imagine that situation (Chalmers [2002], pp. 149-150). Finally, a situation is *prima facie* conceivable when it is conceivable on first appearances. In contrast, a situation is ideally conceivable as long as it is conceivable on ideal rational reflection (Chalmers [2002], pp. 147-149; see also Yablo [1993], and for additional discussion, Vaidya [2007]). On this account, a very restrictive kind of conceivability entails a similarly restrictive kind of possibility, that is, primary positive ideal conceivability entails primary possibility (Chalmers [2002], p. 194).

Suppose we are trying to determine whether we know that the table Hemingway used to write on in his Key West house would have broken had a 26,000-pound giant African bull elephant sat on it. We say that the table—which, despite Hemingway's adventures, has never encountered such an elephant—would have broken. On our account, we know that it would have broken simply by knowing the properties that such an elephant has and the properties the table has, modal in character as they already are. Since the situation involves a counterfactual, it does not fall within the scope of Chalmers' primary positive ideal conceivability, which is supposed to entail possibility. Furthermore, on his account modal knowledge requires some considered assessment of the quality of our conceiving to determine whether it is merely some *prima facie* judgment about possibility or whether it involves sufficient attention to the requisite detail to approximate closely enough some ideal state upon which improvements cannot be made. Such introspection plays no role in our account. It might well be relevant to query the state of our knowledge about giant bull elephants and wooden tables, but no such query concerns our acts or our abilities to conceive things to be actually or counterfactually the case.

Externalists about knowledge can maintain that the modalist conditions we have provided earlier suffice for knowledge of the relevant possibility claims. The transparency of knowledge required by internalists (in the sense that one knows or is, at least, aware that one possesses that knowledge) demands somewhat more. Thus, in one of the cases above we depend only on $P \vDash \Diamond P$ holding. We treat entailment as irreducibly modal (for discussion, see Shalkowski [2004]). Knowing that we know $\Diamond P$ on the basis of our knowing P requires some knowledge of necessity claims (namely, the entailment from P to $\Diamond P$), for which neither (E1) nor (E2) suffices. As '$\Diamond$' introduces a weakening of the claim to which it is prefixed, so '$\Box$' introduces a strengthening. The question for us now is under what conditions it makes sense to introduce '$\Box$' to strengthen some claim.

4.2. Necessity

Consider material conditionals and arguments. Typically, we use material conditionals to express that things either fail to be one way or are another way. Assuming classical logic, antecedent and consequent may be as irrelevant to each other as one can like. Logical neophytes tend to miss this feature of the material conditional, showing that it is common to assert conditionals when there is some perceived or assumed connection between antecedent and consequent, perhaps a causal or a compositional connection. Grasping that "there is more to it" than the mere relation of truth-values is to grasp that the usual connection between antecedent and consequent is stronger than what a material conditional permits us to express. For different kinds of connections, this stronger relation is expressed by the form: $\Box_k(C_1 \ldots C_n \supset P)$, where '$k$' stands for the different kinds of connections between antecedent and consequent. Modalized conditionals of this general form might express causal sufficiency, compositional, or some other that warrants the inference from $C_1 \ldots C_n$ to P.

Arguments typically have premises and whether a conclusion of a deduction is warranted on the basis of that deduction is partly a matter of whether those premises are thought to be true. Quite familiarly, the typical situation is represented as:

$$C_1 \ldots C_n \vdash P$$
$$C_1 \ldots C_n \vDash P$$

When $C_1 \ldots C_n$ matter not at all to either the proof or truth of P we represent the matter thus:

$\vdash P$
$\vDash P$

Putting things together, it is straightforward to introduce '□' unconditionally in such cases.[6] Anyone who treats the inference from $C_1 \ldots C_n$ to P as valid treats—implicitly in the typical cases—$C_1 \ldots C_n$ as guaranteeing P. When, for whatever reason, we think we are entitled to assert that the condition P obtains without recourse to the entitled assertion that other conditions guarantee it, this reflects that we think that reality contains P, and it contains P regardless of how (other) things turn out. If we are entitled to either $\vdash P$ or $\vDash P$, then we are entitled to see the guarantee of P by any other condition as vacuous. This suffices for knowledge of necessities, assuming we are ever in a position to think any condition is guaranteed vacuously. No one who teaches undergraduates the typical nuances of '⊢' and '⊨' may object at this point.

Of course, every consequence relation depends on the underlying logic, so that when '⊢' and '⊨' are introduced, strictly speaking, we should have '$\vdash_L$' and '$\vDash_L$', for some specific logic, L. In particular, $\vDash_L P$ and $\vDash_{L^*} P$ may not have the same meaning for a given P if L and L^* are different logics, since the logical connectives in P might have different properties. Classical negation is explosive, permitting everything to follow from a contradiction, but paraconsistent negation is not.

If P is excluded middle, $A \vee \neg A$, both classical and paraconsistent logicians will be prepared to endorse: $\Box (A \vee \neg A)$, since excluded middle, despite the different negations involved, hold in their respective logics. Things differ, however, when explosion is at issue. Where 'CL' *stands for classical logic*, $A \wedge \neg A \vDash_{CL} B$. Classical logicians are, therefore, perfectly prepared to endorse $\Box ((A \wedge \neg A) \supset B)$. Paraconsistent logicians are not, since when 'PL' *designates any specific paraconsistent logic*, $(A \wedge \neg A) \nvDash_{PL} B$. Thus, whether one is prepared to strengthen a claim by adding a necessity operator depends not only on the particular conditions under consideration (the premises in the relevant argument), but also on the particular consequence relation (the particular logic) that is appropriate. Failing to account for logical diversity disguises how facile it is to speak of what is logically necessary or logically possible, *simpliciter*.[7]

4.3. Probability

Our knowledge of probability can also be explained *via* a similar strategy of progressively eliminating conditions. In this way, our knowledge of probability is a particular form of modal knowledge. Indeed, this form of modal knowledge is ubiquitous and, from the standpoint of those most worried about modal knowledge, rather uncontroversial. Probability can be thought of as a modality with degrees: how likely or unlikely some events ultimately are. How close to a guarantee of a hypothesis does the evidence provide?

Probabilities, like non-probabilistic inferences, make sense only against a background range of possibilities. Assuming classical logic, to know a probability claim we must first know the underlying possibility space and draw appropriate inferences. Consider how we come to know the probability that a fair die will show 4. The possibility space contains six possible outcomes of rolling a die, and the fact '4' shows on a single side. This case is typical of a whole class of instances in which probabilities can be calculated given a well-defined possibility space. Adverting not only to the options regarding the sides of the die, but also to the (sufficiently uniform) distribution of its component's masses, relevant regularities

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[6] Brian Leftow ([2012], pp. 30-37) provides an account of relative modality in terms of various conditions (nomological conditions for nomic possibility, epistemological conditions for epistemic possibility, and so on). He then draws a line between relative and absolute modality (the latter is not relative to any conditions). However, it is unclear to us how this line can be properly drawn, since among the conditions involved are logical principles (such as the law of non-contradiction, excluded middle, etc.). Leftow doesn't take them as conditions as such but he simply assumes classical logic. Anyone sympathetic to logical pluralism will be unmoved by this assumption (see Bueno and Shalkowski [2009] and [2013]), and as a result, the very idea of absolute modality becomes problematic.

[7] For further discussion, see Bueno and Shalkowski [2009].

of nature, and ignoring the vanishingly small probability that the die will land and remain on an edge, we have:

Pr (*Die shows 4*|$C_1 \ldots C_n$) = 1/6

Even when we casually express the probability of the die showing '4' as merely a matter of one of six sides having '4' on it, the probability is always against a rich background of assumed conditions. When, unlike the probability that our die will show '4' on the next roll, our knowledge of worldly conditions provides the same rational grounds for believing something as it does for its contradictory, we have:

Pr ($P|C_1 \ldots C_n$) = 0.5
Pr ($\neg P|C_1 \ldots C_n$) = 0.5

Think tosses of typical coins:

Pr (Heads|$C_1 \ldots C_n$) = 0.5
Pr (Tails|$C_1 \ldots C_n$) = 0.5

Mathematically, we have the limiting cases:

Pr ($P|C_1 \ldots C_n$) = 1.0
Pr ($\neg P|C_1 \ldots C_n$) = 0.0

From an arithmetic point of view, knowing that we have one of these limit cases is not yet knowledge of necessary/impossible relations, since individual possible outcomes among infinitely many receive a conditional probability of 0. This shows only that not every way of arriving at these limiting case conditional probabilities suffices for the requisite modal knowledge, not that none do. Typically, $C_1 \ldots C_n$ are relevant to $P/\neg P$. If those conditions change or if conditions were different, P and $\neg P$ would receive different probabilities in light of those changes/differences. That's just what it is for $C_1 \ldots C_n$ to be relevant to $P/\neg P$. To the extent, though, that one has grounds for thinking that it matters not what the conditions are relative to P, those conditions drop out as irrelevant regarding belief that P. Treating deductive argument as merely the limiting case of evidential support for a conclusion, we have the spectrum:

$\vdash P$
$\vDash P$

warrant:

Pr (P) = 1
Pr ($\neg P$) = 0

When P is not itself valid, we get:

Pr ($P|C_1 \ldots C_n$) = $0 \leq n \leq 1$

where $C_1 \ldots C_n$ are relevant to P. When they guarantee P,

Pr ($P|C_1 \ldots C_n$) = 1
Pr ($\neg P|C_1 \ldots C_n$) = 0

We have now isolated the key difference between contingencies and necessities for which each received the same limiting case conditional probabilities. For the contingencies, the conditions cited in the appropriate conditional probabilities matter to whether *P* or ¬*P* and to their respective probabilities. That a "dart" will hit any particular point received a conditional probability of 0 because the "dartboard" is treated as a surface with infinitely many points and the (intuitive) arithmetic of dividing 1 by infinity yields 0. Changing the conditions changes the appropriate conditional probability. If the board is treated as a granular physical object with finitely many available points for the dart to hit, then keeping the background assumptions constant (e.g., that the dart will hit the board and that it will stick at some point), the conditional probability for hitting any particular point will be some positive value.

When no such conditions matter, we have limiting cases of simple, unconditioned, probabilities. These are probabilities appropriate regardless of how things are. To the extent that we can discern that we can believe with good grounds that the world could be this way or that, whether or not it is yet some third/arbitrary other way, then we have good grounds for thinking that we should thus judge the *unconditioned* probability for the world being that way to be 1. From those very grounds, we have a candidate for prefixing by '□'.

So, our idea of moving from conditional probabilities to unconditioned probabilities is completely within the spirit of the framework of elementary logic. We have yet said nothing about what the appropriate conditions are for thinking that $C_1 \ldots C_n$ are irrelevant to the likelihood of *P*, just like (in classical logic) '⊢' and '⊨' themselves impose no restriction on when $C_1 \ldots C_n$ are irrelevant to the deduction or truth of *P*. Whether the conditions for thinking ⊢ *P* or ⊨ *P* are the same for thinking □*P* is an independent matter and bears on whether there is any absolute necessity and whether it is so-called logical necessity. Nothing about modalism prejudices matters in favor or against those who, like Quine, consent to modalize only to the extent that logic as traditionally understood is our sole guide through modal waters (Quine [1990], p. 244). Our concern at this stage is merely to demonstrate how, given that modality is primitive and given how the standard modal operators serve to weaken ('◇') or strengthen ('□') our claims, one might attain modal knowledge. Our appeals are wholly to this-worldly conditions. No possible worlds are required, even to make sense of how the modal operators operate. Our appeals are wholly to conditions that bear on the *P* that interests us. In the vast majority of cases, the conditions are concrete conditions, because *P* is a claim about some concrete condition. Nothing in the operation of the operators or in the reasons appropriate for using them demands that we advert to abstract entities.[8]

4.4. Some illustrations

4.4.1. Detectives and craps shooters: possibility spaces. In typical instances of inference, conditions do matter and part of the difficulty consists in determining precisely the scope of the relevant possibility space. Here we find a mixture of empirical and inferential considerations. Consider, for instance, a crime investigation. A wife appears to have been murdered in her house. The initial suspects are the husband, the twin teenage sons (who have a history of impersonating each other), and the mysterious couple who live next door. The detective dealing with the case needs to rule out each of the suspects. Of course, it may be that none of them committed the crime, and a larger possibility space needs to be entertained. It turns out that there are good alibis for the husband (who was traveling abroad) and the twins (who were playing a minor league baseball game in another state), but the mysterious couple was clearly at home. That the couple has a motive for the crime is insufficient to deem them guilty. The evidence may be inconclusive (there is no sign of their presence in the house of the victim), and the only odd feature of the crime scene is the hair of a wolf. A larger possibility space than first entertained must now be countenanced. Hunting for wolf owners changes the relevant space of possibilities and narrows the number of suspects, given that the crime took place in Miami, a place not known for a significant wolf population. It turns out that the wife was alive and the body of the deceased was planted there in an attempt to give the family a fresh

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[8] We have used language to discuss the introduction of □ and ◇, of course. Nothing in this discussion requires us to be committed to a particular way of specifying the content of the relevant claims. This is an independent issue from the one we are examining in this paper.

start, given their debt problems. Whose body was it then? Here we have an entirely different possibility space (and off the detective story goes).

This simple example illustrates the changes in the possibility space that an investigation undergoes as part of the specification of the relevant probabilities. To figure out the probabilities in each case, one must determine the possibility space. Initially, the space comprised the husband, the twins, and the mysterious couple. A completeness assumption—that these are all the suspects—must be made to determine how likely it is that any of them committed the crime. When there are alibis for all but the couple and no incriminating evidence against the couple, the completeness assumption must be revised. The discovery of wolf hair and the live wife each change the problem by altering the range of possibilities relevant to the production of the crime scene.

The detective's project is much like that of the craps shooter, but without the mathematical precision. In both cases, though it is largely and harmlessly unacknowledged when thinking about dice, some possibilities are ignored as too unlikely to warrant attention. Dice might land and remain on an edge or a point. Deaths, even in a Miami residence, might result from an elephant attack. These possibilities do not enter into typical probability calculations because they are judged to be too unlikely to be worth the time and effort to take them into account. Completeness assumptions are eminently revisable. They are revised when, as new evidence comes in or old evidence takes on new significance, possibilities initially judged worthy of attention are no longer thought to be, or possibilities first judged unworthy come to be thought likely enough to spend resources investigating them.

The detective works at the disadvantage of not having a mathematically systematized theory from which to work. The range of possibilities is not so easily limited, individual possibilities are rarely equally likely, and there is no way to impose anything but artificial mathematical precision on judgments about the most likely perpetrator of the crime. Nevertheless, the general epistemological character is the same as before.

4.4.2. Injured athletes. How do we know whether it is possible for a runner to complete a marathon in less than 3 hours? Some have done it, so, given E2, it is possible. What of marathoners with a history of running sub-3-hour marathons but who each have recently suffered a major injury (say, a broken foot)? Such runners will know from their recent experiences that they have a maximum pace of far less than the required sub-7-minute-mile pace necessary for a sub-3-hour marathon. They know how long it takes them to "walk" to the post box. The pain of their limbs when under modest stress, their known pain threshold, their knowledge of how pain increases as stress increases, and how stress increases as pace and duration increases leave them in full knowledge that their injury precludes them from running a sub-3-hour marathon, given their current state.

Those who have never managed to run at a sub-7-minute-mile pace when training at their best can also know that they are unable to run a marathon in under 3 hours. The runner's history, current state of fitness, general health, etc. is known (let us stipulate). This suffices for knowing that the runner is, in the relevant sense, unable to finish a marathon in less than three hours. This claim about the runner's inability may be quite strong and left unqualified or it may be explicitly probabilistic. Nevertheless, the knowledge arises from empirically determined knowledge about the world and some grasp of inconsistency, when one event or state crowds out another. None of the knowledge required is knowledge of objects other than what is known in ordinary empirical investigations. Certainly, possible worlds don't come into it.

Once the knowledge of such matters is established, knowledge of conditional possibilities can be acquired. Such knowledge emerges from the consideration of changes in the world and the examination of what would have followed from them. Given a counterfactual conditional, the modalist supposes its antecedent and considers what "follows" about the world from that assumption, once the description of the world is adjusted to suit the antecedent. Once again, what is known is what follows from such assumptions given other claims that are also known about the world. In this way, the modalist offers a process of reiteration in which knowledge of basic modal claims gets incorporated into an account of modal knowledge of conditionals. Our knowledge of what is necessary emerges from our knowledge of the relevant configurations in the world. As argued above, by knowing that something obtains or exists no matter what other configurations there are, we come to know what is necessary.[9]

4.4.3. More complex cases. We noted previously that the introduction of '□' is, in some cases, very straightforward. If the conditions $C_1 \ldots C_n$ in the antecedent of a conditional do not matter, we can introduce the operator; otherwise, things are more complicated. Thus, we have different cases. The simplest one involves, as noted, those in which a given logic is fixed, and P is a theorem of that logic. In this case, one can immediately obtain an instance of $\Box P$. Thus, given classical logic, we have $\Box (A \vee \neg A)$, because $\vDash_{CL} (A \vee \neg A)$.

However, the situation is typically more complex. Let WO be the claim that every set is well ordered. Suppose that we are trying to determine whether this is the case. Some mathematicians will insist that it is—as long as the axiom of choice (AC) is assumed. They will then be prepared to introduce the necessity operator as follows: □WO, given that for them □(AC ⊃ WO) and □AC. But constructivist mathematicians who question the axiom of choice in general will not be prepared to state that □WO, given that for them it is not the case that □AC, since AC does not hold in general.

There are, however, even more contentious cases. Suppose among the conditions $C_1 \ldots C_n$ there are essentialist assumptions about the molecular composition of gold. Essentialists will consider themselves entitled to invoke these assumptions and conclude that □(the atomic number of gold is 79). Non-essentialists, in turn, since they challenge this assumption, will not grant that there is knowledge of the relevant modal claim. Resolution of the matter requires substantive metaphysical assumptions and the epistemic entitlement to those assumptions is more precarious than it was for the more mundane examples. Since one needs such entitlement to obtain the relevant modal knowledge, it becomes less clear to what extent we are in a position to have the relevant knowledge. Cases involving substantive metaphysical assumptions warrant agnosticism commensurate with the contentiousness of those assumptions. We are not in a position to know whether the conditions $C_1 \ldots C_n$ under consideration matter or not. After all, different metaphysical theories provide conflicting answers to this question.

As these considerations suggest, we have an account of modal knowledge (at least of first-order objects as opposed to substantive metaphysical theories) without requiring any special ontological commitments (in particular, to possible worlds) or invoking theoretical virtues as an argument for belief in the existence of a controversial ontology.[10] This is as it should be.

5. CONCLUSION

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[9] Strictly speaking, what we have presented so far is a modalist route into *counterfactual* knowledge. This is modal knowledge, though it may not be all that a metaphysician might want. Whether there is more to be obtained is not, strictly speaking, part of the modalist project, since modalism is compatible with quite limited versions of empiricisms as well as quite ambitious metaphysical theories. *Pace* Williamson [2007], however, we think that not all of modality reduces to counterfactuals and not all modal knowledge is counterfactual knowledge. We are prepared to argue (although it would take us too far afield to do it here) that there is no bar to changing the matter of one's concerns and the degree to which one countenances abstraction away from what is known. As different counterfactual conditionals are true/false depending on what is held fixed in one's assumptions, so different modalities arise depending on one's preferred degree of abstraction.

[10] Our modalist proposal provides a framework that explains, in a principled way, why we have so much ordinary modal knowledge and so little extraordinary modal knowledge (if any at all). This is something that Peter van Inwagen's [1998] modal skepticism also aims to account for, but in terms of conceivability. In contrast to his view, and as noted above, conceivability considerations are not invoked in our account. Moreover, with regard to extraordinary modal knowledge, it may be argued that we have such knowledge at least in a conditional form: if certain metaphysical assumptions are the case, then we know that such and such situations are possible. The problem, however, is to be in a position to assert the antecedent of such conditionals in an informed way. (We thank Bob Fischer for raising these points.)

We have thus far considered a range of cases of modal knowledge. The difficult cases are those in which it is unclear how to measure the items in the possibility space. For a "fair" die it is, for practical purposes, very clear how to delimit the items in the space and their relative measure. There are six equal measures. For most empirical investigations, it is impossible to be as confident about the number or relative measure of the items in the space. The relevant probability is no less objective, but our confidence regarding our access to the relevant facts of the space makes any apparent computation quite artificial. Nevertheless, we may treat them as similar in nature, since there are relevant empirically determined facts that bear on the cases. For dice: six sides, relatively uniform distribution of mass, and basic Newtonian regularities. For detectives: regularities of human motivation for fame, fortune, sex, drugs, and rock-n-roll, the state of technology, geography, as well as physical regularities. In both the well-defined and the less well-defined cases, judgments about a particular case are made against a background of similar cases, constant regularities, and the like so that we can have warranted judgments about particular outcomes based on track records for similar cases.

It is precisely this that is unavailable for metaphysical claims. How often has it turned out that modal realism is correct or that properties are universals or that time has been A rather than B in nature? To ask these questions is to see that the metaphysician's concerns are so very far removed from those for which probabilities are even vaguely defined. This shows that to speak of which metaphysical theory is more probable than others is analogical, at best. The possibility space, treated objectively, is a space of one. Modal realism is correct or else some other broad metaphysics is, and similarly for philosophical views about properties and time. Treated subjectively, the possibility space is limited only by imagination and is, in practice, subject at any given time to the philosophical fashions of the age. Given the impossibility of track record over a range of outcomes, there is no good way to assign measures to each of the options.

Leaving aside probability assignments, metaphysical theories are often motivated and supported *via* theoretical virtues: simplicity, unification, and expressive power. But for the reasons discussed in the context of modal realism, we are skeptical that such considerations provide good reasons to believe in the truth of the relevant theories rather than just to accept them on pragmatic grounds.

Finally, as we saw, worlds are completely dispensable from modal theorizing. Modalist options recommend themselves, however. In fact, a variety of modalisms (some essentialist, others not) are available, so there is no shortage of the philosophy of modality to be done, even with Lewis's plurality thesis behind us.

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