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Modal Epistemology for Modalists

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1 Introduction

For any theory to be in good epistemic standing, its key claims must not only seem plausible to its adherents. The theory itself—or some wider theory within which it is embedded—must account for how its key claims are known. Failing that, there is no useful way of adjudicating philosophical disputes, leaving us with unsatisfying stand-offs or trading intuitions. Philosophers of modality have rightly embraced this constraint on respectable philosophical theorizing.

There are two broad camps. Modal rationalists maintain that modal knowledge is either a matter of exploring suitable intuitions (Bealer 1996, 1999, 2002; Chudnoff 2013), of conceivability suitably idealized (Yablo 1993; Chalmers 2002), or of reasoning from proper principles (Peacocke 1999). Non-rationalists insist that modal knowledge results from theoretical inference based on explanatory considerations, such as inference to the best explanation (Fischer 2017), or similarity relations (Roca-Royes 2017). Both trends face serious difficulties. Rationalists following George Bealer's claim that "modal reliabilism is the correct explanation of why intuitions are evidence" (1996, 121) require that abductive inferences leading us to the "best" explanations are themselves reliable indicators of truth (*contra* Bueno and Shalkowski 2015 and 2020). Those following Chalmers require conceivability so idealized as to be inapplicable to the likes of us (Worley 2003, pp. 19-23). Non-rationalists, such as Fischer or Roca-Royes, also require either inferential or similarity relations to be reliable indicators of truth, against which we argue below. Our critiques will apply to blends using rationalist methods for modal knowledge of abstracta and other methods for concreta.

We provide a middle ground between rationalist and current forms of non-rationalist modal epistemologies. Rationalists are correct that modal knowledge requires reasoning from principles, but we maintain that these principles are local and specific to the relevant domains, not those arising from intuitions, conceivability, or meaning. Non-rationalists are correct that modal knowledge is local, domain specific, and not idealized to a point beyond human ken, but inference to the best explanation and similarity considerations are unnecessary. Better is a modal epistemology emphasizing primitive modality within a metaphysically deflationary stance. A grasp of the implicit modal character of properties and empirical regularities provides a straightforward modal epistemology for modalists.

2 Modal Rationalism: Intuitions

As part of his defense of modal reliabilism, George Bealer develops a two-pronged strategy. First, he argues that intuitions are evidence because they satisfy three significant epistemic conditions—consistency, corroboration, and confirmation (Bealer 1996, 124–125). He then defends the reliability of intuitions, despite their fallibility (Bealer 1996, 130). We argue that neither step succeeds, and that modal reliabilism is unable to provide a proper epistemology of modality.

One's intuitions are "largely consistent with one another"; "there is an impressive corroboration by others of one's elementary logical, mathematical, conceptual, and modal intuitions"; and "intuition is seldom, if ever, disconfirmed by our experiences and observations" (1996, 125). Intuitions constitute evidence since they are mutually consistent, corroborated by others, and not disconfirmed empirically. By implication, intuitions about possibility are central to an epistemology of modality. Anand Vaidya (2021) uses Bealer's corroboration condition to mitigate the internal indistinguishability of accurate and inaccurate (apparent) intuitions and the dependence of intuitive judgements on matters of presentation.

By Bealer's lights, intuitions are "seemings" (1996, 123–124). Someone has an intuition that something is so when it *seems* to that person that it is so, and that seeming satisfies the consistency, corroboration, and confirmation conditions. Rationalists are certainly well advised to respect the appearance/reality distinction enough to demand both the internal consistency condition as well as the external corroboration and confirmation conditions, on the modest assumptions that the relevant portions of reality are consistent and that each of us is epistemically fallible.

Any intuition-based modal reliabilism requires, first, the identification of intuitions and, second, grounds for thinking them reliable about the modal. We determine the reliability of a theoretical model by identifying the consequences of a theory combined with plausible factual claims. With these consequences in hand—predictions, typically—we then compare with observations. Nuances aside, a theoretical model is more reliable than alternatives when its predictions are more often correct than are those of competing models. The entire practice of testing theories by observation assumes that the consequences of theoretical and factual assumptions can be discerned independently of the accuracy of those consequences. This central feature of determining reliability is absent from Bealer's account, given his characterization of intuitions. Each condition reveals that the stock of intuitions is unstable.

Intuitions will appear to be consistent until such time as someone produces a proof that appears to show a contradiction amongst them. This results in competing (apparent) intuitions: the original "intuition" on the one hand and the joint "intuition" that the proof's premises are accurate and that the premises justify the conclusion. "Intuitions" are corroborated by others until such times as they are not, and they lack empirical disconfirmation until they are disconfirmed. Corroboration and fit with observation can wane as well as wax. Bealer's criteria leave us unable to identify intuitions independently of their epistemic merits, thus rendering any claims about the reliability of intuitions trivial.

Reliabilism's rescue is both easy and philosophically unsatisfying. Simply declare offending "intuitions" to be inauthentic, merely apparent intuitions taken to be genuine by the misguided. Easily done, but unsatisfying in any philosophical dispute. This declaration is either unanimous but subject to later change in philosophical group-think, or else it is not unanimous and ill-suited to resolving any disputes of substance. Some illustration is in order.

Consider first the consistency requirement and a variation based on a version of Frege's Basic Law V. That every property corresponds to a set of objects having that property seems not only true, but analytically so. Despite that, Russell's paradox exposed the principle as false because inconsistent and, hence, necessarily false. Consider now an "intuition" of Law V. It *seems* to be consistent with logical intuitions. Despite the appearances, the inconsistent intuition cannot be consistent with other intuitions. At any given stage, we have merely the appearance of consistency and, thus, the appearance of a genuine intuition. Similarly, with the Banach-Tarski theorem, given the axiom of choice. According to the theorem, a sphere may be decomposed into

finitely many pieces and reassembled into two spheres of the same volume as the original. The process may seem to be consistent but proves to be impossible in any space containing ordinary objects such as oranges.

Consider next corroboration. Until the beginning of the 20th century, the "intuition" that time is absolute was corroborated by many other logical, mathematical, conceptual, and modal "intuitions". Time seems to have a structure and order that does not depend on the observer any more than the order of natural numbers does. It has a direction that is as inevitable as it is ubiquitous: the past is gone; the future has not yet emerged. One cannot, in fact, return to the past any more than one can jump to the future. Nonetheless, according to special relativity, the "intuition" of time's absoluteness—the intellectual seeming that time is not relative to some frame of reference—and the network of corroboration surrounding it turned out to be false. Time is relative to a frame of reference. Furthermore, and finally, the empirical confirmation of special relativity provides clear empirical disconfirmation of the "intuition" about time's absolute character. All three modal reliabilist criteria face counterexamples.

These criteria may fail all at once. For those in the 13th century the Earth seemed not to move, as it still *seems* to us. They had a so-called intuition of the Earth's immobility. This "intuition" was consistent with other "intuitions" about Earth, impressively corroborated by others, and not disconfirmed by 13th century observation. Despite meeting all three criteria in the 13th century, the "intuition" is false, as established by 19th century astronomy.

It is no use for rationalists, with the benefit of hindsight, to maintain that there never was an intuition of a stationary Earth, thus saving modal rationalism from counterexample. Certainly, Earth's movement was observ*able* in some sense even in the 13th century, even if not observable to 13th century observers, limited as they were by 13th century technology. Fit with observation, no less than consistency and corroboration, is unstable, so far as philosophical force is concerned, illustrated by the march of technology. Rationalists must reconcile the ever-present possibility of revising an apparent intuition with the alleged reliability that reasoning based on apparent intuition is supposed to display. Revisability regarding the status of any particular seeming as a genuine intuition undermines the presumed lack of experimental and observational disconfirmation of intuitions.

Moreover, Bealer's criteria do little, if anything, to establish that what satisfies the criteria are themselves reliable. It is crucial to Bealer's argument (1996, 121) that intuitions are evidence. Nothing in the criteria of consistency, corroboration, and lack of empirical disconfirmation is evidence for truth. Appearing to satisfy all three is, at most, merely the lack of any grounds for doubting what satisfies them. The criteria must be supplemented to move properly those with apparent intuition from agnosticism to belief. Absent a well-supported story about how intuiting is reliable, rationalism remains magical or wishful thinking. Required is a principle linking the satisfaction of Bealer's criteria with (likely) truth.

Elijah Chudnoff's (2013) perceptualist account of intuition requires that intuition experiences have veridical presentational phenomenology.

> If your intuition experience representing that *p* puts you in a position to know that *p*, then it does so because it has veridical presentational phenomenology with respect to *p* (Chudnoff 2013, 207).

In turn, a perceptual experience has veridical presentational phenomenology regarding *p* provided that:

> it is true that *p* and your perceptual experience really makes you aware of the chunk of reality that makes it true that *p* (Chudnoff 2013, 21).

Presentational phenomenology is veridical as long as one's perceptual experience makes one conscious of the portions of the world that makes the relevant belief true. Putting things together: an intuition of something provides knowledge when it has the right kind of presentation and the right kind of presentation is one that makes one aware of how things are.

We register no objection. Intuitions will yield knowledge when their content is accurate and there is something about the accurate intuitions that signal to us that they are accurate. Call this something 'verdical presentational phenomenology', if you like. We nevertheless can be mistaken about whether any apparent intuition is genuine, since we may be mistaken about whether each criterion is satisfied. Chudnoff's attempt to link intuition with perceptual experience is little help to the modal rationalist, since in any particular instance the question will be: is the presentational phenomenology veridical? If so, the intuition yields knowledge; otherwise, not. No experience, however, carries a self-verifying 'veridical' as a component. Anyone with an experience containing anything analogous to 'veridical' cannot avoid the question of whether the sign itself is a truth teller.

We might appeal to our memory about the character of presentations of other experiences that turned out to be correct or we might think that the experience contains some marker of its own veridicality. Knowing we are fallible, we know that appearances of consistency, corroboration, confirmation, and veridicality have failed us, we have made no progress in thinking that the appearances that we label 'intuitions' are reliable. Establishing their reliability requires some means of checking, since no aspect of an apparent intuition's phenomenology suffices. No trait of the experience itself helps, so long as rationalists intend to preserve the distinction between appearance and reality, testimony—even self-testimony of experiences—and accuracy, etc.

We conclude that a thermometer is accurate and that its reading is evidence about the temperature, once we have checked that it has been properly calibrated. The tools and procedures for this calibration are quite local, not easily transferrable even to other measuring devices. At the very least, calibration requires something for the sake of that procedure to be acknowledged by relevant parties to be sufficiently accurate. With that we can compare what is to be calibrated.

When trying to establish the evidential value of intuitions, rationalists are in the position of having no accepted standard at all, nothing granted by both rationalist and non-rationalist as (sufficiently) accurate, against which rationalists can at least compare the intuitions on which they wish to rely. Indeed, their circumstance is much worse than those with thermometers. We might find thermometers useful even without a standard against which calibrations can be performed. We can construct translations schemes between devices with very different metrics and we can use them to compare with the states of health and illness of patients. There is nothing magical about 98.6°F or 37°C regarding accuracy. For some purposes, it suffices to pick one, stick with it, and compare with others when necessary. All we care about is establishing correlations between changes in the device with changes in human bodies or the environment.

Rationalists are in an entirely different business. They require the accuracy of the contents of some intuitions, but without any prospect of peeking behind the intuition's content to the reality represented. As such, there are no rationalist resources to do more than assert the accuracy of some intuitions, which may have some specifiable "look and feel".

Chudnoff's linking intuition to perception is useful for the epistemology of modality only with suitable perceptual experiences of the chunks of reality that make modal claims true. The account fares better for possibility cases. How, though, does one perceive that water is

necessarily H_2O, if indeed it is? One may perceptually determine how it is, but not relevant modal qualifiers on how it is. Inferences are required to take us from water being H_2O to its necessity, or even its possibility, of being H_2O.

Perception is a useful means of acquiring knowledge because we have learned to rely on it when its deliverances are robust, stable, and factive. Like Chudnoff, Bealer is not wholly unaware of the need to approximate factivity for intuitions. For concept possession he maintains that:

> x determinately possesses the concept of being a multigon iff: x would have the intuition that it is possible for a triangle or a rectangle to be a multigon iff it is *true* that it is possible for a triangle or a rectangle to be a multigon. (Bealer 1999, 41)

We observed that Bealer's criteria for intuitions are external to the intuitions, making their genuineness not perfectly transparent. The same predicament recurs here. Whether one determinately possesses a concept is a matter of making modal judgments about applicability if, and only if, those judgements are true. The simple example obscures the central difficulty. The general form is: one determinately possesses a concept if, and only if, one would make certain modal judgements if, and only if, those judgements are correct. So long as we focus on a few salient cases, it is hard to see how one could know what it is to be a multigon without judging that it is possible for triangles and rectangles to be multigons.

Set aside the peculiarity of building into grasping this concept intuiting the *possibility* that triangles and rectangles be multigons, rather than the judgement that triangles and rectangles *are* multigons. The left-to-right-hand direction of the inference shows that one determinately grasps what it is to be a multigon only if one has (only) correct modal intuitions about multigons. Possession depends on making modal judgments and making modal judgments depends on their accuracy.

This is no advance for rationalists. Philosophical disagreement about modal matters was the problem to which intuitions were to be the solution. When disagreements about modal matters are shifted to disagreements over the genuineness of intuitions or to whether one genuinely grasps a concept, we have no solution at all.

This situation carries over to the more sophisticated social-disjunctive account of intuition-based modal epistemology recently advanced by Anand Vaidya (2021). Granting experimental results that threaten to undermine wholesale the epistemic value of intuitions, Vaidya adapts John McDowell's disjunctive account of perceptual experience (McDowell 2008, 2009), according to which there is a metaphysical difference between veridical and non-veridical experiences. We pose no objection to the use of 'metaphysical' in this context. Those minded to articulate this difference in terms of some relation—causal or otherwise—are free to do so. Vaidya correctly concedes that first-person assessments cannot distinguish between "a veridical intuitional state" and "a non-veridical appearance that is phenomenologically similar to an intuition, but because something has gone wrong it is not a genuine intuition" (Vaidya 2021: 215). We argued earlier that the proposed solution, i.e., incorporating a social dimension to modal epistemology by consulting others trained and competent in relevant matters, fails to solve the fundamental problem. Each party is, as it were, behind the same metaphysical veil. The social dimension simply adds more parties in the same plight: this is how things seem to me/us. Consulting others enhances our own epistemic state only when the others have been able to put themselves into positions to check the facts. When all, however, are limited to their own

seemings, no-one can help anyone else break out of the pool of seemings to verify whose seemings are veridical and whose are not.

All of the talk of intuitions serving as evidence ignores a fundamental feature of evidence. Mostly typically, evidence for one state of affairs is another. Evidence of a mouse is scratching behind baseboards and missing cheese. Evidence of an approaching storm is a precipitous drop in barometric pressure, or the sudden cooling of the air. We may well observe various matters, but our evidence of the mouse is not that it seems to us that there is a mouse except insofar as our use of 'seem' in that context is hardly experiential but inferential. The epistemic work is done by hearing the scratching and finding the cheese gone. We observe some worldly states statistically relevant to another. Knowing that statistical relevance is why we treat some states as evidence for another. Those wishing to treat intuitions as evidence provide nothing like this.

Intuitions as seemings cannot serve as worldly state relevant to our belief in another unless those intuitions themselves are reasonably believed to be statistically relevant to their own contents, which is not established by observing that many (of the right sort, perhaps) are like-minded about matters. No-one escapes Plato's cave by consulting other cave dwellers. Those wishing to treat intuitions as evidence must provide more. A design story may do. Theistic design of human cognitive machinery about modal matters would do. Naturalistic stories have the greater challenge of accounting for how reliability of intuitions about metaphysical matters would have developed. Observational reliability about cheese or air pressure is one thing; intuitive reliability about modal matters is another entirely. We do not claim that no such design stories can be developed, only that they must be, but have not yet been, developed.

Bealer's aim was to develop an account of the *a priori.* We articulated our best approximation of an epistemology of modality along his broader epistemological lines. The autonomy of the philosophical enterprise is crucial for the project. In fact:

> This kind of autonomy thesis is a *modal* claim; it posits only the *metaphysical possibility* of autonomous a priori knowledge, perhaps on the part of creatures in cognitive conditions superior to ours. But, if true, the thesis would nevertheless help to illuminate our own situation. For to the extent that we *approximate* the indicated cognitive conditions, we are able to *approximate* the sort of autonomous a priori knowledge contemplated in the thesis. (Bealer 1999, 48)

Acknowledged here is the highly idealized character of the overall account. Bealer helps himself to the claim that we approximate our cognitive superiors, but that must be established and not merely appropriated. In particular, it must be clearly specified and established for modal claims. Otherwise, the proposal has no force to accommodate how *we* might have such knowledge. If we know the truth, it is reasonably clear how to devise an account of the relevant approximation. The perfectly obvious difficulty, however, is that we are typically trying to determine the truth and cannot use knowledge of it as a guide to explain the relevant approximation. Bealer-style modal reliabilism is not equipped to provide a proper epistemology of modality.

We conclude this section by considering a significant challenge to an influential form of modal rationalism, advanced, for instance, in Chalmers (2002), and that invokes conceivability. The challenge highlights a problematic consequence of the view (Vaidya 2008). According to this form of modal rationalism, an idealized kind of conceivability (so-called ideal primary positive conceivability) entails a particular sort of possibility (primary possibility). As Vaidya argues, it follows from this view that "the space of logically possible worlds is coextensive with the space of metaphysically possible worlds" (Vaidya 2008, p. 191). The presumption of safety and plausibility of this consequence is unwarranted.

One would expect that logical possibility and metaphysical possibility not to be coextensive. After all, nothing in logic precludes one of the authors of this work being a fried egg, since the supposition is not contradictory. This does not, though, *seem* to be a metaphysical possibility. In order for that to be the case, two situations need to be possible: the author is generated inside an egg and the egg is fried. The latter situation is straightforward, but it is unclear that the former is metaphysically possible at all. Being human, a crucial feature of the author, at least given the DNA that humans have, does not seem to be compatible with coming from an egg. A very different creature from the author would end up in the frying pan.

Vaidya's argument challenges the adequacy of any modal rationalism conflating logical and metaphysical possibility. Those conflating them owe us not just claims about the coextensiveness of "spaces" of worlds, but detailed accounts of how it is that a human being could be a fried egg, an oak tree, or a neutrino. What are the existence, identity, and persistence conditions for each? What are the parameters of variability? How could the tool (logic) for specifying one "space" be appropriate for all modalizing, since that tool is designed to wash out as much detail as possible when reasoning formally about things? Or, to put matters slightly differently, why think that the possibilities and the necessities for each thing are the same as they are for every other thing? Absent answers to those questions there is no way to assess that form of modal rationalism.

3 Modalism and Modal Epistemology

3.1 Non-rationalism in the epistemology of modality. Important forms of rationalism, we argued, are inadequate for a proper epistemology of modality. Non-rationalists do better because they typically do not require idealization and they provide accounts more suitable to the epistemic circumstances faced by creatures like us.

Two important developments are Bob Fischer's (2017) account of justification of modal claims in which theories play a decisive role and Sònia Roca-Royes's (2017) similarity-based account of knowledge of possibility for concrete objects. We consider each in turn.

Fischer (2017) rightly emphasizes the way in which justification of modal claims often relies on theories about the relevant domains. The theories encode significant information about the objects whose possibility or necessity is at issue. By relying on such theories one can be guided in the determination of what is possible for such objects. The difficulty is that inference to the best explanation is central to Fischer's account. The notorious unreliability of this type of inference (see van Fraassen 1980 and 1989, and Bueno and Shalkowski 2020 and 2015) makes it ill-suited to an epistemology of modality. Furthermore, there is a fundamental and unresolved ambiguity in the basic nature of IBE.

When determining which theory is best, even if we set aside the prospect that the lot from which we select the best is a "bad" lot (van Fraassen 1989), IBE must select the best theory on the basis of either "internal" features of the theory itself or else features external to the theory. Treatments of IBE are not always explicit about which features are relevant and used. Consider them in turn.

The internal features are those *of the theory*, which is a *representation* of how things are. The theory may be brief, tome-like, simple, complex, stating that few or many (kinds of) things exist with few or many characteristics and relations, tied together in a unified explanatory mechanism or in a patchwork of independent explanations. If the project is to produce a reasonable approximation of a true theory, the representation itself is a distraction. The project is to determine whether there are few or many things, characteristics, relations, explanatory

mechanisms, etc. To compare theories on the usual parameters of simplicity, coherence, unification, etc., is to preempt the task of determining how things are in favor of what the theories are like. Treating a simpler theory, however simplicity is understood, as thereby more plausible is to assume that reality is simple rather than to discover it. Otherwise, this is just a shift of attention from reality to representation.

Avoiding this distraction, looking to external features is to remove anything distinctive about IBE. When answering "How well does each theory represent reality?", we engage in the project of discovery. In doing so we must then make the usual appeals to evidence and/or reasoning. We have no objection to either, we note only that when we cease assessing theories in light of assumptions about reality and look to reality itself to test those assumptions, we no longer engage in IBE. We examine candidates for data, theories, and permissible reasoning. We then assess what is true on the basis of old-fashioned evidence. Modal metaphysics and its epistemology are not well suited to justifications by assessing evidence in the usual ways, most obviously because we have no useful run of assessing hypotheses about it based on various justifying considerations and then in a theory-neutral manner, assessing track records, making probability assessments, and the like. We may use the language of evidence and probability, but there is nothing analogous to frequency distributions in light of which we can compare our stock of relevant evidence to discover how often evidence like this arose because reality was This Way instead of That Way. All we ever have is *what we take to be* evidence and the conclusions we draw from those takings, which are always disputed. For arguments about modal metaphysics and its epistemology ever to be persuasive, there must be some way of breaking out of partisan differences regarding what constitutes evidence and its force. There must be some agreement about relevant facts and success rates of inferential practices in light of those facts. None of this is available to modal metaphysicians and epistemologists. The moral for projects like Fischer's is that either they rely on IBE and thereby focus on the wrong things or they focus on the right things, but with no prospect of weighing evidence that is analogous to its assessments in science.

Like Fischer, Roca-Royes (2017) correctly focuses on the relevant objects to determine what can be known about what is possible. Similarity relations are notoriously vague and hold indiscriminately; everything resembles everything else in some respect or other. Were merely some resemblance with something with characteristic *F* sufficient for knowledge that another could be *G*, then if anything *is F*, then everything *could be G*. Roca-Royes's account, correctly, narrows the focus, selecting some resemblances to actual outcomes to possible outcomes. That a person has a cardiovascular system and that some with a cardiovascular system have fatal coronary incidences provides knowledge that the person might have a similar incident. So far as that goes, it is not wrong. It does not, though, expose the central fact about modal knowledge.

Central to her account, when dealing with concrete objects, is the reliance on induction on similarity relations to ground such knowledge claims. Inductive inferences justify claims only when some regularity underwrites the phenomena under study. There must be some known pattern in which being *F* is associated with being *G* for us to have our confidence justifiably raised that some particular is *G* on the grounds that it is *F*. If one has grounds for thinking that actual nature is uniform regarding being *F* and being *G*, inductions will be reliable as a matter of fact. Modal knowledge requires more, since the actual regularity may be a large-scale cosmic accident, which would have no implications whatever for how things could be.

A non-rationalist alternative that relies neither on IBE nor on inductive inferences or on similarity judgments more generally is called for. We sketch such an approach, with some distinctive empiricist traits.

3.2 Modal properties and modalism. Central to our modalist proposal is establishing access to the possible and the necessary by way of knowing the modal properties of the objects under consideration. These are properties that objects have given what they are. A wooden table is breakable given the materials that constitute it. Breakability is, thus, one of its modal properties. By knowing a table's composition and by knowing the behavior of its materials under various changing circumstances, we acquire knowledge of the table's breakability.

The table's breakability is empirically accessible to anyone with knowledge of its composition. Engineers use sophisticated theories of materials when planning domestic, civil, and commercial projects. Those theories contain articulations of the results of stress tests, which exposed the limits in various conditions of materials and their combinations. The very point of attending to those theories when designing artifacts is to stay well away from the point at which the artifact *would* break, melt, or otherwise degrade.

The same goes for abstract objects. Can every set be well-ordered? The answer depends on the relevant properties of sets. If the Axiom of Choice is in place, then the sets do have that property, since that axiom guarantees the availability of a well-ordering even if none can be explicitly exhibited. Without Choice sets lack that property, since no such well-ordering is generally available. The modal content of this result is only superficially skewed by the use of purely extensional mathematical languages. Given Choice, it is *possible* to well-order any set; otherwise, it is not. As things stand, we can obtain only relative or conditional possibility. Only relative to Choice is well-ordering possible. Constructivists reject Choice and, so, universal well-ordering; classical mathematicians can have both.

The point generalizes. The theories we have been considering, whether empirical or mathematical, typically involve no modal operators. Philosophers should find no deep lesson in this. Materials scientists and engineers are not modal metaphysicians. They ply their respective trades while being cavalier about categorical vs. modal matters. Nevertheless, there is no stretch to the imagination to consider the following:

> Designer: "Here's my design for the table."
> Boss: "This is a joke, right?"
> Designer: "Why?"
> Boss: "Look. Right here at this stress point. Put your typical Thanksgiving turkey right there and the guests would have the entire dinner in their laps!"

Any such conversation exposes that the apparently non-modal mathematics in the background is, by the lights of the practitioners, imbued with modal content.

We decline any philosophically interesting account of these modal properties because we decline any philosophically interesting account of any properties. Paper tears, rubber bands stretch, sugar cubes dissolve in water. We see these things. When convenient we use more passive constructions to say how these things *are*; tear-able, elastic, soluble. When self-consciously distinguishing the item from its attribute, we use property constructions. The paper has the property of being tear-able, the band the property of being stretchable, the cube of being soluble. What each does has been observed. There is no need to invoke highly charged metaphysical descriptions of such properties. They, including modal properties, are nothing but features of objects; perfectly ordinary, observable features at that.

Modal knowledge is an extension of knowledge of actual properties that objects have and how these properties change under changing circumstances. Knowledge of possibility arises from knowledge of actuality. Testing limits is testing the possible. Knowledge of the necessary results from what is precluded from such variations. Tables cannot fly on their own. Philosophical thought "experiments" purporting to show otherwise are almost always wholly inattentive to what makes things what they are. Wooden tables might be unbreakable were wood and steel nuts and bolts to be very different from what they are. Metaphysical fantasies require the hard work of discerning other limits. How different from oak and maple can something be and still be wood? How different from iron's standard chemical composition can something be and still be the iron that composes steel? These and related questions are wholly unanswered by those claiming the possibility of unbreakable tables or flying pigs. As with both rationalist seemings and the conflation of so-called logical and metaphysical possibilities, the hard work is left undone by thought experimenters.

Induction plays no role in the distinctive move to warranted, even if limited, modal knowledge. In our examples, the properties of materials with their actual features suffice. Neither is access to modal properties the outcome of an inference to the best explanation. Most obviously in the mathematized portions of science, the mathematics permits the articulation of the scope of the possible. The breaking point of steel cables is the point beyond which one cannot exert force on an intact cable. Were the engineer's formulae not encoding modal information, there would be no point in thinking counterfactually armed with engineering expertise.

We modalists urge humility. Blue swans? Talking donkeys? Well, no. We have no doubt that there is consistency in things with the appearance of swans being blue. Indeed, that much has, no doubt, been an artificial reality. The envisioned natural reality? The case is never properly made. For convenience only, concede that surface appearance does not make a swan, but some "deep" structure. Tell us more about the tolerances of variation of that structure. Tell us exactly about the color-making features of that deep structure. Tell us when we have no longer a swan but a duck or something Dr. Seuss-like in kind. Similarly for talking donkeys. We should resist any pretense to knowledge in all such under-specified cases. Whenever unestablished assumptions are needed to establish a given possibility or impossibility, some dose of modal skepticism is, therefore, expected (Bueno and Shalkowski 2015).

3.3 Primitive modality. Also central to a modalist epistemology is the reliance on primitive modality. We noted that objects have properties and among those are modal properties, which need not, and should not, be characterized in more basic terms. It is an unnecessary philosophical addition to identify these modal properties with universals, dispositions, powers, propensities, laws, or related metaphysical posits. The tendency in metaphysical theorizing to reify gives the false impression of uncovering the underlying nature of the objects under consideration. As will become clear, reifying the relevant objects in terms of a preferred ontology offers only an illusion of understanding the relevant phenomena better.

Modalists question the wisdom of ontologizing (Bueno and Shalkowski 2015 and 2020). The ontological inclination is driven by presumptions about the primacy of the categorical or the drive for further explanation. What, though, are the grounds for thinking all reality to be categorical? It is difficult enough to banish the modal from the apparently categorical. Things are green not because of how they appear. It may be dark. Not because they are observed to be green. There may be no-one about. Not because *we* think they are green. We may have confused green with blue. Not because our visual fields have a green feature. Some of us may be

colorblind. Any useful account of frogs being green on a desolate night is shot through with modality. Were conditions to change this way or that, the frog's skin, the light, a device or eyes would do various things. Good luck with a non-modal account of an electron's charge.

Drives for deeper metaphysical explanation fare no better. Why does this do what it does? Because it has a disposition, a power, a propensity to do so. While that seems to take us one step further to a full explanation, we have simply traded one form of language for another. More carefully, such reifications fare no better than rationalist intuitions. There is no way to identify the reified portion of reality, save through the activity for which it is to be the explanation. Why does it do what it does? Because it is the kind of thing that does that, or it has a characteristic that makes it do what it does. Notice how the metaphysical explanation differs from a scientific one. Why did the container catch fire? Not because it is the kind of thing that catches fire or because it has the attribute of being fire-able. No. It caught fire because it contained gasoline instead of water, the lid had been removed and some fool thought it a good idea to toss a lit match into it. Here we have distinct facts explaining the one in question. Metaphysical reification manages only to use different form of words to leave us where we were: none the wiser about why things are the way they are and how we might effect change in the future.

A more promising approach is to understand modal properties directly as features of the objects. By taking the modal aspect of some properties as primitive, the modalist resists such reification and insists that some phenomena are better accommodated instead simply in terms of the modal.

3.4 The problem of modal epistemic friction. In light of these considerations, a significant issue emerges. Given the variations involved in modal contexts, one needs to ensure that the possibilities (or necessities) entertained are genuine, that they do not conflict with (the natures of) the objects in question. After all, if there are conflicts between the entertained possibilities (or necessities) and the relevant objects, the conjectured changes are not really possible. It would not be Socrates, under significant counterfactual variation, if the object under consideration is no longer human. Being essentially human seems to constrain the range of modal variations for Socrates.

According to Anand Vaidya and Michael Wallner, the problem of identifying the constraints on modal variation and the problem of knowing those constraints is the problem of modal epistemic friction (Vaidya and Wallner 2021). As they note:

> Suppose you know that Socrates is human. To get from there to the knowledge that it is metaphysically necessary that Socrates is human on the basis of essentialist deduction-theory, what you need to know is that being human is *essential* to Socrates and that what is essential (to some *x*) is metaphysically necessary. In other words, the *epistemic friction creator* […] in this case is the *essentialist principle* […] *together* with some *essentialist proposition* (Vaidya and Wallner 2021, p. S1919).

Vaidya and Wallner thus generalize what we have urged throughout: there must be constraints on our modal theorizing and there must be points of epistemic contact with those constraints for warranted modal metaphysics.

From a modalist perspective, the constraints involved in modal variation are given by the relevant modal properties. These properties are parameters that can be invoked to identify what remains constant across counterfactual scenarios. Clearly, something needs to be held fixed among the variation on pain of losing, amongst the changes, the very objects whose counterfactual shifts are at issue. A modalist who is also an essentialist would have no difficulty

tackling the problem head-on, at least at an initial stage of analysis. No counterfactual variation violating the essential properties of an object and their implications is possible. The very object would be lost.

Modalists, however, need not be essentialists. Our identification of both the object and its modal properties suffices. Non-essentialists typically complain that the essence of a given object is not obvious. We decline to litigate the matter here. There is no need. The modal epistemologist is not engaged in a process of inspecting alternative possibilities using a "Jules Vern-o-scope", which would require knowledge of an object's essence to identify it from amongst many options in an alternative possible world (Kaplan 1979). Rather, in any particular instance we have identified the object and attributed to it a modal property. Rational and empirical grounds for both the identification and the attribution obviate the need for an essentialist theory about the object itself. We have picked it out. It is before us, as it were, even if only by way of reference rather than physical presence (Kripke 1980). Any reason to think that any change permitted by the modal property would obliterate the object is a reason not to attribute that modal property to that object. Any reason to doubt that we know that about which we speak is similarly grounds for not attributing any property to the object. We need not resolve questions about essences of artifacts to know that the table before us is breakable, nor do we need a philosophically robust theory of human nature to know that Socrates could have forsaken the philosophical life. Anyone unable to make these and a multitude of similar assessments would have no business either ontologizing in terms of tables or Socrates or modalizing about those objects.

A full modal metaphysics about tables or people may require more to decide edge cases. The devil will always be in the details. Any gains earned from quite general essentialist commitments are lost in particular judgments or disputes, if the essences of the relevant objects are insufficiently obvious. If the essence of Socrates is *being human*, unless it is known what it is to be human, one will be none the wiser. Identifications of the human essence with DNA, evolutionary genealogy, or social organizations each have their own challenges. Perhaps those challenges can be met. Here we provide no grounds for essentialists to forsake their essentialist programs. We urge only that a great degree of knowledge about possibility for objects with which we are acquainted is achieved without these programs.

Modalists armed with solidly empirically-grounded theory can make progress in the epistemology of modality on bases much more modest than those typically wheeled out. Just as our inability to generate well-grounded consensus about whether a particular shade is chartreuse save by stipulation is no barrier to warranted judgments that a typical rose is not chartreuse, so we may judge ranges of possibilities for the table in front of us and for the Greek philosopher famous for mentoring Plato. We may begin without E. J. Lowe's desired knowledge of the appropriate ontological categorization of an object with *philosophical* sophistication (Lowe 2006), just as no-one needs the sophistication of botanists to know that the wood of an oak may be used to make tables and may burn in a forest fire. As rough and ready as our modal judgments may be, we know enough to know what generates modal epistemic friction. Modal properties of the objects at hand.

3.5 Skepticism and the scope of an epistemology of modality. Given these remarks, we close by considering the scope of any epistemology of the modal. Is an account of modal knowledge expected not to rely on any knowledge of the actual whatsoever? Or is it expected not to rely on any knowledge of the possible or the necessary? A positive answer to either of these questions—

thus requiring an approach to modal knowledge that does not assume any knowledge of actuality or any knowledge of modality—seems to lead one directly into skepticism.

Barry Stroud (2000) has examined the difficulties and inevitable dissatisfaction associated with the philosophical project understanding human knowledge in general. The aim is to understand human knowledge without first helping oneself to some knowledge. The question is: if one does not assume that one already has some knowledge and is using only knowledge-preserving inferences, how can one come to a completely general understanding of human knowledge? If such knowledge is assumed, then skepticism is not defeated, since there is a remainder (that which is assumed) for which there is (yet) no account. If such knowledge is not assumed, skepticism is still not defeated, since there is no grist on which the epistemological mill may operate. To be left with either an unaccounted for remainder (either *tout court* or at any given stage in a hierarchy of accounts) or to be left with no data with which to work is to fail in the project of fully explaining knowledge. The result is an inevitable dissatisfaction familiar from philosophical skepticism (see also Stroud 1984 and 2011).

Earlier, in connection with modal rationalism, we rehearsed part of Stroud's concern. Assuming *arguendo* that a range of our seemings track modal reality sufficiently, the modal rationalist's project is not nearly complete. Advancing the rationalist thesis requires advancing reasons for thinking that seemings do track modal reality. Bealer rightly attempted to give conditions for these seemings that suffice for them amounting to evidence. His plight is that consistency is at any given moment indistinguishable from merely apparent consistency. Corroboration that one's seeming's might provide to another requires—if they are to provide any epistemically useful corroboration at all—that one's seemings track modal reality. Without that assumption Bealer-style rationalists cannot manage to set aside that all such "corroborations" are anything more than the blind leading the blind. They may avoid disaster. They may all end up happy. The stating of the three conditions on intuitions constituting evidence, however, merely assumes what should be placed in evidence, i.e., that any seemings at all ever track modal reality.

The predicament to which Stroud points is generated by the project of a fully general account of knowledge, involving an explanation of how such knowledge is both possible and possessed. Externalist "if-then" strategies fail to tick all of the necessary boxes. Of course, *if* some externalist account is correct, be it Cartesian with a background story of divine design or secular with a different background, then those of us satisfying the relevant external conditions know some things. That is far too easy and satisfied by nearly any theory of knowledge. The sticking point is always to be in the position to assert the antecedent of that conditional, where externalists are always stuck, if trying to give completely general account of knowledge and not merely to maintain that skeptics have failed to demonstrate that we have none (Plantinga 2000).

David Lewis's appeal to a plurality of worlds falls afoul of similar difficulties (Lewis 1986). Of course, if (again) there is a plurality of such worlds with the character ascribed to it on the basis of principles that we use, such as recombination, then we have correct modal beliefs when judging and reasoning in ways validated by the plurality. Since such may also be said for any other modal metaphysics and epistemology, that is no advance. His use of inference to the best explanation to bolster his case does nothing, since IBE just is a variation on this conditional predicament in another guise. A theory is said to be best when if true it would better explain things than would alternatives (Bueno and Shalkowski 2015). Without the IBE strategy, there is nothing but the assumption that the plurality has the requisite Goldilocks character of being just right (Shalkowski 1994).

We modalists suffer no such plight. We have no overarching explanation of the modal and we have as yet attempted no general account of modal knowledge. We satisfy ourselves with acknowledging primitive modality and emphasize that the epistemology of the modal is concerned with modality in actuality. We find modal content in theories developed for other purposes, be they purely intellectual or practical engineering. Ignoring this modal content is to fail to grasp the use to which those theories are put. Were they to have no modal import we could not use them to think counterfactually nor to plan for the future. To take care in treating them wholly non-modally would be to treat their content as indistinguishable from theories about cosmic accidents, which would be no guides to either counterfactual reasoning about the past when thinking about, say, moral responsibility or for thinking about the future for which we may wish to take responsibility. Because the objects are ordinary and the grounds for the relevant theories that warrant the attributions of modal properties are not especially tendentious, we require no controversial substantive philosophical assumptions about what exists, how it exists, or how we come to know either. Such modesty is a virtue.

4 Conclusion

We offered a critical assessment of central epistemologies of modality, especially of a rationalist sort, and sketched a modalist alternative. Central to the proposal we recommended is the identification of the relevant modal properties that ground the corresponding modal knowledge. There is no need to settle the metaphysical nature of such properties. We need only access to the relevant objects and grounds for attributing properties with modal content, even when that content is obscured by categorical representations. We are right to remain agnostic about edge cases and to be doubtful of claims based only on the thin reed of the failure of obvious contradiction. This is as it should be for those sympathetic to the fact that modal knowledge is knowledge of an important aspect of the actual world.

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