What Everett Couldn't Know

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Abstract

In an impressive feat of combining modal metaphysics with fundamental quantum mechanics, Wilson (2020) presents a new genuine realist metaphysics of modality: Quantum Modal Realism. One of the main motivators for Wilson's project is to do better than existent realist metaphysics of modality with regards to *epistemic challenge*: we should be able to explain our knowledge of modality.

In this paper, I will argue that there is a significant worry for the epistemology of Wilson's modal metaphysics, on that parallels Rosen's objection to Lewis genuine modal realism. That is, quantum modal realism fails to explain why our ordinary methods for gaining modal knowledge are reliable. I argue that this means that with regards to the epistemic challenge, Wilson's modal metaphysics is, at best, as well off as Lewis', but potentially worse.

Keywords: Quantum Modal Realism; Epistemic Challenge; Epistemology of Modality; Naturalised Modal Metaphysics; Modal Realism

1 INTRODUCTION

Modal metaphysics concerns the nature of modality. More generally, a metaphysical theory should meet two requirements. First of all, the metaphysics should allow for a more than nominal role of science in constraining metaphysics. That is, in Bryant's (2020, p. 1869) words, the metaphysics should not be free range. Call this the **Cooped Up** desideratum. Secondly, for any field of inquiry, the metaphysics of that field should be compatible with a relevant epistemology, so that it can comply

with the integration requirement (Peacocke, 1999, p. 1; Roca-Royes, 2021, p. 158; Sjölin Wirling, 2021, p. 5658). Call this the **Integration** desideratum.[1]

Rosen (1990, §6) argues that Lewis' (1986) theory of modality fails to satisfy **Integration**. Rosen starts with the assumption that any theory of modality should be able to explain that "our usual methods for forming modal beliefs are generally a good guide to the modal truth." For failing to do so, would "lead rather quickly to modal scepticism, the view that we have no modal knowledge; a claim which, like most strong sceptical theses, is very hard to believe" (p. 339). The central tenet of Rosen's objection is that it is "profoundly puzzling" why our imaginative capacities (which ordinary agents seem to use reliably to find out modal truths) would

> "truly describe a domain of objects [i.e., Lewis' possible worlds] with which human beings had absolutely no contact when those principles were being shaped, presumably by a perfectly natural evolutionary process? After all, there might have been creatures whose imaginative principles were quite out of step with the distribution of worlds in modal space. How is it that we are so lucky as to have been given the *right* imaginative dispositions? (1990, p. 340, original emphasis)

Wilson (2020) agrees and suggests that failure to be compatible with a plausible epistemology is one of the main challenges faced by traditional realist theories of modality, one which they have failed to overcome (p. 6).[2] In an impressive feat of combining modal metaphysics with foundational quantum mechanics, Wilson aims to do better and to provide a naturalised modal metaphysics that is supposed to improve on classic realist theories of modality in relation to **Integration**.

Wilson's modal metaphysics, based on the Everettian, or many-worlds, interpretation of quantum mechanics, is dubbed *Quantum Modal Realism* (QMR). Through a

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[1]My focus will be on **Integration**, so the motivations for **Cooped Up** are not of special importance to us (that is, if it turns out to **Cooped Up** is unmotivated, I also need not assume that Wilson's theory satisfies it as I do below, yet the epistemological worries that I raise will remain). There are, however, some motivations one can give for something like **Cooped Up**. The main worry is that without it, one's metaphysics has to rely on dubious (philosophical) intuitions that lack any epistemological warrant (see, for example, Ladyman et al., 2007; Bryant, 2020; Wilson, 2020 and references in Bryant, 2020). Sharpening these arguments, Bryant argues that properly identifying theories that fail to satisfy **Cooped Up** shows them to "not produce justified theories of reality, *since the constraints on its content are not sufficiently robust and their satisfaction secures insufficient epistemic warrant*" (2020, p. 1868, emphasis added). Thanks to an anonymous reviewer for urging me to point to some motivations for **Cooped Up**.

[2]All page numbers related to Wilson's work are to (Wilson, 2020) unless otherwise indicated.

number of elaborate arguments about the nature of the Everettian interpretation, objective chance in such an interpretation, and the overall utility of his theory, Wilson tries to establish the thesis that "[t]o be a metaphysically possible world is to be an Everett world" (2020, p. 22). In this paper, I will assume that Wilson's theory satisfies **Cooped Up** and I will not question his interpretation of Everettian worlds as diverging rather than overlapping.[3] Instead, I want to focus on Wilson's comments on the advantage QMR has when it comes to the epistemology of modality. I will suggest that Wilson's metaphysics potentially does worse than Lewis' when it comes to Rosen's formulation of **Integration**.

I will first briefly set out Wilson's modal metaphysics and the corresponding epistemology that he suggests (Section 2). After this, I will argue that there is a significant worry for Wilson's modal metaphysics that parallels Rosen's objection to Lewis (Section 3). Finally, I will consider a possible response on behalf of Wilson, in Section 4 and argue that it fails. I conclude that, with regards to **Integration**, Wilson's modal metaphysics, at best, might be as well off as Lewis', but potentially worse.

2 WILSON'S THEORY OF MODALITY

In this section, I will very briefly set out Wilson's modal metaphysics and the corresponding epistemology.

2.1 QUANTUM MODAL REALISM

In quantum mechanics, on the 'standard' interpretation, there are taken to be two (fundamental) rules that describe the way that very small objects (e.g., electrons), and systems composed of them, behave. The Schrödinger equation, which describes the behaviour of unobserved systems, and the Born Rule, which describes the behaviour of systems when observed (e.g., through measuring them). When a quantum state evolves into a superposition, the standard interpretation has it that there is a fundamental indeterminacy to the state. Yet, when we measure something, we never experience such indeterminacy (remember Schrödinger's cat). The problem is that when these two rules are applied hinges on the very vague, and ultimately unclear, notion of "measurement" (this is one way of setting up the measurement problem).

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[3]See Divers (forthcoming) for a terminological note on the use of 'diverging'.

One way out of this problem, which has come to be known as the Everettian or many-worlds interpretation of quantum mechanics, is to hold that there is only *one* fundamental rule, namely the Schrödinger equation, and to 'replace' the indeterminacies of superpositions by a multiplicity of universes. So, whenever the orthodox suggested that one quantum state is in a superposition, and thus ultimately includes some fundamental indeterminacy, Everettians suggest that the quantum state *splits* into two states, each perfectly determinate. As Wilson puts it:

> The quantum dynamics generically evolves quantum states into *superpositions*; where the orthodox interpretation took superposed quantum states to represent single systems with unfamiliar indeterminate properties, Everett proposed taking superposed states to represent multiple systems each with familiar determinate properties. In other words, the central idea of EQM is to replace indeterminacy with multiplicity.
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> (p. 77, original emphasis)

This means that whenever a superposition occurs, the complete quantum state splits into two complete universes. One interpretation of this splitting, favoured by Wilson, suggests that these split quantum states are complete, non-overlapping worlds.[4]

With the Everettian multiverse in hand, Wilson suggests that we have all we need to provide a modal metaphysics: *Quantum Modal Realism*. The core tenet, for our purposes, is the claim that "[t]o be a metaphysically possible world is to be an Everett world" (2020, p. 22).[5] This tenet, which Wilson calls *Alignment*, entails two further principles:

"*Individualism*: If X is an Everett world, then X is a metaphysically possible world.

Generality: If X is a metaphysically possible world, then X is an Everett world."

(p. 24)

Individualism concerns a particular way of interpreting Everettian worlds, which is defended by Wilson in Ch. 3, and will not concern us much. For our purposes, *Generality*, is of interest. Given our interest in QMR's ability to satisfy the **Integration** desideratum, it will be worth to quote Wilson's motivation for *Generality* at length:

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[4]The Everettian interpretation of quantum mechanics is one of the most prominent interpretations of quantum mechanics among those working on the foundations of it (cf. Saunders et al., 2010; Wallace, 2012; Carroll, 2019; and Wilson, 2020, Ch. 2).

[5]Some other core tenets of the theory concern the diverging interpretation of Everett worlds, the indexicality of actuality, propositions as sets of worlds, and the interpretation of objective chance (Wilson, 2020, p. 22).

> Why accept Generality? I will argue for this principle by appeal to the
> theoretical unity and simplicity of the systematic metaphysics that it makes
> possible. Without Generality, Everettians must distinguish two funda-
> mental and fundamentally different kinds of possibility; Generality pro-
> vides theoretical uniformity. Generality also enables a wholly reductive
> theory of objective modality, and *a straightforward account of modal episte-*
> *mology which renders it continuous with ordinary scientific inquiry.*
>
> (p. 26, emphasis added)

Wilson explicitly notes that existent (genuine) realist theories of modality face, what
he calls, the *epistemic challenge* (p. 6).[6] As Wilson points out, "[o]ther Lewisian pos-
sible worlds bear no constitutive, causal, or other explanatory relations to the ob-
servable goings-on within our own world. If Lewisian modal realism is correct, then
how we ascended to our current state of modal knowledge is an intractable mystery,
even if our current modal beliefs were (inexplicably) formed de facto reliably" (p.
11).[7]

2.2   SCIENCE AS A GUIDE TO MODAL KNOWLEDGE

Wilson's modal metaphysics is deeply rooted in quantum mechanics (and a particu-
lar interpretation of it). The resulting theory is a realist theory about modality, very
much akin to Lewis' (1986) *Genuine Modal Realism* (GMR), with the exception that
QMR is supposed to be able to overcome the epistemic challenge. Wilson points out
that a realist account of modality has to "help us to make sense of how we know
which worlds are possible (*the epistemic challenge*)" (2020, p. 6, original emphasis).[8]
That is, Wilson stresses the importance of the **Integration** desideratum mentioned
above. I will now discuss the epistemology that Wilson proposes to explain our
knowledge of modality.

   The first thing to note is that Wilson acknowledges that providing a realist ac-
count of modality means that modality is "discovered, not invented" (p. 61). The
epistemology in question should accommodate the appropriate humility that results

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[6]Throughout this paper, I will use Wilson's terminology of 'the epistemic challenge' and my ter-
minology of 'the integration desideratum' interchangeably.

[7]As we will see below, in Section 4.2, Lewis does have an epistemology of modality, one that is
not dependent on the lack of a causal relation between other possible worlds and the actual world.
(Lewis thought that a causal connection is only needed for knowledge of contingencies.)

[8]Phrased like this, the answer for Lewis is obvious: all worlds are possible. Rather, the issue for
Lewis is *which* possibilities these worlds represent (see Divers (2002, p. 274) for a related discussion).

from this. That is, since it is not up to us which modal claims are true or not, we should not presume to have perfectly accurate or complete modal knowledge (see also Lewis, 1986, p. 114). For our purposes, we can simply accept this and focus on the more interesting question: for the kind of modal statements that we *do* know, how do we know them?

Given the metaphysics presented by Wilson, and the aim to adhere to **Integration**, there is a seemingly straightforward proposal for the epistemology of QMR: let science tell us what is possible.

> In quantum modal realism, modal epistemology is entirely subsumed into general scientific epistemology. When we discover—experimentally or theoretically—that some outcome of some process has a non-zero objective chance, then we can immediately infer that there is a genuine possibility corresponding to it. (p. 63)

So, if there is a system that is "sufficiently decohered" (ibid.) and the Schrödinger equation tells us that there is a (non-zero) chance that φ, then it is also possible that φ. This means that we need to turn to theoretical and experimental physics to tell us which states of affairs have a non-zero chance, which then provides us with knowledge that those states of affairs are possible. For example, in a situation similar to that of set-up relevant for Schrödinger's cat thought experiment, physics tells us that there is a non-zero chance that the cat is alive and that there is a non-zero chance that the cat is dead. That is, there is an Everettian world where the cat is alive and one where it is dead. So, science tells us (correctly according to QMR) that it is possible that Schrödinger's cat is alive and that it is possible that the cat is dead. Call this *Quantum Theory-based Epistemology of Modality* (QTEM).

3 EVERETT CROSSES THE STREET (OR, THE RETURN OF ROSEN)

In this section, I will present an epistemological objection against Wilson's modal metaphysics (a parallel of Rosen's objection to Lewis). The objection has it that Wilson cannot explain the reliability of the methods ordinary agents use to gain modal knowledge and that theories that can't do so would "lead rather quickly to modal scepticism," a price we shouldn't pay for any theory of modality (Rosen, 1990, p. 339). This is particularly pressing for Wilson, as addressing the epistemological challenge is one of the main motivations for his theory.

Consider Hugh as he is getting ready to cross a busy street, while deciding which of the diverging streets to take to mail a postcard to Alastair. There are a number of modal judgements that Hugh needs to make, which all rely on the quotidian modal knowledge that he has: can I cross before that car hits me? If I go left, will I arrive at the mailbox before it gets emptied today? *et cetera*. Arguably, Hugh will rely on his imagination (imagining how quickly he can cross the street and how quickly the car approaches) or similarity and analogical reasoning (last week he took the left street and it took him 10 minutes to get to the mailbox) to do so. Both of these methods have been proposed to explain our (philosophically interesting) modal knowledge (see, respectively, Byrne, 2005; Kung, 2010; Balcerak Jackson, 2018; Gregory, 2020 and Hawke, 2011; Roca-Royes, 2017; Dohrn, 2019; Schoonen, n.d.). It seems that Hugh, like most of us, has swaths of such modal knowledge.

The problem is explaining why "our usual methods for forming modal beliefs are generally a good guide to the modal truth" (Rosen, 1990, p. 339). Call this the *folk challenge*.[9] I claim that Wilson's QTEM fails to meet this challenge.

Note that, with regards to QTEM, in gaining the kind of knowledge exemplified by Hugh, one does *not* put "on a labcoat or fire up a statistics program" (Nolan, 2017, p. 9). That is, it doesn't seem to be the case that ordinary agents, in acquiring their ordinary modal knowledge (which, occasionally needs to be acquired within seconds, Williamson, 2016, p. 116), rely on theories, let alone the findings of experimental and theoretical physics.[10] For example, Fischer (2016, p. 240, original emphasis), who defends an epistemology of modality similar to QTEM, notes that "[i]t *isn't* plausible that I – with my embarrassingly poor understanding of physics – am in any position to assess what is and isn't possible for neutrinos [or quantum states]. It takes more than a passing familiarity with the relevant theories to make such assessments." In particular, since the modal knowledge that we have is crucial for our going about the world (see, e.g., Byrne, 2005; Nichols, 2006; Williamson, 2007). This means that some-

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[9]See Rosen (1990, p. 337-339), Williamson (2007, p. 162), and Sauchelli (2010, p. 347-348) for similar remarks. Combined with the claim that ordinary agents have swaths of modal knowledge, this is an instance of what Alexander & Weinberg (2014) call the *general reliability thesis*: though fallible, ordinary agents' epistemic judgements are generally reliable when concerning mundane cases. The folk challenge can be thought of as a specific instance of the epistemic challenge: the epistemic challenge concerns 'our' knowledge of modality, where this 'our' is interpreted as 'ordinary agents' in the folk challenge (rather than 'philosophers').

[10]This is *not* to say that the cognitive capacities that experimental physicists rely on when doing their quantum calculations are significantly different from (regimented) cognitive capacities used in everyday life. It is just that we don't seem to use the scientific method in order to acquire everyday (modal) knowledge. Thanks to Giacomo Giannini for pushing me to make this clearer.

times, modal judgements have to be made in a split second (consider Williamson's (2016) example of jumping a river while being chased by a wild animal). Even if in principle we could do such quantum calculations (and it is not obvious that we can, see footnote 13), this cannot be the method by which ordinary agents gain the modal knowledge relevant for navigating their surroundings.

The above suggests that ordinary agents usually don't perform the required quantum calculations in order to determine what is possible. What about some methods that have been appealed to in order to explain ordinary agents' knowledge of modality: imagination, similarity reasoning, perception, *et cetera*? Might they be able to explain ordinary agents' knowledge of possibilities given Wilson's QMR?[11] It seems that none of these methods are straightforwardly interpreted as being related to modal space as it is described by the Schrödinger equation. That is, even if these methods might explain some of the modal knowledge that ordinary agents have, QMR cannot *explain* why this is so. That is, QMR cannot meet the folk challenge. As there is in general no reason to think that any of the methods that we rely on in knowledge acquisition can provide us with experiential evidence of non-zero probabilities in quantum states.

So, QTEM does not seem to be the method through which ordinary agents acquire modal knowledge and QMR cannot explain the reliability of the methods we *do* seem to use in our ordinary modal judgements. This suggests that QMR might not do so well with regards to the epistemic challenge as Wilson suggests. We can phrase the worry more directly in terms of the integration desideratum. Possibilities, on QMR, depend on whether or not some particles are in a superposition and thus split the universe. Assuming that this in fact gives us plenitude and that the world does indeed split for each of the possibilities that we think there are,[12] the epistemological challenge is to explain the reliability of the methods of ordinary agents in tracking this (Schechter, 2010, cf.).[13] However, there is absolutely no reason to assume that there are any methods that ordinary agents use in knowledge acqui-

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[11]Note that even if this works, this is already a significant move away from Wilson's preferred epistemology of modality, QTEM.

[12]See Wilson (2020, Sec. 1.8) for a defense.

[13]There is a stronger worry in the vicinity of this one for Wilson. For it is not at all obvious that we (i.e., theoretical and experimental physicists) can in fact translate quantum mechanical phenomena into macro phenomena and *vice versa*. That is, it is unclear how knowing how to solve the Schrödinger equation in a particular instances can tell us anything about whether the car will turn right or left. I will leave this worry aside for the purposes of this paper. Thanks to Giacomo Giannini for bringing this worry to my attention.

sition that track superposition or quantum split universes. That is, there seems to be no explanation linking modal judgements of ordinary agents to the metaphysical possibilities that there are on QMR.[14]

4 WILSON, LEWIS, AND ORDINARY AGENTS

So, Wilson's epistemology leaves the ordinary agent on the street high and dry when it comes to their modal knowledge. I will now consider a possible response on behalf of Wilson: Wilson is simply not concerned with the modal knowledge of ordinary agents. I will first argue that it is not strange to assume that he *should* care about the modal knowledge of ordinary agents given his commitments to naturalism. Secondly, I will argue that, regardless of the previous argument, Lewis *can* explain the modal knowledge of ordinary agents, so if Wilson can't or isn't concerned with it, then his theory is not an improvement over existent genuine realist theories of modality with regards to the epistemic challenge.

4.1 ORDINARY AGENTS' MODAL KNOWLEDGE

Of course, Wilson might retort that his epistemology is not intended to explain the modal knowledge of ordinary agents and that he simply is not interested in explaining that. I will argue that Wilson, as a naturalist, should care about explaining the modal knowledge of ordinary agents, or, at the very least, that it is not far fetched to think that he should.

Wilson puts a lot of emphasis on his naturalistic methodology with regards to his modal metaphysics (esp., sec. 0.4). This kind of naturalism is, what is sometimes called, *ontological* or *metaphysical* naturalism: what there is in the world is that what science tells us there is (cf. Nolan 2017; Papineau 2021). Nolan (2017, pp. 12-13) suggests that accepting metaphysical naturalism (as Wilson does) *motivates* accepting naturalism with regards to the *epistemology* of modality. He characterises methodological naturalism, in the sense relevant for the epistemology (of modality), as follows:

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[14]The ignoring of quantum possibilities precisely *because* it seems obvious that ordinary agents are not concerned with them can be found in a broad spectrum of philosophical debates. For example, see Carey (2009) on core cognition; Lewis (2016) on evaluating counterfactuals; Aimar (2019) on evaluating disposition ascriptions; and Schoonen & Jones (2022) and Boardman & Schoonen (n.a.) on imagination.

> *[M]ethodological* naturalism, is the approach that requires that philosophical *methods* be those of the natural and social sciences, or at least that those methods be of the same general kind and be generally harmonious with the methods of the sciences, particularly the natural sciences.
>
> (Nolan, 2017, p. 8, original emphasis)

On one reading of this definition, Wilson's suggested epistemology is straightforwardly naturalistic: it simply *is* science that tells us what is possible. Call this **Narrow Naturalism** (as I will focus exclusively on methodological naturalism, I will drop the 'methodological'): science and the scientific method provide us with (modal) knowledge.

However, note that this is significantly different from the kind of naturalism we usually find in epistemology (e.g., Quine, 1969; Goldman, 1986; Kornblith, 2002). This kind naturalism has it that epistemologists *turn to* science to see what cognitive capacities or methods they can suggest agents to rely on when acquiring knowledge.[15] For example, the naturalistic epistemologies of, e.g., Goldman (1986) and Kornblith (2002) have it that the methods that an epistemology postulates should be beholden to and in line with our best scientific theories. Call the latter kind of naturalism, which turns to the sciences to determine which of our methods are epistemically useful and reliable, **Broad Naturalism**.

Broad naturalism is the kind of naturalism relevant to the folk challenge: we should turn to the sciences to determine which of the methods *used by ordinary agents* reliably results in modal knowledge (and, potentially, explain why this is so). Phrased in this way, this is closely related to Sauchelli's (2010, p. 347) *feasibility challenge*: "if empirical studies about the means by which our minds process modal judgements are available, then it seems interesting and methodologically correct to take into account such research" (ibid., p. 348). Given that the antecedent of the challenge is true (with regards to, e.g., imagination, see Lane et al., 2016; Harris, 2021), we better take into account how ordinary agents have their modal knowledge. As Sauchelli himself points out, this is supposed to be understood as "a simpler point" than "having a naturalistic stance" (idem). Yet, as we saw, this is something that Wilson's modal metaphysics fails to do.

From an *epistemological* point of view, it seems to me that **Broad Naturalism** is the most interesting interpretation of methodological naturalism (see also Nolan, 2017,

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[15]The former is, perhaps, more aptly called *scientific* epistemology of modality. Thanks to Samuel Boardman for discussion here and for the suggestion of the label.

p. 9). It would thus be very much in line with Wilson's naturalistic commitments that he adopts it. If he does, however, he is committed to explain the folk challenge, which, as things stand, his theory seems to be unable to do. Of course, Wilson might put his foot down and stick to **Narrow Naturalism** on the epistemological side, in which case the folk challenge loses its bite. In the next subsection, I will evaluate what this would mean for Wilson's overall project.

4.2 LEWIS CROSSES THE STREET

Having to retreat to **Narrow Naturalism** and not addressing the folk challenge is, by the light of Rosen's (1990) comments and Sauchelli's (2010) feasibility challenge, in and of itself, a significant strike against Wilson's proposed metaphysics of modality. Worse, I will argue that such a retreat would make Wilson's modal metaphysics *worse off* than Lewis' GMR when it comes to the epistemic challenge. This is particularly worrisome for Wilson as doing better than existent realists theories of modal metaphysics is one of the main motivators for Wilson's account (p. 6).

In order to assess whether or not QMR is not worse off than Lewis' GMR, it will be useful to quickly rehearse what Lewis says about (our) modal knowledge. For Lewis, what is crucial for which possibilities there are (or are represented) is the *principle of recombination*. This principle is something that the Lewisian needs to defend. However, once defended, we can explain how we get knowledge of modality. In particular Lewis (1986, Ch. 2.4) suggests that the proper method of gaining knowledge of modality is a theoretical understanding of the principle of recombination and what follows from it. "[H]ow do we come by the modal opinions that we in fact hold? [. . .] I think our everyday modal opinions are, in large measure, consequences of a principle of recombination" (Lewis, 1986, p. 113). This is of course very similar to Wilson's suggestion, as for Wilson the Schrödinger equation does the work that the principle of recombination does for Lewis (Wilson, 2020, pp. 28, 65-67, 145).

The epistemological work is deferred to theoretical metaphysicians, rather than (quantum) physicists, on Lewis' picture. So, perhaps Lewis has an equally hard time explaining the modal knowledge of Hugh (and ordinary agents in general)? If so, then the problems for QMR don't undermine Wilson's claim that his theory is better at addressing the epistemic challenge than existing realist theories of modality.

However, Lewis does explicitly explain how ordinary agents might gain modal knowledge by relying on imagination, which humans *do* rely on in order to make ordinary modal judgements (cf. Lane et al., 2016; Harris, 2021). Given the principle of plen-

itude, according to Lewis, we can explain why ordinary agents rely on imagination when they are making their modal judgements.

> We get enough of a link between imagination and possibility, but not too much, if we regard imaginative experiments as a way of reasoning informally from the principle of recombination. To imagine a unicorn and infer its possibility is to reason that a unicorn is possible because a horse and a horn, which are possible because actual, might be juxtaposed in the imagined way.   (Lewis, 1986, p. 90)

That is, the principle that governs the space of possibilities is tracked by the imagination in order to explain some of the knowledge that ordinary agents have of modality (even if, ultimately, philosophers need to study the principle of recombination to get knowledge of extraordinary modal claims, Lewis, 1986, p. 113).[16] One way of understanding what Lewis is doing here, is as explaining why the methods that ordinary agents use in making modal judgements are reliable heuristics. This, in turn, can be seen as giving a proper, broad naturalistic, account of the epistemological side of the **Integration** desideratum.

Granted that humans do rely on imagination to make ordinary modal judgements, Lewis has a story to tell why it is that imagination is reliable when it comes to modal judgements and thus he can account for the folk challenge. For Wilson, however, this is not so clear. As argued above, if we assume, with Wilson, that the Schrödinger equation generates modal space, then it is no longer obvious that we can explain the reliability of the methods that ordinary agents rely on in making modal judgements, imagination in particular (again, see Schoonen & Jones (2022) and Boardman & Schoonen (n.a.) on imagination and quantum possibilities).

5   CONCLUSION

Wilson sets out to provide a (metaphysically) naturalistic account of modal metaphysics. This metaphysics is closely related to Lewis' Genuine Modal Realism, but instead of relying on the principle of recombination and concrete spatiotemporally isolated worlds, Wilson suggests that worlds are 'branched' Everettian universes as

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[16]Lewis' point can be strengthened by pointing out that imagination, on certain understandings, does seem to be structured such that it is very likely to mirror the principle of recombination. This is particularly clear on Hume's (1777/1997) picture of imagination (see also Kung's (2017) discussion thereof).

specified by the Schrödinger equation. The main upside of Quantum Modal Realism over Genuine Modal Realism, according to Wilson, is that it can deal with the epistemic challenge: a modal metaphysics "must help us to make sense of how we know which [possibilities there] are" (Wilson, 2020, p. 6).

Wilson suggests that we know which possibilities there are by relying on theoretical and experimental physics; that is, science has to tell us what is possible and what not. This is, though not in letter, in spirit similar to Lewis' suggestion, who suggests that it is theoretical metaphysicians who have to tell us what is possible and not based on the principle of recombination. However, there is another challenge for theories of modality – i.e., the folk challenge – that requires theories to explain the knowledge that non-expert adults have of possibilities. Interestingly, Lewis seems to be able to address the folk challenge, whereas it is not obvious that Wilson can.

One final retreat for Wilson might be to piggy-back on Lewis' explanation. The rough idea would be that *if* the Schrödinger equation and the principle of recombination create an extensionally identical modal space, then the fact that imagination tracks the principle of recombination would also explain imagination's reliability in modal judgements on the QMR picture. Note, however, that this is a pretty big *if* and it is not obvious that Wilson himself thinks that QMR and GMR are extensionally equivalent (in the sense that they generate the exact same set of possibilities). And note that even if we grant this assumption, the conclusion is still only that QMR is *as good as* Lewis' GMR when it comes to dealing with the folk challenge and Wilson has not shown us that QMR is in a better position to deal with the epistemic challenge than, e.g., GMR.

I take it that the arguments above show the importance of being able to address the folk challenge for any theory of modality (see also Rosen, 1990; Sauchelli, 2010; Schechter, 2010). So, even though QMR might be considered better at explaining *philosophers'* modal knowledge, it fares no better when it comes to dealing with the folk challenge. In fact, it potentially fares worse in that regard. As it stands, QMR cannot be said to explain the modal knowledge that ordinary agents have. This is particularly worrisome as it questions the foundational motivation of QRM: providing a better solution to the epistemic challenge than existent realist theories of modal metaphysics.

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