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DOI
10.14275/2465-2334/20240.sch
Publication date
2024
Document Version
Final published version
Published in
Argumenta

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Link to publication

Citation for published version (APA):
Schoonen, T. (2024). What Everett Couldn't Know. *Argumenta*, *10*(1 (19)), 161-172. https://doi.org/10.14275/2465-2334/20240.sch

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Download date:11 Oct 2026

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 motivations 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, one 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: 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: 1; Roca-Royes 2021: 158; Sjölin Wirling 2021: 5658). Call this the **Integration** desideratum.[1]

[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 need not assume that Wilson's theory satisfies it as I do below, yet the epistemological worries that I raise are unaffected by this). 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,

Argumenta 10, 1 (2024): 161—172
ISSN 2465-2334

DOI 10.14275/2465-2334/20240.sch
First published: 30 November 2024
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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" (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: 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 (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 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" (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 is, at best, as well off as Lewis', but potentially worse.

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: 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.

[3] See Divers 2022 for a terminological note on the use of 'diverging'.

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).

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 (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" (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" (24).

[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: 22).

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:

> 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 fundamental and fundamentally different kinds of possibility; Generality provides theoretical uniformity. Generality also enables a wholly reductive theory of objective modality, and *a straightforward account of modal epistemology which renders it continuous with ordinary scientific inquiry* (26, emphasis added).

Wilson explicitly notes that existent (genuine) realist theories of modality face, what he calls, the *epistemic challenge* (6).[6] As Wilson points out, "[o]ther Lewisian possible worlds bear no constitutive, causal, or other explanatory relations to the observable 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" (11).[7]

2.2 Science as a Guide to Knowledge

Wilson's modal metaphysics is deeply rooted in quantum mechanics (and a particular 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*)" (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 account of modality means that modality is "discovered, not invented" (61). The epistemology in question should accommodate the appropriate humility that results 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: 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?

[6] Throughout this paper, I will use Wilson's terminology of 'the epistemic challenge' and my terminology 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: 274 for a related discussion).

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 (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 that 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: 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.a.). 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: 339). Call this the *folk challenge*.[9] I claim that Wilson's QTEM fails to meet this challenge.

[9] See Rosen 1990: 337-339, Williamson 2007: 162, and Sauchelli 2010: 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*:

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: 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: 116), rely on theories, let alone the findings of experimental and theoretical physics.[10] For example, Fischer (2016: 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". Especially since the modal knowledge that we have is crucial for our going about the world (see, e.g., Byrne 2005; Nichols 2006; Williamson 2007), which means that sometimes, 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

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.

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

we think there are,[12] the epistemological challenge is to explain the reliability of the methods of ordinary agents in tracking this (cf. Schechter 2010).[13] However, there is absolutely no reason to assume that there are any methods that ordinary agents use in knowledge acquisition 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 farfetched 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: 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:

> *[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

[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 instance 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.

[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 and Schoonen & Jones (n.a.) and Boardman & Schoonen (n.a.) on imagination.

> of the same general kind and be generally harmonious with the methods of the sciences, particularly the natural sciences (Nolan 2017: 8, original emphases).

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 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: 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.: 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 acquire their modal knowledge. As Sauchelli himself points out, this is supposed to be understood as "a simpler point" than "having a naturalistic stance" (2010: 348). Yet, as we saw, this is something that Wilson's theory 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: 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, in 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 re-

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

alist theories of modal metaphysics is one of the main motivations for Wilson's account (6).

In order to assess whether or not QMR is 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: 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: 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 plenitude, 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: 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: 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

[16] Lewis' point can be strengthened by pointing out that imagination, on certain interpretations, 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.

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 (n.a.) 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 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" (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). Also 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.[17]

[17] This paper was written during a fellowship at *Human Abilities*, a Centre for Advanced Studies in the Humanities (*Kollegforschungsgruppe*) funded by the *Deutsche Forschungsgemeinschaft* (DFG), where I was hosted by Barbara Vetter and Dominic Perler. Thanks to both for hosting me and allowing me to be part of a greatly stimulating research envi-

References

Aimar, S. 2019, "Disposition Ascriptions", *Philosophical Studies*, 176, 1667–1692.

Alexander, J. and Weinberg, J.M. 2014, "The 'Unreliability' of Epistemic Intuitions", In Machery, E. and O'Neill, E. (eds.), *Current Controversies in Experimental Philosophy*, New York, NY.: Routledge, 128–145.

Balcerak Jackson, M. 2018, "Justification by Imagination", In Macpherson, F. and Dorsch, F. (eds.), *Perceptual Imagination and Perceptual Memory*, Oxford: Oxford University Press, 209–226.

Boardman, S. and Schoonen, T. (n.a.), "Core Imagination", Unpublished manuscript.

Bryant, A. 2020, "Keep the Chicken Cooped: The Epistemic Inadequacy of Free Range Metaphysics", *Synthese*, 197, 1867–1887.

Byrne, R.M.J. 2005, *The Rational Imagination*, London: MIT Press.

Carey, S. 2009, *The Origin of Concepts*, Oxford: Oxford University Press.

Carroll, S. 2019, *Something Deeply Hidden*, Dutton.

Divers, J. 2002, *Possible Worlds*, London: Routledge.

Divers, J. 2022, "Book Review: The Nature of Contingency", *Mind*, 131, 524, 1357-1364.

Dohrn, D. 2019, "Modal Epistemology Made Concrete", *Philosophical Studies*, 176, 2455–2475.

Fischer, B. 2016, "A Theory-Based Epistemology of Modality", *Canadian Journal of Philosophy*, 46, 2, 228–247.

Goldman, A. 1986, *Epistemology and Cognition*, Cambridge, MA.: Harvard University Press.

Gregory, D. 2020, "Imagery and Possibility", *Noûs*, 54, 4, 755–773.

Harris, P.L. 2021, "Early Constraints on the Imagination: The Realism of Young Children", *Child Development*, 92, 2, 466–483.

Hawke, P. 2011, "Van Inwagen's Modal Skepticism", *Philosophical Studies*, 153, 3, 351–364.

Hume, D. 1777/1997, *An Enquiry Concerning Human Understanding*, Indianapolis: Hackett Publishing Company.

Kornblith, H. 2002, *Knowledge and Its Place in Nature*, New York: Oxford University Press.

Kung, P. 2010, "Imagining as a Guide to Possibility", *Philosophy and Phenomenological Research*, 81, 3, 620–663.

Kung, P. 2017, "Personal Identity Without Too Much Science Fiction", in Fischer, B. and Leon, F. (eds.), *Modal Epistemology After Rationalism*, Vol. 378, Cham: Springer, 133–154.

Ladyman, J., Ross, D., with Spurrett, D. and Collier, J. 2007, *Every Thing Must Go*, Oxford: Oxford University Press.

ronment. Additionally, many thanks to Samuel Boardman and Giacomo Giannini for feedback on an earlier version of this paper.

Lane, J.D., Ronfard, S., Francioli, S. and Harris, P.L. 2016, "Children's Imagination and Belief: Prone to Flights of Fancy or Grounded in Reality?", *Cognition*, 152, 127–140.

Lewis, D.K. 1986, *On the Plurality of Worlds*, Oxford: Blackwell.

Lewis, K.S. 2016, "Elusive Counterfactuals", *Noûs*, 50, 2, 286–313.

Nichols, S. 2006, "Imaginative Blocks and Impossibility: An Essay in Modal Psychology", in Nichols, S. (ed.), *The Architecture of the Imagination*, Oxford: Oxford University Press, 237–255.

Nolan, D. 2017, "Naturalised Modal Epistemology", in Fischer, B. and Leon, F. (eds.), *Modal Epistemology After Rationalism*, vol. 378, Cham: Springer, 7–27.

Papineau, D. 2021, "Naturalism", in Zalta, E.N. (ed.), *The Stanford Encyclopedia of Philosophy*, Metaphysics Research Lab, Stanford University, Summer 2021 ed.

Peacocke, C. 1999, *Being Known*, Oxford: Oxford University Press.

Quine, W.V.O. 1969, "Epistemology Naturalized", in *Ontological Relativity and Other Essays*, New York: Columbia University Press, 69–90.

Roca-Royes, S. 2017, "Similarity and Possibility: An Epistemology of de re Possibility for Concrete Entities", in Fischer, B. and Leon, F. (eds.), *Modal Epistemology After Rationalism*, Vol. 378, Cham: Springer, 221–245.

Roca-Royes, S. 2021, "The Integration Challenge", in Bueno, O. and Shalkowski, S. (eds.), *The Routledge Handbook of Modality*, New York: Routledge, 157–166.

Rosen, G. 1990, "Modal Fictionalism", *Mind*, 99, 395, 327–354.

Sauchelli, A. 2010, "Concrete Possible Worlds and Counterfactual Conditionals: Lewis Versus Williamson on Modal Knowledge", *Synthese*, 176, 345–359.

Saunders, S., Barrett, J., Kent, A. and Wallace, D. (eds.) 2010, *Many Worlds? Everett, Quantum Theory, and Reality*, Oxford: Oxford University Press.

Schechter, J. 2010, "The Reliability Challenge and the Epistemology of Logic", *Philosophical Perspectives*, 24, 437–464.

Schoonen, T. (n.a.), "Kinds, Categories, and Possibility", Unpublished manuscript.

Schoonen, T. and Jones, M. (n.a.), "Embodied Imagination and Knowledge of Possibilities", Unpublished manuscript.

Sjölin Wirling, Y. 2021, "An Integrative Design? How Liberalised Modal Empiricism Fails the Integration Challenge", *Synthese*, 198, 5655–5673.

Wallace, D. 2012, *The Emergent Multiverse: Quantum Theory According to the Everett Interpretation*, Oxford: Oxford University Press.

Williamson, T. 2007, *The Philosophy of Philosophy*, Oxford: Blackwell.

Williamson, T. 2016, "Knowing by Imagining", in Kind, A. and Kung, P. (eds.), *Knowledge Through Imagination*, Oxford: Oxford University Press, 113–123.

Wilson, A. 2020, *The Nature of Contingency*, Oxford: Oxford University Press.