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Essence, Explanation, and Modal Knowledge

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ESSENCE, EXPLANATION, AND MODAL KNOWLEDGE

by

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ABSTRACT

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Antonella Mallozzi

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The primary aim of this project is to put forward a novel account of knowledge of metaphysical modality. I call this the "Essentialist Superexplanatory" account of modal knowledge, because it relies on the following two main theses: (a) knowledge of metaphysical necessity is grounded in knowledge of essence; and (b) essences are properties, sets of properties, or mechanisms, having distinctive explanatory powers for how things are. While thesis (a) is quite popular in the current debates, mostly thanks to Kit Fine's recent work in modal metaphysics, thesis (b) introduces an original brand of essentialism. As I show by means of various examples involving both kinds and individuals, it seems fruitful to think of essences as underlying cores which cause a multitude of typical properties of things. Because of this, essences explain why those properties consistently co-occur in those kinds and individuals—in this sense essences are "superexplanatory" for how things are.

This account of essence has crucial consequences at the epistemological level. For essences are things that we discover empirically, typically via scientific investigation. Although the discovery of essence has been held to be a central task of philosophy since Aristotle introduced it, essences have also been often disparaged in contemporary debates as hidden mysterious entities, or some sort of relic of a pre-scientific era. The Essentialist Superexplanatory account aims to overcome those

prejudices and show that there is a scientifically grounded way to clarify in what sense essential properties constitute the "nature" of things. If this is correct, the epistemology of central cases of metaphysical necessity is much easier than many have thought. For we infer what is necessarily true of things from our knowledge of what is essential to things.

The Essentialist Superexplanatory account owes much to the work of Saul Kripke in the 1970s and 1980s; especially to his main insight that modal knowledge proceeds *inferentially,* from premises concerning the actual makeup of the world to conclusions about the non-actual and necessary. In fact, a further crucial component of my account is a Kripkean bridge-principle connecting essence and necessity, both at the constitutive-metaphysical level and at the epistemic-normative level. In its simplest formulation, this bridge-principle says that if something is essentially in a certain way, then it is (metaphysically) necessarily that way: "If x is essentially F, then necessarily x is F".

Also importantly, from a methodological point of view, the Essentialist Superexplanatory account prioritizes the investigation of modal metaphysics, and of essence in particular, for elucidating knowledge of modality. I call it accordingly a "modal-metaphysics-first" approach to modal knowledge and oppose it to the more traditional "means-first" approach that has dominated the literature in the past twenty years or so.

As to the structure of the work, this dissertation is not a traditional monograph. Instead, it is composed of three related but independent research articles, each with its own abstract, plus a final Appendix. Here is a brief summary of each piece.

In the first article, "Two Notions of Metaphysical Modality", I argue that Conceivability-theory as cashed out by David Chalmers does not help cast light on knowledge of genuine metaphysical modality as traditionally pictured by Kripke. Instead, Chalmers' conceivability only safely ranges over logical-conceptual possibility under standards of ideal coherence. I show how, at

bottom, Chalmers and Kripke are operating with two different, incompatible notions of metaphysical modality. This article was published in *Synthese* ("online first") on February 1st, 2018: https://doi.org/10.1007/s11229-018-1702-2.

In the second article, "Putting Modal Metaphysics First", I present my metaphysics-first approach to modal knowledge against the dominant tradition and lay out my positive "Essentialist Superexplanatory" account. I use chemical kinds as a case-study and illustrate how essences cause and explain the many properties that are typically shared by all the instances of a kind. Knowing what is essential to (the instances of) the kind in this sense is the basis for knowing what is necessary for (the instances of) the kind. This article was published in *Synthese* ("online first") on May 29th, 2018: https://doi.org/10.1007/s11229-018-1828-2.

In the third article, "Essentialist Constraints on Counterfactual Knowledge", I turn to Timothy Williamson's Counterfactual-theory. I discuss a number of problems that have been raised for it by the recent literature and argue that those all ultimately trace back to the failure to elucidate the proper normative constraints on modal reasoning. By means of various examples, I show how the Essentialist Superexplanatory account instead clarifies such constraints, and thus constitutes a better account of how we gain modal knowledge. This article is in preparation for the volume "Modal Thinking", edited by A. Vaidya and D. Prelevic, forthcoming with Oxford University Press.

Finally, in the Appendix, I discuss a category of potentially problematic cases for the Essentialist Superexplanatory account, namely what I call the "purely *a priori* metaphysical necessities". I lay out a pluralistic picture of modal space which distinguishes different kinds of necessity, based on their source. Specifically, it distinguishes between two kinds of metaphysical necessities: the "general" vs. the "distinctively" metaphysical necessities. I show how this helps us handle the *a priori* cases, and sketch a possible way forward for modal epistemology.

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Introduction

We often have a strong sense that things might have been different. We might regret having done something and wish we had made a different choice, or perhaps feel relieved realizing that we might have just avoided a dangerous or uncomfortable situation. Similarly when we think of the environment and actual global problems: earth might not have been warming and ice might not have been melting in the last decades, had humans not acted so recklessly with their fossil fuel emissions. Think also of things that are not up to us. There might have been purple cows, perhaps. Or there might not have been water on earth, so that life would have never developed. A second moon might have been orbiting around us. And so on. For any fact we can think of, there seem to be a myriad of alternatives that could have been, but are not, actual. On the other hand, many things seem like they could not possibly have been different. Given that the chemical composition of water is H_2O, water could not have had another molecular constitution. Regardless of whether human beings ever used arithmetic, it seems that arithmetical laws could not have been different.

Modal thinking is widespread. Reasoning about what is possible and what is not, and the evaluation of all sorts of counterfactual scenarios, play a crucial role in everyday life; for example in making choices and planning future action, in learning from experience, as well as in interpreting others' behavior and apportioning praise and blame. Also, modal thinking is a key theoretical tool in scientific practice, where counterfactual reasoning helps formulating hypotheses and predictions. At the socio-political level, our ability to work for a better world may be to an important extent a function of our ability to imagine other possible worlds, i.e., other ways our own world could be.

But on what basis do we judge such non-actual matters? How do we know necessities and possibilities? This is the central question for modal epistemology, and the target of my dissertation.

I should clarify that the sorts of modalities here at stake are species of the so-called "alethic" modalities, or those modalities that have to do with truth. These include metaphysical possibility and

necessity, which is my main focus here, as well as logical, and nomological modality among others. These are opposed to "non-alethic" modalities, such as normative possibility and necessity (moral, legal, etc). Much of the present project is dedicated to elucidating metaphysical modality, in particular in connection to essence. But it is worth mentioning that, in its broadest formulation, the notion of modality I am working with is quite different from the ancient one—the one that for example Plato, Aristotle, or the Stoics were working with.

Although, "possibility" could in certain contexts mean being non-contradictory (so, basically, what we would now call strictly "logical" possibility), what stands out the most from the ancient conception of possibility is its being tied to actuality. This is especially clear in Aristotle's metaphysics, where being possible basically means having the potentiality of being actual. But the general idea pervades all ancient thought. Possibilities are bound to actuality or confined to our world and its "real" history, so to say. We can understand these possibilities as diachronic "prospective" possibilities, which are open at a certain moment in time, but then vanish or cease to exist once an event is actualized. In this sense, the ancient conception of possibility is more similar to what philosophers now often call "epistemic" possibility or possibility for all one knows in a certain context. The modal operators could be translated into temporal operators: possibility is what might be true at some time; necessity is what is always true; impossibility is what is never true. Importantly, within the ancient paradigm, all generic possibilities will be actualized—Arthur Lovejoy called this the "Principle of Plenitude".[1] Genuine possibility coincides with actualized potentiality. Otherwise put, actualization as the criterion for genuine possibility. Thus, in ancient thought there seem to be no such things as alternative, unrealized states of affairs, or what we now also call other "possible worlds".

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[1] Lovejoy, A. (1936), The Great Chain of Being: A Study of the History of an Idea, Cambridge, Mass.: Harvard University Press.

By contrast, the modern notion—the one here at stake—understands possibility in terms of simultaneous non-actual courses of events, which might have but have not turned out to be true. This modern conception was first introduced by the medievals, and John Duns Scotus in particular. Scotus redefined a contingent event by departing from the traditional temporal-extensional modal semantics: "I do not call something contingent because it is not always or necessarily the case, but because its opposite could be actual at the very moment when it occurs"[2]. Scholars conjecture that Scotus was probably drawing from Augustine's seminal theological conception of God as acting by choice between alternative histories. For Augustine, God has freely chosen the actual world and its providential plan from alternatives which he could have realized, but did not will to. The important idea in the background, which carries over all the way to our time, is that there is an eternal domain of simultaneous alternatives or unrealized possibilities, instead of one single and necessary world order. The more specific notion of "metaphysical" modality I work with in this dissertation should be thought of as further specifying this modern notion.

In particular, I am going to focus on cases of distinctively metaphysical modalities. By this, I mean specifically a notion of possibility and necessity that is (a) different at least from matters of logical-conceptual coherence and apriority; and (b) *de re* in the sense of being dependent on the nature of things or their essence. Requirement (a) holds that it is logically-conceptually possible, and *a priori*-epistemically possible, that e.g. water is not H_2O, or that Saul Kripke is Rudolf Carnap's son. However, given that water is H_2O—namely, that very substance with that particular molecular structure—it is metaphysically impossible that water is not H_2O. Analogously, given that Saul Kripke—i.e., that very individual with his own particular origin—is not Rudolf Carnap's son, it is metaphysically impossible that instead he is. Requirement (b) specifies that these modal facts

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[2] *Ord.* I.2.1.1–2, quoted in Knuttila (2008), "Medieval Modal Theories and Modal Logic", in D. M. Gabbay and J. Woods (eds.), *Handbook of the History of Logic 2: Mediaeval and Renaissance Logic*, Amsterdam: Elsevier, 505–578: 569. This whole brief historical excursus owes a lot to Knuttila's excellent essay.

depend on facts about essence or the nature or fundamental makeup of the world. A large portion of my dissertation is dedicated precisely to clarify this requirement; but the rough idea is that whether it is metaphysically possible for, say, a sample of water to lack atoms of hydrogen is a matter of the fundamental nature or essence of water (that is, its atomic structure).

This characterization of metaphysical modality covers many (I would say all) typical cases of metaphysical necessity in the literature, including those involving natural kinds, individuals' origin, and the constitution of particulars. Indeed, many of those examples are familiar from Kripke's work, who reintroduced essence in metaphysics in the 1970s especially against Quine's criticisms. On the other hand, this "distinctively metaphysical" necessity excludes other necessities such as logical necessities, conceptual-analytic necessities, and normative necessities. I have gathered these together within the category of the "purely *a priori* necessities", and discussed them to a brief extent in the final Appendix. That has given me also the opportunity to think about the different sources of necessity, and the way the different modal sub-fields are interrelated. I have thus drawn a map of modal space, specifically of the space of "general metaphysical" necessity, which is included in the Appendix (Fig. 1).

The main aim of this project, as mentioned, is to answer the central question for modal epistemology of how we know about metaphysical modality. I call my proposal the "Essentialist Superexplanatory" account because it relies on the following two main theses. First, knowledge of metaphysical necessity is grounded in knowledge of essence; and, second, essences are properties, sets of properties, or mechanisms, having distinctive explanatory powers for how things are. The first thesis is the epistemological correlate of requirement (b) above for metaphysical modality. It is familiar not just from Saul Kripke's work but also E.J. Lowe's as well as Bob Hale's; and it has become increasingly popular in the latest debates, especially among the many followers of Kit Fine's work in modal metaphysics. The second thesis introduces instead an original brand of essentialism.

As I show by means of various examples involving both kinds and individuals, it seems fruitful to think of essences as underlying cores which cause a multitude of typical properties of things. Because of this, essences explain why those properties consistently co-occur in those kinds and individuals—in this sense essences are "superexplanatory" for how things are.

This account of essence has crucial consequences at the epistemological level. For essences are things that we discover empirically, typically via scientific investigation. Although the discovery of essence has been held to be a central task of philosophy since Aristotle introduced it, essences have also been often disparaged in contemporary debates as hidden mysterious entities, or some sort of relic of a pre-scientific era. The Essentialist Superexplanatory account aims to overcome those prejudices and show that there is a scientifically grounded way to clarify in what sense essential properties constitute the "nature" of things. If this is correct, the epistemology of central cases of metaphysical necessity is much easier than many have thought. For we infer what is necessarily true of things from our knowledge of what is essential to things.

As anticipated, the Essentialist Superexplanatory account owes much to the work of Kripke in the 1970s and 1980s; in particular, to his main insight that modal knowledge proceeds inferentially, from premises concerning the makeup of the world to conclusions about the non-actual and necessary. In fact, a further crucial component of my account is a Kripkean bridge-principle connecting essence and necessity, both at the constitutive-metaphysical level and at the epistemic-normative level. In its simplest formulation, this bridge-principle says that if something is essentially in a certain way, then it is (metaphysically) necessarily that way: "If x is essentially F, then necessarily x is F".

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modal knowledge, and oppose it to the more traditional "means-first" approach that has dominated the literature in the past twenty years or so.

I shall not go further into the details of my account in the present Introduction; in particular, I shall not rehearse its main arguments. Instead, I shall briefly present the structure of the work and how the content is organized. A main feature of this dissertation is that it is not a traditional monograph. Instead, it is composed of three related but independent research articles, each with its own abstract, plus a final Appendix.

In the first article, "Two Notions of Metaphysical Modality", I argue that Conceivability-theory as cashed out by David Chalmers does not help cast light on knowledge of genuine metaphysical modality as traditionally pictured by Kripke. Instead, Chalmers' conceivability only safely ranges over logical-conceptual possibility under standards of ideal coherence. I show how, at bottom, Chalmers and Kripke are operating with two different, incompatible notions of metaphysical modality. This article was published in *Synthese* ("online first") on February 1st, 2018: https://doi.org/10.1007/s11229-018-1702-2.

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the proper normative constraints on modal reasoning. By means of various examples, I show how the Essentialist Superexplanatory account instead clarifies such constraints, and thus constitutes a better account of how we gain modal knowledge. This article is in preparation for the volume "Modal Thinking", edited by A. Vaidya and D. Prelevic, forthcoming with Oxford University Press.

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Two Notions of Metaphysical Modality

Abstract

The paper explores the project of an *ambitious* modal epistemology that attempts to combine the *a priori* methods of Chalmers' 2D semantics with Kripke's modal metaphysics. I argue that such a project is not viable. The ambitious modal epistemology involves an inconsistent triad composed of (1) Modal Monism, (2) Two-Dimensionalism, and what I call (3) "Metaphysical Kripkeanism". I present the three theses and show how only two of those can be true at a time. There is a fundamental incompatibility between Chalmers' Modal Rationalism and Kripke's modal metaphysics. Specifically, Chalmers' conceivability entails possibilities that a Kripkean rejects as genuinely metaphysical. However, three positive stances in modal epistemology emerge from the combinations that the triad allows. One of those offers a promising way forward for 2D modal epistemologies. But it comes with a cost, as it requires abandoning modal monism and reshaping the scope of what *a priori* conceivability can give us access to.

Introduction

Although there has been a recent turn toward modal empiricism in the epistemology of modality, there is still a need to look carefully at *a priori* methods in the acquisition of modal knowledge. The issue of whether, to what extent, and how we may have *a priori* access to metaphysical modality is still central to modal epistemology. There is an alluring idea coming out of two-dimensionalist (2D) treatments of modal knowledge—the brand I have in mind is David Chalmers' *Modal Rationalism*. The idea is that we may be able to build an "ambitious" *a priori* 2D modal epistemology, which also satisfies Kripkean metaphysical requirements. In a time where

broadly Aristotelian views of the kind Kripke put forward are also at the center of parallel debates in modal metaphysics, the project of such a modal epistemology seems appealing across the board. However, Chalmers' Modal Rationalism offers an account of modal knowledge that rests on a conception of metaphysical modality that is incompatible with the kind of metaphysical modality that is at the heart of Kripke's work or those that build off of his work. As I argue, Chalmers' 2D framework may provide the structure for a Kripkean modal epistemology only given major modifications to its original program at the level of modal metaphysics.

The alluring idea derives from Chalmers' response to a challenge posed by Kripke's cases of the necessary *a posteriori*. The Kripkean cases seem to show that what is *a priori* conceivable may not be metaphysically possible. To use a familiar example, while we seem to be able to conceive that Hesperus is not Phosphorus, that is not a genuine metaphysical possibility. Empirical investigation eliminates *a priori* open possibilities or *epistemic* possibilities. In this case, it eliminates the *a priori* possibility that those are two distinct heavenly bodies. Furthermore, empirical investigation combined with Kripke's necessity-generating principles (i.e., the necessity of identity, the necessity of origin, of kind-membership, and of substance composition) seems to give us access to the space of metaphysical possibility. On the basis of those principles and the relevant empirical information, we are in a position to rule out certain *a priori* conceivable hypotheses as merely logically or conceptually coherent epistemic possibilities. It is *a priori* conceivable that Hesperus is not Phosphorus. But given that Hesperus is Phosphorus and given the necessity of identity, it is not possible that Hesperus is not Phosphorus. I call this the "Kripkean Challenge": Kripke's *a posteriori* necessities are an apparent counterexample to the claim that *a priori* conceivability entails metaphysical possibility. More generally, accommodating the Kripkean cases is a fundamental task for any modal epistemology that advocates *a priori* methods.

Chalmers proposes an *a priori,* conceivability-based route to metaphysical modal knowledge that aims to answer the Kripkean Challenge. His Modal Rationalism deploys a 2D semantics that assumes one single modal primitive (*modal monism*). This means that, for Chalmers, logico-conceptual possibility and metaphysical possibility coincide, though we can still draw the desired distinctions by using the 2D semantic apparatus. Moreover, we can allegedly accommodate the Kripkean cases at the level of the secondary dimension, in such a way that they are no longer problematic for a rationalist account. If Chalmers is right, modal monism together with the 2D structure give us a way to neutralize the Kripkean challenge and to maintain that *a priori* conceivability entails metaphysical possibility.

Chalmers' proposal has had a groundbreaking role in the debates on the epistemology of modality and has triggered many responses. Most of the critical literature responding to Chalmers' work in the past fifteen years has focused on providing "internal" or direct criticisms of his project, that is, various kinds of objections or counterexamples aimed to spot flaws within his account.[1] My aim is not to add another such criticism of Modal Rationalism to the existing literature. Rather, my target is the alluring idea, mentioned in the beginning, that Chalmers' Modal Rationalism could accommodate a Kripkean view of metaphysical modality; or, otherwise put, that Kripkeans with rationalist sympathies could find in Chalmers' account a suitable modal epistemology. If that were the case, the project of what I called an "ambitious" modal epistemology combining 2D *a priori* methods with a broadly Aristotelian metaphysics would succeed. But the fact that Chalmers' 2D framework accommodates the cases of the necessary *a posteriori* at the *semantic* level does not suffice to provide a viable modal epistemology for a Kripkean, because of their conflicting underlying *metaphysical* commitments. Even a "2D-friendly" Kripkean who accepts the core semantic thesis that expressions have two dimensions of meaning will still reject its consequences at the level of modal

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[1] This literature is vast, but see e.g. Goff & Papineau (2014); Roca-Royes (2011); Soames (2005); Vaidya (2008); Worley (2003). See also Chalmers' discussion of a number of objections in his (2010): 154-205.

metaphysics. Specifically, she will refuse to regard (many of) the 2D *primary* possibilities as genuine metaphysical possibilities.

As I argue, the project of such an *ambitious* modal epistemology involves an *inconsistent triad* whose elements are (1) *modal monism*, (2) *two-dimensionalism*, and what I call (3) "*metaphysical Kripkeanism*". I present the three theses and give reasons why only two of those can be true at a time. Thesis (3), metaphysical Kripkeanism, is what causes the most problems in the attempted combination. For the bridge-principles and *a posteriori* necessities are the cornerstones of Kripke's modal metaphysics. They hinge on an underlying *metaphysics of essence*, and the idea that *the actual world is a source of necessity*. On the other hand, Chalmers' two-dimensionalism itself comes equipped with a broad modal metaphysics that hardly fits the Kripkean essentialist commitments. Two-dimensionalism (2) joined to modal monism (1) results in an *a priori* "conceptual" modal metaphysics, for which modality is grounded in ideally rational concepts of possibility and necessity and ideally coherent entailment relations. There is only one source of necessity for Chalmers—and that is not to be found in the nature of things. Instead, we should look at *a priori* conceptual truths having to do with our understanding of the concept of necessity.

Thus, the purported *ambitious* modal epistemology would have to somehow fit together two conflicting views of metaphysical modality. On the one hand, it would have to hold an *a priori conceptual* metaphysics, built out of theses (1) and (2). On the other hand, however, it would also have to respect the requirements of an *essentialist* metaphysics articulated by thesis (3). Those determine incompatible views of what is genuinely possible, and incompatible views of what *a priori* methods can give us access to. The consequence is that Chalmers' conceivability entails possibilities that a Kripkean still rejects as genuinely *metaphysical*. Modal Rationalism cannot incorporate metaphysical Kripkeanism.

However, there is also a positive story to be told, as three substantive stances in modal epistemology emerge from the combinations that the triad allows. Two of those are different versions of Kripkeanism: the *Monistic Kripkean* combines (3) metaphysical Kripkeanism with a version of (1) modal monism; and the *2D Kripkean* combines (3) metaphysical Kripkeanism with (2) two-dimensionalism. Exploring those views may contribute to gain some insight into familiar interpretative tensions in *Naming and Necessity*. Finally, *Pure Two-Dimensionalism* drops metaphysical Kripkeanism, while keeping (2) two-dimensionalism, together with Chalmers' version of (1) modal monism. Pure Two-Dimensionalism seems to best reflect Chalmers' own view; whereas 2D Kripkeanism is probably the best compromise for a Kripkean friendly to the 2D approach to modal epistemology. However, it comes with a cost, as it requires abandoning modal monism and reshaping the scope of what *a priori* conceivability can give us access to.

I conclude by suggesting a broader moral for modal epistemology: in order to elucidate modal knowledge, we need to first look at the *sources of necessity*. Clarifying what grounds modal truth in the different domains (logico-conceptual, epistemic, metaphysical, etc.) is the prerequisite for understanding the use and scope of *a priori* methods for modal knowledge.

1. *Desiderata for Modal Epistemology*

Many modal epistemologists agree that a promising account of metaphysical modal knowledge should aim to meet the following desiderata: (i) distinguishing metaphysical possibilities from other kinds of possibilities; (ii) integrating the Kripkean bridge-principles and the necessary *a posteriori*; (iii) respecting the fundamentally *a priori* character of modal inquiry.

Desideratum (i) narrows down the focus to metaphysical modality, especially as opposed to epistemic modality. At first approximation, epistemic modality has to do with the possibilities open to subjects relative to what they know, under certain specified conditions, e.g., given the kind or

amount of information available. By contrast, metaphysical modality concerns the possibilities that are determined by the *nature* or *identity* of things. Those are also sometimes cashed out as *objective* possibilities (Williamson 2016).[2]

Desideratum (ii) insists on compliance with familiar results from *Naming and Necessity*. Many metaphysical necessities are grounded in the way the actual world is, and accordingly are only knowable via empirical investigation. Correspondingly, many metaphysical possibilities are also constrained by the features of the actual world. Kripke's essentialist bridge-principles such as the necessity of origins, of composition (substance), of fundamental kind, and the necessity of identity, clarify to an important extent the content of metaphysical necessity and set substantial constraints for metaphysical possibility.[3]

On the other hand, if *a posteriori* investigation is required to know many necessities, that does not look like the whole story. Empirical experience seems confined to tell us only about what is actual, so our modal judgments seem at most only *partially* empirically justified. That was already Kant's diagnosis of our puzzlement with necessary statements: "experience teaches us that a thing is so and so, but not that it cannot be otherwise" (CPR: B3). In fact, for Kripke the bridge-principles are *a priori*. This explains desideratum (iii): when we isolate the basic principles underlying our modal beliefs from possible empirical content, an *a priori* step of some sort (e.g., inferential, or intuitive)

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[2] Some might reject desideratum (i): one might be skeptical that there is a distinctive kind of metaphysical possibility as opposed to other kinds of possibilities, and hold instead a monistic view with only one kind of modality. However, even modal monists usually acknowledge at least a minimal distinction between two *notions* of modality—indeed, the 2D framework rests on this distinction. I take it that the skeptical reader will grant (i) under such a minimal understanding. At any rate, she should grant it as a dialectical point: for this distinction is shared by both Chalmers and the Kripkeans.

[3] Some might reject desideratum (ii): Kripke's essentialist bridge-principles and examples are not uncontroversial. But note that complying with desideratum (ii) does not require further endorsing Kripke's modal metaphysics (what I call here *metaphysical Kripkeanism*). In fact, Chalmers' Modal Rationalism is a working example of how to fix the cases of the necessary *a posteriori* without endorsing the Kripkean modal metaphysics. Because of that, the skeptical reader should grant (ii) as a dialectical point.

seems required in order to justify our modal judgments. Put simply, modal investigation and

knowledge seem importantly partly *a priori*.[4]

2. *Chalmers' Proposal*

Chalmers' *Modal Rationalism* is a working example of how to comply with desiderata (i)-(iii).[5]

Chalmers defends an *a priori*, conceivability-based route to metaphysical modal knowledge, thus

satisfying (iii); it also aims to respect the Kripkean principles and examples, thus satisfying (ii).

Specifically, Chalmers' project appears to answer the Kripkean Challenge:

(Kripkean Challenge) *Conceivability does not entail possibility since not everything we conceive is*

(metaphysically) possible.

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[4] Cf. Peacocke (1999: 41). See also Hale (forthcoming; 2013: ch. 11), and Lowe (2012). For recent discussion of the connection between apriority and modality, see Bueno & Shalkowski (forthcoming); Casullo (forthcoming; 2014); Vaidya (2017a; 2017b). Some might reject desideratum (iii). I mentioned a recent empirical turn in modal epistemology: modal empiricists eschew *a priori* means and defend non-traditional epistemic sources and procedures for modal knowledge like perception, inductive and abductive reasoning, and (quasi-perceptual) imagination. They typically frame modal investigation as an extension of scientific investigation, and prefer naturalist and externalist stances in epistemology. Also, they tend to focus on knowledge of "nearby" possibilities as opposed to the remote "extravagant" ones (see e.g. the essays in Fischer & Leon 2017; Strohminger 2015; Williamson 2016a; 2016b; 2007: ch. 5). Although I also see metaphysical modal knowledge as generally grounded in empirical knowledge (specifically, in essentialist knowledge: see my 'Putting Modal Metaphysics First'), I also distance myself from the more radical aspects of modal empiricism. First, I am skeptical that *a posteriori* ways of knowing by themselves can lead us to knowledge of metaphysical modality. The non-actual is something that structurally or by its very nature escapes empirical observation and experience. Second, I question the scope of those theories. While they seem to safely range over physical-nomological possibility, it is less clear that they cast light beyond that into the metaphysical realm. Metaphysical possibility is covered to the extent that it coincides with physical-nomological possibility; thereby it remains largely unexplored. Third, it is not obvious that the methods modal empiricists appeal to are themselves purely empirical. The justification of *induction*, for example, is a longstanding problem: e.g. BonJour (1998) argues that it is *a priori*. Wilson & Biggs (2016) argue that *abduction* is *a priori*. In any case, the skeptical reader should still grant (iii) as a dialectical point, as *a priori* methods and justification play a central role for modal knowledge for both Chalmers and the Kripkeans.

[5] Chalmers defends Modal Rationalism in his (2002a), but see also his (2004), (2010), (2011). As mentioned, most contemporary accounts fail to satisfy one or another of the desiderata above. A notable exception is Hale (2013: ch. 11), which in my view has the further merit of grounding knowledge of necessity in knowledge of essence.

Answering this challenge means finding some way to grant the necessary *a posteriori* and explaining how, nevertheless, *a priori* conceivability could entail metaphysical possibility.

Chalmers' strategy consists in distinguishing different notions of conceivability as well as possibility—thereby also satisfying desideratum (i)—and connecting a kind of conceivability with a kind of possibility:

(CP)   *Ideal, primary conceivability entails primary possibility.*[6]

When something is *ideally* conceivable, it is so from the virtual stance of a reasoner "free of all contingent cognitive limitations" (Chalmers 2002: 148), which basically eliminates modal error and potential counterexamples based on our cognitive limitations.[7] Furthermore, *primary* conceivability is the way we evaluate an expression's *primary intension*.[8] Primary intensions carry the descriptive content *a priori* associated with a linguistic expression and return its referent or truth-

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[6] More precisely, *positive* ideal primary conceivability. Whereas *negative* conceivability is the inability to exclude certain possibilities *a priori*, positive conceivability requires construing positive hypotheses and coherently filling in relevant details. This distinction is not relevant for what follows and I set it aside. Roca-Royes (2011) offers an excellent criticism of a variety of conceivability-based accounts of *de re* modal knowledge. However, I disagree with her that Chalmers' *primary aim* is to elucidate *de re* and essentialist modal knowledge. That seems rather a nice potential advantage of his view (if it holds). Moreover, Chalmers' basic link between (idealized) conceivability and (primary) possibility, which is one of Roca-Royes' main targets, is not problematic from the point of view of metaphysical Kripkeanism, and thereby it would not be problematic for an *ambitious* modal epistemology.

[7] Chalmers mentions highly difficult unsolved mathematical problems, e.g. Goldbach's conjecture: both its truth and its falsity are *prima facie* conceivable, but only one is *ideally* conceivable (2004: 145). Many have objected to this notion of ideal conceivability, e.g. Priest: "the ideality involved is that of some infinite and infallible *a priori* reasoner—not a very useful notion for mere mortals" (2016: 2660, fn.37). See also Worley (2003). Priest further objects that actually any decent mathematician can conceive of the conjecture being true and also of the conjecture being false, and they would not magically lose this ability if a proof of one or the other were found: examples proliferates in history. We might further note that mathematicians seem to conceive of contradictory scenarios any time they engage in a proof by contradiction. But Chalmers reiterates (in conversation) that while we might *negatively* conceive of these proofs (we might not exclude them *a priori*), we cannot *positively* conceive them (building the proof itself).

[8] I am only sketching the basics of Chalmers' 2D framework, assuming that the reader is already familiar with it and narrowing my focus to those aspects that are relevant for my discussion of Modal Rationalism. Another notable example of a 2D framework with a similar program as Chalmers' is Frank Jackson's (1998), though Jackson does not apply it to modal epistemology. For an extensive discussion of 2D semantics and a comparison between Chalmers' and other 2D programs (including Jackson's), see Chalmers (2004).

value at a world considered as *actual*. Accordingly, primary conceivability requires putting aside

empirical information about our world while supposing that a certain world is actual, and virtually

taking the perspective of a speaker within that world. This is a purely *a priori* exercise based on

considerations of logical and conceptual coherence of the hypotheses under examination. As

Chalmers puts it more formally, primary conceivability consists in evaluating *a priori* entailments:

given a sentence *S* and a world *W*, "the primary intension of *S* is true in *W* if the material

conditional 'if *W* is actual, then *S*' is *a priori*" (2002: 163).[9] That distinguishes it from *secondary*

conceivability, which is empirically informed by how our world is and constrained by the Kripkean

bridge-principles. *Secondary intensions* return the referent or truth-value of an expression at a world

considered *as counterfactual*. Thus, evaluating different intensions is in fact looking at different

possibilities. We judge a sentence to be true or false depending on how the world at which the

intension is evaluated looks like.

This apparatus seems to provide the tools to neutralize the Kripkean Challenge. For

Chalmers, sentences describing Kripkean *a posteriori* necessities express multiple propositions: they

are *secondarily* necessary but *primarily* contingent. This means that ideal primary conceivability

captures a specific kind of possibilities, i.e., primary possibilities, that are sometimes secondarily

impossible. Accordingly, *a priori* conceivability does entail (a kind of) possibility. When we conceive

e.g., that Hesperus is not Phosphorus, we are not struggling to stretch our imagination beyond

metaphysical possibility. For Chalmers, there is a primary possibility verifying 'Hesperus is not

Phosphorus' (i.e., a world where the evening star and the morning star are distinct). However, it is

still secondarily impossible that Hesperus is not Phosphorus (given that both 'Hesperus' and

'Phosphorus' refer to Venus). Our modal evaluations seem no longer restricted by the Kripkean

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[9] Chalmers works with a broad notion of *a priori justification* ("*S* is *a priori* when it expresses a thought that can be justified independently of experience" 2010: 548). Some (e.g. Devitt 2005) have objected to such *negative* formulations on the grounds that they do not say what the *a priori is*. The epistemology of the *a priori* is notoriously a thorny issue. Here I grant Chalmers' broad formulation.

assumptions built in the subjunctive mood. Modal thinking expands to cover an unexplored space of possibility, where ideally rational hypotheses are also genuine possibilities. At the same time, those Kripkean assumptions still stand, and the bonds of metaphysical necessity are preserved.

With such an apparatus in hand, it is tempting to think that Chalmers' Modal Rationalism may accomplish the difficult task of deploying 2D methods for modal knowledge in a way that satisfies the requirements of a Kripkean modal metaphysics. The envisioned *ambitious* modal epistemology may seem within reach. Indeed, why would a Kripkean resist Modal Rationalism?

3. An Inconsistent Triad

I argue that the project of combining Chalmers' Modal Rationalism with a Kripkean modal metaphysics entails an *inconsistent triad* composed of the following theses:

(1) Modal Monism (*there is only one modal primitive. Metaphysical=logical=conceptual possibility*)

(2) Two-Dimensionalism (*expressions capture two dimensions of possibility: epistemic and metaphysical*)

(3) Metaphysical Kripkeanism (*metaphysical modality depends on the essential features of the actual world plus the Kripkean bridge-principles*)

Only two of the three theses can be true at one time. Specifically, the inconsistency lies in the conflict between Chalmers' own modal metaphysics, which can be thought of as the combination of (1) and (2), coming up against the Kripkean's (3). The latter can only be compatible with *either* (1) *or* (2), not both. Here is how to unpack each thesis and the inconsistency in more detail.

Metaphysical Kripkeanism (3) holds that metaphysical modality is *de re,* in things. Things are necessarily or contingently in a certain way independently of how we choose to describe them or

conceptualize them. Their modal profiles depend instead on their fundamental nature. Both individuals and kinds have *essential properties,* which constitutively determine not just how things are, but how they must be across possible worlds. The bridge-principles capture this dependence relation between the nature of the actual world and metaphysical necessity, based on essential properties of things.[10]

Kripke introduces this notion of metaphysical modality in the context of his famous distinction between the *a priori* and the necessary (1980: 35-36). He distinguishes metaphysical necessity from three other notions or senses of necessity: first, *epistemological* necessity, which "might just mean *a priori*". Second, *physical* necessity; and, third, *logical* necessity. Setting aside epistemological necessity for the moment, modal space is arguably carved out in such a way that metaphysical possibility is not as *broad* as logical possibility but not as *narrow* as physical possibility. For Kripke, we can get a grip on the content of metaphysical necessity by simply asking ourselves: "is it possible that, in this respect, *the world should have been different from the way it is*?" (36: my emphasis). The "world" is for Kripke a combination of the actual makeup of things—individuals and kinds, with their essential properties—together with the bridge-principles that govern necessity. This combination sets the parameters for genuine *metaphysical* possibility.

Accordingly, in conducting our modal evaluations, we should reason from how the world is—from its actual makeup—to how it must be. The bridge-principles that guide modal inference have the form '$P \rightarrow \Box P$' (1971: 153). Certain essential features of the actual world, *P,* determine what must be the case (metaphysically) or what is the case at all worlds, $\Box P$. These principles bridge the realm of the actual and non-modal with the realm of the non-actual and necessary. Furthermore, it

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[10] A distinction between *trivial* vs. *non-trivial* essentialist import of Kripke's *a posteriori* necessities has become standard (probably after Salmon, 1981: 82-87). Cases involving identities between rigid designators may only commit one to the "trivially" essential property of *self-identity* (and, although more tentatively, so do the cases of theoretical identifications. See also fn.13 below). Whereas, cases of kind essentialism and origin essentialism rather involve a commitment to "substantive" or non-trivially essential properties. I will discuss examples of both types.

appears that modal inquiry has an important *empirical* aspect: in most cases, it is informed by observation and scientific investigation.[11] In Kripke's words: "in general, science attempts, by investigating basic structural traits, to find the nature, and thus the *essence* (in the philosophical sense) of the kind" (1980: 138).[12] It was an empirical discovery that heat is molecular kinetic energy: we discovered its fundamental nature or, simply, what heat *is*. That means, for Kripke, that heat could not have been anything else than molecular motion: given that heat *is* molecular motion, it is necessarily so.[13] This is the powerful, two-sided idea behind Kripke's necessary *a posteriori*. We need empirical information about the world in order to know certain necessities (an *epistemic* thesis); but this is so, in turn, because those necessities are grounded in the way the world is or in the intrinsic nature of things (a *metaphysical* thesis). Kripke has illuminated another *source of necessity* besides the traditional *a priori* logico-analytic necessity. Our world—specifically, the essences of things— generates metaphysical necessities.

Given this picture of metaphysical modality, it is not clear that Chalmers' primary possibilities can be genuinely *metaphysical* for a Kripkean. From the point of view of metaphysical Kripkeanism, Chalmers' account seems in danger of allowing worlds that go against the nature of things—that is, primarily possible worlds that deny the essential properties of things. Two-dimensionalism has a more generous attitude, we may say, to what is possible and enriches the picture with further possibilities. But those are *de dicto*, purely *a priori* possibilities. From the 2D

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[11] Not in all cases. The truths of logic and mathematics are presumably both necessary and purely *a priori,* for Kripke.

[12] If Kripke is right, essences are not hidden substrata or mysterious entities, but rather an object of scientific investigation. Unfortunately, Kripke does not further explore the metaphysics and epistemology of essence. In my 'Putting Modal Metaphysics First', I argue that we can effectively do so by pursuing the thesis that, at least in the case of natural kinds, the essence of the kind is what *causes* and *explains* all the many, many other properties and behaviors shared by all the instances of the kind.

[13] This is one of Kripke's paradigmatic *theoretical identifications,* typically having the form of identity sentences involving a rigid (general) term for natural kinds on the left-hand side and a rigid semantically complex expression on the right-hand side (1980: 125-140). It is a matter of debate what exactly the semantic status of the right-hand side expressions is (for a survey, see Beebee & Sabbarton-Leary 2010), but this is an issue at the level of language and reference that we do not have to settle here.

perspective modality is a matter of ideally rational concepts and entailments; thereby, metaphysical

possibility is largely independent of how things actually are and their essential properties. "Primary

conceivability is always an *a priori* matter. We consider specific ways the world might be, in such a

way that the true character of the actual world is irrelevant" (Chalmers 2002: 158). The 2D

parameters for the scope of metaphysical possibility turn out to be antithetical to the Kripkean's, as

they allow for worlds that she would not accept.

To illustrate, take Kripke's example of the necessity of (biological) origin. According to

Kripke's principle, it is metaphysically impossible for a human being to have different parents than

the ones she actually has. While Chalmers' framework respects this principle at the level of the

secondary dimension, it also treats ideally *a priori* conceivable possibilities—i.e., primary

possibilities—as genuine metaphysical possibilities (again, there is only one modal primitive). Since it

seems ideally *a priori* conceivable that a human being might have had different parents from those

she actually has, we should conclude that this is primarily and, as such, metaphysically possible. But

for a Kripkean this is unacceptable.

Let us look at this contrast more closely. Chalmers' strategy to avoid worlds that go against

the nature of things from a Kripkean perspective can be broken down in two parts. On the one

hand, Chalmers stresses that the worlds in question verify the primary intension of the relevant

expressions, which is independent of their actual referents (i.e., of *that* particular human being and

her parents). Primary intensions only capture an aspect of content under a specific mode of

presentation (i.e., the rules for assigning names to referents, based on their semantic content). Since

that intension is *a priori* and independent of the nature of the actual referents, it should not conflict

with the nature of those referents, namely with what is essentially true of them. As I explain below

(sections 4.1-4.2), this bit of Chalmers' strategy appears to meet the Kripkean requirements only

superficially, that is, only at the level of semantics. Although this is sufficient for the two-

dimensionalists' purposes, it does not satisfy the Kripkeans'. For her, those possibilities may still go against the nature of things. Depending on whether we consider an "orthodox monistic" Kripkean, or a "2D-friendly" Kripkean, primary possibilities turn out to be either impossible *tout-court*, or merely epistemic not metaphysical possibilities (or *scenarios,* as they are often called).

On the other hand—this is the second bit of the strategy—Chalmers emphasizes that the Kripkean necessities are preserved at the level of the secondary dimension. This is so thanks to the rules for assigning secondary intensions that respect the Kripkean bridge-principles. However, those rules are here motivated by the 2D machinery itself—they are conceptual truths based on our understanding of linguistic expressions and of the notion of metaphysical necessity. From a Kripkean perspective, it seems accordingly largely *arbitrary* that the rules are like that. In fact, two-dimensionalists simply disregard such rules when evaluating primary intensions. When switching from a referential, *de re* reading to a descriptive, *de dicto* reading of expressions, one considers the *a priori* associated intensions while disregarding the actual referents and their properties, as well as the bridge-principles. But a Kripkean finds this wrong. Far from being merely arbitrary conceptual truths, the bridge-principles are rather tied to the actual makeup of the world. For the Kripkean, modal space is structured bottom-up, from the nature of things to the possibilities that their essences allow; it is not primitively *a priori* given in the manner Chalmers holds.

The contrast becomes especially clear if we distinguish a strictly *semantic* Kripkeanism from metaphysical Kripkeanism.[14] The 2D project only signs up for the former. Integrating semantic Kripkeanism requires fixing the cases of the necessary *a posteriori* and respecting the bridge-principles; whereas the essentialist commitments belong to metaphysical Kripkeanism. However, the latter is further needed to get the *ambitious* modal epistemology off the ground. For a Kripkean, compliance with the bridge-principles and the examples of the necessary *a posteriori* is not something

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[14] Thanks to Jonathan Schaffer for suggesting this distinction.

that one can just opt out of by adding suitable intensional content to our expressions. It is instead a matter of respecting the nature of things, where that is independent of any description or mode of presentation. As I am picturing the Kripkean stance, one can hardly accommodate the semantic doctrine without taking into account also the underlying metaphysics. The attempt to divorce them has the consequence of going against the Kripkean requirements themselves, while endorsing a largely arbitrary modal metaphysics that disregards the nature of things. Thus, the *ambitious* modal epistemology that would successfully combine the 2D framework with a Kripkean metaphysics turns out to be rather out of reach.

Some tenacious modal epistemologist might suggest that we avoid this difficulty by distinguishing different *sources of necessity*. Roughly: *a priori* logico-conceptual truths and ideally rational entailments would be the source of primary-epistemic necessity; whereas the essential makeup of the world would be the source of secondary-metaphysical necessity. Distinguishing between sources of necessity would provide a corresponding *qualitative* distinction between kinds of possibilities or possible worlds—namely between genuinely metaphysically possible worlds vs. epistemically possible worlds or scenarios.

This is an attractive possibility. In fact, this is the route chosen by the *2D Kripkean* (4.2 below). However, taking this route requires giving up a central component of Chalmers' account, that is, the commitment to *modal monism* (1). Modal monism can be cashed out in a number of ways. It may capture the idea of a single modal primitive or source of necessity; or a single kind of possibility; or, also, formally, the notion of a single space of worlds. Those are not equivalent characterizations. For example, one might hold that there is a single source of necessity, while drawing nonetheless interesting distinctions between e.g. logical vs. metaphysical possibility.[15] Furthermore, regardless of one's theoretical commitments, one might choose to work with either a

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[15] See e.g. Vaidya (2006); Hale (2013).

monistic or a dualistic space of worlds, depending on one's particular purposes. In Chalmers'

account, however, all those notions line up: he describes monism in terms of a single modal

primitive, and a single space of worlds. Moreover, there is only one source of necessity—logico-

conceptual necessity—whereas the nature or essences of things play no role. Logico-conceptual

possibility is coextensive with metaphysical possibility: "Of course I hold that conceptual

possibility=logical possibility=metaphysical possibility (at the level of worlds)" (1999: 478). Any

logico-conceptual possibility is also a metaphysical possibility, with no qualitative distinction

between them. "Ultimately, there is just one circle of modal concepts, including both the rational

modal concepts…and the metaphysical modal concepts" (2002: 194).

Still, according to Chalmers, endorsing monism does not compromise the desired modal

distinctions. We do not need two modal primitives or distinct sources of necessity, and so we do not

need two kinds of qualitatively different worlds, since the intensional apparatus can account for all

the differences we are interested in. Any world that is logico-conceptually possible is also

metaphysically possible; but different intensions will be verified, or satisfied, at each world.

Otherwise put, whether something is primarily or secondarily possible depends on where an

intension is verified or satisfied within a single space of metaphysically possible worlds; not on

whether a certain world is located in the space of genuine metaphysical possibility as opposed to

mere epistemic possibility.

It follows that Chalmers' monism cannot accommodate the *de re* essentialist Kripkean

commitments that locate the source of metaphysical necessity in the nature of things. His monism

forgoes that further source and rather tracks such commitments back to the *a priori* semantic rules

for assigning secondary intensions. On the other hand, a *dualistic* picture of modality, by adding a

further source of necessity, could provide the desired corresponding qualitative distinction between

kinds of possibilities. That is probably the only way to successfully meet the requirements of metaphysical Kripkeanism while preserving the core thesis of 2D semantics.

4. *Three Positive Views*

On the bright side, the triad allows three combinations, which correspond to three positive views in conceptual space. Two of those are broadly Kripkean, by both including (3) metaphysical Kripkeanism. One, which I am calling *Monistic Kripkeanism,* endorses a version of (1) modal monism. The other, which I am calling *2D Kripkeanism,* endorses (2) two-dimensionalism. It is a methodological point in *Naming and Necessity* that Kripke does not aim to offer formal theses or definitions that satisfy sets of necessary and sufficient conditions. Rather, he is interested in broad *pictures* (1980: 93). That is why both strands of Kripkeanism appear to be consistent with Kripke's views. Indeed, besides being interesting positions *per se,* these may help us gain some deeper insight into those pictures that Kripke laid out. On the other hand, exploring both strands of Kripkeanism casts light on why Chalmers and Kripke's modal metaphysics are fundamentally incompatible. The last available stance resulting from the triad, which I am calling *Pure Two-Dimensionalism*, drops (3) metaphysical Kripkeanism while retaining (2) the 2D framework together with (1) a monistic picture of modality.

In the remainder of the paper, I examine those three views in turn. In the end, the following should be clear. From the Kripkean perspective, Chalmers' Modal Rationalism is not a viable option. For it either (a) fails to neutralize the Kripkean Challenge (conceivability still does not entail possibility); or (b) the main conceivability-to-possibility thesis has to be amended to avoid the Kripkean Challenge; but with the result that *a priori* conceivability may fail to access genuine metaphysical possibility. The Monistic Kripkean represents outcome (a): for her, *a priori* conceivability still does not entail metaphysical possibility. The 2D Kripkean represents outcome (b):

for her, *a priori* conceivability only entails epistemic possibilities having ideally coherent logico-conceptual content, which however may not be genuine metaphysical possibilities. Finally, the Pure Two-Dimensionalist replaces metaphysical Kripkeanism with her own monistic modal metaphysics, which is grounded in purely *a priori* rational notions rather than in the *de re* essential profiles of things. Whichever of the three views one chooses, the project of fully combining the original program of Modal Rationalism with metaphysical Kripkeanism into a coherent modal epistemology does not succeed.

4.1. *Giving Up Two-Dimensionalism: The Monistic Kripkean*

It seems common ground between Chalmers and *both* the Monistic and the 2D Kripkean that cases like 'Hesperus is not Phosphorus', 'Cicero is not Tully', 'Water is not H_2O', 'Heat is not molecular motion', and so on are metaphysically impossible. The question is whether a Kripkean could concede that they are still possible in some interesting sense; and, if yes, what more precisely is the content of those possibilities.

The Monistic Kripkean rejects the 2D framework and the thesis that expressions have a further, primary intension. Accordingly, she also rejects Chalmers' take on *a posteriori* necessities. For her, the relevant examples are possible only in the loose sense that it is not *a priori* that, for example, Hesperus is Phosphorus. The possibility that Hesperus might not have been Phosphorus is *illusory*: it only corresponds to a subject's lack of information about certain astronomical facts. "Obviously, the 'might' here is purely 'epistemic'—it merely expresses our present state of ignorance, or uncertainty" (Kripke 1980: 102-103). Strictly, that does not even count as a *possibility* at all: we shall not model it by means of possible worlds. In general, for the Monistic Kripkean there is no distinct primary possibility, no further dimension of possibility besides the metaphysical one. When we speak of epistemic possibility, we do not refer to objective possibilities "out there" in the metaphysical realm.

For the Monistic Kripkean, often the scenarios that one conceives when conceiving the falsity of some *a posteriori* necessity are (*ceteris paribus*) metaphysically possible. But, crucially, the objects thus conceived are alien and unrelated to the actual ones. For Kripke, in such cases we are "*qualitatively in the same epistemic situation* that in fact obtains" (1980: 142), but what we are considering is a different object. Examples proliferate. Supposing that *this particular* table could have been made of ice rather than wood means supposing that "I could have the same sensory evidence that I in fact have, about *a table* which was made of ice" (ivi). Had there been a substance having the same phenomenal properties as water, but having a completely different atomic structure, that would not have been water but rather some *other* substance (1980: 128-129). Insisting that Hesperus might not have been Phosphorus, or Cicero might not have been Tully, only amounts to contemplating cases involving, say, *Sch-Hesperus, Sch-Cicero*, and so on.[16]

In this perspective, 2D ways of explaining Kripkean intuitions do not succeed.[17] For the Monistic Kripkean, the content that Chalmers takes to be verified at a scenario or primary possibility does not really *falsify* an *a posteriori* necessity, because it does not involve the actual objects that we should be considering, but other ones that only have superficial properties similar to those. What the two-dimensionalist takes to be primarily possible is instead for the Monistic Kripkean only the misguided expression of a momentary state of ignorance, or an epistemic illusion.[18] More generally, metaphysical Kripkeanism holds that the actual world with its individuals, kinds and relevant essential properties determine the scope of metaphysical possibility. *The possible is constrained by the actual.* For the Monistic Kripkean this means that there is only one space of possibility, i.e., metaphysical possibility—and nothing beyond that. Thus, she endorses a version of *modal monism.*

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[16] What about a scenario where e.g. 'Tully' refers to the *actual* individual, while 'Cicero' to someone else? For the Monistic Kripkean this would still *not* be a possibility where *Tully is not Cicero*; but rather one where Tully is not also *called* Cicero. For surely the metalinguistic statement "Cicero and Tully are names of the same Roman orator" might have been false (cf. 1971:154).

[17] *Pace* Chalmers (2010: 188-189, fn.3).

[18] See Yablo (2006) for an insightful discussion of such cases.

For her, too, there is only one source of necessity and one kind of possibilities or possible worlds, i.e., the genuinely metaphysically possible worlds. But her version of monism differs from Chalmers' in two crucial respects. First, no merely epistemic possibility has a place within modal space. And second, the source of metaphysical necessity lies in the makeup of the actual world as determined by the essential properties of individuals and kinds.[19]

That is why *a priori* conceivability does not really help cast light on metaphysical possibility, for the Monistic Kripkean. One needs to know how things actually are and which kinds of principles one ought to follow in order to reason about metaphysical modality. That is also why Chalmers' modal metaphysics is antithetical to Kripke's. Both the intrinsic and structural features of the actual world as well as the Kripkean essentialist principles are irrelevant to the content of Chalmers' primary possibilities.

From the point of view of the philosophy of language, Kripkean intuitions against an intensional semantics like Chalmers' may not be surprising. As mentioned, for the Monistic Kripkean, sentences expressing *a posteriori* necessities do not carry the extra-content needed to build the typical surrogate primary possibilities. Chalmers stresses that intensions are functions not descriptions; they rather reveal an expression's cognitive role, similarly as coarse-grained Fregean senses do (2002b). Still, his 2D framework operates under the main assumption that expressions have an associated descriptive content (Papineau: 2007; Soames: 2005). This is something that the

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[19] Kripke's discussion suggests some form of nomological necessitarianism, for which the laws of nature are metaphysically necessary. Theoretical identifications and scientific statements more generally are "not contingent truths but necessary truths *in the strictest possible sense*" (1980: 125, my emphasis). And at least for a range of cases, "it might be that when something's physically necessary, it always is necessary *tout court*" (99). Still, Kripke is also cautious: "physical necessity *might* turn out to be necessity in the highest degree. But that's a question which I don't wish to prejudge" (ivi). Overall, it seems safe to say that Kripke endorses a *weak* necessitarianism for which properties are individuated by their role in laws or their causal role. E.g.: "It's not just that it's a scientific law [that gold has atomic number 79], but of course we can imagine a world in which it would fail. Any world in which we imagine a substance which does not have these properties is a world in which we imagine a substance which is not gold, provided these properties form the basis of what the substance is" (125).

Monistic Kripkean rejects. She may hold, as some put it, that expressions are often *radically opaque* (Goff & Papineau: 2014).[20]

Finally*,* for the Monistic Kripkean the Kripkean Challenge itself seems misguided. The conceivability of the falsity of an *a posteriori* necessity turns out to be only apparent, and quickly fades away. How can one conceive that *this particular* table is not made of wood, that *water* is not H$_2$O, that *Hesperus* is not Phosphorus, that *Cicero* is not Tully? We struggle to deny the essentialist bridge-principles, and ultimately the necessity of identity. But every time we seem to be doing it, we realize that a shift in content occurred. Chalmers is trying to press a *de dicto* reading, supposedly available at the level of the primary dimension, which would not violate the essentialist principles and the necessity of identity. But the Monistic Kripkean pushes back with the *de re* reading and denies any further dimension of meaning.[21]

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[20] Kripkean Monism entails a sort of *direct reference about meaning.* This is the view, as Devitt puts it regarding names, that "the meaning of a name is simply its bearer" (2015: 128). Cf. Soames (2002; 2005), Salmon (1986). However, it is worth stressing that although Kripke rejected descriptivism, he never explicitly endorsed direct reference. Perhaps more in seminars than in print, Kripke has remarked that senses *qua* associated descriptions are fine so long as they are not treated as *definitions* of the corresponding expressions. They are not part of the content of an expression, and do not provide necessary and sufficient conditions to determine their extension. Does this leave any room for Chalmers' intensions? Perhaps only for a sort of secondary ones: "in the formal semantics of modal logic, the 'sense' of a term *t* is usually taken to be the (possibly partial) function which assigns to each possible world *H* the referent of *t* at *H*. For a rigid designator, such a function is constant" (Kripke 1980: 56, fn. 22). 'Cicero' or 'Hesperus' cannot fail to pick out the very same individual at all possible worlds where that individual exists. Those names would not pick out someone else in the primary dimension, like Chalmers wants. But, again, this does not necessarily make of Kripke himself a Monistic Kripkean.

[21] Thus, I disagree with Goff (in Goff & Papineau 2014) that radically opaque expressions provide examples of *strong necessities,* because those expressions lack the further dimension of meaning that is needed to build such cases. Chalmers characterizes a *strong (a posteriori) necessity* as what a counterexample to (CP) would look like, if there were such a thing (then of course everyone took up the challenge and tried to come up with a good case. For discussion: Chalmers 2010: 170-180). A strong necessity must be: (i) metaphysically-secondarily necessary; (ii) epistemically-primarily necessary; (iii) conceivably false. In the case of radically opaque expressions, against Goff, I do not see how (ii) is satisfied, given that no extra descriptive content motivates such a further dimension. Instead, the Monistic Kripkean neutralizes Chalmers' challenge by simply *rejecting* his 2D analysis of *a posteriori* necessities as weakly necessary because primarily contingent. It is rather the *2D Kripkean* the one who has the theoretical resources to build cases of strong necessities (i.e., modal dualism). However, I recommend against engaging with such a quest after strong necessities. Given Chalmers' setup, any such attempt is doomed to failure. Since he treats conceivability and epistemic-primary possibility as *de facto* coextensive, any conceivable falsity (iii) automatically denies epistemic-primary necessity (ii).

To take stock: in order to accommodate the Monistic Kripkean's view, Chalmers would appear to have only two options. The first: he could concede that what we refer to as e.g. "water" at worlds where 'water is not H_2O' is verified, is rather some *other* substance (similarly for the other examples). While this would make it a genuine metaphysical possibility for the Monistic Kripkean, it would also leave her wondering why we should be calling such a substance "water". For her, the very idea of a further dimension of meaning seems misguided. After all, that further intensional content leads us astray by having familiar terms pick out alien referents across possible worlds. The second: Chalmers could agree that the possibility of water not being H_2O is merely illusory, and it is better described in terms of a momentary subjective state of ignorance. For that matter, it could even still be called "epistemic". However, the unwanted result is that that would not constitute a genuine metaphysical possibility. Rejecting both those options, on the other hand, would seem to put Chalmers in a bad spot: for the only alternative available seems to be that we can conceive *de re* metaphysical impossibilities, including actual water not being H_2O. While this may be a perfectly respectable view (Priest 2016), it is clearly a non-starter in this context. For such a view not only directly denies the Kripkean assumptions; but it also amounts to rejecting Chalmers' whole setup.

In terms of the triad, the Monistic Kripkean rejects (2) two-dimensionalism, while retaining (3) metaphysical Kripkeanism. The space of possibilities for her covers *only* metaphysical possibilities, thereby she endorses (1) monism.

4.2. Giving Up Monism: The 2D Kripkean

The 2D Kripkean has some sympathy for two-dimensionalism. She is more flexible about the philosophy of language and engages with Chalmers' 2D framework. For her, expressions may have some extra descriptive content and that plausibly opens up a further dimension of possibility. As we might put it, where the Monistic Kripkean only sees a misdescription, the 2D Kripkean sees

an epistemic possibility that is not merely a momentary illusion. Thus, the 2D Kripkean agrees with Chalmers that there is a more robust sense in which "a world with XYZ in the oceans can be seen as satisfying the statement 'Water is not H_2O'" (Chalmers 2002: 162).

For the 2D Kripkean, we can speak of e.g. "Hesperus" not "*Sch*-Hesperus", *actual* "water", and so on when considering controversial primary possibilities, without thereby denying the essentialist principles or the necessity of identity. For she agrees that the relevant descriptions or associated Fregean senses partly constitute the content of expressions. So, even once we know how things have actually turned out, we can still make sense of those epistemic possibilities and model them by means of a suitable world-semantics. For the 2D Kripkean, modal space is richer.

However, crucially, such robust epistemic possibilities are qualitatively different from genuine metaphysical possibilities. Modal space as the 2D Kripkean envisages it is *dualistic* not monistic, with two sources of necessity. On the one hand, there is the actual makeup of the world with all its *de re* properties. This is the source of metaphysical necessity—more precisely, in the essential properties of things. On the other hand, there are the ideally rational modal concepts and the *a priori* entailments resulting from the intensional contents of expressions. That is instead the source of epistemic necessity. Epistemically possible worlds or epistemic possibilities, in this light, although robust (not merely momentary psychological states) may not be also metaphysically possible worlds or metaphysical possibilities. Accordingly, the 2D Kripkean endorses an amended version of (CP) for which primary conceivability only gives us access to ideally coherent *a priori* epistemic possibilities, or scenarios, with no metaphysical import.[22] As anticipated, endorsing a qualitative difference between sources of necessity and corresponding kinds of possibilities is

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[22] Strictly, with only *some* metaphysical import. For scenarios in some cases map metaphysical possibility. So, although we cannot generally infer metaphysical possibility from epistemic possibility, the relevant intensional contents might provide a connection that does allow for such inferences in certain cases (Thanks to an anonymous referee for drawing my attention to this point).

probably the only way to construe a coherent modal metaphysics that is both Kripkean and "2D-friendly".

In fact, the 2D Kripkean finds Chalmers' modal monism puzzling. How can Chalmers treat *both* primary *and* secondary possibilities (or possible worlds) as genuinely *metaphysical*? Recall that monism commits one to accepting that primary-epistemic possibilities are verified by metaphysically possible worlds, just like genuine Kripkean possibilities are. Chalmers converts the qualitative difference between epistemic and metaphysical possibility into an intensional difference, which is dependent on one's (ideal) evaluative standpoint. In the case of *a posteriori* necessities, such worlds cannot be genuinely *metaphysically* possible from a Kripkean perspective. Specifically, the 2D Kripkean might object that Chalmers commits what I call "*modal upgrading*". In Chalmers' picture, purely *a priori* ideally coherent logico-conceptual possibilities seem to have been promoted or *upgraded* to the status of full-fledged metaphysical possibilities. Primary intensions, just like secondary intensions, are verified by worlds that are theoretically-qualitatively indistinguishable from all the other worlds—most importantly, from *our* world. For Chalmers, there is a metaphysical possibility or world where Hesperus is not Phosphorus, or water is not H_2O—actually, a "*first class* metaphysical possibility" (2002a: 165). This seems unacceptable for a Kripkean—even for the 2D Kripkean.

In sum, for the 2D Kripkean we can accept the 2D semantic apparatus—in fact, we should. Expressions do pack multiple meanings or intensions; and we do have multiple ways of evaluating those tokens. But this semantic apparatus and its rational epistemic implications need not have any metaphysical import. Monism is a further thesis. It is precisely the combination of 2D semantics and modal monism that even the most open-minded Kripkean rejects. For her, considerations of rational coherence cannot carry over onto matters of metaphysical possibility, on pain of falling into modal upgrading. What is genuinely possible is not a matter of how we (or even ideally rational

beings) evaluate *a priori* statements. What is genuinely possible is a matter of how things really are—of their nature or essential properties.

I should stress that the 2D Kripkean does not dismiss epistemic-primary possibilities as illusory (like the Monistic Kripkean does). Nor does she suggest that the content of such possibilities is merely a function of one's modal intuitions, which would trivialize the link between conceivability and possibility (not to mention treat genuine possibilities as psychological products). For the 2D Kripkean, *both* epistemic-primary possibilities *and* metaphysical-secondary possibilities are "real" in the sense that they are independent of our conceptualization and subjective intuitions. However, they are grounded in different aspects of reality, which makes them qualitatively different and irreducible to each other. The difference is categorical or metaphysical: the two modalities hold in virtue of different primitive aspects of reality. Borrowing Fine's (2005) terminology, we might call such epistemic-primary necessities that structure reality "*transcendental truths*". For they are taken to hold necessarily "regardless of the circumstances or how things turn out". As the term suggests, those would be in effect *preconditions* for the existence of any world. Like a web or empty structure, such necessities would set the *a priori* fundamental conditions for world-existence. Both logically and metaphysically possible worlds would *constitutively depend* on such necessities.[23] In this perspective, epistemic *a priori* modality would be perfectly "real" and capture fundamental aspects of reality. But since it would also be constitutively independent of the particular features of the world—it would be independent of the features of *any* world—by itself it would not help us cast light on what is genuinely metaphysically possible. By dealing with *a priori* preconditions of possibility, epistemic modality would simply lack the resources to capture the metaphysically-based modal profiles of things.

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[23] Arguably, epistemic necessities include, at a first approximation, mathematical, logical, and traditional analytic/conceptual truths. What distinguishes this class of truths is that they are necessarily truth-preserving patterns of inference (Cf. Hale 2013: 60-62; see also his forthcoming).

In conclusion, although more flexible with the philosophy of language, the 2D Kripkean does not negotiate the metaphysics. She does expand the space of possibility but maintains that metaphysical modality is rooted in the essential makeup up of the actual world. The resulting picture is therefore dualistic.

Looking back at the triad, (2) two-dimensionalism and (3) metaphysical Kripkeanism cannot be conjoined with (1) modal monism. From the point of view of the 2D Kripkean, Modal Rationalism can only be viable if paired with modal dualism.[24]

Here is the general dialectic. From a *broadly* Kripkean perspective, Chalmers' Modal Rationalism seems to do either of the following. It may give us access to primary-epistemic possibilities which verify an expression's primary intension. Although these have the correct *de re* content (i.e., they involve the actual referents), they are not genuine metaphysical possibilities. This is the 2D Kripkean's position, combining (2) and (3). In effect, this is a sort of *severed* Modal Rationalism, which only elucidates our *a priori* access to part of the modal space—the purely epistemic space. Alternatively, Chalmers' conceivability may give us access to *certain* metaphysical possibilities. Although those are genuine possibilities also for the Kripkean, they crucially involve different referents not the actual ones (the '*sch*'- reconstructions of the relevant actual referents). This is the Monistic Kripkean's position, combining (1) and (3). Either way, from a Kripkean perspective conceivability does not entail possibility in Chalmers' sense, and *a priori* access to metaphysical modality is blocked. Once again, Modal Rationalism cannot be successfully combined with a Kripkean modal metaphysics.

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[24] Chalmers does not reject in principle modal dualism. He concedes that "a two-space model is coherent and useful for various purposes" (2011: 79, fn. 9). Moreover, he has devised a technical account of possibility in terms of purely epistemic scenarios—constituted by maximally consistent sentence-types of an ideal language. However, he admits that his metaphysical claims will not go through if one works with the pure epistemic construction (2010: 552-3).

4.3. Intermezzo: Two Notions of Metaphysical Modality

One might wonder whether at the heart of this dialectic is a *terminological* issue. Perhaps there is a misunderstanding concerning the term 'metaphysical' that Chalmers and the Kripkean might work out together. From Chalmers' point of view, *both* primary-epistemic possibilities and secondary-Kripkean possibilities are *metaphysical*. For the Kripkeans, only the latter deserved to be called so. But couldn't this conflict be simplified by saying that Chalmers is willing to call "water" something that the Kripkean is not?

From a certain point of view, it does seem so. After all, the scenario depicting 'Water is not H₂O' that both Chalmers and the Kripkeans contemplate has probably the same features: namely a world-state where some liquid substance looks exactly like water and has the same roles as actual water. Chalmers wants to call that "water" while also at the same time denying that it is H₂O. The Kripkeans, instead, either do not want to call it "water" but something else, whatever it is (this is Monistic Kripkean), or accept calling it "water" but only insofar as the described scenario is not a genuine metaphysical possibility (the 2D Kripkean). Maybe all the *ambitious* modal epistemologist needs to solve the inconsistency and get her project off the ground is to specify further senses of 'metaphysical modality'. She might need to distinguish between, say, a notion of "strict" metaphysical possibility vs. an "epistemic-*but-somehow-still-metaphysical*" possibility.

But the apparent terminological point is only the tip of a *world-view*. For Chalmers, the metaphysical makeup of possible worlds or the content of genuine metaphysical possibility can change as long as the scenario that verifies the relevant intensions is ideally coherent. We can call those different things at the other worlds with the same old words, as long as we are careful not to fall into a contradiction. But for the Kripkeans this is unacceptable. For her, what a possible world could look like, both intrinsically and structurally, is determined by how the actual world looks like,

not by the descriptive content of our expressions.[25] We cannot just associate familiar words to different things when that involves a deep metaphysical change—e.g., a change in the structure of a fundamental kind, or one that leads us to give up transworld identity. From a Kripkean perspective, Chalmers' metaphysical modality may seem dangerously flimsy. Primary conceivability can only tell us that *if* things are so and so, given the descriptive content of a primary intension under ideal rationality, *then* certain counterfactuals follow. But that does not address the issue of how the modal realm *really* is. Given two-dimensionalism and a liberal approach to what is metaphysically possible, modal monism can only be integrated given a purely *a priori* logico-conceptual notion of modality, while a Kripkean modal metaphysics is excluded.[26]

4.4. Giving Up Metaphysical Kripkeanism: The Pure Two-Dimensionalist

This leads us to the *Pure Two-Dimensionalist* view, the last available option from the triad. *Pure Two-Dimensionalism* consists of maintaining the combination of (1) modal monism with (2) two-dimensionalism; while endorsing a notion of metaphysical modality that is non-Kripkean and independent of the nature of things. A two-dimensionalist who is only committed to *semantic* Kripkeanism and does not want to give up modal monism would choose this option. Metaphysical possibility itself is *a priori* rooted in those primitive logico-conceptual structures and relations that hold regardless of how the actual world happens to be. Our world with its essential makeup does not play any special role for what is metaphysically possible. More than that, for the Pure Two-Dimensionalist our world is itself one of countless epistemic possibilities within a monistic modal

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[25] Similarly, Soames: "[Kripke] did not view *language* as the source of the necessary *a posteriori* status of his examples. Instead, he looked to metaphysics" (2005: 203).
[26] Cf. Vaidya: "[Chalmers' considerations] suggest that the conception of modality at play is one that eliminates the notion of metaphysical modality as originally conceived by Kripke" (2008: 196).

space—it is just *the* possibility or world that happens to have been actualized. Antithetically to the Kripkean view, *the actual is determined by the possible.*[27]

The Pure Two-Dimensionalist view seems to best reflect Chalmers' own view. That gives us a key to interpret certain suggestive remarks of his, for example, that "the concept of metaphysical modality itself has roots in the *epistemic* domain" (2010: 566). Indeed, we noted that Chalmers' framework rests on a sort of *a priori conceptual metaphysics*. Unfortunately, though, he does not expand on these ideas, leaving us with the puzzle of how exactly Kripkean counterfactual possibilities are rooted *a priori* in the epistemic domain. The worry here is that his reassurances that the epistemic notions are wholly grounded in rational notions will hardly convince a Kripkean that such epistemic notions also capture genuine metaphysical possibility. The notion of intensional content certainly implies that modal truth is partly built into our expressions. It is constitutive of an expression's intensional content that the referent(s) of that expression have certain modal features. But what those features are is not generally an *a priori* matter for the Kripkean. Moreover, given Chalmers' use of the 2D framework, it seems that both the primary and secondary dimensions ultimately capture *de dicto* modality.

On the other hand, Chalmers holds that a Kripkean modal metaphysics of the kind outlined here "will put constraints on the space of possible worlds that are brute and inexplicable" (1996: 137). For the Kripkean, however, it is not clear why those constraints should be *brute and inexplicable*. In her view, the constraints derive from the fundamental nature of our world. Its essential makeup plus the bridge-principles determine the range of genuine metaphysical possibilities. For her, this is simply how *nature* is. Perhaps the "brutality" of the relevant constraints could be traced back to their

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[27] In a talk at Princeton in November 2012, Chalmers presented this idea by recalling David Armstrong's point that "There is a picture in Leibniz, in Lewis, and in other metaphysicians that *the actual swims in a wider sea, the sea of the possible. The actual is just one case of the possible*" (Chalmers, 'Two Concepts of Metaphysical Possibility', quoting from Armstrong, *A World of States of Affairs*, Cambridge University Press 1997: 173-174 my emphasis. Slides available at http://consc.net/slides/possibility.pdf).

being at the mercy of nature; or of how God shaped reality, if one prefers. In this sense, how the modal realm is may be a brute matter. But the constraints for her are not brute in the sense of unjustified, or "inexplicable". The nature of the actual world as revealed by empirical investigation draws the boundary between the epistemic and the metaphysical space—it justifies and *explains* that boundary. Moreover, the Kripkean might contend that, from her perspective, it seems equally brute and inexplicable to grant that logico-conceptual coherence—however pure and idealized—gives us a secure criterion for metaphysical possibility.

A broader moral for modal epistemology emerges from this conflict. In trying to elucidate our knowledge of possibility and necessity we need to first get clear about the underlying modal metaphysics, particularly about the source(s) of necessity. As I like to put it, it might prove fruitful to approach the epistemology of modality by *putting modal metaphysics first*. Conceivability as used by traditional rationalism may guide us safely to possibility within a purely conceptual-epistemic understanding of modal metaphysics; whereas this seems more controversial if the source of necessity is located in the essential properties of things. Such an essentialist modal metaphysics would instead likely be captured by non-uniform modal epistemology, combining different methods and procedures. And we may predict an analogous result on the assumption that there are multiple sources of necessity, and a fragmented, non-monistic picture of modality and modal space.

5. Conclusion

Finally, I should note that the sort of modal knowledge that Modal Rationalism promises does not appear to match broadly Kripkean metaphysical interests. For *ex hypothesi* (CP) primary possibilities are the only possibilities we may access *a priori*. Knowledge of secondary possibility remains an *a posteriori* matter for Chalmers, since we need empirical information concerning the actual world in order to conceive and judge those matters (secondary conceivability). In other words,

primary *a priori* conceivability does not have the resources to illuminate Kripkean possibilities.[28] Yet, arguably those are the possibilities that Kripkeans are interested in. In general, Kripkeans are mostly concerned with how things are—actually—and how they might have gone—counterfactually. They have a special interest in how *our* world might have been different; which is probably why they may find Kripke's picture of *de re* modality so attractive and consolatory.

From a Kripkean perspective, Modal Rationalism may give us a general formula to construct perfectly coherent hypotheses, which however might have very little to do with how the modal realm really is. Chalmers' strategy of taking modal issues to the semantic level is not really an answer to the Kripkean worries. For a Kripkean, we cannot just reduce metaphysical modal differences to purely intensional ones. There is *a whole world* standing in between that reduction, and that is the *actual* world as we can come to know it.[29]

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[28] The only cases where primary conceivability captures secondary possibility are those where the primary and secondary intensions of the relevant expressions coincide. For Chalmers, those include mathematical and analytic truths, and phenomenal truths (2010: ch.6). However, it might be objected that whereas mathematical and analytic truths seem to *obviously* verify the thesis, the class of phenomenal truths makes it on the other hand extremely *controversial.*

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Abstract

I propose that we approach the epistemology of modality by *putting modal metaphysics first* and, specifically, by investigating the metaphysics of *essence*. Following a prominent Neo-Aristotelian view, I hold that metaphysical necessity depends on the nature of things, namely their essences. I further clarify that essences are core properties having distinctive *superexplanatory* powers. In the case of natural kinds, which is my focus in the paper, superexplanatoriness is due to the fact that the essence of a kind is what causes all the many properties and behaviors that are typically shared by all the instances of the kind. Accordingly, we know what is necessarily true of kinds by knowing what is essential to them in the sense of actually playing such causal-explanatory roles. Modal reasoning aimed at discovering metaphysical necessity thus proceeds via *essentialist deduction*: we move from essentialist truths to reach necessary truths.

Introduction

I recommend approaching the epistemology of modality by *putting modal metaphysics first*. In order to elucidate knowledge of modality, we should first have a good grip on what this knowledge is *about*. For we cannot hope to explain how we know the truths of a given domain without some conception of what constitutes the truths of that domain. (My focus here is *metaphysical* modality, but an analogous point can be made for logical modality, physical modality, and so on). Putting modal metaphysics first means prioritizing questions concerning the proper domain and scope of metaphysical modality, and what grounds this kind of modal truth as opposed to other modalities.

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[1] Inspired by the title of Michael Devitt's book *Putting Metaphysics First,* Oxford: OUP (2010).

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More precisely, this is an *essence-first* approach to modal knowledge. Following a prominent Neo-Aristotelian view, I hold that the metaphysically necessary truths depend on truths about essences. There is a distinctive *source* of metaphysical necessity, which is located in the *nature* of things—specifically, in their essential properties. Accordingly, knowledge of necessity should be understood primarily in terms of essentialist knowledge. Metaphysical investigation guides us to formulate principled criteria for modal knowledge based on essentialist truth.

Typical cases of metaphysical necessities (after Kripke's *Naming and Necessity*) include fundamental kind membership, individuals' origins, the constitution of particulars, and certain cases of the necessity of identity. In this paper I focus on the necessities involving *natural kinds*.[2] Chemical, biological, geological, physical, and even astrophysical kinds are all good examples. So, for instance, the metal silver could not have had a different atomic number than the one it actually has, though it probably might have been blue and dull, rather than white and shiny. These are metaphysical modal claims which, I maintain, depend on facts about essence. But what is the *essence* or nature of a natural kind?

My thesis is that essences have special *explanatory* powers for natural kinds—indeed, they are *superexplanatory* for the many properties and behaviors that are typically shared by all the instances of a kind.

In philosophy of science, many agree that natural kinds are *causally grounded*. There is an underlying property or set of properties, or a mechanism, which *causes* the many properties and behaviors that are typically shared by all the instances of a kind. That crucially explains what is sometimes called the "epistemic fertility" of natural kinds: namely, the fact that they support a wide set of scientific practices including inductive, taxonomic, and explanatory practices. My proposal is

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[2] For a discussion of other typical cases of metaphysical necessities, see Godman, Mallozzi, and Papineau: "Essential Properties are Super-Explanatory. Taming Metaphysical Modality" (ms.)

that this underlying causal core, or mechanism, is the *essence* of a natural kind. Essences cause the many properties and behaviors that typically characterize all the instances of a kind, and that is why they are in turn superexplanatory with respect to all such instances.

We thus have a better grip on what it is *about* the nature or identity of a kind that determines modal implications; or what *roles* essence plays for the modal profiles of the instances of natural kinds—particularly, for their *necessary* properties.

If this metaphysical story is correct, the modal epistemology of a wide range of cases is simpler than many have supposed. Essentialist knowledge is within our reach; actually, it is largely available to us *already*. For in many cases essentialist knowledge is *empirical, scientific* knowledge about the fundamental nature of kinds, particularly about their causal structure. Understanding what is necessarily true of silver is a function of understanding what is essential to silver, in the sense of actually playing the relevant causal-explanatory role for all the instances of this element. More generally, reasoning aimed at grasping metaphysical necessity proceeds via *essentialist deduction*: we move from essentialist truths to reach necessary truths.

The Plan

In section 1, I explain the modal metaphysics-first approach and situate it within the broader debate. In section 2, I lay out what I call a "constitutive" notion of essence in line with the Neo-Aristotelian notion promoted by Fine and introduce a basic Kripkean bridge-principle for knowledge of necessity. In section 3, I propose that, in the case of natural kinds, such an essence or nature is characterized by distinctive *causal* and *explanatory* powers for the occurrence of all the properties typically shared by the instances of a kind. In section 4, I say more about the causal and explanatory powers of essence and address a few objections. In section 5, I explain how the Kripkean basic bridge-principle captures the metaphysical relationship between essence and

necessity and guides modal inference accordingly. In section 6, I take stock and make some conclusive remarks.

1. Switching the Focus. Why Modal Metaphysics First

Putting modal metaphysics first means elucidating the subject matter of modal knowledge as the basis to elucidate how we gain modal knowledge. The project might thus be seen broadly as a contribution to the attempt to meet, in the area of metaphysical modality, Christopher Peacocke's *Integration Challenge*: namely, "the general task of providing, for any given area, a simultaneously acceptable metaphysics and epistemology" (1999: 1). Moreover, while discussing the nature of x before addressing the issue of how we know about x is generally a profitable methodology (because an answer to the latter issue largely depends on what x is), we see additional advantages in the case of metaphysical necessity. For we learn from the modal metaphysics that the epistemology of modality depends on the epistemology of essence.

What I am recommending is in a way a *return* to modal metaphysics. The epistemology of modality of the past two decades or so (starting perhaps with van Inwagen's 1998 seminal paper) might be seen as a whole as a response to much philosophy of modality up to that point, which had focused instead mostly on modal metaphysics. (Think of the enormous literature following the developments in modal logic in the 1960s and 1970s, and the many issues concerning possible worlds, their ontology, and the conditions for individual transworld identity in particular. Think of the work of Kripke and Lewis, and of all those who built off of their work throughout the 1980s). In the face of so much modal metaphysics, it then seemed natural to turn to the central question of *how we know*, or form justified beliefs about, such modal matters, and to the investigation of modal and counterfactual reasoning.

The dominant approach in the past twenty years has indeed focused on the analysis of the proper *means* (i.e., the methods, or cognitive-psychological processes) that we use in modal reasoning and in forming modal beliefs. This approach is widespread: it includes the family of so-called *conceivability* theories (Chalmers 2002; Yablo 1993; Menzies 1998); as well as those appealing to *modal intuition* (BonJour 1998; Bealer 2002; Chudnoff 2013); but also those theories variously appealing to *imaginative* exercises, *counterfactual* reasoning, and *similarity* reasoning (Ichikawa & Jarvis 2011; Kung 2010; Williamson 2007; Roca-Royes 2016). These "means-first" theories, as I call them, may operate on the basis of specific notions of metaphysical possibility and necessity, and sometimes include some discussion of modal metaphysics. Accordingly, they may still be regarded as proper ways of addressing Peacocke's Integration Challenge. However, it is not one of these theories' primary aims to tackle the issue of the source of metaphysical modal truth; nor, *a fortiori,* to undertake the study of essence and its relationship to modality.

Some question the idea that there is something uniquely "metaphysically significant" about metaphysical necessity (Clarke-Doane 2017). Others go further and assimilate metaphysical modality, depending on the cases, to the domain of *physical* modality, or *logical* modality, etc. (Priest "Metaphysical Necessity: A Skeptical Perspective" ms.) I will not take issue with such deflationary and skeptical views.[3] There are a number of positive characterizations of "metaphysical modality" that we might consider instead. A classic reference is *Naming & Necessity,* where Kripke carves out a notion that is distinct from both *physical* necessity and *epistemic* necessity ("which might just mean *a priori*"). He encourages us to ask ourselves: "is it possible that, in this respect, *the world should have been*

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[3] An even more radical challenge comes from recent forms of *modal anti-realism* such as Thomasson's *Modal Normativism* (2007) and Sidelle's *Conventionalism* (1989). These theorists deny that our modal language describes real facts "out there" in the world and offer non-descriptivist accounts of the meaning and function of our modal expressions. For Sidelle, modal claims are fully grounded in our linguistic conventions. For Thomasson, they express constitutive semantic rules of our language. They both think that these sorts of solutions in turn simplify the modal epistemology. Here I am granting that our modal notions track genuine modal facts—specifically, facts about essence—which are independent of the way we shape the world linguistically or conceptually. My aim is to clarify what those essentialist facts are, which in turn I also believe simplifies the modal epistemology for a wide range of cases. This is a fundamental contrast between "conventionalism" vs. "realism" about essence and modality worth exploring further (cf. Vaidya 2017). (Thanks to an anonymous referee for pushing me on this issue).

different from the way it is?" (1980: 36. My emphasis). He further characterizes this as "absolute necessity" and "necessity *tout-court*", as well as "necessity *in the strongest sense*". Some of the Kripkean glosses are still popular in the literature (Fine 2005; Hale 2013; Kment 2014); while others have been added. For example, some classify metaphysical modality within the category of the so-called "objective" modalities; in fact, as the "broadest objective modality" (Williamson 2016; Vetter 2016).

My view is that we have a grip on a notion of possibility and necessity that is both (a) different at least from matters of logical-conceptual coherence and apriority; and (b) *de re* in the sense of being dependent on the fundamental nature of things or their essences. I take those to be the most general, distinctive features of metaphysical modality. This characterization lines up with the notion adopted within the Neo-Aristotelian camp lead by Fine, as well as the Kripkean notion, while also being compatible with the idea that metaphysical modality has objective status.

Furthermore, a modal-metaphysics, essence-first approach helps us address what might be regarded as *the* central problem for modal epistemology. We need suitable constraints for modal reasoning and imaginative exercises, so as to ensure (or at least enhance the chances) that they result in true beliefs. Vaidya and Wallner call this the problem of "*Modal Epistemic Friction*" (in "The Epistemology of Modality and the Problem of Modal Epistemic Friction", ms.) In order for our conceivability, counterfactual, and other imaginative exercises to reliably capture modal truth, there must be some kind of push-back, or *friction*, to make sure that they do not lead us astray but rather capture genuine possibility and necessity. It is thus crucial to understand what the correct constraints for each particular modal sub-field are, and in virtue of what they lead us to correct modal judgment.

I am suggesting that integrating this bit of essentialist theorizing might prove fruitful to get a better grip on the constraints for the sub-field of metaphysical modality—for those, I maintain, are a function of essentialist truth. By locating the source of metaphysical necessity in facts about the fundamental makeup of the world, my modal metaphysics-first approach secures us with principled,

non-arbitrary criteria for judging modal matters. We might compare an opposite, "*a priori-conceptual*" approach, which instead locates the source of metaphysical necessity at the level of our modal concepts—"in the rational domain", as Chalmers puts it (2010: 185). This kind of modal metaphysics instead identifies metaphysical modality with conceptual truths based on our understanding of linguistic expressions and of the notion of metaphysical necessity. Thereby, it makes metaphysical possibility a matter of (ideal) coherence, rather than of what is compatible with the nature of things.[4]

The broader philosophical atmosphere indicates that the project comes at an opportune moment, as we witness to an explosion of interest in modal metaphysics in the latest debates, especially the Neo-Aristotelian type here defended. Moreover, it is encouraging to see that several authors have recently developed an account of modal epistemology based on essentialist knowledge, thereby endorsing a modal-metaphysics, essence-first approach of the kind I propose (examples include Hale 2013; Jago "Knowing How Things Might Have Been" ms., Lowe 2012; Oderberg 2007; Tahko forthcoming; Vaidya 2008; Vaidya and Wallner ms., cit.) However, to anticipate a little the following discussion, my account of modal knowledge differs from other essentialist accounts in the literature primarily in the way I characterize the notion of "essence". My thesis is that essences are special properties that have two distinctive features. First, they have important *causal* and *explanatory* powers for how things are—indeed, they are *superexplanatory* properties. Second, essences are typically an object of empirical, *scientific investigation*.

2. A Constitutive View of Essence

What are essential properties? Following a prominent Neo-Aristotelian tradition lead by Fine (1994*a*), I hold that essential properties are not merely the necessary properties of things. We can

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[4] For more on this contrast see my (2018).

distinguish between, on the one hand, a *modalist* conception of essence, for which essentialist notions simply amount to certain *de re* modal notions, namely metaphysically necessary properties and truths; vs. a Finean conception of essence, I call it "*constitutive*", for which essentialist notions rather depend on the *nature* or *identity* of things. Essential properties *make* a thing what it is or constitutively determine *what it is to be* a certain thing. A thing is the very entity it is *in virtue of* its essence (cf. Kment 2014; Hale 2013; Devitt 2008). Essences in this sense are also often said to be captured by Lockean *real definitions*, i.e., roughly, propositions that define the thing itself (as opposed to a word for the thing).[5]

According to the constitutive conception, essences do not merely *amount* to necessities, they rather *yield* necessities.[6] By contrast with the modalist account, which leaves the source of modal truth unspecified, the constitutive treatment clarifies that essentialist truths are a matter of the nature of things. Such a nature is what determines metaphysical necessities or what makes them true. In the case of kinds, which is our focus here, this fundamental relationship between essence and necessity can be expressed by the basic bridge-principle that:

(E)   If it is essential to x being F that it is G, then necessarily anything that is F is G[7]

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[5] More precisely, we can distinguish between "essential properties" and "essences" for kind-membership. 'P is an essential property of being an F iff anything is an F partly in virtue of having P'. Whereas, essences *qua* the sum or collection of the essential properties of an instance of a kind fully determine kind-membership: 'P is the essence of being an F iff anything is an F in virtue of having P' (cf. Devitt 2008: 345).

[6] Cf. Devitt "Defending Intrinsic Biological Essentialism" (ms.)

[7] Incidentally, for cases of *individual essentialism* we have a corresponding basic principle

(E)[i]   If x is essentially F, then necessarily x is F

At the sentential level, (E) and (E)[i] can be expressed in a straightforward way with the Finean notation:

(E)[F] $\Box_x P \rightarrow \Box P$

which reads, "If a proposition P is true in virtue of the essence of x, P is metaphysically necessary"; where "x", depending on the cases, stands for either an individual or a kind (I here leave out some complications discussed in Fine 1994*b*). See also Vaidya and Wallner (ms.), cit.

The constitutive conception expressed by principle (E) may help us gain a deeper understanding of some familiar cases of kind-essentialism. Take, for example, Kripke's claim that necessarily gold has atomic number 79 (1980: 123). This suggests a more general connection between molecular structure and chemical kind-membership, such that

(P1)   If a chemical substance c has molecular structure M, then necessarily c has M

We might well wonder what the status of (P1) is, namely how we know it. We may notice that (P1) instantiates Kripke's conditional guiding our knowledge of *a posteriori* necessities:

(P)   If P, then necessarily P (1971: 180)

Because of that, a natural thought is that (P1) is itself something that we know "by *a priori* philosophical analysis", as Kripke remarked (ivi). But how can that be right, given that it took scientific investigation to find out about molecular structure?

The answer is that (P1) follows from our overarching principle (E), together with an empirical premise saying that

It is important to stress that there is no direct entailment from (E) to the distinct thesis of *Essential Membership*: i.e., the doctrine that if an individual belongs to a kind it does so essentially (in Devitt's terminology, "Individual Essentialism in Biology" ms.). According to Essential Membership, an individual I is essentially a member of kind K iff its having Ei (a certain individual essence) entails its having Ek (a certain kind-essence). So for example, a particular chunk of silver, call it *Chunk*, would essentially belong to the kind silver because having atomic number 47 is part of its individual essence. But that is not obvious. Granted that having atomic number 47 is essential to being an instance of silver, it is not clear that *Chunk* would stop existing altogether, i.e., it would go out of existence as an individual, were it somehow to lose or change its subatomic structure. A further nice example that I heard from David Papineau is a lead statue that turns into silver (imagine a conceptual artist making one). Arguably, the statue *qua* that very individual would still exist, though its kind-membership would have changed, from being a sample of lead to one of silver. Here I do not commit to non-conditional individual essences, but only to the relatively uncontroversial principle (E)^i. The intended moral is that knowledge of individual essence still requires careful investigation (but see Godman, Mallozzi, and Papineau (ms.), cit. for further discussion. I thank an anonymous referee for suggesting the *Chunk* case and pushing me on this point).

(C)   Having molecular structure *M* is *essential* to being a certain kind of substance *c*

In fact, especially in the case of natural kinds, we typically discover the essence of a kind empirically, as the result of scientific investigation. Thus, although Kripke did not say this explicitly, from his analysis we can take "*P*" to generally stand for some claim about a feature that we know to be *essential* via empirical investigation. In the case of kinds, the thesis is that instances of the original Kripke's conditional (P) are true when an instance substitutes for "*P*" an appropriate statement about what is *essential* to a certain kind. We can think of many further cases similar to (P1), which follow in an analogous way from (E), plus its own version of (C), and lead to corresponding *a posteriori*, necessary conclusions.

If this is correct, Kripke's analysis of *a posteriori* necessities involves not only the familiar *epistemic* thesis that we need empirical information in order to know certain necessities. It also involves an embryonic or implicit version of Fine's *metaphysical* thesis, namely the constitutive view of essence. More than that, Kripke's epistemic thesis holds *because* metaphysical necessities are grounded in the way the world is or in the nature of things; or, equivalently, because essential properties are the source of metaphysical necessity. Fine's essentialist insight completes Kripke's inferential story: the bridge-principles support knowledge of metaphysical necessity because they embed essential properties. Their views look thus complementary: whereas Kripke focuses on the epistemic issue, Fine leaves that open and targets the metaphysical issue. But we can combine them in one organic positive view, according to which knowledge of necessity is the joint product of essentialist knowledge and knowledge of the bridge-principles.[8] Following the constitutive view and

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[8] I thus disagree with a certain reading of Kripke that wants him to hold a modalist conception of essence. His famous essentialist examples all appeal to properties that are distinctive of the individual or kind he considers (perhaps *uniquely* distinctive), in the sense

principle (E), "essence", "essential property", and "essentialist truth" are all more fundamental and more fine-grained notions than the corresponding *de re* modal notions, and give us a deeper understanding of metaphysical necessity—at least in the case of natural kinds.

The broader consequence for modal epistemology is that knowledge of metaphysical necessity is typically the joint product of two things: essentialist knowledge on the one hand, and knowledge of the bridge-principles on the other hand, which are themselves based on principle (E).

We might wonder how much progress we have made. For it seems that with this move we have just recast the epistemology of necessity in terms of the epistemology of essence. And we know that essences are often disparaged in the literature as elusive and mysterious, as some sort of relic of a pre-scientific era. I think that these criticisms are mistaken. Far from being hidden inaccessible entities, essences are rather things that we discover empirically. Actually, they are in many cases the plain object of scientific investigation, as we see most clearly in the case of natural kinds.

3. Essences as Superexplanatory

As anticipated, my thesis is that the essence of a kind plays a crucial explanatory role for all the instances of the kind. I should say something about natural kinds first. A very interesting fact about them is that they support many, many inductive generalizations. We can predict that unobserved members of the kind (members that are yet to be observed, members that existed in the past, or otherwise remotely physically located), will have the same many properties and behaviors that are typical of the observed members of the kind. These generalizations run along two dimensions of projectability: first, *generality*, that is, the projections cover all members of a kind. And, second, *variety*, that is, each kind supports many, many different generalizations (Khalidi 2015).

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that they appear to be *constitutive of the very nature* of the individual or kind—of its *identity*. Think of the "internal structure" of tigers; of the genetic material of the Queen, and her particular biological origin; think of the specific chunk of wood that this lectern is made of.

Moreover, this is not only about inductive capacity, since kinds exhibit indeed a broader epistemic fertility, in the sense that they further support our scientific taxonomic and explanatory practices. We can describe and classify things as instances of a certain kind according to all their shared properties and behaviors. Crucially, we can explain all those features by appealing to kind-membership.[9]

But what does such a remarkable epistemic fertility itself depend on? What explains the global success of our scientific practices involving natural kinds? The point is not just that, in order to count as scientific, empirical generalizations have to be non-arbitrary and non-accidental—namely, that there must be some sort of "nomological glue" that makes them more than correlations. The point is, rather, that there appear to be something which supports, at bottom, a great abundance and variety of generalizations that is uniquely distinctive of natural kinds. There is a reason why all the members of a kind share so many properties and behaviors. It would be indeed a weird huge coincidence if no such reason existed.[10]

The answer is that there must be a *common ground*. There is a common *cause*—an underlying property, set of properties, or a mechanism—which explains all such occurrences. It is not a baffling massive coincidence, in other words, that all those properties and behaviors constantly co-occur in certain entities in nature. The causal ground determines kind-membership, and supports the whole range of projectible, lawful patterns and counterfactual dependencies that feature in the relevant scientific generalizations. More broadly, it explains the unique epistemic fertility of natural kinds.[11] In

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[9] One issue that I do not address here is the ontology of kinds or what sorts of entities they are (if they are entities at all). Not only would answering this question require its own paper; but, strictly, my view does not commit me to the existence of kinds (or properties, for that matter), since I am not quantifying over them. Take principle (E): this is a schema into which one substitutes real predicates for "*F*" and "*G*", which means it is committed to *Fs* but not to *F-hood*. The central thesis presented here is neutral with respect to this issue, and indeed compatible with a variety of answers (ranging from kinds being some sort of universals to being just sets).

[10] Similarly, Devitt (2008); Millikan (1999), (2000); Papineau (1993), (2010).

[11] The causal structure of a natural kind might not be as simple as I am picturing it here. For Khalidi (2015), natural kinds are defined by *multiple networks of causal propertie*s. Causal relationships might thus not be strictly "horizontal" and "one-to-many" as I sketched

this light, natural kinds realize a distinctive fit or accommodation between our scientific epistemic practices on the one hand, and the causal structure of the world on the other hand (Boyd 1999*a*: 69). We may further note that this aptness to fit the aims of science, particularly its search for structural explanations, may well be part of what makes a natural kind "natural". "Naturalness" might thus be thought of largely as a matter of possessing such unifying causal properties or mechanisms. Science is especially aimed at disclosing the causal structure of the world, and natural kinds exhibit such a causal structure—or "nature's joints" in the metaphysician's idiom. Accordingly, "scientific kinds" might be a better term choice than "natural kinds".[12]

The idea that natural kinds are causally grounded in this way has been circulating in the philosophy of science for quite a long time, sometimes under the name of "causal ground hypothesis" for natural kinds (Boyd 1980, 1991, 1999*a*, 1999*b*; Craver 2009; Khalidi 2013, 2015; Millikan 1999, 2000; Wilson 1999). The crucial point for our purposes is that this causally and explanatory powerful core is what I call the "essence" of the kind, and thus what constitutes the fundamental nature of the kind.

Let us consider silver again, i.e., the element with atomic number 47. Having atomic number 47 is the essence of silver because the specific number of protons (and subatomic configuration) in the nucleus of a sample of silver is what *causes*, given opportune environmental conditions, the many chemical and physical properties and behaviors typically shared by all those instances (e.g. melting and boiling point, electrical and thermal conductivity, disposition to combine chemically, tensile strength, color, and odor). Accordingly, having atomic number 47 also *explains* all those properties

[12] For a recent criticism of the idea that natural kinds depend on a core causal ground, see e.g. Slater (2015), who argues that natural kinds, although they may in fact be causally grounded, should be nonetheless defined in terms of the stability and cohesiveness of "cliquish" clusters of (superficial) properties. For a response to Slater, see Lemeire: "The Causal Structure of Natural Kinds" (ms.)

and behaviors that typically characterize silver. Silver is an extremely soft and malleable white, shiny metal. It actually exhibits the highest reflectivity and electrical and thermal conductivity of any metal. It is also rather unreactive, and resistant to corrosion. All those properties shared by all samples of silver *qua* instances of that element are caused and explained by its unique atomic number and subatomic structure, as reported on the periodic table. And that is why I call it the "essence" of silver: for having atomic number 47 is what actually plays those core causal-explanatory roles for all the instances of silver.

The causal-explanatory account thus gives us a grip on the nature of silver, or what is about silver that determines, together with the environment, the typical features of all its instances.[13] Some of those properties are also shared with other chemical elements *qua* members of the same chemical *group*. For example, other elements in group 11, to which silver belongs, like gold and copper, have a number of properties in common with silver qua members of that group. In particular, they also are highly light-reflecting metals, as well as excellent conductors of electricity and heat. We can think of chemical groups as *higher* chemical kinds; and themselves, in turn as included in even "higher" categories, such as *metals*, *non-metals,* and *quasi-metals*. Similarly, elements belonging to a certain chemical group share all the properties they do in virtue of certain common features of their subatomic structure, which causes and explains the occurrence of all the properties and behaviors typical of the group. Accordingly, we may distinguish essential properties that are uniquely identifying for being an instance of a certain element, from the essential properties that are tied to group-membership, and thus may be possessed by different elements. But just as the former are

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[13] Strevens (2014) suggests that we think of kinds as "*entangled*" with such underlying core properties or causal mechanisms. Being an instance of silver, in Strevens' picture, is thus more precisely a *concomitant cause* of all the properties and behaviors shared by all instances of silver. All *Fs* are *Gs* because *Fs* are entangled with an underlying core *C*, which in turn is causally responsible for all the occurrences of *G* in all the instances of *F*. Strevens' analysis has the advantage of clarifying that being an instance of e.g. silver strictly doesn't *cause* anything; and to allow for exceptions to the relevant causal generalizations.

necessary to being an instance of a certain element, so are the latter for certain elements to be members of a certain group.

By contrast, it is merely contingent that silver is white and lustrous. Being so shiny plays no causal and explanatory role for the many, many other properties typically shared by all instances of silver; which is to say, being white and lustrous is not essential to being an instance of silver. Silver's being shiny is rather one of the many properties that, in the right conditions, are caused and explained by a set of underlying core properties possessed by silver—specifically, by its distinctive atomic number.[14]

By generalization from the element case, we can then conjecture that an analogous story is available in a whole range of cases, including not only other chemical elements as well as compounds, and minerals and stones; but also stars and planets, and perhaps also fundamental physical kinds, like massive objects. The substantive hypothesis is thus that something is an instance of a certain kind in virtue of a core of structural properties, or a mechanism, which, given opportune environmental conditions, causes and explains the many superficial properties and behaviors that are typically exhibited by all instances of that kind. If this is correct, there may be a scientifically grounded way to clarify in what sense essential properties constitute the "nature" of those kinds. When we talk, in a Finean fashion, of the "nature" of a kind, what we are pointing to is this causally and explanatorily powerful underlying core of properties, or mechanism.

Importantly, like in all causal explanations, a number of other factors will be relevant to fully explain certain effects, e.g., contingent local environmental factors, but also the relevant laws of nature, and other broad background conditions, depending on the case. Ideally, one should be able

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[14] Perhaps the story may be further complicated by adding that *mass* number (which equals the number of protons plus neutrons) also plays a role in the occurrence of the typical chemical properties and behaviors of elements. But note that the neutron number *per se* has only a slight influence on chemical behavior, which argues that the atomic number is after all the main feature responsible for the resulting properties.

to lay out the details of the whole causal structure underlying a certain effect. These are the sorts of "opportune environmental conditions", mentioned above, which have to obtain in order for essential properties, or mechanisms, to produce their typical effects. Essential properties and mechanisms should always be understood as operating together with the environment, as well as the relevant laws of nature; and full structural explanations will ideally mention all the relevant surrounding factors. Take silver again. Its being white and lustrous is largely a consequence of a variety of metaphysically contingent nomological and environmental conditions, including e.g. the particular intensity and frequency of a certain range of wavelengths on Earth; the laws governing reflection as well as the nature of electromagnetic radiation; not to mention the particular features of the human eye and brain. It is plausible to think that had any of those conditions been different, silver might have been blue and dull, say, even if its atomic number were the same.[15]

In order for silver to be necessarily white and lustrous, some form of nomological necessitarianism would have to hold, according to which the laws of nature are metaphysically necessary (and perhaps also the relevant local environmental conditions would have to be stable across worlds). For example, if dispositional essentialism is right, properties have their identities fixed by their causal roles, that is, they are identified by *dispositional essences*.[16] This in turn accounts for the laws of nature, which are taken to be a result of those causal behaviors. Laws *spring from within* the properties themselves, as opposed to being imposed, so to say, from without, whether by nature or by God. By being tied in such a way to the essence or identity of properties, the laws are themselves metaphysically necessary. Although fully compatible with nomological necessitarianism, and

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[15] *Contra* Elder (2004). According to Elder, essential properties rather come in clusters held together by virtue of the laws of nature. All that matters for the existence of a kind is that "in combination they ensure, by virtue of the laws of nature, a package found in no other natural kind" (27). There appears to be no real distinction between the essential or underlying properties of a kind, and the accidental, often superficial, properties of the kind. All the properties possessed by an instance of a kind seem indeed essential to being an instance of the kind. Couldn't silver have had a different melting point, say, if certain laws of nature happened to be different? Elder's answer is that this would not have been *silver*—even if it still had atomic number 47 (39-41).

[16] See esp. Bird (2007) and Ellis (2001). See also Swoyer's seminal paper (1982).

dispositional essentialism in particular, my account is neutral on the issue of the modal status of the laws of nature.

Also importantly, the underlying essential cores belonging to the kinds we have looked at so far are typically *intrinsic*, in the sense that they are independent of the relative location in time and space of the members of the kinds. Put otherwise, those sorts of kinds seem to be characterized by stable, unchanging underlying structures. Ruth Millikan categorizes them accordingly as "*eternal*" kinds. Chemical, physical, and astrophysical kinds are for her all examples of eternal kinds, having a distinctive underlying core of structural properties, or a mechanism, with just the sort of causal and explanatory powers that I am describing. She calls such a core the "ontological ground of induction" (1999: 50).[17]

Although in the case of chemical elements we can individuate their essence with a good approximation at the level of the subatomic particles, it is of course sometimes not easy to pin down exactly which properties or mechanisms do the relevant causal work. This should not be taken to undermine the essentialist picture, however. Often times we just do not know *yet* what the essence is—science *progressively* discloses the causal structure of the world. But even if such properties and mechanisms were *in principle* unobservable, that would still not affect the main point that structural explanations concerning all the properties shared by the instances of a kind appear to depend on an underlying causal ground that characterizes the kind (cf. Strevens 2014; Devitt 2008; Boyd 1980).[18]

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[17] By contrast, for Millikan biological kinds are rather *historical* kinds, in that they are identified by their histories (1999). Similarly, Godman and Papineau (forthcoming), and the above-mentioned Godman, Mallozzi, and Papineau (ms.), where we hold that copying mechanisms from common ancestors play the relevant superexplanatory roles for biological species. Note that Devitt (2008), forthcoming, "Defending Intrinsic Biological Essentialism" (ms.) cit., and "Individual Essentialism in Biology" (ms.) cit., also defends a version of biological essentialism where essences have crucial causal-explanatory roles. In his view, essences are partly relational and historical, and partly intrinsic (largely genetic).

[18] An analogous point could be made in response to certain criticisms of Putnam's example that *water is essentially H_2O* (Needham 2011; Tahko 2015). I take it to be a philosophically minor issue, and one that we can disregard, whether the molecular structure of water is *exactly* H_2O, or rather something more complex. *Whatever* that structure or mechanism is exactly, we can identify it as what plays the relevant causal and explanatory roles for kind-membership. As Devitt puts it, the talk of certain specific essences, like H_2O in the case of water, should be seen as "nothing more than a philosopher's hand wave toward the scientific facts" ("Defending Intrinsic Biological Essentialism" ms. cit.: 12, fn. 21).

4. Defending the Causal and Explanatory Powers of Essence

I think that many metaphysical necessities can be understood by applying this causal-explanatory notion of essence. This casts important light not just, of course, on what essences are, which is an important task *per se*; but also crucially on the source of metaphysical necessity, namely what grounds or determines those necessities. We have in other words a better grip on what in virtue of which a certain category of necessary truths hold or what they depend on.

Philosopher of science, especially in the Quinean tradition, are usually critical of modal notions like essence and necessity, perhaps because they are afraid that these might be too "metaphysically loaded" and ultimately unscientific. But again, this is a prejudice that we should overcome. First, in investigating the causal structure of natural kinds with the goal of disclosing their fundamental nature or ontological basis, we also at the same time disclose modal consequences. Counterfactual reasoning based on core causal features of kinds plays central role in formulating scientific generalizations; and it does involve evaluating non-actual scenarios or other possible worlds, which are not mere nomological duplicates of the actual world. Moreover, essences fall squarely within a scientific description of the world because they are simply underlying causal cores having superexplanatory character.

On the other hand, we may note a potential corresponding suspicion on the side of metaphysicians, who might raise doubts about a "naturalized" conception of essence. Particularly, some might find the claim that the defining features of essences are causal powers suspicious. Essence is often associated to claims of *non-causal* ontological dependence. As Bennett has recently put it, the received view seems to be that "causal and non-causal determination are rather different beasts" (2017: 67). In response, I shall stress again that investigating the nature of things is importantly partly a matter of trying to disclose their causal structure, especially when the inquiry

concerns natural kinds. But I should also say something else. Let us take, for example, microessentialism for chemical compounds, which holds that possessing a certain molecular composition is essential to being a certain kind of chemical substance. For example, having a microstructure (to a good approximation) H_2O is essential to being a sample of water. According to the non-causal analysis, the essentialist claim amounts to saying that hydrogen and oxygen atoms are "ontologically prior" to the substance water; or, according to some, that the existence of a molecule of water is "grounded" in the existence of the underlying atoms of hydrogen and oxygen.

But the causal and the non-causal form of determination, and the corresponding explanations, are not mutually exclusive. On the contrary, both analyses may capture important aspects of the nature or identity of a chemical substance, particularly the relationship between its microstructure or fundamental composition and its macrostructure or superficial properties. The non-causal or grounding analysis treats the structural properties of a substance as what in virtue of which something counts as an instance of that substance, and results in non-causal, mereological explanations concerning the deep composition of those instances. This analysis thus pursues broad conditions of existence as well as compositional truths concerning chemical substances, which have distinctive modal, necessary consequences. The causal analysis, on the other hand, also holds that the structural properties of a substance are what in virtue of which something counts as an instance of that substance; but it further tells us that those structural properties, when the conditions are right, cause the superficial properties that are shared by all the instances of that substance. This analysis thus results in causal and structural explanations, and pursues truths capturing the causal structure of natural kinds. Importantly, this, too, entails modal, necessary, truths that are tied to the nature of substances. Thus, more generally, both the causal and the non-causal analyses may count as pursuing *metaphysical, essentialist* explanation; and we might indeed think of putting them together in fruitful cooperation. The intra-world behavior of essential properties of natural kinds may thus be

captured partly by a "horizontal" causal analysis, and partly by a "vertical" non-causal analysis, each having cross-world modal implications that are tied to the nature of the kind. Together, the two may lead us to develop a more complete account of the nature of such kinds. Causal and non-causal forms of determination may not be such *different beasts* after all.[19]

Turning to the *explanatory* power of essences—better, their *superexplanatory* power—this is also partly a reflection of their causal roles. The capacity of explaining so many generalizations involving the properties and behaviors of things is a central desideratum of both scientific and metaphysical inquiry. Specifically, "explanation" here should be understood as (a) fully objective or *metaphysical*; and (b) of central interest for both the natural sciences and metaphysics. Point (a) stresses that this type of explanation is not merely subjective or otherwise dependent on particular human interests or goals. Certain relationships between things, which are informative and explanatory when discovered, are actually "out there" in the world independently of those discoveries and our particular formulations. Those are *structural* explanations, as opposed to epistemic ones. Point (b) stresses that the explanations in question address crucial questions for both scientific and metaphysical inquiry, because they appeal to causal patterns in nature that are ultimately tied to *what it is to be a* certain (kind of) thing.

Conceiving essentialist explanation as both objective and tied to causation also helps us answer certain skeptical objections concerning kind-essentialism. Why should a certain property or set of properties of a natural kind be "elevated" above all the others? Silver has many *other* properties, especially extrinsic and social properties, like being used for manufacture of silverware and jewelry, or being valuable to us human beings. Why couldn't any of those properties turn out to play the relevant causal and explanatory roles for identifying the kind silver? What if the biggest

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[19] This is also Bennett's stance. We can think of causal and non-causal determination as part of the same family, which she calls "*building*". Importantly, as she remarks, "the class of building relations—causation together with vertical building—is unified not just on the cheap, but in *explanatorily* useful ways" (2017: 103. My emphasis).

overall causal-explanatory factor for being (an instance of) silver is that, say, people like to make forks out of it? And what would prevent us from taking some completely arbitrary description—say, a child's first sentence about silver—to pick out the essence of silver?[20]

In response: first, let us not lose sight of our goal here. What we are pursuing are non-arbitrary, non-accidental conditions that explain all the properties and behaviors shared by all the instances of a kind. Children's utterances are simply not significantly related to those properties and behaviors; whereas the sort of ontological ground that I have identified as the "essence" of the kind is. For that is properly what *causes* all such properties and behaviors. That is the reason why we should "elevate it" above all the other properties that characterize the kind. In the case of silver, the chemical properties and behaviors shared by all its instances are certainly not the product of people's feelings about silver. By focusing on the social properties of silver, in other words, we miss the target of clarifying what in virtue of which something is a sample of silver. Indeed, every sample of silver would have the chemical properties and behaviors it does even if there were not, or had never been, anyone around to appreciate those qualities, let alone make forks out of it.

More generally, we can certainly single out and name all sorts of kinds, as many as we please. But note, first, that what then does or does not go into the kind is not up to us. That it is rather determined by how the world is (think of a bunch of random things that we decide belong to the same kind simply because they are all from New York: say, the Empire State Building, my super Joe, the Yankees, and the delicious everything bagels). Second, things are clearly different when we turn to *scientific* kinds. Then it is not a matter of our frivolous classificatory intentions. Instead, there is an underlying goal of progressively discovering the causal structure of the world. To be sure, in some cases we might found out that we were wrong and a certain kind actually depended on something

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[20] Thanks to Jonathan Schaffer for raising a version of this objection. For a classic criticism of kind-essentialism centered on the idea that traditional categories like "essence" and "kind" have pragmatic, interest-dependent roles, especially in biology, see Dupré, e.g. (1993).

different than what we had initially thought. We might mistakenly identify a certain property for its essence, in other words. But note that in such cases, like the chemical elements that we have been considering so far, we would need a *scientific* story for why that counted as a mistake, as well as for identifying another property as the actual essence of the kind. That story could not be based on our social customs or personal feelings; it would have to invoke instead the causal structure of the kind.[21]

To take stock. The account I propose shares the central tenets of traditional kind-essentialism from Aristotle through Locke to Kripke, and develops them in light of the causal ground hypothesis on the one hand, and a Finean, constitutive conception of essence and modality, on the other hand. According to the hypothesis I advance, essences constitute the nature of kinds in two different respects. First, essences causally bind together all the instances of a kind, thereby they underlie the structure of the kind. Second, they determine the modal implications involving the instances of the kind—essences ground or constitutively determine metaphysical necessities involving the instances of the kind. Both capacities are part of what we refer to as the "nature" of a kind. The causal capacity may be understood as part of the intra-world behavior of essence, at any metaphysically possible world. The modal capacity is instead distinctive of the cross-world behavior of essence. Furthermore, note that the latter is in some sense "fixed" by the former: what is essential to a certain natural kind at the actual world grounds or constitutively determines what is metaphysically necessary for the instances of that kind.

In virtue of such combination of capacities, essences play a role for both scientific and metaphysical explanation, which is tied to the very nature of the kind. Furthermore, there should not

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[21] Thanks to Michael Devitt for helpful discussion of this point. See also Devitt (1991), esp. ch. 13.

be any residual question that essential properties are somewhat elusive or mysterious. They are rather ordinary and accessible properties: the properties that are, typically, of interest in science.[22]

5. *From Knowledge of Essence to Knowledge of Metaphysical Necessity*

I call "*reductionists*" those who think, like I do, that once we have a grip on the metaphysics of essence we have all the elements in place to understand our *knowledge* of metaphysical modality (e.g. Lowe 2012; Hale 2013). From a reductionist point of view, there is a direct route, so to say, from the epistemology of essence to the epistemology of modality. Accordingly, elucidating the metaphysics of essence further enables us to resolve both epistemologies at once.[23]

An immediate problem that we can put aside is *how we know essential properties*. We may take reductionists to have a straightforward answer, at least if they endorse the view recommended so far for the case of natural kinds. Our knowledge of essential properties in those cases is simply knowledge of the relevant structural core properties, or mechanisms, having the relevant causal and explanatory powers for all the instances of the kind, as identified by the results of the natural sciences.

However, it is important to stress that, for the reduction to go through, knowledge of essential properties is not strictly sufficient. We further need to know specific *bridge-principles*

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[22] I assume that we can generally trust the scientific knowledge that is already available to us and that we can use it to make progress in modal epistemology. Fischer (2016) raises the question how we know the scientific theories themselves, and how we can trust that our philosophical interpretations of such theories are correct. One of his worries is that some modal knowledge might be needed to assess those theories in the first place. These are crucial questions for both the epistemology of science and of metaphysics, and like Fischer, I am not aiming to answer them. Note however a crucial difference between Fischer's and my view. Fischer has a deflationary view of modal epistemology, which is based on knowledge of theories. If Fischer's view gives us modal knowledge on the cheap from non-modal theories, such as chemistry, then he needs to make sure that we never adopt a theory in virtue of modal knowledge, on pain of circularity. But no such a problem arises for my view.

[23] What about all the *other* modal knowledge that needs explaining, especially the necessities of logics and mathematics, as well as conceptual necessities and normative necessities? The crucial problem is that in those areas empirical factors do not seem to contribute to knowledge of necessity. Specifically, we do not seem to have any causally-mediated connection to their relevant objects, e.g. numbers, or sets. One might perhaps develop an analogous story for such cases of *purely a priori necessities*—as I call them—trying to preserve the general thesis that essences have "superexplanatory" powers. One could, for example, appeal to *conceptual entailments from real definitions* as the analogues of causal connections from essential properties and mechanisms. Clearly, addressing those issues adequately requires its own paper, which is why I leave it to future work. (Thanks to Paul Boghossian for pressing me on this issue).

connecting actual essentialist truths with their modal necessary implications[24], the most basic of which is the above introduced

(E)   If it is essential to x being F that it is G, then necessarily anything that is F is G

Specifically, knowledge of metaphysical necessity proceeds inferentially from knowledge of essence, following Kripkean bridge-principles of the sort 'If a chemical element e has subatomic structure S, then necessarily e has S'; where this, in turn, is supported by the overarching bridge-principle (E), plus the empirical premise stating that having a certain atomic number is essential to being a certain element. If having atomic number 47 is essential to being (an instance of) silver, then necessarily anything that is an instance of silver has atomic number 47.[25] These Kripkean bridge-principles capture the metaphysical connection between essence and necessity and support our inferences from essentialist truths to metaphysically necessary truths accordingly. In this way, they contribute to justify those inferences from knowledge of particular essential properties to knowledge of the corresponding metaphysical necessities, and provide the desired extra-component for knowledge of necessity, besides essentialist knowledge. Without such principles, our modal inferences appear *unsupported*. Any serious attempt at elucidating the justification of our modal beliefs thus needs to incorporate such principles.

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[24] Compare Horvath's criticism of Lowe's account of modal knowledge (2014). Horvath crucially draws the general moral that essence-based accounts of modal knowledge need to integrate knowledge of the fundamental connection between essence and metaphysical necessity. Tahko (2016: 34-35) disagrees. For him, reductionism just follows from a Finean constitutive conception of essence. While this may be true, nonetheless I do not think that it exonerates us, for epistemological purposes, from making knowledge of that underlying connection explicit. Similarly, Vaidya and Wallner (ms.) cit.

[25] We can further specify two sub-principles of (E), depending on whether we are considering essential properties or essences:

(E)^p If E is an essential property of being an F, then necessarily anything that is an F has E

(E)^e If E is the essence of being an F, then necessarily anything that has E is an F

If, as I hold, having a certain atomic number is the essence of being an instance of a certain element, then as per (E)^e we should conclude that e.g. necessarily anything that has atomic number 47 is an instance of silver.

At the most basic level, principle (E) makes clear that metaphysical necessities are grounded in essentialist facts. By explicitly embedding an essential property or set of essential properties "*F*", (E) improves Kripke's original conditional, 'If *P*, necessarily *P*', by clarifying what in virtue of which all the metaphysically necessary truths are true. (E) draws attention to the *content* of the empirical premises that feature in modal inference; and, in this way, it also sets a working framework for potential new cases and expanding on Kripke's original examples. Principle (E) thus holds at the *metaphysical-constitutive* level because it expresses the fundamental relationship between essence and metaphysical necessity. But it also holds at the *epistemological-normative* level because it shows how correct modal inference to metaphysical necessity goes, based on that fundamental relationship.

Moreover, (E) is *a priori,* as it expresses the fundamental connection between the actual and the non-actual (necessary). It is a familiar point that empirical knowledge of the actual world cannot give us access to the non-actual, which is something that structurally or by its very nature cannot be an object of empirical observation and experience. (One might draw a comparison with the analogous case of induction).[26] Nonetheless, this should not throw us into deep modal skepticism. The epistemology of other important areas of knowledge where we similarly seem to lack experiential connections with their objects, primarily logic and mathematics, also requires that we resort to some form of *a priori* justification in order to explain how we support the relevant beliefs.[27] The structural lack of experiential connection with the non-actual thus simply shows that modal knowledge is importantly partly *a priori*. We need an *a priori* step of some sort (inferential, or intuition-based) to contribute to justify those beliefs that go beyond our experience of the actual world. Principle (E) supports such a step, and accordingly is itself *a priori*. Indeed, it is *analytic*—on a

[26] For an opposite view, see e.g. Strohminger (2015), who argues that we have perceptual knowledge of possibility. Indeed, a number of authors in the literature have recently advocated a sharply *empirical* turn in modal epistemology, often with the goal of eschewing traditional *a priori* means for knowledge of metaphysical modality (e.g. Bueno and Shalkowski 2015; Fischer and Leon 2017; Vetter 2016). But note also that there has already been an opposite push-back (see Mallozzi: forthcoming).

[27] Cf. the classic Benacerraf (1973).

Finean, "thick" notion of analyticity that captures truth in virtue of the very nature of the concepts involved—as (E) expresses part of what the concepts of "metaphysical necessity" and "metaphysically necessary truth" pick out.[28]

Finally, as anticipated, while all bridge-principles will have an *a priori* component by working as connectives between the actual and the non-actual realm, their conclusions will often come out *a posteriori,* especially in the many cases involving natural kinds. This is because discovering what plays the actual causal and explanatory roles for a kind, that is its essence, is an empirical matter. We typically carry it out within scientific practice, through considerations of empirical nature, particularly inductive and abductive ones.

6. Conclusion

I argued that knowledge of metaphysical necessities involving natural kinds is the product of essentialist knowledge concerning those kinds, together with knowledge of certain Kripkean conditionals that instantiate a basic modal bridge-principle. We discover (most) essential properties *a posteriori*, via scientific investigation aimed at disclosing the causal structure of kinds; while the particular Kripkean conditionals all involve an *a priori* inferential component. This approach to the epistemology of metaphysical modality puts *metaphysics first* and, specifically, *essence first*. Thus, we should focus on investigating the properties that constitute the nature of things, namely the essential properties, as well as the metaphysical principles that structure modal reality, namely the Kripkean essentialist bridge-principles. In the background of the project is the idea that metaphysical modal inquiry is an empirically informed inquiry into what is possible and necessary for the things of our world, given their nature. T. E. Wilkerson nicely pointed out that natural kinds "lend themselves to

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[28] A further option could be that the principle is neither strictly *a priori* nor *a posteriori*. The friend of Williamson's views would claim that its justification is perhaps "armchair", as it seemingly straddles our ordinary epistemological categories (Williamson 2007, 2013).

science" (1988: 29). As it turns out, the *essences* of natural kinds lend themselves *to us through science*. The epistemology of metaphysical modality thus proceeds, via the epistemology of essence, hand in hand with scientific investigation.[29]

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Essentialist Constraints on Counterfactual Knowledge

Abstract

I compare my approach to modal knowledge—a form of Essentialist Deduction, which grounds knowledge of metaphysical modality in knowledge of essence—against Williamson's "Counterfactual-theory" of modal knowledge. I discuss a number of problems that have been raised against Williamson's theory, and argue that those all ultimately trace back to a common source. Namely, the failure to elucidate the proper normative constraints on modal reasoning. This is the central problem of "Modal Epistemic Friction" for modal epistemology (Vaidya and Wallner forthcoming). On the other hand, the "Essentialist Superexplanatory" account I defend successfully addresses the problem of Modal Epistemic Friction. For it clarifies (a) that the proper constraints on modal reasoning are *essentialist* constraints, and (b) that essences have distinctive causal and explanatory powers. As such, the Essentialist Superexplanatory account is an overall better choice than Counterfactual-theory in the epistemology of modality.

Introduction - Three Accounts of Modal Knowledge and the Problem of Modal Epistemic Friction

In order to clarify how we know modal truth we need to first clarify the *nature* of modal truth. According to the approach I favor, metaphysical necessity depends on facts about essence, so that it is a consequence of the fundamental nature or makeup of things that certain features of things are metaphysically necessary. In previous work (2018a, Godman Mallozzi Papineau ms.), I gave an account of essences based on what I called their "superexplanatory" power. Essences cause

and explain many, many properties of individuals and (instances of) kinds, which captures the nature of those individuals and kinds. On the basis of this metaphysics of essence, we can build a corresponding modal epistemology. We gain knowledge of metaphysical modality based on essentialist knowledge, which is typically empirical, scientific knowledge about the causal structure of the world. More precisely, modal knowledge proceeds *inferentially*, on the basis of a basic Kripkean bridge-principle connecting the actual to the non-actual and necessary. I call this principle "(E)": in the case of kinds, (E) says that 'If it is essential to x being F that it is G, then necessarily anything that is F is G'. In the case of individuals, 'If x is essentially G, then x is necessarily G'. The theory I promote is thus an *inferentialist* theory, specifically a form of "Essentialist Deduction" (as Vaidya 2017 labels it). Essentialist Deduction goes back originally to Kripke's analysis of the necessary *a posteriori* (1971). More recently, it has been developed in a systematic form by Lowe (2012) and Hale (2013; 2018) and has gained increasing popularity in the latest debates. Among his latest promoters are Vaidya and Wallner (forthcoming), Jago (forthcoming), Tahko (forthcoming), and myself (2018a). Moreover, Essentialist Deduction seems the natural choice in modal epistemology for all those metaphysicians who endorse Fine's Neo-Aristotelian reduction of metaphysical modality to essence (1994).

Essentialist Deduction is also a main alternative to *Conceivability-theory*, which has long dominated the field of the epistemology of modality. In its broadest lines, Conceivability-theory argues that our imaginative capacities, when adequately constrained, give us knowledge of metaphysical possibility and necessity (I am thinking mostly of Chalmers' *Modal Rationalism*, 2002; but see also e.g. Ichikawa and Jarvis 2012; Kung 2010; Menzies 1998; Yablo 1993). In previous work (2018b), I argued that Conceivability-theory as cashed out by Chalmers does not help cast light on genuine metaphysical possibility and necessity as traditionally pictured by Kripke, but it only safely ranges over logical-conceptual possibility under standards of ideal coherence. Essentialist Deduction,

on the other hand, offers a more promising alternative by getting straight at the heart of metaphysical necessity and *de re* modality. Further problems that have been raised over the years for Conceivability-theory include resorting to dubious notions of *ideal* coherence and reasoning (Priest 2016; Worley 2003); presupposing a specific semantic framework, namely *two-dimensionalism*, which is fundamentally misguided (Bealer 2002; Soames 2005); failing to account for *de re* modality (Roca-Royes 2011a; Vaidya 2008), and/or for *strong necessities* (Goff and Papineau 2014). (See also Chalmers' discussion of a number of objections in his 2010: 154-205). More generally, there is a longstanding skepticism against epistemologies that rely wholly or in part on *a priori* methods, as these are usually thought to be carried out by some special *sui generis* faculty for accessing modal truths (as well as, typically, mathematical, conceptual, and normative truth. For discussion, see e.g. BonJour 2001; Boghossian & Peacocke 2000; Devitt 2005; Williamson 2007).

A third leading theory in recent debates in modal epistemology is *Counterfactual-theory*. Here I am looking specifically at Williamson's version (2007 ch. 5) (but see also Hill 2006; Kroedel 2012; and Kment 2014 and forthcoming). Williamson's Counterfactual-theory assimilates our capacity for knowing metaphysical possibility and necessity to our capacity for counterfactual reasoning. According to Williamson, the ordinary cognitive capacities that we use in all sorts of everyday epistemic tasks also underlie our capacity for handling metaphysical modality. Williamson supports these claims by invoking certain basic logical equivalences involving modal and counterfactual operators, to the effect that statements of possibility and necessity can be reformulated by means of the counterfactual language in a straightforward way. On the basis of those equivalences, Williamson argues that we gain knowledge of what is necessary and possible by evaluating counterfactual suppositions via imagination.

A main advantage of Counterfactual-theory over Conceivability-theory is that it seems to avoid the problems that arise for Conceivability-theory mentioned above. In particular, in the spirit

of philosophical "anti-exceptionalism", we don't need to appeal to "supernatural" ideal reasoners, or mysterious *a priori* faculties, which in Williamson's view indicate "a bizarre lack of cognitive economy" (162) (but see Malmgren 2011 for an argument against this conclusion). For Williamson, modal knowledge can be easily explained within ordinary epistemology; whereas any residual skepticism about metaphysical modal knowledge quickly translates into skepticism about ubiquitous and uncontroversial ordinary counterfactual knowledge. As he puts it, "far from being *sui generis,* the capacity to handle metaphysical modality is an "accidental" byproduct of the cognitive mechanisms that provide our capacity to handle counterfactual conditionals" (162).

On the other hand, we can see that Conceivability-theory and Counterfactual-theory have something important in common, in that they both fall squarely within what we might call the "traditional" approach to the epistemology of modality. This tackles the question "how do we know (metaphysical) modal truths?" by giving an account of the *means* or *mental operations* that we actually carry out when reasoning about modal matters. As I say, theories within the traditional approach prioritize the investigation of the means by which we gain modal knowledge, or "put the means first".

There is a crucial problem that all such "means-first" theories face. In order for our conceivability, counterfactual, and other imaginative exercises to reliably capture modal truth, they need to be somehow adequately *constrained.* Indeed, this may very well be *the* crucial problem for the epistemology of modality. I follow Vaidya and Wallner (forthcoming) in calling it the problem of "Modal Epistemic Friction". There must be some kind of push-back, or *friction,* on modal reasoning to make sure that it does not lead us astray but rather capture genuine possibility and necessity. For our conceivability and other imaginative exercises may present to us a number of (*ceteris paribus*) equally plausible scenarios; while they do not also indicate which one is the correct one. It seems *prima facie* conceivable, for example, that water might have had a different molecular structure, or

that Saul Kripke might have been Rudolf Carnap's son, say. But how do we know from those imaginings alone which ones are genuinely metaphysically possible? Recent literature in the philosophy and psychology of imagination has pointed to a corresponding problem in the case of practical everyday imaginative exercises. Even among equally "realistic" imagined scenarios, imagination does not tell you *which one* is the correct one. You can imagine, say, flying rocks as easily as you can imagine rocks falling down because of the actual force of gravity. You can imagine the couch going through the doorway as well as getting stuck in there. All such mental simulations might be equally realistic. Against recent enthusiasms for the epistemic roles of imagination, this can be taken to undermine the thesis that imagination is a source of knowledge (see e.g. Spaulding 2016; Langland-Hassan 2016; Kind & Kung 2016).

But what are the relevant constraints for modal reasoning, and in virtue of what do they hold? The version of Essentialist Deduction I promote tackles the problem of Modal Epistemic Friction by prioritizing the investigation of the relevant constraints. This involves switching our whole approach to modal epistemology and putting "modal metaphysics first". In order to answer the question "how do we know (metaphysical) modal truths?", we need to first clarify the *nature of modal truth* itself, namely, what metaphysical possibility and necessity is. Having a metaphysical story about modality, in turn, helps us not only make the correct modal judgments; but also define the correct modal epistemology by telling us what those judgements depend on. Specifically, Essentialist Deduction holds that metaphysical necessity depends on facts about *essence*. In order to know what is necessarily true of things, we need to know what is essential to them or part of their fundamental nature. If this is correct, it is then a short step to safely reduce the epistemology of metaphysical modality to the epistemology of essence.

My aim in this paper is to show that Essentialist Deduction is explanatorily more powerful than Counterfactual-theory, and that it avoids a number of problems that arise for Counterfactual-

theory. In my view, those problems depend, at bottom, on a failure to clarify what provides the modal epistemic friction in the theory. Williamson's method involves keeping certain "constitutive facts" fixed in the background while developing in imagination the supposition in the antecedent. He gives us examples of such constitutive facts throughout his discussion, so that we might build a rough list of which things in his view count as proper constraints on counterfactual reasoning. However, he does not give us a story of why those facts should be selected rather than others, or what distinguishes them from non-constitutive facts. To be sure, Williamson gives us an interesting *empirical hypothesis* about the psychological processes and methods that we actually carry out in modal reasoning. But he overlooks the *normative issues* of how or in virtue of what those are to be constrained, exactly, and why. This results in a poor overall explanatory capacity of his theory of modal knowledge. Essentialist Deduction, by contrast, provides an account of the relevant constitutive facts, thus addressing the crucial problem of Modal Epistemic Friction. As such, it constitutes an overall better option in modal epistemology compared to Counterfactual-theory.

1. *Williamson's Counterfactual Route to Knowledge of Metaphysical Modality*

Williamson's main thesis is that knowledge of metaphysical modality is a "special case" of knowledge of counterfactual conditionals. In particular, "the ordinary cognitive capacity to handle counterfactual conditionals carries with it the cognitive capacity to handle metaphysical modality" (136). The capacity for modal knowledge can be thought in other words as a byproduct of our capacity for counterfactual thinking.

Williamson supports this thesis with an apparatus of *logical equivalences* between counterfactual operators and modal operators, which show that statements of possibility and necessity can be reformulated in counterfactual terms in a straightforward way. The two central equivalences are the following:

(N) $\Box A \equiv (\neg A \,\Box\!\!\rightarrow \bot)$

(it is necessary that A IFF if it were not the case that A a contradiction would follow)

(P) $\Diamond A \equiv \neg(A \,\Box\!\!\rightarrow \bot)$

(it is possible that A IFF it is not the case that if A were true a contradiction would follow[1])

According to Williamson, (N) and (P) show that "metaphysically modal thinking is logically equivalent to a special case of counterfactual thinking." Consequently, "modulo the implicit recognition of this equivalence, the epistemology of metaphysically modal thinking is tantamount to a special case of the epistemology of counterfactual thinking" (158). By means of those equivalences, we come to know about possibility and necessity by developing counterfactuals in search for a *contradiction*, while keeping fixed certain *constitutive facts* in the background of our supposition.

Counterfactual reasoning is itself strictly tied to causal thinking, and plays an important, widespread role in everyday life. We resort to counterfactual reasoning in making choices and planning future action, in learning from experience, as well as in interpreting others' behavior and apportioning praise and blame. Also, counterfactual thinking is a key theoretical tool in scientific practice, where we reason counterfactually in formulating hypotheses and predictions: "If it is a law that property P implies property Q, then typically if something were to have P, it would have Q"

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[1] In quantified contexts, the following two equivalences also hold:

(N)q $\Box A \equiv \forall p\,(p \,\Box\!\!\rightarrow A)$
i.e., something is necessary IFF whatever were the case, it would still be the case,
and

(P)q $\Diamond A \equiv \exists p\,\neg\,(p \,\Box\!\!\rightarrow \neg A)$
i.e., something is possible IFF it is not such that it would fail in every eventuality (159).

(141). In sum, "counterfactual thought is deeply integrated into our empirical thought in general" (141).

Importantly, counterfactual thinking is for Williamson largely *imaginative* thinking—and typically, though not necessarily, quasi-perceptual imagining. In assessing a given counterfactual, we evaluate the consequent on the supposition of the antecedent by developing the supposition through an imaginative exercise, which typically involves *offline simulations* of our cognitive capacities. Also importantly, the exercise requires keeping certain *background knowledge* fixed within the scope of the supposition. As a main example of how this works, Williamson considers a case where a rock falls down a mountain and ends up into a bush. What would have happened if the bush had not been there? It is worth quoting Williamson's answer at length:

> A natural way to answer the question is by visualizing the rock sliding without the bush there, then bouncing down the slope into the lake at the bottom. Under suitable background conditions, you thereby come to know this counterfactual:
>
> *If the bush had not been there, the rock would have ended in the lake.*
>
> [...] Somehow, you came to know the counterfactual by using your imagination. That sounds puzzling if one conceives the imagination as unconstrained. You can imagine the rock rising vertically into the air, or looping the loop, or sticking like a limpet to the slope. What constrains imagining it one way rather than another? You do not imagine it those other ways because your imaginative exercise is radically informed and disciplined by your perception of the rock and the slope and your sense of how nature works. The default for the imagination in its primary function may be to proceed as "realistically" as it can, subject to whatever deviations the thinker imposes by brute force: here, the absence of the bush. Thus the imagination can in principle exploit all our background knowledge in evaluating counterfactuals. Of course, how to separate background knowledge from what must be imagined away in imagining the antecedent is Goodman's old, deep problem of cotenability (1954). For example, why don't we bring to bear our background knowledge that the rock did not go far, and imagine another obstacle to its fall? Difficult though the problem is, it should not make us lose sight of our considerable knowledge of counterfactuals: our procedures for evaluating them cannot be too wildly misleading. (142-143)

Thus, according to Williamson, we can generally trust our capacity for assessing counterfactual conditionals to deliver the correct answers, as it is informed and disciplined by a whole lot of pre-existing knowledge concerning how nature works. Our imaginative exercises faithfully trace our cognitive capacities in an "offline" mode; so that Williamson's thought seems to be that they inherit, so to say, the reliability of the ordinary perceptual capacities. Counterfactual reasoning is in other words an important *source* of knowledge, with widespread applications in ordinary life (see also Williamson 2016 for the role of imagination in acquiring specifically quotidian, *non-modal* knowledge).

Williamson's story carries over, via the above mentioned logical equivalences, a corresponding account of modal knowledge. We gain knowledge of metaphysical modality via the same cognitive capacities and methods at play in the case of counterfactual knowledge. Concretely, in our example, we know that it is *possible* for the rock to have landed in the lake, for imagining away the bush does not lead to a contradiction. If Williamson is right, we have a straightforward picture of modal knowledge. In the spirit of philosophical anti-exceptionalism, we no longer need to postulate a special *sui generis* faculty for accessing modal truth. Incidentally, we might note that in Williamson's view modal knowledge is not even strictly "*a priori*" as it has been traditionally characterized. Mostly because of the role of imagination and offline simulation for counterfactual thinking, the resulting knowledge is rather "hybrid" between traditional *a priori-a posteriori* classifications. As Williamson puts it, modal knowledge is an example of "armchair knowledge", where experience plays a role that is not strictly *evidential*, nor merely *enabling* for the resulting knowledge. A strictly evidential role would result in a clear case of *a posteriori* knowledge according to traditional parameters; while a merely enabling role, e.g. in acquiring the necessary concepts via empirical means, would not affect the apriority of the resulting knowledge (Williamson 2013. I

criticize Williamson's rejection of the *a priori-a posteriori* distinction in my "Imagining Shades of Red", ms).

2. *Normative Modal Epistemology and Modal Epistemic Friction*

I see a central problem for Williamson's account of modal knowledge. Williamson puts forward a *speculative empirical hypothesis* within what we might call "*descriptive*" modal epistemology, namely that part of modal epistemology dedicated to individuating the belief-formation processes and methods actually involved with modal reasoning. But Williamson's hypothesis does not bear directly on issues relevant to "*normative*" modal epistemology. This aims instead to elucidate what constrains such processes and methods or in virtue of what those are correct or incorrect. Normative modal epistemology is in effect primarily concerned with answering the problem of Modal Epistemic Friction.

While Williamson stresses the role of background knowledge of "constitutive facts" for correctly developing the supposition in a counterfactual conditional, it is not clear what this background information exactly is, and why it counts as "correct". As a result, his theory of modal knowledge does not answer the problem of Modal Epistemic Friction, and has little explanatory power within normative modal epistemology. I think that a number of problems that have been raised by recent literature against Williamson's theory all point in effect to the same failure to address the problem of Modal Epistemic Friction. I look at some of these problems next.

3. *Issues for Williamson's Counterfactual-theory*

3.1 *Logical Equivalences and Metaphysical Modality*

Williamson's subsumption of the epistemology of modality under the epistemology of counterfactual conditionals relies on logical equivalences (N) and (P). But those are not

uncontroversial. In particular, in order for (N) to hold, one has to accept that all counterpossibles (i.e., counterfactual conditionals with impossible antecedents) are vacuously true. But this is actually the subject of heated disputes in the literature, as many defend false counterpossibles within a semantics that includes impossible worlds (e.g. Berto 2011; Berto French Priest Ripley 2017; Brogaard and Salerno 2013; Jago 2013; Nolan 1997; Restall 1997). Thus, insofar as equivalences (N) and (P) are meant to offer support for Williamson's epistemological reduction, questioning their validity also casts doubt on the broader project.

More generally, it actually seems wrong to think that logical contradictions directly bear on matters of *metaphysical* necessity and possibility. Counterfactually assuming that water is not H_2O, or that Saul Kripke is Rudolf Carnap's son, does not entail a logical contradiction. We might accept, perhaps, that there is a purely *formal* equivalence between counterfactual statements and modal statements as Williamson draws it, but with the important qualification that the modality at stake is *logical* not metaphysical. But if that is the case, and modal reasoning is actually a simple a search for contradictions, Williamson's theory would only range over logical possibility and necessity, and merely give us a method to establish matters of logical truth. (Note how an analogous worry arises for Chalmers' Conceivability-theory. However, Chalmers' theory identifies logical-conceptual and metaphysical modality, and relies on considerations of ideal coherence to access modal truth. See my 2018b).

It is thus crucial to clearly distinguish between logical and metaphysical modality, and in particular to specify what the latter is about, or what sorts of modal truths it involves. In other words, we need a story about the nature of metaphysical possibility and necessity. Essentialist Deduction complies with these needs well. According to the version I promote, metaphysical modality in its most general characterization has two main distinctive features. It is (a) different at least from matters of logical-conceptual coherence and apriority; and (b) *de re* in the sense of being

dependent on the fundamental nature of things or their essences. Accordingly, considerations of logical-conceptual coherence may not be sufficient to cast light on metaphysical possibility and necessity, but knowledge of essentialist truths is further needed. I will say more about how to understand essence and essentialist truth according to my "Essentialist Superexplanatory" account in section 4.

3.2 Constitutive Facts and Pre-Existing Modal Knowledge

There is an easy way to resist the objection that Williamson's theory only ranges over logical modality as opposed to metaphysical modality. As mentioned, Williamson's method for applying (N) and (P) further involves keeping certain "constitutive facts" fixed within the scope of the supposition while assessing a counterfactual. As he remarks, "the imagination can in principle exploit all our background knowledge in evaluating counterfactuals" (2007: 141). Once we integrate this background information in our counterfactual supposition, we might effectively go beyond matters of strictly logical modality and deploy our search for contradictions to establish metaphysical modal conclusions. At several points Williamson indicates that knowledge of such constitutive facts will include general knowledge of chemical, physical, and other basic scientific facts, as well as some grasp of the causal-natural laws. More tentatively, our background knowledge might perhaps also include some essentialist principles— for example, Kripke's principle of the necessity of origin, which Williamson finds "plausible" (161). Thus, developing a counterfactual supposition where water has a different chemical structure than H_2O leads to a contradiction. So it does, probably, developing the supposition that Saul Kripke might have been Rudolf Carnap's son. Whereas, developing a counterfactual supposition where the bush is not there in the falling rock scenario does not.

However, introducing those further requirements for counterfactual reasoning triggers a whole number of other issues. Several authors, including Roca-Royes (2011a, 2011b) and Tahko (2012) have pointed out that in this way our counterfactual evaluations seem to rely on *pre-existing modal knowledge*, rather than vice-versa. In this light, Boghossian also has a point that this might undermine Williamson's whole project: "I am very doubtful that knowledge of modal claims can be reduced to knowledge of counterfactuals. It seems to me that, on any plausible account, knowledge of logical, mathematical and constitutive truths will be presupposed in accounting for our knowledge of counterfactuals" (2011: 490, fn. 1).

We can guess Williamson's reply. First, he would probably back off on the reductionist claim (he never really speaks of a "reduction" after all), and stress that his main thesis is simply that our capacity for handling modal claims is a special case or byproduct of our capacity for counterfactual thinking. This *per se* does not imply a reduction of modal knowledge to counterfactual knowledge. (It would be of course interesting to push Williamson to clarify what exactly the relationship between the two is). Second, he would contend that the counterfactual procedure does not involve pre-existing knowledge that the constitutive facts are *necessary*. The background knowledge is just general knowledge about how nature works, which we fruitfully put to use in drawing modal conclusions as a product of the counterfactual assessment.

Still, that does not exhaust the possible concerns regarding the required background knowledge of constitutive facts. On the contrary, there are several serious problems that emerge in this regard.

3.3 Knowledge and Analysis of Constitutive Facts

What are the constitutive facts? And how do we select them among all other facts? We saw that based on Williamson's suggestions, we might build a rough list of such constitutive facts. However, Williamson's theory does not give us any principled *criterion* for individuating them.

Thus, Tahko (2012) raises the issue of how to select the constitutive facts when this involves deciding between rival scientific hypotheses. For example, how are we to decide whether we should keep fixed atomic number, or rather nuclear charge, in counterfactual reasoning aimed at establishing modal truths involving chemical elements?

More generally, we might point out that some things that are explicitly on the list are actually controversial. Take the *causal and natural laws*. These would come out as necessary within Williamson's theory, while the received view seems to be rather that those are metaphysically contingent. On the other hand, some things that we would like to see on the list are actually not there. We saw for instance that Williamson is rather cautious with Kripke's essentialist principles; even more so with matters such as the mind-body identity, say. His theory does not wish to speak about e.g. philosophical zombies, and how those might be relevant to deciding substantive issues in metaphysics (164). But one might protest that those are crucial matters to address for any purported theory of modal knowledge. In sum, the list of constitutive facts that we may gather from Williamson's discussion is problematic because it is not clear what it does and does not include, and on the basis of what criteria we might decide that.

Roca-Royes (2011a, 2011b) pushes an analogous line, and argues that for Williamson's method to succeed, we need to know not only the constitutive facts; but also *that they are constitutive*, namely that those are the right facts to be held fixed in our counterfactual supposition. Roca-Royes' objection is another variation on the problem of Modal Epistemic Friction. We need a story of what the correct constraints on modal reasoning are; specifically, we need a story of how we can tell apart constitutive and non-constitutive facts. But importantly, for Roca-Royes there is more than that: it

cannot be that we somehow just *happen* to tell those facts apart. In order to be able to put those facts to use in counterfactual reasoning, we further need to *know* that those are constitutive facts.

From his externalist, reliabilist stand in epistemology, Williamson would likely reply that Roca-Royes sets the bar too high. For one does not need to *know* that those facts are constitutive, and thereby that they count as the right facts to be held fixed in counterfactual reasoning. Instead, it is sufficient that one is somehow reliably *sensitive* to those facts, so that "something short of knowledge is enough" (Yli-Vakkuri 2013). However, one might insist that relaxing the epistemic requirements in this way only superficially answers the problem. Vaidya and Wallner (forthcoming) thus argue that the problem re-emerges at the lower level. Even granted more relaxed epistemic requirements, for which, say, the subject only needs to have "some sort of epistemic access" to some criterion for discerning the constitutive facts, she still needs to be somehow acquainted with those facts in order to create epistemic friction and put them to good use in counterfactual reasoning.

It may also be worth questioning *who* are those epistemic subjects doing the counterfactual thinking that Williamson has in mind.[2] He seems to be referring to *non-experts* all along; indeed, to just about *any thinker* who might find herself engaged with those sorts of reasonings. We may thus suppose that, to the extent that people do keep certain facts fixed in actual practice, we (modal theorists) can read off a list of relevant facts out of what they do. *But are people reliable here?* Can we theorists trust the actual practice to track the correct normative constraints? A natural worry is that people's practice actually misses a lot of things. Also, it seems merely accidental that people think in a certain way rather than another. Again, there is an important gap between descriptive empirical modal epistemology and normative modal epistemology in Williamson's theory.

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[2] Thanks to David Papineau for drawing my attention to this point.

Finally, Peacocke (2011) also targets Williamson's appeal to the constitutive facts for correct counterfactual reasoning, though from a different angle. By contrast with Tahko and Roca-Royes, Peacocke questions not as much Williamson's purported epistemology, but rather the underlying metaphysics. He complains that Williamson does not give us an *analysis* of the constitutive facts and how they are connected to modal facts. At bottom, Williamson does not clarify *metaphysical necessity*. I of course fully agree with Peacocke's criticism, which I think hits at the heart of Williamson's proposal. But Williamson might protest that this is not a fair objection. After all, it is not among the aims of his Counterfactual-theory to offer an analysis of metaphysical necessity, but only to show that our capacity to handle counterfactual conditionals is sufficient to handle modality as well (cf. Deng 2016). Asking for an analysis of metaphysical necessity might seem to go far beyond the scope of the project. Still, in order for Williamson's theory to have some serious epistemological bearing as far as normative modal epistemology is concerned, it needs to integrate an account of the underlying metaphysics. While the theory is not required to give us a definitive account of metaphysical necessity, that is, it should at least further develop the analysis of the constitutive facts and their connection to modal facts. In general, it seems impossible to assess a claim about how we know about some area of reality without being told about the nature of that reality we are supposed to know. This is indeed the core idea of my "metaphysics-first" approach to modal knowledge, which instead tackles these issues head-on.

In fact, Essentialist Deduction—and my Essentialist Superexplanatory account more specifically—scores better than Williamson's Counterfactual-theory, since it offers a substantive analysis of the constitutive facts. As we are looking at typical cases of metaphysical necessity, the constitutive facts are *essentialist facts*. Moreover, we have a principled criterion for individuating those facts among all others. Essences are *superexplanatory* properties, or sets of properties, or mechanisms, thanks to the fact that they cause the many superficial properties and behaviors that characterize a

certain individual or (instance of a) kind. This criterion thus invites us to investigate, case by case, which properties play the relevant causal and explanatory roles for that individual or (instance of a) kind. In this light, essences are not mysterious as it has often been argued, but are rather the plain object of scientific investigation. The Essentialist Superexplanatory account offers just the sort of metaphysical analysis of the relevant constitutive facts that is required in order to cast light on modal knowledge.

3.4 Causal-Nomological Necessity and Metaphysical Necessity

I remarked that it is an especially controversial claim in Williamson's theory that the constitutive facts should include the actual causal and natural laws. But assuming that Williamson is right and those come out correctly as necessary, a different sort of problem arises. This mirrors in a way the first problem we encountered in 3.1 above—i.e., the one concerning Williamson's purported logical equivalences. As we saw, taken by themselves, all that those equivalences seem to give us is a method to establish matters of *logical* not metaphysical modality. Now, the target is still the adequacy of Williamson's theory to handle *metaphysical* modality; but the worry this time is that Williamson's method merely leads us to gain knowledge of *causal-nomological* modality.

In different ways, Lowe (2012), Deng (2016), Gregory (2017), and Thomasson (2018) among others, have all called into question the capacity of Williamson's account to elucidate knowledge of metaphysical modality. Gregory contends that is not clear that the same sorts of considerations effectively bear upon mundane counterfactual judgments as well as metaphysical modal judgments. Lowe and Deng similarly argue that Williamson's account only explains knowledge of causal-nomological modality not metaphysical modality. The reason for this is that knowledge of metaphysical modality is subsumed as a special case of knowledge of counterfactual conditionals, where this is in turn strictly causal-nomological knowledge. Lowe worries that Williamson is then

"surely misrepresenting the metaphysical modalities as a species of causal modality" (2012: 932). Whereas Deng points to "a gap between the modality involved in our ordinary counterfactual thinking, which is usually causal, and the "metaphysical" modality properly so-called" (2016: 490). Thomasson (2018) raises this problem as well, while she further remarks that this not just a problem for Williamson's theory, but a widespread problem in the contemporary debate. Other recent "empiricist" accounts of modal knowledge that are for Thomasson equally open to this objection include Vetter (2015), Bueno and Shalkowski (2015), Leon (2017), and Roca-Royes (2017).

How does Williamson's theory deal with traditional cases of metaphysical possibility and necessity on the basis of mere causal counterfactual thinking? How is the theory to answer distinctively metaphysical questions such as whether a zombie-world is possible? (Deng 2016: 480)

Van Inwagen (1998) has famously distinguished between *ordinary, everyday* modal knowledge, which we can and often *do* have, vs. modal knowledge about concerns *remote from everyday life*. The latter is the sort of modal knowledge that is at stake in fanciful philosophical arguments—like the zombie case just mentioned. Van Inwagen is skeptical that this sort of modal knowledge is within our reach. On his part, Williamson explicitly says that his theory is meant to cover the ordinary cases rather than the more extravagant ones. That is still by all means knowledge of *metaphysical* possibilities, although admittedly only "close-by" possibilities. It should be no drawback to the theory that those cases are more tractable than the remote ones. On the contrary, we probably have an additional *practical* interest in explaining the "easy" cases first, as those are mostly directly relevant to the epistemic purposes of our ordinary lives. (Williamson is not alone in restricting the target of modal epistemology in this way. Similarly, Strohminger 2015; Leon 2017; Roca-Royes 2017).

Fair enough. But these considerations seem to confirm the worry that Williamson's theory does not address cases that are "metaphysical" in any distinctive sense of the term. Otherwise put, while his theory only safely ranges over causal-nomological possibility, it is less clear that it can cast

light beyond that into the metaphysical realm. Metaphysical possibility is covered only to the extent that it coincides with causal-nomological possibility; thereby it remains largely unexplored (I raised this worry already in my 2018b: fn.4).

Once again, it seems that an analysis of the constitutive facts would help. What sorts of considerations do we appeal to when assessing modal claims via Williamson's counterfactual method? We know his answer: our sense of how *nature works*, which is based on a vast amount of background knowledge, and especially on knowledge of chemistry, physics, and other sciences; and more generally on our more or less explicit grasp of the causal laws. This all seems correct. Indeed, we might note that Kripke's own conception of metaphysical modality, which is originally behind Essentialist Deduction, seems often to take a similar turn, and perhaps to coincide with causal-counterfactual modality. The Kripkean conception of metaphysical modality might in other words amount to nomological necessitarianism: causal-nomological modality and metaphysical modality coincide. However, as it is well-known, whether this is correct depends primarily on whether the laws of nature are metaphysically necessary. This is not an obvious matter; and perhaps not even something that we might be able to establish by *a priori* philosophical argument. Unless one is overtly eliminativist or deflationist about metaphysical modality, it is a substantive philosophical issue whether causal-nomological modality and metaphysical modality overlap wholly, or in part. That means that a theory of modal knowledge that wants to be neutral on this issue needs to have at least in principle the resources to address not only the easy "close-by" cases where the difference between the two is less obvious, but also the harder "remote" cases which would count as distinctively metaphysical within a non-reductionist framework. Thomasson puts it in terms of a general challenge for accounts of knowledge of metaphysical modality: "the distinctively *metaphysical* modal features at issue in characteristic metaphysical debates are cases in which we have the *very same empirical information, and same physical laws and properties*, and yet come to different modal conclusions"

(2018: 6, original emphasis). Thomasson's point is that appealing to empirical facts and criteria is not sufficient to answer the relevant metaphysical questions. I think that this is correct, and that, in response, we need to bring in further considerations in assessing counterfactuals with remote metaphysical content; or we need a different general analysis of the constitutive facts. As I hold, empirical information is useful for the purposes of the epistemology of metaphysical modality once it is properly located within an *essentialist* framework.

Accordingly, Essentialist Deduction can deal with this issue in a straightforward way. For the constitutive facts, as mentioned, are essentialist facts, and the sorts of considerations that guide modal reasoning do not just invoke causal-counterfactual principles, but rather distinctively *metaphysical* Kripkean principles connecting essence and necessity. Against this framework, we have a substantive story of how the modal knowledge we acquire is about *metaphysical* modality. And whether or not nomological necessitarianism is true, there is still at least an interesting conceptual difference between strictly causal-nomological and metaphysical modality.

Furthermore, my own version of Essentialist Deduction, namely the Essentialist Superexplanatory account, directly connects essence and causal relationships. Essences are causally responsible for many of the properties characterizing both individuals and (instances of) kinds; so that in investigating the causal structure of the world we trace these causal networks all the way back to underlying properties and mechanisms. Those underlying properties and mechanisms are thus essential to being a certain individual or (instance of a) kind; that is why those are superexplanatory with respect to individuals and kinds. Moreover, this account gives us a grip on how essences constitute the "nature" of things in a genuinely metaphysical sense. The modal, necessary consequences that seem problematic and unexplained within Counterfactual-theory, are in my account instead straightforward consequences of facts about essence. We know about metaphysical modality by knowing the constitutive facts (chemistry, physics, biology, etc.) and about their

superexplanatory character, which is what makes them properly essentialist facts with their associated modal consequences. Causal-nomological modality and metaphysical modality are thus intimately interconnected via the notion of essence and the nature of things; though it is still a substantive philosophical question whether, and to what extent, they overlap.

To take stock. All these problems we saw in section 3 can be taken as direct consequences of one common underlying problem, namely, a fundamental lack of clarity on Williamson's part concerning what creates modal epistemic friction in his account. Williamson's theory neglects to elucidate what the proper constitutive facts are, why they are constitutive, and how we can know them. While we can see an interesting empirical hypothesis about the means and processes by which we gain modal knowledge, Williamson's Counterfactual-theory does not engage with the central concerns of normative modal epistemology. As a theory of modal knowledge, Counterfactual-theory has thus poor explanatory power and it is open to many objections.

I anticipated that a theory based on Essentialist Deduction has instead the right tools to address the issues involving the constitutive facts, and thereby answer the central problem of Modal Epistemic Friction. I now turn to the details of my own version of Essentialist Deduction, i.e, the Essentialist Superexplanatory account, and give some examples.

4. *The Inferentialist Approach to Knowledge of Metaphysical Modality*

Essentialist Deduction is based on the central idea that we can derive modal knowledge from knowledge of essence. Kripke gave an implicit formulation of this idea in the context of his treatment of *a posteriori* necessities (1971). He showed how we can come to know that certain empirical, often scientific statements are necessary, on the basis of the conditional: "If P, then necessarily P". In all Kripke's examples, "P" stands for some statement that not only we know to be true via empirical investigation, and so *a posteriori;* but also that distinctively involves reference to

what is *essential* to a certain individual or kind (see my 2018a; 2018b). In recent work by Hale (2013) and Lowe (2012), the method of deduction from essentialist truths has been developed in explicit and systematic form. This is done in particular against the background of Fine's treatment of essence and modality (1994). Fine locates the source of metaphysical necessity in facts about essence, and contrasts this picture with a "modalist" conception that instead treats necessity as a *primitive,* which merely captures truth at all possible worlds (analogously for possibility). If the conception of metaphysical modality promoted by Fine is correct, it is then plausible that we have a corresponding *epistemic* route available, *from knowledge of essence to knowledge of necessity.*

In my 2018a I developed an "Essentialist Superexplanatory" account, which understands essences in terms of their special *causal* and *explanatory* roles. Essences cause and explain the many, many properties and behaviors that typically characterize a certain (instance of a) kind, as well as a given individual. I showed how this in turn elucidates knowledge of metaphysical modality. We first gain knowledge of essence empirically, largely via scientific investigation. From there, we proceed to knowledge of what is necessary *inferentially*, on the basis of certain Kripkean bridge-principles connecting the actual with the non-actual and necessary. More precisely, these conditionals can be treated as instantiations of a basic bridge-principle, which I call "(E)", explicitly connecting essence and metaphysical necessity. In the case of kinds,

(E)   *If it is essential to x being F that it is G, then necessarily anything that is F is G*

In the case of individuals,

(E)^i *If x is essentially F, then necessarily x is F*

Finally, at the sentential level, (E) and (E)^i can be expressed in a straightforward way with the Finean notation:

$$(E)^F \qquad \Box_x P \rightarrow \Box P$$

which reads, 'If a proposition P is true in virtue of the essence of x, P is metaphysically necessary'; where 'x', depending on the cases, stands for either an individual or a kind. Importantly, principle (E) holds both at the *metaphysical-constitutive* level (because it expresses the fundamental relationship between essence and metaphysical necessity), and at the *epistemological-normative* level (because it guides modal inference to metaphysical necessity, based on this fundamental relationship). Essentialist Deduction as cashed out by the Essentialist Superexplanatory account thus offers a clear and straightforward method for modal knowledge.

It is worth stressing that the Essentialist Superexplanatory account is meant to apply to distinctive cases of *metaphysical* necessity: i.e., traditionally, after Kripke's *Naming and Necessity,* all those cases involving *fundamental kind-membership, individual origin, the constitution of particulars,* and cases of the *necessity of identity* (for examples and discussion, see Godman Mallozzi Papineau ms). On the other hand, I am setting aside a whole range of other necessities, including *logical* and *mathematical* necessities, *conceptual* necessities, and *normative* necessities. It is no surprise that such cases are all plausibly purely *a priori.* For these involve (relatively) uncontroversial *abstract* entities, which are structurally causally disconnected from the actual world and from us (cf. Benacerraf 1973). (I say more about these purely *a priori* necessities and their relationship to the distinctively metaphysical necessities in the *Appendix* below).

The Essentialist Superexplanatory account successfully handles knowledge of all typical cases of metaphysical necessity and gives us a robust method to handle new cases as well. We gain

knowledge of necessity by inferring appropriately from essentialist truth, that is on the basis of principle (E) and its particular instantiations. And we know about essences empirically, mostly on the basis of scientific investigation, and in virtue of the distinctive causal and explanatory roles that those play for individuals and kinds. Once this is understood, we have a story of why in reasoning about metaphysical necessity and possibility we should proceed from facts about essences. In the language of Williamson's Counterfactual-theory, we could say that we have an answer to the question why we should treat those particular facts as "constitutive", rather than others, and hold them fixed in assessing the relevant counterfactual conditionals. The answer is because they are *essentialist facts*. Furthermore, we can give a story of why they are essential, or what it means to be essential more precisely. This provides an analysis of the constitutive facts and answers the problem of modal epistemic friction.

Drawing in part from previous work (2018a, Godman Mallozzi and Papineau ms.), I give now a few concrete examples of how Essentialist Deduction, by contrast with Williamson's Counterfactual-theory, clarifies what the "constitutive facts" are and why they count as such. In particular, I show how the proposed account answers central questions of normative modal epistemology by appealing to the special causal and explanatory powers of essences.

4.1 Natural Kinds. Chemistry and Biology

Chemical kinds offer probably the clearest example of the superexplanatory roles of essences, and of how those reflect their distinctive causal powers. Chemical elements as well as compounds all display a similar structure: in normal conditions, samples of each kind share many, many typical chemical properties and behaviors. Thus, all samples of gold share the same boiling and melting point, the same capacity for electrical and thermal conductivity, the same combinatorial dispositions, and so on. How is that possible? The answer is that all these properties are *caused by* an

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underlying core property, namely their atomic number (according to a specific subatomic configuration). Thereby, the atomic number of gold also *explains* all such properties and behaviors. Atomic number plays an absolutely unique role within the economy of properties of a sample of gold, which is why we identify it as the *essence* of gold. That is the fundamental *nature* of gold, or what determines all the actual typical features of gold. Accordingly, gold *necessarily* has atomic number 79. At all possible worlds, that is what identifies a certain chemical chunk as a sample of gold. (A parallel story can be told for chemical compounds, such as *water,* as well as for chemical mixtures, such as *rocks* and other minerals).

Biological kinds are trickier. The sort of mainstream essentialism that draws from the views of Kripke and Putnam in the 1970s and 1980s is usually taken to claim that biological essences are—not differently from chemical essences—fully *intrinsic.* A traditional reference is *Naming & Necessity,* where Kripke argues that tigers have a certain "internal structure", and that is what in virtue of which, at any possible world, something is a tiger, regardless of its superficial features (1980: 120-121). However, the consensus in the philosophy of biology (insofar as theorists refer to "essences" at all) is to reject that essences are intrinsic. Philosophers of biology rather treat essences as *relational* and *historical*: what determines kind-membership is having a certain history. In previous joint work with Godman and Papineau (ms.), we took a similar line, arguing that appealing exclusively to intrinsic components does not have the sort of explanatory power that historical and, particularly, *copying* mechanisms have for all the phenotypic features of the members of a species. More precisely, first of all, an explanation merely in terms of intrinsic essences fails to deal with non-genetic inheritance and non-sexual reproduction (Papineau and Godman forthcoming). Second, and most importantly, it is the copying mechanism from common ancestors having certain features, which explains why all those same features co-occur in the members of a certain species. In other words,

the essence of the species is the *copying mechanism* involving those particular properties because that is what plays the superexplanatory role for all the members of a species.

Note that the account we propose is not the only way to spell out biological essentialism in terms of core causal and explanatory powers. In a series of recent papers, Devitt has also elaborated the traditional Kripke-Putnam line with regards to biological taxa, particularly species (2008, forthcoming a, forthcoming b, ms). Devitt holds that there is an underlying, intrinsic, "largely genetic" component to the essence of a biological species, which causes, given appropriate environmental conditions, the distinctive phenotypic features of the members of a species. Accordingly, this intrinsic component is at the basis of structural or "proximal" explanations in biology. On the other hand, Devitt also goes along with the consensus and grants a further relational and, specifically, historical component to the essence of a species, which is responsible for the origin of the species. This other component is instead at the basis of evolutionary and historical explanations in biology. Thus, in Devitt's view essences are tied to causal roles and explanation in a crucial way, like the Essentialist Superexplanatory account, at least in its general lines, predicts.

In conclusion, in the case of essences of kinds, we have a story of why those count properly as constitutive facts within a theory of modal knowledge. For they play special causal and explanatory roles for all the instances of a kind. That gives us a principled reason why they count as "essential", and a clear sense of how to distinguish them from the non-constitutive or merely accidental facts.

4.2 Individual Origin

The superexplanatory account of essences also gives us the tools to handle metaphysical necessities involving *individuals* (I am drawing here from our discussion in Godman Mallozzi and Papineau ms.) We can treat individuals as similar to historical kinds, by thinking of the different

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stages of an individual's history virtually as multiple instances of that individual. Like in the case of the instances of a kind, all the stages of an individual will then share many, many properties. What is that plays the relevant causal and explanatory role for all such properties in this case? Similarly to the case of biological taxa, it is plausible to think that it is the *individual's origin* that plays the relevant roles; and thus that origin is essential to being a certain individual. Each stage in the individual's history can thus be thought of as a copy of the previous one, all the way back to the individual's origin. Although it is likely that many properties would change over time throughout an individual's history, the particular origin will explain all the many stable properties that characterize that individual. We thus conclude that the original stage of any individual is essential to it. "Necessarily, something is a stage of a given Individual only if it descends from that particular origin" (17).

4.3 Zombies?

Could there be *zombies*, i.e., beings that are physically identical to us but that lack consciousness entirely? As it is well-known, the answer to this question it thought to have the potential to settle once and for all the problem of the relationship between the mental and the physical. If zombies are possible, the mental is not fully reducible to the physical. If they are not possible, on the other hand, several options open up regarding the correct account of the relationship between the two—whether *identity, supervenience, grounding*, and so on. (I won't get into the technicalities of this literature). The zombie case seems to fall squarely within distinctively *metaphysical* modal speculation. Indeed, it is paradigmatic of Conceivability-theory as developed by Chalmers (2002); and, as we saw, it has also been presented as a challenge for Counterfactual-theory as developed by Williamson. For empirical knowledge and causal-counterfactual thinking do not seem sufficient to give us an answer (Deng 2016; Thomasson 2018).

How does Essentialist Deduction as cashed out by the Essentialist Superexplanatory account deal with the zombie case? It might seem that in this respect we are not better off than Counterfactual-theory. How could appealing to empirical knowledge of essence help here?

In response. First of all, I should stress that the Essentialist Superexplanatory account does not claim to have an answer to all the questions of metaphysical possibility and necessity that we might happen to contemplate. By difference with Williamson, however, this does not mean the theory somehow sets in advance the modal space that it can cover. Nor it does mean, *a fortiori,* that it conveniently circumscribes such a modal space to the cases that are closest to the actual world. Instead, the account I propose *could* in principle answer all the questions of metaphysical possibility and necessity that we might happen to contemplate—including the more remote and extravagant ones. The Essentialist Superexplanatory account gives a general method for answering metaphysical modal questions of all sorts. As we saw, this involves starting from empirical, typically scientific knowledge of the relevant essentialist facts, and proceeding by simple inference to the corresponding necessary truths, based on the basic bridge-principle I called "(E)". Importantly, this account gives us *conditional* knowledge of modality: *if* something is essential, *then* it is necessary. It is empirical, typically scientific work that establishes the truth of the antecedent, by individuating what plays the relevant causal and explanatory roles in the case under consideration. Thus, a *preliminary*, perhaps disappointing point here is that my account does not claim to have a definitive answer to the question whether zombies are possible—like instead it does to the question whether gold could have had a different atomic number, say.

But there is a more important point. Note that the question whether zombies are possible, although obviously modal, is not ultimately meant to establish a modal truth, but rather an *actual* one. For answering this question, as mentioned, supposedly amounts to answering the question whether the mental is actually nothing above and beyond the physical. The speculation over whether

zombies are possible, if meaningful, in effect legitimates the method of Conceivability-theory for establishing modal truth—where in this case that serves as a purely instrumental step to establish an *actual* truth.

But in my view, wondering whether zombies are possible is rather an unnecessary detour to establish what the right connection between the mental and the physical is. Indeed, the latter issue (which is the real main issue), although certainly metaphysical, is not a distinctively modal one. We should thus flip the perspective altogether: it is not *a priori* modal speculation that can give us answers regarding actuality. Quite the other way around, it is empirical knowledge that gives us answers regarding the possible and the necessary. (Papineau 2013 makes a similar point. Interestingly, though, he concedes that intuitions of possibility are in general philosophically important not as a source of evidence for or against our theories, but rather as a means to *clarify our thinking*). Once science will have established what the nature or essence of consciousness is, we will then be able to derive in the usual straightforward way the relevant modal consequences—including the answer to whether or not zombies are possible.

In conclusion, the zombie-case does not constitute a challenge to Essentialist Deduction and the causal-explanatory account, because establishing whether zombies are possible is a misguided way to answer a question regarding actuality. Like all other questions regarding actuality, its answer will mostly depend on empirical results—not on purely *a priori* conceivability exercises.

Conclusion

I argued that Williamson's Counterfactual-theory fails to answer normative concerns in modal epistemology and, in particular, it fails to address the crucial problem of Modal Epistemic Friction. Essentialist Deduction as cashed out by the Essentialist Superexplanatory account, on the other hand, gives us an account of the relevant constraints on modal thinking in terms of essences

and their superexplanatory powers. With a number of examples involving both individuals and

kinds, I showed how this results in a stronger theory of knowledge of metaphysical modality.

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APPENDIX

<u>**On Purely A Priori Necessities**</u>

1. *The Essentialist Super-Explanatory Account*

In a couple of recent papers (2018b; and ms.) I laid out a picture of modal epistemology based on knowledge of essence. I call this the "Essentialist Superexplanatory" account. My focus so far has been on *metaphysical* modality, and particularly on a wide range of distinctive cases of metaphysical necessity. Within post-Kripkean modal metaphysics, examples typically include the necessity of fundamental kind-membership, the necessity of individual origin, of particular substance composition, and cases of the necessity of identity. My thesis is that knowledge of necessity in all those cases is a matter of knowing what is essential to the individuals and kinds at stake, in the sense of knowing what plays certain causal and explanatory roles for those individuals and kinds. Specifically, it seems fruitful to think of essence in terms of a single underlying core property or set of properties, or mechanism, which (actually) causes a multitude of properties that are typical of the entities at stake. This is especially clear in the case of *kinds*. (For example, the atomic number of an element causes the many chemical properties and behaviors that are typically shared by all the instances of that element. Similarly, the copying mechanism from common ancestors causes all the phenotypic properties that are typically shared by all the members of a certain species). Such "one-

to-many" causal structures, as we might label them,`do not only characterize kinds. As I argue in joint work with M. Godman and D. Papineau (ms.), *individuals* also display that very same pattern. In this respect, individuals are indeed similar to kinds—particularly, to biological kinds having a historical essence (simplifying a bit, we argue again in a Kripkean fashion that part of what is essential to being a certain individual, say a particular human being, is having a particular *origin*). The causal powers of essences thus understood determine, in turn, corresponding *explanatory* powers. For essences explain why so many properties consistently co-occur in those individuals and kinds. Understanding essences in this way gets at the heart of the "nature" or fundamental makeup of things, thus clarifying what it is *about* those entities that yields characteristic modal consequences.

The overall account thus claims that knowledge of metaphysical modality proceeds *inferentially* from knowledge of essence. Specifically, we form our beliefs about what is metaphysically necessary via *essentialist deduction*, based on a basic bridge-principle that I call "*(E)*", which connects the actual with the non-actual and necessary (in the case of kinds: 'If it is essential to x being F that it is G, then necessarily anything that is F is G'. In the case of individuals: 'If x is essentially G, then x is necessarily G'). Importantly, knowledge of modality in all such cases is largely an *empirical* pursuit, as we get to know what is essential to those entities via empirical investigation—often scientifically.

To sum up, the Essentialist Superexplanatory account systematizes knowledge of a wide range of cases of metaphysical necessities around the following four theses:

(1) metaphysical necessities depend on facts about *essence*

(2) essences have distinctive *causal and explanatory* powers for how things are, according to a "one-to-many" structural pattern

(3) we infer from essentialist knowledge to knowledge of necessity via a basic *Kripke conditional, (E),* which connects what is actual to what is necessary

(4) we discover essences *empirically*, which makes the resulting modal knowledge *a posteriori*, even though principle *(E)* is plausibly *a priori*

2. *Counterexamples?*

Although the Essentialist Superexplanatory account appears to work well for the cases mentioned so far, it might also seem to leave out quite a bit of *other* modal knowledge. Think, for example, of knowledge of *logical* necessities, or of *mathematical* necessities. An immediate problem with those kinds of truths is that we seem to grasp them *a priori*, that is presumably via some intuitive or inferential method, which is alleged to be evidentially independent of experience. If the Essentialist Superexplanatory account is meant to be exhaustive and cover *all* cases of modal knowledge, those "purely *a priori* metaphysical necessities", as I call them, would be counterexamples to it. For, in those cases, not only we do not gain epistemic access to such necessities in an *empirical* way; but also the presence of *causal* networks like those mentioned above is excluded. Causal relationships can only involve concrete actual particulars—however we want to spell that out more precisely—certainly not abstract entities like numbers and sets. Moreover, since I claim that the causal roles of essences support corresponding structural explanations, in cases where causal relationships are absent, the explanatory power of essence would also seem undermined. In sum, unless the Essentialist Superexplanatory account is restricted to only empirically grounded modal knowledge, the purely *a priori* metaphysical necessities may constitute a counterexample to it.

More precisely, such potentially problematic modal sub-fields include (at least) the following:

- **Logical** necessities (e.g., *'∀x nec(x=x) - Necessarily, everything is self-identical'*)

- **Mathematical and geometrical** necessities (e.g. *'Necessarily, two plus two equals four'*)

- **Conceptual** necessities (e.g., *'Necessarily, all crimson things are red'*. Perhaps more controversially, '*[Necessarily,] There must be a valley in between two mountains'*, van Inwagen: 1998)

- Laws of **Grounding/supervenience** (e.g. *'Necessarily, [P&Q] is grounded in [P], [Q]'*) and Principles of **Mereology** (e.g. *'Necessarily, everything is part of itself'*)

- **Normative** necessities (e.g. *'Necessarily, violence is wrong'*)

How could the Essentialist Superexplanatory account spelled out by theses (1)-(4) above handle these various cases of purely *a priori* necessities?

Perhaps one might deny that some or all of these truths are in fact *necessary*. Consider for example the XXth century developments of mathematics and geometry. The choice between, say, classical vs. non-Euclidean geometry might not be a matter of which one is strictly speaking true, but rather of which axiomatic system we decide to adopt for certain purposes. But then, the added modal force that has been traditionally attributed to the classical conceptions of math and geometry also has to go. Simply put, the truths of math and geometry might not be necessary. Similar considerations apply to the case of logical truth; just think of all the non-classical logics that have been developed in the last few decades.

Still, one might insist that at least certain bits of mathematics are both true and necessary: by contrast with the case of geometry, they do not have alternatives.[1] Furthermore, even someone like Graham Priest would keep modus ponens and universal instantiation fixed across any sort of (non-classical) logical systems. So, let us assume that truths in those modal sub-fields are in fact necessary.

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[1] I should flag, however, that fictionalists in mathematics deny the existence of abstract mathematical objects and thus maintain that mathematical theories based on such entities are strictly *false*.

I will also not question that those truths are in fact *a priori*. However problematic the epistemology of the *a priori* is, I take it as uncontroversial that if there are any genuine examples of truths that can be known *a priori,* the most plausible candidates will be from math, logic, and the other modal sub-fields in our list above.

My aim in what follows is to set up a framework for discussing these cases of purely *a priori* metaphysical necessities, and to sketch a possible way forward for the Essentialist Superexplanatory account of modal knowledge. Methodologically, I take this to be an issue we should address first of all at the level of modal *metaphysics*. Indeed, this constitutes a clear, practical example of how a *metaphysics-first* approach to modal knowledge is actually most helpful (cf. my 2018b). In order to elucidate modal epistemology, we need to first clarify the underlying metaphysics or the nature of modal truth.

3. *Modal Pluralism and Non-Uniform Modal-Epistemology*

As mentioned, an easy way for the Essentialist Superexplanatory account to deal with knowledge of purely *a priori* necessities is simply to *avoid* the challenge. One could say that the account is aimed at explaining just those necessities that are not *a priori*. Would this weaken the overall theory? Perhaps not, if restricting the target in this way were to go together with a certain broader stance in modal epistemology, namely what is sometimes called a "*non-uniform*" modal epistemology. According to this, different kinds of necessary truths require us to employ different epistemic-cognitive means or methods in order to know them, which determines in turn different accounts of modal knowledge. In this light, it would be ok to think that those abstract domains, which are traditionally thought to be only accessible *a priori*, do not really fall within the scope of the Essentialist Superexplanatory account, but have instead their own modal epistemology.

Note however, that the need for both *a priori* and *a posteriori* methods for modal knowledge *per se* might not determine a non-uniform modal epistemology with multiple epistemic means and methods. It is not *sufficient,* for it is possible that one single epistemic means or method operates both *a priori* and *a posteriori*, depending on the cases. Think, for example, of Chalmers' *conceivability*, which operates both purely *a priori*—i.e., "primary" conceivability—as well as *a posteriori,* based on empirical inputs—i.e., "secondary" conceivability. See his (2002). Nor it is *necessary*, for it is possible that knowledge of modality involves a variety of epistemic means and methods, which happen to be either *all* empirical or *all a priori*. Think of a version of non-uniform modal epistemology which variously resorts to, say, rational intuition, abduction, and imaginative procedures for modal knowledge, depending on the cases.

I suggest that we think of non-uniform modal epistemology rather as the natural correlate of a "*pluralistic*" picture of modal space that distinguishes different kinds of modal truth. In particular, the kind of modal pluralism I have in mind sharply separates metaphysical necessity as interpreted so far from necessities in other modal sub-fields—especially those in our "problematic" list above. What determines epistemological differences is in other words the underlying modal metaphysics; that is, what constitutes modal truth and its source in the different sub-fields. The simplest example of a pluralistic framework is perhaps a familiar version of the so-called "*modal dualism*". According to this, roughly, metaphysical modality and logical modality (sometimes logical-conceptual modality), constitute two different separate regions of modal space, each with its own kind of modal truth. The idea can be further cashed out in various ways, depending on one's purposes, e.g. in terms of different modal *primitives*, or different *sources* of necessity; or, also, formally, in terms of different *domains of worlds* (for discussion, e.g. Chalmers 2006, 2010, ch. 3, 2011; my 2018a; Soames 2011; Vaidya 2008). The important point for our purposes is that according to pluralism, modality can vary in substantive ways, i.e., ways that might not be captured by a general umbrella notion of "necessity"

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or single modal primitive.[2] A pluralistic picture of modal space accommodates this variety of more fine-grained modal notions by allowing for different sources of necessity, which ground truth in the corresponding modal sub-fields.

A non-uniform modal epistemology naturally matches such a pluralistic modal metaphysics. For it argues that we need multiple epistemic means and methods to access different kinds of modal truths. For example, one might argue that we come to know about everyday *physical-causal* possibilities through, say, counterfactual reasoning and quasi-perceptual imagination; about *metaphysical* possibilities via essentialist deduction based on knowledge of essence; and about *logical* possibilities purely *a priori*, say via intuition or rational insight (this is of course just one possible combination). In a non-uniform perspective, the Essentialist Superexplanatory account may not be required to handle the purely *a priori* necessities, because those would be part of different modal sub-fields not metaphysical necessity, and so they would have their own modal epistemology. As a result, those *a priori* necessities would not constitute a real challenge to the account.

4. The Monistic Push-back

Against the non-uniform-epistemology strategy, however, one might point out that it is not obvious that we can just "cut out" all the *a priori* necessary truths from the space of *metaphysical* necessity (which is the domain that is covered by the Essentialist Superexplanatory account, *ex hypothesi*). On the contrary, there seems to be a clear sense in which e.g. logical truths, or normative truths, are *also metaphysically necessary*. The received view seems to be that those hold at all metaphysically possible worlds. More generally, granted that we come to know many necessities *a*

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[2] Though note that modal *monists* may not deny that modality is varied. Some hold that we can still draw the desired distinctions between different kinds of modal truths at the level of their meaning or content (semantics), rather than at level of the source of their truth (metaphysics), e.g. by distinguishing e.g. different rules for assigning referents and truth-values to sentences across worlds. The main claim of monism in such cases is that the different modalities are *not irreducible* to each other, but can rather be traced back to one single source or modal primitive (see e.g. Chalmers 2002 and 2010, ch. 3).

posteriori, the space of metaphysical necessity seems not limited to what we can discover empirically. Quite the opposite, if there are any truths that we can know to be necessary via purely *a priori* methods, those will likely be *metaphysical* necessities. For arguably, the reason why we can grasp such necessities *a priori* is that they are most basic or fundamental truths structuring reality, and as such independent of the particular makeup of the actual world. In this light, they certainly qualify as properly "metaphysical". It might thus look like an arbitrary choice to restrict metaphysical necessities only to truths that we can know *a posteriori*, via empirical means. From this point of view, modal pluralism may seem misguided. The space of metaphysical necessity might instead be more inclusive and monistic. Metaphysically necessary truths might only differ *superficially*, so to say, as to their particular subject matter. Correspondingly, although we would still know some of those truths *a priori* and some *a posteriori*, a *uniform* modal epistemology with one single means or method for modal knowledge might look like a more suitable option.

If this is correct, the defender of the Essentialist Superexplanatory account should offer good reasons for endorsing a non-uniform framework nonetheless. She should try, in particular, to draw substantive differences among modal sub-fields so as to back up her desired epistemology with a pluralistic modal metaphysics.

So far we have focused on how knowledge of purely *a priori* necessities stands against a specific bit of the Essentialist Superexplanatory account, namely that captured by thesis (4) above (i.e., "We discover essences *empirically*, which makes the resulting modal knowledge *a posteriori*"). But in evaluating the possibility of modal pluralism and a corresponding non-uniform modal epistemology, we should look also at theses (1) and (2), which are meant to clarify the *source* of metaphysical necessity (i.e., respectively, "Metaphysical necessities depend on facts about *essence*"; and "Essences have distinctive *causal and explanatory* powers for how things are, according to a "one-to-many" structural pattern").

To see how this is relevant to our issue, consider that *a priori* necessities are also often thought to depend on facts about *essence*. Several philosophers think for example that logical necessities are grounded in the nature or essence of logical functions—they are "written into" the logical operations themselves (Fine 1994; Hale 2013); or, analogously in the case of geometry, the necessary truths about e.g. circles depend on the real definition or *what it is to be* a circle (Lowe 2012, Hale 2013). According to this picture, the space of metaphysical necessity is qualitatively homogeneous, so to say, with essence as the single source of metaphysically necessary truths. So, regardless of whether such metaphysically necessary truths are about, say, fundamental subatomic particles, or rather numbers and sets, they all have their source in facts about essence.

One possible concern regarding the project of a non-uniform modal epistemology has to do with economy. Many would say that, in general, we should aim for a single, unitary explanation that holds across all modal sub-fields and cases. There are familiar reasons for thinking so, involving the theoretical advantages of formal virtues like simplicity and unification, and the beauty, perhaps, that those bring about. But the considerations above suggest that there might be a more substantial reason not to pursue a non-uniform modal epistemology: namely, the simple fact that *there is* uniformity across modal sub-fields. Perhaps the differences among modal truths are only superficial. They might only have to do, say, with the way we organize different subject matters through useful categories; or with the particular semantic rules governing our use of words. But such truths in the different sub-fields are all on a par or qualitatively alike with respect to their modal status in that they all are metaphysically necessary. This depends, specifically, on the fact that they all have the same source by all being grounded in facts about *essence*.

Do the above considerations indicate that we should endorse a *monistic* picture of modal space—one with a single, overarching kind of necessity, i.e., metaphysical necessity, unifying all the cases across-the-board? Does such a monism rely on *essence qua* the common source of those truths

or what in virtue of which they are true? Finally, should we endorse, in turn, a uniform modal epistemology with a unified account of how we know modal truths?

5. Taking Stock

The purely *a priori* necessities seem problematic for the Essentialist Superexplanatory account of modal knowledge because they are taken to have the following two features. They are

- *a priori,* i.e., we know them independently of empirical evidence
- *abstract*, and as such not involved in causal connections

Because of that, they are apparently located *outside* the scope of the Essentialist Superexplanatory account. This suggests a *pluralistic* picture of modal space, matched by a *non-uniform* modal epistemology. But this seems not a viable option when we consider that purely *a priori* necessities are also presumably

- *metaphysically necessary*
- *grounded in essence*

Because of that, they are instead apparently located *inside* the scope of the Essentialist Superexplanatory account. This rather suggests a *monistic* picture of modal space, matched by a *uniform* modal epistemology. However, this seems not a viable option, either, for Essentialist Superexplanatory account operates with specific, *restricted* notions of "metaphysical modality" and "essence", which are incompatible with the purely *a priori* cases, by being tied to empirical investigation, causal networks, and structural explanations.

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Is there a way for the defender of the Essentialist Superexplanatory to reconcile these two conflicting pictures of modal truth and knowledge?

As I explain in detail in the next section, I think that a promising option for picturing modal space is what I am calling *"Sophisticated Modal Pluralism"*. This recognizes different sources of modal truth, as well as a more comprehensive notion of necessity in the background. The main feature of this proposed framework is that it distinguishes between *two kinds of metaphysical necessities*: the *"general"* vs. the *"distinctively"* metaphysical necessities. In developing an account of modal metaphysics that acknowledges the varieties of modality, we may thus need to rethink our categories of modal truth, and draw a map of modal space that clearly shows how the different sub-fields are interrelated and how they stand with respect to this broader notion of necessity. I have literally drawn such a map (fig.1 below).[3]

We can predict that against Sophisticated Modal Pluralism, future developments in modal epistemology will then likely lead us to a corresponding non-uniform account of modal knowledge.

6. Sophisticated Modal Pluralism

I am calling *"distinctively"* metaphysical modality a kind of possibility and necessity that is both (a) different from matters of ideal logical-conceptual coherence; and (b) *de re* and dependent on

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[3] A distinct question that I should here mention and set aside is what I call the "H-question", as I draw it from an issue recently raised by Paul Horwich (in a seminar on Necessity at NYU in fall 2017). The H-question is twofold. It asks (a) whether there is a primitive or most basic notion of necessity—a sort of "supercategory" or "Ur-Necessity", say; and (b) whether this may correspond to a (only minimally qualified) notion of "metaphysical" necessity according to familiar glosses like "absolute", "the most general", or "the broadest" necessity. I think that we may have some sort of immediate, intuitive grasp on a notion like (a), though in my view this is as completely unqualified as we can think of—something like a most basic, purely definitional concept of "MUST". At any rate, I will not delve further into this issue, and in particular I will not try to address point (b). But note how the H-question is different from the issue of modal monism. Whether or not we accept this sort of Ur-Necessity, and whether or not this corresponds to metaphysical necessity according to the above characterizations, it still open to discussion whether this is the *only* kind of necessity, or whether there are more (in which case they will be built on it, according to a sort of modal hierarchy). In setting aside the H-question, I turn instead to a *qualified* notion of metaphysical necessity, which I take to be metaphysical necessity proper. As I say below, I call it "distinctively" metaphysical necessity, and I distinguish it in particular from a broader kind of "general" metaphysical necessity.

the nature or essence of things as cashed out by the Essentialist Superexplanatory account. I take this characterization to capture metaphysical modality *properly speaking*.

Distinctively metaphysical necessity is "this-world": these necessary truths are true at all (metaphysically) possible worlds in virtue of their being grounded in truths concerning the fundamental makeup of the actual world. This restricted notion of metaphysical necessity, or metaphysical necessity "proper", excludes the purely *a priori* cases. Instead, distinctively metaphysical necessities are grounded in essentialist truths concerning the causal networks that structure our world, with their typical "one-to-many" patterns (namely, again, patterns where one fundamental property, set of properties, or mechanism, causes many typical, consistently co-occurring properties). Correspondingly, distinctively metaphysical *possibility* is *genuine* possibility or the only kind of possibility that is truly compatible with the nature of things.[4] Since main examples come from Kripke's work (1971; 1980), I further call them "Kripkean" necessity and possibility. But it should be clear that this kind of modality is also in a robust sense "Finean", in that it treats metaphysical necessity as dependent on the nature or essence of things. The point of difference with the received Finean notion, if any, is that the Essentialist Superexplanatory account specifies *what* this nature or essence is in the relevant cases, or what it is *about* the entities at stake that determines (distinctively) metaphysical necessity (cf. my 2018b).

On the other hand, there is a *unifying* and *looser* notion of metaphysical possibility and necessity, which I call *"general"* metaphysical modality. *General metaphysical necessity* is a coarse-grained notion of necessity that captures truth at all metaphysically possible worlds, where such truths have *no special tie or connection* to the nature or fundamental makeup of the actual world. We can think of it

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[4] I am taking for granted that we can contrast metaphysical modality to *epistemic* modality in similar terms. This is indeed a standard point in the literature. Many hold that metaphysical but not epistemic modality is "real" (Edgington 2004), or "genuine" (Kripke 1980; Fine 2005b), or "objective" (Williamson 2016). A more interesting point, in my view, is whether *logical-conceptual* modality coincides with epistemic modality, when the latter is understood under idealized, *a priori* conditions (like Chalmers' Modal Rationalism seems to imply: see my 2018a).

as a *pre-Finean*, or "modalist" notion of necessity, as it is sometimes called, which may group together different ways in which truths are metaphysically necessary, or different sources of modal truth.

The notion of general metaphysical necessity helps us handle the cases of purely *a priori* necessities. When we say that logical, mathematical, or normative truths, and so on, are metaphysically necessary, we use the expression "metaphysical necessity" in a somewhat *promiscuous* way, since those necessities are not really grounded in the nature or fundamental makeup of the world. But we are *roughly* correct in that those also happen to hold at all metaphysically possible worlds.

General metaphysical necessities are true instead in virtue of most general or *purely structural, a priori* requirements for something to be the case. We might think of them as *epistemically* necessary in Chalmers' sense; and as *de dicto,* in the sense that they do not depend on the essence or nature of specific entities, but rather have their source in fundamental aspects of reality such as logical and mathematical facts, and basic conceptual categories. Following a suggestion from Fine (2005a), we can think of such purely *a priori* necessities as *transcendental truths* or *preconditions* for any world to exist. The idea is that those truths are independent of how things have actually turned out or any particular matter of fact at our world. Correspondingly, general metaphysical *possibilities* are in a sense "empty" possibilities: namely, purely formal *a priori* possibilities that are completely independent of the actual makeup of our world—indeed, of *any* world (cf. my 2018a).

Furthermore, we are also *roughly* correct when we speak of the purely *a priori* necessities as being true *in virtue of the nature or essence* of logical constructions, mathematical entities, or geometrical categories (and so on). Though here, too, we are using, "nature" and "essence" in a somewhat loose or inappropriate way, since those are all perfectly abstract, purely formal entities. We are in other words stretching the meaning of "essence" and "nature" by detaching them from any actual matter of fact. Take some necessarily truth-preserving inference rule such as modus ponens or universal

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instantiation. Those do not seem to be grounded in the nature of the world in any substantial sense. In fact, they do not seem to have *any* connection to our world as opposed to any other worlds. Thus, purely *a priori* metaphysical necessities are *not* distinctively metaphysical. They rather each constitute their own specific modal sub-field (logical, conceptual, normative, etc.) according to a pluralistic picture of modal space that acknowledges different sources of necessity. The idea is that we can know *a priori* which things are necessary, in such cases, precisely because they are *not grounded in the nature of the actual world.*

Given this picture, we can agree with several authors in the field that we know some metaphysical necessities *a priori* (e.g. Lowe 2012, Hale 2013). Usually the idea is that there is a *real definition* that gives the conditions in virtue of which something is the very thing it is. This definition captures the essence of the thing and is knowable *a priori.* Hale and Fine have a similar story on the case of *conjunction,* for example. "Having the property of being true only if both conjuncts are true *makes conjunction the very thing it is*, that truth-function; and it also explains why it is necessarily so" (Hale 2013: 158. My emphasis). But again, the important point for the Essentialist Superexplanatory account is that here "essence" is to be understood more or less just as a manner of speaking.

A consequence of this is that the *superexplanatory* powers of essences properly called may not carry over to the *a priori* cases. It seems that when *a priori* matters of definition are involved, such powers are more limited compared to the empirical cases. That is not just because there are no causal connections at stake to determine corresponding structural explanations. But also because examples indicate that there may not be the sorts of "one-to-many" relationships among properties that we saw in the distinctively metaphysical, empirical cases. Think of conjunction again. In these cases it seems that the real definition or "essence" that we access *a priori* does not explain *many* properties of conjunction. It is arguable that there are not many to be explained to start with—but just one or a few. Other examples, however, suggest an opposite verdict. The real definition of *circle*,

for instance, as the *collection of all the points in a plane equidistant from a given point,* might plausibly be taken to explain the many geometrical properties and relationships that pertain to circles. Thus, I am inclined to say that whether essences in this loose general sense have superexplanatory powers in the purely *a priori* cases has to be established on a *case-by-case* basis.

Finally, I believe that we can still frame modal knowledge in terms of (broadly) *essentialist deduction.* But importantly, the direction of inference will vary depending on whether we look at the distinctively metaphysical necessities vs. the general metaphysical necessities. Recall thesis (3) above: i.e., "We infer from essentialist knowledge to knowledge of necessity via a basic *Kripke conditional, (E),* which connects what is actual to what is necessary". We can now restrict this thesis to the distinctively metaphysical necessities. Specifically, in these cases we proceed from empirical premises through an *a priori* inferential transition to empirical conclusions. By contrast, in the case of purely *a priori* metaphysical necessities the direction of inference seems reversed. We infer from necessary *a priori* truths to particular *actual* instantiations of such necessities, for any world considered as actual (that is just the T-axiom, "$\Box P \rightarrow P$"). The inferential transition is again itself *a priori*, and so are the conclusions.

Will Sophisticated Modal Pluralism be matched by non-uniform modal epistemology? As we saw, the fact that we need both *a priori* and *a posteriori* means and methods for modal knowledge may not mark a substantial theoretical difference for modal epistemology. What about the two, opposite directions that deduction might take in modal reasoning? Perhaps what we loosely call "deduction" in both cases actually picks out quite different epistemic routes for accessing modal truth, leading thereby to a non-uniform epistemology (a natural thought is, for example, that in the purely *a priori* cases inference is aided by intuition or insight, which thus contribute evidentially to our resulting justification).

My view is that the most important factor in determining whether modal epistemology is uniform or non-uniform has to do with what constitutes truth in the different modal sub-fields; and, in particular, with whether we can analyze all kinds of necessity in terms of essence. Although I sketched a way to answer these questions positively, I wish to leave further discussion to future work.

Finally, here below is Fig.1, representing modal space according to Sophisticated Modal Pluralism.
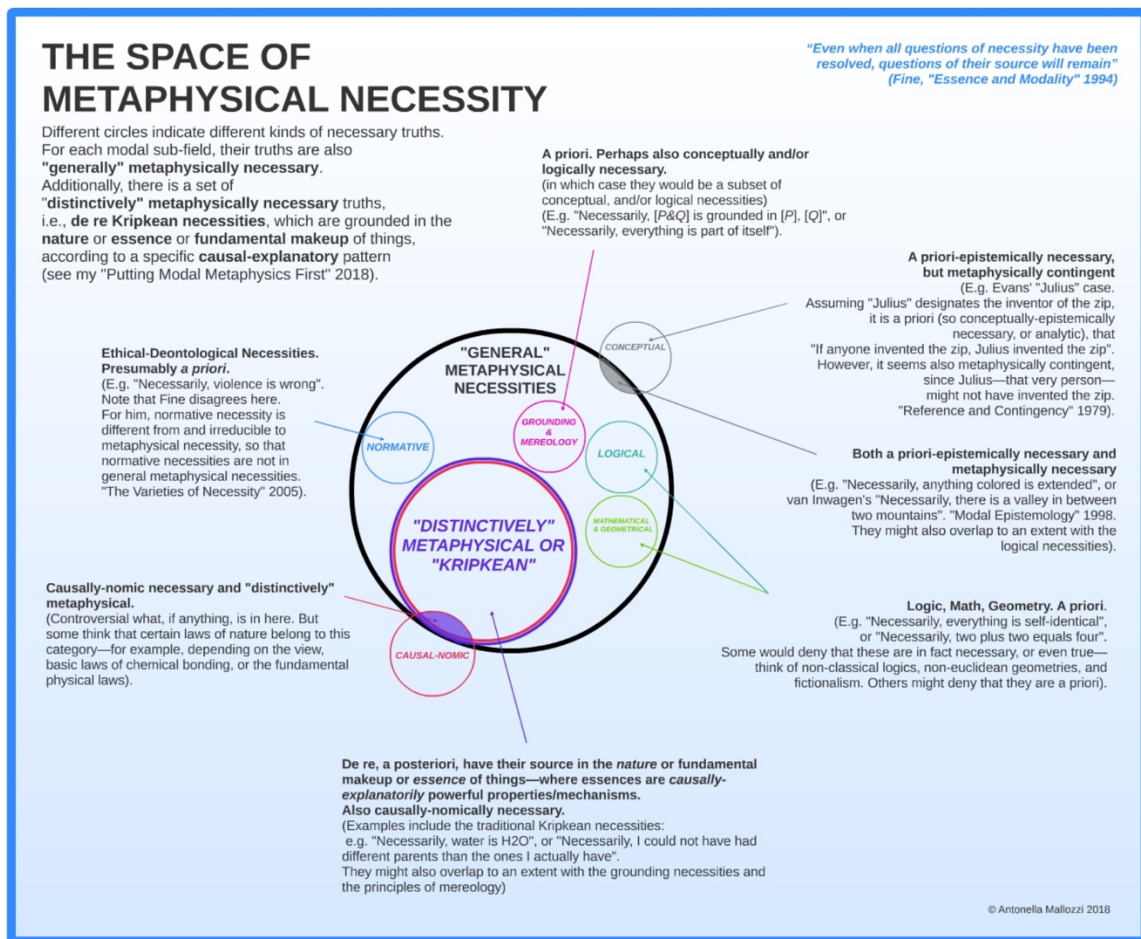

Fig. 1. The space of "general" metaphysical necessity and its sub-fields.

The diagram should be self-explanatory at this point. I will just flag that (1) *normative* necessities might require more careful consideration. Those necessities seem to depend in an important way on *human beings*—not in the sense that moral norms are "up to us" or a matter of our creative decisions; but rather in that they arguably *necessarily coexist* with sentient individuals like human beings. But human beings are only contingent beings—we might not have existed. So normative necessities are "conditionalized" necessities, after all. They are not pre-conditions for any world to exist, nor therefore are they completely independent of the nature of the actual world—like, instead, mathematical and logical necessities are. Note, also, that Fine (2005b) treats normative necessity as different from and irreducible to metaphysical necessity; he would accordingly locate it outside the outer circle in the diagram. (2) The laws of *grounding* and the principles of *mereology* might plausibly be thought as part of, or even reducible to, the *logical* or *conceptual* necessities. Accordingly, those circles should be thought as possibly intersecting with each other, or even being concentric. Where the main rationale behind this is that those modal sub-fields appear to be themselves at the intersection of logic and ontology. (3) *Grounding* and the principles of *mereology* might also be thought to partly overlap with the *distinctively metaphysical* or *Kripkean necessities*. Think of how we can analyze central cases of e.g. kind essentialism by means of such principles (say, "water is H_2O"). (4) Note, finally, that conceptual necessities (*epistemic* necessities in Chalmers' sense, as noted), are not coextensive with metaphysical necessities: Evans's *Julius* case (1979) is a clear example of that. Thereby, it seems best to picture the spaces of epistemic and metaphysical necessity as partly overlapping with each other.

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