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On Modal Knowledge

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Résumé : L'objectif de cette introduction est double : elle présente les articles rassemblés dans ce volume et offre une synthèse des développements récents de l'épistémologie des modalités.

Abstract: The role of this introduction is twofold: it presents the papers collected in this volume and offers a synthesis of recent developments of the epistemology of modality.

The present volume is the result of a research project, *Ontologie et épistémologie des modalités*, supported during 2010-2012 by the universities of Rennes 1, Nantes, Paris IV and Nancy 2. Most of the papers collected here were presented and discussed in the course of an international workshop on modality held at the Maison des Sciences de l'Homme de Lorraine in Nancy, from the 1st to the 3rd December of 2010. Two main themes stood out.

The first was the application of possible worlds semantics to fictional and propositional attitudes statements. It is illustrated here by Manuel Rebuschi's paper "Représentations de soi et modalités". Rebuschi starts from those puzzling cases in which reflexive pronouns do not seem to co-refer with their antecedent, notably in reports of someone considering a representation of herself: photograph, statue, mirror, etc. Rebuschi suggests treating these as "modal windows" that represent how an individual would be in other possible circumstances. Rebuschi then offers a semantics in which reflexive pronouns can be interpreted according to modal windows. This accounts for the specificity of *de se* attitudes while maintaining the co-reference link between anaphoras and their antecedents.

The second theme was *modal epistemology*. Almost all the papers gathered here deal more or less directly with the vexed question: how can we acquire

knowledge of necessities and possibilities? Even though works on modal epistemology have flourished over the past two decades, syntheses on the subject are still scarce.¹ This is what our introduction will provide, along with an overview of each paper of the volume.

After a quick survey of the different forms that modal knowledge endorses (§ 1), we outline the main difficulty encountered by modal epistemology and probably the simplest theory conceived to remedy it: the analytic theory of necessity (§ 2). We then show how Kripke's theses on the necessary a posteriori and the contingent a priori put the problem back on the table (§ 3). Next, two attempts to accommodate the analytic account of modal knowledge to Kripke's results are presented: Alan Sidelle's conventionalism and Jackson-Chalmers' brand of two-dimensionalism (§ 4). The more specific question concerning how to integrate possible worlds style metaphysics into modal epistemology is then addressed. This is followed by a discussion of David Lewis' argument to the best explanation and Christopher Peacocke's principled account of possibility as two possible answers to the integration challenge (§ 5). Finally, we examine a recent proposal made by Christopher Hill and Timothy Williamson. Their aim is to give knowledge of metaphysical modality a certain respectability by showing that it can be derived from knowledge of ordinary counterfactuals (§ 6). We will defend the counterfactual approach against a potential charge of circularity (§ 7).

1 Varieties of modal knowledge

Modal epistemology is a recent branch of epistemology that purports to explain our knowledge of possibilities and necessities, in the alethic sense of modality. As stated, this task presupposes two things. First, that modal truths are at least knowable, if not known. This assumption is nonetheless cancellable to the extent that modal knowledge-claims do not have the robustness of perceptual knowledge-claims or even mathematical knowledge-claims. Thus, if we fail to explain modal knowledge, modal skepticism is still an open option. Second, modal realism is assumed. Modal realism here means that modal statements and beliefs are true or false in virtue of objective features of reality. From [Hume 1992] to [Blackburn 1987], various forms of non-cognitivism have challenged this claim.² On such views, a statement such as "Socrates is necessarily a person" is not designed to *describe* a modal fact but to *express* a norm (to use "Socrates" as a person-noun) or a cognitive state (our incapacity to imagine Socrates as a cat or as a stone). Albeit coherent, non-cognitivism should be considered as a

1. Precious syntheses can be found however in [O'Leary-Hawthorne 1996], [Gendler & Hawthorne 2002], [McLeod 2005], [Vaidya 2007] and [Hale & Hoffmann 2010].

2. Strictly speaking, [Blackburn 1987] does not endorse modal non-cognitivism, but his "quasi-realism" comes close to it.

position of last resort insofar as it would lead one to say that ordinary speakers are massively wrong about the truth-value aptness of their modal assertions. Importantly, modal realism so intended is not committed to saying that reality has irreducible modal features. It is indeed compatible with semantic accounts of modality on which linguistic conventions are the ultimate truth-makers of modal statements.

In everyday life, modalizing is a pervasive cognitive activity that takes many forms. It manifests itself in ascriptions of capacities and dispositions. It occurs in practical deliberations when possible courses of action are considered. It takes place more prominently in counterfactual reasoning. Assessing statements of the form “If p were (had been) the case, q would (have) occur(red)” plays a crucial role in our capacities to discover causes,³ to impute responsibilities, to ascribe dispositions or to categorize objects.⁴ Curiously, ordinary modal knowledge has been quite neglected by epistemologists, their attention being instead focused on modal assertions made in *philosophical* contexts.

Many philosophical statements aim to describe the nature, the identity or the dependence relations between objects, events or properties. Even though these claims have no modal content, they do have modal consequences, mostly expressed in terms of necessity, and the way to test them is to imagine unactual but possible counterexamples. The recent blossoming of modal epistemology is to a large extent indebted to the revival of thought-experiments, in particular in metaphysics of mind. We are, in this respect, witnessing some kind of revival of what happened in the seventeenth century when Descartes’ dualist “proof” sparked off debates on the reliability of conceivability arguments. The impetus today is the famous argument that [Kripke 1980] sets forth against type physicalism. Type physicalists hold that phenomenal properties, for instance a painful sensation (P), are identical to brain properties, say such and such cortico-thalamic oscillation (C). Yet, it is an instance of the necessity of identity principle that ($C = P$) only if $\Box(C = P)$.⁵ Arguing that C could conceivably have occurred without P , and vice versa, Kripke concludes by *modus tollens* that type physicalism is false. Since then, Kripke’s conceivability argument has had plenty of descendants: conceivability of zombies, mad pain, Swampman, inverted spectrum, and so on. Interestingly, most of these thought-experiments result in possibility rather than in necessity claims. They are used negatively, to rebut identity or dependence theses, or else to undermine the alleged necessary and sufficient conditions defining a certain concept (knowledge, person, responsibility, etc.). They are often devised by dualists, as shown by the debates around the mind-body problem or material constitution. Their significance in philosophy

3. In order to know that an event a caused an event b , a speaker must surely know that b would not have happened had a not happened.

4. Consider for example the following reasoning: “If a had been a K , it would (not) have presented those features that we are actually observing. Hence a is (not) a K .”

5. Here and in the following, “it is necessary that p ” is symbolized by “ $\Box p$ ”.

ical reasoning reminds us how much modal epistemology is an integral part of the epistemology of philosophy.

We have distinguished between two forms of modal knowledge, ordinary and philosophical. It is methodologically best to keep them apart, at least to begin with, since problems raised by the one are not inevitably those raised by the other. Some authors, such as [Van Inwagen 1998] and [Wilkes 1988], thus profess skepticism toward the second and not toward the first. The main difference lies in the fact that ordinary counterfactuals describe possibilities that only differ slightly from the way things actually are; intuitively, they are *close* possibilities. Correlatively, ordinary necessities are always *relative* to a set of actual facts held as fixed. In contrast, philosophers claim to describe *absolute* possibilities and necessities: not only, for instance, what I could have been, given my physical constitution or given what actual technology allows me to do, but what I could have been *simpliciter*. The philosophical term of art for these absolute modalities is *metaphysical* possibility and necessity. Since philosophers claim to reason on the most inclusive sphere of possibilities, most of the constraints imposed upon ordinary modality are removed, thus opening the door to *remote* possibilities in which technology or physical laws differ radically from those prevailing in the actual world. We are asked, for instance, to imagine what would happen to us if we were subjected to a split-brain transplant [Parfit 1984], something that is technologically, and also probably biologically, impossible. Philosophical assertions also claim to deliver the strongest necessities, for metaphysical necessities imply other necessities but not the other way around. Even thought-experiments of the most speculative parts of physics cannot claim to reach such necessities, for such imaginary scenarios comply with natural laws, traditionally held to be metaphysically *contingent* by philosophy.⁶

2 Necessity, apriority and analyticity

Let us concentrate for the time being on problems common to both kinds of modal knowledge. The traditional challenge for modal epistemology is this: perceptive experience constitutes the main source of knowledge; however, it only gives us access to what is the case, and not to what is necessarily the case or what could have been the case. So, how do we come to gain knowledge of modal facts? Given that necessities and unactual possibilities are lacking in perceptive contents, only two options remain. The first is to embrace radical empiricism: it denies the reality of modality so that the question of modal knowledge cannot arise. The second option is initiated by [Kant 1965]. Restating his trust in

6. Even if it is the dominant view on the modal status of the laws of nature, it is not uncontroversial. [Shoemaker 1984] and [Ellis 2001] argue thus for their metaphysical necessity. Note that even if physical necessity and metaphysical necessity turned out to coincide extensionally, they would still remain *notionally* distinct.

modality and admitting that it cannot be known empirically, Kant concludes that it must be known *a priori*. Modal knowledge is then less a problem than the starting point of an argument designed to prove the existence of *a priori* knowledge, in particular the apriority of mathematics. Kant's argument rests on the following implication:

(1) If $\Box p$, it is then true *a priori* that $\Box p$ (if $\Box p$ is knowable at all).⁷

Kant however relies on a stronger principle,⁸ one that allows him to conclude from the necessity of mathematical truths to their apriority (and not only to the apriority of their necessitation):

(2) If $\Box p$, it is then true *a priori* that p (if p is knowable at all).

This strategy only postpones the problem. To claim that modal knowledge is a sub-domain of *a priori* knowledge tells us nothing about its *source*, insofar as *a priori* justification is defined negatively: one is justified *a priori* to believe that p iff empirical evidence does not play any role in the justification of one's belief. Defined thus, *a priori* knowledge appears no less mysterious than modal knowledge.

An appealing solution is to reduce modal knowledge to a kind of *semantic* knowledge. The most straightforward way to do this is to adopt the analytic theory of necessity (AN), in the footsteps of the logical empiricists [Carnap 1956], [Ayer 1971]. AN is, first and foremost, a theory concerned with the *source* of necessity. It explains that a sentence S is necessarily true by the fact that S is analytically true, that is, true *purely in virtue of the meaning* of its component expressions. It is critical to note that the italicized phrase has no immediate epistemological import. It does not convey that meaning provides knowledge of S 's truth, but that it is the *truth-maker* of S . In the terms of [Boghossian 1997], we are faced here with the *metaphysical* concept of analyticity, and it is easy to show how metaphysical analyticity can be a source of necessity. Take e.g., an instance p of the first axiom of Łukasiewicz's propositional logic, $(\Phi \rightarrow (\Psi \rightarrow \Phi))$. According to the metaphysical concept of analyticity, p is true purely in virtue of the meaning of the constant " $\rightarrow$ ". Since meaning is sufficient to make p true, then, keeping p 's meaning constant, p would be true no matter what else was the case. Yet, "being true no matter what" captures precisely the pre-theoretical sense of absolute necessity, the one reflected in the phrase "true in all possible worlds" whose use is common practice nowadays. Conclusion: p is necessarily true; p 's analyticity explains its necessity.

The route from AN to modal epistemology is then straightforward. One only has to add the thesis according to which meaning is *transparent* to competent speakers. It amounts to saying that if S is true by meaning alone, then, just by grasping S , a reflective speaker can know that S is true by meaning alone.

7. "It is true *a priori* that p " abbreviates " p is true and knowable *a priori*".

8. (2) is stronger than (1) for (2) implies (1) but not the other way around in any modal logic including the axiom schema $\Box\Phi \rightarrow \Box\Box\Phi$.

To get from here to S being necessarily true, the speaker only has to replicate the explanation given above. So, it is semantic knowledge that gives us access to modal truths. Moreover, AN readily explains how such knowledge is a priori. Metaphysical analyticity is indeed convertible in *epistemic* analyticity (but not the other way around),⁹ which leads naturally to the analytical theory of a priori. According to the latter view, S is true a priori iff the mere grasp of S 's meaning suffices for being justified in holding S true. This makes modal knowledge respectable not only as *modal* knowledge but also as a *a priori* knowledge.

It follows from this ambitious theory of analyticity that modal categories (necessary/contingent) and epistemic categories (a priori/empirical) are reduced to a single pair of semantic categories (analytic/synthetic). This reduction has a cost however: it does not allow *de re* modal claims such as “Socrates is necessarily a person” or “No one could have biological parents other than those one actually has”. [Quine 1947, 1953] showed indeed that attributing a property that is “analytically true” of an object is meaningless.¹⁰ “Too bad for essence!” might say those who think that the notion is unintelligible.

Another consequence of AN, rarely noticed, is that it “modalizes” a priori knowledge, making it a kind of modal knowledge. In such an account, one cannot know a priori that p unless one has prior knowledge that p is true by meaning alone. More precisely, it is the fact that p is known to be true by meaning alone “no matter what” that explains how one can know it a priori to be true of the actual world, whatever it turns out to be. Since necessity reduces to analyticity, this amounts to saying that one must know a priori that $\Box p$ in order to know a priori that p . Necessity is not injected afterwards to what is known a priori: all a priori truths are known *sub specie necessitatis*. On this point, AN is rejoined by rationalist conceptions of a priori knowledge on which a rational a priori insight that p is true consists in apprehending p as *necessary* [BonJour 1998]. To the extent that all a priori knowledge involves knowledge of a necessity, AN implies the converse of Kant's principle (2) seen above:

(3) If it is true a priori that p , then $\Box p$.

As we will see in the next section, this is the touchstone of the analytic theory of necessity.

9. [Boghossian 1997] thus intends to redeem epistemic analyticity while rejecting its metaphysical concept.

10. Kripke's rigidity thesis is often considered as rebutting Quine's objections against *de re* modality. As [Burgess 1997] reminds us, this is mistaken. Certainly, if we interpret, as Kripke does, $\Box$ as meaning *metaphysically necessary*, draining any idea of analyticity in it, then attributing non-trivial essential properties is intelligible. Modality thus understood does produce transparent contexts that allow the substitution of co-referential rigid terms and the “quantifying in”. However, Quine's objections aim for *de re* modals when $\Box$ means *analytically true*. In this sense, the idea of non-trivial essential properties remains unintelligible, even after the Kripkean turn.

3 The Kripkean turn

The renewal of modal epistemology is greatly indebted to Kripke's innovative theses on modality. [Kripke 1980]'s main aim is to emancipate modal categories from epistemic and semantic categories. To this end, Kripke brings to light two kinds of statements: necessary but empirical truths and a priori albeit contingent truths. In this section, we will examine first the consequences they have vis-à-vis the analytic theory of necessity, and then their consequences for conceivability-based accounts of modal knowledge.

Consider the following statements:

- (a) Socrates is a human being.
- (b) This table is made out of wood.
- (c) Isaac Newton is the biological child of Hannah Ayscough.
- (d) Gold has the atomic number 79.

(a)-(d) are necessarily true since they attribute essential properties concerning fundamental kind, material composition, origin or microphysical structure to rigidly designated objects.¹¹ Nevertheless, none of them can be known a priori: we need empirical evidence to know that they are true. Such empirical necessities provide a case against modal theories committed to Kantian principles (1) and (2), in particular against AN. Let us consider an a posteriori necessary truth p . If p can only be known empirically, then p cannot be known just by grasping its meaning. As metaphysical analyticity requires epistemic analyticity, a fortiori, p cannot be true by virtue of its meaning. Yet p is necessarily true. Therefore, it follows that p 's necessity does not take its source from meaning or linguistic conventions.

This result, however, is not enough to show that the concept of *truth by meaning alone* is incoherent or denotationless for it remains compatible with the fact that *some* statements, typically logical and conceptual truths, owe their truth to their meaning. What it does show, at least, is that AN as an ambitious theory of necessity is false. Cases of empirical necessities do seem to show that necessity may take its source from the very *nature* of things. Correlatively, the new term of *metaphysical* necessity ousts the use of *logical* necessity (broadly taken to cover logical as well as conceptual truths) in order to refer to absolute necessity. This new term captures better than its predecessor the idea that necessity may stem from the nature of things and not from meaning alone. Now, in breaking up with analyticity, Kripke not only takes us back to our original problem, that is, explaining modal knowledge, he also makes the problem more mysterious: how can there be empirical essences if experience can only tell us how things are and not how they must be?

11. To accommodate the contingent existence of their objects, (a)-(d) are implicitly prefixed by an existential condition.

The emancipation of necessity from apriority does not stop here. Kripke wants us to push it further, up to the denial of the converse implication (3), from apriority to necessity. One counterexample is:¹²

(e) Neptune perturbs the orbit of Uranus.

(e) is true a priori albeit contingent. Suppose that, as did the French astronomer Urbain Le Verrier, we fix the reference of the rigid name “Neptune” by the definite description “the planet, whatever it is, that is responsible for the deviations in Uranus’ orbit”. This reference-fixing condition then puts us in a position to know a priori that (e) is true. However, it remains contingent that Neptune perturbs Uranus’ orbit: had the history of our solar system been different, Neptune could have found itself too far from Uranus to interfere with its path.

That this kind of counterexample is fatal to AN, insofar as AN is committed to (3), is all too rarely observed. The lesson one can draw is twofold. First, epistemic analyticity is independent from metaphysical analyticity. Just by grasping (e), one can know a priori that (e) is true. However, the contingency of (e) indicates that it owes its truth to extra-linguistic facts, not to meaning alone. Second, a priori knowledge does not involve modal knowledge, a priori truths are not known *sub specie necessitatis*. This rebuts not only AN but also rationalist theories of a priori knowledge. Indeed, it is one thing to explain how one knows a priori that *p*, it is quite another to explain how one knows a priori that $\Box p$, since a priori truths can be necessary as well as contingent. Epistemic analyticity may help to explain a priori non-modal knowledge but it is far from obvious that it can have as much success with a priori *modal* knowledge. We have thus landed on an old problem: how do we come to know the necessity of logical and conceptual truths? At the epistemological level, the necessity of these a priori truths is no less mysterious than empirical necessity.

We have seen that, by bringing down the analytic theory of necessity, the divorce between necessity and apriority raises old, as well as new, problems for modal epistemology. One feels its repercussions beyond the analytic theory since it also threatens conceivability-based accounts of modal knowledge.

Here lies the difficulty: take an empirical necessity, such as “gold has the atomic number 79”. It is *conceivable* that gold has a different atomic number—think for example about all the alternative hypotheses that were contemplated before experiment showed us what gold’s atomic number was. By this, it is meant that one can imagine a situation in which gold has a different atomic number, without facing logical or conceptual inconsistencies. Nonetheless, gold could not have had an atomic number other than 79: if an element had possessed a different atomic number, it would not have been gold. This gap between conceivability and possibility is a matter of concern for it is a common view, since Descartes at least, that conceivability is a reliable guide to possibility.

12. Again, (e) is tacitly prefixed by an existential condition since Neptune’s existence cannot be known a priori.

For those who subscribe to conceivability-based accounts of modal knowledge, conceivability is even the *only* road to possibility.

Whereas the analytic theory of necessity puts the emphasis on knowledge of necessity, conceivability accounts start from knowledge of possibility. The key idea is that possibilities are known by conceivability intuitions, though there are disagreements concerning the strength of the inferential link that leads from conceivability to possibility.¹³ It may be strict implication or fallible justification depending on whether the notion of conceivability is more or less cognitively idealized, the difficulty being to strike a happy medium: a too loose notion of conceivability would not provide a reliable criterion of possibility; a notion too idealized would be useless and would only replace the question “How do we know that p is possible?” with the question “How do we know that p is conceivable?”. Still, most supporters of the conceivability method accept the (CP) thesis:

(CP) If a subject S can imagine a situation under a description which
(i) makes p true (ii) is sufficiently detailed and (iii) does not contain any logical or conceptual inconsistencies, then S is justified in believing that it is possible that p .

(CP) leaves room for modal errors. They typically occur when an inconsistency goes unnoticed due to an insufficiently detailed description. To detect them can take time. Consider, for example, how long it took to realize that the universal class was in fact impossible since it contradicted Cantor’s theorem. Note however the crucial point that such errors challenge neither the reliability of the conceivability method, nor its a priori character, inasmuch as they can always be corrected through a better reasoning, in a purely a priori way.

This traditional picture is swept away by Kripkean cases of empirical necessities. Indeed, for any empirical impossibility p , the conceivability method will generate a “false positive”, i.e. a case where p is conceivable without being possible. Worse: the gap between conceivability and possibility can never be fulfilled, not even by ideal cognizers. A subject with unlimited time and reasoning capacities is as incapable as we are to detect a priori an inconsistency when conceiving p . It is as if our concepts were blind to impossibilities, at least the empirical ones. Even though this gap does not generate “false negatives” (i.e. cases of inconceivability without impossibility) and so does not directly affect necessity claims, it does cast a doubt on all possibility claims. This has, it would seem, disastrous consequences for armchair style philosophy since many of its distinction or independence theses are based on possibility claims.

13. For various elaborations of the notion of conceivability, see in particular [Yablo 1993], [Menzies 1998], [Chalmers 2002], [Geirsson 2005], along with the articles published in [Gendler & Hawthorne 2002].

4 Reconciling necessity and apriority

While they have contributed to rehabilitate the notion of essence that has fallen into disfavor since Quine's critics, Kripkean a posteriori necessities have sparked off a vigorous reaction from the supporters of the traditional link between modality and apriority. Their main strategy consists not in questioning the existence of a posteriori necessary truths, but in offering a deflationist reading of them, both at an epistemological and a metaphysical level. The philosophical significance of Kripkean necessities, so they say, has been greatly exaggerated: these question neither the fundamentally a priori character of modal knowledge, nor its reduction to a sort of semantic knowledge. They are also compatible, it is argued, with the idea that necessity has its source in meaning. In a certain way, it is all about elaborating a sophisticated version of the old analytic theory of necessity, one that is able to incorporate Kripke's results and then render them harmless.

Paradoxically, Kripke himself suggested the main line for this strategy. [Kripke 1971] claims that empirical knowledge of a necessity stems from knowledge of two kinds of premises: on one hand, one (or many) empirical and non-modal premise(s), responsible for the empirical character of this knowledge; and, on the other hand, one (or many) modal and a priori known premise(s), responsible for its modal content. In order to illustrate this division of epistemic labor, consider the following a posteriori truth:

(4) $\Box(\text{water is made of H}_2\text{O molecules})$

According to Kripke's proposal, empirical knowledge of (4) can be factorized into empirical non-modal knowledge of (5) and a priori modal knowledge of (6):

(5) Water is made of H₂O molecules

(6) Water is made of H₂O molecules $\rightarrow \Box(\text{water is made of H}_2\text{O molecules})$.

If it is contested that (6) is known a priori, the factoring can be pushed further until the step where necessity is injected corresponds to an a priori knowledge. Abstracting from the particular subject and predicate, one could claim thus that the *de re* necessity occurring in (6) is ultimately derived from the general individuation principle (7) that is known a priori:

(7) $(K \text{ is a chemical kind and } S \text{ is a microphysical structure}) \rightarrow ((K \text{ has } S) \rightarrow \Box(K \text{ has } S))$

The crucial point is that all essentialist conditionals used as ultimate premises in the derivation of empirical necessities are a priori known. If Kripke's conjecture is right, this reconciles knowledge of essence with apriority. Kripkean necessities thus lose much of their puzzling appearance. One can indeed assert that there are a posteriori necessary truths while conforming to Hume-Kant's dictum according to which experience tells us only what is, and not what must be.

There is still, however, an unelucidated point here: how do we get to know a priori (7) or (6) in the first place? Kripke is rather allusive in this respect and simply says that essentialist conditionals can be known “by a priori philosophical analysis” [Kripke 1971, 153]. This opens the door to refined versions of the analytic theory of necessity. A noteworthy example is given by Alan Sidelle’s conventionalist account of necessity [Sidelle 1989]. Sidelle holds that what makes *de re* general principles such as (7) true are not extra-linguistic modal facts, but the rich semantic structure of natural kind terms. It is thus argued that the meaning of natural kind terms encodes a complex convention concerning how to apply them in the description of counterfactual situations. One can formulate it as follows:

If most of the samples that fix “*K*”’s reference satisfy a property *P* which is responsible for their observable features, then “*K*” applies to *x* in a counterfactual situation *w* iff *x* satisfies *P* in *w*.¹⁴

This leaves room for experience since schematic letters figure blanks that can only be filled by empirical inquiry. However, once the values of the parameters have been specified, necessity is generated by a purely semantic rule that determines the counterfactual extension of the terms as a function of their actual extension. An essentialist conditional such as $(K \text{ is } P) \rightarrow \Box(K \text{ is } P)$ (where “*K*” and “*P*”’s range are restricted to relevant kinds and properties) is then nothing more than a semantic rule put in the material mode. Likewise, modal knowledge is no longer mysterious, being based on tacit knowledge of rules governing the application of terms in counterfactual reasoning.

If Sidelle is right, necessity takes its *source* in meaning. However, and this is where Sidelle’s theory diverges from the old analytic theory of necessity, this does not mean that all necessary statements are *true by meaning alone*. For instance, even if (5) owes its necessity to semantic rules, it is still made true by extra-linguistic facts, namely that most of the samples by which the reference of “water” is fixed, are made of H₂O molecules. This is what accounts for the empirical profile of (5). In this way, all cases of a posteriori necessity can be integrated into the analytic conception of necessity. This also shows a deeper difference between the old and the new analytic theory of necessity. In the old theory, the necessity of a statement (e.g., it being made true by meaning alone) explains why it is actually true. The new theory reverses the order of explanation: the actual truth of (5), combined with conventions, explains why (5) is true of necessity. Insofar as a posteriori necessities are concerned, necessity is not something from which truth derives; it is something that our conventions add on top of truth.

14. For practical purposes, this is a simplification of Sidelle’s view. For more details, see in particular chapters 2 and 3 of [Sidelle 1989]. Sidelle’s conventionalism also postulates semantic rules in order to account for *de re* necessities concerning singular objects, for instance the necessity of origin.

Although it reconciles knowledge of essence (in its general form) with apriority and analyticity, Sidelle's theory does not fill the gap between conceivability and possibility generated by a posteriori necessities. This is precisely the challenge that [Jackson 1998], [Chalmers 1996, 2002] are claiming to meet. According to them, the divorce between necessity and apriority is only a superficial linguistic phenomenon that does not constitute a real threat for conceivability approaches of modal knowledge; the golden triangle that linked modal, epistemic and semantic categories before Kripke can be restored thanks to the powerful machinery of two-dimensional semantics.

Two-dimensional semantics covers a family of semantic theories whose common point is to evaluate statements and their components, not relative to a single index, as in standard modal semantics, but relative to a pair of indices, the first one normally used as a context of interpretation, and the second as a circumstance of evaluation. This double dependence of semantic values on indices enables two sorts of intensions to be defined, from which emerges a finer-grained theory of meaning. The strong two-dimensionalism advocated by Chalmers and Jackson stands out by its metaphysical and epistemological ambitions. Their declared purpose is to re-establish the equivalence between necessity and apriority undermined by Kripke.

The central idea is that there are two ways of considering a possible world w when evaluating a statement S . First, we may assess S 's truth-value relatively to w considered as *counterfactual*. This is the standard procedure since Kripke: we keep the actual world fixed, and w is considered as a way the world could have been but is not. The "secondary intension" or "2-intension" associated with S is then defined as a function from possible worlds taken as counterfactual to truth-values. Second, we may evaluate S relatively to w considered as *counter-actual*. This is the novelty: we suspend our knowledge of how the actual world is and we consider w as a way the actual world may turn out to be, for all we know a priori. The "primary intension" or "1-intension" associated with S is then defined as a function from possible worlds taken as actual to truth-values. The whole interest of the two-dimensionalist apparatus lies in those cases in which 1-intension and 2-intension do not coincide.

Take, for instance, the statement (5) seen above and a possible world w_1 in which the Earth verifies the Twin-Earth scenario imagined by Putnam: the surface of the Earth is 70% covered in a liquid that has all the macroscopic features of water (it quenches thirst, is colorless, tasteless, findable in the seas, the lakes and the oceans, and so on—in short, the waterish stuff), but it consists of molecules of XYZ. Let us then grant that the term "water" has its reference fixed by a complex descriptive condition, e.g., being the waterish stuff, which any speaker tacitly knows by being competent in her use of the term "water". Since "water" is rigid and its reference-fixing condition picks up H_2O in the actual world, "water is H_2O " is true relatively to all possible worlds taken as counterfactual, including w_1 : considered as counterfactual, w_1 can be described

as a world in which water—alias H_2O —is replaced by some other superficially similar liquid. The 2-intension of (5) is thus necessary. This is what accounts for the fact that it is metaphysically necessary that water is H_2O . However, (5) is false relatively to some possible worlds considered as actual, especially w_1 : if w_1 turns out to be our actuality, then the XYZ-liquid satisfies the reference-fixing condition of “water” and (5) is then false. Considered as actual, w_1 must this time be described as a world in which water is XYZ. Since the truth-value of (5) varies depending on the way the actual world might turn out to be, the 1-intension of (5) is contingent. This accounts for the empirical character of (5).

This example shows that the discrepancy between apriority and necessity noticed at the level of secondary modality disappears at the deeper level of primary modality. Jackson and Chalmers extend this conclusion to all cases of Kripkean a posteriori necessities: albeit 2-necessary, they are all 1-contingent, in accordance with their empirical character. Likewise, all a priori contingent statements are 2-contingent but 1-necessary, in accordance with their apriority. Thus, the Kantian equivalence between necessity and apriority can be re-established at the level of 1-modality. This is the core thesis of Chalmers’s two-dimensionalism:

Core Thesis: for any sentence S , S is a priori iff S has a necessary 1-intension. [Chalmers 2004, 165]

This amounts to saying that we have a priori access to possibility when modality is taken in its primary sense. Read from right to left, the equivalence excludes “strong necessities”, namely cases where a hypothesis H cannot be excluded by a priori reasoning in spite of the fact that all 1-possible worlds verify $\sim H$. Granted that there is no such counterexample, the link between conceivability and possibility can thus be restored. Let us say that S is 1-conceivable when it is possible in principle to imagine in great detail a situation considered as actual that verifies S , such that no contradiction is revealed, even on idealized a priori reflection [Chalmers 2002, 153]. It is one thing to say that one can 1-conceive a situation that verifies S , it is another to say that there is a true 1-possible world that verifies S . Yet the Core Thesis warrants that there is no deceitful 1-conceivability or illusion of 1-possibility, when the notion of conceivability is sufficiently idealized. This is the main line of the new brand of Modal Rationalism championed by Chalmers:

Modal Rationalism: For any sentence S , S is 1-conceivable only if S is 1-possible. [Chalmers 2002, 194]

The critical point is that the conceivability method keeps its a priori character, for 1-conceivability rests on a priori reasoning and mastery of 1-intensions, to which competent speakers have a priori access. More importantly, 1-conceivability may be used as a reliable guide to metaphysical possibility in those cases in which it can be established a priori that 1-possibility implies 2-possibility. It happens for any sentence whose 1-intension and 2-intension coincide (again, something to which a competent speaker has a priori access).

Lack of space prevents us from discussing in detail the abundant literature that Chalmers and Jackson's two-dimensionalisms have generated. Many criticisms came from the supporters of a posteriori physicalism who dispute the inference from conceivability to possibility in Chalmers' zombie dualist argument.¹⁵ The neo-descriptivist interpretation that Chalmers and Jackson give of primary intensions also gave rise to vigorous reactions from philosophers of language within the tradition of Direct Reference Theory [Soames 2005].

The present volume includes two papers from the two-dimensionalist trend.

In "Conceptual Truths, Strong Possibilities and our Knowledge of Metaphysical Necessities", Christian Nimtz undertakes to show that knowledge of conceptual truths can provide a priori knowledge of metaphysical necessities. His argument proceeds thus: first, he champions the idea of conceptual truth against the recent objections that [Williamson 2007] addressed to epistemic analyticity. Then, Nimtz uses two-dimensionalist tools in order to show that there is a reliable epistemic route that leads from epistemic analyticity to a priori knowledge of metaphysical necessities (2-necessities in Chalmers' terminology). This route incorporates two steps. (i) First, from the fact that p is a conceptual truth, one infers that p is 1-necessary. (ii) Second, from the fact that p is 1-necessary, one infers that p is 2-necessary. Step (ii) is the critical one. Its legitimacy is indeed questioned by all cases of contingent a priori in which 1-necessity coexists with 2-contingency. Nimtz's answer is that it does not undermine the reliability of this inference insofar as we can know a priori what those cases where it fails are. Indeed, all cases of contingent a priori occur in the presence of an actuality-dependent term, that is, a term whose counterfactual extension is determined by its actual extension. And, precisely, a competent speaker can know a priori which terms are actuality-dependent. Step (i) remains, which corresponds to the Core Thesis read from left to right. (i) would be defeated only if there existed "strong possibilities", that is to say converse cases of the "strong necessities" seen above, in which p is not conceivably false for all we know a priori, though there is a true possible world considered as actual that falsifies p . Arguing that there isn't any such plausible counterexample, Nimtz concludes that step (i) is safe and that it can thus be the starting point of our knowledge of metaphysical necessities.

In "A Two-Dimensional Semantics for Epistemic Modals", Dan Quattrone concentrates on a thorny difficulty posed by cases of empirical necessities for the semantics of epistemic modals. Standard truth-conditions of statements of the form "It may/might be the case that p " (in symbols $\Diamond_e p$) are given by quantifying over a restricted set of possible worlds: $\Diamond_e p$ is true iff there is a possible world consistent with our knowledge in which p is true. Consequently, $\Diamond_e p$ cannot be true unless p is metaphysically possible. Now, take any a posteriori necessity, for instance "water is H_2O ", and suppose we assert " $\Diamond_e(\text{water is XYZ})$ " while there is no available empirical evidence that water is not XYZ. Intuitively, the

15. For a survey of physicalists' objections to the Zombie argument along with Chalmers' responses, see [Chalmers 2010].

epistemic modal is true. However it has to be false under the standard account: since “water is H_2O ” is true by metaphysical necessity, there is no possible world in which water is XYZ, and a fortiori no such possible world consistent with our knowledge. In short, we don’t have enough possible worlds to represent all the hypotheses left open by our current knowledge. Quattrone sets himself the task of reformulating epistemic modals’ truth-conditions leaning upon the conceptual resources provided by Stalnaker’s two-dimensionalism [Stalnaker 1978].

First, each sentence S is associated with a metaproposition that represents how the proposition expressed by S varies depending on the world in which S is produced. Next, epistemic modals’ truth-conditions are given by “diagonalizing” the metaproposition: $\Diamond_e S$ is true iff there is a possible world w such that the value of S ’s metaproposition in w is true at w . Since “water is XYZ” expresses a true proposition when produced in a “waterish-XYZ” possible world, this accounts for the intuitive truth of $\Diamond_e$ (water is XYZ). An interesting and quite puzzling feature of Quattrone’s account is that the $\Diamond_e$ operator behaves like a “Monster” [Kaplan 1989], that is, like an operator capable of shifting the context of utterance. Sentences embedded in $\Diamond_e$ seem indeed to be interpreted from a world different from the world of utterance. Quattrone replies that it does not affect the plausibility of his account inasmuch as there are recognized cases of monstrous operators in natural languages. Finally, Quattrone shows how his two-dimensionalist treatment of epistemic modals differs from Chalmers’ and why his should be preferred.

5 The Integration Challenge

The problem we are now facing is much more general in its scope than the previous one. The *Integration Challenge* put forward by [Peacocke 1999] concerns not only the modal domain but also the philosophy of mathematics, of time, of mind, and metaphysics of properties. In its modal version, it starts from the acknowledgment that the demands for modal epistemology and those for modal metaphysics seem to push in opposite directions. A gain for the former constitutes a cost for the latter, and vice versa. Theories that ground modality in possible worlds are *prima facie* appealing as they match directly with our best account of truth-conditions for modal statements, i.e. possible worlds semantics. But the same feature that makes them ontologically recommendable seems also to induce insuperable difficulties in epistemology for we have no idea on how to access possible worlds. Conversely, by adopting an analytic theory of necessity, we dispel the aura of mystery surrounding modal knowledge since it reduces to a sort of semantic knowledge. Yet, this advantage has a metaphysical cost, analytic theories being ill-adapted to account for the modal strength of logical or mathematical principles—how can we make necessity out of contingent conventions? The challenge is thus to make modal ontology and modal epistemology

coherent with each other. We would like to have a satisfactory account of what makes modal statements true and how we know them to be true.

The difficulty is made especially acute in that most of the metaphysical modal theories that flourished in the 1970s and 1980s have developed in the wake of possible worlds semantics, without paying attention to epistemology. From such semantics, we have inherited the now deeply entrenched habit of giving truth-conditions for modal statements by quantifying over possible worlds. Possible worlds have, in fact, become almost indispensable nowadays: used in the meta-language of modal logic, they make sense of iterated modalities and provide an illuminating account of the validity of modal inferences; their expressive power seems even superior to that of modal operators. Similarly, a lot of theses in philosophy of mind, such as physicalism, mind-body supervenience and externalism, would be hardly intelligible without the possible-worlds idiom, not to mention philosophy of language, whose main theses and concepts are often put directly in terms of possible worlds (think for instance about the rigidity thesis or the distinction between intension and character).

For a lot of metaphysicians, the theoretical utility of possible worlds is a good enough reason to consider them otherwise than as mere heuristics. They argue that quantification over possible worlds must be taken at face value, thus embracing possible worlds realism, be it extreme [Lewis 1986] or actualist [Adams 1974], [Plantinga 1976], [Stalnaker 1976]. Possible worlds realism often goes hand in hand with a stronger thesis according to which possible worlds are the ultimate *truth-makers* of modal statements. In such a view, the truth-maker of “Socrates could have been killed at the battle of Potidaea” is not Socrates himself, his nature (the fact that it does not preclude Socrates being killed), nor one of his dispositional properties (being possibly killed). It must be founded in the very existence of a possible world in which Socrates, or one of his counterparts, is killed at Potidaea.

Albeit ontologically appealing, such views seem to make the problem of modal knowledge intractable. In Lewis’ strong realism, possible worlds are maximal mereological sums of spatiotemporally related concrete parts. *Ex hypothesi*, each world is causally isolated from all others, and this is particularly true of our world. Yet a possible constraint that weighs on knowledge is that it must rest on a causal link, even indirect, with its object, especially when it deals, as is the case here, with *concreta*. Now, if possible worlds have no causal influence on our cognitive lives, how can we ever come to know of them? Moreover, if modal statements have inaccessible truth-makers, how can we be justified in believing that they are true? Lewis retorts that all modal truths are necessary and that a

causal relation is not required in order to know necessary facts.¹⁶ However, this reply blatantly conflicts with cases of empirical necessities.¹⁷

Our epistemological concern does not dissipate if we fall back on a more moderate form of possible worlds realism. Suppose that we endorse an actualist view in which possible worlds are maximally consistent sets of propositions. Propositions are no longer defined, as in Lewis' account, as functions from possible worlds to truth-values; they are now more fundamental abstract intensional entities out of which possible worlds are made. If so, we fall into one of the instances of the problem Benacerraf formulated concerning the epistemology of mathematics [Benacerraf 1973]: abstract entities such as numbers, sets or propositions, being causally inert, do not have any impact on our cognitive lives, making our capacity to know them utterly mysterious.

In this volume, two attempts to take up the Integration Challenge in possible worlds style metaphysics will be discussed: David Lewis' explanationist strategy and Christopher Peacocke's principle-based theory of modality.

Lewis' point of departure is this: to the extent that causally isolated *possibilia* pose the same epistemological problem as *mathematicalia*, they call for the same solution [Lewis 1986, 190]. What paves the way to numbers is not causality but their theoretical utility: if our current best theory of reality involves mathematics and if it requires quantifying over abstract objects such as numbers or sets, then we are justified in believing that numbers or sets exist. Thus, their existence can be known by an *inference to the best explanation* (IBE).¹⁸ Note that, according to Lewis, theoretical utility does not merely give reasons to use numbers or sets: it justifies the belief that mathematical realism is true. This epistemic warrant conferred by explanatory virtues is what one is to expect if one takes IBE seriously as a knowledge-conducive method.

Lewis then applies the same line of argument to explain how we can know that modal realism (in its strong Lewisian form) is true. Strong modal realism outperforms its rivals regarding explanation—or so Lewis argues. First and foremost, it allows a reductive analysis of modality, something actualist realism

16. It is usually admitted that metaphysical modality verifies the axiom schemata $\Box\Phi \rightarrow \Box\Box\Phi$ (S4) and $\Diamond\Phi \rightarrow \Box\Diamond\Phi$ (S5). That's why Lewis holds that all true statements of the form " $\Box\Phi$ " and " $\Diamond\Phi$ " are themselves necessary.

17. Take for instance the non-modal statement "If Hannah Ayscough (HA) and Isaac Newton (IN) exist, IN is the biological child of HA." Assuming that origin is essential, this statement describes a fact which (i) is necessary, albeit knowable only empirically, (ii) concerns *concreta*. It should be obvious that the necessity of such a fact does not exempt us from needing a causal relation to know it. To accommodate such examples, Lewis has no choice but to embrace a strong form of two-dimensionalism in which all empirical necessities are 1-contingent.

18. This line of reasoning is close to the so-called "indispensability argument" for mathematical realism. Arguments by IBE must nonetheless be carefully distinguished from indispensability arguments, for the indispensability condition is much more demanding than the best *explanans* condition.

about possible worlds is unable to do given that it uses possibility as a primitive concept. Armed with the counterpart relation, Lewisian realism solves in an elegant manner some vexing puzzles, such as the paradox of material constitution or the modal versions of sorites paradoxes. Mostly, it offers a highly systematic account of intensional and epistemic notions, such as properties, propositions, knowledge and so on. All this provides the premises needed to conclude, by IBE, that strong modal realism is true.

Most modal philosophers think that something is amiss with Lewis' argument as its conclusion is simply unbelievable. One way to resist his explanationist strategy would be to dispute his right to use IBE inasmuch as every explanation lies on a causal relation, and causal relations are precisely absent in the case of Lewisian worlds. However, this objection collapses when it is pointed out that there are many non-causal explanations, including in sciences.¹⁹ More annoyingly, one may challenge the alleged explanatory superiority of strong modal realism,²⁰ or more drastically, reject the idea of IBE altogether [Van Fraassen 1989]. In "Modal Integration", Scott Shalkowski follows another line of criticism, first put forward in [Shalkowski 2010]. His purpose is to show that, even if IBE is a legitimate inference in scientific and ordinary contexts, it cannot provide warrant in metaphysical contexts, especially not in modal metaphysics. The core objection is to say that there are no grounds for thinking that IBE is reliable in such contexts as there are no *independent* ways to determine if IBE leads us to the truth. Shalkowski defends his "independence" objection against a recent attempt to rehabilitate the use of IBE in metaphysics by means of a reliabilist epistemology.

Let us now turn to Peacocke's principle-based account of modality, probably the most thorough attempt to reconcile possible worlds style metaphysics with epistemology. The crucial link between the two is through the *Principles of Possibility*, to which Peacocke assigns a dual-purpose. At the metaphysical level, these principles are what *makes* some worlds possible, namely those that conform to these principles. At the epistemological level, these principles are tacitly known by the very fact that one possesses the concept <possible> (in its metaphysical-absolute sense). Conjoining these two purposes, it follows that the mere competence for <possible> puts one in a position to know modal truths.

The overall metaphysics in which such principles operate is actualist: possible worlds are not huge *concreta* but sets of (Fregean) propositions. Contrary to what the term might suggest, Principles of Possibility do not impose constraints directly on possibility but on the more fundamental notion of *admissibility*, said of assignments. An assignment allocates to each atomic concept its appropriate extension: objects for singular concepts, functions from n objects to truth-values

19. For an example of non-causal explanation in science, see in particular [Lipton 2004, 31–32].

20. The literature on this point is profuse but one can find a valuable discussion in [Divers 2002].

for n -place predicative concepts, and so on. To each assignment corresponds its specification, which is the set of propositions true under this assignment. Hence, possible worlds are nothing but specifications of a certain kind, e.g., those that are genuine possibility (interestingly, this framework admits impossible worlds). We now come to the delicate point met by every actualist theory of possible worlds: what does the possibility of worlds—that is, of specifications in Peacocke's terms—consist in? Here comes the key notion of *admissible assignment*:

A specification is a genuine possibility iff there is some admissible assignment which counts all its members as true. [Peacocke 1999, 126]

Albeit indefinable explicitly, the concept of admissibility is implicitly defined by a set of Principles of Possibility, each formulating a necessary condition for falling in its extension—their conjunction being sufficient for admissibility.²¹ Two types of principles are distinguished. The first takes the form of a unique general principle concerning concepts, the Unified Modal Extension Principle (MEP):

Unified Modal Extension Principle. An assignment s is admissible only if: for any concept C , the semantic value of C according to s is the result of applying the same rule as is applied in the determination of the actual semantic value of C . [Peacocke 1999, 136]

As an illustration of MEP, an assignment would be counted as *inadmissible* if the concept of <bachelor> were not allotted the intersection of the extensions of <man> and <unmarried>.

The second type of principle consists of a *list* of “Constitutive Principles”, not claimed by Peacocke to be exhaustive. Constitutive Principles are metaphysically more loaded than MEP. They capture constraints that are not concerned with the nature of concepts but with the nature of objects, properties and relations. For instance, if a is a person who actually originated in the particular sperm b and egg cell c , then there will be a constitutive principle responsible for the essential character of a 's origin:

An assignment is inadmissible if it both counts the proposition a *exists* true and counts the proposition a *develops from b and c* as false. [Peacocke 1999, 146]

Next, Peacocke gives the truth-conditions for modalized thoughts:

Characterization of Necessity (Possibility): A proposition is necessary (possible) iff it is true according to all (some) admissible assignments. [Peacocke 1999, 150]

Combined with the theory of modal concepts possession, this principled account of modality provides a straightforward explanation of how we can know *de dicto*

21. This clause of sufficiency is stated by a second-order principle of possibility, the “Principle of Constrained Recombination” [Peacocke 1999, 149].

(by MEP) and *de re* modal truths (by Constitutive Principles). The gap between knowledge of modals and their truth-makers is easily filled once one realizes that modal judgments are drawn from tacit knowledge of those very principles responsible for their truth.

Peacocke's account gave rise to a number of criticisms, notably the recurrent charge of circularity. The complaint is that the concept of admissibility must involve an irreducible notion of possibility to account for modal truths [Sullivan 1998], [Rosen 2002]. Even if Peacocke, contrary to Lewis, does not seek to give a reductive analysis of modality, this circle nevertheless constitutes a threat to his epistemology as it requires a priori knowledge of which assignments are "possible" in a sense not accounted for by the theory.

Another objection is the charge of incompleteness. Modal knowledge, Peacocke says, is grounded on tacit knowledge of constitutive truths; but how did we come to know constitutive truths in the first place? For instance, how do we know that biological origin is constitutive of persons? This does not as such raise a circularity worry since Peacocke has it that constitutive truths are not modal in content, rather they have to do with the identity of a thing, *what makes it the thing it is*. Yet, the feeling remains that Peacocke's modal epistemology would not honor its agenda if it did not elucidate constitutive knowledge, in which modal knowledge originates [Heathcote 2001], [Wright 2002], [Roca-Royes 2010].

At first sight, the challenge is easily met insofar as Principles of Possibility implicitly define the concept <admissible>. This means that <admissible> denotes by definition the property of assignments that renders Principles of Possibility true. So, Principles of Possibility, and especially Constitutive Principles, cannot fail to be true. Moreover, the mastery of <admissible> simply consists in the tacit knowledge of principles defining <admissible>. Hence, the mere competence for <admissible> puts one in a position to know that Constitutive Principles are true.

Certainly, but this does not dissipate our concern since it does not exclude the following pessimistic scenario: suppose that our concept of absolute possibility operates exactly as described by Peacocke but that, as a matter of fact, principles that govern its use fail to capture the nature of things, either by default, or by excess. By default: there are constraints in the nature of things to which no principle corresponds. By excess: there are principles governing <possible> to which no constraint in the nature of things corresponds—imagine for instance that origin does not belong to the nature of things. If this were the case, it would mean that our concept of <possible> did not track the nature of things. Of course, as <possible> is implicitly defined by Principles of Possibility, all modal statements about origin, fundamental kind, and so on would remain *true*, and it would also still be true that we would know them. So, in a sense, Peacocke would nevertheless manage to explain modal knowledge. However, this knowledge would lose all its interest insofar as <possible> would be drained of its

metaphysical charge. Indeed, possibilities and necessities thus generated would be disconnected from the nature of things, in a way quite similar to “metaphysically blind” modalities such as epistemic possibility or logical possibility. The main task of modal epistemology is precisely to assure us that our concept of absolute possibility is, so to speak, “tuned” to the nature of things. Evidence for this external correspondence is what Peacocke cannot provide from the inside of his self-enclosed theory of modality.

In “Peacocke’s Epiphany”, Jon Barton examines another, but related, difficulty discussed in [Peacocke 1999] and [Wright 2002]. The trouble here is that, if truth in all possible assignments does not merely coincide with necessity but captures its target property, it has to be shown, by the means of Peacocke’s theory, that Characterization of Necessity (Chzn) seen above is not merely true, but necessarily so. Barton shows that the theory cannot provide the intended result. More precisely, he holds that, contrary to what [Peacocke 1999] suggests, the self-recursive application of MEP cannot establish the necessity of Chzn, or even its truth. At best, the necessity of Chzn must be accepted as a brute fact, knowledge of which has no explanation in Peacocke’s theory.

6 Counterfactual accounts of modal knowledge

The problem of integration is as much a problem for philosophical modal knowledge as for ordinary modal knowledge. In this section, we will address a problem affecting the former and present the strategy that seems the most promising to solve it: counterfactual approaches.

In the first section, we saw that philosophical modal knowledge differed significantly from ordinary modal knowledge by its object, i.e. modality taken in an absolute sense. It is thus very tempting to allocate to this special knowledge a *sui generis* faculty whose function is to detect metaphysical possibilities and necessities. Even though it has long predominated in the rationalist tradition, the hypothesis of such a specialized faculty is unfortunately implausible since it makes no sense from an evolutionary point of view. As [Williamson 2007, 136] reminds us, humans evolved under no pressure to do philosophy. Certainly, the existence of a capacity for ordinary counterfactuals can receive an evolutionary explanation insofar as it gives us a lot of advantages (like detecting causes, imputing actions, attributing dispositions. . .) that can explain why it was selected throughout our evolutionary history. Yet, knowledge of metaphysical possibilities and necessities seems to have played no role at all in the survival of our species. What is advantageous from the point of view of our survival is the capacity to conceive close possibilities that can easily obtain, such as the possibility of a source of water or the presence of a predator, rather than speculative possibilities such as the inverted spectrum or philosophical zombies.

The hypothesis of a “sense” of metaphysical modality being ruled out, two options remain: either we adopt skepticism toward philosophical modal knowledge or we show that this knowledge is anchored in ordinary modalizing. It is this last option that is favored by the champions of the counterfactual approach of modal knowledge [Hill 2006], [Williamson 2007]. According to them, philosophical modal knowledge does not rest on cognitive mechanisms isolated from those that allow us to know ordinary counterfactuals: it is only a by-product of the capacity to handle counterfactuals. This means that the epistemology of metaphysical modals is subsumed under the epistemology of counterfactuals.

One can distinguish four steps in the implementation of this project. The first is to link metaphysical modality to subjunctive conditionals. This is permitted by the following equivalences:²²

$$\begin{aligned} \text{(E)} \quad \Box\Phi & \text{ iff } \neg\Phi \Box\rightarrow\perp \\ \Diamond\Phi & \text{ iff } \neg(\Phi \Box\rightarrow\perp). \end{aligned}$$

According to (E), the fact that Φ is metaphysically necessary is logically equivalent to the fact that an inconsistency follows from the counterfactual supposition that Φ is false.

The next step is to give the counterfactual idiom an *explanatory priority* over metaphysical modality, in the sense that the former can explain some properties of the latter. In “What is Absolute Necessity?”, Bob Hale thus holds that counterfactual modality explains in what sense metaphysical modality is *absolute*, as opposed to relative modalities such as “technologically possible” or “biologically possible”. Most modal theories explain the contrast between absolute and relative necessities by means of the distinction between unrestricted and restricted universal quantification over possible worlds. Thus, it is absolutely necessary that $2^4 = 16$ because this statement is true relatively to all possible worlds without restriction. Whereas, if we say that the speed of an object with a mass cannot exceed c , this physical impossibility is only relative since only the subset of those worlds in which laws of physics hold is considered.

Hale rejects this traditional line of explanation. The main defect of the quantificational approach is to make of metaphysical necessity a relative notion, which seems highly counterintuitive. Indeed, as all logical necessities are metaphysical necessities but not the other way around, such a view commits us to say that metaphysical necessities only hold in a restricted sphere of possibilities, namely those metaphysically possible worlds that form a subset of the maximal set of logically possible worlds. Rejecting the quantificational approach and other candidates, Hale defines the absoluteness of metaphysical necessity

22. “ $\Phi \Box\rightarrow \Psi$ ” abbreviates “if Φ had been the case, Ψ would have been the case”. Equivalence (E) appears in [Lewis 1973]. [Stalnaker 1968] prefers: $\Box\Phi \text{ iff } \neg\Phi \Box\rightarrow \Phi$. While both use the $\Box\rightarrow$ operator in order to define $\Box$, they have never exploited these definitions for epistemological purposes. As noted by [Williamson 2007, 159] “[...] such definitions seem to have been treated as convenient notational economies, their potential philosophical significance unnoticed.”

by means of the counterfactual idiom. In his view, Φ is absolutely necessary because Φ *would obtain no matter what else was the case*; in symbols:

$$(\forall \Psi)(\Psi \Box \rightarrow \Phi).$$

This formula is provably equivalent to the one occurring in (E) seen above. In a sense, then, Hale keeps something from the quantificational approach since absolute necessity is characterized by an unrestricted quantification over propositions (or, alternatively, over statements). Relative necessities, such as those expressed when we say: “I could not come on time to this appointment” or “objects with a mass cannot travel faster than the speed of light” are explained by the fact that, when they are submitted to the counterfactual test, the antecedent is filled by a restricted set of propositions, namely those that hold in the contextually relevant possibilities. When combined with an essentialist theory of modality [Hale 2012], this generalized counterfactual analysis of absoluteness has the serious advantage of accounting for the distinction between logical necessities and non-logical metaphysical necessities, without relativizing metaphysical modality or introducing a dualism between logical possibilities and metaphysical possibilities in the whole space of possibilities.

An additional step consists in saying that metaphysical modality, and not just one of its properties (*viz.* absoluteness), is *reductively explained* by the counterfactual idiom. In such a view, (E) does not only state a logical equivalence, rather it gives the full *explanans* of metaphysical modality. If one intends moreover to explain how philosophical modalizing emerged from ordinary counterfactual practice, as is the case here, one must make a further step and claim that the *concept* of metaphysical modality originated from our capacity to handle counterfactuals (combined with our mastery of the concept of inconsistency).²³ From this, it follows that the epistemology of metaphysical modality is a special case of the epistemology of counterfactuals. It suffices that one knows that $\neg p \Box \rightarrow \perp$ to analytically infer that $\Box p$.

The success of counterfactual accounts depends on the correctness of (E). However (E) seems to be challenged by some counterexamples, in particular in cases of a posteriori necessity. Consider for instance a speaker who knows that gold has the atomic number 79 and who wonders what would have been the case had gold had a different atomic number. The speaker has to imagine scenarios that make true the antecedent of the counterfactual, and develop this assumption so that imagination proceeds as “realistically” as it can [Williamson 2007, 143]. It is notoriously difficult to detail the rules that a speaker must tacitly know in order to evaluate a counterfactual, but the following would be a good approximation: when evaluating a counterfactual “ $p \Box \rightarrow q$ ”, (i) add the antecedent p to what is known of the actual world, (ii) minimally revise background knowledge

23. We take this last step to be independent from reductive explanation since A can reductively explain B even if concepts required for entertaining B are not analytically tied to concepts exercised in entertaining A.

in order to preserve consistency, then (iii) use all available knowledge to check if q follows. Thus, in our example, the speaker must imagine a scenario that verifies “gold has an atomic number other than 79”, and then imagine away the fact that gold has the atomic number 79 in order to preserve consistency. From this, the speaker, using her background knowledge, can infer that gold would have shown different thermal and electrical conductivities, ductility, malleability, and so on from those that it actually has. But note the crucial point: it seems that however far the speaker pushes the development of the antecedent, she will *never* face a logical inconsistency. If the truth-conditions of counterfactuals reflect the methodological rule seen above, then the right hand side of (E) is false. However, the left hand side is true: it is metaphysically necessary that gold has the atomic number 79. Therefore, it seems that the use of counterfactuals cannot provide knowledge of metaphysical necessities, especially those that are not logical or conceptual truths.

Williamson is well aware of this difficulty. It originates from the fact that the rule of development of counterfactual assumptions given above is not sufficiently constrained. Condition (ii) must be reinforced in the following way: revise minimally the background knowledge in order to preserve consistency, *but never imagine away “constitutive facts”* [Williamson 2007, 164]. Good candidates for being constitutive facts are facts concerning microphysical structure, origin, kind-membership, material composition, and so on. If Williamson is right, our competence for ordinary counterfactuals presupposes a capacity to discriminate constitutive from non-constitutive facts. Constitutive facts must always be kept fixed when we develop a counterfactual assumption, even at the expense of an inconsistency. This is precisely how we are led to know metaphysical necessities: in the example of gold, condition (i) stipulates adding the assumption that gold has an atomic number other than 79 whereas condition (ii) forbids imagining away the constitutive fact that gold has the atomic number 79. The application of (i) and (ii) creates a contradiction, hence the conclusion that it is metaphysically necessary that gold has the atomic number 79.

The constraint stemming from constitutive facts is analogous to Peacocke’s Constitutive Principles and raises the same kind of difficulty. The risk is to make counterfactual accounts circular. Knowledge of counterfactuals can hardly explain knowledge of metaphysical modality inasmuch as the former presupposes the latter. Let us go back to our example: in order to infer an inconsistency from the assumption that gold has an atomic number other than 79, the speaker must first know that it is a constitutive fact—that must be kept fixed—that gold has the atomic number 79. To ignore this would lead the speaker to under-detect inconsistencies, and therefore to acknowledge more possibilities concerning gold than there actually are. The speaker must also know which facts concerning gold are *not* constitutive. Thus, it is not a constitutive fact that 8 500 m³ of gold have been mined throughout human history until now; believing the opposite would lead the speaker to over-generate inconsistencies, and therefore

to acknowledge more necessities concerning gold than there actually are. What does knowledge that a fact is constitutive consist in if not in modal knowledge? To say that it is constitutive of gold that it has the atomic number 79 is just another way of saying that this property is part of its essence, and essence is a modal notion. If the speaker was asked to explain herself, she would invoke counterfactual considerations such as “It is constitutive for gold to have the atomic number 79 because if a substance had an atomic number other than 79, it would not be gold” or “It is not a constitutive fact of gold that 8500 m³ of it have been extracted since we can easily imagine that half as much gold could have been extracted or even not at all”. Therefore, either knowledge of constitutive facts rests on counterfactual reasoning, in which case counterfactual accounts of modal knowledge are circular; or knowledge of constitutive facts is admitted as a brute epistemic fact, in which case counterfactual accounts fail too since they do not explain our basic modal knowledge, namely knowledge of constitutive facts. At best such accounts can explain how we *expand* our modal knowledge thanks to counterfactual reasoning, but they remain silent about its *origin*.

As embarrassing as this negative result is, it does not threaten the evolutionary respectability of philosophical modal knowledge. It keeps intact the core thesis of counterfactual accounts according to which our capacity to hold ordinary counterfactuals somehow involves a capacity to detect metaphysical modality, even if it rests on an unexplained sensitivity to constitutive facts. It is precisely this thesis that is targeted by Sònia Roca-Royes in “Essentialist Blindness Would Not Preclude Counterfactual Knowledge”. Roca-Royes wants us to imagine a speaker who knows (tacitly) all the development rules of counterfactual assumptions (i) to (iii) seen above, while ignoring rules concerning constitutive facts. This speaker is, so to speak, affected with *essentialist blindness*, to the point that she even lacks the concepts required to entertain contents such as “it is essential for *a* to be *P*”. Will this blindness preclude our speaker from knowing the truth of all the counterfactuals that are useful in everyday life, namely those that contribute to detecting causes, to explaining and predicting events, to imputing responsibility, and so on? Roca-Royes answers that it will not. At most, the blind speaker will be mistaken about *some* counterfactuals, those whose evaluation crucially relies on sensitivity to constitutive facts, in particular “counterpossibles”, i.e. counterfactuals whose antecedent describes a metaphysical impossibility. Consequently, our speaker will ignore metaphysical necessities concerning origin, identity, microphysical structure, and so on. She will also overestimate the number of remote possibilities. But for all the rest, her knowledge of counterfactual truths will be in all respects similar to ours. The lesson drawn by Roca-Royes from the fictitious case of essentialist blindness is that our capacity to handle ordinary counterfactuals does not bring with it a capacity for metaphysical modals. If the latter can be removed from our conceptual scheme without collateral damage, counterfactual accounts cannot appeal

to the evolutionary relevance of counterfactual reasoning in order to explain the emergence of essentialist thought and, a fortiori, the existence of a capacity for metaphysical modal knowledge.

If correct, this second objection is devastating for counterfactual accounts. Since it raises cognitive and evolutionary issues, it would be particularly interesting to confront it with results obtained in cognitive sciences. Indeed, some cross-cultural and developmental studies tend to show that a cognitive bias governs inductive generalizations and projections made by pre-schoolers [Gelman 2003]. It concerns natural kinds rather than individual objects. Conditions for kind-membership seem to be spontaneously identified with “hidden” properties that are responsible for clusters of correlated observable features. This poses a challenge to the position defended by Roca-Royes. Indeed, if such an essentialist thought has been selected for the advantages it provides to our inductive practices, it must therefore make a difference in the practice of *ordinary* counterfactuals, in particular those of the form “If x was/had been a K , x would present/have presented the property P ”.²⁴ This suggests that our capacity to hold ordinary counterfactuals would be severely impaired if essentialist thought were removed from our cognitive architecture. Does this not conflict with the thesis defended by Roca-Royes according to which our capacity to detect essential facts does not constitute a *core* capacity for counterfactual knowledge? The answer is far from obvious since several points need first to be clarified. One in particular is that we have no direct proof of this unarticulated essentialism. Cognitive scientists postulate it on a tacit level in order to explain the inductive behavior of pre-schoolers. It remains to be shown whether this tacit essentialism has enough in common with philosophical essentialism in order to claim that the second is anchored and can thus be explained by the first. These are difficult questions whose treatment deserves more space than we have here. Putting them aside, therefore, for another occasion, in what follows we will focus on the first objection against counterfactual accounts of modal knowledge.

24. The thesis according to which essentialist thought is an adaptive capacity must be taken *cum grano salis*. As Susan Gelman remarks “[...] essentialism is not a *single* adaptation, but the result of several distinct cognitive biases that emerged for varying purposes. In other words, essentialism *per se* was not specifically selected, but components of essentialism were” [Gelman 2003, 15]. Let it be also repeated that the fact that a cognitive mechanism has been selected does not in any way prove that it tends to produce true beliefs in wider contexts, particularly in philosophical theorizing. It is well known that folk essentialism brings with it many erroneous beliefs, not only about socially constructed categories, such as race, but also about natural kinds. People thus believe that kind-membership rests invariably on the sharing of intrinsic properties when evolutionary biology considers that biological species are individuated by relational properties, namely their phylogeny.

7 Knowledge of essence

This objection stated that counterfactual accounts are circular since our capacity to hold counterfactuals presupposes knowledge of some basic metaphysical necessities, namely those constitutive truths that must be kept fixed during counterfactual reasoning. We will maintain that this charge cannot hold inasmuch as our knowledge of constitutive truths is in no way a kind of modal knowledge. Even if it delivers our basic modal contents through subjunctive reasoning, neither its object nor its epistemology belongs *per se* to the modal domain.

Let us examine first its object. “It is a constitutive truth about a that Φa ” will be hereafter used to capture the old but vivacious pre-modal notion of essence or nature. Except for its factivity, it is intended to mean the same thing as “being Φ belongs to the nature of a ”.²⁵ The crucial point is that this notion of essence is not coined in modal terms. This view, in line with a long tradition running from Aristotle to the present day with e.g., [Fine 1994], [Lowe 2007] and [Hale 2012], considers that the notion of essence or nature is fundamentally characterized in terms not of necessity but of *identity*. In this sense, a being F is a constitutive fact about a iff a being F *makes a what it is*. By claiming that a property is a part of the essence of an object when it contributes to define it, we are assuming that definitions can be about *things* and not only about words. This seems to us to be no more obscure than the modal conception of essence that dominates contemporary metaphysics today. Those who despise definitions of things are primarily those who despise essentialism in general, be it formulated in terms of necessity or in terms of identity.

It is important then to carefully distinguish the concept of essence relevant for constitutive knowledge from the more widespread *modal* concept of essence, according to which the essence of an object is the set of properties that are necessary conditions for its existence. (8) is neither defined nor explained nor even equivalent to (9):

(8) It is a constitutive truth about a that a is F .

(9) a exists and necessarily, a exists only if a is F .

A connection certainly exists between constitutive facts and necessary facts to the extent that (8) implies (9); it is even crucial that such an implication holds if we want to explain how constitutive knowledge generates modal knowledge by interacting with counterfactual reasoning. However, the independence of constitutive facts toward modal facts is (in part) shown by the fact that the converse implication from (9) to (8) does not hold, as [Fine 1994] forcefully emphasized. For instance, it is necessary that, if Kripke exists, Kripke is numerically distinct from de Gaulle since they are actually numerically distinct and distinction is

25. If it is a constitutive truth about a that Φa , then Φa . But, it can be argued, someone can claim that being Φ belongs to the nature of a without committing herself to the existence of a , and so without implying Φa .

necessary.²⁶ Yet, it is not constitutive of Kripke that he is numerically distinct from de Gaulle. The distinction with the hundreds of billions of persons that have existed or that exist is not a part of his essence. Since constitutive facts about x imply necessary facts about x , but not the other way around, one may be tempted to believe that there will be many more necessary properties than constitutive ones. Albeit true, this claim requires more support than we can give it here, due to lack of space. Let it be sufficient here to say that, as the constitutive concept of essence is more constrained than its modal surrogate, necessary properties are abundant whereas constitutive properties are sparse.

One could argue against this proposal to emancipate essence from modality by pointing out that the failure of the implication from (9) to (8) shows at most that the notion of essence is too fine-grained to be captured by conditionals of the form (9), and this is entirely compatible with the fact that essence stays an intrinsically *modal* notion whose knowledge requires modal methods. Our response to this is that someone can attribute a constitutive property to an object by relying on purely *explanatory* considerations, without using counterfactual reasoning or thought experiments on remote possibilities. In order to be convinced of this, one only has to turn to science and examine the kind of methods used to isolate constitutive facts. Let us take for example number theory. It is a constitutive fact about 2 that it is the immediate successor of 1 in the $\mathbb{N}$ sequence. Mathematicians know that. By saying this, not only do we mean that it is a constitutive fact that 2 is the immediate successor of 1, and that mathematicians know this fact, we are also saying that they know that this is a constitutive fact about 2. In other words, mathematical knowledge brings with it a “frankly inequalitarian attitude” [Quine 1961] that separates constitutive facts about 2 from facts involving properties that, albeit necessary, are not constitutive of 2, such as the property of being the positive square root of 4. How do mathematicians distinguish here between what is constitutive and what is not? By knowing that if the number 2 is defined this way, this property, combined with Peano’s axioms (and with the definitions of the other numbers and operations), *explains* all the other properties of 2. Knowing what is constitutive of 2 results from explanatory considerations, and not from answers to modal questions such as “What would have happened if 8 were the immediate successor of 1 in $\mathbb{N}$?” or “Can we imagine a world in which 2 is the immediate successor of 5?” In this sense, knowledge of constitutive facts is *amodal*, in its content as well as in its epistemology.

This claim can be generalized, *mutatis mutandis*, to all empirical sciences such as physics, chemistry or biology. It has often been claimed, since Kripke, that science contents itself with discovering such amodal truths as gold having the atomic number 79, and that it is up to philosophy to say whether such a property is essential to gold, as if science were blind to the special status of this property compared to all the other properties of gold (ductility, thermal conduc-

26. I.e., $(a \neq b) \rightarrow \Box(a \neq b)$, where “ a ” and “ b ” are rigid designators.

tivity, etc.). If “essential property” is understood as a metaphysically necessary condition for existence, this claim is correct: physicists do not ask themselves whether gold could have had another atomic number, and there is no room for metaphysical modals in physics papers or manuals. On the other hand, if “essential property” is intended to mean a constitutive property that makes gold what it is, the claim is then false: “What is gold?”, “What is electricity?” or “What is light?” are *scientific* questions that require the constitutive properties of gold, electricity or light to be isolated, and the answers to these questions can be found without philosophical modalizing. In the case of gold, we have discovered empirically that having the atomic number 79 is constitutive of gold because this property explains the cluster of observable properties possessed by the samples that fixed the reference of the term “gold”. Once again, only explanatory considerations come into play to separate what is constitutive from what is not; modal reasoning does not play any role in this. If, as we maintained above, knowledge of constitutive facts does not presuppose a capacity to know metaphysical modality, we can follow Williamson in assuming the constraint of keeping fixed constitutive facts in counterfactual reasoning, without making counterfactual accounts of modal knowledge circular.

To conclude this sketchy defense of counterfactual accounts, we will address a last but important concern. Some might protest that, even if they show no circularity, such accounts deprive counterfactual reasoning of any interesting epistemological role; it becomes, so to speak, a mere registering chamber of what is delivered by our capacity to know constitutive facts. As soon as we know that water being H_2O , that persons having first-person thoughts or that knowledge involving true belief, are constitutive facts, it seems that the role of counterfactual reasoning is limited to reformulating this knowledge in a modal form, putting “It is metaphysically necessary that...” instead of “It is a constitutive fact that...”.

Modal knowledge then seems redundant vis-à-vis knowledge of constitutive facts. Now, if our capacity for the latter carries all the weight of the epistemic labor, in what sense do counterfactual accounts reveal anything of epistemological interest about metaphysical modal knowledge? Does this not come down to saying that interesting questions are not on the side of modal epistemology but on the side of the epistemology of constitutive knowledge? If this is indeed so, then counterfactual accounts do not advance us much. Much ado about nothing!

We reject this pessimistic assessment. Most modal truths are remote consequences, rather than mere reformulations, of constitutive truths, and one of the roles of counterfactual reasoning is precisely to help us discover them.

Let us take, for instance, the necessity of distinction: $(a \neq b) \rightarrow \Box(a \neq b)$. From our perspective, this is a substantial modal principle: since there is nothing in the nature of an object a that makes it so that it has to be distinct from another object b , it is not platitudinous to claim that two daughter cells could not have formed one and the same cell, or that two sibling species could not

have constituted one and the same species, while maintaining their identity. Yet, these modal truths cannot be drawn from the simple reformulation of constitutive truths. Thus, it is probably a constitutive fact about identity that it is a reflexive relation or that it involves indiscernibility. By keeping fixed such constitutive truths in counterfactual reasoning, one can immediately obtain the necessity of self-identity or the necessity of the indiscernibility of identicals, but one can never draw the necessity of distinction. How can we then get this substantial piece of modal knowledge? This is where counterfactual accounts are fruitful, by showing how the interplay of various constitutive truths plunged into counterfactual reasoning may result in new modal truths. In this case, the explanation proceeds as follows. First, from the trivial $(a \neq b) \Box \rightarrow (a \neq b)$ and from the fact that reflexivity of identity is a constitutive fact that must be kept fixed, we draw $(a \neq b) \Box \rightarrow ((a \neq b) \wedge (a = a))$. Suppose now that actually $a = b$. From the fact that “ a ” and “ b ” are rigid *de jure* in counterfactual reasoning,²⁷ one can infer that $(a \neq b) \Box \rightarrow ((a \neq b) \wedge (a = b))$, or in other words: $(a \neq b) \Box \rightarrow \perp$. From (E) seen above, it follows that $\Box(a = b)$. By discharging the supposition, we thus obtain the Necessity of Identity (NI): $(a = b) \rightarrow \Box(a = b)$. Next, it can be shown that the Brower principle (B) $\Diamond \Box \Phi \rightarrow \Phi$ is a theorem of logic of counterfactuals, as it is equivalent under (E) to $\neg(\neg(p \Box \rightarrow \perp) \Box \rightarrow \perp) \rightarrow p$, which follows from axiom schemata and inference rules for counterfactuals. From (B) and by distributing $\Diamond$ over (NI), we draw $\Diamond(a = b) \rightarrow (a = b)$, which is the necessity of distinction in its contraposed form.

This example, chosen amongst many others, shows how reasoning counterfactually on quite trivial constitutive truths can lead to substantial modal truths, such as the necessity of distinction, schemas (B), (S4) and (S5), and many specific modal truths about persons, mental states, and so on; and also—we conjecture—to much more controversial truths such as the necessity of origin. We saw that to achieve this, counterfactual reasoning must be constrained by constitutive truths that are known by other means. In a sense then, counterfactual approaches of modality do not tell us the truth of the matter. The elucidation of the ultimate source of modal knowledge requires them to be supplemented by an epistemology of the constitutive. However, this hardly calls into question their fruitfulness. It just reminds us that answering a “What is X?” question in philosophy, as well as in science, does not rely on modal methods alone. After all, the recourse to reflective equilibrium or inference to the best explanation has resulted in many partial but valuable answers to philosophical questions, without any need whatsoever for modal intuitions.

27. Notice that in counterfactual accounts, the rigidity of referential terms within the scope of $\Diamond$ and $\Box$ operators is a consequence of their rigidity in $\Box \rightarrow$ contexts.

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