THE INTERPRETATION OF NECESSITY AND THE NECESSITY OF INTERPRETATION

Much has happened in modal logic since 1947. In particular, in regard to the problem of interpreting such logics. In that fateful year Quine published his seminal paper “The Problem of Interpreting Modal Logic” from which this work takes inspiration. Since then a certain kind of model theory – universally referred to as “possible worlds semantics” – has come to dominate both advanced research and introductory textbooks. Many would say that the problem of interpreting modal logic has been resolved.

In the work below I argue that some of the 1947 problems raised by Quine have indeed been resolved by the possible worlds model theory. But I also claim – perhaps against common perception, but in line with Quine’s persisting fifty-year-old skepticism – that one problem of Quine’s original paper is still alive: the problem of interpreting modal logic. Surprisingly, Quine’s best ally on these matters turns out to be the very philosopher who engineered the possible worlds model theory: Saul Kripke.

I. THE HISTORICAL DEBATE

I.1. QUINE’S 1947 INTERPRETATION PROBLEM

Quine’s 1947 paper starts by saying:

There are logicians, myself among them, to whom the ideas of modal logic . . . are not intuitively clear until explained in non-modal terms.¹
As if in response to this complaint, in the late fifties logicians have sought to put modal logic on equal footing with the familiar non-modal systems. The idea was to extend to it a form of the Tarski-style extensional model theoretic treatment of first order logic. A leading example is the work of Saul Kripke. In 1959, Kripke proved the completeness of a certain formulation of the quantified modal system S5. In the introduction, as if he were consciously addressing Quine’s worry, he remarked:

It is noteworthy that the theorems of this paper can be formalized in a metalanguage (such as Zermelo set theory) which is “extensional,” both in the sense of possessing set-theoretic axioms of extensionality and in the sense of postulating no sentential connectives other than the truth-functions. Thus it is seen that at least a certain non-trivial portion of the semantics of modality is available to an extensionalist logician.

We might take Kripke to have provided the extensional, non-modal, explanation of modal logic that Quine had been asking for, thus bringing to a happy resolution Quine’s problem of interpreting modal logic.

Happy resolution? Not for Quine. Writing on the matter a decade later, by which time the possible worlds model theory had become the standard form of ‘interpreting’ modal logic, Quine persists in his skepticism:

The notion of possible world did indeed contribute to the semantics of modal logic, and it behooves us to recognize the nature of its contribution:
it led to Kripke’s precocious and significant theory of models of modal logic. Models afford consistency proofs; also they have heuristic value; but they do not constitute explication. Models, however clear in themselves, may leave us still at a loss for the primary, intended interpretation.  

Despite the advent of a model theory for modal logic, Quine suggests that his problem of interpreting modal logic is still simmering. So far, Quine has made a negative claim concerning the interpretation of modal logic, viz., model theory does not suffice to provide the intended interpretation. What then does? It is here that Quine formulates his positive conjecture – what does it is the doctrine of Essentialism:

Talk of possible worlds is a graphic way of waging the essentialist philosophy, but it is only that; it is not an explication. Essence is needed to identify an object from one possible world to another.

It is easy to misunderstand this last contention. Quine may be interpreted – indeed has been interpreted – as saying that the model theory of modal logic has essentialism built into it. This reading of Quine – the-model-theory-is-crypto-essentialist charge – launched a philosophical counter-project, led by R. B. Marcus and T. Parsons, aimed at proving quantified modal logic free of any commitment to essentialism. No invidious –
non-logical and inherently metaphysical – essentialist claim is a theorem of the familiar systems of quantified modal logic.

However, already in 1962, Quine had tried to dissociate himself from the-model-theory-is-crypto-essentialist charge:

I’ve never said or, I’m sure, written that essentialism could be proven in any system of modal logic whatever. I have never even meant to suggest that any modal logician even was aware of the essentialism he was committing himself to, even implicitly in the sense of putting it into his axioms. I’m talking about quite another thing–I’m not talking about theorems, I’m talking about truth, I’m talking about true interpretation.8

So, on my reading, when Quine conjectures that the semantics of modal logic intrinsically calls upon the doctrine of essentialism, it is in a different sense of semantics: the provision of the intended interpretation of the necessity operator.

I.2. TWO FUNDAMENTAL THESIS OF QUINE

As seen, Quine presented two connected charges against modal logic. First, the possible worlds model theory is very useful in exploring the notion of deductive consequence and in affording consistency proofs, but it does not provide the intended interpretation of the modal operators. This is Quine’s negative conjecture:
Quine’s second thesis is positive: the key to providing the intended interpretation for modal logic resides in essentialism. To capture the intended interpretation, we have to commit to some substantial theses about the subject matter at hand. In particular, he conjectures that we will have to espouse essentialism to get at the intended meaning of “necessarily”:

**[The Necessity of Essentialism]**

A necessary condition for providing the intended interpretation of the operator “necessarily” is the commitment to essentialism.

In the next section, we will focus on other, doubtlessly more notorious, charges of Quine against modal logic. This will help us differentiate those more familiar objections from the Insufficiency and Necessity theses.

I.3. QUINE’S THIRD GRADE CHARGES

In “Three Grades of Modal Involvement” (1953) Quine famously distinguishes three different grades of involvement with modal notions. At the first grade of involvement, we only allow for a meta-linguistic predicate of necessity that applies to names of sentences.
At the second grade, we make use of an object-language necessity operator modifying closed sentences, as, e.g., in propositional modal logic when we write ‘[ ]p’. Finally, coming to the third grade, in the context of quantified modal logic, we allow the operator to attach to open sentences. With ‘[ ](Fx)’ legitimized, quantification across the modal operator – ‘quantifying in’ – e.g., ‘(∃x)[ ](Fx)’, is syntactically well formed.

Quine’s criticisms of the third grade of involvement are familiar. They encompass two claims:

[The Logical Charge] Quantification across an operator is logically coherent only if the operator produces a non-opaque context, viz., one that allows the intersubstitution salva veritate of co-denoting singular terms. However, the necessity operator turns out to be opaque.

[The Metaphysical Charge] Quantified modal logic is committed to essentialism, viz., there is no semantics for quantified modal logic free of commitment to essentialist truths.

I.4. QUINE REBUTTED

The last thirty years have seen the rebuttal of Quine’s third grade charges. In “Opacity” David Kaplan has shown how The Logical Charge rests on a fallacy – the coherence of
quantifying across an operator is independent of the question of substitutivity *salva veritate* of singular terms in the operator’s scope. In spite of the substitutivity failure, we can give a coherent model theoretic interpretation, either in Kripke’s extensional style,\textsuperscript{11} or in Kaplan’s singular propositions style.\textsuperscript{12}

The Metaphysical Charge has also been defused. R. B. Marcus and T. Parsons on the one hand, and D. Kaplan on the other, have shown that, given a model theoretic approach, quantified modal logic is at most committed to a benign, i.e., logical, form of essentialism.\textsuperscript{13}

The maximal models of Marcus and Parsons are one early example of such ‘anti-essentialist’ model theoretic constructions. In such models, for every atomic property of individuals and for every individual, there is a world in which that individual bears that property.\textsuperscript{14} Another example is provided by Kaplan’s principle of the fungibility of individuals,\textsuperscript{15} which again refutes any essential predication of individuals, except for the benign logical form of essentialism, e.g., that Socrates is necessarily self-identical or red-or-not-red. Kaplan notices his philosophical affinities with Marcus and Parsons’s anti-essentialist project, while adopting a different methodology to refute Quine’s charges.\textsuperscript{16} Marcus and Parsons start by identifying the syntactic form of problematic essentialist claims, and proceed to prove quantified modal logic free of theorems of such a form. Kaplan instead extracts a benign notion of logical necessity from the models of first order logic. Given the compatibility of Kaplan’s logical necessity with quantified modal logic, this last is proved uncommitted to invidious essentialist claims.

Kaplan takes an additional step. He suggests that from this kind of anti-essentialist first-order model theory we could ‘read off’ an interpretation of a logical
necessity operator ‘[L]’. ‘[L]’ embraces (the necessitation of) logical truths. Insofar as individuals are involved, the operator verifies only essentialist claims of the benign, non-invidious kind, e.g., the above ‘Socrates is self-identical’ and ‘Socrates is red-or-not-red.’

I accept the availability of such a stipulated reading of ‘[ ]’. However, how does this stipulated operator apply to a variety of intended attributions of necessity? Some familiar essential predications, e.g., that Socrates is human – let alone that Socrates originates (essentially) in gametes X and Y – turn out to be, logically speaking, merely contingent. We may, of course, add some premises relative to which such predications become necessities after all. They will then not be absolute necessities like ‘Socrates is self-identical,’ but merely relative necessities.

This is how I read Kaplan’s introduction of the derivative notion of metaphysical necessity [M]. Given a set of relevant hypotheses H, we may think of ‘[M]A’ as shorthand for ‘[L](H→A)’. It is up to us which extra metaphysical hypotheses we want to assert. If none, then [L] = [M] (a case considered by Kaplan). We may then contemplate a variety of increasingly bolder extensions of the hypotheses set. Perhaps one such very bold extension will give us the full range of examples Kripke has described as ‘metaphysically necessary’ or ‘necessary tout court’.

This procedure provides one model of the relation between logical and metaphysical necessity: we first defuse Quine’s third grade problems, by showing [L] to be coherent. We may then add extra hypotheses to assert extra metaphysical truths. But interpretationally the fundamental move, both in refuting Quine and in providing the fundamental meaning of ‘[ ]’, has been made with the introduction of [L]. [M] is a subsidiary extension, an appendix for the aficionados of metaphysical speculation.
In what follows, I would like to suggest a different model, according to which [L] is derivative and the fundamental interpretation of ‘[ ]’ lies in something akin to [M]. On this approach, it is [L] that would be an artificial limit-case obtained by ‘generalizing’ over the fundamental notion of necessity, in such a way as to capture those necessary truths that are independent of the individuality of particular individuals or of particular categories of individuals. But, if this is our order of ideas, it seems that Quine’s worries are creeping in again. We need to supply a direct, non-reductive, interpretation of ‘[ ]’, viz., of ‘[M]’, that cannot be reduced to construction-‘tricks’ from Boolean algebras, model theory, state spaces of probability theories and other such calculated-in-advance spectra of points.19 Right from the get-go, we have to confront head on the intended metaphysical notion of necessity. When this is the task, Quine’s two worries – model theory is insufficient and essentialism is inevitable – seem real enough.

I.5. INTERMEZZO: CHARGES DISMISSED VS. CHARGES UPHOLD

The aforementioned work of Marcus, Parsons and Kaplan (henceforth ‘MPK’) successfully rebuts Quine’s distinctly third grade charges. Furthermore, I agree that an operator ‘[L]’ may be introduced and coherently stipulated to admit of meaningful quantification in, while allowing no essentialist theorems.

Another way of putting the present outlook is: quantified modal logic does not present further deep interpretational problems over and above those of propositional modal logic. Suppose an acceptable interpretation for propositional modal logic, making use of the extensional model theory, is available. I would then agree, following MPK,
that that model theoretic interpretation extends to quantified modal logic. We might put this idea in the form of the following ‘heuristic’ equation:

\[
\text{Model Theoretic Semantics of Quantified Modal Logic} = \text{Model Theoretic Semantics of Propositional Modal Logic + Model Theoretic Semantics of Non-Modal Quantification Logic}. 
\]

In a nutshell, if there are no interpretational problems with the second grade, the road to an interpretation of the third grade is clear.\(^\text{20}\)

We seem to be back in 1959. The extensional model theory answers some worries raised by Quine. But does it solve Quine’s problem of interpreting modal logic? Have we addressed the worries encapsulated in his Insufficiency of Model Theory and Necessity of Essentialism theses?

For the second time around, now in 1986, Quine remains skeptical about the alleged resolution brought about by the model theoretic work. We see him responding to Kaplan very much in the way he responded to Kripke in 1959, viz., acknowledging the meta-mathematics, but doubting the interpretational breakthrough:

A striking divergence between Kaplan’s intuitions and mine is keynoted midway in his section XVIII, where he writes that “some metaphysician may assert that all truths are metaphysically necessary . . . And it wouldn’t be an abandonment of modality.” \(I\ would\ not\ see\ what\ point\ the\ metaphysician\ was\ trying\ to\ make,\ for\ want\ of\ invidious\ distinctions.\)\(^\text{21}\)
I.6. **BACK TO QUINE’S TWO FUNDAMENTAL THESES**

To understand Quine’s conjectures concerning the interpretation of ‘[ ]’, let us consider two more familiar cases: first order logic, as a paradigm of a formal system we view as a logic, and first order Peano arithmetic (PA), as a paradigm of a formal system we view as a theory. In coming to interpret modal logic, do we face a conceptual situation similar to that faced when interpreting a logic, or rather similar to that faced when interpreting a theory?

In the case of first order logic, it is generally thought that Tarski’s model theoretic semantics is sufficient to provide the intended interpretation of the logical symbols. All that there is to the meanings of the logical connectives is given by the clauses in the truth definition. So, for example, the meaning of the negation sign is given by the truth clause according to which ‘∼A’ is true if and only if ‘A’ is not true, and the meaning of the universal quantifier is completely captured by the corresponding clause in the definition of satisfaction. It seems then that Quine’s Insufficiency thesis doesn’t apply.

*Idem* for Quine’s second thesis of Necessity. First order logic is often taken to capture some merely formal, ‘topic neutral’, relations that hold universally independently of the subject matter addressed. But, surely, if there is no natural specific subject matter, there is no place for the thesis that the intended interpretation of the connectives depends on reflecting some substantial truths about that subject.

Let us contrast this with the situation befalling theories, such as PA. I am thinking of this theory as aiming at axiomatizing the structural features of the numbers 0, 1, 2, and so on. In this case, we think that there is an antecedently given natural subject matter, the
arithmetical truths, that the axiomatization is meant to capture. To capture the arithmetical truths, we need to reflect ‘essential’ features of the natural numbers and of the arithmetical operations.

Necessity applies and in its wake Insufficiency applies too: the class of models satisfying PA doesn’t give us the intended interpretation, even in the weak sense of giving us one isomorphic class of models; but surely this last is a necessary condition for articulating the intended interpretation. (I do not raise here the question of whether this is also a sufficient condition.)

Of course, we might be interested in the class of all the models which satisfy the PA axioms, but this would not be a direct interest in the truths of arithmetic, rather a meta-mathematical inquiry of a certain class of structures. Aware that the class is a mix of structurally very different models, we might add some requirements to restrict it, hoping thus to capture the intended interpretation. We might, for example, add a requirement that every entity in the domain has only finitely many predecessors, or that ‘+’ or ‘.’ are assigned recursive functions. The addition of such constraints would vindicate the general idea behind Quine’s Necessity of Essentialism thesis: to get the intended interpretation, some substantial truths about the subject matter have to be asserted.

The resulting profile of a theory is very different from that of a logic. Theories are not topic-neutral: they are formal systems that reflect truths about antecedent target topics. Thus the specter of failure arises: the system may not articulate the intended interpretation.
Which way is it with modal logic? On my reading of Quine, we may well say that though we all speak of modal logics, these systems may well be modal theories. Like arithmetic, these systems are viewed by Quine as pursuing an antecedent subject matter, and so an intended interpretation, reflecting fundamental truths about the subject matter, has to be given.

We might articulate Quine’s view of modal logic in the very terms he has used to describe another such ‘logic’, viz., second order logic. Quine has famously characterized second order logic as “set theory in sheep’s clothing”:

Set theory’s staggering existential assumptions are cunningly hidden now in the tacit shift from schematic predicate letter to quantifiable set variable.

. . . The set theorist’s ontological excesses may sometimes escape public notice, we see, disguised as logic.26

I suggest that Quine’s position may be summarized by attributing to him the view that:

Modal Logic is Essence Theory in Sheep’s Clothing.

To interpret modal logic, essence theory – not model theory – is called upon.

II. MODEL THEORETIC VERSUS METAPHYSICAL INTERPRETATIONS
II.1. **Naming and Necessity: Two Frameworks**

When *Naming and Necessity* (henceforth *N&N*) appeared in 1972, it must have seemed to many that Quine’s suspicions about modal logic had finally been laid to rest. Led by his suspicions about interpretability, Quine was led to submit that all that the logical engineering of the 50’s and 60’s did was merely to “engender an illusion of understanding”. But now, in the conceptually informal *N&N*, the very philosopher who engineered the possible worlds model theory was coming back to clear away any misunderstanding engendered. And the clearing away had indeed the ring of finality. Kripke sharply identified a spectrum of ‘pseudo-problems’ about possible worlds and went on to dispose of them, making intuitive sense of ‘where’ the worlds were and ‘what’ they were made of. The road now seemed open for treating the model theory as an interpretation of necessity.

On this popular reading, we find in *N&N* a single interpretational framework, one I will dub ‘The Model Theory as an Interpretation’ (MTI). The MTI is the philosophical elucidation of the model theory provided in 1959 and 1963. What we get in the 1972 comeback is this: the nature of the possible worlds (merely a set of abstract points in 1963) gets clarified. In turn, some misconceptions that have taken root in the meantime (e.g., those of David Lewis and of the “Transworld Heir Lines” early Kaplan) are exposed. On this reading, once the nature of the possible worlds gets clarified, we shall see them as adequate in providing the intended interpretation of modal logic.

In what follows, I want to suggest a different way of reading *N&N*. This rich monograph contains, not one, but two conceptual frameworks. One is indeed the aforementioned MTI. But, in addition, *N&N* offers us a second interpretive framework,
one I will call ‘The Metaphysical Necessity Interpretation’ or, in short, MNI. I argue below that there is an inherent tension between the two schemes. In our quest for the intended interpretation, we have to make a choice.

II.2. The Model Theoretic Framework: The Dice

First, let us work our way through the MTI. Kripke produces a paradigm passage in this vein in his 1980 preface to *N&N*. He is there intent to set straight any remaining misunderstandings engendered by his use of possible worlds. The purpose of the passage is to show that questions of cross-world identity of individuals need not – indeed could not – be settled on qualitative grounds.

Kripke asks us to consider two dice of which he says:

There are some conceptions of ‘possible worlds’ that I repudiate and some I do not. An analogy from school–in fact, it is not merely an analogy–will help to clarify my view. Two ordinary dice (call them die A and die B) are thrown, displaying two numbers face up. For each die, there are six possible results. Hence there are thirty-six possible states of the pair of dice, as far as the numbers shown face-up are concerned, though only one of these states corresponds to the way the dice actually will come out. . . .

The thirty-six possibilities, the one that is actual included, are (abstract) *states* of the dice, not complex physical entities. Nor should any school pupil receive high marks for the question ‘How do we know, in the state where die A is six and die B is five, whether it is die A or die B which is
six? Don’t we need a “criterion of transstate identity” to identify the die with the six—not the die with a five—with our die A?’ The answer is, of course, that the state (die A, 6; die B, 5) is *given* as such (and distinguished from the state (die B, 6; die A, 5)).

Kripke starts with two objects (die A and die B) and six properties (showing number 1, or 2, and so on). A and B together with the six properties generate 36 possible outcomes. I agree that Kripke’s example is indeed a commonsensical description any elementary school pupil would provide. But is the dice’s story indeed a mere variant of Kripke’s controversial *a posteriori* metaphysical necessities for less ‘controllable’ subjects like Nixon, Queen Elizabeth II, the wooden table, the substance gold and the missing species of unicorns?

The example succeeds in at least two tasks it was designed to accomplish. First, it elucidates the nature of the possible worlds as abstract states of affairs, rather than physical entities. Second, we are shown that, if the worlds are conceived as abstract combinations of given materials, we do not need some criterion of trans-world identity, given in purely qualitative terms. Our question is: what view of necessity does the example rest on and, in turn, lend credence to?

To answer the above question, consider the term “given” as used by Kripke in describing the dice. Kripke says that each state of the dice is “*given* as such”. One thing Kripke might mean is that, when he describes a certain state as, e.g., “die A, 6; die B, 5”, it is given, stipulated, what individuals he is talking about, viz., A and B. This sense of stipulation concerns the subjects of the discourse. Let me call this kind of stipulation (or
‘givenness’) ‘The Stipulability of the Subject’. For example, if I ask you to consider whether Nixon could have been a horse, then I am stipulating that I am talking about Nixon and the property of being a horse. But stipulate as I may the subjects of my discourse, I cannot quite stipulate in the same breath that it is indeed possible for this one subject, Nixon, to bear the other stipulated item, the property of being a horse. After all, it does seem impossible that Nixon could have been a horse. At any rate, quite a different sense of stipulation – The Stipulability of Modal Predicates – would be called upon to make it possible for Nixon to have been a horse. It is not clear that – by Kripke’s own lights in the main text of *N&N* – even God could successfully stipulate: ‘Let Nixon be a horse.’ Exactly which kinds of stipulation and ‘givenness’ are involved in Kripke’s dice example?

Consider die A and the property of showing number 6 face-up. This is a ‘given’ combination specifying a certain possible state of the world, a (mini) possible world. If I operated in the same stipulative vein, perhaps I could just ‘give’ you the combination (the abstract state simply given in terms of its constituents) of Nixon’s being a horse. Suppose I now claimed that this is sufficient to make it a possible state of the world. In so claiming, I would not be relying on the innocent principle of The Stipulability of the Subject; I would be making use of the exceedingly strong principle of The Stipulability of Modal Predicates.

On my reading of the dice passage, Kripke is making use not only of The Stipulability of Subjects, but also of The Stipulability of Modal Predicates. In calculating 36 possible outcomes for A and B, Kripke relies on a stipulative maximum principle for
possibility – any combinatorial arrangement of the dice is deemed possible. What notion of possibility is Kripke relying on here?

The stipulated combinatorialism of Kripke places us back in our earlier discussion of the Marcus-Parsons-Kaplan maximal models and fungibility of individuals. This model theoretic maximization policy led to Kaplan’s notion of [L]. We take some given objects and properties. This much rests on The Stipulability of Subjects principle. Next, we apply The Stipulability of Modal Predicates principle – all the combinations of object-property pairs are declared possible. Notice that in proclaiming all such states as possible, we proceed purely *a priori*, before we know anything more – actual empirical facts – about the objects and the properties in question. Coming from Kripke’s pen, this must strike us as rather surprising: what has happened to all of Kripke’s *a posteriori*-based necessities?

Suppose that we applied the model theoretic telescope of the dice example to ordinary individuals, e.g., members of the Royal family. Consider then a mini-world of just these two individuals, Charles and William. Let it be ‘given’ (as in the assumption of the six-sided die) that at least one of them needs to be the father of the other. Proceeding combinatorially by the model theoretic telescope, the probability of William’s being Charles’s father is fifty percent – there is one possible state of the world in which Charles is the father of William, and one in which William is the father of Charles. However, this would contradict Kripke’s own metaphysical views. Looking at the actual world, we find that Charles is the father of William. This makes it absolutely impossible for William to be Charles’s father.
Like remarks may be made about the very dice Kripke discusses. In the example, they are discussed as ‘ideal’ geometric (topological) objects with six distinct faces. But in reality they are historical objects, with a certain origin and substantial make-up, e.g., they are of a certain chemical fabric; and it may well be that their being loaded is due to their own substantial make-up. Given these empirical facts, it may turn out that, of necessity, Kripke’s possibilities (A-5, B-6; B-5, A-6) are excluded; Kripke’s a priori probabilities (and spectrum of 36 possibilities) will have resulted to be metaphysically impossible. It thus seems that the model theoretic framework may stray away from the actual metaphysical possibilities open to these items.31

Kripke’s discussion of the dice rests on the logical-model theoretic notion of possibility. Confirmation of this may be found on yet another front where Kripke expressed trenchant metaphysical views in the main text of N&N. I have in mind here his theses regarding the necessity of origin. Such views regarding essence preclude a counterfactual situation that is isomorphic to the real world except that in it Julius Caesar bears all of Mark Antony’s features and vice versa. And yet, Kripke’s dice example proposes a framework that is receptive to what has been called ‘bare Haecceitism’, i.e., the possibility of qualitatively identical but numerically distinct individuals (and, in turn, worlds), e.g., the world A-6, B-5 and the world A-5, B-6. Such bare particular Haecceitism is the natural result of the combinatorial notion of logical necessity, itself ‘read off’ from the maximalist model theory. As I see it, when we approach things from a purely arbitrary model theoretic view – before external considerations creep in – the natural models are the MPK maximal models. In such structures, any object can have any (logically consistent) property. Thus qualitatively similar (isomorphic), but distinct,
combinations become possible. I believe this is no accident but part and parcel of the notions of (i) individual and (ii) possibility coming to us from the model theory.

In the model theoretic setting (for that matter, of ordinary non-modal quantification theory), we encounter two natural conceptions of ‘objects’. We may take the individuals of the domain to be point-like bare particulars that support any (logically consistent) qualities whatsoever. Alternatively, we may identify them with the bundles of the qualities proper. The first position is congenial to the logician, e.g., our earlier MPK and Kripke himself in the dice discussion. The second is the position of the hyperdeterminist, who can think of any property as essential to the object, because the object is reduced to the actual bundle of qualities.

The above concerns the point-like conception of individuals integral to the model theory. An analogous conception informs the model theory’s point-like ‘worlds’. Again, each such point may be seen in two ways. The first – promoted by Kripke’s 1963 mature model theory – views each world as a bare point of evaluation at which formulae are assigned truth values by valuation functions (this conception makes no property (proposition) intrinsic to the point). The second conception is the analogue of the aforementioned ‘bundle of qualities’ reduction, this time with propositions (facts, true sentences) making up the bundle.

It is often claimed that logic is metaphysically non-committed concerning its objects, worlds, or propositions. For example, the only requirement on Kripke’s set K of ‘worlds’ is that it be non-empty. We may think of the members of K as worlds, but logically speaking they can be any entities whatsoever; similarly for the individuals in the domain. Kaplan emphasizes the metaphysical innocence of logic:
The use of models as representatives of possible worlds has become so natural to logicians that they sometimes take seriously what are only artifacts of the model. In particular, they are led almost unconsciously to adopt a *bare particular metaphysics*. Why? Because the model so nicely separates the bare particular from its clothing. The elements of the universe of discourse of a model have an existence which is quite independent of whatever properties the model happens to tackle onto them. Suppose we want a model for the sentence of $L$ which asserts that there is exactly one thing and that it is a unicorn. . . . It is certainly not required that the single element of the universe of the model really be a unicorn. . . . [it] may be Jaakko Hintikka, or . . . it may be the null set, or singleton null. But, at any rate, it will be some definite entity which, in this model, is dressed as a unicorn. $^{32}$

Similarly Marcus:

Any set of n’tuples assigned to any predicate will define models on the structure. On such an unconstrained interpretation, a silk purse in one world may be a sow’s ear in another. But it is a misreading of the picture to conclude that what we are therefore *committed to* is an ontology of bare particulars . . . In its unconstrained version, what we have is a theory which can give us an account of the logical modalities. Logical possibility
and logical necessity are indifferent to all but the logical features of things.

But we need not therefore conclude that things have only logical features…

Surely any object can function as a world in a modal structure, but the reason it can so function is that its own (intrinsic) features are completely irrelevant for the purpose it serves in the structure. Aside from its self-identity and distinctness from other worlds, all that matters for logical purposes is which valuation function is associated to it (questions of accessibility aside). Similarly for individuals: The null set can be taken as a unicorn in some model only because we are abstracting from its non-logical features.

However, once the individuals are taken in abstraction of all but their logical features, the model theory dictates that they are open to many (logical) possibilities. And so it becomes logically possible for Nixon to be a turnip. But whose possibility is this? If not of the real man Nixon prior to the abstraction of his manhood, then the post-abstraction model theoretic Nixon simply cannot be the real Nixon.

If the model theory is only taken to abstract away some of Nixon’s actual features in order to sift his actual logical traits and set them apart from the non-logical, Marcus’s point is unobjectionable. However, once the model theoretic sieve is used to dictate on the modal too, it ends up attributing to Nixon the logical possibility of being a turnip. Is this so-called ‘logical possibility’ a real possibility for Nixon? If not, if Nixon simply cannot be a turnip, then either (i) Nixon-in-the-model is not the real Nixon, or (ii) logical possibilities are not real possibilities.
Assuming it (simply) impossible for Nixon to be a turnip, ‘Nixon is a turnip’ is indeed a logically consistent sentence. One may for this reason call it a logical possibility, in which case logical possibility just amounts to consistency. If, on the other hand, one requires that logical possibilities be real possibilities, then Nixon-in-the-model (Nixon-in-abstraction) just isn’t Nixon.

My claim on the point-like nature of model theoretic entities rest on the assumption that logical possibilities are real possibilities and on my granting to MPK a view of necessity/possibility, not simply revised logical talk. Insofar as the conception of model theoretic entities I argue for rests on such assumptions, I wholeheartedly grant that it is not merely motivated by the model theory, prior to any modal reinterpretation of its results.

I would indeed also argue that outside the logical-model theoretic framework, such conceptions – be they of individuals or worlds – are not natural at all. An ordinary man like Nixon is, as Kripke himself says eloquently “neither a bare particular nor a bundle of qualities”. Analogously, this world of ours, the real world, is neither a bare point (at which any valuation function can evaluate sentences at will) nor a bundle of facts (propositions), in which case the slightest change – from my standing to my sitting – would make it into another, numerically distinct, world.

Let me summarize Kripke’s discussion of the dice example. I see it as promulgating a paradigm of the MTI approach to the understanding of necessity. Fundamental tenets of this logical, model theoretic framework are:

(a) All the model theoretically consistent combinations are possible;
(b) The objects of the set theoretic models – both individuals and worlds – are either bare particulars or bundles of qualities;

(c) We practice what Quine might have called ‘semantic descent’ – the meta-language span of structures (needed to analyze validity) is projected down to determine the intended interpretation of the object language ‘[ ]’.

(d) The spread of model theoretically calculated possibilities for \( x \) is logically prior to \( x \)’s actual state;\(^{34}\)

(e) Being logically prior to \( x \)’s actual state, \( x \)’s model theoretical possibilities are epistemologically prior to information about \( x \)’s actual state, hence known \textit{a priori};\(^{35}\)

(f) Bare Haecceitism, i.e., qualitatively identical but numerically distinct individuals and worlds, become possible;

(g) All necessities and possibilities have a \textit{de dicto} source.\(^{36}\)

II.3. \textsc{Internal vs. External Questions: Identity vs. Reduction}

I would like to introduce the second framework – the MNI or Essence Theory – by attending to an emblematic passage of \textit{N&N}. It distinguishes clearly between model theoretical and interpretive concerns. Kripke is here addressing the notion of ‘identity across possible worlds’. His own comment is that such a notion is misleading:

\[\text{[Misleading], because the phrase suggests that there is a special problem of ‘transworld identification’, that we cannot trivially stipulate whom or}\]
what we are talking about when we imagine another possible world. The term ‘possible world’ may also mislead; perhaps it suggests the ‘foreign country’ picture. I have sometimes used ‘counterfactual situation’ in the text; Michael Slote has suggested that ‘possible state (or history) of the world’ might be less misleading than ‘possible world’. It is better still, to avoid confusion, not to say, ‘In some possible world Humphrey would have won’ but rather, simply, ‘Humphrey might have won’. The apparatus of possible worlds has (I hope) been very useful as far as the set-theoretic model-theory of quantified modal logic is concerned, but has encouraged philosophical pseudo-problems and misleading pictures.37

At the beginning of this passage, Kripke addresses the question of the identity of objects across possible worlds, a question internal to the possible worlds model theory. It is because Kripke views the identity question in this way, that he can claim that there is no problem of identity across possible worlds, at least no problem that cannot be solved by simple stipulation.

On the other hand, when, in the central part of the passage, he faces the interpretive question, Kripke suggests that we would be better off without mention of possible worlds at all. The interpretation question is now seen as external to the model theory. Concerning the non-reducibility of the interpretive question to the internal model theoretic perspective, Kripke remarks just a few pages earlier, in the new 1980 preface:
I do not think of ‘possible worlds’ as providing a *reductive* analysis in any philosophically significant sense, that is, as uncovering the ultimate nature, from either an epistemological or a metaphysical point of view, of modal operators, propositions, etc., or as ‘explicating’ them.\(^{38}\)

To clarify the distinction between the identity question internal to the model theory, and the external question of whether the model theory can provide a reductive analysis of interpretational matters, let us consider one other case: first order logic.

There clearly is no identity problem internal to Tarski’s model theory of predicate logic. When we consider a model \(M\) and an individual \(a\) in its domain (say \(a\) is a value to be assigned to the variable in the open sentence \(Fx\)) we do not ask: but how do we know that this item in \(M\) is the very individual \(a\) assigned to \(Fx\) when we evaluated that formula at the model \(M^*\)? We simply are given that \(a\) is the value of \(x\) and, on this stipulated assignment, we evaluate \(Fx\) at \(M\). In predicate logic, we do not worry about an alleged trans-model identity problem. However, resolving trans-model identities by stipulation does not in itself provide a solution to interpretive questions. For example, a question discussed about predicate logic in recent years is the adequacy of Tarski’s ‘analyses’ of logical truth and consequence in terms of models. In resolving the internal trans-model identity problem we do not thereby resolve the external question of whether ‘logically true’ is really analyzed in terms of ‘true in all models’.

Let us recall the earlier ‘heuristic equation’ I proposed in discussing MPK’s work:
Model Theoretic Semantics of Quantified Modal Logic = Model Theoretic Semantics of Propositional Modal Logic + Model Theoretic Semantics of Non-Modal Quantificational Logic.

We may use the equation to further Kripke’s point about the internal problem of trans-world identity. It is at the level of quantificational logic that issues of identity arise. There is no trans-model identity problem in quantificational non-modal logic. If we now assume our equation, we are on our way to accepting Kripke’s observation – there is also no identity problem in quantificational modal logic. Model theoretic identity questions are solved by stipulations, regardless of whether we add modal operators to our logic.40

The general moral I draw is this. The absence of model theoretical problems of identity is not a guarantee that the model theoretical apparatus provides a genuine interpretation. This leaves us with the following question: if the model theory does not supply it, where does the intended interpretation come from? Quine suggests that it comes from an essentialist metaphysics, which grounds necessity in essential features of entities. In what follows, I broadly review some of Kripke’s ideas about the intended essentialist interpretation of necessity (the MNI).

II.4. THE METAPHYSICAL FRAMEWORK

As seen, it is possible to bypass Quine’s concerns about interpretability by giving a model theoretic interpretation of necessity. Moreover, as its proponents are well aware, such an interpretation has the advantage of benignity – only non-controversial logical truths get necessitated. Is this however what Quine intended by “true interpretation”?
As Quine promptly noticed benignity is the mark of many an interpretation whose starting point is semantical:

When we modalize logical truth into logical necessity by shifting from a predicate of sentences to an operator on sentences, essentialism supervenes. It is a benign essentialism, Kaplan urges, in that whatever is essential to one object is essential to all. There is no gainsaying its benignity, as essentialism goes. The same could be said of a modal logic based not on logical necessity but on its chemical, economic, or ornithological analogue. Most of the interest that modal logic has commanded, however, hinges rather on a notion of metaphysical necessity . . . and this course is committed to invidious essentialism, as Kaplan calls it, in which an essential trait of one object can be an accident of another. Moreover, it is this pattern, rather than the benign one, that I see as useful and customary in daily discourse . . .

In Quine’s eyes the benignity of Kaplan’s logical necessity resides not so much in its necessitating only logical truths, rather in the universality of the necessitated claims (but then ‘If x is a bird, then x has hollow bones’ is as universal as it gets). Implicit is also the charge of reductionism: ‘Socrates is necessarily red-or-not-red’ is just the modal translation of ‘“Socrates is red-or-not-red” is a logical truth’.

In what follows I would like to develop this last point of Quine. The key to a non-reductive interpretation of necessity lies in abandoning any semantic notion, be it truth in
all models or economic truth, and latch on instead to the entities that make up such truths. Once this is our starting point, we have to select – and of course Quine would ask on what basis – the necessary truths among others. The unavoidable mark of a real interpretation is an invidious selection of necessary truths. Such a selection is unavoidably invidious insofar as it might well end up distinguishing among the truths of one and the same kind (even logical) those that are necessary from those that are not. Naturally, this need not happen, and one might perhaps end up necessitating all and only the logical truths. But there is no a priori guarantee of such a benign outcome, which would have to be reached on the basis of some peculiar metaphysical views.

II.5. THE LOGICAL PRIORITIES OF A METAPHYSICAL INTERPRETATION: ACTUALITY FIRST

In a formal framework, where the starting point is logical/model theoretic truth, logical necessity, i.e., truth in all models, is logically prior not only to metaphysical necessity but also to actual truth, or at least to its formal representation as truth in the model representing the actual world. We see this very clearly in the above mentioned Kripke’s model structure where any arbitrary set K of worlds is given prior to a choice of the G-world. First we have truth in all worlds/models, then we select a world/model isomorphic to the real world to represent actual truth. This logical priority has an epistemological consequence: necessary truths – independent as they are from actuality – are known a priori, viz., prior to any knowledge of actual truths.

In a metaphysical interpretation the opposite logical priorities reign. The actual non-modal truth – and incidentally not a model theoretic representation thereof – supplies the primal basis. Then necessities are determined from this primal basis, viz., a necessary
truth is an actual truth that in addition is… . The reverse logical priorities lead to reverse epistemological priorities: there is no guaranteed *a priori* knowledge of necessities, not unless the non-modal truth is itself known *a priori*.

Necessary truths are determined from the non-modal truths: How does the determination work? In his philosophical work Kripke shows how the metaphysical approach proceeds. In “Identity and Necessity” Kripke proposes a certain mechanism for the grounding of necessary truths. He displays a form of argument that is an instance of *modus ponens*:

\[
P
\quad \rightarrow \quad [ ]P
\]

We may call this mechanism ‘Kripke’s Mechanism of Necessity Projection’ (in short, KM). We are given a non-modal truth P about a given subject, e.g., that this table is made of wood. Given the particular identity of the individuals and properties involved in P, we have ground to necessitate P. We then detach and conclude: P is necessary.

Let me bring out this determination by way of some familiar examples. Consider the Roman orator Cicero. It may perhaps be ‘given’ in a dice-like manner – before any reference to actual facts – that he is necessarily self-identical (at this juncture, I ignore how we are given this man’s actual existence, a question which, as shown below by
Kripke-on-unicorns, is anything but trivial). However, what about the ‘identity statement’ (Kripke’s phrase) ‘Cicero is Tully’? Here there is no bypassing of (historical) facts of actuality. Only given the pertinent fact of actuality (P, in the above KM scheme), is the necessity of P determined.

Other Kripkean conjectures all seem to follow the same pattern: something has to hold in actuality prior to holding of necessity. For instance, consider what Kripke tells us about origin and substantial make-up. This table is necessarily wooden because actually wooden. Had it been – per impossibile – made of ice, it would have been necessarily so. Also, the table actually came from a particular block of wood, and hence could not have come from a different block of wood.

I mention now two other such surprising examples of the priority of actuality in the determination of necessity. One application regards mathematical necessities. This is an interesting case because when it comes to mathematical necessities it might seem that the formal and the metaphysical approach will agree in extension. But agree in extension as they may, the grounding of the necessity proceeds in opposite ways. Discussing Goldbach’s conjecture, Kripke makes it clear that the truth of the conjecture has to be given prior to its necessity. Goldbach’s conjecture is necessarily true, if true. When it comes to necessitation, mathematical truths are on a par with empirical truths. As a consequence, according to Kripke, we might never know a priori that Goldbach’s conjecture is true; if for example the proof were too complex for humans to provide on their own and computers had to be employed in the task.

A second interesting example Kripke mentions is that of missing objects or species. Given that there are no unicorns, Kripke submits that we are barred from
asserting that there might have been unicorns. The actual lack of the relevant item takes away the ground for possibilities and necessities: no unicorns, no possibilities for ‘them’. At most there are some general possibilities, that something having certain characteristics, as detailed as you like, might have existed. But this is not a possibility for a particular species:

[I]t is said that though we have all found out that there are no unicorns, of course there might have been unicorns. Under certain circumstances there would have been unicorns. And this is an example of something I think is not the case. Perhaps according to me the truth should not be put in terms of saying that it is necessary that there should be no unicorns, but just that we can’t say under what circumstances there would have been unicorns.\textsuperscript{50}

We see in the case of unicorns that the lack of the relevant non-modal fact P – unicorns really exist – precludes the availability of modal facts – possibly there are unicorns.\textsuperscript{51}

The case of a missing substance or species is very instructive on the epistemological front too. To interpret ‘There might have been unicorns’ we have first to provide the species unicorn: no species, no interpretation for the term ‘unicorn’ and in turn for the sentence ‘There might have been unicorns’. This is a first step where a posteriority strikes; it concerns the subjects available for interpretation: once we do not operate on definitions, rather on the subjects themselves, there is no way of knowing \textit{a priori} that they might have existed. Secondly, a posteriority applies to which predicates are borne by which subjects. In the lucky cases where the relevant thing is supplied and
we have an interpreted sentence to evaluate, as for example in ‘Necessarily whales are mammals’, we still have to check the relevant facts about whales, and here too a priority is barred.

Consider now how the Kripke 1963 possible worlds model theory is set up to deal with such suggestions. In the model theory, it is natural that the worlds be all ‘given’ (recall the dice) before any ‘looking’ as to which point is the actual world. This alone creates tension between the model theory and the determination of possibilities from actuality. Next, given that the set K of worlds is given prior to a choice of the G-world, there is no internal reason why the domains of different elements of K should depend on that of G. As a result, domains of individuals that are merely possible are admitted. In this way Kripke is able to construct in 1963 a counter-example to the ‘Barcan Formula’:

\[(BF) \quad (\forall x)[ \Box Fx \rightarrow [ \Diamond (\forall x)Fx] \]

Kripke considers a structure with two worlds, the actual G point and one possible world H extending it. The domain of G is the individual a which is F (and thus all things in G are F). The domain of H is the set \{a,b\}. a is still F at H and so we get that the antecedent of (BF) is true at G. But the consequent is false. It is false because (\forall x)Fx is false at H. And this last is false because the new individual b – a mere possibilium from G’s point of view – is made to be not-F at H. Here then the model theory makes use of merely possible individuals that the metaphysics seems to bar. Thus the question arises whether this world H is (as Quine suggested) a mere model theoretic device designed to
witness consistency (useful in showing the independence of (BF) from quantified modal logic) or rather a genuine possibility, a way G might have been.

Such questions move us from the model theoretic set-up to the MNI framework. I will, for the sake of the present point, suppose that the MNI allows, on top of the actual world G, a plurality of other objects falling under this count noun (‘world’). It now seems that if we operate by the necessity projection mechanism, G determines K. Hence, in line with Kripke’s remarks about the non-availability of a possibility of unicorns, we may wish to reconsider the free and easy deployment, by the 1963 model theory, of possible individuals. It now seems that, though the above world H employed in the counter-example to (BF) may be model theoretically useful, it still might not depict a metaphysical possibility. The lesson to be learned is that we need to proceed cautiously as we move from model theoretic constructions to the assertion of possibilities.52

II.6. THE INTERPLAY OF LOGICAL AND METAPHYSICAL NECESSITY

Let us consider how logical and metaphysical necessity are connected in the MNI picture.53 In the MTI, logical necessity is the starting point; metaphysical necessities are conditional to extra-logical assumptions. Hence, logical necessity turns out to be a stricter form of necessity than metaphysical necessity. The logical necessity of P leaves no room for the possibility – not even for the metaphysical possibility – of not-P. Instead the metaphysical necessity of P leaves open the logical possibility of not-P. The assumed metaphysical necessity of ‘Socrates is human’ leaves open the logical possibility of Socrates’s not being human. This is the dominant, received view of the interplay between
I want to contrast the above picture with the kind of unification of \([L]\) and \([M]\) that an entity-based metaphysical interpretation supports. A metaphysical interpretation proceeds from actual truth to necessity. We start from truths, some of them logical, some economical, etc., then we have an independent ground for their necessitation (represented by the second step of Kripke’s projection mechanism). Some truths project into necessities, some don’t.

When it comes to the unification of \([L]\) and \([M]\), it is brought home by the fact that we have only one mechanism of necessitation (Kripke’s KM). As I mentioned already, Kripke speaks of necessity *tout court*. Particular kinds of necessities are just necessities of certain kinds of truths. In particular, logical necessities are a special class of necessities closed under universalization (because such a closure is the mark of logical truths). They are absolute necessities that hold of all objects \(qua\) objects and all properties \(qua\) properties.

When we operated in the model theoretic mode, with validity as our starting point, there was no possibility of getting a gap between the notions of logical truth and of necessity (both formally conceived).\(^{54}\) In an entity-based interpretation instead a new thing happens: we move from actual truth to necessity, and being a truth of a certain kind is not by itself enough to guarantee necessitation. This makes it inevitable the separation of logical truth from (even logical) necessity. Not all logical truths need be logical necessities. And even if it were the case that all and only logical truths happened to

logical and metaphysical necessity: The logical space of possibilities is larger than the metaphysical span.
project into necessities, still it would not be *qua* logical. There would be no reduction of the notion of necessity to logical truth.

Whether it is a logical or a non-logical truth to get projected into a necessity, the projection, the necessitation, is the same in both cases. We have one unique notion of necessity. If we want to call a necessity ‘botanical’ it is only to mean that it is a botanical truth that is also necessary. The same holds for logical necessities. They are logical truths that are also necessary.

Once we operate with an independent notion of necessity, logical truth is not guaranteed to be either necessary or sufficient for necessity. That is why we may have not only necessities that are not logical, but also logical truths that are not necessities. This is the case because the notion of necessity of the MNI framework does not guarantee the necessitation of all the truths of a certain kind, e.g., logical. Hence, it remains to be seen whether the notion of logical truth guarantees necessity. It may or it may not. However, if it does it’s because of the nature of logical truth, not of necessity.55

In the MNI framework [L] implies [M] too,56 but in this case simply because all necessities (including logical necessities) are just that: necessities. On the other hand, necessities need not be logical necessities, in the sense that the projected truth need not be logical. However this leaves no possibility, not even logical, of the opposite holding. The simple necessity of P makes it absolutely impossible for not-P to hold. Sure enough the ground of the impossibility of not-P is not logical (if P is not a logical truth/falsehood neither is its negation), but this does not mean that there is space for a logical possibility of not-P (no matter how much model theoretically consistent not-P is).
To sum up our discussion, the following are the characteristic features of a metaphysically grounded interpretation of necessity:

(a) Model theoretical consistency is not in itself sufficient for possibility – not even for logical possibility;

(b) The objects of a metaphysical interpretation are real objects, neither bare particulars nor bundles of qualities;

(c) Bare Haecceitism is excluded;

(d) We practice no ‘semantic descent’ – a direct interpretation of the object language ‘[ ]’ is our starting point;

(e) x’s actual state is logically prior to x’s real span of possibilities;

(f) Being logically posterior to x’s actual state, x’s real possibilities are epistemologically posterior to information about x’s actual state;

(g) All necessities and possibilities are ultimately de re (where the res might be an individual, a species, a property, etc.).

III. CONCLUDING THOUGHTS

Since 1947 the theme of the interpretability of talk of necessity has remained a recurring theme in Quine’s thought. In this work I have argued that, despite their different philosophical dispositions, when it comes to necessity Quine and Kripke (when providing the MNI) agree on fundamentals: first, negatively, they both regard the model theory as insufficient for articulating the intended interpretation of ‘necessarily’; second,
positively, they both conjecture that a full-fledged, non-reductive interpretation has to embrace essentialism.

Under the heading of the insufficiency of the model theory, I have articulated two claims. First, the possible worlds belong to the model theory of modal logic and as such are useful for evaluating the consistency and independence of modal statements, but not for interpreting them; second, a logical interpretation of necessity which regards as necessary all and only the validities of a certain type (e.g., first-order validities) is reductive.

Concerning the necessity of essentialism conjecture, I have articulated it as the claim that (setting aside epistemic readings) an interpretation of the modal operators has to find its source in essential predications of real entities. It follows from this that the interpretation of the modal operators is grounded in actual truth. Moreover, such an interpretation is inevitably invidious (in a sense which has been specified). And so I would like to propose the following Quine-Kripke Conjecture:

(QK) An interpretation of ‘necessarily’ (or ‘[ ]’) has to be grounded in actual essential predications: whereby some but not all truths are metaphysically necessary.

This brings us back to Kaplan’s claim that nothing in the notion of metaphysical necessity prevents the necessitation of all truths. This hyper-determinist position “would not be an abandonment of modality”. While we may concede that the notion of necessity in and of itself does not break down under the hyper-determinist stretching, the same may
not be granted for essentialist metaphysical necessity. If the grounding notion of essence breaks down under the two extreme positions that all features or no features of an object are essential to it (recall Quine’s “I would not see what point the metaphysician was trying to make for lack of invidious distinctions”), then metaphysical necessity breaks down with it (barred revisions on the notion of object).

When we so unify Quine’s and Kripke’s positions we go back full circle to Quine’s 1947 claim that “the ideas of modal logic are not intuitively clear until explained in non-modal terms.” As we have seen above, the logical tradition has read in this claim a quest for a reduction of necessity to a notion of non-modal truth, but has identified the latter with an idea of formal truth, viz., truth in all models. In my view however, Quine’s pursuit of a non-modal basis points to the just articulated conjecture (QK) that an interpretation of necessity be grounded in essentialism.

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5 Cf. “Three Grades of Modal Involvement”, where Quine characterizes essentialism as asserting that for some open sentences ‘Fx’ and ‘Gx’, the following holds: (∃x) ([ ]Fx ∧ Gx ∧ ¬[ ]Gx).


9 This second thesis is positive insofar as it identifies what is required of an interpretation. It may be seen as negative given that it restricts the field of admissible interpretations.

Cf. S. A. Kripke, “A Completeness Theorem in Modal Logic”.


Cf. R. B. Marcus, “Essentialism”; T. Parsons, “Grades” and “Essentialism”; D. Kaplan, “Opacity”, part C. Kripke, as we shall see, will have his own way of defusing The Logical and Metaphysical Charges.

In maximal models not only any individual can bear any property whatsoever, but also all combinations of different individuals bearing various properties (relations) is possible. Technically, a maximal model is such that for every function \( f \) which assigns n-tuples of individuals to the predicate symbols of the language (with the exclusion of the identity symbol), and for every subset \( U^* \) of the universe of the model, there is a world in the model which has \( U^* \) as its domain and \( f \) as its assignment. For a complete characterization of maximal models, see T. Parsons, “Essentialism”, Appendix A.

By the principle of the fungibility of individuals, if a formula is logically true under an assignment of values to its free variables, it is logically true under an isomorphic assignment.
Kaplan’s reading of [ ] as [L] may seem to some, perhaps many, to capture the proper, intuitive understanding of (logical) necessity. Nonetheless, it remains a stipulated reading, raised as it is from the first-order model theory and the notion of logical truth it encapsulates.

The above formulation is slightly misleading insofar as it suggests the requirement that the set H of hypotheses be expressible in the object language.


Granted that a model theoretic treatment of propositional modal logic can be extended to quantified modal logic, two questions remain open. The first is whether such treatment provides an interpretation – let alone the intended interpretation – of the modal operators. The second is whether there really is no further interpretational, versus model-theoretical, problem for quantified modal logic over and above those of propositional modal logic. In this paper I focus on the first question. In some work in progress I deal with the second.
Emphasis added.

In reading this passage of Quine, I separate between a general theme of Quine: the separation of the model theory from the intended interpretation, and the specific case he is raising: should the sheer semantics of ‘[ ]’ guarantee that some truths are not necessary?

On the second, specific issue, I read Quine as saying that if one is interested merely in the model theory, then it is possible for him to remain neutral on this question. On the other hand, if one is interested in the intended interpretation, then one (i) cannot remain neutral on this question, and (ii) Quine’s particular stand is the thesis that modal determinism is false under the intended interpretation.

Quine’s formulation in the quote somewhat fuses theses (i) and (ii) above. In what follows, in discussing the intended interpretation, I will agree with Quine about (i): the intended interpretation of necessity cannot be neutral about determinism. I will also agree with Quine about (ii): on the essentialist theory, every object – including the whole world – has some contingent features.

The model theory differentiates between the logical and the non-logical symbols. Strictly speaking, the logical symbols are treated pre-model theoretically – they are assigned pre-model truth clauses – while non-logical symbols are assigned values at models. Gila Sher draws this distinction in her book The Bounds of Logic, (Cambridge: MIT Press, 1991). So, when I speak here of the Tarskian model theoretic treatment of logical symbols I am speaking generically to include truth definitions too.

I am only describing, not endorsing, this common view of first order logic.
I am referring to a generalization of Quine’s Necessity thesis as stated above, according to which in the commitment to some substantial truths about the subject matter at hand lies a necessary condition for providing the intended interpretation of an operator.

Things would have been different with regard to both theses, had it been the case that the natural meaning of ‘all’ was not as topic neutral, but rather something like ‘all of the finitely many’. The standard model theoretic truth definition for ‘∀’ of first order logic would not have provided this intended finitude-bound meaning, because of the presence of models with non-finite domains.


Kripke, NdN, pp. 16-7.
A common objection to my reading of the dice passage states that the dice case is meant to be an example from elementary probability theory, and that such a theory assumes as a factual premise that the dice are ‘fair’. My point is exactly this: probability theory is not a theory of real possibility.


More strongly, the possibilities are, in a sense, the same for all individuals.


I certainly do not hold the opinion that “one must know a great deal about what is actual in order to say what is possible”. On the contrary, my interpretation of logical possibility and the other logical modalities is of such a kind that statements about them are entirely independent of any knowledge of the actual world.

The model theory is first and foremost a way of evaluating sentences. The logical possibility of Nixon’s being a turnip ultimately rests on the consistency of ‘Nixon is a turnip’.

Kripke, N&N, p. 48, footnote 15.

Kripke, N&N, p. 19, footnote 18.

For a discussion of the external problem see J. Etchemendy, The Concept of Logical Consequence, (Cambridge, Mass.: Harvard University Press, 1990); and Mark Rubin,

40 Very instructive in this respect is quantified tense logic, an intermediate case between non-modal quantification theory and full quantified modal logic (‘intermediate’ in terms of resistance to straightforward interpretation). Observations in this vein were made by Arthur Prior about the interpretation of quantified tense logic. Prior simply separated two independent issues: (i) the internal question within a model theory for tense logic – does identity across moments of time raise any special problems? And (ii) the external question of interpretation – does the moments-of-time model theory provide the intended interpretation of natural language tenses?

Prior believed that there is no identity problem across time; his basic items were enduring individuals whose trans-temporal existence and identity is primitive. Nonetheless he argued that the external question stands. Indeed he believed that instants are not genuine individuals and do not provide an analysis of our natural tense languages. The model theory – of which he was the founder – was just this for Prior: a model theory. When it comes to interpretation, we find in Prior a less ambivalent attitude than in Kripke – nowhere does Prior try to legitimize the model theory’s instants by arguing they are bona fide items after all, albeit abstract entities (of the kind Kripke’s states are meant to be). See A. N. Prior, “Quasi-Propositions and Quasi-Individuals,” in Papers on Time and Tense, (Oxford: Clarendon Press, 1968): pp. 135-144, especially p. 142.

Questions of grounding-versus-reducing necessity to some other notion are very delicate. Naturally, there is no guarantee that a logical reading be reductive, and a metaphysical interpretation not. However, a minimum prerequisite for a non-reductive interpretation of necessity seems to be that the grounding notion be able to carry some explanatory force of why something holds or does not hold of necessity. Logical (economic, ornithological) readings of necessity just do not seem to hold such an explanatory power.

What I say in this paper should not be constructed as implying that the only non-reductive interpretations of necessity are metaphysical. In particular, epistemic interpretations, which I set aside in this paper, seem also able to carry the explanatory burden.

The invidiousness strikes four times over. First, there is no guarantee that only logical truths turn out to be necessary: some non-logical, non-universal, truths may be necessary. Second, inside one and the same category of truths only some may turn out to be necessary, hence not all logical truths (as well as not all – let us say – biological truths) need be necessary. Third, on an essentialist reading it is reasonable to expect that some but not all the properties of an object apply of necessity, hence that some but not all truths be necessary. Finally, it may happen that one and the same property be necessary of an object and contingent of another.

The interesting question of whether model theoretic validity offers an adequate representation of logical truth (both notionally and extensionally) goes beyond the limits of this work.
The two key features of Kaplan’s interpretation of (the reduction of necessity to logical truth and the model theoretic interpretation of necessity) need not go hand in hand.


When it comes to mathematical truths, the champions of logical necessity are inclined to grant an exception. See in this vein “Opacity”, section XVII, on set theoretic necessities.

The logical priority of the actual on the modal is surely harder to grasp in the mathematical case. Empirical truths like “Socrates is human”, even if granted necessity, might still not be truths after all, e.g. if Socrates had not existed. So when we say, ‘No truth, no necessity’ the antecedent is a real possibility. In the case of mathematical truths it is generally acknowledged that, so to speak, the truth might not be absent. Hence it is harder to see in what sense actuality still precedes necessity. Nonetheless, even if mathematical truths hold no matter which world is actual, in the MNI their truth is logically prior to their necessity. An analogy with the case of ontological priority may be useful. Consider pure sets. Let it be given that both the empty set and its singleton exist of necessity, and so that neither one could have existed without the other; let it also be
given that the empty set and its singleton are essentially interdependent. Even if the modal and the essential connections go both ways, there is still a sense in which the empty set is ontologically prior to its singleton. Similarly, mathematical truths are logically prior to their necessitations, despite the facts that (i) the truth can only be given with the necessity, (ii) it is constitutive of the nature of such truths to be necessary, and (iii) such truths must indeed be given (this last is the feature that ‘Socrates is human’ lacks).


51 Existence is a limit case in which the lack of actual truth (e.g., of ‘Unicorns exist’) precludes the possibility of truth. In other cases, something may be possible even if not true. However, even in those cases the range of possibilities must depend on actuality (given that necessity does).

52 The MNI framework grounds necessity in essential predications of real entities, and so in actual non-modal truths. It is a further point to claim that such a framework precludes mere possibilia and possibilities and necessities for them. I will not enter here into the metaphysical question of whether starting from actual entities we may recover some merely possible ones (e.g., the offspring of actual gametes which never met; the almost assembled car in the assembly line, etc.). What remains clear is that the model theoretic consistency of larger domains is not by itself sufficient to establish the real metaphysical possibility of a larger universe of individuals, let alone the existence of merely possible individuals.

53 In presenting the model theoretic interpretation, I followed its terminology in speaking of metaphysical necessity. On the other hand, in presenting the metaphysical
interpretation I will not so allude. Kripke never uses this locution ‘metaphysical necessity’. He says that necessity is a metaphysical notion, but stresses that necessity is necessity *tout court*; and so in presenting this interpretation I refer to absolute necessity or necessity *tout court*.

54 Things may change once we move to a more complex logic, e.g., the logic of demonstratives. In that case Kaplan himself has detached necessity from validity (the rule of necessitation fails for the logic of demonstratives). However, this need not speak of a non-logical view of necessity, rather simply of a new, enlarged view of logical truth/validity. Necessity can still be formally conceived and linked to the old notion of validity. Cf. D. Kaplan, “Demonstratives,” in J. Almog, J. Perry, H. Wettstein, eds., *Themes from Kaplan* (Oxford: Oxford University Press, 1989), pp. 481-563.

55 J. Almog, “Logic and the World,” *Journal of Philosophical Logic*, XVIII (1989): 197-220, and E. Zalta, “Logical and Analytic Truths that are not Necessary,” *Journal of Philosophy*, LXXXV (1988): 57-74 argue that there are indeed logical truths that are not necessities. Their central examples are sentences of the form ‘If actually Φ, then Φ’. Such sentences are true at all actual worlds of all models, hence true at all models, but they may still fail to be true at all worlds. Almog also gives some (admittedly controversial) examples of non-modal logical truths that are not necessary.

56 I am here allowing myself the formalist’s locution.

57 I follow Quine in focusing mainly on objects, but the same point applies to properties. They too are real items that may be qualitatively described or directly supplied. Like real objects, real properties are not bundles of qualities.