

Gómez-Torrente on Modality and Tarskian Logical Consequence*

Manuel GARCÍA-CARPINTERO

ABSTRACT: Gómez-Torrente's papers have made important contributions to vindicate Tarski's model-theoretic account of the logical properties in the face of Etchemendy's criticisms. However, at some points his vindication depends on interpreting the Tarskian account as purportedly modally deflationary, i.e., as not intended to capture the intuitive modal element in the logical properties, that logical consequence is (epistemic or alethic) necessary truth-preservation. Here it is argued that the views expressed in Tarski's seminal work do not support this modally deflationary interpretation, even if Tarski himself was sceptical about modalities.

Keywords: Tarski, modality, logical consequence

1. *Introductory*

Gómez-Torrente (1996a, 1996b, 1998, 1999 and 2000) has provided replies to Etchemendy's (1990) all out attack on the Tarskian standard, model-theoretic account of the logical properties *logical truth* and *logical consequence* (**m-t**, henceforth), which is usually thought to have been originally introduced by Tarski (1936)¹. This paper critically examines some of the lines that Gómez-Torrente's rejoinder takes. In my view, Etchemendy's criticisms rest on an erroneous characterization of the Tarskian, model-theoretic account. On this I agree with other critics, whose views I find congenial with the one I took in García-Carpintero (1993): Hanson (1997), Macià (1997), Pérez-Otero (2001) and Sher (1996). But I grant Etchemendy's most significant contention. He rightly noticed that many philosophers understand **m-t** as deflationary with respect to the modalities (alethic and epistemic) intuitively constitutive of logical consequence². Etchemendy main goal is to rebut any such deflationism. In this I think he is

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¹ Etchemendy questions this attribution, on the following considerations: (i) Tarski presupposes that a sentence of the form " $\forall xP(x)$ ", where the domain is the class of natural numbers, follows *logically* from the infinite class including sentences $P(0), P(1), \dots, P(n), \dots$; this is not a case of standard, model-theoretic consequence. (ii) Tarski's definition assumes a fixed domain, while the standard account is given for variable domains, which are required if the account is to capture the pre-theoretical concept; for otherwise, sentences like ' $\exists x\exists y(x \neq y)$ ' ("there are at least two objects") would count as logical truths, while intuitively they are not. However, Gómez-Torrente (1996a) and Sagüillo (1997) argue persuasively that Tarski did not intend the inference in (i) as first-order, but as formalized in a higher-order language; when so formalized, its formal validity is defensible. Gómez-Torrente (1996a) and Ray (1996) show that (ii) is also unsupported; trained in the "algebraic tradition" of Schröder, Löwenheim and Skolem, Tarski was well aware of variable domains, and takes them into account in other works of the same period.

² Tarski might have joined these philosophers; more specifically, he might have subscribed a Quinean modal deflationism. This, however, is in any case a matter of mere *biographical* interest, not the sort of *historical* concern that our investigation deals with. For the distinction between historical issues that are of relevance to us and mere biographical matters, see below § 2.

right; no proper defence of **m-t** from Etchemendy's criticism helps modal deflationism.

2. *M-t and conceptual analysis*

Etchemendy's criticisms presuppose that **m-t** is put forth as conceptual analysis. He takes for granted that there are sufficiently clear-cut pre-analytical concepts of logical consequence and logical truth, and **m-t** is an attempt at a philosophical elucidation of those concepts: "the correctness of our model-theoretic definition is not determined by arbitrary fiat; on the contrary, whether the definition is right or wrong will depend on how closely it corresponds to the pre-theoretic notion it is meant to characterize" (Etchemendy 1990, p. 5). Some critics reject this starting point. Ray (1996) contends that "there are good reasons to suppose that Tarski's aim was to give a *materially adequate* characterization of logical consequence", that his account "is only intended to be a materially adequate account", lacking any "modal force" (Ray 1996, 642-646). Let us abbreviate 'pre-analytically valid' as 'pa-valid', and 'valid according to Tarski's account' as 'T-valid'. Ray's claim is then that Tarski only argued for this: for any argument $\langle \Gamma, \sigma \rangle$ with premises Γ and conclusion σ , $\langle \Gamma, \sigma \rangle$ is pa-valid iff $\langle \Gamma, \sigma \rangle$ is T-valid. This claim is to be taken without any modal force, as having the truth conditions of a merely accidental generalization. Etchemendy says: "my claim is that Tarski's analysis is wrong, that his account of logical truth and logical consequence does not capture, or even come close to capturing, any pretheoretic notion of the logical properties" (p. 6); Ray replies that the modally strong condition of adequacy presupposed by Etchemendy is not required. Thus, what Etchemendy considers to be his main argument - an allegedly unacceptable dependence of **m-t** on "substantive" propositions to avoid overgenerating logical validities - is averted from the start. To make that argument, Etchemendy describes possible counterfactual circumstances, relative to which arguments (or propositions) pa-valid would not be declared so by **m-t**. If, however, Tarski's account ought only to be answerable to the non-modal adequacy condition Ray assumes such a criticism would be pre-empted.

I think that this is not correct. A "merely material" generalization *for all x, Px iff Qx* is the sort of generalization linking properties such that, as far as we can tell, no modality-involving relationship ties them together; hence, it is the sort of generalization which we are in a position to assert only after checking all cases, one by one, to conclude that all Ps, and only Ps, are Qs. This is not the way that Tarski (1936) intends to convince us that an appropriate relation exists between his defined notions and the pre-analytical one. What he in fact does is to make salient some intuitively fundamental feature or features of the latter, some marks of the intended properties selected in those concepts as constitutive of the intended properties (the *necessity* and *formality* conditions, see § 3), and then he argues that his definition is acceptable in that it characterizes the defined properties as possessing those very same features. Not every proposal justified on the basis of this kind of consideration is itself an analysis; think of the definitions of 'algorithmic procedure' by Church, Gödel and Turing. All of them, however, establish (if anything) some modality-involving relationship between

the property captured by the pre-analytical concepts and the precisely defined ones. Any purported justification of this kind, if it is justification enough and is provided for a true proposition, justifies a claim having a modal force absent in merely material generalizations; such justifications typically legitimise assertions about counterfactual extensions of the concepts, and other modal claims.

Ray would say that his point was only historical; he himself would concur with the previous claims if the issue were philosophical rather than historical (*op. cit.*, 646-7). I want to distinguish historical facts that the present discussion cares about from *merely biographical* facts. Tarski (1936) insists at crucial places that he is putting forward concepts that capture important aspects of pre-analytical notions. The opening sentence settles the tone: “The concept of *logical consequence* is one of those whose introduction into the field of strict formal investigation was not a matter of arbitrary decision on the part of this or that investigator; in defining this concept, efforts were made to adhere to the common usage of the language of everyday life” (409). Now, perhaps Tarski did not really care about the relationship between ordinary and technical concepts; some evidence in fact exists for this. That, however, would be a fact of mere biographical interest. The historical matters I am interested in concern the appraisal of Tarski’s influential contribution to the philosophy of *l-consequence*. For that we only need to care about what a reader of his published work, knowledgeable of the context in which it was produced and of the intellectual problems it addresses, while otherwise ignorant of details about the author views, as recorded in letters, memoirs, etc, can rationally gather from it.

3. Adequacy conditions for explications of the concept of *l-consequence*

This is how Tarski (1936) characterizes the distinctive features of the pre-reflective concept of *l-consequence*:

Consider any class *K* of sentences and a sentence *X* which follows from the sentences of this class. From an intuitive standpoint it can never happen that both the class *K* consists only of true sentences and the sentence *X* is false. Moreover, since we are concerned here with the concept of logical, i.e. *formal*, consequence, and thus with a relation which is to be uniquely determined by the form of the sentences between which it holds, this relation cannot be influenced in any way by empirical knowledge, and in particular by knowledge of the objects to which the sentence *X* or the sentences of the class *K* refer. The consequence relation cannot be affected by replacing the designations of the objects referred to in these sentences by the designations of any other objects (414-5).

On the face of it, Tarski is selecting here two features as “very characteristic and essential for the proper concept of consequence” (415); the first, *necessary truth-preservation*, is a modal feature, the *necessity* of the consequence relation (necessarily, either some of the premises are in fact false, or the conclusion is in fact true); the second, *formality*, is a feature of unrestricted generality or structural character, the absence of specific subject-matter in logical validities. Tarski’s remarks support in fact the traditional view that the necessity at stake is, in the specific case of the logical properties, also a matter of a priori knowledge. Tarski thus suggests that the truth-preservation of arguments standing in the relation of *l-consequence* is qualified by two modalities: apriority-necessity, and formality.

These features, then, are intended to serve as adequacy conditions for proposals to explicate the concept of *l-consequence*: any successful explication should introduce a concept with those properties. People who have reflected at all on these matters would easily find clear instances and non-instances of the intuitive concept of *l-consequence*, as preliminarily introduced relative to the two features selected by Tarski; and they would agree with each other about most of their findings. As Tarski notices, those characteristics have been part of the trade long before he wrote his 1936 paper: “The ideas involved in this treatment will certainly seem to be something well known, or even something of his own, to many a logician who has given close attention to the concept of consequence and has tried to characterize it more precisely” (414). Indeed, the two features selected by Tarski have been highlighted by many other people who have thought about the matter, beginning with Aristotle himself; there are good reasons to think that they would find them “something of their own”, as Tarski says. Of course, this is only a preliminary indication that the pre-analytical concepts are in order: if, for instance, every attempt at an acceptable explication failed, that would cast an overwhelming shadow on the assumption that there are real properties captured by those concepts, having instances and non-instances.

Prima facie, thus, there are reasons to resist a suggestion shared by Gómez-Torrente (1998) with those of Etchemendy’s critics more sympathetic towards a deflationary attitude, including Jané (1997, pp. 140 and 154-5), Ray (1996, p. 624) and Sagüillo (1997, p. 237). The suggestion is to take away the modal elements in Tarski’s formulation of his first adequacy condition, hoping to make do with *material* truth-preservation plus formality. I will discuss later Gómez-Torrente’s (1998) argument for this. At this point I will make two remarks. Firstly, Tarski’s first adequacy condition is modal in the most straightforward sense that it is formulated by having recourse to modal expressions (modal particles, like ‘can’, ‘must’, and so on, and the subjunctive mood)³. Secondly, the recourse seems necessary, in that if we simply take away the modal expressions, we end up with a condition that we cannot consider at all, as Tarski puts it, “something of our own” as a constitutive feature of *l-consequence*. In particular, if we replace the *necessity* condition by a condition of merely material truth preservation, the resulting condition cannot reasonably count as an adequacy criterion for explications of *l-consequence*. By propounding *merely material* truth preservation as one of

³ Hart concedes this much, even though begrudgingly: “Whatever the fallacies or felicities of Tarski’s 1936 paper about logical consequence and even if it ‘is peppered with modal and quasi-modal descriptions of this relation’ (Etchemendy 1990, p. 91), it would seem that by 1940 Tarski really did mean just plain truth” (Hart 1991, 492; the reference to 1940 is based on a famous discussion among Tarski, Quine and Carnap about the analytic-synthetic distinction in which Tarski sided with Quine, about which there is evidence in Carnap’s “Intellectual Autobiography” and in other sources). Given that the 1936 paper *is* peppered with modal descriptions, Hart seems to be intimating here that Tarski changed his mind by 1940, joining by then the ranks of the anti-modalists. This is an entirely implausible suggestion. On the one hand, Carnap referred Tarski’s doubts regarding the tenability of a distinction between “factual” and “non-factual” truths to the early thirties, so that he appears to have found them consistent with the use of modal notions he makes in the 1936 paper; and, on the other, Tarski refers his readers much later to his 1936 paper for his definition of logical consequence, without suggesting that any substantial modification of his views on the issue has taken place.

our criteria, we would be suggesting that this is the strongest modal force that, in general, arguments declared logically valid can be guaranteed to have. This is not the case, however. If an argument is *merely materially* truth-preserving, the ascription to it of that modal status ought to be established by showing that at least one of the premises is false, or the conclusion true. But there is *no* argument declared logically valid whose truth-preserving character need be established in this way; the epistemological status of any justification we typically have for a claim of *l-consequence* makes it a justification for a claim stronger than a merely material conditional. It would thus be at the very least pragmatically misleading to suggest otherwise, by mentioning the modally weak criterion when a modally stronger one could be proposed.

4. Tarski's alleged fallacy

A main criticism by Etchemendy lies in his attribution of a certain modal fallacy to Tarski (which he calls 'Tarski's fallacy'). Having indicated the two conditions of adequacy described above, the *necessity* and *formality* conditions, Tarski (1936) goes on to state a proposition that, he claims, jointly expresses them:

(F) If, in the sentences of the class K and in the sentence X , the constants - apart from purely logical constants - are replaced by any other constants (like signs being everywhere replaced by like signs), and if we denote the class of sentences thus obtained from K by ' K' ', and the sentence obtained from X by ' X' ', then the sentence X' must be true provided only that all sentences of the class K' are true (415).

'F' - as Gómez-Torrente (1998, 232) indicates - probably stands for 'formality'. The question then arises why not take convention (F) as our definition of consequence, i.e., as providing a necessary and sufficient condition for arguments standing in the relation of logical consequence. Tarski considers this proposal and rejects it because (F) does not provide a sufficient condition for logical validity; he then proposes **m-t** as an obvious repair. This is a well-known story, which some of the works I have mentioned tell, so I will not go into it.

Having thus formulated **m-t**, Tarski goes on to claim the following:

It seems to me that everyone who understands the content of the above definition must admit that it agrees quite well with common usage. This becomes still clearer from its various consequences. In particular, it can be proved, on the basis of this definition, that every consequence of true sentences must be true, and also that the consequence relation which holds between given sentences is completely independent of the sense of the extra-logical constants which occur in these sentences. In brief, it can be shown that the condition (F) formulated above is necessary if the sentence X is to follow from the sentences of the class K (417).

In this paragraph, according to Etchemendy, Tarski commits a modal fallacy. To make that charge, Etchemendy assumes that an account like the one that Tarski developed from (F) is a *completed* explication of a *fully relativized* notion of a relation, X is a consequence of K relative to \mathbf{F} , where the schematic letter ' Φ ' represents any arbitrary selection of "logical" constants. The alternative interpretation, in the opinion of critics like Ray, Sher or myself, is that Tarski's account is rather an *incomplete* explication of a *more or less absolute* (or *partially relativized*) notion of the relation of *l-consequence*. The account is incomplete in that it presupposes an independent criterion to select the logical constants from other expressions in the language. It is still partially relativized, in that it allows that the validity of an argument be relativized to specific subsets of the class of logical constants.

Some claims in Tarski's paper appear to support Etchemendy's interpretation:

Perhaps it will be possible to find important objective arguments which will enable us to justify the traditional boundary between logical and extra-logical expressions. But I also consider it to be quite possible that investigations will bring no positive results in this direction, so that we shall be compelled to regard such concepts as 'logical consequence', 'analytical statement', and 'tautology' as relative concepts which must, on each occasion, be related to a definite, although in greater or less degree arbitrary, division of terms into logical and extra-logical (420).

No objective grounds are known to me which permit us to draw a sharp boundary between the two groups of terms. It seems to be possible to include among logical terms some which are usually regarded by logicians as extra-logical without running into consequences which stand in sharp contrast to ordinary usage. In the extreme case we could regard all terms of the language as logical. The concept of *formal* consequence would then coincide with that of *material* consequence (418-9).

To use Etchemendy's examples, under the usual selection of logical constants 'Lincoln had a beard' is true, but not logically true, and 'Washington was president, therefore Lincoln had a beard' is materially truth-preserving, but not logically valid; in the "extreme case" Tarski contemplates, however, the first sentence counts as logically true and the argument as logically valid.

The previous quotations, however, do not explicitly support Etchemendy's interpretation; the texts do not say that the notion Tarski is defining is a relativized one. They only assert that some fluctuation is allowed in the class of fixed terms, because it is to a certain extent indeterminate what counts as a logical expression; any precisification of *logical constant* would involve making some arbitrary decisions. They do not assert either that the "extreme case" determines a notion of consequence compatible with ordinary usage.

On the other hand, the following text tells against Etchemendy's interpretation: "Underlying our whole construction is the division of all terms of the language discussed into logical and extra-logical. This division is certainly not quite arbitrary. If, for example, we were to include among the extra-logical signs the implication sign, or the universal quantifier, then our definition of the concept of consequence would lead to results which obviously contradict ordinary usage" (418). And there is another consideration against it. In the text where he allegedly commits a modal fallacy, Tarski claims that the defined concept satisfies his condition of adequacy; in particular, he claims that it characterizes a *formal* relation. The notion of *formality* is certainly vague. However, I cannot think of any reasonable precisification given which *Tarskian consequence relative to the "extreme case"* would count as a formal relation. It would be at the very least misleading for Tarski to intend his phrase "it can be proved ... that the consequence relation which holds between given sentences is completely independent of the sense of the extra-logical constants which occur in these sentences" in the quotation before as applying also to that "extreme case". But he should, if Etchemendy's interpretation were correct. Given that interpretation, any alleged proof that Tarskian consequence is formal should apply independently of which expressions are being counted as fixed.

Now, in the text allegedly including a modal fallacy Tarski contends that the concept he has defined passes his adequacy test. This, as we saw, requires him to establish that the defined concept shares the necessity and formality of the pre-analytical concepts. Let P be 'X is a consequence of K according to Tarski's definition, relative to

some set Φ of fixed terms', let Q be 'all sentences in K are true', and let R be ' X is true'. To establish that the defined property has the *necessity* feature requires thus to prove (1):

(1) if P , then \Box (if Q then R).

Under Etchemendy's interpretative assumption that the defined relation of consequence is essentially relativized, any proof we may have that it has a given property should be valid independently of what the second term of the relativization is; that is to say, the proof should establish its conclusion independently of the selection of fixed terms, including in particular the "extreme case". There is indeed such a proof; it does not establish (1), however, but at most (2):

(2) \Box (if P , then (if Q then R)).

The proof is essentially this. Assume (i) that X is a consequence of K according to Tarski's definition, relative to any particular selection Φ ; assume further (ii) that all sentences in K are true, and suppose for *reductio* (iii) that X is false. Given (i), (iv) no matter which expressions Φ includes, every proper assignment to the expressions not in Φ that makes all sentences in K true, makes also true X . No matter which expressions Φ includes, there is an obvious assignment to the expressions not in Φ that is admissible, to wit, that which assigns to them their *actual* values. Given (ii), all sentences in K are true under this assignment. It follows from (iv) that X is true under this assignment; that is to say, it follows that X is true, period. This contradicts the supposition (iii), which is thus shown to be false⁴.

If this were a valid argument, it would establish a necessary truth. But the modal claim justified by means of this proof is the one formalized by (2), not (1). This can be seen in the following way. As we have emphasized, if the argument had the power of establishing that the notion defined by Tarski (under Etchemendy's interpretation) passes the adequacy test - in particular, that any argument declared valid by such a notion is necessarily truth-preserving - it should establish this independently of the selection of Φ . Now, one such selection corresponds to the "extreme case" envisaged by Tarski. However, there is no reasonable understanding of the modality here at stake such that 'Washington was president, therefore Lincoln had a beard' is *necessarily* truth preserving. This can be appreciated in that there is no plausible notion of a priori knowledge under which the truth preserving nature of such an argument is known a

⁴ Given standard assumptions about models, any proof along these lines is not correct, as Hanson (1997) and Gómez-Torrente (2000) make clear. The problem is that not all intuitively correct interpretations of the original argument might have corresponding models. If the intended interpretation of the original argument, for instance, concerns a domain that is not a set but a proper class, the argument might be truth-preserving relative to every model, and still not truth-preserving relative to its intended interpretation.

priori. There cannot be any condition under which such an argument is necessarily truth preserving.

Under the crucial assumption of Etchemendy's interpretation, the only argument that can be envisaged for establishing something akin to what Tarski is trying to prove in the text we are glossing establishes at most (2). What Tarski is trying to establish is (1); but moving from (2) to (1) is an error. This is "Tarski's fallacy". I believe that there is a philosophically sound argument for (1), assuming that Etchemendy's interpretation is disregarded in favour of the alternative view that Tarski's account is an incomplete explication of a less relativized notion of *l-consequence*, based on an account of the semantics of logical expressions. There is no indication of any such argument in Tarski (1936), however, and he cannot have entertained in any detail the one I take to be correct. He might well have been confused about the kind of proof required to establish the adequacy of **m-t**.

5. Does the generality in the Tarskian explication of *l-consequence* eliminate modality?

There is a much simpler way of confronting "Tarski's fallacy" than the one I envisage. If we simply take away the necessity operator in (1) and (2), we cannot incur the suggested fallacy; the reasoning outlined by Etchemendy, perhaps in a more sophisticated form (see Ray (1996, appendix B) might be then thought to work⁵. This can be done simply by formulating the adequacy conditions without mentioning any modality, as Ray does. If no modality were involved in the adequacy conditions, no modality would then need be involved either in the proof that the condition is met. I argued in § 3 that, without further support, this is not a very convincing line to take. Gómez-Torrente (1998) purports to provide such further support.

Gómez-Torrente claims that the modal expressions that Tarski uses (most particularly, in (F) and in the quotation that Etchemendy targets for his allegation of fallacious reasoning) do not signify "strongly loaded" or "philosophically loaded" or "vague and imprecise," "intuitive" modal concepts; they rather signify generality of some sort. Now, except for the suggestion of a *relevant* contrast between the generality in question and the modality in the adequacy conditions - which is rhetorically achieved by the qualification of the latter with 'strong', 'loaded', 'philosophical', 'intuitive' and similar terms of abuse -, I do not have any objection to this. After all, there are standard semantic analyses of modal operators as quantifiers. Gómez-Torrente offers quite persuasive reasons for interpreting some uses of modal expressions by Tarski as quantifiers. As he points out, Tarski says that, if (F) gave not only a necessary, but also a sufficient condition "the problem of formulating an adequate definition of the concept of consequence would be solved affirmatively. The only difficulty would be connected with the term 'true' which occurs in the condition (F). But this term can be exactly and adequately defined in semantics" (p. 415). Tarski here assumes that, in the envisaged case, (F) could count as the explication of *l-consequence* he was looking

⁵ As Gómez-Torrente (2000) and Hanson (1997) show, it cannot be as simple as that; see the previous footnote. Gómez-Torrente (2000) argues that Tarski was not merely contemplating set-theoretic interpretations.

for. Gómez-Torrente (2000, 531-2) remarks: “I trust the reader will agree that it is nearly impossible to picture Tarski saying this if (F) had contained a modal or epistemic term”. He also indicates that what Tarski has in mind is a mathematically precise proof; “the mere idea that Tarski would try to *prove* anything involving a vague and imprecise concept of necessity is very unlikely” (Gómez-Torrente, 1998, 233).

These considerations, and others advanced by Gómez-Torrente to the same effect, support the view that we should take the modal ‘must’ in (F), and in the text allegedly containing “Tarski’s fallacy,” as a universal quantifier over a certain domain, perhaps the domain constituted by the relevant set-theoretical structures. Now, Gómez-Torrente also points out that Tarski describes (F) as “jointly expressing” or “summing up” the two adequacy conditions involving the pre-analytical concepts, necessity and formality. Surely, he claims, “if this is so and (F) does not contain modal concepts (as opposed to “modal” words), it is only natural to think that (a) [Tarski’s necessity condition, “it can never happen that both the class *K* consists only of true sentences and the sentence *X* is false”] does not either. A little reflection suggests that the ‘can never’ in (a) may be there simply to signal generality, just as ‘must’ clearly does in (F); more specifically, with (a) Tarski is clearly just saying that all arguments of the same form as a correct argument $\langle K, X \rangle$ are truth-preserving” (*ibid.*, 231). Because the generality that Gómez-Torrente sees in (a) thus coincides with that already constituting Tarski’s other condition, formality (“the consequence relation cannot be affected by replacing the designations of the objects referred to in these sentences by the designations of any other objects”), his argument concludes that the necessity condition (a) only adds to the formality condition the contention that *l-consequence* is (“merely material”) truth-preservation. Modality thus vanishes from Tarski’s adequacy conditions. As other writer has put it,

“Tarski is not talking about any sort of necessary truth, or about truth knowable a priori, or about analytic truth. He is talking just about truth full stop [...] the plain, simple, unqualified, unvarnished truth about sets” (Hart 1991, 490).

Recall however that, whatever the accuracy of this conclusion as a piece of Tarski’s biography, it is not as biography that I think we are mainly interested in it. I take it that the conclusion is also advanced as the sort of historical claim we are indeed concerned with; that is to say, as stating the interpretation of Tarski (1936) that any unprejudiced reader well acquainted with the problems there confronted would make, and therefore the real content of **m-t**. What plausibility does it have, viewed in that light? The argument moves from the premise (which I think we should accept) that the modal expressions in Tarski’s explication only express quantification over entities of a certain sort, to the conclusion (which I think we should reject) that no modality is involved in his adequacy conditions for correct explications, more specifically that it is only formality plus material truth-preservation which is required for adequacy. It is clear, however, that the conclusion does not soundly follow from the premise.

This is because there is no reason to think that a *relevant* contrast exists between the modality in the adequacy conditions and the generality (the “unvarnished truth about sets”) in the precise model-theoretical explication. Some contrast there is; but it could just be the one to be expected to obtain between a precise semantic explication and the explicated pre-theoretical notions, and this is not contrast enough for the goals of

Gómez-Torrente's argument. We are familiar with semantically precise quantificational explications of pre-analytical, intuitive modal concepts; these are explications in terms of generalizations over entities (possible worlds), representatives of which - if not the possible worlds themselves, adopting a deflationary view of them - have also a place in the set-theoretical universe. Precise versions of these interpretations make crucial use of Tarskian techniques, and are therefore posterior to Tarski's discussion; however, the very notion of having recourse to them is already in the *Tractatus*, as a matter of fact invoked there to give an account of *l-consequence*. The existence of such explications, by itself, thus offers little support for eliminating modal concepts from the explicated propositions in the way envisaged in the conclusion of Gómez-Torrente's argument. The semantic explanation of 'the cat could be on the mat' in terms of 'there exists a possible world relative to which the cat is on the mat' offers no plausibility to arguments for assimilating the first sentence to 'the cat is on the mat', or to 'there is at least a cat on the mat'. An argument that, on the basis of the claim that the modalities in (F) - or in the proof to which Tarski referred - convey generalization, takes away the modality in the necessity condition turning 'necessary truth-preservation' into 'truth-preservation full stop' has as little plausibility.

Lewis's well-known view about the metaphysics of modality envisages the quantificational semantics for modal operators as providing a *reduction* of modal ideology in favour of clearer concepts, without identifying on this basis 'the cat could be on the mat' to 'the cat is on the mat' or 'there is a cat on the mat'. But even this is arguable; Shalkowski (1994) aptly exposes the difficulties confronted by reductive explications of modality that try to be sensitive to the facts of pre-analytical usage. We can apply his considerations to our present concern by adapting an example of Roy (1993). Imagine that we take a book (say, a biography of Turing), and we say that a sentence is *moo relative to the book* iff it is asserted in the book. Imagine also that we have a range of such books at our disposal, and we "explicate" *l-consequence* as moonness-preservation relative to all the books in the class. This would indeed "reduce" modality to non-modal notions, for the explication appeals only to quantification over what happens to be, or not to be, in entities (books) of a non-modal nature. It is also an unpromising strategy, however, unless it is just intended as an arbitrary redefinition of a word already in use for a different purpose. In the first place, books are sometimes incoherent, so that we run the risk that the negation of an obviously inconsistent sentence fails to be declared *l-valid* by the proposal. And secondly, there is the opposite problem; for lack of books witnessing it, sentences that are not *l-valid* will wrongly be declared so.

Pre-analytically, *l-consequence* has to do with truth-preservation, and thus with truth; not, however, merely with actual truth, but with *truth according to different ways things might turn out*, or something of the sort. (Remember that the view we are now examining does not take issue with the use of modal concepts in "intuitive" talk; it only purports to get rid of it by reductive explication when seriously speaking.) For a quantificational reductive account as the one we have assayed to have any good prospects, *moonness relative to the book* should be appropriately connected with these pre-analytical notion of *truth according to a way things might turn out*. It fails to be so connected on two counts. In

the first place, it fails because some of the entities over which the account quantifies (sentences in biographies) do not correspond to any of these ways things might turn out. In the second place, it fails because some of the ways things might turn out do not correspond to any of those entities.

The moral of this is that, when we do judge that a quantificational account has some chances of being adequate, we are (implicitly if not explicitly) judging that none of these flaws appear to obtain. The model-theoretic account declares that ‘Nixon fathered himself’ is not logically false, because it is formalized as ‘ $\exists x Rax$ ’ and there are models relative to which this sentence is true. But this is O.K. only to the extent that we take these models to be, or to represent, genuine possibilities, ways for things to turn out (in the relevant sense: ways for things *logically* to turn out). Otherwise - as with the account based on moonness - we could be wrongly failing to recognize a contradiction as such. *Mutatis mutandis* with the other potential failure: **m-t** correctly declares that ‘Nixon did not father himself’ is not a logical truth, in so far as there is a model for ‘ $\neg \exists x Rax$ ’ relative to which it is false; in general, the belief that **m-t** does not overgenerate logical validities presupposes that the domain over which the account quantifies includes at least all (representatives of) ways things might (in the relevant sense) turn out. Now, every serious account of these facts, speaking as seriously as it may allow itself to speak, should explicitly include both claims: the claim that only genuine possibilities (or representatives thereof) are quantified over, and the claim that all possibilities are quantified over. There is no way of making these claims without explicitly using modal concepts.

There are some moves that the reductivist can make in reply, but we need not explore the issue any longer. For the appeal to Lewis’ views concedes that Tarski’s adequacy condition does involve modal notions and not solely modal words, and hence also requires an alternative to “Tarski’s fallacy” to justify that **m-t** meets it. Tarski might well have been as much confused about what notions an account of *l-consequence* along the lines of **m-t** involve, as about what kind of proof is required to establish its intuitive adequacy. I myself think that he was similarly confused in thinking that his famous account of truth does not involve semantic primitives. But, to my mind, that is neither here nor there. What matters is whether his 1936 article contains the main guidelines of a philosophically correct account of *l-consequence*. This is what most readers have assumed, and what Etchemendy has argued against. I think he is wrong, but, as witnessed by the sophistication of the papers by Gómez-Torrente that I have been discussing, to sufficiently establish that will require serious work. Putting aside qualms like those I have examined, it is clear that those papers make a substantial contribution to it.

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Manuel GARCÍA-CARPINTERO works on issues concerning the epistemology and metaphysics of meaning. He has recently published “Sense-Data: the Sensible Approach”, (*Grazer Philosophische Studien*, 2002). “Gricean Rational Reconstructions and the Semantics/Pragmatics Distinction” (*Synthese*, 2001), “A Presuppositional Account of Reference-Fixing” (*Journal of Philosophy*, 2000) and “Indexicals as Token-Reflexives” (*Mind*, 1998).

Address: Departament de Lògica, Història i Filosofia de la Ciència, Universitat de Barcelona, Baldiri Reixac, s/n, E-08028 Barcelona. E-mail: garcia@mat.ub.es