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The Ontological Commitments of Logical Theories

1. Introduction

This paper is partly inspired by a well-known debate between Ruth Barcan Marcus, Terence Parsons and W. V. O. Quine in the sixties, concerning the extent to which Quantified Modal Logic ('QML' henceforth) is committed to "essentialism"; the issue nevertheless goes back to the origins of "analytic philosophy", to the reflections of Frege, Russell, and the earlier Wittgenstein on the nature of logic. By elaborating on a suggestion by Quine, we purport to show that there is a relevant and interesting way to look at the ontological commitments of logical systems such that they are stronger than they are usually taken to be.

In the more usual way of looking at the issue—adopted by writers like Marcus and Parsons—the commitments of logical theories are just those explicitly acquired by their theorems, the class of logical truths they determine. These may be called "the description-commitments", for they are captured in the body of claims which can be taken to fulfill the *descriptive* goals of a logical theory: at the very least, a logical theory aims to lay down in a precise and systematic way a set of sentences and arguments expressed in a language, or fragment thereof, thus *describing* the set of logical truths and logically valid arguments in the fragment. Developing the suggestion by Quine we will argue, however, that a separate, and usually stronger set of commitments can be distinguished from the description-commitments of a given logic. We will refer to them as "the explanation-commitments", for in our view they are required for the successful fulfillment of the *explanatory* concerns of logical theories, as pursued nowadays. A logical theory should not merely characterize a set of sentences and arguments; it should also make manifest what it is that distinguishes the members of the class from other sentences and arguments in the fragment, improving on the intuitive means through which we come upon the notion of logical theories in the first place.

It is in pursuing this second goal (as it is pursued contemporarily by the logical theories we accept) that the commitments we are interested in are acquired; or so we will try to show. Although the explanation-commitments of a given logical theory do not need to be explicitly stated by theorems of the theory (they only need to manifest themselves when the logical theory is contemplated, as it were, "from outside", at a metatheoretical level), the theory is still committed to them as much as if they were.

We will not confine our discussion to QML; instead, we will establish what we take to be an illuminating analogy by giving first an example of the distinction between description-commitments and explanation-commitments applying to the best established and least controversial logical system, First Order Logic ('FOL' henceforth). In fact, in our view it is clearer that a distinction along the lines sketched should be made and applied in the first-order case than that the distinction can in fact be used to vindicate Quine's attribution of essentialism to QML. The main objective of the paper is therefore to argue for the former, and only secondarily and tentatively—taking for granted a fair number of arguable assumptions—for the latter.

We begin our examination in section 2 by placing the issues we want to address in the context where they originated in contemporary times: the Quinean charge that QML is committed to a form of "essentialism", and Parsons' rejoinder to it. In section 3, we elaborate on the distinction between describing and explaining as applied to logical theories, so far only outlined. We develop the idea of explanation-commitments in section 4 on the basis of the promised analogy with FOL, and conclude with a few remarks about essentialism in the last section.

2. Parsons and Quine on the Ontological Commitments of QML

QML originated with the development of different formal (axiomatic) systems in the forties. It has to do with the validity and logical truth,

respectively, of arguments and sentences involving the interaction of modal operators, '$\Box$' and '$\Diamond$', with the logical expressions of FOL. In particular, the class of well-formed sentences of QML includes sentences in which modal operators appear inside the scope of quantifiers; that is to say, sentences like '$\exists x\,(\Box\,\Phi(x))$'[1] involving "quantifying into" modal contexts.

From the beginning, QML was rejected by its harshest critic, Quine. In Quine's work on the subject, we can discern three different types of argument against it. First, there is the use of the "slingshot", the form of argument—first sketched by Frege and then developed by Church, Gödel and Quine himself—to conclude that any linguistic context (as discerned in "logical" syntax) admitting free substitution of coreferential singular terms (crucially including definite descriptions among the singular terms) and replacement of logically equivalent formulas is truth-functional. A related second form of criticism from Quine is a general objection to the intelligibility of any form of "quantifying into" a position in logical syntax regarding which the principles of substitutivity and existential generalization, as usually understood, do not apply in their full generality. As Smullyan 1948 made clear, however, these two arguments can be resisted by treating descriptions as quantifiers in the manner of Russell's theory of descriptions. In reaction to this defense of QML, Quine elaborated the last type of objection, the one we are interested in here. Quine now argues that, in any case, accepting the semantic correctness of "quantifying into" positions governed by modal operators would commit us to Aristotelian essentialism; this is a doctrine he assumes (and takes his readers to assume with him) to be nonsense.

The first explicit pronouncement by Quine on this issue can be found in Quine 1953b; the revised version of 'Reference and Modality', Quine 1953a, includes a similar claim. He there characterizes Aristotelian essentialism as the view that some attributes of some entity are essential to it, while other attributes of that same thing are only accidental to it; this, independently of the way we refer to the object, or conceptualize it. He takes this to be

1. Throughout the paper, we use simple quotation-marks as ambiguously expressing either ordinary quotation, or the form of quasi-quotation usually expressed with Quine's corner-quotes. We trust that in each particular case the context will include enough information to disambiguate.

embodied in the truthfulness of sentences like (1), for some open formulae '$F(x)$' and '$G(x)$':

(1) $\exists x\,(\Box F(x) \wedge G(x) \wedge \neg\Box G(x))$

A plausible example could be

(2) $\exists x\,(\Box\, x > 5 \wedge$ there are exactly x planets $\wedge \neg\Box$ there are exactly x planets$)$

QML, says Quine, is committed to something even stronger, namely,

(3) $\forall x\,(\Box F(x) \wedge G(x) \wedge \neg\Box G(x))$

for some open formulae '$F(x)$' and '$G(x)$'. To show this, it is enough to take as '$F(x)$' '$x = x$' and '$x = x \wedge p$', in which 'p' is some contingently true sentence, as '$G(x)$'. There have to be such sentences as 'p'; otherwise, '$\Box$' would be vacuous, and modal logic would lack interest. (See Quine 1953b, 175–6.) As regards the other aspect of essentialist claims mentioned above—the independence of their truth from the "modes of presentation" or linguistic resources by means of which we refer to the objects at stake—it is taken by Quine to be manifested by the fact that in QML modal expressions are not predicates of fully-fledged sentences (the "first grade of modal involvement"), but genuine operators, forming in particular open formulae out of open formulae.

These days, after the work of writers such as Putnam, Wiggins and especially Kripke, Aristotelian essentialism may not be such a loathsome symptom of philosophical blunder. It was of course otherwise in the fifties and sixties. We will, in any case, leave the issue aside, and concern ourselves only with the question of whether or not Quine was right in his contention that QML involves the doctrine in some way.

Some writers argued to the contrary; Parsons (1969) is a case in point. In Parsons' argument, it is not sentences instantiating schema (1) that are taken to express essentialism, but rather sentences instantiating the following schema:

(4) $\exists x_1 \ldots \exists x_n\,(\pi_n x_n \wedge \Box F(x_1 \ldots x_n)) \wedge \exists x_1 \ldots \exists x_n(\pi_n x_n \wedge \neg\Box F(x_1 \ldots x_n))$

where $\pi_n x_n$ is a conjunction of formulae (the same for both conjuncts) of the form '$x_i = x_j$' or '$\neg x_i = x_j$' for each $1 \le i < j \le n$ which does not entail, for any i, '$\neg x_i = x_i$'.[2] Parsons' essentialist sentences, thus, assert that some attributes are necessary to some objects and not necessary to others. The reader may perhaps perceive more clearly the contrast between Parsons' and Quine's formulations of essentialism by considering the following schematic case of (4) closer to (1): $\exists x\,\Box F(x) \wedge \exists x \neg\Box F(x)$.

Parsons' formulation of essentialist claims is not without problems. Instead of asserting a distinction between essential and accidental properties of objects, as was the case with Quine's version, Parsons' formulation asserts that some properties are such that some objects have them essentially, while others have them accidentally. This, however, is even compatible with the "collapse" of modal distinctions: (4) is consistent with the truth of the schema '$\Box p \leftrightarrow p$', which would entail that modal operators make no discrimination not already made without them. However, Quine's version has problems of its own. His essentialism is compatible with the possibility excluded by Parsons' formulation, i.e. that all objects have exactly the same essential properties. Fine (1989), however, describes a way to specify the truth-conditions of QML's sentences which is compatible with this form of "essentialism", but should not be objected to by anybody accepting the usual model-theoretic characterization of logical truth—which Quine does. (See Fine 1989, pp. 206–210 and 258.)

With characteristic verbal ingenuity, Quine described the Aristotelian distinction between essential and accidental attributes as "invidious". That invidiousness in attempting to discriminate, *de re* and for some objects but not others, a proper subclass of their attributes as essential might perhaps be better captured by means of the conjunction of (1) and (4). In any case, taking a stand on this debate would have little bearing on the conclusions of this paper. The reader may choose whatever formulation he or she finds preferable—Quine's, Parsons', or the conjunction of the two—for our main contentions apply equally to the three of them.

2. Parsons (1969), 77. Parsons considers languages without constants; otherwise, a more elaborated formulation would be needed. We have slightly modified Parsons' description of the formula (4). He requires that $\pi_n x_n$ does not include, for any i, j, '$x_i = x_j$' and '$\neg x_i = x_j$'. This, however, does not secure what appears to be its intended goal, that $\pi_n x_n$ does not entail any formula '$\neg x_i = x_i$'. Parsons' condition would be satisfied (against what appear to be his intentions) if, for instance, $\pi_n x_n$ were '$x_1 = x_2 \wedge x_2 = x_3 \wedge \neg x_1 = x_3$'. We are thankful to our colleague, Ramón Jansana, for pointing this out to us.

Having thus enunciated the schema that he takes to be common to essentialist claims, Parsons proceeds to distinguish three ways in which a logical system could in some way be committed to them (Parsons 1969, pp. 77–8): (i) some instances of (4) are theorems of the system; (ii) the system entails some instances of (4), given some obvious non-modal facts; (iii) the system allows for the meaningful formulation of some instances of (4).

The semantics for the modal systems that Parsons presupposes is the classic semantics developed by Kripke, as in Kripke (1963). Every model is determined by a set of possible worlds, with a highlighted member (the actual world), an accessibility relation between the worlds, and a function assigning to every predicate and world an appropriate extension in the domain of the world; this interpretation can be extended, in the usual way, so as to obtain a truth-value with respect to every possible world for every formula, relative to an assignment to the variables. A *logical truth* is a sentence true in every world in every model. (See the details in Parsons 1969, p. 86, and Kripke 1963, pp. 64–6.)

The existence of *maximal* models can be proved (Parsons 1969, p. 87): these are models that, for every consistent set of non-modal sentences, include a possible world with respect to which they all are true. It can also be proved that no instance of (4) is true in any possible world in a maximal model. Thus, there is no commitment to essentialism in Parsons' sense (i). Moreover, if we take (as Parsons does) sense (ii) to entail that the system has as theorem a sentence of the form $\alpha \to \beta$, in which α is an obvious non-modal truth and β an instance of (4), it also follows that QML is not committed to essentialism in sense (ii); for, $\{\alpha\}$ being a consistent set, there is a maximal model containing a possible world with respect to which α is true, while β, as we have indicated, is false with respect to that world (and any other in the model). Finally, says Parsons, QML is certainly committed to essentialism in sense (iii); but the anti-essentialists need not be worried about this, if they sensibly limit themselves to contending the falsehood of essentialism rather than seeking to render it non-sensical. They are even free to take the negation of every instance of (4) as an axiom of their world-theory, so that no essentialist claim is true in any possible world of any model (Parsons 1969, p. 85).

Parsons thus connects the ontological commitments of a logical system to the explicit contentions of its set of logical truths. He is not alone in doing so. Ruth Barcan Marcus, one of the philosophers most deeply involved in the development of QML, appears also to have conceded relevance to Parsons' criteria (i) and (ii) in deciding the ontological commitments of QML. This is what she has to say on the issue in Marcus 1981—a good survey of the development to that date of philosophical issues related to QML: "In what sense committed? Granted such [essentialist] sentences are well-formed, is every model of a modal system committed to the truth or more strongly, the validity of essentialist sentences?" A few lines below she indicates that Parsons 1969 has shown that there are models consistent with the falsity of any sentence making an essentialist claim (Marcus 1981, p. 285).

Parsons' and Marcus' notion of the ontological commitments of a logical system is a reasonable one, and they seem right to contend that, in that sense, QML is not committed to essentialism. In the next section, however, we develop the distinction between describing and explaining for logical theories, in order to pave the way for our later demonstration of another way of looking at the issue in which things are not so clear.

3. The Constitutive Goals of Logical Theories

Logic may not only be approached as a solely mathematical enterprise; it can also be taken as a *scientific* pursuit. We use 'scientific' instead of 'empirical' for lack of a better word, since the use of the word 'empirical' would be a solecism in view of the fact that logic, even when not purely mathematical, may well be in a well-defined sense *a priori*. The solecism, however, is tempting; because the contrast we mean is similar to the one existing between purely mathematical geometry and empirical geometry, or between purely mathematical physics and empirical physics. Purely mathematical geometry provides precise characterization of "spaces", establishes that these "spaces" possess certain properties of interest to well-regarded practitioners of the art, proves consequences of their possessing those properties equally interesting to those practitioners, and so on. These theoretical activities are pursued without any commitment to the "spaces" being in fact spaces in which physical entities interact or spaces of which we have sensory representation; the correct theoretical characterization of this space is the concern of physical geometry. Analogously, purely mathematical physics consists in the precise characterization of "physical systems", "gravitatory fields", and so on, establishes that they possess some properties that well-regarded theoreticians find interesting, proves consequences of this, and so on; while empirical physics aims to offer accurate characterizations of actual physical systems, actual gravitatory fields, etc. No disrespect is intended by reserving "scientific" for the latter members of pairs like these; we believe that the former members only constitute a genuine body of knowledge (and are thus indirectly "scientific", in the etymological sense of that much abused word) to the extent that it is reasonable to pursue them in the hope (which, of course, may not be realized) that the information thus acquired will be important for the adequate development of the concerns of the latter members.

Purely mathematical logic characterizes "logical systems" precisely: "languages" are defined, their "syntax" and "semantics" given in a precise way; deductive relations are established, and are proved to have certain properties (particularly having to do with the interaction of relations of deducibility and a relation of "logical consequence"). It then defines properties of those systems that mathematical logicians find interesting, and proves consequences of the fact that systems have or lack those properties. Scientific logic, on the other hand, is concerned with actual cases, in our assertions and arguments, of logical validity, and subsidiarily of logical truth. As in every other similarly interesting case, we cannot offer at the outset a philosophically acceptable explication of these properties. We can only provide paradigm instances (arguments and thoughts expressed in our vernacular languages, among them some of the ones used by purely mathematical logicians when they present their systems and argue about their properties) and a rough, "intuitive" characterization. In our view, this rough characterization would involve three features, perhaps conceptually related. Firstly, logically valid arguments *necessarily preserve truth* (necessarily, either some of the premises are not true, or the consequence is true), and logical truths are necessarily true. Secondly, these facts can be recognized or known *a priori*. Thirdly, logical validity and logical truth depend on the semantic properties of relatively *structural* traits of the sentences and sequences of sentences involved.

Because this last feature will play an important role in our argument, we will elaborate on it. The structural traits whose semantic significance is essential for logical validity and logical truth consist mainly of the following (this is of course no attempt at a definition): firstly, expressions by means of which complex sentences are built out of less complex phrases (like 'and', 'or', 'for all' and so on) in a well-determined, systematic way, and secondly, logico-syntactical traits of the expressions conforming elementary sentences, also structurally relevant to their well-formedness. Among the latter traits are those distinguishing *referential expressions, n-adic predicates, kind-terms, propositional expressions*, and so on; also, traits like those indicating when two expression-instances are intended to make the same truth-conditional contribution (say, to have the same reference) and when they are not so intended.

It is very important not to confuse the structural traits themselves with their semantic significance, a mistake which is more likely in the case of the logico-syntactical traits of the expressions conforming elementary sentences. In order to avoid confusion, it may help to note that here as elsewhere the same semantic fact may be expressed by two different formal means. For instance, in natural language the fact that two predicate-instances are intended to make the same truth-conditional contribution is usually expressed by using instances of the same type. In languages used in logical systems the same applies to "constants", the equivalent in those languages of referential expressions. But in natural languages this is not always the case. For instance, the fact that a given referential expression is intended to make the same referential contribution as that made by a previously used indexical is not indicated in natural language by using an indexical of the same type, but by using anaphoric expressions. This is thus a case in which the same semantic fact (co-reference of two expression-occurrences) is indicated by two different structural means.

By the (perhaps artificial) device of counting the logico-syntactical traits of proper names, basic predicates, etc., as separate *expressions* in their own right, we can conveniently summarize the third feature of our "intuitive" characterization of logical truth and logical validity by saying simply that these properties depend on the semantics of structural expressions ("logical constants"). The reader should remember henceforth, though, that "logical constants", in the present understanding, include not only separate expressions like conjunction, negation, existential quantification and so on, but also syncategorematic features of expressions like monadic predicatehood, etc. Now, part of the reason why the three features constituting our intuitive characterization of logical truth and logical validity are rough is that they are expressed in terms of concepts, like *necessity, aprioricity* and *structurality*, which are themselves as much in need of illumination as those that we are characterizing by means of them, *logical validity* and *logical truth*. Moreover, while the characterization remains at this intuitive, rough level, there is no denying that, at the end of the day, we may have to abandon the assumption that logical truth and logical validity, so understood, are genuine properties having instances and making discriminations. But there is no denying, either, the strong *prima facie* presumption that the sets of logical truths and logically valid arguments constitute non-empty proper subclasses of the sets of significative thoughts and purportedly argumentative sequences of thoughts.

Philosophers of science distinguish two separate domains in which the comparative virtues of theories provided to account for the facts in a given field may be measured: *description* and *explanation*. One theory may be descriptively as adequate as another, while failing to be as explanatory. A typical example lies in the contrast between Newton's theory applied to celestial mechanics and Kepler's laws: the degree to which Newton's theory improves on Kepler's laws regarding the adequate description of the motions in the planetary system, if in fact it does, cannot quite match the degree to which the former improves on the latter at the level of providing adequate explanations.

The structural character of logical truth and logical validity makes it possible to classify sets of instances of these properties relative to the structural traits on whose semantic significance their being logical truths or logically valid arguments depends. This is how the distinction arises between propositional logic, first-order logic and, of course, QML. Scientific logic makes use of the logical systems studied in mathematical logic. This follows the usual scientific strategy of considering "frictionless worlds"; it allows for the clear-cut isolation of the specific properties on which the facts to be explained depend, according to the theory, abstracting them away from other properties in conjunction with which they may well appear always instantiated in the actual world, perhaps even lawfully so. It is, in a nutshell, a way of setting the really explanatory facts into relief and making the explanation perspicuous. Thus, the sentences of languages devised by logicians are supposed to "formalize" corresponding sentences of natural languages expressing the relevant thoughts and arguments. At the very least, the formalization should render perspicuous the logically relevant structural traits of corresponding sentences in the vernacular.[3]

3. For the remarks about the relationship between natural and formal languages we are indebted to discussions with our colleague Josep Macià, and to his MIT doctoral dissertation.

By these means, the theories provided by scientific logic achieve one of their goals: they can present, in a systematic and clear manner, the set of logical truths and logical consequences "in virtue of" a specified class of logical constants. In some cases (those where a *complete* deductive calculus is available), this can even be done in a purely formal, syntactical way. It can even be done without bothering to make explicit the semantic significance of the structural traits isolated in devising the artificial language, nor the extent to which its sentences *translate* the sentences in the vernacular they formalize, preserving some of the semantic properties that go into the individuation of the thoughts the vernacular sentences express. Now, unlike the goal we will describe presently, achieving this goal can be properly characterized as obtaining only a higher or lower degree (relative to the perspicuity, simplicity, etc., of the system) of *descriptive* adequacy. Something is missing if this alone is achieved—something which is to be expected from a truly scientific logical theory.

QML is, in fact, a well-known case in which the descriptive goal was first pursued in a purely syntactical way. David Kaplan points to the contrast we want to highlight in this passage:

> What we have done, or rather what we have sketched, is this: a certain skeletal language structure has been given, here using fragments of English, so of course an English reading is at once available, and then certain logical transformations have been pronounced valid. Predicate logic was conducted in this way before Gödel and Tarski, and modal logic was so conducted before Carnap and others began to supply semantical foundations. The earlier method, especially as applied to modal logic (we might call it the run-it-up-the-axiom-list-and-see-if-anyone-deduces-a-contradiction method), seems to me to have been stimulated more by a compulsive permutations-and-combinations mentality than by a true philosophical temperament" (Kaplan 1969, pp. 208–209).

What is achieved when a semantic interpretation (like the possible-worlds semantics for modal logic, or the model-theoretic semantics for FOL) is provided, which would be definitively missing if the set of logical validities and logical truths were merely characterized syntactically? What is it that a "true philosophical temperament" requires in addition? Newton's celestial kinematics constitutes an improvement in explanatory adequacy, in that it provides a better account of properties on which the already well-characterized movements in the Solar System depend. Similarly, we would gain in explanatory adequacy in the field covered by logical theories if, in addition to a simple, clear characterization of a given set of logical validities, we also had an account of what makes a given argument belong in that set. Because we start with a rough, merely "intuitive" answer to this, such an improvement, we suggest, would have mainly to do with showing, in clearer and more precise terms than those of the rough intuitive presentation of the logical properties, how the three features intuitively characterizing logical truths and logically valid arguments do indeed capture real properties, having instances and making discriminations.

This inevitably requires a detailed examination of the relevant semantic properties, and cannot be given while remaining at a purely formal level; this is therefore why the purely combinatorial method described by Kaplan is insufficient for explanatory purposes. Achieving some degree of explanatory adequacy in the field covered by logical theories has to do with tracing illuminating connections among the three features, which clarify why they hang together. In previous work (cf. García-Carpintero 1993 and 1996a), one of us has argued that the adequacy of the model-theoretic definition of the logical properties, whose acceptance is widespread at least regarding FOL, depends on the semantic account of the relevant structural traits that flows from the truth-theoretical semantics usually provided for first-order languages. Given the classical logical empiricist analysis of a priori knowledge as semantic knowledge (the "metasemantic" account in Peacocke 1993 is a contemporary variation we find appealing), the structurality of logical truth and logical consequence would be enough (as indicated in the work just mentioned) to account for their aprioricity. This, traditionally, would also have been considered sufficient to account for the necessity of logic, but contemporary Kripkean sophistication indicates that the relations between a priori knowledge and necessity are to be handled with more care than previously thought. Still, an account of modality along the lines of Peacocke 1997 would connect the structurality of the logical properties with the modal ways in which they apply.

This is a sketchy answer to the question of what is missing from an explanatory viewpoint when the validities are only syntactically characterized. It allows, however, for the distinction between description- and explanation-commitments we seek to establish.

4. The Explanation–Commitments of Logical Theories

Let us go back now to the debate that pitted Quine against critics like Parsons and Marcus regarding the ontological commitments of QML.

This is what Quine had to say about criticisms such as those in the course of a discussion (much discussed these days, for not directly related reasons) with Føllesdal, Kripke, Marcus and McCarthy:

> I've never said or, I'm sure, written that essentialism could be proved in any system of modal logic whatever. I've never even meant to suggest that any modal logician ever 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.* And what I have been arguing is that if one is to quantify into modal contexts and one is to interpret these modal contexts in the ordinary modal way and one is to interpret quantification as quantification, not in some quasi-quantificatory way that puts the truth conditions in terms of substitutions of expressions—then in order to get a coherent interpretation one has got to adopt essentialism [...] But I did not say that it could ever be deduced in any of the S-systems or any system I've ever seen. (Quine *et al.* 1962, p. 32; our italics).

Our goal in this section is to develop, on the basis of the proposal put forward in the previous section, Quine's suggestion that there is a further way of looking at the ontological commitments of logical theories that have to do with truth, or with true interpretation, rather than with the set of logical truths.

As indicated at the outset, we want to use an analogy with FOL to present our view. To that end, consider the following question: to what extent is FOL ontologically committed to the existence of individuals? On the face of it, a smooth working of the analogy would require the following: that, on the one hand, the existence of individuals were not a description-commitment of FOL, in that no instance of the schema '$\exists x\, F(x)$' is a theorem of FOL; while, on the other hand, there was a sense, linked to the explanatory aims of FOL, in which that was indeed the case. Unfortunately, the first requirement is not satisfied, which prevents the smoothness of the analogy; for '$\exists x\; x = x$' is a logical truth of FOL. That, however, is a consequence of relatively superficial facts, of theoretical decisions that could be modified without affecting the substance of the issues; and the analogy is, we believe, the best to be had, and so we are prepared to suffer its superficial lack of smoothness. A non-empty domain is always assumed in devising the semantics for first-order languages; it is this decision that has the consequence we have mentioned. However, the decision is taken just for reasons of expediency. (Perhaps, we would suggest, adopting it is also facilitated by the dim perception that, *in some sense*, we are committed to the truth of

'$\exists x\ x = x$'. The reasons that we are about to elaborate, although not strictly speaking logical, are after all substantially akin to logical reasons: they make the claim, in a reasonably broad sense, *analytical.*) Nothing of substance would change if empty domains were accepted; it is only that things would necessarily be more complicated. Empty domains, on the other hand, seem clearly conceivable, so that no instance of the schema '$\exists x\ F(x)$' should be counted, strictly speaking, as logically true. We will therefore assume, to pursue our analogy, that FOL is not committed to the existence of individuals at the level that Parsons and Marcus discuss. Deep down, the existence of individuals should not count as a theorem of FOL.

We can now proceed with our analogy. When FOL is considered not only as a theory that achieves descriptive goals (perspicuously systematizing the logical truths and logical validities "in virtue of" the first-order logical constants—including, remember, the structural traits), but also as a theory that achieves explanatory goals, the ontological commitment to individuals does indeed arise. The reason is this. Logical truth and logical validity are defined model-theoretically, as truth in all models and truth-preservation in all models, respectively. This definition achieves explanatory goals, only in so far as it is based on a certain semantic analysis. A crucial semantic fact according to this semantic analysis is that sentential expressions signify truth-conditions; and it is in addition essential to the explanatory power of the analysis that it carefully separates the relatively abstract truth-conditional import of the logical constants from the more specific *import* of non-logical expressions. We obtain different "models" by keeping the semantic significance of the logical constants fixed while taking all possible variations in the semantic significance of the non-logical expressions compatible with that fixation, as permitted by set-theory—the theory we assume as a meta-theoretical tool to represent truth-conditional determinants. That is to say, we keep fixed semantic facts such as the following, which, though abstract, definitely shape truth-conditions: there is a domain of individuals (possibly empty, we are now assuming); referential expressions (variables and constants) can only take values in this domain, the same value for every instance of the same expression-type (it may or may not be different for instances of different expression-types); n-adic predicate expressions represent subclasses of n-tuples of members of the domain, the same subclass for every instance of the same expression-type. Other semantic features change from model to model: the identity and number of the specific individuals in the domain, the values in that domain of referential and predicative expressions.

This semantic analysis, which is an essential correlate of the model-theoretic account, is directly provided, by stipulation, for the artificial language of FOL; however, if the claims in the previous section are correct, the fulfillment of the explanatory goals of the theory forces us to think that they are presumed to apply, too, (even if in a messy way) to the sentences by means of which we express the thoughts and arguments whose logical properties we want ultimately to account for. This assumption should be validated via the formalization relation. The structural traits of first-order sentences we have called "logical constants" have correlates in vernacular sentences (or thought-vehicles) whose semantic significance is presumed to be accurately represented by the semantic significance of the corresponding traits in the first-order expressions that translate them. The fact that this correlation exists (required for the theory to be explanatory, in the sense developed in the preceding section) has consequences which are not particularly momentous; indeed, the fact that they are not is intimately related to the enormous intuitive plausibility of FOL, which even critics like Etchemendy acknowledge.[4] But even if the consequences are not momentous, they do not need to show up among FOL's theorems; and that is what really matters for our point.

It is one of these humble consequences that our analogy depends on. Our world-theory includes, for instance, the assumption that sentences like 'Empedocles, who is a person, leapt' and 'someone leapt' are meaningful, and indeed are so in such a way that the former logically entails the latter. FOL accounts for this, after formalizing the premise of the argument as, say, '$P(e) \wedge L(e)$' and its conclusion as '$\exists x(P(x) \wedge L(x))$'. Now, when FOL is *applied* to explain the presumed validity of arguments such as these, it is part of the semantic analysis—on whose accuracy whatever explanatory value FOL may have as a scientific theory depends—that expressions like

4. Disposing of Etchemendy's criticisms of the model-theoretic account in Etchemendy 1990 was the main purpose of García-Carpintero 1993. Pérez Otero takes a different line of criticism in Pérez Otero (forthcoming). For other criticisms, see the doctoral dissertations of Mario Gómez Torrente at Princeton, 1996, "Tarski's Definition of Logical Consequence. Historical and Philosophical Aspects", and of Josep Macià at M.I.T., 1997, "Natural Language and Formal Languages".

'Empedocles' have structural traits corresponding to those of first-order constants.

To be sure, while it is very easy to describe the structural traits at stake in the case of first-order languages, nothing short of the resources of mature psycholinguistic theories would be needed to give an accurate characterization of the corresponding features of referential expressions in natural languages. The relevant structural features of a first-order expression like '*e*' above consist of how expressions like '*e*' combine with some *n*-adic predicate and *n*-1 expressions of the same category as '*e*' to form well-formed elementary sentences; it is also relevant that quantified variables occupy those same positions, i.e., that '*e*' instantiates positions governed by quantifiers. Even if we still know little about the syntax of natural language, it is enough to know that a much more complicated story (involving, say, the role of a level of "logical form" vis-à-vis other levels of syntactic representation) would be required to characterize the corresponding structural trait of 'Empedocles'. This is in part why the recourse to artificial languages is so serviceable.

The explanatory value of applying FOL presupposes additionally that the structural traits of 'Empedocles' corresponding to those of '*e*' also have an analogous semantic significance. This means that those structural facts regarding 'Empedocles' which correspond to the facts just described—those which the character of '*e*' as a constant of FOL amount to—possess, according to the semantic analysis which is an essential part of FOL's explanation, a determinate semantic significance. They contribute to shaping the truth conditions of the sentences in which the expression appears, by indicating that this expression signifies *an individual*: a member of the domain, a potential member of some *n*-tuples discriminated by some predicates in the language, and the sort of entity whose assignation as semantic value to a constant makes inferences of the form "$P(e)$, therefore $\exists x P(x)$" and "$\forall x P(x)$, therefore $P(e)$" truth-preserving.[5] Nothing more is required by the explanation given by FOL; nothing more, for instance, regarding the identity of that entity. From a logical point of view, this "Empedocles" may be anything we can correctly take to be an individual. But this much is indeed required.

It is in this way that by accepting FOL as an explanatory theory, one that applies explanatorily to some inferences in the vernacular, we commit ourselves to the existence of individuals. This ontological commitment can be properly described as "pragmatic", in that it arises not solely from the logical theory, but from it together with the *use* to which we put the theory, from the *application* we make of it. It does not show up at the level of the theorems (the set of logical truths characterized by the theory), because the theorems are the truths *required* by the meanings of the logical constants, and to quantify over an empty domain is compatible with those meanings. From a logical point of view, the only requirement deriving from the semantics of quantifiers is the existence of a proper domain; nothing more specific is required regarding the identities and number of its members. In particular, the empty domain is a possible domain of quantification; this is why there is no (deep) commitment to the existence of individuals asserted by the theorems. But the commitment does appear when we take into account some of the claims we want to make—or at least to take to be meaningful—over and above the claims that are logically true, given the semantics that the explanatory applicability of FOL to them requires us to attribute to them.

This ontological commitment is meager at least on two counts. Firstly, the individuality to whose instantiation FOL is thus committed is a very abstract property, shared by Empedocles with numbers, ghosts, gods and devils, cardinal virtues, events, etc. Secondly, the commitment to individuals like Empedocles is not a commitment to their ultimate, metaphysically irreducible individuality. For all that the explanatory adequacy of FOL commits us to, phenomenalism or even solipsism may still be true. FOL may explain perfectly adequately the facts about logical truth and logical consequence in virtue of the first-order logical constants, even if Empedocles is ultimately a "logical construct" out of the really ultimate particulars, which are in fact the sense data of one of the authors of this paper at the time of conceiving this very sentence: he would still be an individual of the proper sort.[6]

Moreover, nothing hangs on granting a referent to 'Empedocles' itself, as the possibility of empty domains we are contemplating should make clear. That is to say, the commitment we are emphasizing does not arise specifically from any given sentence including referential expressions which we take to be meaningful and able to take part in first-order inferences in a particular context. In any particular case—like, for instance, that constituting

5. We are putting aside the issue of how a free logic should handle the relevant inferences.

6. For rather similar views, see Stalnaker 1984, pp. 57–8.

our example—we might be considering an empty domain without realizing it, regarding which the presuppositions for meaningfully using referential expressions would not be in fact satisfied. The ontological commitment is better seen as arising from applying FOL to our whole world-theory, the set of claims we are epistemically justified in accepting. It arises when we consider the *intended* model in its totality, "the" model for our complete world-theory, given the beliefs about its nature we can ourselves take to be most justified. It is logically permitted that we are quantifying over an empty domain in specific contexts; some sentences we take to be meaningful may fail to be so; but we obviously do not take the intended model to have an empty domain. This much seems safe, even if it is not (deeply) logically the case: that we are justified in using some referential expressions, when stating our current world-view. The commitment we have been highlighting arises from the explanatory application of FOL to sentences (thoughts) for which this justification is correct.

The reader has probably anticipated that the commitment to the existence of individuals is not in our view the only explanation-commitment of first-order logic.[7] There is also, for instance, a commitment to the existence of domains; and another to the existence of "conditions", which discriminate *n*-tuples of members of a given domain. If we take serioulу the theory we use to present these facts, these are ultimately commitments to sets. Of course, these commitments are as meager as the one we have been mostly discussing so far. For instance, the commitment to "conditions" is not a commitment to universals in any philosophically interesting sense. It is not a commitment to attributes, natural or objectively explanatory properties, or the like. For it is just conditions that may well be expressible only with "wildly disjunctive"

7. In his criticism of the model-theoretic account in Etchemendy 1990, Etchemendy makes much of the fact that for this account to make intuitively correct predictions about validity, it is committed to the existence of infinite domains. As indicated in García-Carpintero 1993 and more clearly in Pérez Otero (forthcoming), it is important to make clear, as Etchemendy does not, that the correctness of the model-theoretic account in no way requires to take the claim at stake as, strictly speaking, *logically* true. On the other hand, the account can be taken to be committed to the "analyticity" of the claim, in some broad sense. But this cannot be taken so easily to discredit the account; not, certainly, on the basis of Etchemendy's considerations. We take the ontological commitment in question to have a similar status to the other commitments we are discussing here.

open sentences that we are committed to, by the explanatory application of FOL to the meaningful claims by means of which we would establish our world-view. On the other hand, this also vindicates the distinction between description-commitments and explanation-commitments, for it is even clearer that the sort of second-order commitments to domains and conditions on them we have been describing in this paragraph cannot be properly expressed by FOL-sentences, let alone by its logical truths.

Entry 5.552 of the *Tractatus* includes the very much quoted contention that logic "is prior to the question 'How?', not prior to the question 'What?'." With most other interpreters, we read this as the contention for which we have been arguing: logic as such (which Wittgenstein, we believe, takes to go no further than first-order logic) is committed to the existence of "objects" (the 'What?'), although it is not committed to any specific objects or number of them (this is a matter left for the application of logic, *Tractatus* 5.557), nor to the nature of the state of affairs in which objects enter (the 'How?'). In justification for this, Wittgenstein offers the following characteristically enigmatic argument: "And if this were not so, how could we apply logic? We might put it in this way: if there would be a logic even if there were no world, how could there be a logic given that there is a world?" (Wittgenstein 1921, 5.5521) The following interpretation by paraphrase, which we cannot justify here on the basis of its internal coherence with the text or otherwise,[8] provides a reading of the cryptic argument which brings it close to the one we have been elaborating so far.

"*There is a world*; that is to say, we have a representational system which allows for the construction of claims, the conditions for whose truth are satisfied or are not satisfied given the states of an independent reality. Now, a necessary condition for there being a *real logic* is that *it has application* to that representational system which we have. A real logic must account for logical relations among claims belonging to our representational system, logical relations which obtain precisely in virtue of their truth conditions. A real logic should account for the *validity* of certain inferences involving the claims mentioned, for the fact that, if the truth conditions of all the premises in an argument are satisfied, the truth conditions of the conclusion must be satisfied too. Suppose, however, that *there would be a logic even if there were no world*; i.e., suppose that the only "logic" to be had is a purely

8. But see García-Carpintero 1996b, ch. 9.

formal system, one in which certain sentences are pronounced valid and a certain procedure is arbitrated for them to yield more sentences also pronounced valid, all of this on the basis of purely formal traits of the sentences, entirely independently of their semantic interpretation, of facts about the truth conditions of the sentences at stake. Then, the necessary condition for a real logic could not be satisfied; for a system of this kind is unable to explain the validity of the most plainly valid inference involving claims expressed in our representational system, no matter how well they fit some of the forms pronounced valid by the "logical" system. *There would not therefore be any* (real) *logic.* But this is an absurd result. Logic should refer to semantic relations between expressions and features of the extralinguistic reality corresponding to those expressed in our representational systems (even if only to semantical relations with very abstract features, whose obtaining it is plausible to assume we know a priori)."

This argument only disparages the lack of explanatory value of a logic considered as a mere calculus, while we have been concerned to make a distinction between commitments that arise at a descriptive level versus those that arise at an explanatory level, in both cases regarding systems which are not mere calculus but incorporate also a semantics. Aside from that, however, the concern with the consequences of logic having an application to inferences involving our beliefs and their expressions in natural language is rather close.

5. QML's Commitment to Essentialism

As we indicated at the beginning, the main part of our paper ends with the establishment of a distinction we take to be interesting between two ways of looking at the ontological commitments of a logical theory, one of which, disregarded by critics of Quine like Parsons and Marcus, can be taken to be the one alluded to in the remark by Quine we quoted at the beginning of the preceding section. To establish that philosophical distinction between the description-commitments and the explanation-commitments of a logical theory (justifying that they may differ in some cases), in sum, we have argued as follows. (i) Over and above setting apart, in a precise and clear way, a class of arguments (ultimately arguments expressed in the vernacular), a logical theory should contribute to accounting for the distinction between the arguments in the class and other sequences of sentences. (ii) This requires taking very seriously the semantic account which is part of the

logical theory, because the explanation at stake is ultimately given model-theoretically, relative to the distinction between expressions whose interpretation varies from model to model and expressions whose interpretation remains fixed. (iii) When we consider FOL as applied to the ordinary arguments to which we take it to apply, taking that semantic account seriously entails that there are meaningful expressions whose truth-conditional contribution is an individual.

A more arguable issue is whether the distinction can in fact be used to vindicate Quine's contention; as we would put it, the claim that essentialism is among the explanation-commitments of QML. The reason why it is more arguable is related to the fact that the status of QML as a scientific theory cannot quite compare to that of FOL. Firstly (at the descriptive level), there are many modal logics, and it is not clear that any one of them captures even approximately all and only the inferences that should be counted as valid, given the way we use modal expressions and other theoretical considerations. Perhaps we use modal expressions in logically different ways in different contexts; perhaps the usual leeway that the different indeterminacies in our usage leave to theoretical decisions in matters of regimentation is here wider than in other cases. (This makes Quine's skepticism at least understandable, whatever we think of his arguments.) Turning secondly to explanatory concerns, there are many conceptual unclarities regarding the most widely accepted semantics for QML; but the explanatory application of QML also depends on the adequacy of that semantics. It is not clear, for instance, whether the commitment to possible-worlds is a commitment to particulars as objective as we take the actual world to be, and how this would tally with the Kripkean intuition that "possible worlds are not viewed through telescopes", that conceivability is a *prima facie* more reliable guide to metaphysical possibility than the mere appearance of truth can be taken to be a guide to truth.

However, to the extent that these unclarities can be ignored and QML regarded as a genuinely explanatory logical theory, we believe that a good case can be made, following Quine, for its explanation-commitment to essentialism. Consider the following schema, combining Quine's and Parsons' formulations of essentialism:

(5) $\exists x(\Box F(x) \wedge G(x) \wedge \neg\Box G(x)) \wedge \exists x \neg\Box F(x)$

Let us grant that no instance of (5) is a theorem of QML. This only establishes that essentialism is not a description-commitment of QML. But is it an explanation-commitment? By granting that no instance of (5) is a theorem, we grant just that the semantic properties of QML's logical constants do not require their truth; we grant that, compatible with that semantics, we can contemplate models relative to which they are false. In that sense, there is no commitment either arising from the logic of modality to the truth of, say, '□ 9 > 7' or '□ no bachelor is married': there are acceptable models that falsify the claims (they are false, for instance, relative to Parsons' maximal models). In the same way that the logically relevant features of the semantics of quantifiers are compatible with an empty domain, the logically relevant features of the modal operators are compatible with models that falsify essentialist claims. What is at stake now, however, is whether, relative to the standard possible worlds semantics, the explanatory application of QML to the modal claims constituting our world-view which enter in arguments essentially involving their modal properties in fact commits us to what is asserted by instances of (5). (The way in which, analogously, the *intended* model for our world-view should validate '□ 9 > 7' and '□ no bachelor is married'.)

We take it that our ordinary use of modal expressions (modal adverbs and the subjunctive, combined with the expressions that have translations in the language of FOL) allows for many true applications of (expressions that should be translated into QML by means of) open sentences of the form '$\Box F(x) \wedge G(x) \wedge \neg\Box G(x)$' to some entities, and true applications of open sentences of the form '$\neg\Box F(x)$' to some other entities. Think just of a claim to the effect that an event caused some other event. Arguably, claims like this involve—relative to the semantics that comes with the application of QML—separating (causally) essential properties of the event ("it was an earthquake of such and such intensity"), properties that *it* keeps in every relevant (accessible) world, from (causally) accidental properties of *that very same* event ("it was reported on the front page of today's *El País*"), properties that *it* lacks in some accessible possible world. Moreover, it is also part of our view that there are some other events lacking the (causally) essential properties of this one; that is to say, lacking in some accessible possible world the essential properties of *that event*, the particular earthquake in question.

Besides, as Quine points out, and as our use of italics in the previous sentence intends to stress, what is involved in applying the open formula to the event is the *de re* correctness of the attribution. The open formula is intended to apply to *the event itself*, independently of how we think of it; otherwise, we would rather resort to a less committal "way of modal involvement", paraphrasing the title of Quine 1953b. That is to say, the properties by means of which the event is presented to us may well be other than the relevant essential properties; we may even ignore them, when representing it as causing some other event.

It should perhaps be stressed that the preceding is independent of whether we assume the same individuals to be in the domains of different possible worlds, or rather we reject this notion, assuming a counterpart-theoretic semantics instead. In counterpart-theoretic semantics, a "counterpart" in w' of the individual assigned to the variable x in possible world w is assigned in w' to 'x', instead of the same individual being assigned (the domains of the possible worlds are taken not to overlap), and the same goes for genuinely referential expressions. Moreover, the relation of counterparthood is supposed to be determined by qualitative facts.[9] However, it is not assumed (and could not be assumed compatibly with giving an account of modal semantics fitting our semantic intuitions) that the qualities in question constitute the very modes of presentation through which we represent the individuals assigned to the expression relative to the actual world. The ultimate (linguistic) fact of the matter, to be respected both by counterpart theorists and theorists preferring the more ordinary semantics, is that while a description functioning *de dicto* in a modal context picks up its referent in other possible worlds "qualitatively", relative to the properties conforming the description, this is not the case with variables and referential expressions.[10]

Thus, we tend to agree with Quine that, in our own terms, essentialism is indeed an explanation-commitment of QML. To put it in different words, just by making the most ordinary modal inferences involving the interaction of modal expressions and the expressions translated in first-order languages which we take to be correct (something we mortals all do, including among mortals the most no-nonsense minded scientists in the pursuit of the most

9. See Hazen 1979, for an adequate presentation of these issues.
10. See chapter 4 of Lewis 1986, for elaboration and illumination on these issues.

serious of their scientific concerns), we are committing ourselves to there being *de re* essential and accidental properties of objects, if and to the extent to which the explanation of the validity of those inferences provided by QML is correct. Quine takes a rather grim view of QML on account of this.[11] As the reader has probably guessed, this is not an attitude we share with him. But that is an issue we have refrained from discussing here.[12]

References

Etchemendy, J., 1990, *The Concept of Logical Consequence*, Cambridge, MA: Harvard University Press.

Fine, K., 1989, 'The Problem of De Re Modality', in J. Almog, J. Perry, and H. Wettstein (eds.), *Themes from Kaplan*, Oxford: Oxford University Press, pp. 197–272.

García-Carpintero, M., 1993, 'The Grounds for the Model-Theoretic Account of the Logical Properties', *Notre Dame Journal of Formal Logic* 34, 107–131.

11. We should say, on behalf of Parsons, that he does recognize some form of commitment more substantive than that captured by what we have called description-commitments, arising from the "applications" of the logical system. These further commitments may come, he suggests, from truths of a priori theories to which the logical system is intended to apply, like arithmetics, or truths which are analytic but not logical theorems. He proposes to capture those additional commitments as further axioms of the logical theory. He then goes on to argue that, even so, no commitment to essentialism would follow, if two certain assumptions are granted (see Parsons 1969, sec. IV). Let us assume, for the sake of the argument, that our explanation commitments can be considered as "analytic truths" in a wide sense, and captured the way Parsons suggests. If so, this argument of his begs the question. For one of the two assumptions Parsons needs turns out to be that any additional axioms "be closed and contain no constants" (Parsons 1969, p. 80). This ensures, by assumption, that there will not be any "quantifying into" modal operators among the additional axioms. That is, however—in the framework that Parsons has chosen—just what is at stake; what is at stake, in this framework, is whether or not the additional non-logical axioms expressing the commitments that come from the "applications" include instances of (5). In assuming, without any justification, that this is not the case Parsons blatantly begs the question.
12. The present paper develops ideas first presented in Pérez Otero (1996). We want to express our gratitude to Ignacio Jané, Ramón Jansana, Josep Macià, and Gabriel Uzquiano for comments and discussions on previous versions of this material. Financial support has been provided by research project PB96-1091-C03-03, funded by the DGES, Spanish Department of Education.

García-Carpintero, M., 1996a, 'The Model-theoretic Argument: Another Turn of the Screw', *Erkenntnis* 44, 305–316.

García-Carpintero, M., 1996b, *Las palabras, las ideas y las cosas*, Barcelona: Ariel.

Hazen, A., 1979, 'Counterpart-Theoretic Semantics for Modal Logic', *Journal of Philosophy* 71, 319–38.

Kaplan, D., 1969, 'Quantifying In', in D. Davidson and J. Hintikka (eds.), *Words and Objections*, Dordrecht: Reidel, pp. 178–214.

Kripke, S., 1963, 'Semantical Considerations on Modal Logic', in L. Linsky (ed.), 1971, pp. 63–72.

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

Linsky, L. (ed.), 1971, *Reference and Modality*, Oxford: Oxford University Press.

Marcus, R. B., 1981, 'Modal Logic, Modal Semantics and their Applications', in *Contemporary Philosophy. A Survey*, Vol. 1, The Hague: Martinus Nijhoff.

Parsons, T., 1969, 'Essentialism and Quantified Modal Logic', in L. Linsky (ed.), 1971, pp. 73–87.

Peacocke, C., 1993, 'How Are A Priori Truths Possible?', *European Journal of Philosophy* 1, 175–199.

Peacocke, C., 1997, 'Metaphysical Necessity: Understanding, Truth and Epistemology', *Mind* 106, 521–574.

Pérez Otero, M., 1996, 'Verdad necesaria *versus* teorema de lógica modal', *Theoria* 11, 185–201.

Pérez Otero, M., forthcoming, 'A Fallacy about the Modal Status of Logic', forthcoming in *Dialectica.*

Quine, W. V. O., 1953a, 'Reference and Modality', revised version of the paper with the same title in his *From a Logical Point of View*, in L. Linsky (ed.), 1971, pp. 24–35.

Quine, W. V. O., 1953b, 'Three Grades of Modal Involvement,' *Proceedings of the XIth International Congress of Philosophy*, Brussels, 1953, Volume 14, Amsterdam: North-Holland. Also in W. V. O. Quine, *The Ways of Paradox*, New York: Random House, 1966, pp. 158–176 (to which we refer).

Quine, W. V. O., Marcus, R. B., *et al.*, 1993, 'Discussion', in R. B. Marcus, *Modalities. Philosophical Essays*, New York: Oxford University Press, pp. 24–35.

Smullyan, A., 1948, 'Modality and Description,' in L. Linsky (ed.), 1971, pp. 88–100.

Stalnaker, R., 1984, *Inquiry*, Cambridge, MA: MIT Press.

Wittgenstein, L., 1921, *Tractatus Logico-Philosophicus*, English translation by D. F. Pears and B. F. McGuiness, Atlantic Highlands, NJ: Humanities Press, 1992.

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Validity

1. Introduction: Approaching the Problem

1.1 *The Nature of Logic*

Knowledge may well, in the last analysis, be a seamless web. Yet it certainly falls into relatively well-defined chunks: biology, history, mathematics, for example. Each of these fields has a nature of a certain kind; and to ask what that nature is, is a philosophical question.[1] That question may well be informed by developments within the field, and conversely, may inform developments in that field; but however well that field is developed, the question remains an important one, and one that will pay revisiting. It is such a revisiting that I will undertake here.

The field in question is logic, one of the oldest areas of knowledge. The nature of this has been a live issue since the inception of the subject, and numerous, very different, answers have been given to the question 'what is logic?'. To review the major answers that have been given to this question would be an important undertaking; but it is one that is too lengthy to be attempted here. What I do intend to do is to give the answer that I take to be correct. Even here, it is impossible to go into all details. Indeed, to do so one would have to solve virtually every problem in logic! What I will give is the basis of an answer. As we will see, there is enough here to keep us more than busy.

1.2 *Focusing on Validity*

What, then, is logic? Uncontroversially, logic is the study of rea-

1. Even when—especially when—the field is philosophy itself. See Priest 1991a.