MANUEL GARCÍA-CARPINTERO

THE MODEL-THEORETIC ARGUMENT: ANOTHER TURN OF THE SCREW*

My aim in this paper is – dreadful though the prospect may appear – to add to the already enormous amount of literature on Putnam's "model-theoretic" argument against realism.[1] I shall do so even though I believe that the argument has already been conclusively refuted, and that everything of substance which could be said to refute the argument has already been said.[2] However, recent attempts to defend the model-theoretic argument in the face of the aforementioned criticisms – showing how what I take to be the main point of previous rebuttals of the argument can be easily missed – justify my purpose.[3] It may be illuminating and helpful, I believe, to expound the same point again in a different guise, by having recourse to ideas on models and the model-theoretic account of the logical properties I have developed in another place.[4]

Some writers appear to think that the charge of previous criticisms is that Putnam's argument begs the question, by involving as premise a proposition which all too obviously entails the falsity of realism – precisely what the argument is designed to establish. They then defend it by claiming that Putnam does not simply *take for granted* the truth of the offending premise, but *argues for* it.[5] This, however, does not defend Putnam's argument against the *pragmatic* charges of irrelevancy and potential for provoking confusion – which I take to be the main criticisms levelled against it by previous writers. In a nutshell, this is the point I shall be developing in the following pages. If Putnam has an independent argument for the question-begging premise, one not involving any model-theoretic considerations, then this is all that is needed; the specifically model-theoretic considerations are irrelevant, and could lead to spurious debates.

In the first section, I shall present what I take to be Putnam's model-theoretic argument. In the second, I shall show, by having recourse to the ideas on models and the model-theoretic account of the logical properties I referred to above, how the soundness of the specifically model-theoretical aspects of the argument depends on certain assumptions about the meanings of the logical constants. In the third I shall take up again the pragmatic charges against the argument summarized above.

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1.

Let G be an "epistemically ideal" subject. The concept of such a subject is not crystal-clear, and certainly a serious examination of the debate realism-antirealism would crucially depend upon the various ways in which we can render the idea precise enough. It will be established later, however, that the reasons why the model-theoretic argument fails do not hinge essentially on the issue. I shall therefore help myself to the customarily vague characterization: An *epistemically ideal subject* is one who, endowed with a cognitive system similar to that of a normal human being and (therefore?) with the canons of methodological virtue epistemology would ideally settle on, has access (unrestricted by "medical" limitations) to every relevant observable circumstance, every relevant obtainable experimental result and every reading of every relevant attainable instrument. G can be said to belong to the Peircian community of scientists in the ideal limit to which rational inquiry ideally converges on.

Let $\mathcal{L}$ be G's representing language, and $\mathcal{T}$ G's theory, the set (closed under logical consequence) of $\mathcal{L}$-sentences accepted by G. Putnam defines "realism" to be the thesis that $\mathcal{T}$ might be false:

(R) $\mathcal{T}$ might be false.

As I said, a serious examination of the debate about realism would require us to check this contention carefully. But, as nothing relevant to the present discussion will hinge on the issue, we can safely accept (R).

It seems reasonable to believe that $\mathcal{L}$ might well be regimented by having recourse to some (or a mixture) of the artificial languages designed by the twentieth-century logicians who have followed in the footsteps of Frege, Russell and Whitehead. At the very least, it seems extremely plausible to see $\mathcal{L}$ as a first-order language; and perhaps (also) as a higher-order language, or even a higher-order intensional language. This does not mean only that $\mathcal{L}$ contains expressions with the syntax of their counterparts (quantifiers, connectives, first-order singular terms and predicates, etc.) in the languages designed by logicians, but that it contains expressions with their semantics as well. Thus, to see $\mathcal{L}$ as a first-order language (or any other artificial language studied in mathematical logic) means to impose on $\mathcal{L}$ a determinate relation of logical consequence. Therefore, we may assume:

(LR) $\mathcal{L}$ is logically regimentable ($\mathcal{L}$ is at least a first-order language).

It follows from (LR) that L will have "models," or "interpretations," in the sense logicians give to these words. On the assumption (which we can take to follow from the fact that it is an epistemically ideal theory) that $\mathcal{T}$ is consistent, some of them will be models of $\mathcal{T}$. I.e., $\mathcal{L}$'s models will make true all the sentences in $\mathcal{T}$, when $\mathcal{T}$ is viewed as a formal theory: a theory all of whose terms other than the logical ones admit every possible interpretation which satisfies constraints such as the requirement that the monadic predicates be interpreted as subsets of the domain of quantification, etc. In fact, $\mathcal{T}$ will have many such models. In "Models and Reality," Putnam belabors this point by resorting to what for the layman is sophisticatedly technical expertise, but in fact (as previous writers have indicated, and Putnam grudgingly acknowledges) the point is easily made. Even if $\mathcal{T}$ is not only consistent, but also categorical (if, say, $\mathcal{T}$ just has finite models, or $\mathcal{L}$ – and $\mathcal{T}$ with it – has been regimented in a second-order language), *to the extent that $\mathcal{L}$ has been regimented relative to any of the familiar formal languages* $\mathcal{T}$ will certainly have many different models: for *being categorical* just means that all models of $\mathcal{T}$ are isomorphic, not that $\mathcal{T}$ has just one model. This is Putnam's model-theoretical point.[6]

(MT) $\mathcal{T}$ – viewed as a partially uninterpreted theory – will have many different models.

Now, according to Putnam, it is a presupposition of (R) (or it is otherwise entailed by it) that $\mathcal{L}$ has a determinate "intended" model: the model which (R) states that could falsify $\mathcal{T}$. This claim can also be reasonably challenged. Every language we know of that represents the material world is somehow vague. Models, however, in the logician's sense we are considering here, are defined relative to the language. It follows that the "intended" model for a given regimentable language is left unspecified to the very same extent that the language is vague. However, again nothing hinges on this, so that we can grant this point too.

(IM) $\mathcal{L}$ has a determinate intended model.

The logic of the situation (we are presenting a "model-theoretic" argument against realism) apparently requires us now to expose some logical conflict between (MT) and (IM). How does Putnam manage to bring (LR), through its consequence (MT), to bear on (R), through its consequence (IM)? As far as I can tell, he does so by means of a claim which, given its superficial resemblance to verificationist contentions, I shall refer to as the "verificationist point."

(VF) Except for the logical vocabulary (and perhaps also for the observational vocabulary), $\mathcal{T}$ provides the only intelligible way to specify the intended model for $\mathcal{L}$: The intended model is "the" model which satisfies $\mathcal{T}$, viewing $\mathcal{T}$ as a formal theory. Any proposed constraint could intelligibly bear on the specification of the intended model only in this way, by belonging to $\mathcal{T}$.

It is clear now how (VF) brings the model-theoretic considerations to bear on the discussion, for it not only explicitly denies (R); it contradicts (IM), as (MT) makes it clear that the alleged definition is bound to be improper.

Previous philosophers who have discussed Putnam's argument have clearly shown how (VF) begs the question. Indeed, it may seem that only a straw man designed to be easily refuted could have actually defended the argument as so far presented.[7] A more sympathetic interpreter might thus contend that the argument should be viewed as including an independent argument for (VF) – instead of just taking it for granted. We shall discuss later to what extent this would make Putnam's argument less flawed. But the textual evidence clearly sustains taking (VF) as a premise when reconstructing Putnam's argument. Firstly, there is Putnam's consistent practice of countering any possible suggestion as to the relevance of any given further constraint by adding it to $\mathcal{T}$ and then applying the model-theoretic point to the result. (This is Putnam's contention that his opponents merely add "just more theory" or try "to determine the interpretation of an unfixed language with an equally unfixed metalanguage".)[8] Secondly, (VF) at least establishes the required connection between the model-theoretic point and realism. After all, the argument was supposed to be a *model-theoretic* one.

2.

I said before, in justifying (LR), that it seems reasonable to believe that $\mathcal{L}$ might well be regimented having recourse to some of the artificial languages invented by contemporary logicians; and that through this regimentation we would impose on $\mathcal{L}$ a determinate relation of logical consequence. Further reflection on this will cast new light on a well-known rebuttal of Putnam's argument.

Artificial languages serve multiple purposes, but the main one, I have argued elsewhere,[9] is to provide streamlined "scale models" for fragments of natural languages. These scale models are designed so that precise and conceptually well-justified definitions of the logical properties can be indirectly given for the modelled fragments. The definitions of the logical properties I have in mind are, of course, the familiar Tarskian model-theoretic definitions: logical truth is truth in all models, logical consequence the relation that holds between a set of sentences Γ and a sentence σ iff σ is true in every model in which each and every sentence in Γ is true. The word 'model' is used here in a technical sense, which must be carefully distinguished from the ordinary one I have invoked in calling the artificial languages for which these definitions are strictly speaking provided "scale *models*" of natural language.

The conceptual justification for the model-theoretic definitions of the logical properties is perhaps not so familiar; to delve into the issue will provide further light on the nature of these "models." The intuitive concept of the logical properties (we will consider only *logical truth*, for simplicity's sake), as Tarski says in his classic paper on the issue,[10] has a *modal* and a *formal* dimension. The modal dimension is captured in the model-theoretic account by explicating logical truth as a species of *analytic truth*, truth in virtue of the meaning of a class of expressions (the "logical constants"). (By "meaning" we understand throughout the paper *truth-conditional import*.) At first sight, it is not obvious how the standard model-theoretic definition of logical truth makes it a species of analytic truth. The point can be seen by considering the way the model-theoretic account captures the other dimension of the intuitive concept, the *formality* of the logical properties. Tarski himself tried to capture this "formal" dimension by characterizing the truth-conditional import of the logical constants as *invariant under permutations of the universe*.[11] We can frame the idea instead in a more general and accurate way by taking certain cues from Wittgenstein's *Tractatus*.

The truth-conditional import of sentential connectives is answerable to some semantic values of the sentences they connect, but, what are those *semantic values*? Are they the *truth-conditions* of the sentences they connect, in the last resort the truth-conditions of the atomic sentences? Not so, at least according to the semantic analysis embodied in the specification of the language of propositional logic on which the model-theoretic account is based. So far as the truth-conditional import of the propositional connectives goes, the *specific* truth-conditions of the atomic sentences do not matter; their truth-value is all that matters. The truth-conditional import of propositional connectives is indifferent to the subject-matter of the sentences they connect; it is only sensitive to the atomic sentences' truth-value. Because of that, if (but only if) a sentence is true no matter what the *truth-values* of the atomic sentences in it are, it is a truth in virtue of the meaning of the propositional connectives.[12] The same, *mutatis mutandis*, holds for logical consequence. It is for this reason that "models," in the context of propositional logic, are precisely assignments of truth-values to the atomic sentences: given the propositional connectives' meanings, *truth in all models* will then coincide with *truth in virtue of the meaning of the logical constants*. Understanding the way the model-theoretic account captures the idea of "formality" present in the intuitive concept of the logical properties helps us to understand also how it captures its "modal" aspect.

Models are an artifact for phrasing definitions for the logical properties in a precise way, given a previous semantic analysis of the logical constants' meanings. In the presence of this semantic analysis, by referring to models we abstract away from differences in subject-matter which, if the analysis is correct, are bound to be irrelevant to determining whether a given sentence is true, or an argument valid, in virtue of the meaning of the propositional connectives. To the extent that the semantic analysis of the propositional connectives is correct, any two sentences and any two arguments with the same "logical structure" must share their logical properties. In this sense, models blur differences that a fully-fledged semantic theory for the non-logical expressions would certainly grant. Of course, for the semantic analysis of the logical expressions to be tenable, a fully-fledged semantic theory must determinately link the fully-fledged interpretations it attributes to the non-logical expressions (the truth-conditions for atomic sentences, in the propositional case) with the more abstract model-theoretic "interpretation," the non-logical expressions' *logical values*: those values to which the truth-conditional import of the logical expressions is exclusively sensitive (the truth-values for atomic sentence, in the propositional case).[13]

By 'logical value' I refer to the semantic properties of the nonlogical expressions to which alone the truth-conditional contribution of the logical expressions is sensitive, according to the meanings that our semantic theory attributes to them. The claim being made is then that models are possible logical values that expressions belonging to the same logical category as the nonlogical expressions in the sentence could have had. They represent possible combinations of those semantic values of the nonlogical expressions on which the specific contribution made by the logical expression to the truth conditions of the whole depends.

The propositional case suffices to make the point, for it is relatively uncontroversial. I submit that similar considerations apply to first-order logic, and also to higher-order logic.[14] In all these cases, in accordance with a particular semantic analysis of the relevant logical expressions, and pursuing a precise definition of truth and validity in virtue of the meanings of those expressions, models abstract away from the specific

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contents of the nonlogical expressions (referring expressions and predicates of any order and poliadicity). As far as the truth-conditional import of the quantifier is concerned, according to that semantic analysis, all that matters for the truth of the quantificational claim "all As are Bs" is a certain set-theoretical relation between the extensions of the predicates in the domain. The specific natures and identities of the objects in the domains, or the properties shared by the objects in the extensions of the predicates do not matter at all. This "semantic analysis" is of course provided with the semantic specifications for the formal language, and carries over to any interpreted language to which logic is applied. That it thus carries over is presupposed by the theoretical claim that the crucial properties of the artificial languages *model* the target properties of natural language; for the theoretical properties on which logical truth and logical consequence depend in the artificial language are precisely the meanings of the logical constants.[15]

The remarkable consequence for our present concerns is this: logical truth, truth in virtue of meaning of the logical expressions, will reasonably coincide with truth in all models, but models are going to be such that isomorphic (first-order, higher-order or intensional) models are to count as one and the same model. For models are possible combinations of those semantic values of the nonlogical expressions to which alone the truth-conditional import of the logical expressions is sensitive. They are just combinations which could have corresponded to *expressions belonging to the same logical category*, for, as we claimed, the truth-conditional contribution of the logical constants is not sensitive to the specific identities of the entities referred to by singular terms or to the attributes shared by entities in the extension of relational terms.

The ordinary concept of the logical properties applies, of course, to arguments in natural language. If the preceding points are correct, then, the justification of the model-theoretic account presupposes the validity of the semantic analysis of the logical expressions on which the theoretic account rests. I.e., it presupposes that, as far as the truth-conditional imports of the logical expressions are concerned, artificial languages really are good "models" (now using the word in the sense it has when we say that scientific theories characterize abstract "models" of the world) of natural languages. I do not see any reason to deny this in the first-order case. Higher-order and intensional languages are clearly more controversial matters. The points we are going to make would apply without modification, though, were a precise definition of $\mathcal{L}$'s logical properties to require regimentation in any of those languages, so let us stick to the first-order case henceforth.

3.

Consider again the controversial premise in the model-theoretic argument:

(VF) Except for the logical vocabulary (and perhaps also for the observational vocabulary), $\mathcal{T}$ provides the only intelligible way to specify the intended model for $\mathcal{L}$: The intended model is "the" model which satisfies $\mathcal{T}$, viewing $\mathcal{T}$ as a formal theory. Any proposed constraint could intelligibly bear on the specification of the intended model only in this way, by belonging to $\mathcal{T}$.

We have seen in the previous section that it belongs to the very essence of models that the "intended" model for a logically regimented language *cannot* be fixed (except maybe up to isomorphism) in the way contemplated in (VF), relative to any previously specified class of sentences in the language containing some uninterpreted nonlogical vocabulary. This validates the argument to which (VF) contributes with a vengeance, but it also undermines the argumentative role it is designed to play.

For the sake of having in mind concrete intuitions, let us consider the paradigmatic vocabulary regarding which realists and antirealists part company: theoretical terms in advanced scientific theories, together with causal-explanatory talk. Following Putnam, we have been very vague about the consequences of $\mathcal{T}$ being the set of sentences in $\mathcal{L}$ accepted by *an epistemically ideal subject*. To make matters more simple, let us assume that the idea is presented in such a way that, as the exceptions contemplated in (VF) suggest, the meanings of the logical and the observational vocabularies are determined in all relevant respects independently of $\mathcal{T}$.[16] Now, given our findings in the previous section about the role of models, what is the semantic consequence of (VF) for theoretical terms and terms essential to causal-explanatory talk? It is, obviously, an antirealist one. Thus (VF) simply begs the question of realism about theoretical terms and causal-explanatory talk. (VF) simply asserts exactly what the realist denies; namely, that the extensions of 'causes', 'explains', and the theoretical vocabulary are fixed (to the extent that they are fixed at all) by facts about the epistemically relevant aspects of the psychological endowment of human beings.

In order not to beg the question, Putnam could now give an independent argument for (VF). There are plenty of ideas in the literature, for this is in fact what the real dispute between realists and antirealists is all about. A first possibility is to request from the realist his account of what fixes the meanings of theoretical terms and causal-explanatory talk, as an

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alternative to the proposal contained in (VF), and examine it critically. Contemporarily, the realist is a functionalist of some variety: what he proposes is that the meaning of 'mass', 'force' and causal-explanatory talk in physics is to be specified by theoretical terms in psychology and linguistics and causal-explanatory talk in these disciplines, themselves interpreted of course along the same realist guidelines. Putnam could oppose this by arguing that causal-explanatory talk, particularly when involving "macroscopic" subjects, is ever so ridden with "pragmatic" or otherwise anthropomorphic aspects to fulfil its intended role properly. Alternatively, Michael Dummett's "full manifestability in use" requirement offers a more direct argument for something like (VF).

In fact, Putnam does not simply assert (VF); he supports it with some considerations along the lines of the first type of argument.[17] A defender of his argument may thus insist that the full model-theoretic argument should be taken to include this additional argument for (VF). (This is, indeed, Anderson line in Anderson 1993.) But this misses the point of the criticism. For the additional argument for (VF) leaves the longer argument of which it is supposed to be a part devoid of any substantial significance. If we can really show that the meanings of theoretical terms and those involved in nomological talk are to be explained "by description," relative to the already understood meanings of observational and logical expressions, then we do not need any further model-theoretic consideration: we are definitively through with scientific realism, in a simple and very perspicuous way. Hence, to the extent that we do have a good argument for (VF), it is pragmatically very confusing to place it in the context of the model-theoretic argument. For this would be an argument for what already follows from (VF), without further ado. There is no reasonable purpose that could be served by such an argumentative strategy: (VF) is already *a direct rejection* of realism.

Assuming that we already have an argument for (VF) – and therefore an independent argument against realism – we could perhaps find some conceptual illumination in combining (VF) with (MT) to contradict (IM) and thus (R). This will be more properly described as *some model-theoretic consequences of anti-realism which further contradict realism* than *a model-theoretic argument against realism.*[18] This is not a mere terminological point. Suppose that I propose an argument with two premises, A and B, for a certain conclusion C. On account of relying on premise A, I declare the argument to be an F-theoretic argument for C. Premise B is necessary to bring the F-theoretic considerations in A to bear on the issue. In this situation, my audience is pragmatically entitled to assume that B is either *prima facie* acceptable to the different parties to the dispute, or at least defensible on the basis of facts not directly implying C by themselves, independently of the F-theoretic considerations in A. This pragmatic entitlement arises from the only sensible rationale that in the situation can be ascribed to my announcement. If, as it happens, far away from being at least *prima facie* acceptable to those rational beings who may well not be prepared to grant the intended conclusion C, B is *manifestly* a direct contradiction of it; and if I therefore have to support C with an independent argument which does not involve at all F-theoretic considerations, then the least than can be said of the way I have conducted the argument is that it has been very misleading and puzzling to my audience. As I have shown, this schema fits well Putnam's procedure, as presented now by last-ditch supporters like Anderson.

A doubt can arise as to whether (VF) is indeed *manifestly* a direct rejection of realism. Indeed, if it were necessary to take into account the Löwenheim-Skolem theorem (or the still sophisticated considerations regarding modal languages in Putnam 1981), this claim could be reasonably disputed. But, as I have shown in the second section, this is not the case. The only requirement to appreciate the point is to understand the role of models in the model-theoretic account of the logical properties: if causal-explanatory talk and the theoretical vocabulary are to be viewed as only partially interpreted by their relations in $\mathcal{T}$ to the independently interpreted logical and observational vocabulary – any further attempt to interpreting them being "just more theory" – $\mathcal{T}$ *trivially* cannot have just one intended model. Any model isomorphic to the allegedly intended one will do as well, and – given what models are – there necessarily are plenty.

To put it briefly, the charge against the model-theoretic argument is pragmatic: not that the argument can be shown to be invalid, but that it is a twisted and extremely confusing piece of reasoning. We had better forget about models and straightforwardly devote our efforts to the traditional disputes between realism and anti-realism; that is to say, to the arguments for and against (VF).[19]

NOTES

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[1] Sources for the argument in Putnam's writings are Putnam 1978, pp. 123-138; Putnam 1981, ch. 2 and "Appendix"; Putnam 1983, and the "Introduction" in the same volume, pp. viii-xiii), and Putnam 1989.

[2] In papers such as Merrill 1980; Devitt 1983; Lewis 1984; Brueckner 1984; Heller 1988,

and van Cleve 1992.

[3] Anderson 1993 is a good case in point.

[4] In García-Carpintero 1993.

[5] This is the main point in Anderson 1993.

[6] The version of the argument Putnam gives in *Reason, Truth and History* is less technically imposing in that he only appeals to the point made in the main text. He still manages to give it (apparent) extra depth, by applying it to an intensional language.

[7] Anderson says that, as presented thus far, the argument is "pathetic," "not worthy of our attention." (Anderson 1993, p. 322.)

[8] See Putnam 1981, pp. 36 and 45-6; "Introduction" to Putnam 1983, p. xi; "Models and Reality," pp. 18 and 24; and Putnam 1989 p. 217. Anderson says "the 'just more theory' response is a reduction directed specifically at causal realism" ("What Is the Model-theoretic Argument?," p. 319), but the first and last texts contradict his claim: in them, Putnam applies the response to 'see' and 'explain' as alleged reference-fixers.

[9] See García-Carpintero 1993 for a more detailed presentation of this and the following contentions.

[10] Tarski 1956, p. 415. I *do not* intend the following as an interpretation of Tarski's (although I do not think it is far away from his actual intention).

[11] See G. Sher's recent development of the idea (and further references) in Sher 1991, especially chapter 3.

[12] See García-Carpintero 1993 pp. 113–119 for a detailed justification of this contentious claim.

[13] On the other hand, and exactly for the same reasons, there could well be model-theoretic "interpretations" which a fully-fledged semantic theory would not acknowledge as possible. As far as propositional logic is concerned, the logical properties of 'it is not the case that this patch is entirely red and this patch is entirely green' are to be the same as those of 'it is not the case that this patch is red and this patch is round', which forces us to have a "model" such that the valuation of both 'this patch is entirely red' and 'this patch is entirely green' is the truth.

[14] I have argued the point for the first-order case, in the paper already mentioned.

[15] This point is also developed at length in "The Grounds for the Model-theoretic Account of the Logical Properties."

[16] Putnam's "concessions" regarding the independent determinacy of the observational vocabulary (see Putnam 1983, pp. 12–13 and p. 16; Putnam 1981, p. 218, and Putnam 1989, p. 215) allow this; and the argument presupposes the independent determinacy of the logical aspects of meaning.

[17] See particularly "Why there isn't a ready-made world," in the same compilation as Putnam 1983, pp. 205–228. See E. Sosa "Putnam's Pragmatic Realism," *Journal of Philosophy* **90**, 1993, pp. 605–626, both for some considerations to reject Putnam's version of the argument and for new grounds to elaborate a more forceful version of it.

[18] When the model-theoretic considerations are put in this, more modest and accurate light, a new problem comes clearly to the fore. As we have seen in the previous section, the correctness of the model-theoretic point crucially rests on the assumption that the Tarskian semantics for the first-order logical constants is the correct one. However, familiar Dummettian considerations cast a doubt on that assumption if antirealism is true. Putnam has insisted that his brand of antirealism is compatible with bivalence; but, at the very least, what he has to say in this regard is too summary to be of any help ("Models and Reality," 19–21). See the excellent discussion in Wright 1992, 37–48 for some problems.

[19] Nothing in what I have said should be taken as implying that I find congenial Putnam's

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argument for (VF). That is far from being the case. But there certainly are important philosophical problems related to the realist account of *causality*, *explanation* and so forth, and his pressure on naive realists who seem to ignore it is helpful and salutary. I cannot say the same regarding the model-theoretic point.

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Departamento de Logica, Historia y
Filosofia de la Ciencia
Universidad de Barcelona
08028 Barcelona
Spain