LOGICAL DISPUTES AND THE *A PRIORI*

[DISPUTAS LÓGICAS E O *A PRIORI*]

Graham Priest
Professor at CUNY (City University of New York) (USA)
Visitor Professor at University of Melbourne (Australia)

Natal, v. 23, n. 40
Jan.-Abr. 2016, p. 29-57

Princípios
Revista de filosofia
E-ISSN: 1983-2109

Resumo: Neste artigo proponho um modelo geral para a solução racional de disputas sobre lógica e discuto algumas de suas características, que incluem a dispensa da noção tradicional de *a priori* em lógica, e algumas objeções que daí possam surgir.

Palavras-chave: Lógica, Escolha de teorias, Racionalidade, *a Priori*, Critérios múltiplos.

Abstract: In this paper, I propose a general model for the rational resolution of disputes about logic, and discuss a number of its features. These include its dispensing with a traditional notion of the a priori in logic, and some objections to which this might give rise.

Keywords: Logic, Theory choice, Rationality, *a Priori*, Multiple criteria.

This article will also be published in a forthcoming volume of "Logique et Analyse" <http://www.logiqueetanalyse.be>. The Journal "Princípios" would like to thank Jean Paul Van Bendegem, editor of "Logique et Analyse", who kindly allowed its publication here.

1 Introduction: Logical Disputes

Human beings, being what they are, are capable of disputing most things, from the age of the cosmos and the metaphysical nature of substance, to who will win the next Australia/England cricket test series, and which is the most beautiful city in the world. And one would hope that some of these disputes, at least, should be rationally resolvable — which is not, of course, to say that all parties can be brought to agree.

One of the things that human beings — well, philosophers anyway — dispute about, is logic. In the last hundred years, for example, there have been many, sometimes heated, debates between those who endorse "classical" logic and those who reject its hegemony: intuitionist logicians, relevant logicians, paraconsistent logicians, etc. It may be felt, though, that disputing logic is problematic. When people dispute, they argue; when they argue, they use logic. That is, they appeal to what follows from what they or their opponent holds. (That, at least, is preferable to using bombs.) If logic is part of the *mechanism* of dispute-resolution, how can it itself be disputed?

The problem is not as acute as it might appear. There are clear analogies. The law is a mechanism that is set up to resolve disputes of a certain kind; but, in a court of law, legal procedures can themselves be disputed. (For example, one may contest the claim that the issue at hand falls within the jurisdiction of the court in question.)[1] Nonetheless, this at least raises the question of how, exactly, disputes in logic are to be conceptualised. That is the topic of this paper.

I think that they are to be conceptualised in terms of a very general model of dispute-resolution. In the first part of this paper I will describe the model, and argue that it applies to logical disputes. A salient feature of the model is that it dispenses with something that

[1] And the constitutions of countries normally specify procedures governing how laws are to be revised. But they normally contain clauses about how they themselves may be revised.

has often been taken to be an important part of the epistemology of logic: a privileged role for a certain notion of the *a priori*.[2] In the second part of the paper I will consider and reply to three objections to the model based on this fact.

2 A Model for Theory-Choice

2.1 Rational Theory-Choice

The model I will propose is one that is familiar, in many ways, from the philosophy of science. It is applied whenever we have to choose rationally between competing theories.[3]

Start by noting that there are many criteria that speak in favour of a theory. The exact list is a matter for contention.[4] The details will be largely irrelevant to what I have to say; but standard candidates include:

- adequacy to the data
- simplicity
- consistency
- power
- avoidance of *ad hoc* elements

On the other side of the ledger, a bad performance by a theory on any of these criteria will speak against its rational acceptability.

Note, next, that the criteria enumerated will often not all line up on the same side. Thus, for example, in the debate between Copernicus and his detractors (at least according to traditional wisdom),

[2] For a nice introduction to accounts of the *a priori*, see Mares (2011).

[3] This is articulated Priest (2006), ch. 8. Although ch. 10 of the book defends the revisability of logic, the model is not there applied specifically to logic. The point of this paper is to do so.

[4] And may depend, in some cases, in the area in question. For example, accuracy of prediction might be a desideratum. This is obviously applicable only in a theory that has quantitative consequences.

the Copernican and the Ptolemaic models were about equal on adequacy to the data; the Copernican model was simpler; but the Ptolemaic model was unified with contemporary dynamic theory, whilst the Copernican model could deal with the dynamics of the Earth's motion only in an *ad hoc* way, if at all.

Given the possibility (probability) of such a non-uniform distribution, when is one theory rationally preferable to another? The natural answer is that it is preferable when it is sufficiently better on sufficiently many of the criteria. That is, of course, vague — and probably ineradicably so. But we can render it a little more precise with a formal model. Let the set of criteria be $\{c_1,...,c_n\}$. We may measure how good any theory is according to each criterion. The scale is conventional to a certain extent. Let us suppose that it is the set, X, of reals between -10 and $+10$.[5] Thus, for any criterion, c, there is a measure function, μ_c, such that for any theory, T, $\mu_c(T) \in X$. There is no reason to assume that all criteria are equally important. Thus, each criterion, c, has a weight of importance, w_c; and we can again assume that $w_c \in X$. Now, given a theory, T, define its *rationality index*, $\rho(T)$, to be the weighted sum of its performance on each criterion:

$$\rho(T) = w_{c_1}\mu_{c_1}(T) + ... + w_{c_n}\mu_{c_n}(T)$$

In a dispute, there will be a bunch of theories on the table, T_1, ..., T_k.[6] The rationally preferable theory is the one with the highest rationality index. If there is a tie for first place then the rational choice is indeterminate. Perhaps we should refrain from judgment; perhaps it is rational to select any of the tied alternatives.[7]

[5] Thus, one can imagine someone being given a questionnaire, where they have to score the theory on that scale, with 0 being the point of indifference.

[6] These are the theories from which a serious choice must be made. Even to get on the table, a theory must satisfy certain conditions. In particular, it must do a reasonable job of accounting for the data. It would be absurd for the rationally preferable theory to explain none of the data.

[7] Thus, for example, as discussed by Cook (2007), there is a continuum of logics between classical and intuitionistic logics. Suppose that a number of these are on

The model is clearly simplistic in various ways. For example, to expect exact values for the various quantities seems unduly unrealistic, though we may hope that there is enough consensus about rough figures to give determinate answers. The model can be articulated to accommodate some of these complexities,[8] but the basic model will suffice for purposes here.[9] Note that I am not suggesting that in real-life disputes people actually sit down and do the calculations. Rather, the point is that when rational disputes are in progress, the arguments deployed may be understood as implicitly addressing the model. The model, then, gives a "rational reconstruction" of what actually happens.[10]

At any rate, though formulating a sufficiently precise and realistic model of the methodology of theory choice in logic may not be easy, it is no harder than the same problem for theory choice in general. They are the same problem.[11]

---

the table. There may be nothing much to choose between them, and we can simply choose arbitrarily.

[8] See Priest (2006, ch. 8).

[9] A rather different model which is purely qualitative is as follows. Each criterion simply determines an ordinal ranking of each theory. Since we need to take into account all the criteria, these rankings themselves have to be aggregated. One may do this by taking the rankings as preferential votes, and use a suitable voting procedure. A problem with this model is that all criteria have, effectively, equal weights. This can be rectified by assigning different weights to the vote of each criterion, though this reintroduces quantitative considerations into the procedure.

[10] The view given here seems to be of a piece with the view put forward more informally by Russell (2014). She illustrates her hero going through the kind of reasoning in question, weighing up the virtues of classical logic *vs* a three-valued logic, as follows (p. 172): 'the three-valued logic has all the virtues of classical logic: it explains the presence of the various logical properties, does so in a simple, unified fashion etc. but it also accounts for some difficult cases where classical logic says nothing. So on balance she thinks it better...'. That is, the three valued logic scores better on adequacy to the data, and scores just as well on the other virtues. Hence it is preferable.

[11] In his (2014) Mares has an elegant construction of probability functions which allows the assignment of probabilities to different logics. An agent's acceptance of a logic can then be thought of as having a sufficiently high (subjective) probability. A

2.2 Comments on the Model

So much for the model itself. Let me now make some comments on it, spelling out some of its implications.

First, the model is essentially *fallibilist*. That is, the theory that is rationally preferable, according to this account, may change as things develop. This is for several reasons. The choice between theories is to be made from those currently on the table.[12] It is quite possible that a new theory will come along, and that its emergence will change matters. (Dually, if the rationality index of a theory becomes vanishingly low, it may simply drop off the list entirely.) Also, how well a theory performs on the criteria may well change as we learn more. Thus, a new piece of data may come to light, affecting the adequacy criterion; or ongoing research may show that a theory is inconsistent, which had not been suspected before; and so on.

The fallibility should be understood as applying to data as well. Generally speaking, data are soft, in the sense that they can legitimately be rejected. Thus, for example, if the theory is one in the empirical sciences, a datum may be provided by some experimental result. If the result is out of line with the rationally dominant theory, then it may be rejected as due to experimental error. Of course, if

change of acceptance can be modelled by conditionalisation on new evidence. This gives an account of theory-change. A weakness of the model, as it stands, is one which it shares with all Bayeseanism: the priors are entirely arbitrary (save only for satisfying certain coherence constraints). Relativism therefore beckons. A second weakness is that it provides no account of what sort of evidence it is that occasions revision (as Mares himself points out, in the conclusion of his article). There may, however, be some interesting connections between his model and the one presented here. The present model may be seen as spelling out rational constraints on priors, and also as giving an answer to the question of what sort of evidence is at issue in revision. These matters promise further interesting investigation.

[12] There is no reason to suppose that these have to be comparable in all regards, say being expressed in the same language. We can compare first-order logic and Aristotelian syllogistic. Of course, if the power of one theory, as determined by its expressive ability, is greater than that of another, that will speak in its favour.

this is just an *ad hoc* move, this will itself speak against the theory; better for the theory if it can find an independent explanation for the appearance of the datum.

Third, exactly how to articulate many of the criteria is contentious. Simplicity, for example, is said in many ways; conceivably, there could be many different kinds of simplicity, and corresponding criteria. The most straightforward of the criteria is consistency. But note that, like all other criteria it is, in principle, a matter of degree. If a theory uses a paraconsistent logic, where a contradiction does not imply everything, the theory may be more or less inconsistent. Of course, if a theory (like that of Frege's *Grundgezetse*) has an explosive underlying logic, then any inconsistency will result in inconsistency of the worst kind: triviality. Note also that the triviality of a theory will affect criteria other than the consistency. Since the theory delivers everything, it will also fare very badly with respect to the criterion of adequacy to the data, for example. It will entail many rejected data points. (For example, the theory will predict that we saw the sun turn green yesterday; we did not.)[13]

Still on the subject of consistency: it is only one criterion amongst many. How to weight it is, I am sure, itself the subject of some dispute. But whatever the weight, an inconsistent theory can be rationally preferable to a consistent one, if the performance of the inconsistent theory outweighs the consistent one on the other criteria. Thus, for example, Newtonian dynamics, based, as it was, on the inconsistent theory of infinitesimals, was inconsistent. Its explanatory and predictive power was so enormous, however, that this trumped problems about inconsistency (such as those articulated by Berkeley).

[13] Of course, just a high degree of inconsistency may well have the same consequences. So adequacy to the data and consistency may be connected. What this shows is that criteria of evaluation need not be independent.

2.3 Paraconsistency

This is perhaps the place to say a word about another matter, since logical disputes, and so by implication paraconsistency, is on the table. It is sometimes objected to one who advocates the rational possibility of accepting contradictions that, if this were permissible, any theory would be rationally immune from objection, since a person could accept both the theory *and* the conclusion of the objection establishing something inconsistent with it. This, of course, is a complete *non-sequitur*, as the model makes clear. Accepting an inconsistency is always a potential move in logical space. It could yet produce a theory which is rationally inferior to other theories, because of the theory's performance on various of the criteria.[14]

More fundamentally, one might wonder whether the possibility of endorsing contradictions undercuts the possibility of rational choice itself. Why can we not accept two (or more!) theories, which are inconsistent with each other? The answer is simple. Accepting two inconsistent theories, say T_1 and T_2, is indeed a possibility. It amounts to accepting the theory $T_1 \cup T_2$. If this is a serious possibility, it is one of the theories on the table, and should be evaluated in the same way as other theories. In general, however, the theory is likely to have little to recommend it. If either of the theories is based on an explosive logic, the collective theory is trivial. And even if this is not the case, putting the resources of T_1 and T_2 together will, generally speaking, allow us to infer all sorts of things in conflict with the data. Thus, if T_1 says that the earth moves, and T_2 says that the Earth does not move, but that objects not attached to a moving

[14] Thus suppose, for example, that a datum is to the effect that something is red (which is observed). If a theory does not entail that it is red, it gains no positive points on the criterion of adequacy to the data. If it entails, instead, that it is blue (and so not red), it gains negative points, because this state of affairs is not seen. And now if we say that the object really is both red and blue, then at least absent an independent explanation of why we do not see the blueness, the theory will fail badly on the criterion of *ad hoc*ness.

object will fall off, then $T_1 \cup T_2$ entails that people will fall off the Earth.

It should also be remembered that what makes theories rivals with respect to choice is not simply inconsistency. Suppose that T_1 explains some human behavioural symptoms in terms of a chemical imbalance in the brain, and T_2 explains them in terms of demonic possession. The combination of these two theories is quite consistent! The chemical imbalance can be a manifestation of demonic activity, curable *both* by chemical intervention and by exorcism. The joint theory fares very badly, however, in terms of the criterion for a certain kind of simplicity: Ockham's Razor.

Finally, while we are in this neck of the woods, note that to reject one theory in favour of another is not to accept its negation. Theories do not have negations. If a theory is finitely axiomatisable, the conjunction of its axioms has a negation. But even to reject a single sentence, A, is not to be identified with accepting $\neg A$. Rejecting A and accepting $\neg A$ are quite distinct mental states. Even leaving dialetheism aside, most people have inconsistent beliefs (with or without realising it). They accept both A and $\neg A$, for some A. *A fortiori*, they do not reject A. Moreover, uttering a sentence of the form $\neg A$ may indicate a rejection of A; it may not. That just depends on what kind of speech act is being performed: assertion or denial. Orthodoxy notwithstanding, these are distinct kinds of speech act (as are questioning and commanding). The utterance of one and the same sentence can, of course, constitute distinct speech acts. (If I utter 'The door is open' then, depending on the context, this could be an assertion, a command or a question.)[15]

2.4 Logic as Theory

So much for the model. I claim that it applies to resolving disputes about logic. This requires seeing logic as a theory (in the scientist's

[15] The matter is discussed at length in Priest (2006, ch. 6).

sense, not the logician's[16]). One should not get too hung up about the word 'theory'. To say that something is a theory is to say two things. The first is that it provides an account of the behaviour of certain notions (some of which are non-observational) and their interconnections. It is common to take this to be done by providing axioms and the rules of an underlying logic, but such is normally some kind of regimentation. The theory of Christianity, for example, has never been axiomatised; no doubt, doing so would keep theologians busy for a few (hundred) years.

Anyway, logic clearly satisfies this condition. The central notion of logic is validity, and its behaviour is the main concern of logical theories. Giving an account of validity requires giving accounts of other notions, such as negation and conditionals. Moreover, a decent logical theory is no mere laundry list of which inferences are valid/invalid, but also provides an explanation of these facts. An explanation is liable to bring in other concepts, such as truth and meaning. A fully-fledged logical theory is therefore an ambitious project. Examples of such projects are the Aristotelian theory of the syllogism, augmented by Medieval accounts of truth conditions (supposition theory); Frege's classical logic, augmented by Tarski's model theoretic account of validity; intuitionistic logic, augmented by a proof-theoretic account of meaning; and so on.

The second thing involved in calling something a theory is that its acceptability can be determined only by some sort of process involving evidence and argument. That logic satisfies this condition is, perhaps, more contentious; but only a cursory knowledge of the history of logic is necessary to see that this is so. As I have already observed, the last hundred years have witnessed debates over logic. Nor is this period atypical: in all the periods in Western philosophy in which the study of logic thrived, there have been lively debates about how to analyse conditionals, logical consequence, negation, and so on. Thus, the Stoics and Megarians disputed many theories of the

[16] There may therefore be no simple criteria of theory-individuation.

conditional, and of inferences concerning time and truth; Medieval logicians disputed different theories of supposition, the conditional, truth; and so on.[17]

Ignorance of the history of logic is only one factor that can operate to produce a myopic view of the nature of logic. Other factors can also operate. After "classical" logicians won the disputes between themselves and traditional logicians in the early years of the 20th century, these disputes were forgotten, and the hegemony of classical logic was entrenched. Though there were rivals, such as many-valued and intuitionistic logic, these were quietly ignored. It could then seem that there was but a single game in town. This attitude, in turn, both fostered and was fostered by a certain way of teaching logic, and a certain kind of logic text-book, both of which could give the dogmatic impression that logic is a god-given doctrine, not open to serious dispute.[18]

A word on the use of the word 'logic', here. 'Logic' is ambiguous. It can mean both the theory of an investigation and the subject of the investigation. In the same way, the word 'dynamics' is ambiguous. It can mean a theory, as in 'Newtonian dynamics', and it can mean the way that a body actually moves, as in 'the dynamics of the Earth'. It is logic in the first of these senses that I am talking about in this essay. Theories come and theories go, and a dominant theory can be replaced by another. Logic, in this sense can clearly change. Logic in the latter sense is a different matter. It is constituted by the norms of correct reasoning, that is, the norms of what follows from what,[19] and it is the theorising of these that logic in the first sense is aimed at. Whether logic itself can change over time (and, for that matter, topic) is moot. Logical theory being a social science (one involving cognitive creatures and their activities), one cannot *assume*, as one can in the natural sciences, the independence of theory and its ob-

[17] For further discussion, see Priest (2006, ch. 10) and Priest (2014).

[18] See, further, Priest (1989).

[19] I note that some people, following Harman (1986), use the word 'reason' to apply to the norms of belief revision. This is a quite different matter.

ject. Maybe theorisation can affect its object in this case; maybe not. Fortunately, this is an issue with which we do not need to engage here.

Finally, a comment on logical pluralism. It might be thought that specifying, as I have done, a method for choosing the best logic has begged the question against logical pluralists, who hold there to be a plurality of logics. It does not. Even pluralists may debate which is the correct logic for a particular domain, application, etc. The methodology then applies. The debate between logical monists and logical pluralists is, in fact, a meta-debate, and we evaluate the two positions involved with exactly the same method.[20]

2.5 Logic and Evidence

If logic is a theory, it may reasonably be asked what sort of evidence and arguments are involved in its rational assessment. The answer to this has essentially already been provided. When people argue for a particular logical theory, what they are doing, in effect, is trying to show that their preferred candidate fares better on one or more of the criteria than a rival.

One of the criteria may give pause, however. In the criterion of adequacy to the data, what counts as data? It is clear enough what provides the data in the case of an empirical science: observation and experiment. What plays this role in logic? The answer, I take it, is our intuitions about the validity or otherwise of vernacular inferences. (The construction and deployment of formal languages is an aspect of contemporary *theorisation* in logic.) Thus, inferences such

[20] It might be thought that pluralism will always come off better in the evaluation, since it has the freedom to fine-tune a logic for each application, and so will fare better on adequacy to the data. This is not at all obvious, however. Unity is itself a desideratum; conversely, fragmentation is a black mark. Just think how one would react to an account of planetary dynamics which mooted quite different theories for each planet.

as the following strike us as correct:

John is in Rome.
If John is in Rome he is in Italy.
John is in Italy.

John is either in Rome or in Florence.
If John is in Rome he is in Italy.
If John is in Florence he is in Italy.
John is in Italy.

and the following strike us as invalid:

John is either in Rome or in Florence.
John is in Rome.

If John is in Rome he is in Italy.
John is not in Rome.
John is not in Italy.

Any account that gets things the other way around is not adequate to the data.[21]

It must be remembered, though, that the data is soft, and can be overturned by a strong theory, especially if there is an independent explanation of why our intuition is mistaken.[22] Thus, for example, the inference:

Mary is taller than John.
John is taller than Betty.
Mary is taller than Betty.

strikes most of us as correct. According to received logical wisdom, it is not. We can explain our initial reaction as follows. There is an evident suppressed premise, the transitivity of 'taller than': for all

[21] In the case of some invalidities, we can, indeed, support these intuitions. The premises may actually be true, and the conclusion not so.

[22] So other theoretical virtues can trump a lower score on adequacy to the data — especially if the *ad hocness* measure does not go up at the same time.

people, x, y, and z, if x is taller than y and y is taller than z, then x is taller than z. It is the inference with this premise added that is valid. The premise is so obvious that we confuse the two inferences. (I am not endorsing this answer; I give it simply to illustrate a familiar way in which we may attempt to account for aberrant intuitions.)

More problematically, one may take the data to concern not just *particular* inferences, but *forms* of inference. Thus, one might suggest, the following pattern of inference (*modus ponens*) strikes us as intuitively correct:

$$\frac{\begin{array}{l}A\\ \text{If } A \text{ then } B\end{array}}{B}$$

The pattern needs careful articulation. Neither of the following strikes us as valid:

$$\frac{\begin{array}{l}\text{If I may say to, that is a nice coat.}\\ \text{I may say so.}\end{array}}{\text{That is a nice coat.}}$$

$$\frac{\begin{array}{l}\text{If he were here he would be hopping mad.}\\ \text{He were here.}\end{array}}{\text{He would be hopping mad.}}$$

But let us suppose this done. If theorisation is to take account of such data, they are certainly *much* softer than those concerning individual inferences. Very often, a form of inference strikes us as correct only because of an impoverished diet of examples. Think only of forms of inference such as strengthening of the antecedent:

$$\frac{\text{If } A \text{ then } C}{\text{If } A \text{ and } B \text{ then } C}$$

Perhaps most would be inclined to take this form to be valid, at least until they meet standard counter-examples from conditional logic, such as:

If we go to the station, we can catch a train to London.
If we go to the station and there is a strike, we can catch a train to London.

And should we be so sure of the validity of the form *modus ponens*, given Sorites arguments such as the following?

Eliza is a child on day 1
If Eliza is a child on day 1, she is a child on day 2.
If Eliza is a child on day 2, she is a child on day 3.
$\vdots$
If Eliza is a child on day $10^5 - 1$ she is a child on day 10^5.
Eliza is a child on day 10^5.

Perhaps it is best to think of our views about forms of inference as low-level theoretical generalisations formed by some kind of induction.

Before I leave this topic, it needs to be said that the intuitions in question here need to of a robust kind, purged of clear performance errors. As the literature on cognitive psychology shows, people make not only mistakes, but systematic mistakes, such as those involved in the Wason Card test.[23] What makes these clear mistakes is that once the matters have been pointed out to the people concerned, they can see and admit their errors. Neither is this done by teaching them some high powered logical theory: it can be done by showing simply that they get the wrong results. The intuitions invoked in theory-weighting have to be steeled in this way.

[23] See, for example, Wason & Johnson-Laird (1972) for a discussion of this and other examples. Further on these matters, see Priest (2014).

3 Problems for the Model

3.1 WAM and Quine's Web of Belief

I will call the model of theory-choice just articulated the Weighted Aggregate Model, WAM. In this second part of the essay, I wish to turn to some criticisms of WAM as an approach to the epistemology of logic. To bring out the central issue, let us start with a brief comparison of WAM with Quine's famous account in 'Two Dogmas of Empiricism' (1951). According to this, all our beliefs are members of a "web", and can be revised in the light of "recalcitrant observations".

There are important differences between Quine's account and WAM. For a start, the latter makes no use of Quine's problematic metaphor of the periphery and centre of the web. Next, for empirical theories, observation plays a role in providing data to be deployed in the criterion of adequacy to the data. But observation is not the only source of data. And revision need not be made just in the light of new data; it could be occasioned by the appearance of a new theory, for example. Quine is also silent on how modifications to the web are to be handled. WAM is quite explicit on this.[24]

Another way in which WAM differs is that it is not committed to Quine's holism. According to Quine, any modification to a location in the web can affect any other. In WAM, revision of a theory is local to that theory, though of course revisions may have knock-on effects. Quine also makes no distinction between logic the theory and logic the object of theory. Though, no doubt, he would of agree that when one changes one's theory of dynamics, the way in which the planets move does not change, he has a tendency to talk as though revising one's logical theory is changing logic itself. Thus, for example, just consider his famous dictum: change of logic, change of subject.[25] Changing one's theory of how one ought to infer (or of what certain

[24] I take it that he would have been largely in agreement on this point, however. The material in Quine & Ullian (1978) suggests a similar approach.
[25] Quine (1970), p. 81.

words mean), is not, itself, changing how one ought to infer (or changing what those words do mean).

Perhaps most importantly, according to Quine, his account is not compatible with the analytic/synthetic distinction.[26] WAM, however, is compatible with certain truths, notably logical ones, being analytic. When we theorise about which inferences are valid, we may do so as part of a theory of the meanings of logical words, like 'if'. It may well be the upshot of the theory that inferences such as *modus ponens* are valid simply in terms of the meaning of the logical operators involved. Note, though, that our access to meanings is itself theoretically constituted. And we may well revise our views about what a word means as our theory changes — though this does not entail revising the meaning of the word.

Differences noted, there is one very important way in which WAM and Quine's account are the same. For both, all knowledge — or better, rational belief, but it is more common to talk in terms of knowledge here — including our knowledge of logic, is *situated*. There is no privileged starting point from which we begin. Cognitive agents operate within the context of a structured set of beliefs determined by the agent's socio-historical context. The set is revised in the light of further developments. In terms of Neurath's famous metaphor, the corpus of knowledge is like a boat at sea. We can revise it, but this has to be done piecemeal.[27] There is no way that we can take the boat into dry dock and rebuild it from the bottom up. Similarly, knowledge cannot be built on any kind of bedrock.

[26] This is moot, though. See Priest (1979).

[27] This applies to the methodology of itself. I take the methodology given here to be something like (a rational reconstruction) of that which is currently used. However, the details could be revised (or even the very method itself). For example, the list of criteria may be changed, or the relative weights may be changed. How is this to be done? By applying the methodology we have. Thus, for example, there may be different theories about the relative weight of a criterion (such as, e.g., consistency). We then evaluate those theories according to our methodology. (Though in this case, one would, presumably, take that criterion off the list, so as not to beg any questions.)

3.2 Enter the *a Priori*

In the way just noted, then, both WAM and Quine's account differ radically from the foundationalist epistemological accounts which hold that certain logical principles are part of the *a priori* bedrock of knowledge: independent of any empirical evidence, certain, and unrevisable.

Crispin Wright (2007) describes views about logic of this kind as 'logical Euclideanism': 'at the foundations of logic are certain immediately obvious, certain, *a priori* truths—these constitute our Basic Logical Propositional Knowledge (BLPK)'. Such a view was clearly held by great early modern philosophers, such as Kant. As more modern examples, Wright cites , BonJour, Boghossian, and himself.[28]

The notion of BLKN is so central to the history of the philosophy of logic that it may be felt that an account which gives no role to this must be missing something. In what follows, I will articulate three worries which one might have in this regard,[29] and see what may be said about them from the perspective of WAM.

3.3 Problem 1: the Phenomenology of Obviousness

The first worry concerns the phenomenology of things which are claimed to be BLPK: they seem to be obvious, self-evident. We do indeed find some things such as particular instances of *modus pones* obvious. How is this to be explained?

Actually, a defender of BLPK has a similar debt to discharge. The Kantian explanation is that the principles are true because of the innate structure of our mind, and they are obvious because we have immediate access to this. If this explanation was not destroyed by the bad company that the a priority of logic kept (Euclidean geometry and Newtonian physics), it fell to the attack on introspection of

[28] See, e.g., Bealer (1996a), Bealer (1996b), Bonjour (1998), Boghossian (2000), Wright (2004). I note that there are other conceptions of the *a priori*, including certain fallibilist kinds. These are not the ones in Wright's purview, nor in mine.

[29] The formulations are due to Crispin Wright (2007).

20th Century psychology. The workings of our own minds are singularly opaque to us. Those who would explain the phenomenon by appeal to a faculty of rational intuition (such as Bealer and BonJour), do little more than give a name to the phenomenon to be explained. Those who would locate the obviousness of the principles in our own language, concepts, or definitions (such as the Logical Positivists, Boghossian, and Wright himself), have to face the fact that our language and concepts are social constructions—in an obvious sense, an individual is not free to do as they please here—and the workings of these are even less obvious than that of our own minds. There is still no consensus, for example, about the grammar of English, let alone its semantics.

However, this is all beside the point. I leave it to the defenders of BLPK to articulate and defend their own answers to the question. The point here is simply to answer the objection that WAM has no explanation of the phenomenon of obviousness to offer. What can be said? Start by noting that obviousness is a psychological notion, not a logical one; and people find obvious many things other than logic. Thus, when Galileo claimed that the earth moved, people thought that it was obvious that he was wrong. We do feel the earth move occasionally, in earthquakes and tremors; and we know that this does not happen very often. Similarly, the American Declaration of Independence says:

> We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.

The examples show, by the way, that what is obvious to one group of people may not be obvious to another; and, moreover, that what is obvious may well be false.

Anyway, what makes these things 'self-evident'? A simple answer is that, in each case, there is a "folk theory" that has been internalised by the parties. Thus, the pre-Copernicans had a folk theory of motion, and those who signed the Declaration of Independence

had internalised a Lockean theory of political rights. Similarly, we may suppose, native speakers have a folk theory of logic, learned at their mother's knee, or the knee of whoever it was that taught them how to give and not to give reasons.

The situation has an extra dimension in the case of logic: since logic can play a role in the generation of the obvious. Those who signed the Declaration of Independence would have taken it to be obvious, had it been put to them, that George Bush and Osama bin-Laden were created equal, even though they had never thought about this before. That is because it follows from the claim that all men are created equal by an instance of the inference of Universal Instantiation, the validity of which is also obvious. Similarly, we may suppose, people will find it obvious that Osama bin-Laden is identical to Osama bin-Laden, if this is put to them, even though they have never thought about it before — and for exactly the same reason: it follows from the Law of Identity, $\forall x\ x = x$, by an instance of Universal Instantiation, the validity of which is obvious. Thus, if we can obtain something from obvious statements by the application of inferences the validity of which are obvious, the results are obvious — at least as long as we do not have to apply too many inferences: the number of applications must be rather small, or, presumably the most Rococo theorems of arithmetic would be obvious, which they are not. How many applications, presumably depends upon the number that can be made at some cognitive level of which the agent is unaware.[30]

Note that appealing to the fact that some things are obvious in accounting for why other things are obvious is not vicious in any sense. The aim is not to justify the truth of the obvious things: an appeal to the truth of some obvious things would certainly beg the

[30] There is the famous joke about the mathematician Hardy who was lecturing on some topic or other, and, at one point, said 'For this part of the proof, it is obvious that...'. He tailed off, then looked puzzled, then troubled, then left the room. He returned a few minutes later, and continued, 'For this part of the proof, it is obvious that ...'.

question in that context. The point is to explain a psychological phenomenon: why we react to certain claims in certain ways. This is a question of our cognitive processing, which can proceed recursively — at least for a few steps.

One might suggest that someone who endorses BLPK will object to the explanation offered here: folk theories are notoriously all too fallible and revisable. The appearance of something in one of these cannot, therefore, account for the kind of the apparently privileged epistemic status in question. In particular, the obviousness of some laws of logic seems to be of a kind different from laws of motion or political rights. The obviousness, one might suppose, resides in certitude: theories in physics and politics come and go; not so logics. Such a view can be maintained, however, only in ignorance of the history of logic. Theories in logic have come and gone just as much as in other inquiries.[31]

I end this discussion by noting that although the obvious does not play the epistemic role in WAM that it plays in a BLPK account, it does play some role. As I have already observed, certain kinds of obvious things play the role of data, relevant to the criterion of adequacy to the data.[32]

[31] This is not the place to defend this point in detail. (That is done in Priest (2006, ch. 10) and esp. (2014).) I doubt that many historians of logic would disagree with the claim. If someone has any doubts, I would merely ask them to consider the very different things that have been taught in some of the standard logic text books through the ages, such as: Aristotle's *Analytics*, Paul of Venice's *Logica Magna*, the Port Royal *Logique ou l'Art de Penser,* Kant's Jäsche *Logic*, Hilbert and Ackermann's *Grundzüge der theoretischen Logik*.

[32] And some of these may be *a priori* in at least one sense. Thus, the judgments about validity in the case of the inferences of 2.5 do not require sensory observation of John, Rome, or Italy. However, these judgments are neither unrevisable nor foundational.

3.4 Problem 2: Logic and Circularity

Let us turn to the second objection. Logic is involved in the process of rational choice. The mechanism of choice therefore presupposes logic, and this cannot be used to justify logic itself. That must receive a different, *a priori*, justification.

Let us start by getting clear about the exact way in which logic is deployed in the mechanism of rational choice. To compute the rationality index of a theory, we need to be able to perform the operations of multiplication and addition. To choose the most rational theory, we need the ability to determine the maximum of a bunch of numbers. For these things, we need some arithmetical reasoning, and this will employ certain logical inferences. We may also need to apply logic in working out the properties of a theory, so that we can determine its value on each criterion. For example, we may need to determine what follows from the axioms of the theory, to see what data it explains, or to see whether it is inconsistent.

The kind of reasoning in both of these cases is fairly basic; certainly finitary. (Maybe that of some primitive-recursive arithmetic.) But some logic (and arithmetic) is necessary. Which? The logic (and arithmetic) we have. If we were trying to establish logical knowledge from first principles, then any use of logic would generate a vicious regress. But we are not: our epistemic situation is intrinsically situated. We are not *tabulae rasae*. In a choice situation, we already have a logic/arithmetic, and we use it to determine the best theory — even when the theory under choice is logic (or arithmetic) itself.

Note what this does not mean. The choice of a logic is, as I have pointed out, a fairly major project, and many theoretical notions are part of the theory under choice. These are likely to include those relevant to the (metatheoretic) semantics of the logic. And, presumably, the (meta)logic of that semantics should be the logic itself — not the received logic. Thus, a theory that endorses intuitionistic or a paraconsistent logic should use that very logic in framing its own

semantics. (Or if not, it is liable to face some charge of incoherence.) In other words, we, the theorists, use the received logic in performing our evaluation; but the theories to be evaluated are allowed to use their own logics "internally".

However, it remains the case that logic (arithmetic) is deployed in the choice process, and we may end up choosing a logic (arithmetic) different from the one we currently employ. If we do so, then the choice-computation will have to be redone after the new theory is adopted. The amount of logic/arithmetic employed in the computation is pretty minimal, and so one may hope that the result would be a robust one; but there is no *guarantee* that this is the case. In principle, anyway, the new computation could trigger a new revision; and of course, the situation could iterate. Again, one would hope that some kind of stability will eventually be reached, but there is no guarantee of this either. A worst-case scenario is one where we simply flip back and forth between two logics (arithmetics), each of which is better according to the other! It is hard to come up with realistic examples of this sort of situation, and, therefore, to pursue a realistic discussion of how to proceed under such circumstances. (I can't think of any historical examples of this kind of situation.) But, presumably, the fact that we are in such a loop would itself be new information to be fed into the decision process. It exposes some kind of incoherence in the theories at hand, and we might be best off looking for a new theory which is not subject to this kind of incoherence. How to do this? That is a matter for theory-creation, not theory-evaluation.

One might object as follows. The picture presented here runs into trouble if the beliefs one holds at the outset are simply too crazy to be reined back in, even through very extensive episodes of belief revision. (An analogous problem might be thought to arise on a subjectivist Bayesian account if one's priors are too eccentric.) In order for repeated theory-choice procedures to lead to a workable logic, there must have been a fairly reasonable folk theory at the outset.

How did we arrive at that? Is there an evolutionary explanation in the offing? We are owed an explanation.

There is certainly nothing that guarantees that proceeding in the way in which I have suggested will lead to the correct theory—assuming such a notion to make sense. Nor, if one is a fallibilist, is this to be expected. Moreover, it is not at all clear to me that there are theories that are too wild to be 'reined in' by inquiry. But let us grant this for the sake of argument. There are good reasons why a folk theory of logic should not be too wildly off the mark. Compare motion: our folk theory of this is certainly wrong; but it it were too wrong, the individuals possessing it would not survive in their environment. Someone who takes it that if they jump off a cliff they will not fall, is not likely to last very long. Similarly, someone whose folk logical theory is wildly wrong is not likely to survive in their environment. Someone who reasons <if I cannot be seen, I am safe from predators; I cannot see; therefore I am safe from predators> is not likely to last very long. There are therefore good evolutionary reasons why crucial folk theories such as these cannot be too dysfunctional.

3.5 Problem 3: Methodological Impredicativity

The third problem concerns another (supposed) circularity, not involving logic, but involving methodology itself. We may call it *methodological impredicativity*. The application of a method can presuppose other methods. Booking an airoplane flight, for example, may involve methods of writing and speaking. Those methods, too, may involve other methods, and so on. But the regress cannot go indefinitely, on pain of a vicious infinite regress. Somewhere the regress must ground out, or nothing would be done. Now, it may be argued, in providing an account of how we know truths of logic, the *a priori* provides such a ground: something immediately obvious, vouchsafed as true with no application of method required. WAM has no such ground, and so is subject to a vicious regress.

It is indeed true that a regress of methods must ground out somewhere. But WAM does ground out; in fact it grounds out in many places. It grounds out, in one way, in our current state of information. Thus, for example, in assessing the adequacy of logical theory to the data, we depend upon the results of our intuitions about various inferences, as we have seen. We accept these, *pro tem*. But as we have also seen, these results can be overturned should we come to accept a theory according to which they are mistaken.

Another way in which the method grounds out is not in the things we accept, but in the actions we perform. Thus, once we have established that the rationality index of a new theory is greater than that of the current theory, we reject the old and adopt the new. This is not a further methodology: it is an action. The action is in accord with a norm of rationality (and WAM spells out exactly what that norm is); but it needs no further grounding. As Wittgenstein puts it in the *Investigations*: 'I have reached bedrock and my spade is turned... This is simply what I do.'[33]

Similar considerations apply to logical inference. In his discussion of the problematic nature of the impredicativity of Quine's web of belief model — in particular, as it applies to the notion of recalcitrance — Wright (1986) argues that statements of the form:

(W) $A \vdash_L B$

— where $\vdash_L$ indicates deducibility with respect to some logic, L — must provide a distinguished ground.[34] They do not. As I have already noted, such judgments can be revised. But Wright is on to something here. As Lewis Carroll (1895) pointed out, in effect, you can have all the logical beliefs in the world, including a belief in the truth of (W), but unless you *infer*, nothing happens. Thus, given that A holds in a theory, we have to "jump" to the conclusion that

[33] Wittgenstein (1953, § 217).
[34] Wright (1986, pp. 192–194).

B does.[35] It is in actions of this kind that the business-end of logic grounds out.

We see, then, that the methodology of WAM finds grounds in many different sorts of ways. But one place in which it does not find a ground, is in the acceptance of some traditional *a priori* truths.

4 Conclusion

In this paper, I have argued that our knowledge, or at least, our rational belief, about logic, is, in principle, no different from our knowledge (rational belief) about other topics of theorisation. In all areas, rational choice is determined by a method of constraint-maximization of a certain kind. I have said nothing at all about truth. In particular, the question of the sense in which the truths of logic are true, and what makes them so, is a topic appropriate for a different paper.[36]

Another question also looms: why, if at all, is a theory — in particular, a logical theory — chosen in the way that I have suggested, a good candidate for the truth? Why, for example, are simplicity and consistency rational desiderata? This is a fraught question, and takes us into the very heart of debates in methodology. I doubt that there is anything to be said in this matter specifically about logical theory, which distinguishes it from other kinds of theory. But that is also too big an issue on which to embark here. Getting clear on what the methodology of rational theory-choice is, is only a first step towards addressing the question; but it is a necessary first step.[37]

[35] And it may well be that (W) has a distinguished status in virtue of our disposition to so jump. See Priest (1979).

[36] A discussion may be found in Priest (2006), esp. ch. 11.

[37] Earlier versions of this paper were given at the New York Institute of Philosophy, NYU, April 2008, the conference *Analytic Philosophy* at the Inter-University Centre Dubrovnik, May 2010, and the conference *Logic, Reasoning and Rationality*, University of Gent, September 2010. Versions have also been given at departmental colloquia at the University of Otago, the University of Buenos Aires, the University of Western Ontario, the Australian National University, the University of Bristol,

References

BEALER, G. A priori knowledge and the scope of philosophy. *Philosophical Studies*, v. 81, p. 121–142, 1996.

BEALER, G. A priori knowledge: Replies to William Lycan and Ernest Sosa. *Philosophical Studies*, v. 81, p. 163–174, 1996.

BOGHOSSIAN, P. Knowledge of logic. In: BOGHOSSIAN, P.; PEACOCKE, C. (Ed.). *New Essays on the a Priori*. Cambridge: Cambridge University Press, 2000. p. 229–254.

BONJOUR, L. *In Defence of Pure Reason*. Cambridge: Cambridge University Press, 1998.

CARROLL, L. What the tortoise said to achilles. *Mind*, v. 4, p. 278–280, 1895.

COOK, R. Intuitionism reconsidered. In: SHAPIRO, S. (Ed.). *The Oxford Handbook of the Philosophy of Mathematics and Logic*. Oxford: Oxford University Press, 2007. p. 387–411.

HARMAN, G. *Change of View: Principles of Reasoning*. Cambridge MA: MIT Press, 1986.

MARES, E. *A Priori*. Kingston-ON: McGill-Queen's University Press, 2011.

MARES, E. Belief revision, probabilism, and choice of logic. *Review of Symbolic Logic*, v. 7, p. 647–670, 2014.

PRIEST, G. Two dogmas of quineanism. *Philosophical Quarterly*, v. 29, p. 289–301, 1979.

PRIEST, G. Classical logic aufgehoben. In: PRIEST, G.; ROUTLEY, R.; NORMAN, J. (Ed.). *Paraconsistent Logic: Essays on the Inconsistent*. Munich: Philosophia Verlag, 1989. cap. 4.

Carnegie Mellon University, and the University of Indiana. I am grateful to the audiences for their comments and discussion, and especially to Alexander Bird, Dave Chalmers, Hartry Field, Dan Korman, James Ladyman, John MacFarlane, Peter Milne, Josh Parsons, Stewart Shapiro, and Crispin Wright. Finally, thanks for comments go to a referee from "Logique et Analyse". Just as I was about to submit the final draft of this paper for publication, I came across an old paper by Richard Routley (1980), where he moots a similar model, which he argues for, discusses, and applies.

PRIEST, G. *Doubt Truth to be a Liar*. Oxford: Oxford University Press, 2006.

PRIEST, G. Revising logic. In: RUSH, P. (Ed.). *The Metaphysics of Logic*. Cambridge: Cambridge University Press, 2014. cap. 12.

QUINE, W. V. O. Two dogmas of empiricism. *Philosophical Review*, v. 60, p. 20–43, 1951.

QUINE, W. V. O. *Philosophy of Logic*. Prentice Hall: Englewood Cliffs NJ, 1970.

QUINE, W. V. O.; ULLIAN, J. S. *The Web of Belief*. McGraw-Hill: New York, 1978.

ROUTLEY, R. The choice of logical foundations: non-classical choices and the ultralogical choice. *Studia Logica*, v. 39, p. 79–98, 1980.

RUSSELL, G. Metaphysical analyticity and the epistemology of logic. *Philosophical Studies*, v. 171, p. 161–175, 2014.

WASON, P. C.; JOHNSON-LAIRD, P. *Psychology of Reasoning: structure and content*. Cambridge-MA: Harvard University Press, 1972.

WITTGENSTEIN, L. *Philosophical Investigations*. Oxford: Basil Blackwell, 1953.

WRIGHT, C. Inventing logical necessity. In: BUTTERFIELD, J. (Ed.). *Language, Mind and Logic*. Cambridge: Cambridge University Press, 1986. p. 187–209.

WRIGHT, C. Intuition, entitlement, and the epistemology of logical laws. *Dialectica*, v. 58, p. 155–175, 2004.

WRIGHT, C. Basic (propositional) knowledge of (truths of) logic. *Arché Seminar Paper, University of St. Andrews*, 2007.

Artigo recebido em 28/06/2015, aprovado em 30/07/2015