Logical Abductivism and Logical Pluralism

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Abstract

A logic, in one of the many senses of the word, is a theory of what follows from what and why. Different such theories have been accepted at different times in the two and half thousand year history of the subject. What makes one theory rationally preferable to another? According to logical abductivism—often called by the somewhat misleading name of "anti-exceptionalism"—one theory of logic is rationally preferable to another if it fares better on the standard criteria of theory choice, such as adequacy to the data, simplicity, unificatory power, etc. Logical monism is the view that there is one correct deductive logic. Logical pluralism is the denial of this. Both logical abductivism and logical pluralism have found a number of eminent defenders over the last 20 years or so; and it might be thought that logical abductivism is incompatible with logical pluralism, since it specifies how to pick *the* rationally preferable logical theory. In fact, this is not so: logical pluralism is compatible with logical abductivism, and may even presuppose it. In this paper I will explain all these things.

1 Introduction

The word 'logic' is highly ambiguous; but in one of its senses, it means a *theory* about what follows from what and why.[1] It is clear that classical logic, intuition-

[1] See Priest (2014). In the present essay, I restrict myself to theories of deductive logic. Non-deductive logic merits its own discussion. See Priest (2021a).

ist logic, various paraconsistent logics, etc, can be seen as providing such theories. Indeed, as anybody familiar with the history of Western logic knows, logicians have provided many such theories—often incompatible with each other—for some two and a half thousand years.[2]

Why was one theory selected over another? Indeed, what makes it rational to choose one theory over another? A very traditional view, to be found, for example, in Kant, is that there is something special about the way a logical theory is chosen: logic is *a priori* transparent; and as such, the correct method of choosing the best theory is entirely different from that deployed in choosing theories about more mundane matters, such as in physics.

According to a quite different view, now gaining some acceptance, theorising is a a human activity which is undertaken in many areas: science, metaphysics, ethics, logic; and in all cases, the rational theory to accept is the one delivered by abduction (inference to the best explanation)—however it is best to understand that notion.[3] Indeed, once one has seen that logic—in the pertinent sense—is a revisable theory, there seems, in fact, to be little alternative.

The view is a species of what has come to be called *logical anti-exceptionalism*, since, the thought is, there is nothing exceptional about theory choice in logic. The name, I think, is rather unfortunate, since it suggests that theory choice in, say, physics is *exactly* the same as that in logic. That is certainly not true, since different factors may well be operative. Thus, the accuracy of numerical predictions is pertinent in physics, in a way that it is not in logic. For this reason, I prefer the name *logical abductivism* for the view. I will use this in the rest of this essay.

Another view which has found favour with some of late is *logical pluralism*: crudely, the view that there is more than one legitimate logic. That could mean many different things, and when matters are disentangled, some of these are obviously true. Some, however, are not. In particular, when a pure logic is applied for its most familiar application, it provides a theory about what vernacular inferences are correct. It is not obvious that there is a uniquely right answer to the question of which theory is correct. Logical pluralism, in the relevant sense, is the view that there is not.

Now, it might be thought that one committed to logical abductivism is com-

[2]Again, see Priest (2014).

[3]On abduction, see Douven (2017). I note that the making of novel predictions is often not taken as a criterion of a good abduction. The making and verification of predications certainly seems to be a good-making property of a theory in certain areas, however (notably the empirical sciences). So I am happy to take it to be such a criterion *if* it plays a role in logical theory evaluation. See fn 7. Arguing about the meaning of the word 'abduction' strikes me as fruitless.

mitted to logical monism: the view that there is a uniquely right answer. After all, it might be thought, it is a way of choosing *the* correct logic. This, however, does not follow. Logical abductivism is perfectly compatible with logical pluralism in the pertinent sense. Indeed, logical pluralism may even presuppose it. The point of this paper is to explain why and how.

In the first half of the paper I will look at logical abductivism more closely, outlining its method and one application. In the second part of the paper, we will turn to logical pluralism, and how logical abductivism bears on this.[4]

2 Logical Abductivism

When we theorise, there is something we wish to account for—some phenomenon, if you like—of which we wish to understand the whys and wherefores. We construct theories and then choose whichever seems the best. That will be a fallible and revisable matter. New aspects of the phenomenon may come to light which require us to revise our theory; and indeed, even without this, new and better theories may appear. But how do we choose which theory is currently best?[5]

First, we will have some data that we have to account for. The whole point of theorising, after all, is to account for something. So that something will provide data to be accounted for. Hence, adequacy to the data will be the most important consideration.

It cannot be the whole of the matter, though. It may well be the case that different theories account for all the data. Thus, it is sometimes suggested that the Special Theory of Relativity and the Lorentz-Fitzgerald contraction hypothesis were empirically equivalent.[6] But more commonly it will be the case that no extant theory accounts for all the data. Some data will have to be explained away, or simply left as an anomaly. Hence, adequacy to the data cannot be the sole criterion.

A whole raft of other criteria may be deployed at this point. Philosophers of science have mooted many such, and one may well dispute exactly what these are. Indeed, it is not implausible that the exact list may depend on the area under investigation. For present purposes, we do not need to enter into many details. It will

[4]This paper is a written-up version of a talk given at the conference *Exceptionalist and Anti-Exceptionalist Perspectives on Logic*, Hebrew University of Jerusalem, June 2019. Many thanks to Ben Martin for comments on an earlier draft of this essay.

[5]For more on the content of this and the following two sections, see Priest (2016).

[6]See Oberdan (2017), §4.

suffice for what follows that good performances on the following are standardly taken to speak in favour of a theory:

- adequacy to the data
- consistency
- simplicity
- power
- unifying power

Conversely, of course, a poor performance on any of these would speak against it.[7]

Moreover, the criteria need not all pull in the same direction. Thus, in the 16th Century, Copernicus proposed a heliocentric theory of the cosmos, *contra* the then orthodox geocentric theory. Both theories were roughly adequate to the observed astronomical data. The heliocentric theory was simpler (not, NB, because it avoided the use of epicycles; but because it did not use the equant[8]). But the geocentric theory had greater unifying power, since it was in accord with the current Aristotelian theory of dynamics; whilst the geocentric theory was at odds with it. (That matter changed only later, with the invention of a new dynamics by Galileo and Newton.)

So, given some theories, and a bunch of criteria, which theory is best? The one that does best overall. That, of course, is a somewhat vague notion, and probably ineradicably so—though none the worse for that.

[7] Should making successful predictions be an *independent* criterion of a good (logical) theories? Of course, if a theory makes predications and these are tested, the results will deliver more data, and so affect the criterion of adequacy to the data. Should making *novel* predictions be an independent criterion? And what exactly does it mean to be novel—not known at the time, not taken into account in producing the theory? These matters, though interesting, play no role in the present discussion; so we may happily pass them over here. See, further, Martin and Hjortland (2020).

[8] The epicycle of a planet had its centre on a larger circle, the deferent. However, it did not move uniformly round the centre of this, but of an off-centre point called the equant. See Rabin (2023), §2.1.

3 A Model

We can, however, model the idea in relatively precise terms. We take it that we have a bunch of theories, $\mathcal{T}$, on the table, and a scale, S, on which to evaluate things. Let us suppose that the scale is numerical, and that greater is better. We have a set of criteria, $C = \{c_1, ..., c_n\}$, we use to evaluate theories, and for each criterion, c, there is a function, μ_c which tells us how good each theory is according to that criterion. That is, for every $c \in C$ and $T \in \mathcal{T}$, $\mu_c(T) \in S$. Not all criteria are equal though. (As we noted, adequacy to the data has to be the most important, since the very point of theorising is to account for the data.) So for every criterion, c, it will have a weight, $w_c \in S$. We may now define the rationality index, $\rho(T)$, of each theory, T, as the weighted sum of the performance on each criterion, as follows:

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

(The weights factor in the relative importance of each criterion.) The best theory, and so the theory it is rational to accept (fallibly and revisably) is the one with the highest rationality index. If there is a tie, perhaps one should suspend judgment; more plausibly, since one may well have to act on the choice, one can go either way.

Let me make it clear that I am not suggesting that the members of a community of theorists explicitly go though a computation of the kind this procedure requires. But, effectively, that is what they are doing implicitly when they weigh the pros and cons of competing theories.

4 Logical Data

Before we leave the matter, what is it, in theorising about logic, which provides the data for applying the criterion of adequacy to the data? It is, I take it, a bunch of inferences that we are inclined pre-theoretically, to judge to be valid or invalid. Thus, the inference:

> You are in Rome.
> If you are in Rome, you are in Italy.
> So you are in Italy.

strikes us pre-theoretically, and on reflection, as being intuitively correct. Whilst the inference:

You are in Italy.
If you are in Rome you are in Italy.
So you are in Rome.

strikes us as not so.

I note that, as in all theorising, such data is fallible. Thus, the following inference will strike most as (deductively) valid:

This is red.
So this is coloured.

But contemporary logic tells us that it is not so. Conversely, according to a theory of the conditional that at least used to be orthodox, the following inference is valid.

I will not stand for political election.
So if I stand for political election I will be elected.

However, it will strike most as invalid.

So a theory can be orthodox, even though it does not do justice to all the data. Of course, rather than simply writing off such data, it is better if one can find an independent explanation of why our judgements concerning them are wrong. This is, of course, exactly what one finds in contemporary logical theorising. We take the first inference to be valid because we confuse it with an enthymeme with the suppressed premise 'all red things are coloured'. And we take the second to be invalid because we confuse validity with the issue of whether the conclusion would normally be assertible when the premise is. Note, that I not endorsing these moves. I am merely pointing them out as examples of the kind of move that can be made to account for aberrant data.[9]

5 Example: Vacuism

So much for the general picture. It will help in what follows if we have a small example of an application of this methodology before us.

There is an issue in contemporary logical theorising concerning whether conditionals with necessarily false antecedents are vacuously true or not. Perhaps the orthodox view—Vacuism—is to the effect that they are. But consider the pair:[10]

[9]For a general discussion of the criteria of good formalisation, see Paseau (2019).

[10]I assume here that intuitionism is a false theory of logic. Those who disagree may simply change the example according to the logic they prefer.

- If intuitionist logic is correct, the Principle of Excluded Middle is not valid.
- If intuitionist logic is correct, Explosion is not valid.

The first certainly seems to be true; the second does not. Or again, consider the pair (where the antecedent is whichever is false):

- If you were to prove [refute] Goldbach's conjecture, you would become a famous mathematician.
- If you were to prove [refute] Goldbach's conjecture, I would give you my life's savings.

Again, the first certainly seems to be true; the second most definitely is not. Non-Vacuism is the view that these judgments are correct: some conditionals with necessarily false antecedents are true; some are false.

Now, rival formal theories of conditionals may be produced for Vacuism and Non-Vacuism. The major difference between them is that a Vacuist semantics employs only possible worlds, whilst a Non-Vacuist semantics deploys both possible and impossible worlds. We do not need to go into the details here.

When we evaluate the two theories according to our criteria, the following picture emerges:

	Vacuism	*Non-Vacuism*	*Weight*
Consistency			*high*
Simplicity	+		*medium*
Power			*medium*
Unifying Power		+	*medium*
Adequacy to Data		+	*very high*

A '+' in a column indicates an advantage for the theory of that column. Weights are vague, but would probably be generally agreed to be roughly right. By way of explanation, we may note the following:

- Both theories are consistent, so there is nothing to choose between them here.
- Vacuism is simpler (in one sense) because it deploys only one kind of world.
- The Vacuist semantics validate more inferences than the Non-Vacuist semantics, but those inferences can be recaptured as appropriate enthymemes. In that sense, both have the same power.

- The Non-Vacuist semantics use impossible worlds, which can be deployed to give accounts of the semantics of intentional states, content, and other important notions. A theory with only possible worlds can give an account of such notions only by quite different means. Hence, the impossible-world semantics provides for much unification of theory.

- Given the above examples, adequacy to the data clearly operates in favour of Non-Vacuism. Of course, one can contest this by attacking the correctness of the judgments involved. But, to cut a long story short, such moves do not stand up to examination.[11]

Given the situation depicted in the table, and even with the rough values for weights, it is clear that Non-Vacuism comes out ahead on the weighted average, and is therefore the rationally preferable theory.[12]

6 Logical Pluralism

There is, of course, much more to be said about all the matters so far discussed. However, what has been said provides enough background for us to turn to the second half of the paper, and to address the issue of how logical abductivism bears on logical pluralism. So let us turn to this.

As I noted in the introduction, logical pluralism can be said in many ways, and many of these are not contentious. There are clearly many pure logics (classical, intuitionist, paraconsistent), and as pure mathematical structures they are all equally good—just as there are many equally good pure geometries. A pure logic may be applied, and different logics are appropriate for different applications (classical logic for simplifying electrical circuits, the Lambek calculus for testing for grammaticality). But a pure logic has a canonical application: testing the validity of ordinary arguments—just as a geometry has a canonical application: charting the structure of physical space.[13] It is only here that logical pluralism is an issue: can there be equally correct pure logics for the canonical application?

The argument that it can, can itself be articulated in a number of different ways. For my money, the most plausible is to the effect that different domains of reasoning require different pure logics. Thus, it may be supposed that reasoning

[11] Moreover, possible-world theories tend to deploy a variety of *ad hoc* hypotheses to this end, which decreases their simplicity.

[12] For a full discussion of matters, including further references, see Priest (2019).

[13] That, after all, is what geometry was originally created for.

about mathematical objects, medium sized dry goods, sub-atomic particles, etc, require different canons of inference. At any rate, this is the kind of logical pluralism that I want to discuss in what follows. The corresponding logical monist is one who holds that the same pure logic is correctly applied to all domains of reasoning.[14]

Now, a logical pluralist must still determine the correct logic for application to each domain. How should they do this?

There is one way of settling the matter very simply. By fiat. Thus, there is a version of pure mathematical pluralism according to which one can, in principle, consider mathematical structures based on any pure logic. Thus, one can consider pure mathematical structures based on classical logic, intuitionist logic, paraconsistent logic, and so on. One simply specifies the structure and lays it down that one is to reason about it using the logic in question. The intuitionist theory of smooth infinitesimals and the paraconsistent theory of inconsistent topology are like this.[15] If one proceeds in this way, then clearly different kinds of logic are correct to reason about different kinds of structures. There is nothing to argue about here.[16]

But choosing the correct pure logic for a particular application cannot simply be made by fiat. The results it delivers about the domain of the application must "get things right" (or at least as right as possible)—whatever that means. How is the choice to be made? Since we now need a theory of how one should reason for the domain, one will apply abduction of course. In particular, then, logical abductivism does not rule out logical pluralism: the pluralist will simply apply the method to each of the domains at issue.

But the relevance of logical abductivism does not end there. How should one understand the debate between logical monists and logical pluralists? This is itself a theoretical choice, and one resolves it by applying abduction. Thus, one may see the choice between logical pluralism and logical monism as a second-order theoretical debate, with exactly the same methodology for resolution.

[14]For a general discussion of logical pluralism, see Russell and Blake-Turner (2023). I think it fair to say that logical monism has been a relatively unchallenged assumption in the history of Western logic, challenges arising only relatively recently. Since then, it has been defended at length by, e.g., Griffiths and Paseau (2022), Stei (2023).

[15]See Shapiro (2014) and Priest (2020).

[16]Though in fact, I do not think that this is a species of logical pluralism, properly so called. See Priest (2021b).

7 Initial General Evaluation

Let us look at this matter more closely. Let us start with a general evaluation of the difference between monism and pluralism. We may evaluate the two theories with the same template that we used above. A summary of the general evaluation is as follows:

	Monism	*Pluralism*	*Weight*
Consistency			*high*
Simplicity	+		*medium*
Power			*medium*
Unifying Power	+		*medium*
Adequacy to Data	?	?	*very high*

How does one arrive at this?

- For a start, both theories are consistent (at least as usually articulated) so there is nothing to choose here.
- For simplicity, it is clear that monism is the simpler theory. It is clearly simpler to have one deductive logic than to have many.
- For power, we may assume for the present that there is nothing to choose between the theories. There is no domain of reasoning that is left out of our considerations.
- Unifying power again speaks in favour of monism. It clearly unifies reasoning about all domains, while pluralism fragments it. In a similar way, it is clearly better, *ceteris paribus*, to have a theory of planetary motion which applies to all planets, rather than a different one for each of Mercury, Mars, Venus, etc.

Which brings us to adequacy to the data. As ever, this is the most important criterion. Clearly, an evaluation of how the individual theories at issue handle the inferences at issue cannot be made in general terms. One must look at the particular theories proposed. I will turn to this matter in the next section.

However, before we turn to this, let us note the upshot of the present discussion. Setting aside matters of adequacy to the data, logical monism is *clearly* ahead. The onus of proof is therefore on the pluralist. They must show that matters concerning adequacy to the data speak strongly in favour of the particular plurality of logics against the particular singular logic in question—strongly enough to outweigh the other considerations

8 Adequacy to the Data

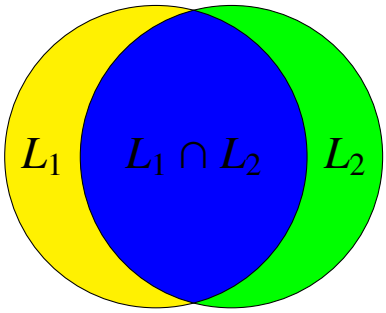
So let us now turn to the matter of adequacy to the data. Can the onus of proof on the pluralist be discharged? That will depend on the details of the logics of first-order debate and how they apply to the data. Naturally, as noted, one can take this only on a case-by-case basis. But we may note some general considerations.

Certainly, the pluralist starts off with an advantage here. For they have a degree of freedom in tuning their theory to the data which a monist does not have. But this may well not be sufficient to overturn the onus of proof. For the monist may have perfectly good strategies for accommodating any recalcitrant data. Let us consider some general scenarios.

We are assuming that logical abductivism has been applied to each of the domains that the pluralist has distinguished. Of course, if the method determines the same answer in each case, then we simply have monism, and there is nothing to adjudicate. But suppose that it does not. Then we have a situation where there is *prima facie* a plurality of logics. The relation between these is crucial. Let us consider some possibilities.

Scenario 1

In the first scenario there is a plurality of logics, but there is a substantial overlap between them. Thus, suppose, to keep matters simple, that there are just two, related as follows:



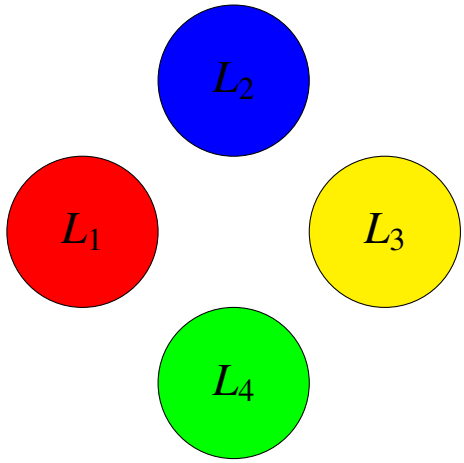
L_1 is for reasoning about some domain, and L_2 is for reasoning about some other domain; but as the diagram suggests, there is a large overlap between the theories, $L_1 \cap L_2$. Each of L_1 and L_2 may be obtained from the common core by adding a few extra rules of inference (in the way that intuitionist logic may be obtained from classical logic by adding the Principle of Excluded Middle, or classical logic can be obtained from *LP* by adding Explosion). The monist may simply claim that

$L_1 \cap L_2$ is the one correct logic; and that to reasoning about each of the separate domains we simply have to add a few "contingent" principles—in the way that an intuitionist may add Excluded Middle when reasoning about finite (or at least decidable) domains; and the paraconsistentist may simply add explosion to *LP* when reasoning about consistent domains.

True, the monist picture has been complicated a little, but hardly enough to outweigh the initial advantage. It must be borne in mind that the pluralist picture is also likely to have been complicated too. For in general, we will wish to reason about the relationship between entities in the two domains. Thus, for example, we may want to reason about the relationship *between* macroscopic objects and microscopic objects, or between abstract objects and concrete objects. What logic is appropriate for this? Presumably $L_1 \cap L_2$.[17] So we now have, not two, but three domains. And, in general, for every pair of logics in the plurality, we have to consider their overlap. Indeed, for every *set* of logics in the plurality, we will have a logic for their overlap. We have a case of exponential explosion.

Scenario 2

Let us turn to the second scenario. In this case, we have a plurality of logics, but there is absolutely no overlap between each pair of the plurality, thus:



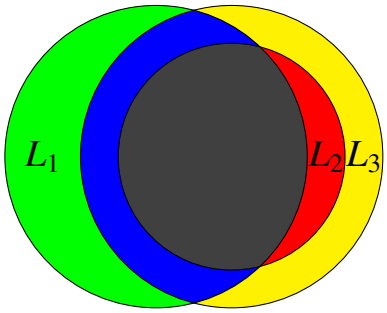
A monist could argue in the same way as in the last scenario, but it would obviously be pretty hopeless. (Maybe they could deploy some other strategy, but I

[17] That, at least, has the virtue of being truth-preserving for both kinds of entities. But one might think that the logic for the hybrid domain should be *sui generis*. If so, one would have to find this by abduction. And as is clear, this will cause further complexity in the pluralist theory.

can't think of one.) There is still a core logic, of course, but it is the empty logic. So it is the "contingent assumptions" that are doing all the work. Obviously, any advantage in terms of relative simplicity, let alone unification, has disappeared. We still have the same exponential explosion for the pluralist as before; but matters are exactly the same for the monist. In other words, any monist advantage has been lost. Pluralism is the correct view.

Scenario 3

So let us turn to the third scenario. The first two scenarios are, of course, extreme cases. A case in the middle ground is going to be much messier. It might look something like this:



Clearly, it is unlikely that there can be any uniform resolution of the decision between monism and pluralism in such cases. Matters are going to have to be dealt with on a case-by-case basis.

But somewhere between the two extreme cases (Scenario 1 and Scenario 2), there is another phenomenon. It ceases to be clear what, exactly, is at issue. The monist and the pluralist agree on what inferences can be used where. In that sense, they agree on the facts. Outwith other considerations, whether to call it monism or pluralism would seem to be arbitrary. One might call this duck/rabbit pluralism,[18] after the well known ambiguous figure.

So, in theory, matters may be complex. However, in practice, I suspect that the complex cases rarely arise. Indeed, I think that most realistic cases, if they arise, are probably cases of Scenario 1.

[18]Priest (2001), p. 203 of reprint—though the kind of pluralism at issue there is slightly different.

9 Conclusion

What we have seen clearly, however, are two things. The first is that logical abductivism is quite compatible with logical pluralism. It by no means rules it out. Indeed, the pluralist will simply apply logical abductivism to each of the plurality. Secondly, the choice between logical monism and logical pluralism is a second-order theoretical debate. The result of this may well be dependent on first-order choices. However, the second-order choice is again determined abductively. Indeed, as I have suggested, abduction determines the rational choice in all cases of competing theories. Theorising in logic is no exception.[19]

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