

What is inference?

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1 Introduction

In some previous work, I tried to give a concept-based account of the nature of our *entitlement* to certain very basic inferences (see the papers in Part III of Boghossian 2008b). In this previous work, I took it for granted, along with many other philosophers, that we understood well enough what it is for a person to *infer*.

In this paper, I turn to thinking about the nature of inference itself. This topic is of great interest in its own right and surprisingly understudied by philosophers. A correct understanding of inference promises to shed light on a number of important topics. In particular, it threatens to undermine the sort of concept-based story about entitlement to which I had previously been attracted.

2 Preliminaries

We will need to spend some time making sure that we zero in on the topic I mean to be discussing.

An earlier version of this paper was presented as a talk at the Pacific Division Meeting of the APA in San Diego in April of 2011, with John Broome and Crispin Wright serving as commentators. I am very grateful to the members of that audience, as well as to audiences at the Universities of Cambridge and Geneva, and to David James Barnett, Sinan Dogramaci, and Paul Horwich for comments and feedback. The author owes a very special debt of gratitude to his two distinguished commentators, not only for their feedback on this particular paper, but for conversations and writings that have greatly influenced his thinking on these issues. Crispin and the author have been discussing these topics for many years. More recently, the author has been greatly stimulated by conversations with John Broome and by reading bits of his manuscript in progress, *Rationality Through Reasoning*. As will be evident, the present paper is part of an extended dialogue with both of these philosophers.

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By “inference” I mean reasoning with beliefs. Specifically, I mean the sort of “reasoned change in view” that Harman (1986) discusses, in which you start off with some beliefs and then, after a process of reasoning, end up either adding some new beliefs, or giving up some old beliefs, or both. I, therefore, explicitly leave aside practical reasoning.

Within the sphere of theoretical reasoning, it is becoming customary to distinguish between two kinds, dubbed “System 1” and “System 2” by Daniel Kahneman. As Kahneman (2011, pp. 20–21) characterizes them,

System 1 operates automatically and quickly, with little or no effort and no sense of voluntary control.

System 2 allocates attention to the effortful mental activities that demand it, including complex computations. The operations of System 2 are often associated with the subjective experience of agency, choice, and concentration.

Examples of System 1 thinking are detecting that one object is more distant than another, orienting to the source of a sudden sound, responding to a thought experiment with an intuitive verdict. Examples of System 2 thinking are searching memory to identify a surprising sound, monitoring your behavior in a social setting, checking the validity of a complex logical argument.

There are many things to be said about this distinction, but I don’t have the space to say them here. I will make two brief comments. First, to the extent to which I understand the distinction, it seems to me to correspond to the distinction between reasoning that is sub-personal, sub-conscious, involuntary and automatic, on the one hand, and reasoning that is person-level, conscious, attention hogging and effortful, on the other. Second, given this understanding of the distinction, it seems to me that a lot of reasoning falls somewhere in between these two extremes. Consider, for example, the following episode of thought, which I will call (Rain):

On waking up one morning I recall that:

(1) It rained last night.

I combine this with my knowledge that

(2) If it rained last night, then the streets are wet.

to conclude:

So,

(3) The streets are wet.

This belief then affects my choice of footwear.

I judged (1) and (2) and inferred from them that (3). This is neither the sort of sub-personal, sub-conscious, involuntary process characteristic of System 1. Nor is it the effortful, concentrated process attributed to System 2. It resembles System 2 thinking in that it is a person-level, conscious, voluntary mental action; it resembles System 1 in that it is quick, relatively automatic and not particularly demanding on the resources of attention. We could call it System 1.5 reasoning.

When I say that I am interested in inference, I mean that I am interested in reasoning that is System 1.5 and up. That is to say, I am interested in reasoning that

is person-level, conscious and voluntary, not sub-personal, sub-conscious and automatic, although I shall not also assume that it is effortful and demanding.

Since it will help us focus attention on the issues that interest me, I shall work with the simple and somewhat simplistic (Rain) example. I shall be asking: What is it for me to *infer* (3) from (1) and (2)?¹

This question about inference may be thought to fall under some other more general rubrics. My inferring (3) from (1) and (2), it may be thought, is for me to judge (3) *on the basis* of (1) and (2). Our question about inference, then, may be seen to be a special case of the topic that is discussed in the epistemological literature under the label the ‘basing relation.’

My inferring (3) from (1) and (2), it may also be thought, is for (1) and (2) to serve as *my reasons* for concluding (3). It is for me to arrive at the judgment that (3) with (1) and (2) serving as my reasons for so judging. Our question about inference, then, is also a special case of the topic that is discussed in the theory of action literature under the label ‘explanatory reasons.’ Explanatory reasons are the reasons that, in some appropriate sense, you take yourself to have for what you are doing, even if they may not be good reasons for doing what you are doing. (See Lenman 2009)

Although our topic might plausibly be thought to fall under these other more general rubrics, and although these more general notions will play a role in what follows, I want to begin by pursuing our question about inference in its own right.

3 The nature of inference

So let us turn, finally, to asking: What is it for me to *infer* (3) from (1) and (2)?

It goes without saying that it can’t simply consist in my judging (3) *after* I have judged (1) and (2). Lots of thoughts can succeed one another without being related by inference.

It may be less obvious, but is no less true, that my inferring (3) can’t consist just in my judging (1) and (2), and in this fact *causing* me to judge (3).

Many philosophers would agree with this verdict because of what is known as the problem of ‘deviant causal chains.’ Alvin Plantinga has given a nice example. Suppose I see Aline. This causes me to believe that I see Aline, which causes me to drop the coffee I had been holding, which causes a stain on my shirt, which leads me to believe that my shirt is stained. My belief that I see Aline is part of the causal explanation for why I believe that my shirt is stained. But we wouldn’t want to say that I inferred that my shirt is stained from the fact that I see her.

It’s not sufficient for my judging (1) and (2) to cause me to judge (3) for this to be inference. The premise judgments need to have caused the conclusion judgment ‘in the right way.’

¹ In working with this toy example, I might seem to be leaving out both inferences in which no premise is left undischarged (as in conditional proof or *reductio ad absurdum*) and inferences that proceed on the basis of suppositions. I focus on this toy example both because the issues about inference that interest me are best brought out by ignoring these complexities for now, and because what I say extends naturally to them, as Wright shows explicitly in his comments.

Now, this formulation is harmless enough, I suppose, because the notion of ‘the right way’ could be taken to be a placeholder for whatever the correct relation is. But it would be a mistake, I think, to embark upon a search for the correct relation merely against the backdrop of the problem of deviant causal chains. Because the examples that illustrate this sort of deviance typically involve causal chains that are *indirect* they suggest that the problem is merely one of finding an intimate enough causal relation between the premise judgments and the conclusion.

But such a view would be mistaken, I think. A habitual depressive’s judging ‘I am having so much fun’ may routinely cause and explain his judging ‘Yet there is so much suffering in the world,’ as directly as you please, without this being a case in which he is *inferring* the latter thought from the earlier one. What’s missing?

I think that Frege (1979) put his finger on it when he said:

To make a judgment because we are cognizant of other truths as providing a justification for it is known as *inferring*. (p. 3)

I agree with the gist of Frege’s thought here, which I take to be this. A transition from some beliefs to a conclusion counts as inference only if the thinker *takes* his conclusion to be *supported* by the presumed truth of those other beliefs.

Here I am tweaking Frege’s characterization in certain small ways. First, we needn’t always infer from *truths*, if we are to count as inferring. It’s enough that we take our premises to be true, that is, judge them to be true.

Second, ‘cognizant’ seems to have a success grammar built into it, and so Frege’s characterization would seem to imply that one cannot reason badly: if one is reasoning at all, one is reasoning to a conclusion that one has justification to draw.

There is, of course, a substantial tradition in philosophy that maintains that there are limits to the extent to which one can be said to be reasoning badly. However, I don’t want to assume any such limitation up front. If there are limits on the extent to which one can reason badly, they should be *explained* by a correct account of the nature of inference.

At any rate, even if there were such limits they would surely leave a great deal of room for reasoning that is bad. And even this modest room for error would not seem to be accommodated by Frege’s characterization of inference in terms of one’s being ‘cognizant’ of the justification one has for one’s conclusion.

I would therefore prefer to offer the following modified version of Frege’s characterization:

(Inferring) S’s inferring from p to q is for S to judge q *because S takes* the (presumed) truth of p to provide support for q.

On this account, my inferring from (1) and (2) to (3) must involve my arriving at the judgment that (3) in part *because I take* the presumed truth of (1) and (2) to provide support for (3). Let us call this insistence that an account of inference must in this way incorporate a notion of “taking” the Taking Condition on inference. Any adequate account of inference, I believe, must, somehow or other, accommodate this condition.

(Taking Condition): Inferring necessarily involves the thinker *taking* his premises to support his conclusion and drawing his conclusion *because* of that fact.²

The intuition behind the Taking Condition is that no causal process counts as inference, unless it consists in an attempt to arrive at a belief by figuring out what, in some suitably broad sense, is supported by other things one believes. In the relevant sense, reasoning is something we *do*, not just something that happens to us. And it is something *we* do, not just something that is done by sub-personal bits of us. And it is something that we do with an *aim*—that of figuring out what follows or is supported by other things one believes. It's hard to see how to respect these features of reasoning without something like the Taking Condition.

Although I think that these observations ought to be enough to underwrite the Taking Condition, it is worth noting that that condition can help us make sense of two further phenomena involving inference that might otherwise seem puzzling.

4 Deductive versus inductive inference

It is tempting to think that there are two kinds of inference—deductive and inductive. But in what could the difference between these two kinds of inference consist?

Of course, in some inferences the premises logically entail the conclusion and in others they merely make the conclusion more probable than it might otherwise be. That means that there are two sets of standards that we can apply to any given inference. But that only gives us two standards that we can apply to an inference, not two different kinds of inference.

Intuitively, though, we are able to distinguish between a person who intends to be making a deductively valid inference versus someone who intends merely to be making an inductively valid one.

A scientist need not be perturbed if we were to point out to him that some inference of his was not deductively valid, but merely inductively strong; but a mathematician would, and should, be perturbed.

How, though, are we to capture the difference between the scientist and the mathematician, if not in terms of how they *take* their premises to be related to their respective conclusions?

So, the Taking Condition enables us to distinguish, as intuitively we ought to be able to do, between deductive and inductive inferences.

5 Impossible inferences

Some inferences seem not only obviously unjustified, and so not ones that rational people would perform; more strongly, they seem *impossible*. Even if you were

² I am in no way implying that the Taking Condition is a solution to the problem of deviant causal chains or that that problem no longer arises. That problem is still with us: the 'taking' on which I am insisting has to cause the conclusion 'in the right way.'

willing to run the risk of irrationality, they don't seem like inferences that one could perform.

Consider someone who claims to infer Fermat's Last Theorem (FLT) directly from the Peano axioms, without the benefit of any intervening deductions, or knowledge of Andrew Wiles's proof of that theorem. No doubt such a person would be unjustified in performing such an inference, if he could somehow get himself to perform it.

This fact about justification is itself a puzzle, for the inference would be a truth-preserving one. It is certainly a puzzle for many reliabilist views of justification. However, my main concern just now is not to explain why such a transition would be unjustified, but to explain why we have the considerable feeling (as Kripke is fond of saying) that no such transition could be an *inference* to begin with.

The Taking Condition provides an answer. For the Peano Axioms to FLT transition to be a real inference, the thinker would have to be taking it that the Peano axioms support FLT's being true. And no ordinary person could so take it, at least not in a way that's unmediated by the proof of FLT from the Peano Axioms. (The qualification is there to make room for extraordinary people, like Ramanujan, for whom many more number-theoretic propositions were obvious than they are for the rest of us.)

6 The doxastic construal of taking³

How, though, should we understand the Taking Condition? What is it to believe something *because* one *takes* it to be supported by other things one judges to be true? What kind of taking are we talking about?

The first thought that is likely to occur to one is that the Taking Condition requires that a thinker have a *meta-belief* about the relation between his premise judgments and his conclusion, a belief to the effect that his premise judgments supply him with a justification for believing his conclusion. We may call this the "full-fledged normative doxastic construal" of the Taking Condition.

(FFNC) My judging (1) and (2) supports my judging (3).

Such a construal would be problematic in at least two respects.

First, we don't want to say that a thinker regards the fact that he *judges* p to be his reason for judging q . We want his reason for judging q to be the (presumed) truth of p , not the fact that he judges p .

Second, there is a worry that the content of any such normative belief will be too sophisticated for ordinary thinkers. A child, we are inclined to think, can reason. Luke and Drew are playing hide-and-seek. Seeing Drew's bicycle leaning against the tree, Luke thinks: "If he were hiding behind that tree, he would not have left his bicycle there. So, he must be behind the hedge." That looks like reasoning. But do

³ Although Broome does not approach the issue of the nature of reasoning through the Taking Condition, I have benefited from his discussion of what he calls 'linking beliefs' in Chap. 9 of his manuscript, *Rationality Through Reasoning*.

children have meta-beliefs about the relations between their premise judgments and their conclusions? Do children have the concepts of premises and conclusions? Do they have the normative concept of one belief justifying another?

Worried, perhaps, by these sorts of consideration, some philosophers have proposed doxastic views that are “meta-propositional” rather than meta-attitudinal. Philip Pettit, for example, has written:

A meta- propositional attitude is an attitude towards a proposition – if you like, a meta- proposition – in which propositions may themselves figure as objects of which properties and relations are predicated. Some meta-propositions will ascribe properties like truth and evidential support and relations like consistency and entailment to propositions, as in the claim that ‘p’ is true or that it is inconsistent with ‘q’. ...

The absence of meta-propositional attitudes in the robot and its more flexible counterparts means that they are subject to a salient restriction...because the robot and its counterparts don’t have meta-propositional attitudes, they cannot ask themselves similar questions about connections between propositions, say about whether they are consistent or inconsistent, and then do something – pay attention to the inter-propositional relations – out of a desire to have a belief form one way or the other.

This restriction means that the robotic creatures cannot reason. (Pettit 2007, pp. 498–499)

So, Pettit’s idea is that a genuine reasoner must be able to ask itself questions about the propositions that figure in its judgments and let the answers to those questions guide his thinking, if he is to be a genuine reasoner.

Applied to our Taking Condition, it would imply that a genuine reasoner would have to believe (take it) that his conclusion proposition follows, in a suitably broad sense, from his premise propositions and let that guide what conclusion he arrives at. Someone performing the seemingly simple (Rain) inference would have to have the meta-propositional belief

(Meta-Rain): (3) follows from (1) and (2).

Now, this proposal successfully evades the first objection to the meta-attitudinal proposal; but it seems to leave the second one in place: we still seem committed to attributing to ordinary thinkers implausibly sophisticated concepts and propositional attitudes. Do Luke and Drew, playing hide-and-seek, really need to have the concept of a proposition, and the concept of one proposition following from another?

To deal with this residual problem, we could try going even more first-order, requiring only that a reasoner have a belief in the appropriate conditional:

(First Order Rain Belief, FORB): If **It rained last night** and **If it rained last night, then the streets are wet**, then, **the streets are wet**.

But this proposal only invites new objections.

First, we know from Carroll’s famous note (1895) that we must at all costs avoid insisting that (FORB) be part of the *premises* from which the conclusion of the (Rain) inference is to be derived. In that direction lies a vicious regress from which

no reasoning can emerge. So, if there is to be such a first-order belief invariably involved in inference, it must act as a *background condition* rather than as a premise judgment.⁴

But what exactly is the difference between a premise belief and a belief that plays a role in the background of an inference? Presumably, it is the difference between a belief on which the conclusion is *based* versus a belief that, while somehow involved in the inference, is *not* one on which the conclusion is based.

But the notion of a conclusion's being based on a premise judgment is precisely the notion that we are trying to understand, in investigating the nature of inference. So in employing the notion of a belief that plays a role as mere background, and so not one on which the conclusion is based, we seem to have helped ourselves to the very notion at issue.

Secondly, there is a pair of problems having to do with the question how any such doxastic view would mesh with a plausible account of inferential *justification*.

An account of the nature of inference will eventually have to confront the question what conditions an inference must satisfy if it is to transmit the justification that a thinker has for its premises to its conclusion. In other words: What explains why I would be *justified* in concluding (3) on the basis of (1) and (2)?

If we have such a doxastic account of the nature of inference, it is natural to think that the answer to the justification question will involve the relevant belief. What conditions would (FORB) have to fulfill if (Rain) is to be a justified inference?

Clearly, (FORB) should be true. But is that enough? It doesn't seem so. What if (FORB) were arrived at unjustifiably? Given that it is a *belief*, it can be assessed not merely for its truth but also for its epistemic properties. And given that it can be so assessed, a positive appraisal of its epistemic standing seems required for the inference in which it is involved to be a justified one.

But it's hard to see how one could acquire a justification for (FORB) without this involving some justified, logical inferences, whose justification will eventually depend on that of a basic rule (Modus Ponens, we may suppose).

And, of course, if this were true, then we would have no hope of explaining what it is for (Rain) to be justified by saying that it involves (FORB)'s being justified, for we will have turned around in a tight little circle.

However, let us waive this problem. Let's assume that we have some non-inferential way of arriving at a justified belief in (FORB).

Still, it's very hard to see how such a belief could *explain* why I am in a position to justifiably perform the (Rain) inference. How does my belief in

(FORB) **If, It rained last night and If it rained last night, then the streets are wet, then the streets are wet.**

explain why I am in a position justifiably to infer that

(3) The streets are wet

from

⁴ On this point see Wright (2001) and Broome *ibid*.

(1) It rained last night

and

(2) If it rained last night, then the streets are wet.

Wouldn't anything that looked like an *explanation* here need to invoke the subject's ability to infer from (FORB) that the 1-2-3 pattern of inference is valid? And wouldn't any such explanation, therefore, be hopelessly circular?⁵

7 An intuitional construal of taking

It might be thought that an *intuitional* construal of taking will do a lot better than any of the doxastic construals that we have been considering. While I think there is something to this claim, the intuitional proposal ultimately succumbs to some of the same objections we have been developing (and to some other ones as well).

By an intuition I mean an 'intellectual seeming.' I won't take a stand here about whether such a state has a distinctive phenomenology. Following Ernest Sosa, we may also think of an intuition as a 'temptation to believe.' We experience such an intuition when, for example, it seems to us that there must be more whole numbers than even ones, a seeming that seems to persist long after we have ceased to be disposed to *believe* that there must be more whole numbers than even ones.⁶

Now, if we think of the intentional state that connects premises with conclusions along intuitional lines, we can evade the first of the problems listed above. We would evade the problem of having to say how to tell the difference between the enabling background condition and the premise beliefs. An intuition, not being a belief, would not engender such a problem.

We would also do better with at least *part* of the problem about inferential justification. An intuition, like a perception, is not subject to epistemic assessment—it is beyond justification. So we can rest content with saying that an inference is justified provided that its taking intuition is true; we wouldn't face the problem of saying how the taking state could be justified in some non-inferential way.

But even if all of this were so, it seems to me that the intuitional view would still clearly succumb to the final objection that we described for the doxastic view. For even if we switch to thinking of the connecting state as an intuition, it is still impossible to see how my intuition that

(FORI) If, **It rained last night** and **If it rained last night, then the streets are wet**, then, **the streets are wet**.

could non-circularly *explain* how I am justified in performing the (Rain) inference.

⁵ For a nice exposition of this point, drawn from my 2003 see Dogramaci ms.

⁶ I learned this example from David Barnett.

8 The counterfactual proposal

Let us take stock. I have argued that a thinker doesn't count as reasoning unless, in some appropriate sense, he *takes* his premises to support his conclusion. And I have looked at all the major ways of understanding this taking in terms of some occurrent intentional state. Of these ways, the most promising, I believe, is the intuitional proposal, though even it faces severe difficulties.

The question arises, therefore, whether there is some *other* way of satisfying the Taking Condition, other than through an occurrent intentional state. I can think of two.

The first attempts to account for the nature of inference counterfactually.⁷

What is it for S to infer (3) from (1) and (2)? According to the Counterfactual Proposal, the answer is: His beliefs in (1) and (2) cause S to believe (3). And, *were* he to be asked why he believe (3), he *would* offer (1) and (2) as his *reasons* for believing (3). And it is the truth of this counterfactual—that S would offer (1) and (2) as his reasons for believing (3)—that makes them his reasons for believing (3). There need be no occurrent intentional state contemporaneous with the 1-2-3 transition that constitutes S's taking the premises to justify his conclusion. Rather, the difference between a mere transition and an inference consists in the holding of the counterfactual: Were S to be asked (or perhaps were he just to ask himself) why he believes (3), he would cite (1) and (2) as *his reasons*.

I don't believe that this proposal can be correct.

For one thing, it seems to run into the old problem of demanding an unreasonable degree of sophistication from reasoners.

But its main difficulty is that it treats the property of being an inference as though it were a response-dependent property, which I believe it cannot be.

A property is response-dependent, roughly, if our disposition under certain circumstances to say that something has that property analytically entails that it has the property in question.

Hume's account of beauty is such a theory. According to Hume, what makes it the case that something is beautiful is that a preponderance of suitably ideal judges would judge it to be beautiful. Another favorite candidate for response-dependent treatment is color.

There are many difficulties making sense of response-dependent properties in general (for some discussion see Boghossian 1989a, b). But at least such accounts have a certain face plausibility in the cases of color and beauty.

However, the property of a person's thinking something *for a reason* is not response-dependent. To say that R was S's reason for A'ing implies that S took R to support his A'ing at the time that he A'ed, and that his so taking it led to his A'ing.

I don't see how S's being disposed to *say* that R was his reason for A'ing could *make it the case* that he took R to support his A'ing and that this taking had a certain causal impact. His saying it might be very good evidence that R was his reason. But

⁷ I have not tracked down a reference for this view in the literature. It was suggested to me in discussion by Tim Scanlon as a view that he was sympathetic to, although I wouldn't want to commit him to it on such a slender basis.

saying that R was his reason can't be *constitutive* of R's being his reason. Causation is part of the idea of R's being his reason—and causation can't be a response-dependent property.

9 The rule-following proposal: motivations

The second main idea for avoiding an occurrent, intentional state account of inference involves deploying the idea of following a rule. The idea is that we can capture the notion of inference by thinking of our thought transitions as *guided by inference rules*.

As we shall see, this view has great appeal. I have myself often assumed it in the past. Of course, I was aware that there are deep issues, raised by Wittgenstein and others, notably Kripke, about how rule-following is so much as possible. But I assumed that those problems could be resolved, with the result being a deeper account of rule-following rather than an abandonment of it.

John Broome (ms), it turns out, has been thinking independently along very similar lines; here is an interesting statement of the rule-following view of inference from him:

I have arrived at necessary and sufficient conditions for a process to be one of reasoning. Reasoning is a process in which you say to yourself the contents of your premise-attitudes, you operate on them by applying a rule to construct a conclusion, which is the content of a new attitude of yours that you acquire in the process. To put it briefly and not quite accurately: reasoning is an operation on contents.

This account makes the whole of the process of active reasoning something you do. It is the activity of operating on the contents of your attitudes. For a contrast, compare the jogging model I described...That model limits your activity to saying certain propositions to yourself; you leave the rest of your reasoning to automatic processes. In my account, you are active right through to the conclusion. (p. 235)

I would distance myself from Broome's talk of reasoning as inevitably involving "saying to yourself the contents of your premise-attitudes." This seems to me to involve an overly restrictive conception of what it is to reason with beliefs. But putting that optional restriction to one side, what could be said in favor of such a rule-guided conception of reasoning?

Broome emphasizes the respects in which such a picture can capture the *active* character of reasoning, the respects in which inference is a mental action. I agree that this is important. But there are at least three further points that we can make in its favor.

First, and most important, the rule-following picture seems to be able to effortlessly accommodate the Taking Condition. Consider, for example, the following mundane rule that someone might wish to follow as a matter of policy:

(Email Rule) Answer any email that calls for an answer immediately upon receipt!

It seems right to say that anyone following this rule would be *treating* the receipt of an email *as a reason* for composing an answer to it immediately. S's acting on the Email Rule explains and *rationalizes* S's answering the email immediately upon receiving it. If S did follow the Email Rule in answering the email, it would be natural to say that he took his receipt of the email to be a reason to answer it. (See Boghossian 2008a for further discussion.)

So the notion of following a rule incorporates the very idea of *taking a circumstance to be a reason for believing something* that I have insisted is essential to inference. If we construe inference as a matter of following a rule of inference, then, at a minimum, we will not run afoul of the Taking Condition.

Second, the rule-following picture enables us to capture something that seems very central to our inferential abilities, and that is that they are both *general* and *productive*. In addition to the (Rain) inference, I am disposed to perform many other inferences that, as we like to say, are of a "similar logical form," for example:

(Space-Time)

If x is a Malament-Hogarth space-time, then it has no Cauchy surface.

x is a Malament-Hogarth space-time.

Therefore,

x doesn't have a Cauchy surface.

I may know very little about the concepts ingredient in the (Space-Time) inference. But I will be very confident that, if its premises are true, its conclusion will be true as well.

What's more, it is quite clear that I did not acquire (Rain) and (Space-Time) individually, but rather all together. What explanation could there be for this except that I somehow came to accept a general Modus Ponens rule that now governs my thoughts?

Finally, there is another aspect of inference that the rule-following picture seems to get right and that is that, in an inference, we might be hard pressed to say *exactly* why, or in what respects, we take these premises to justify this conclusion. We take the premises to justify the conclusion and we might have a rough sense of how they do so. But we might be hard pressed to say exactly how they do so.

This is another aspect of reasoning that the rule-following picture seems to be able to capture, for we do tend to think that our thoughts can be under the influence of rules, even if we have not explicitly formulated those rules to ourselves, and would be unable to do so with great precision if we tried.

These, then, are three further strong considerations in favor of the rule-following picture of inference.

10 The rule-following proposal: the intentional view

Unfortunately, though, I believe that there is a difficulty seeing how inference *in particular* could consist in guidance by rules, a difficulty that I am now inclined to think is at the heart of Wittgenstein's discussion of following a rule. (The argument of this section is laid out in more detail in my 2008a.)

This problem is different from Kripke's way of reading the moral of Wittgenstein's discussion (see Kripke 1982). Kripke's treatment was based on what we might call the impossibility of our being able determinately to *internalize* a particular rule, given that it is supposed to cover a potential infinity of cases. What, asks Kripke's Wittgenstein, would determinately make it the case that it is *Modus Ponens* that I am following, as opposed to some bent rule that deviates from *Modus Ponens* at some point past my computational abilities?

That is not the problem I have in mind. Kripke's problem arises against the backdrop of a naturalistic outlook relative to which it is difficult to see how there could be determinate facts about which infinitary rule I have internalized. But I am willing to waive naturalistic constraints. Let it be that there is as determinate a fact as you might want about which inference rule it is that someone has internalized, and let's allow such a fact to be a primitive of our ontology. The problem is to understand how such a rule could *guide* a person's inferences.

To see what the problem is, let us look closely at an especially clear case in which we would say that my thinking involved the active application of a rule. Suppose I receive an email and that I answer it immediately. When would we say that this behavior was a case of following the:

(Email Rule) Answer any email that calls for an answer immediately upon receipt!

as opposed to just being something that I happened to do that was in conformity with that rule?

Clearly, the answer is that it would be correct to say that I was following the Email Rule in replying to the email, rather than just conforming to it, when it is *because* of the Email Rule that I reply immediately.

Of course, the Email rule, qua rule, is just an abstract object. So, if it is to have any hope of explaining my behavior it must be by virtue of the fact that my behavior is to be explained via some state of mine that represents or encodes that rule.

We seem to need, then, to postulate the existence of an intentional state that represents the rule. Let's call this the Intentional View of rule-following.⁸ Now, how should we conceive of this intentional state as guiding the conduct that constitutes my following the rule it encodes?

Well, I have grasped the rule, and so am aware of its requirements. It calls on me to answer any email that I receive immediately. I am aware of having received an email and so recognize that the antecedent of the rule has been satisfied. I know that the rule requires me to answer any email immediately and so conclude that I shall answer this one immediately.

On this Intentional construal of rule-following, then, my actively applying a rule can only be understood as a matter of my grasping what the rule requires, forming a view to the effect that its trigger conditions are satisfied, and drawing the conclusion that I must now perform the act required by its consequent. In other words, on the Intentional view of rule-following, rule-following requires inference.

⁸ See also Wright (2007) on what he calls the 'Modus Ponens model' of following a rule.

Of course, all of this grasping and inferring can take place very quickly. Indeed, the entire procedure can be “automated” to such an extent that it can seem as though no thoughts at all intervene between receiving the email and answering it, just as one can so thoroughly master the route one takes from home to work that one can drive it without giving it a second thought. But just because one can automate an inference doesn’t mean that it wasn’t an inference to begin with.

So, now we face a problem. On the one hand, we have the Intentional View of rule-following, according to which applying a rule always involves inference. On the other hand, we have the Rule-Following picture of inference according to which inference is always a form of rule-following.

These two views, however, can’t be true together. Combining the two views would lead us to conclude that following any rule requires embarking upon a vicious infinite regress in which we succeed in following no rule (for further discussion see Boghossian 2008a). Call this the Inference Problem for Intentional views of rule-following.

11 Rule-following without intentional states: dispositions

Is there any way to rescue the rule-following picture of inference from these considerations?

We can try one of two tacks. The first and most radical would be to rid our picture of rule-following of any rule-encoding intentional state. The other would be to allow a rule-encoding intentional state into our picture, but to find a way of maintaining that it can exert its control over our thought and behavior in a way that’s *non-inferential*.

Let us begin with the first idea. A number of philosophers have thought that we can explicate what it is for a rule R to guide our thoughts merely in terms of our dispositions to conform to R under appropriate circumstances. For S to follow rule R is for S to be disposed to conform to R under appropriately ideal conditions. If this sort of account could be made to work, then clearly there would be no Inference Problem.

Unfortunately, I think that Kripke (see also Fodor 2008 and Boghossian 1989a, 2008a) was perfectly right to say that any such construal would not be an explication of rule-following, but rather an abandonment of it.

There are at least two major reasons. First, our dispositions are finite, whereas the rules we follow are infinitary. Second, the rules we follow are supposed to guide our behavior; but this element would appear to be missing from a Dispositional View. We can see this clearly if we observe that the rules we follow *explain* why we have the dispositions we have: for example, my following the Modus Ponens rule explains why I am disposed to perform the (Rain) inference. No such thing could be true on a Dispositional View, though, since our dispositions can’t explain themselves.

I believe, therefore, that no Dispositional account of rule-following can hope to succeed. However, even without arguing against a dispositional account of rule-following in general, I think we are in a position to see why no such idea can help us

with our present task of explaining inference, and specifically in helping us to explain how the Taking Condition might be accommodated.

Recall that we are trying to explain what it is for a thinker to *take* (1) and (2) to justify (3). And our idea is that this taking can be understood as a matter of the thinker applying a rule that he accepts, Modus Ponens, to the contents (1) and (2), deriving from them the conclusion (3) and so coming to believe it.

Now, if all we mean by a thinker's applying the rule MP to the contents (1) and (2) is that the thinker is disposed, when considering such contents, to form the conclusion (3), we have clearly lost any prospect of respecting the Taking Condition through the deployment of the notion of following a rule. This will just look like regular causation of some thoughts by others, without the element of taking that Frege rightly saw to be essential to inference.

If I am genuinely applying the rule Modus Ponens, then my applying that rule explains and rationalizes my concluding q from p and 'if p , then q '. Nothing like that would be true on a merely dispositional account.

12 Applying a rule as sub-personal

What about an intermediate picture, according to which, while there is a rule-encoding intentional state involved in following a rule, such a state is not consciously accessible to the thinker and is not something that he consults in figuring out what follows from the contents he believes?

To flesh this out a bit more, suppose that what happens is something along these lines. I consider (1) and (2). I do so with the aim of figuring out what follows from these propositions, what proposition they support. A sub-personal mechanism within me 'recognizes' the premises to have a certain logical form. This activates some sub-personal state that encodes the MP rule which then puts into place various automatic, sub-personal processes that issue in my believing (3).

In "Epistemic Rules," (Boghossian 2008a) I argued that going sub-personal in this way would not help with the regress problem:

In the present context, going sub-personal presumably means identifying rule-acceptance...not with some person-level state, such as an intention, but with some sub-personal state...Let us say that [such a state] is some sub-personal intentional [i.e., representational] state in which the rule's requirements are explicitly encoded. Then, once again, it would appear that some inference (now sub-personal) will be required to figure out what the rule calls for under the circumstances. And at this point the regress will recur. (498)

Although I believe that this argument is importantly correct, I can imagine an opponent who insists that nothing deserving the name of 'inference'—and certainly not a process that is characterized by the Taking Condition—would be needed at the sub-personal level. All that would be needed, such an opponent might claim, is a representational state that ensures, via some causal mechanism or other, and *ceteris paribus*, that a belief in (3) will result from judging (1) and (2).

Such a picture deserves consideration. And it may well be that something like it perfectly characterizes what I earlier called, following Kahneman, System 1 reasoning—the sort of reasoning that is automatic, quick, sub-personal and done with little sense of voluntary control. Such a picture would be similar to what Broome calls the ‘jogging model of reasoning,’ according to which the only active thing that you do in reasoning is say certain propositions you believe to yourself and the rest is left up to sub-personal automatic processes. Such a jogging model may well adequately characterize System 1 reasoning.

But that is not the sort of reasoning that this paper is about—rather, it is about person-level reasoning, reasoning as a mental action that a person *performs*, in which he is either *aware*, or can become aware, of why he is moving from some beliefs to others.

No such process of reasoning can be captured by a picture in which (a) reasoning is a matter of following rules with respect to the contents of our attitudes and (b) our following rules with respect to the contents of our attitudes is a matter of automatic, subconscious, sub-personal processes moving us from certain premises to certain conclusions.

13 Why isn't system 1 reasoning enough?

At this point it might be worth considering why we are so sure that there is such person-level reasoning. Or, to put the matter differently, why are we so sure that all reasoning cannot be fully captured by something along the lines of the jogging model?

A reasonable first response is simply that it is obvious that there we are able to engage in reasoning in which we are active all the way from premises to conclusion.

But I think there is a stronger point in the offing, one that is elusive but important: and that is that our ability to think of ourselves as rational agents depends upon there being the sort of reasoning that I am trying to describe.

Suppose some reasoning was such that, having rehearsed the premises, some conclusion simply came to you (accompanied perhaps by the feeling that it is ‘right’), but not accompanied by any awareness of the process leading up to it. Full rationality would require that one ask oneself whether to *endorse* the conclusion that has simply come to you in this way. And this in turn would require that you lay bare the reasoning process by which the premises are supposed to have led to the conclusion.

In other words, full rationality requires that a self-aware process of reasoning, one with no blind spots in it, vet the deliverances of a System 1 process and rule on their correctness. And it is that sort of reasoning that I am trying to capture.

14 Where do we stand?

Here is where we have arrived. Inference requires Taking. The most obvious way to accommodate Taking would be via an account that postulates an intentional state

whose content would concern the relation between the premises of the inference and its conclusion. But this leads nowhere palatable.

The rule-following picture of reasoning seems to accommodate Taking naturally enough. But if we try to analyze rule-following, as it seems we ought to be able to do, we run smack into the Inference Problem for following a rule, which makes it impossible to see how inference in general could be a rule-governed phenomenon.

Where can we go from here?

If these considerations are correct, we face a stark choice between attempting to account for our mental lives without something that looks like the traditional notion of person-level reasoning, on the one hand, and being willing to take the notion of following a rule as an unanalyzable primitive, on the other.

Since I have no idea how to dispense with the notion of reasoning, and since there are independent considerations that favor thinking that rule-following cannot be analyzed, I incline firmly towards the latter option.

If this is correct, then inference is essentially a matter of following a rule of inference in one's thought; and we can have no expectation that we will be able to give a non-circular analysis of what following a rule of inference amounts to.

15 Speculative conclusion

By way of conclusion let me speculate briefly on what implications such a picture of reasoning would have for some of the topics that have interested philosophers.

One consequence is for so-called 'inferential-role semantics.' Some philosophers, myself included, have allowed themselves incautiously to say things like this: it is *in virtue of* our inferring with Modus Ponens that we come to have the concept *if*. And some of us have gone further to say that it is partly in virtue of Modus Ponens' having such a concept-constituting role that we are entitled to reason according to it. (This is presented, of course, as part of a broader strategy of explaining concept-possession, at least in the case of the logical constants, in terms of 'inferential role,' and of explaining a priori entitlement in terms of concept possession.)

One consequence of emphasizing the Taking Condition on inference is that it draws our attention to something that should have been obvious, but that is often lost sight of, including by me (though not by Broome): and that is that reasoning is an operation on thought *contents* and not on symbols (that have content).

That immediately implies that the usual ways of presenting programs of 'inferential role semantics' are confused—a logical constant's role in inference must be explained by its content; its content cannot be explained by its role in inference.

Of course, it is always open to an 'inferential role' theorist to give up on the claim that concept possession arises out of the *inferential* manipulation of *symbols*, and to insist, rather, that *both inference* and *concepts* arise simultaneously out of some pre-cognitive operations on symbols. But it is not easy to see how to flesh out such a view in a plausible way.

A second possible lesson of the present discussion concerns the question of the generality of reasons. Particularism, the view that we act out of reasons that are

particular rather than general, is increasingly influential in many quarters (see Dancy 2004 for the moral case).

The rule-following approach to reasoning would seem to militate against Particularism by claiming that our best prospects for making sense of reasoning sees us as guided by general rules of reasoning. I am not saying that this consideration by itself defeats Particularism in any specific domain, just that it poses a further challenge for it to overcome.

Finally, there is a possible implication for Naturalism. The phenomenon of consciousness has, of course, always seemed to pose a deep challenge to naturalistic or physicalist views of the world. But the same has not generally been thought to hold true of cognition.

If the present account of reasoning is along the right lines, it opens up the possibility that reasoning poses as much of a challenge to a naturalistic worldview as does consciousness. It makes it difficult to see what naturalistic process inference could consist in.

References

- Boghossian, P. (1989a). Colour as secondary quality (Reprinted in Boghossian 2008b).
 Boghossian, P. (1989b). The rule-following considerations (Reprinted in Boghossian 2008b).
 Boghossian, P. (2003). Blind reasoning (Reprinted in Boghossian 2008b).
 Boghossian, P. (2008a). Epistemic rules (Reprinted in Boghossian 2008b).
 Boghossian, P. (2008b). *Content and justification: Philosophical papers*. Oxford: Oxford University Press.
 Broome, J. ms. *Rationality through reasoning*.
 Carroll, L. (1895). What the tortoise said to achilles. *Mind*, 4(14), 278–280.
 Dancy, J. (2004). *Ethics without principles*. Oxford: Clarendon Press.
 Dogramaci, S. ms. Inferences to easy deductive consequences.
 Fodor, J. (2008). *LOT 2*. Oxford: Oxford University Press.
 Frege, G. (1979). Logic. In *Posthumous writings*. Chicago: University of Chicago Press.
 Harman, G. (1986). *Change in view*. Cambridge: MIT Press.
 Kahneman, D. (2011). *Thinking fast and slow*. NY: Farrar, Strauss, Giroux.
 Kripke, S. (1982). *Wittgenstein on rules and private language*. Cambridge: Harvard University Press.
 Lenman, J. (2009). Reasons for action: Justification vs. explanation. *Stanford Encyclopedia of Philosophy*.
 Pettit, P. (2007). Rationality, reasoning and group agency. *Dialectica*, 61, 495–519.
 Wright, C. (2001). Basic logical knowledge: Reflections on Paul Boghossian's 'How are objective epistemic reasons possible?' *Philosophical Studies*, 106(1–2), 41–85.
 Wright, C. (2007). Rule following without reasons. *Ratio*, 20(4), 481–502.