In Defense of Rationalism about Abductive Inference

Ali Hasan

Abstract: Laurence BonJour (1998) and more recently James Beebe (2009) have argued that the best way to defend the claim that abduction or inference to the best explanation is epistemically justified (in the internalist sense) is the *rationalist* view that it is justified *a priori*. However, rationalism about abduction faces a number of challenges. I focus on one particular, highly influential objection, that there is no interpretation of probability available which is compatible with rationalism about abduction. We have no *a priori* access to probabilities if we accept frequency-based interpretations of probability, and so the rationalist who wants to maintain a strong connection between epistemic justification and probability would do best to rely on a Keynesian interpretation of probability. However, the latter is vulnerable to F. P. Ramsey's famous criticism that we do not seem to perceive or be aware of such probabilities. I argue that Ramsey's criticism is unsuccessful, and that there are good reasons to be optimistic about our ability to have access to probabilities relevant to abductive inference.

1. Rationalism, abductivism, and rationalism about abduction

According to rationalism, as I shall understand it here, some of our beliefs and inferences are justifiable purely *a priori*; these beliefs and inferences do not depend for their justification on any of the sources traditionally classified as *a posteriori*: testimony, sensory perception, or introspection. On the traditional rationalist view I favor, our *a priori* justification depends on some sort of grasp or awareness of abstracta.[1]

According to the abductivist response to external world skepticism—"abductivism" for short—belief in the external world is justified by explanatory considerations: the hypothesis of an external world of spatial objects, one that is in line with our ordinary beliefs in at least some central respects, is the best explanation of our experiential regularities.[2]

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[1] This view remains very much out of favor, though there are signs of resurgence. See, for example, BonJour (1998:180-6). For recent views of *a priori* knowledge as involving a direct awareness of abstracta, see Bengson (2015) and Chudnoff (2013).

[2] See, for example, BonJour (1999), Vogel (1990) and (2008), Huemer (*forthcoming*), and Hasan (*forthcoming*).

Rationalism about abduction is the view that, at a fundamental level, explanatory or abductive inference is justifiable *a priori*. Rationalism about abduction to the external world is the view that explanatory or abductive inference from our experiential regularities to the external world is justifiable *a priori*. One might be a rationalist about abduction and yet be a skeptic about our external world beliefs, i.e., hold that some abductive reasoning is justifiable a priori, but deny that our external world beliefs can be justified, perhaps because we have no good reason to prefer the external or real world hypothesis over the hypothesis that we are brains in vats or victims of a Cartesian evil demon. I'll focus on the rationalist about abduction who is not a skeptic, and in fact accepts an abductivist response to external world skepticism.

Rationalism about abduction is not a popular view. As Beebe notes, "practically everyone who works on abductive inference believes that such inferences are justified empirically and that the theoretical virtues [like simplicity and explanatory power] are broadly empirical and contingent marks of truth" (2009: 625). A large part of this rejection of rationalism about abduction derives from the concern that, at least when it comes to nondeductive inferences, it just seems implausible that we could have an *a priori* reason or justification for thinking that the premises make the conclusion probable.[3] Sometimes the concern seems to be that any such principle will be synthetic rather than analytic, and so those who reject the possibility that synthetic judgments be justified *a priori* will reject the possibility of *a priori* justification of nondeductive inferences. Of course, traditional rationalists are not likely to be moved by this sort

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[3] See Douven (2011: sec. 3.2):

> Hardly anyone nowadays would want to subscribe to a conception of truth that posits a necessary connection between explanatory force and truth—for instance, because it stipulates explanatory superiority to be necessary for truth. As a result, a priori defenses of abduction seem out of the question. Indeed, all defenses that have been given so far are of an empirical nature in that they appeal to data that supposedly support the claim that (in some form) abduction is a reliable rule of inference.

See also Sober (1988), Boyd (1999), and Psillos (1999).

of objection. Sometimes the concern is that the connection between the truth of the premises and the truth of the conclusion in such inferences is bound to be contingent, and so those who reject the possibility of contingent *a priori* will reject the possibility of *a priori* justification of nondeductive inferences. Some might worry that even when we set these arguments aside and leave open the possibility, in principle, of an *a priori* justification of nondeductive forms of inference, we really don't seem to have the sort of awareness or grasp of, or insight into, the inductive or probabilistic connections required, let alone have enough to bridge the epistemic gap between our experiential evidence and our external world beliefs.[4]

My main focus here is to examine these reasons against the existence of *a priori* justification of inductive or probabilistic relations. I'm inclined to think that this rejection or restriction of the *a priori* is unjustified. I argue that the case against the existence of such an insight is much weaker than contemporary epistemologists seem to think, and that there are good reasons to be optimistic about our ability to have such an insight.

2. Motivating rationalism about inferential justification

I have characterized rationalism as the view that some of our beliefs *and inferences* are justifiable *a priori*. It is intuitive and relatively uncontroversial that, in order for a subject to have justification for believing that Q inferentially, on the basis of another belief that P, (i) the subject must have justification for P, and (ii) the subject must have justification for the inference from P to Q. The latter condition has been understood in different ways, but a very natural interpretation is that it involves the following requirement: *in order for the inference from P to Q to be justified, the subject must have justification for believing that there is a suitable relation between P and Q, one that is potentially relevant to the truth or probability of Q, such as a relation of entailment or probability*. Call this the *principle of inferential justification* (PIJ). We can motivate PIJ by

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[4] See Ramsey (1926) and Fumerton (1995).

considering a person who infers *Q* from *P*, where *P* does in fact logically entail or makes

probable *Q*, but where the entailment or probability is far too complex for the person to grasp or

even understand. A subject S might be disposed to form the belief that *Q* as a result of believing

that *P*, perhaps because someone has, unbeknownst to S, implanted a chip in S's brain that leads

S to believe *Q* if and when S believes *P*. Surely, the belief that *Q* is not justified if the person who

reaches the conclusion couldn't see how *P* entails or makes probable *Q*.[5]

Why is PIJ so intuitive? It is often associated with access internalism about epistemic

justification, and the requirement can be seen as a natural application of the core intuition behind

the view. According to access internalism, in order for the subject to have justification for

believing something, the subject must be aware of or have access to something that makes a

difference to the subject's perspective on the truth, or probable truth, of the proposition believed.

Without some such justification, the internalist claims, there is no epistemically relevant

difference to the subject's perspective on the truth or probability of the inferred belief; the subject

seems to just be flying blind. The access internalist thus hopes to secure two intuitively attractive

and historically prominent requirements for epistemic justification: internal access to good

reasons, and a robust connection to truth or probability. Applying this to inferential justification:

in order for a subject to have justification for believing *Q* by inference from *P*, the subject must

have a good reason to think that the truth of *P* is relevant to the truth or probability of *Q*.

A belief's justification is inferential if it depends on one's justification for other beliefs.

My justification for *Q* depends on my justification for *P*, and the latter might depend in turn on

my justification for various other propositions. The same might be said of *inferences*: I might be

justified in inferring one belief from another, but only because I am justified in believing

something about the connection between the propositions believed. But foundationalists have

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[5] See Hasan and Fumerton (forthcoming) for more detailed discussion.

long argued that, on pain of vicious regress, if any of our beliefs are justified then there must be some beliefs that are "basic" or "foundational": they are justified but do not depend for their justification on any other beliefs. Foundationalists who accept PIJ have also argued that, on pain of vicious regress, inferential justification requires, at some fundamental level, a *non-doxastic* grasp or awareness of the relevant inferential connection.[6] In the case of deductive inferences, one must have or at least be capable of having a *non-doxastic* grasp of the entailment between the premises and conclusion (or between the premises and conclusions of sub-arguments) so that the regress of justification comes to a halt. The same holds for nondeductive inferences. Perhaps our justification for abduction depends on enumerative induction or (more plausibly, in my view) enumerative induction depends on abduction, but it is implausible to think that either are reducible to deduction. What is required to halt the regress of justification for such inferences is a *non-doxastic* grasp of a relation, other than entailment, that is relevant to the truth or probability of the inferred belief. It seems implausible to construe our awareness of these relations of entailment or probability as *empirical* or *a posteriori* sources of justification; our reasoning or inference must be wholly or partly *a priori*. True to a form of awareness or access internalism, this traditional rationalism about deductive and nondeductive inference requires a positive grasp of broadly logical and probabilistic relations, and not merely that these logical and probabilistic relations do in fact hold. To deny that we have any such grasp thus seems to lead to a radical skepticism, undermining our justification for any inferences or inferentially justified beliefs.

I have put it in more general terms here, but this sort of motivation for rationalism has been discussed in detail elsewhere.[7] One thing I want to stress, however, is that on its own such an argument does not show that we have *a priori* justification. At best, it shows that *if* we have

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[6] For the inferential internalist, this seems to be the lesson of Lewis Carroll's regress. See Fumerton (1995: Ch. 7), and BonJour (2005).
[7] See BonJour (1998) and (2005). For some criticism, see Casullo (2003). For attempts to respond to Casullo and develop the argument further, see Thurow (2009) and Hasan (2014).

any justification for certain beliefs and inferences, then the justification of some fundamental

deductive and nondeductive inferences must be (wholly or partly) *a priori*. Rationalism about

abduction may be the most defensible *non-skeptical* view, but even granting that for sake of

argument, why should we think we do indeed have the sort of *a priori* justification the rationalist

claims we need in order to avoid radical skepticism? Indeed, some have argued that we just don't

have the sort of justification the rationalist needs.[8] As I've indicated, my main task here is to

respond to some of these concerns and motivate the claim that we do have an *a priori* justification

for nondeductive inferences, including explanatory ones.

I want to briefly discuss two likely concerns related to the argument of this section before

moving on. First, coherentists about epistemic justification might object that the argument

assumes that coherentism about epistemic justification is false, for it does not consider the

possibility that one's justification for believing that some propositions make other propositions

probable could take the form of beliefs that are justified by virtue of their *coherence* with the

subject's other beliefs. A vicious regress may result if we think of justificatory relations as linear

or one-directional, but the coherentist rejects this linear conception of justification for a holistic

one. I have two responses to this concern.

First, coherentism cannot accept PIJ, for the problem is not just that there is some sort of

regress that ensues, but that satisfying that requirement leads to a hierarchical regress of beliefs of

ever-increasing complexity. In order for S to be justified in believing that *P makes probable Q*, S

must have some reason *R* to think this, and, given PIJ, must have justification for believing that *R*

makes probable that (P makes probable that Q). In order for the latter belief to be justified, S

must have some reason *T* to believe this, and have justification for believing that *T makes*

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[8] See notes 3 and 4 above.

probable that (R makes probable that (P makes probable that Q)). And so on.[9] The problem is

not just that there is some regress here (which coherentists might not be too worried about), but

that it is just implausible that we are able to form such complex beliefs even at a few iterations,

let alone be able to have an infinite hierarchy of them.

There is a second, related worry with coherentism, which is that although it was largely

motivated by the internal access requirement and the alleged failure of foundationalism to satisfy

this requirement,[10] it turns out that coherentism itself is, ironically, incapable of satisfying it.[11]

Suppose for simplicity that the subject has only three beliefs that cohere with each other: *P, Q,*

and *R*. (This is implausible, but it will be easier to state the problem with this simplification in

place, and once the problem is clear it will become clear that adding further beliefs won't help.)

For the coherentist, access to one's reasons for believing that *P* will have to take the form of (i)

access to the other beliefs that support or cohere with *P*, namely, *Q* and *R*; and (ii) access to the

fact that *Q* and *R* support or cohere with *P*. Now, for the coherentist, any such access cannot take

the form of a direct, non-doxastic awareness of one's beliefs or of the fact that they support or

cohere with *P*; for the coherentist, any such access must take the form of other, *higher-order*

beliefs to the effect (i) that one believes *Q* and *R* and (ii) that *Q* and *R* support or cohere with *P*.

But these higher-order beliefs were beliefs that, by hypothesis, the subject did not already have,

and so the subject does not have the relevant access. It won't help to add these higher-order

beliefs to the subject's belief set, for then access to *these* higher-order beliefs will require still

further beliefs that the subject did not already have. The result is that internal access to any of

one's reasons for belief turns out to be impossible. (Note that the problem remains even if the

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[9] See Bergmann (2006: Ch. 1 and 2) for a similar argument that such a requirement leads to an infinite regress of beliefs of ever-increasing complexity. Bergmann's argument for this is one horn of a dilemma against access internalism. The other horn of the dilemma attacks versions of access internalism that require only a non-doxastic grasp of the connection between one's grounds and the beliefs they allegedly justify. For a defense of the latter form of access internalism, see Hasan (2011).
[10] See BonJour (1985).
[11] See Moser (1989) and BonJour (2003) for similar arguments.

coherentist accepts a weak form of internalism that requires only access to cohering beliefs and not to their coherence.) The coherentist might drop the internal access requirement, as some recent coherentists seem to have done, and perhaps find some other way to motivate coherentism rather than accept externalist foundationalism.[12] But for those who want to hold onto access internalism, a direct, non-doxastic grasp of relations between propositions is needed.

The second concern might come from someone sympathetic to phenomenal conservatism rather than coherentism. I am interested in defending the claim that we can be directly aware or have a direct grasp of relations between propositions, including non-deductive or probabilistic relations. Indeed, I am inclined to think that, in Bertrand Russell's terms, we are *acquainted* with such relations, that we have an awareness of such relations that is "factive." But why not hold that what is required is a non-factive "seeming" that one proposition entails or makes probable the other? That would, according to the phenomenal conservative, be a non-doxastic state capable of providing justification and avoiding any regress. Perhaps those who are inclined to appeal to such seemings are also be able to respond to Ramsey's concerns about our access to probabilities as I do below, and I welcome their attempts to develop similar responses. One worry with this suggestion, however, is that if all we have are non-factive seemings then there is no necessary connection between epistemic justification and objective probability. For those who accept a conception of epistemic justification as involving reasons that are *both* internally accessible *and* objectively truth-conducive, a mere seeming that some probability relation obtains won't do for justified inference.

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[12] See Poston (2014) for an attempt to defend coherentism without accepting the internal access or awareness requirement.

3. Interpretations of epistemic probability

One of the major challenges facing a rationalist account of abduction is to provide an interpretation of probability compatible with our knowing statements of probability *a priori*. I will be concerned in this section with how to understand probability. To get a sense of the challenge, consider the rationalist who favors the abductivist response to skepticism regarding the external world. Suppose I accept this sort of rationalism. I grant that it is possible that I am the victim of a new evil demon world, but I claim that, in light of my experiential evidence and what I can draw from it, I am justified in believing that this world is *not* a demon world. I might naturally claim: it is *possible* but *improbable* that I am an evil demon victim, and this is because (i) I have such-and-such experiences, and (ii) my having these experiences is best explained by, and hence makes highly probable, or at least more probable than not, that the real world hypothesis (RWH) holds—i.e., that my beliefs are more or less correct with respect to the spatial features of objects in my local environment. And the latter probability claim is, according to the rationalist, knowable or justifiable *a priori*, and it holds true even *if* it turns out, unbeknownst to me, that I am actually in an evil demon world or that RWH is false in some other way.

But how, then, should we understand the claim of probability? First, suppose we understand it as some claim about *actual frequency*, the frequency of beliefs of a certain kind that are *actually* true in this world. The claim then is roughly that most, or at least more than half, of the actual (past, present, and future) cases of perceptual belief (beliefs based on sensory or perceptual experience) turn out to be true. In that case the probability claim would be false in a demon world, since the external world beliefs are all false in that world. We need some understanding of probability according to which such experiences make the RWH probable *even in a demon world*, and the actual frequency interpretation does not allow for that. The same holds for ordinary and scientific inferences that assume the falsity of external world skepticism: if justified belief requires that our observations or empirical evidence make scientific hypotheses

probable in the actual frequency sense, then all sorts of scientific hypotheses that we apparently

have excellent evidence to accept would be unjustified if our evidence turns out to be misleading

and such hypotheses are never or very rarely true in this world.

It's worth noting that this is not a problem about our *access* to such probabilities; the

problem, rather, is just that the actual frequency interpretation of probability, if it is intended as

an interpretation of *epistemic* probability, is vulnerable to counterexamples, for there are

intuitively epistemically justified beliefs that are not probable in this sense. Necessary falsehoods

provide clear cases: it is possible for one to have a justified belief in mathematics or logic that

turns out to have a probability of 0 on the actual frequency interpretation. Any who hold that

epistemically justified beliefs must be probable in some sense, and this includes externalists of

various sorts, must have some alternative way of thinking about this probability, something other

than the actual frequency interpretation. It is for this reason that various contemporary

epistemological theories that wish to retain some sort of "truth-connection" turn to a notion of

probability that employs subjunctive conditionals, holding, for example, that only those beliefs

that would usually be true under such-and-such (possibly false) conditions are epistemically

justified.

The rationalist about abduction has the *additional* problem that actual frequencies don't

seem to be the sort of thing that is even in principle accessible to us *a priori*. These actual

frequencies are clearly *contingent*, not *necessary*, and so cannot be justified *a priori*. The same

holds if we understand probability in terms of truth in nearby possible worlds, or in terms of

subjunctive conditionals regarding what *would* hold under certain conditions: these too are

contingent, and so cannot be justified *a priori*.[13]

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[13] This is to assume that we cannot come to know contingent truths *a priori*, and it may turn out that there
are some interesting counterexamples to this. (Turri 2011 provides one of the best counterexamples.)
While I cannot discuss these examples here, they do not suggest that the rationalist should embrace these
subjunctive analyses of epistemic probability. Even if such cases of contingent *a priori* knowledge or

The rationalist might prefer a *modal frequency* interpretation of probability. On this interpretation, the relevant probabilities are limiting frequencies across all possible worlds rather than just in the actual world or similar, "nearby" possible worlds. Worlds where induction and abduction fail systematically are, as BonJour puts it, "quite rare and unlikely within the total class of possible worlds, which would make the claim that the actual world is not such a world itself highly likely to be true" (1998: 209). BonJour is aware that this talk of the "rarity" of certain sorts of worlds in the class of all possible worlds involves a controversial assumption:

> This way of putting the matter assumes in effect that it is possible to make sense of the relative size of classes of possible worlds, even though both those classes and the total set of possible worlds are presumably infinite. But I have no space to go into the issues surrounding this assumption and must be content here with saying that its intuitive credentials in other cases (e.g., the claim that there are twice as many positive integers as even integers) seem to me strong enough to make it reasonable to construe the difficulties as problems to be solved and not as insuperable objections. [1998: 209, n. 24]

However, as Beebe (2009) points out, this interpretation yields frequencies that are undefined in the absence of some ordering of the members of these infinite sets or classes, and unless we can see how this ordering can be determined *a priori*, we lack a workable interpretation of probability that can serve the rationalist's purposes. Beebe explains:

> The critical difficulty is that there is no privileged or natural ordering of worlds to which we can appeal. Yet if his [BonJour's] claims about limiting frequencies are not relativized to any particular sequence(s) of worlds, the frequencies in question will be undefined and hence his claims about them cannot be true." [Beebe 2009: 630]

Consider a simple example for illustration: what is the frequency of even numbers in the set of all natural numbers? If the set were *finite*—if, for example, we consider the ratio of even numbers that are less than a thousand to all numbers that are less than a thousand, then there is a clear way to determine this frequency or ratio. Simply divide the number of even numbers less than a thousand by the number of natural numbers less than a thousand. The problem of course is that

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justification are genuine, it's arguable that we can arrive at them only via a grasp of a *necessary* truth that these contingent truths are *probable*. This will make better sense after we have discussed the Keynesian view of probability.

the set of evens and the set of naturals both have *infinite* members, and so determining the frequency of evens is a tricky matter: it seems that we can make sense of frequency in this case only if there is already some way that the members are ordered, something we didn't need to worry about in the finite case. Under one ordering, the natural ordering of "greater than" (0, 1, 2, 3…) the limiting frequency of even numbers would be one half, since the frequency of even numbers approaches one half as the series approaches infinity. But other orderings are possible. Even numbers might be more spaced out than the odd ones, yielding much lower frequencies (e.g., 1, 3, 5, 7, 2, 9, 11, 13, 15, 4..., which yields a limiting frequency of 1/5). It should be easy to see the problem as it occurs for sets of possible worlds: if the set of counter-inductive worlds, or worlds where abductive forms of inference fail regularly, or worlds controlled by an evil demon are infinite in number, then it seems that their frequencies are undefined without some sort of ordering. If we are offered no indication of how to impose a particular ordering *a priori*, then we lack an adequate rationalist account of our justification for claiming that such worlds are rare or improbable.

How, then, could we understand the epistemic probabilities so that they can be known *a priori*? What the rationalist requires is some notion of probability that holds *necessarily*. The actual and subjunctive frequency interpretations won't do since they are only contingent, and the modal frequency interpretation won't do because it is undefined in the absence of a particular ordering, an ordering that would have to be justified *a priori*.

On the *Keynesian* interpretation, epistemic probabilities are "internal relations" between propositions in the sense that they are relations that depend on the propositions themselves and nothing else. Entailment is an internal relation between propositions in this sense: if an entailment relation holds between two propositions, then it holds of necessity; that the relation holds depends only on what the propositions are, and not in any way other factors such as the state of the external world (or nearby possible worlds) or the state of the believer. On the Keynesian view,

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epistemic or logical probability is also an internal relation between propositions—indeed, the case

of entailment might be understood as the limit of the "making probable" relation between

propositions, a case where one proposition makes another probable to the highest possible degree.

Fumerton (1995: Ch. 7) has argued that internalists who want to avoid skepticism should accept a

Keynesian theory of probability and hold that the probability relations between our ultimate

evidence and our inferred, external world beliefs hold necessarily.[14]

In an excellent discussion of the Keynesian theory, and despite finding much to

recommend it, Bertrand Russell (1948) ultimately rejects the Keynesian theory of probability.

His central dissatisfaction with it seems to be that it fails to secure a connection to the actual truth

of our beliefs, and only some sophisticated version of a frequency view will do. Our evidence

might make a proposition probable in the Keynesian sense, but this yields no necessary

connection to the truth. So it looks like we lose the "truth-connection" that is so dear to many

epistemologists. However, as Fumerton argues (1995: 200-3), the Keynesian can respond that

there is indeed a necessary connection: Necessarily, if our evidence E makes a proposition P

probable and E holds, then P is *probably* true. It is possible that our inferred beliefs are never

true, but they may yet remain *probable*, and a necessary connection between our evidence and

their *probable* truth remains.

While I accept a Keynesian or logical interpretation of probability, my aim is not to

defend the specific view that Keynes himself held. Indeed, I am inclined to accept certain claims

that I am not sure Keynes would accept, though it would take more research to determine whether

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[14] In many cases, when we say that P makes probable Q we might mean that this probability relation holds *given some empirical background information*. That my car is not starting this morning may make probable that the battery is dead, but that only holds given a background of empirical information about cars and batteries. For the traditional rationalist, in line with the argument of the previous section, we must have access to some probability relations between propositions that do not depend on further background information. So, like Keynes, we are interested in whether probability relations hold between propositions independently of any further background information.

or not this is so. First, while Keynes, and Ramsey in his interpretation of Keynes, seems to assume that there are probability relations between every pair of propositions, I see no clear reason to accept this; and even if there are (and here at least Keynes would agree), there is no clear reason to think that we have access to all these relations. Second, in addition to having access to some probabilistic relations between propositions, I think we can have *a priori* access to the fact that certain propositions are highly likely or unlikely, and not just to relations between propositions. I will say more about both of these points below.

4. Ramsey's objection to Keynesian probability

Let us turn now turn to the skeptical concerns regarding our *a priori* access to Keynesian probabilities.

> But let us now return to a more fundamental criticism of Mr. Keynes' views, which is the obvious one that there really do not seem to be any such things as the probability relations he describes. He supposes that, at any rate in certain cases, they can be perceived; but speaking for myself I feel confident that this is not true. I do not perceive them, and if I am to be persuaded that they exist it must be by argument; moreover I shrewdly suspect that others do not perceive them either, because they are able to come to so very little agreement as to which of them relates any two given propositions. [Ramsey 1926: 161]

Ramsey thus doubts that there are any such things as Keynesian probability relations, and there seem to be two main sources of this doubt. The first is a phenomenological one: speaking for himself, he feels confident that he does not perceive them. The second concern is that there is so little agreement about what probability relations hold between any two given propositions that we should be skeptical that any subjects have access to probability relations. I want to argue that there is in fact plenty of agreement on some simple cases, and while there is a sort of

philosophical disagreement that persists, this is not surprising and is not a problem unique to the Keynesian view.[15]

These two concerns are related, but let us begin with the second. It may help to distinguish two ways to understand the nature of this disagreement. We might understand the disagreement to be about, on the one hand, the claim that some proposition makes another probable, and on the other hand, the claim that in some cases I perceive or am directly aware of an internal probability relation between propositions. Suppose it is the latter. I admit that there is little agreement on this matter. But this is no surprise, and while disagreements between philosophers may be epistemically significant and require us to lower our confidence or even revise our stance in some cases, this is not a problem peculiar to the Keynesian view. To see the point, it may help to compare a parallel distinction in the debate on the nature of perception between the claim that we perceive certain ordinary objects, and the claim that what is involved in our perception of these objects is a direct awareness of a sense datum, a way of appearing, an abstract sensible profile or universal, an external world object, or the view that there really is no genuine "awareness" at all, and perhaps still other views. There is substantial agreement that we do perceive all sorts of objects, but very little philosophical agreement as to what sort of awareness perception involves, of what sorts of entities, belonging to what ontological categories. The fact that there is substantial disagreement in such debates may raise serious questions about the epistemic significance of disagreement in philosophy, but these epistemological and meta-philosophical problems are not specific to particular theories of perception. The same is true of

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[15] One might be inclined to think that the widespread agreement regarding some cases is due to shared background knowledge. However, I am not arguing that we have access to Keynesian probabilities *merely* because there is widespread agreement on simple cases. My main task in this section is to respond to objections to the claim that we have such insights, including the objection from lack of agreement. I do want to motivate the idea that we have such insights, but that depends on phenomenological and theoretical considerations, and not merely on the existence of significant agreement on simple cases.

the claim that such irreducible internal relations do or do not exist, or that we can or cannot perceive such relations between propositions.

It is worth adding at this point that using the term 'perception' to describe our access to relations of probability can be misleading, even though proponents of Keynesian probability, including Keynes himself, have used that term. The problem is that the term suggests a relation that is similar to that of sensory perception, which many hold to involve or require a causal relation of some sort between the subject and the object, whether or not that causal relation is taken to be part of the very analysis of perception. Abstracta, such as universals, propositions, and relations of entailment or probability between propositions, are not causes and do not have causal powers, so it seems that we cannot stand in the very same sort of perceptual relation to such entities. This is not to deny that there is a sense in which they may be said to "influence" our cognition or what we think in some way, but the abstracta influence our states by partly constituting them rather than in the standard causal way, much as on classical views regarding our access to phenomenal or experiential qualities, these qualities partly constitute our states of direct awareness or "acquaintance" rather than causing them.

Ramsey is confident that he does not "perceive" probability relations. Nor does his position seem to depend on the use of the latter term; he probably would have also denied that he is ever directly aware of or acquainted with, or has any direct access to, such probability relations. And it is possible that many who reject the Keynesian view do so because they find themselves agreeing with Ramsey's phenomenological report. Indeed, while Fumerton has argued that the internalist who wishes to escape radical skepticism should embrace Keynesian probability relations, he too denies that he is aware of such relations:

> The Keynesian strategy described above for avoiding skepticism is, I suspect, dialectically impregnable. … For me, it has only one drawback. I cannot quite bring myself to believe that I am phenomenologically acquainted with this internal relation of making probable bridging the problematic gaps. …And in the end, I strongly suspect that

the probability relation that philosophers *do seek* in order to avoid skepticism concerning inferentially justified beliefs is an illusion. [1995: 218]

Like Fumerton, and apparently Ramsey too, I think phenomenological appeals can carry significant weight. Indeed, I take them to be indispensible in philosophy. But there are ways we can push back. First, we should admit that phenomenological investigations can be difficult and that our phenomenological claims are susceptible to the influence of our beliefs and judgments. (This of course goes both ways: it is possible that my own confidence is simply the product of bias, or is a mere projection of what I already accept.) While I do take phenomenological appeals to be indispensible, I'm inclined to think that here and with other fundamental epistemological issues, we must evaluate theories on both phenomenological and broadly theoretical grounds.

This is important, and worth further discussion. Some might be inclined to begin with beliefs and inferences that are justified from the point of view of common sense, and to then tailor one's fundamental epistemological principles so as to deliver the commonsensical results we want. This "epistemological commonsensism" utterly fails to take skepticism about common sense seriously; it just assumes that skepticism must be false. Some phenomenology is needed to ensure we are not, in the interest of avoiding skepticism, just making things up. If we hope to avoid skepticism without simply assuming it is false—to avoid skepticism while taking the skeptical challenge seriously to some extent—we need some sort of access to what our experiences are like, and also some sort of access to connections between our experiences and what we hope to infer from them. And we must do some phenomenology if we want to check on our ability to have these sorts of access. But, on the other hand, I do not want to deify phenomenological investigation, or pretend that by directing the inner eye in a certain direction I can tell conclusively and without any doubt that I have or do not have access to just what is needed.

To be fair to Ramsey, while he does say that he does not perceive Keynesian probability relations, his claim about the lack of agreement seems directed at the level of examples of probability claims and not at philosophical claims about whether and how we might have access to them. But part of the reason Ramsey seems to deny that there are such examples may have to do with the particular examples he focuses on, and on his assessment of those examples. I will end up agreeing to some extent with Ramsey that many examples of apparent intuitive grasp of probabilities are less straightforward than Keynes' view suggests, but deny that this means we should abandon the Keynesian view.

5. A priori probabilities, and the connection to abduction

Now, speaking for myself, I find it plausible that I am aware of relations of making probable between some propositions. There do seem to be some examples where I have stable intuitions about probability claims, and where I also seem to grasp the relations in question *a priori*. The latter part of this phenomenological appeal—that it not only seems to me that the relations hold but that I also seem to grasp the relations *a priori*, simply by considering the relevant propositional contents or properties involved—is important, for it suggests, even if it does not prove, that the intuitions are not due to some prior or background beliefs. As with all other arguments that depend at least in part on phenomenological appeals, I cannot literally show others what, it seems to me, I am aware of. But what I can do is present and discuss some central examples which are very intuitive, and which, if supplemented with a discussion of how one might be misled to deny that there are any such examples, at least can open one's mind to the possibility that one is in fact aware of such relations.

Let us begin with examples relevant to *deductive* inference, for that may open us up to the possibility of awareness of relations relevant to non-deductive inference. It is intuitively and phenomenologically plausible that we can grasp relations of entailment between propositions.

(Recall that, for proponents of Keynesian or logical conception of probability, entailment is the upper limit of the making-probable relation.) To offer just a few simple examples, I can infer from the fact that some figure is a circle that it has no corners, and from the fact that some figure is a triangle (has three angles) that it is also a trilateral (has three sides). In these cases, what justifies me in the inference is just that I grasp a certain logical relation between these facts: I grasp a logical relation of incompatibility or exclusion between something's being a circle and its having corners; I grasp a logical relation or inclusion or entailment between something's being triangular and its being trilateral. Phenomenologically, the grasp does not seem to be derivative or indirect: it not only seems that circles have no corners, and triangles are trilateral, but I grasp *why* this must be so, and it is in virtue of this that I am justified in inferring from the proposition that something is a circle that it does not have corners, or from the proposition that it is a triangle that it is a trilateral. We can also reflect on our own experiences and that of our students in logic classes. We are able to grasp entailment relations between particular premises and conclusions in some very simple cases with ease, and do so without relying on any principle of inference— indeed, logic students can often just "see" the connection between the relevant propositions prior to knowing anything about such principles.

Turning now to examples of relations of probability between propositions: Consider some simple examples from Euclidean projective or perspectival geometry, the sort of geometry that is involved in the technique artists use to determine how to represent objects in a drawing or painting. *Given* that certain shapes or figures in an approximately Euclidean three-dimensional space have two-dimensional projections, we can tell *a priori* what sorts of projections they are likely to have. A straight line segment will rarely project a point, but is highly likely to project a line of varying lengths. The projection of two straight lines the ends of which meet at an angle (an L-shaped vertex) is likely to be two straight lines whose ends meet at an angle, though the angle and size of the lines in the projection can change; in a small subset of cases (i.e., when both

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lines share a plane with the line of sight), the two connected lines will project a single line. Two straight detached lines (imagine two chopsticks or pencils) are likely to project two straight lines, but very unlikely to project lines that meet at their ends to form a corner. A circle or disc is unlikely to project a circle or line, and much more likely to project an ellipse. A square (like the square top of a table) is likely to project quadrilateral shapes, and relatively unlikely to project a line or a square. Spheres are highly likely to project circles, and cylinders less likely to do so. Thus, given that such-and-such Euclidean objects have projections, the projections are likely *a priori* to take such-and-such forms, and unlikely to take such-and-such other forms.[16]

Here is another example, involving color, given by Huemer (2016): suppose that a computer is programmed to place a random color at each position in a 1000 x 1000 grid. While it is *possible* that this produce a completely red grid, say, or the image of Donald Trump, or some other such meaningful or identifiable image, these results are all *highly improbable*. A random assignment of colors to each position or pixel in a 1000 x 1000 grid makes highly probable that the result for the entire grid is just meaningless static.

Do these examples involve a direct awareness of probability relations between the relevant propositions? Perhaps not. At a first approximation, it seems that that our grasp of the relevant probability relations are applications of the *principle of indifference* to the effect that when we have competing possibilities and no evidence favoring any one over another, we should assign an equal probability to all of them. If we wish to avoid notorious paradoxes in our employment of the principle of indifference, we will need to constrain its application in some way—to atomic states of affairs perhaps, or to some "natural" partitioning of possibilities. However, perhaps we need not solve all paradoxes or difficulties regarding the application of the

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[16] For a more detailed discussion of such examples and their relevance to the abductivist response to skepticism, see Hasan (forthcoming).

principle of indifference in order to be justified in its restricted application in some clear cases.[17]

In the projective geometry and color examples just discussed, in the absence of any evidence to favor one possible assignment of one sort of projection rather than another, or one assignment of colors to positions or pixels in the grid over another, we can see *a priori* that they are equally likely. Given that such-and-such a shape has two dimensional projections, and given no evidence to favor the claim that it is projected toward one particular direction rather than any other, it is equally probable that the shape is projected toward one region of the surrounding space rather than another. This is the fundamental insight, which is not insight into a general and unrestricted principle of indifference that is taken to apply to all cases and is then applied to the particular case; it is a grasp that certain specific possibilities are equally likely given a specific hypothesis. Just as one does not need to grasp a general logical principle to see that an entailment holds between certain propositions, one need not grasp a general principle of indifference to see that these possibilities are equally likely given a particular hypothesis. One can then also see, *a priori*, that line segments are likely to project line segments of varying lengths, that two detached lines are unlikely to project two lines with ends that meet at a point to form an L-vertex, that circles or discs are likely to project ellipses, and so on. The fundamental insight in the color example is that given a random assignment of colors to each pixel or position, each possible distribution of colors over the entire grid is equally likely. One can then also see, *a priori*, that random assignments of color to each pixel are highly likely to yield meaningless static images. Whatever our concerns about a general and unrestricted principle of indifference, we seem quite able to grasp that in these cases the possibilities are equally probable, and be able to infer from these that some types of possibilities are highly probable, others highly improbable, and some much more probable than others.

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[17] Huemer (2016) motivates this as well.

I can know *a priori* that certain propositions are highly probable or highly improbable, and not just that some propositions make others probable or improbable. This follows trivially from the view that we have insight into certain probabilistic relations between propositions: if I see that *P* makes it highly probable that *Q*, then I can also see that *P & ~Q* is highly improbable, and that *~P v Q* is highly probable. For example, I know that it is highly probable that the projection of a circle or disc is an ellipse, highly improbable that a 1000 x 1000 grid of pixels with randomly assigned colors produce a uniformly red grid, and so on. But it is not necessarily because I grasp relations between propositions that I grasp probabilities regarding single propositions. I grasp *a priori* that any particular experience I have has a very low *prior* probability, for I grasp that it is but one of indefinitely many *a priori* possible experiences. I also grasp *a priori* that any very specific hypothesis about the nature of this world has a very low prior probability. For example, I grasp *a priori* that it is highly improbable that there are currently exactly 10^{25} stars in this world.

Examples of this sort are, I believe, crucial for rationalism about abduction or inference to the best explanation, for they suggest that we can see, *a priori*, that certain hypotheses make some sorts of experiences or observations highly probable, and others highly improbable, and we can compare different hypotheses on this basis. For example, as just discussed, certain sorts of two-dimensional figures are more likely to result from certain objects as opposed to others; and certain images on a color grid are more likely given certain mechanisms or processes of color assignment as compared to others. But how are we to get from here to a rationalist justification of inference to the best explanation? The basic idea is that the proponent of a Keynesian or logical conception of probability can use this *a priori* grasp of probabilities and Bayes' Theorem (which is widely accepted and can also be justified *a priori*) to guide one's selection of hypotheses. According to Bayes' Theorem, for any hypothesis *H* and evidence *E*:

$$P(H \mid E) = \frac{P(H) \times P(E \mid H)}{P(E)}$$

Suppose that we are trying to determine the posterior probability of H, $P(H \mid E)$, where E is the total evidence. What should we take into consideration? (i) Well, the probability of E given H, $P(E \mid H)$ is intuitively relevant; the higher this probability, all else equal, the higher the posterior probability of H. The intuitive idea here, roughly, is that the better a hypothesis accounts for the evidence, the more likely it is that the hypothesis is true; so, other things being equal, if one hypothesis accounts better for some evidence than another, the more likely it is than the other. For example, if my monitor displays an image of Donald Trump, I will take it to be extremely improbable that the image was generated by a random assignment of colors to the pixels, for the probability of such an image is much too low given that hypothesis. Or consider the following more general case: if there is an identifiable pattern or strong correlation of some sort, the probability that this pattern or correlation has some explanation (other than chance or coincidence) is probable.[18] We commonly say when we observe persistent or extensive correlations that "there must be an explanation," but the "must" here is not because we think a lawful explanation is *necessary*, but because we take it to be so probable that we would be very surprised if there were no explanation, and more surprised the stronger the correlation.

But the prior probabilities $P(E)$ and $P(H)$ are relevant too. (ii) The more improbable, *a priori*, that the evidence is, the more probable is the hypothesis that accounts for it. The intuitive idea here is that an explanation that accounts for a surprising bit of evidence is better, all else equal, then one that accounts for something not very surprising. (iii) Finally, other things being equal, the more probable is the *a priori* probability of a hypothesis, the more probable its

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[18] BonJour (1998: Ch. 7) relies on a similar principle in his attempt to provide an *a priori* justification of induction, and takes it to be evident *a priori*. It is important that the correlation is strong in the relevant sense. It may be that whenever I'm typing, some butterfly in China is flying, but that would not make a causal explanation probable. For one, it may be that even when I am not typing some butterfly in China is flying. Something like a strong statistical co-variation in observed cases is needed. Moreover, it would not necessarily follow that there is a causal explanation, but only that such an explanation is *probable*.

posterior probability. If, for example, one hypothesis is *a priori* less probable compared to another because it is much more specific or complex, then, other things being equal, its posterior probability will be lower than the other.

I have been motivating the idea that we can be aware of some of the probabilities that enter into these assessments—not that we can arrive at very precise probabilities, but that we can have at least a rough sense of the probabilities, or be able to determine that some propositions are more probable than others, or make certain other propositions more probable than others do. Our *a priori* grasp of probabilities and Bayes' Theorem can thus be used to guide our selection of hypotheses, or to determine that certain hypotheses provide better explanations than others do.

I must remind the reader that my task here is not to offer anything approaching a rigorous defense of abduction or inference to the best explanation. Rather, I am attempting to motivate the idea that we can grasp the truth of some probability claims that seem to depend essentially only on the propositions (or theories) themselves, and not on the way the actual world, nearby worlds, or space of possible worlds is like. I have attempted to offer probability claims of this sort, claims regarding which there is likely to be widespread agreement. Many will disagree that we can know such principles *a priori*, or that we can be aware of these probabilities, but again, that there is this sort of disagreement is not surprising in philosophy, and does not seem to be a problem specific to rationalism about abduction or probabilistic inference.

Let us consider one more kind of example: simple cases of enumerative induction. That the first 50 balls I have drawn from this urn are white make highly probable that all or almost all the balls in the urn are white. Moreover, the intuition that it is highly probable that all or almost all the balls in the urn are white given that the first 50 draws were white remains even if, as a matter of fact, most balls in the urn are black. Should I later discover that the urn contained 100 black balls and 50 white ones, I would still have said: yes, but given my evidence that was a very improbable result! Some may be inclined to think that we have a direct grasp of the probability

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relation between the relevant propositions in such cases. While I do believe that this justification

is *a priori*, I'm inclined to think it is derivative. When I ask *why* it is that I should expect more

white balls, part of the answer is that there must be some explanation (more precisely, it is highly

probable that there is some explanation) why I kept getting white balls on the first 50 draws, and

an explanation that takes this sample to be representative is a better explanation, for it does not

require that there is some additional change or interfering condition responsible for the sample's

being unrepresentative (and so it has a higher *a priori* probability). The full story is more

complicated of course, but the justification of induction thus seems to me to depend on a prior

grasp of the sorts of probabilities than enter into a comparison of hypotheses, in line with Bayes'

Theorem.[19] While these apparently simple examples turn out to be more complex, the Keynesian

seems to me to have the resources to provide an intuitive and potentially compelling justification

of induction, one that does not simply take a principle of enumerative induction to be basic or

foundational, but still regards it as *a priori*, depending on explanatory considerations.

Ramsey does admits that there is significant agreement in some cases: "…we all agree

that the probability of a coin coming up heads is ½, but we can none of us say exactly what is the

evidence which forms the other term of the probability relation about which we are then judging"

(1926: 162). It might be tempting to claim that the other proposition in the relation is that the coin

is symmetrical, but though symmetry is relevant, the justification is more complex than that,

involving some simplifying assumption that heads and tails are the only two possibilities

(disregarding the possibility that the coin land on its edge) and an application of the principle of

indifference to these two possibilities. Still, it's not clear why something like this cannot be used

to justify the assignment of probability ½ in this case. As a matter of fact, we rely on much more

to justify this probability assignment than something like a principle of indifference, including

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[19] See BonJour (1998: Ch. 7), for an a priori justification of induction along these lines, though one that
does not make explicit reference to Bayes' Theorem.

our past experiences of coin flips and background knowledge of our physical world, but it may yet be the case that we would be justified, to some degree, in assigning a probability of ½ in the absence of this empirical knowledge. Moreover, even if this example is a problematic case for the Keynesian, the other examples discussed above seem relatively straightforward and enjoy widespread agreement.

Aside from questioning the simplicity or straightforwardness of examples that enjoy significant agreement, the other main concern that Ramsey raises is that when "we take the simplest possible pairs of propositions such as 'This is red' and 'That is blue' or 'This is red' and 'That is red', whose logical relations should surely be easiest to see, no one, I think, pretends to be sure what is the probability relation which connects them" (1926: 162). First, there is no reason, as far as I can see, that the Keynesian should insist that there be a probability relation between every pair of logically independent propositions. Second, even where such a probability relation exists, there is no reason to think that we must have direct access to it, even when the propositions related are very simple. It may help to note that in some cases of entailment even between very simple propositions, we have extreme difficulty determining whether there is an entailment without a complex proof, if at all. The field of mathematics is filled with examples of rather simple propositions entailed by other simple propositions, but where the entailment is notoriously difficult to prove. But why, then, should we think any different in the case of probability relations, if these are internal relations between propositions?

Conclusion

Rationalism about abduction is dialectically attractive for those who want to avoid radical skepticism, but many share Ramsey's concern that we just don't have access to the Keynesian probability relations the rationalist requires. My main task here is the modest one of rescuing rationalism about nondeductive inference and nondeductive principles, including abduction, from

the latter objection. In certain respects, Ramsey is right: there aren't all these internal probability relations between all pairs of propositions, or if there are, we aren't aware of them. Moreover, I agree with Ramsey that many examples that enjoy significant agreement are less simple or straightforward upon reflection. However, I have argued that these worries don't affect the view that we can have *a priori* awareness of probabilities of the Keynesian or logical sort, probabilities that are relevant to abductive inference. These are not the only objections Ramsey and others have raised to the Keynesian view, and much work remains to be done to make this interpretation of epistemic probability rigorous and workable.[20] But if I am right, then at the very least such arguments from phenomenology and disagreement are rather weak, and whatever other serious obstacles remain in the way, these are not among them.

Acknowledgements

References

Beebe, James (2009). "The Abductivist Reply to Skepticism." *Philosophy and Phenomenological Research* 79 (3): 605 - 636.

Bengson, John (2015). "Grasping the Third Realm." *Oxford Studies in Epistemology* 5.

BonJour, Laurence (1998). *In Defense of Pure Reason*. Cambridge University Press.

---- (1999). "Foundationalism and the external world." *Philosophical Perspectives* 13 (s13):229-249.

---- (2003). "A Version of Internalist Foundationalism." In L. BonJour and E. Sosa (eds.), *Epistemic Justification: Internalism vs. Externalism, Foundations vs. Virtues*, 5-96. Malden, MA: Blackwell.

---- (2005). "In defense of the a priori." In Steup and Sosa (ed.) *Contemporary Debates in Epistemology*, Malden, MA: Blackwell Publishing Ltd.

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[20] See Russell (1948) for an excellent discussion of Keynes' work and on formal and other problems facing his interpretation of probability.

Boyd, Richard (1999). "Kinds as the 'Workmanship of Men': Realism, Constructivism, and Natural Kinds", in J. Nida-Rümelin (ed.), *Rationalität, Realismus, Revision: Proceedings of the Third International Congress, Gesellschaft für Analytische Philosophie*, Berlin: de Gruyter.

Casullo, Albert (2003). *A Priori Justification*. Oxford University Press.

Chudnoff, Elijah (2013). "Awareness of Abstract Objects." *Noûs* 47 (4):706-726.

Douven, Igor (2011). "Abduction", *The Stanford Encyclopedia of Philosophy* (Spring 2011 Edition), Edward N. Zalta (ed.), URL = <http://plato.stanford.edu/archives/spr2011/entries/abduction/>. (Accessed December 20, 2016)

Fumerton, Richard (1995). *Metaepistemology and Skepticism*. Rowman and Littlefield.

Hasan, Ali, and Richard Fumerton (forthcoming). "Foundationalist Theories of Epistemic Justification." *The Stanford Encyclopedia of Philosophy*, Edward N. Zalta (ed.).

Hasan, Ali (2014). "Review of Albert Casullo, *Essays on A Priori Knowledge and Justification*" (Oxford University Press 2012). *Notre Dame Philosophical Reviews*, January 2014. http://ndpr.nd.edu/news/45701-essays-on-a-priori-knowledge-and-justification/

---- (forthcoming) "Skepticism and Spatial Objects," *International Journal for the Study of Skepticism*.

Huemer, Michael (2016). "Serious theories and skeptical theories: Why you are probably not a brain in a vat." *Philosophical Studies* 173 (4):1031-1051.

Moser, Paul K. (1989). *Knowledge and Evidence*. Cambridge University Press.

Poston, Ted (2014). *Reason and Explanation: A Defense of Explanatory Coherentism*, Palgrave Macmillan.

Psillos, Stathis (1999). *Scientific Realism: How Science Tracks Truth*. Routledge.

Ramsey, F.P. (1926) "Truth and Probability", in Ramsey, 1931, *The Foundations of Mathematics and other Logical Essays*, Ch. VII, p.156-198, edited by R.B. Braithwaite, London: Kegan, Paul, Trench, Trubner & Co., New York: Harcourt, Brace and Company.

Russell, Bertrand. (1948) *Human Knowledge and Its Limits*. New York: Simon and Schuster.

Sober, Elliott (1988). *Reconstructing The Past: Parsimony, Evolution, and Inference*. MIT Press.

Thurow, Joshua C. (2009). "The a priori defended: A defense of the generality argument." *Philosophical Studies* 146 (2):273 - 289.

Turri, John (2011). "Contingent A Priori Knowledge." *Philosophy and Phenomenological Research* 83 (2):327-344.

Vogel, Jonathan (1990). "Cartesian skepticism and inference to the best explanation." *Journal of Philosophy* 87 (11):658-666.

Vogel, Jonathan (2008). "Internalist Responses to Skepticism." In John Greco (ed.), *The Oxford Handbook of Skepticism*. Oxford University Press.