How to Solve Hume's Problem of Induction

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Abstract

This paper explains what's wrong with a Hume-inspired argument for skepticism about induction. Hume's argument takes as a premise that inductive reasoning presupposes that the future will resemble the past. I explain why that claim is not plausible. The most plausible premise in the vicinity is that inductive reasoning from E to H presupposes that if E then H. I formulate and then refute a skeptical argument based on that premise. Central to my response is a psychological explanation for how people judge that if E then H without realizing that they thereby settled the matter rationally.

1. Introduction

Reading Hume's ***Enquiry Concerning Human Understanding*** makes me think of an argument for skepticism about inductive reasoning.[1] I'd like to tell you where I think that argument goes wrong. I'll start by formulating the skeptical argument I want to talk about (§2). §3 introduces my proposal, and sketches how I'll spell it out in the rest of the paper. I end, in §7, by considering the value of addressing the skeptical argument.

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[1] Hall and Hájek (2002), Weintraub (2008) and Lange (2011) survey the recent literature on the problem(s) of induction.

2. Hume's _Enquiry_ and the skeptical argument this paper addresses

Our topic is enumerative inductive reasoning. For example, I've been to Tony's Pizzeria nineteen times over the past four years, and each time the pizza was good; I infer that Tony's will serve good pizza next Friday. (Psychologists tend to study 'category-based induction', in which one generalizes from a claim about tigers to a claim about lions, for example. Hayes, Heit and Swendsen 2010 survey this literature.)

Let's look at what Hume (2000) says in the _**Enquiry**_ section IV part II. I'll focus on extracting an interesting argument for skepticism, rather than subtle Hume scholarship. I reconstruct Hume's reasoning as (i)–(iv). Hume doesn't assert (v) or infer (vi), but as I explain below, it's hard to resist the skeptical conclusion if we grant (i) and (iv).

i. Whenever one reasons inductively, one thereby presupposes that the future will resemble the past. (premise)

ii. One cannot establish that the future will resemble the past by reasoning inductively, as one would thereby presuppose the very thing one attempts to establish. (inferred from i)

iii. There is no good argument of any other kind that that the future will resemble the past. (premise)

iv. There is no good argument that the future will resemble the past. (inferred from ii and iii)

v. There is no non-inferential way to rationally judge that the future will resemble the past. (premise)

vi. It is irrational to reason inductively. (inferred from i, iv and v)

Hume reasons from (i) to (ii) as follows. (Drawing an 'experimental conclusion' is the same thing as reasoning inductively, as is making a 'probable argument' or an 'argument regarding existence'.)

> All our experimental conclusions proceed upon the supposition that the future will be conformable to the past. To endeavor, therefore, the proof of this last supposition by probable arguments, or arguments regarding existence, must be evidently going in a circle, and taking that for granted, which is the very point in question. (***Enquiry*** 4.19)

Hume defends (iii) as follows:

> All reasonings may be divided into two kinds, namely, demonstrative reasoning, or that concerning relations of ideas, and moral reasoning, or that concerning matter of fact and existence. That there are no demonstrative arguments in the case seems evident; since it implies no contradiction that the course of nature may change, and that an object, seemingly like those which we have experienced, may be attended with different or contrary effects. (***Enquiry*** 4.18)

That is: arguments that are not inductive ('moral') are demonstrative. Demonstrative arguments only establish conclusions it would be contradictory to deny. But it is not a contradiction to deny that the future will resemble the past.

Hume doesn't infer (vi), but it is hard to resist given (i), (iv), and the plausible extra premise, (v). From (iv) and (v) it follows that there is no way (inferential or non-inferential)

to rationally judge that the future will resemble the past. But it is irrational to believe a conclusion that rests on a presupposition one cannot rationally judge to be true. And so, given (i), the skeptical conclusion follows.

The rest of this paper does not focus on (i)–(vi), but on a variant that escapes the following objection to (i). The future may resemble the past in some respects and not others. Inductive inferences had better not presuppose that the future will resemble the past in all respects, for that supposition is contradictory. Let T_0 be the present moment. Define: an object x is 'ribble' at t iff: either $t \leq T_0$ and x is red at t, or $t > T_0$ and x is not red at t. In the past, raspberries have been red, and they have been ribble. The future cannot resemble the past in both respects, as that would require future raspberries to be red and not red.[2]

When we reason inductively, we do not presuppose that the future will resemble the past in all respects, including which things are ribble. So we need to replace Hume's (i) with a claim that inductive inferences presuppose that the future will resemble the past in ***certain*** respects. But which respects? When I reason inductively about the behaviour of electrons, I don't presuppose that Tony's Pizzeria will continue to serve good pizza. The least demanding and hence most plausible premise is that: an inductive inference presupposes that the future will resemble the past with respect to the very feature one is projecting into the future. For example, when I infer inductively that the pizza at Tony's

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[2] I won't try to explain why it is rational to infer that raspberries will be red in the future, but irrational to infer they will be ribble. That's a different problem about induction (see the end of this section).

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will be good next Friday, I thereby presuppose that if Tony's served good pizza in the past, it will do so in the future too.

One might suspect that some more general principle underlines my inductive inference. When I infer inductively that the pizza at Tony's will be good next Friday, do I thereby presuppose that if any given restaurant served good food in the past, it will do so in the future too? I don't think so. I take restaurants in my small city to be more stable and predictable than those in New York. I take chain restaurants to be more stable and predictable than independent ones. And so on (in ways I can't introspect). I doubt there is a neat general principle my inductive inference presupposes. So the skeptical argument is most plausible if it alleges that: my inductive inference presupposes that if Tony's served good pizza in the past, it will do so in the future too.

But this replacement for (i) still faces a problem. When I infer that the pizza at Tony's will be good next Friday, I am not presupposing that the future will continue forever to resemble the past in the relevant respect. After all, I am not willing to infer that Tony's will be serving good pizza in 100 years. The most plausible view is that when I infer that the pizza will be good at Tony's next Friday, I presuppose that the future will resemble the past in the relevant respect ***at least until next Friday***.

Putting these points together, I suggest that the most plausible claim in the ballpark of (i) is (1):

1. Whenever one reasons inductively from E to H, one thereby presupposes that
    E→H.

I write "E→H" for the ordinary indicative conditional "if E then H".[3] To illustrate, suppose I reason that since in my ten experiments electrons always repelled each other, electrons always repel each other. According to (1), I thereby presuppose that: if in my ten experiments electrons always repelled each other, then electrons always repel each other. When I infer that Tony's will serve good pizza next Friday, I thereby presuppose that if they've served good pizza each of the nineteen times I've been there over the past four years, then they will serve good pizza next Friday. That's a lot more plausible than what (i) says.

E→H is the claim most plausibly presupposed, as commitment to E→H goes hand in hand with reasoning from E to a full belief that H. If one doubts that E→H, then the inference from E to H is undermined. If one is convinced that E→H, then the inference from E to H won't be undermined by doubts about some other claim. Now the inference may also presuppose some logically weaker claims, entailed by E→H. But it won't be more plausible that the inference makes some weaker presupposition than that it presupposes E→H. Moreover, it would be harder to derive a skeptical conclusion from an unnecessarily weakened premise. So the best skeptical argument in the neighbourhood takes (1) as a premise.[4]

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[3] We might instead formulate the premise in terms of the material condition E⊃H, but I doubt that doing so makes any difference to how the following skeptical argument should be addressed.

[4] Another skeptical premise: when one reasons inductively, one thereby presupposes that one's inductive reasoning is generally reliable (i.e., it usually leads to true conclusions given true premises). (See Cohen 2002, and White 2015.) I don't find this premise compelling. When I reason about the behaviour of electrons, do I really presuppose that I am reliable at predicting the

If we replace (i) with (1), then the rest of the skeptical argument needs to be reformulated. From now on, we will be concerned with the argument (1)–(5):

1. Whenever one reasons inductively from E to H, one thereby presupposes that E→H. (premise)

2. One cannot use the inductive inference from E to H as part of a conditional proof and thereby rationally conclude that E→H. (inferred from 1)

3. There is no other way to rationally judge that E→H. (premise)

4. There is no way to rationally judge that E→H. (inferred from 2 and 3)

5. It is irrational to reason inductively. (inferred from 1 and 4)

In a conditional proof that E→H, one supposes that E, infers that H under the scope of that supposition, and then discharges the supposition to conclude that E→H. One reasons from E to H while leaving it open at that stage of inquiry whether E→H. Note that (2) only rules out the use of one particular inductive inference to establish that E→H,

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quality of pizza restaurants? If an inductive conclusion feels compelling, must I settle that my inductive conclusions on other occasions are true too? I think not. Knowing that one has got things right on this occasion is enough, and need not depend on knowing that one gets things right on a variety of occasions. Moreover, knowing that one has got things right on this occasion is what's needed (as well as sufficing). It's not enough to believe that inductive reasoning about the near future is generally reliable, but suspend judgement on whether there will be a Great Change in behaviour tonight. (White 2015: 286–9.) One needs to know that E→H—but how?

namely the inference from E to H. The use of other inductive arguments to establish that E→H is ruled out by (3).

One should want to hear more about the notion of presupposing which appears in (1). However, it wouldn't help present my rebuttal of the skeptical argument to start with a theory of presupposing. For now, let's just consider another example of the phenomenon, to suggest that we are not dealing with an isolated case.[5] Suppose one judges, in the normal kind of way, that one will be at the office at 9am tomorrow. Plausibly, one thereby presupposes that one won't be permanently abducted by purple aliens tonight. That explains why it is rationally impermissible to reason that since one will be at the office tomorrow at 9am, one won't be permanently abducted by purple aliens tonight.[6] The skeptical argument alleges that the same thing is wrong with a conditional proof that E→H: such reasoning presupposes the very thing it is meant to establish. Note that presupposing does not entail occurrently believing. For example, people anticipating another day at the office do not typically consider alternatives involving purple aliens. So the skeptical premise, (1), does not imply that people occurrently believe that E→H whenever they reason inductively from E to H. So (1) does imply that inductive reasoning is really deductive reasoning by modus ponens (as one reader has objected).

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[5] Recent work on the general phenomenon at hand includes Wright (2002) and Pryor (2012).

[6] The problem with the malign inference is not that the premise is too weakly connected to the conclusion. For one should believe the corresponding conditional: if one will be in the office tomorrow then one won't be permanently abducted by purple aliens tonight.

Some philosophers have thought that the problem of induction is generated by a mistaken assumption that inductive reasoning is a matter of following general rules. (E.g. Okasha 2001, though Okasha 2005 is more circumspect; Norton 2003, 2014.) The argument (1)–(5) shows that this is not the case. Now I agree that we don't typically follow inductive rules. I argued above against several general suggested rules, starting with Hume's premise (i). Furthermore, the psychologists tell us that a variety of non-introspectible mechanisms are responsible for our inductive reasoning (Hayes et al. 2010, Sloman and Lagnado 2005: 111–3). Because the mechanisms are not introspectible, it is not plausible that one 'follows' the general rules that they implictly encode. Similarly, it is not plausible that one 'presupposes' the general claims one can't tell are implicitly encoded by one's belief-forming mechanisms. But it remains plausible that reasoning from E to H presupposes that the world is a certain way: E→H, and thus that ¬(E&¬H). (1)–(5) is still a potent skeptical argument. So it does not solve the problem of induction to note that we don't follow general inductive rules. Okasha (2001) is aware that (1)–(5) still needs addressing. In reply, he appeals to the Personalist Bayesian framework to argue that it isn't irrational to 'presuppose' that E→H. Let's now turn to this class of response. (Footnote 10 discusses the specifics of Okasha's position.)

Arguably, the Personalist Bayesian framework[7] doesn't allow the skeptical argument to be formulated. Personalist Bayesian views attribute degrees of belief to people, rather than full beliefs. They hold that people's degrees of belief at a time should be probabilistically coherent, with some versions placing further rational constraints. Some versions also hold that there are rational constraints on how one changes one's

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[7] Recent reviews include Easwaran (2011a, 2011b), and Weisberg (2011, 2015).

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degrees of belief. The Personalist Bayesian framework makes it hard to ask a troubling question as to how one could rationally judge that E→H, or how one could rationally have a high degree of belief in H given E. If one's degrees of belief are in the approved class (probabilistically coherent and meeting any other requirement), and one hasn't changed one's degrees of belief in a forbidden fashion, then no worry can be raised in this framework about one's high degree of belief in H given E. So it seems that nothing in the vicinity of the skeptical argument can be formulated in this framework.[8] This would speak in favour of Personalist Bayesianism, if the skeptical problem stated above were insoluble.[9] On the other hand, the problem seems real. So if it can be straightforwardly solved, then that is reason to celebrate, and to take frameworks in which the problem cannot be stated to be expressively incomplete.[10]

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[8] Brian Weatherson (2014) formulates an important skeptical argument using the concepts of knowledge, learning, apriority and a posteriority in addition to the Personalist Bayesian framework. Footnote 25 briefly discusses a priority and a posteriority.

[9] Colin Howson (2000) defends such an answer to the problem of induction. "Inductive reasoning is justified to the extent that it is sound, given appropriate premises. These consist of initial assignments of positive probability that cannot themselves be justified in any absolute sense." (Howson 2000: 239)

[10] Okasha (2001) argues that one's credences can't be criticised for building in assumptions, say by assigning (E&¬H) an exceedingly low probability. He says that as they are probability functions, credence functions are all equally commital, and so none are criticisable in that regard. But that all credence functions are committal just shows it is too crude to model credal states as probability functions. Less crudely, credal states can be modeled as sets of probability functions (e.g. Weatherson 2007). The maximally uncommitted credal state can be modeled as the set of all

Many formal epistemologists and philosophers of science refer to a very different issue as "the problem of induction". They are concerned to say what makes some non-deductive inferences rational and some irrational. (In the Personalist Bayesian framework, this forms part of "the problem of the priors": are induction-friendly degrees of belief rationally required, and if so, why?) As we'll see, we can say where (1)–(5) goes wrong, without saying what distinguishes good inductive arguments. Conversely, I don't see why explaining what makes some non-deductive inferences rational would tell us where (1)–(5) goes wrong. Compare deductive inference. It is one thing to explain when P logically entails C; it is quite another to defuse the skeptical worry that one would, *per impossibile*, need to know first that P entails C before one can reason from P to C. Similarly, we must not run together the two issues sometimes called "the problem of induction". (As I explain in the following footnote, I doubt the issues are equally worthy of the name.[11])

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probability functions. So we *can* ask how it can be rational to start with a credal state that is not maximally uncommitted. (This is the upshot of the exchange between Okasha (2001: 321–3), Lange (2002: 227–8), Okasha (2003: 421–2), and Lange (2004: 201–3).)

[11] I doubt the challenge of saying what (if anything!) makes inductive inferences rational raises a skeptical problem. Possessing an account of what makes certain inferences rational is not part of what makes those inferences rational; it does not 'justify' them. Similarly, one need not possess a theory of what makes perceptual beliefs justified in order to have justified perceptual beliefs. Moreover, we shouldn't be perturbed that we quickly end up saying that certain inferences *just are* rational, not in virtue of anything at all. Analogously, we shouldn't be perturbed that nothing makes it wrong to cause pain to others for fun—it *just is* wrong. We must not assume that something must make inductive inferences rational.

3. How might we respond to the skeptical argument?

The skeptical conclusion, (5), is obviously false. Our task is to find an account of where the skeptical argument goes wrong that satisfies ***us***, we sensible philosophers who are sure that much inductive reasoning is rational. This task should not be confused with the pointless one of trying to change the mind of an inductive skeptic. One should not insist that we "avoid begging the question against the skeptic", for we are not in conversation with such a lunatic, but with ourselves.[12] For more on this, see for example Pryor (2000: 517–8), Greco (2000: 22–3), or Jackson (2015, §1). Astute readers may suspect that (1)–(5) generalizes naturally to an argument for skepticism about all inference, including deduction. I agree (see Haack 1976, and Boghossian 2001, 2003); but let's stick to the argument that's before us.

Let's quickly look over the possible objections to the skeptical argument, ending with my strategy and a plan for the rest of the paper. One cannot reject the inference from (2) and (3) to (4), and the inference from (1) to (2) seems solid. That leaves one inference and two premises to consider.

One might attack the inference from (1) and (4) to (5), but that's not where my money is. According to this approach, reasoning inductively presupposes that E→H, which one cannot rationally believe, but that's OK. For example, Crispin Wright (2004)

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[12] For example, I think Lange (2004: 199) is mistaken to press the following objection. "[Reliabilism] simply fails to engage with the traditional problem of induction. It does not set out to persuade the inductive sceptic that she has a good reason to believe that a given inductive argument will likely yield the truth regarding unexamined cases."

distinguishes 'trusting' that p from judging or believing that p. In his view, it can be epistemically rational to trust that p, even when p is neither non-inferentially obvious nor supported by one's evidence. Wright explores sophisticated variants of the idea that it is epistemically rational to trust that a proposition is true, when doing so is needed for inquiry to take place at all. Maybe this idea could be parlayed into the claim that when one reasons inductively from E to H, it is epistemically rational to trust that E→H. On this proposal, it is rationally permissible to reason inductively, thereby presupposing that E→H, because one rationally trusts that E→H, even though one cannot rationally believe that E→H. I worry that rationally trusting that E→H is not enough. It seems that if we merely hope or hypothesize that the presupposition is true, then we should merely hope or hypothesize that our inductive predictions are true. Wright (2004: 207) calls this 'the leaching problem' for his proposal.[13] To my mind, he does not solve the problem, and the prospects for a solution are gloomy. Let's put this class of response aside (without pretending that I've presented a decisive case against it here).

So it seems the weakness in the skeptical argument lies in the premises, (1) and (3). In fact, my proposal denies both (1) and (3). But let me first explain the burden on rejecting them.

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[13] A version of the leaching problem remains, even if Wright claims it is epistemically rational to **believe** that E→H because one must do so to give oneself a shot at knowing whether H. If one takes a punt on E→H, surely the result can't be knowledge that H. Wright rejects this charge (2004: 208–9), but McGlynn (2017) presses it.

It is not easy to deny (1) with plausibility.[14] It is irrational to suspend judgement on whether E→H and yet reason from E to H. A natural diagnosis is that by reasoning from E to H, one presupposes that E→H.

Moreover, (2) is compelling; I think it would be unwise to deny (1) in order to deny (2). In fact, it is incoherent to deny (1) *solely* in order to deny (2). The key to the skeptical puzzle cannot be to endorse the conditional proof that E→H. If (2) is false and the conditional proof is legitimate, then one can reason from E to H while leaving it open at that point in inquiry whether E→H. If that's right (which it isn't), we can reason inductively without worrying about whether E→H. Whether one can establish that E→H, by conditional proof or any other means, is then irrelevant to the rationality of inductive reasoning.

One might object that (2) must be wrong, else all conditional proofs would be illegitimate. But (2) does not have such a wide-reaching consequence. While it's initially plausible that reasoning directly from P to C presupposes that P→C, it is not compelling that one presupposes that P→C when one reasons from P to L and then from L to C. That is, one need not first settle that P→C, before reasoning from P to L to C. So (2) only threatens the shortest conditional proofs, in which one reasons in one step from P to C, and concludes that P→C. Such conditional proofs do seem to violate the proper order of settling questions, even in the case of deductive inference from P to C (that's why there's a

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[14] Denying (1) is the natural response for reliabilists. According to reliabilism, if one's inductive reasoning from true premises usually leads to true conclusions, then reasoning inductively from justified beliefs produces a justified belief in the conclusion. Reliabilist responses to inductive skepticism include van Cleve (1984), Papineau (1993, chapter 5), and Greco (2000: 172–4).

skeptical problem about deduction of the same form as our problem about induction).

Moreover, (2) is compatible with endorsing conditional proof as a rule of deductive logic.

One can hold that all instances of conditional proof are logically valid, though some

presuppose the very thing they are meant to establish. Compare: modus ponens is a

logically valid rule, but it presupposes the very thing one tries to establish to reason by

modus ponens from the premises that I will be at the office at 9am tomorrow, and that if I

will be in the office at 9am tomorrow then I won't be permanently abducted by purple

aliens tonight. In Crispin Wright's terminology (2002), one's warrant for the premises

'fails to transmit' to the conclusion, though the inference is logically valid. Similarly, (2)

does not imply that conditional proof is not a rule of logic.

To satisfactorily resolve the skeptical puzzle by denying (3), one must give a

plausible account of **how** one can rationally judge that E→H.[15] I don't find it plausible

that one must establish that E→H independently of reasoning from E to H. Surely the

appeal of reasoning from E to H needn't be recreated using other intellectual resources.[16]

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[15] Annalisa Coliva (2015: 153–7) argues that it just is rational to reason inductively, so it just is

rational to believe the presuppositions of inductive reasoning, though those presuppositions are

not "warranted". She thinks that inductive reasoning presupposes the general claim that the

future will resemble the past, which I argued against in §2. Coliva could say it just is rational to

believe all the allegedly presupposed conditionals of the form E→H. Presumably one can't

rationally believe that E→H as a mere guess, so we still need a plausible account of the

psychological process whereby one can rationally believe it.

[16] John Norton (2003, 2014) argues that an inductive inference from E to H is backed by a

'material postulate', a generic claim which subsumes the inference. For example, "We can infer

inductively from the evidence that some samples of the element Bismuth melt at 271 °C to the

However, it isn't obvious how one can respect this point without endorsing a conditional proof of E→H, i.e. denying (2). (My proposal finds a way to do so.)

Let me add a Humean problem for denying (3).[17] It would be worrying if one could only know that E→H by means of a clever philosophical argument. Most people are not in possession of a clever argument that E→H. That would raise the spectre that, given (1), most people are being irrational when they reason inductively: they thereby presuppose that E→H without having in hand a justification for doing so. To my mind, the rational way to judge that E→H must be in everyone's grasp.

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universal conclusion that all samples melt so. The warrant is a fact about chemical elements: ***Generally***, all samples of one element agree in such physical properties." (2014: 673) But how do we know that the material postulate is true—by induction? Kelly (2010) and Worrall (2010) thus object that Norton has unleashed a vicious regress. Norton (2014) responds by endorsing a form of coherentism about inductive support. I have two objections.

First: there is a coherent set of material postulates which posit a Great Change in behavior at the stroke of New Year 2020, but predictions made on such a basis are not justified. Norton responds by adding the condition that only ***true*** material postulates warrant non-deductive inferences (2014: 688, and p.c.). But that's too strong a requirement: eighteenth century predictions backed by Newton's laws of motion were warranted.

Second objection: there are good inductions that are not backed by a rich coherent set of material postulates, such as when a scientifically ignorant people reason that night will follow day because it has done so for time immemorial. To my mind, Norton's proposal excessively intellectualizes and unifies the disparate "bag of tricks" the mind uses to draw inductive inferences (Sloman and Lagnado 2005: 111–2; cf. Hayes et al. 2010).

[17] ***Enquiry*** 4.23 is suggestive.

My strategy is as follows. When people reason from E to H, and consider the question of whether E→H, they typically judge that E→H. For example, I'm sure you believe that if electrons repelled each other in the past, then they will continue to do so next week. (If you don't, then you need a doctor, and not a doctor of philosophy.) My core idea is that people judge that E→H in exactly the right way, a way that is rational and typically produces knowledge of the conditional. I will sketch a psychological theory of how people actually come to judge that E→H. On this account, people do not settle that E→H by conditional proof. Nor do they establish that E→H independently of reasoning from E to H. Roughly: one recognizes that the inference stands or falls together with judging that E→H, and the high degree to which the inference seems right causes one both to judge that E→H and to reason from E to H. When it is rational to reason from E to H, it is also rational to judge that E→H in the way my proposal describes. So when the question comes up, people usually judge that E→H in a rational way.

I spell out the psychological story in two stages. §4 explains how some psychologists working on metacognition understand the idea that some inferences seem right to a high degree. §5 extends that story to say how one judges that E→H. §6 then layers the epistemological claims on top of the psychological account. I explain why the proposal satisfyingly resolves the skeptical puzzle. In particular, the account of how we judge that E→H explains why we normally overlook the view that we did so in exactly the right way. That leads us to worry that there is no way to rationally judge that E→H, and thus to be ensnared by the skeptical argument.

The psychological theory described below is speculative. I hope you will forgive me for adopting the tone of assertion as I explain the proposal, leaving out the hedges

that are no doubt necessary. The proposal is plausible, however, and illustrative. I hope it is already clear that we want a psychological explanation for why people judge that E→H without naturally thinking that they thereby settled the matter rationally. Any such psychological account allows us to solve the skeptical puzzle along the lines suggested in §6.

4. Feelings of Rightness

People do not always judge things to be the way they seem. Psychologists classify this as a kind of metacognition (their name for the monitoring and control of one's mental processes). Asher Koriat and Valerie Thompson's work suggests a unified account of how we regulate belief-formation, whether the source is memory, reasoning, or something else. On this approach, a seeming that p is a representation that p with a Feeling Of Rightness (FOR) attached. A strong FOR typically causes the subject to judge that p, inquiring no further into the matter. A weak FOR (which might be better called a Feeling Of Doubt) typically causes the subject to withhold judgement, sometimes prompting further inquiry. The differing strengths of the relevant FORs explains why we often unreflectively judge things to be as they seem, but sometimes do not. (Beliefs about one's competence and the circumstances, and other feelings, can also play a part.) Subjects typically have no introspective access to why certain contents Feel Right to particular degrees. In fact, the strength of the attached FOR is determined by the character of the processing that yields the content of the seeming.

Koriat (2007) presents this picture for memory, and surveys the empirical work motivating it. Thompson (2009) argues that the same framework should be applied to reasoning. She introduces the terminology of 'FORs', whereas Koriat talks of subjective

feelings of confidence. Thompson et al. (2011, 2013a, 2013b) argue directly that we must posit FORs in the case of reasoning to make sense of certain experimental data. In particular, FORs must be distinguished from global feelings of fluency, to which they are assimilated in the literature surveyed by Alter and Oppenheimer (2009).[18] Thompson's experiments concern syllogistic and mathematical reasoning, not inductive reasoning. But it seems generally plausible to understand seemings as representations with FORs attached. Evans and Stanovich make FORs central to their general model of judgement and decision-making (2013a: 223, 236; 2013b: 265, 267). Joelle Proust (2013) seems to have a similar picture in mind. In recent work, Koriat goes further, arguing that a common kind of mechanism determines the FORs in a variety of judgments and decisions (Koriat 2011, 2012, 2013, Koriat and Adiv 2011). So because the general account of seemings and self-confidence is plausible, it is plausible that inductive reasoning results in a representation of the conclusion, with an attached FOR.[19]

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[18] Alter, Oppenheimer and Epley (2013) dispute Thompson et al.'s (2013a) separation of FORs from global feelings of fluency. Thompson et al. (2013b) reply. I summarize some central points in Jackson (2015 §2.1 n. 22).

[19] Sinan Dogramaci (2013) claims that when one infers, one has an intuition that consciously relates one's premises to one's conclusion. "To have a conditional intuition is to be tempted, in a phenomenally conscious way, *by* certain existing considerations *to* believe a conclusion." (2013: 395.) I don't think that's right. It is familiar that one's reasons for action need not be transparent to one (Nisbett and Wilson 1977, Carruthers 2011: 147–8). For example, doctors have poor insight into the factors their diagnoses are sensitive to (Wigton 1996, Harries et al. 2000). In my view, one is conscious that the conclusion Feels Right, but one must *figure out* what premises one infers from (though it may be so obvious that it feels as if it lies on the surface). One's recent

(I've proposed that seemings are representations with FORs attached. This counts as an 'experience view' of seemings according to the recent philosophical literature, surveyed by Tucker (2013b §1) and Moretti (2015 §2). That is, my proposal holds that seemings have representational content, the distinctive phenomenology of Feelings of Rightness, and that they aren't simply beliefs or inclinations to believe. This last point is assumed by the next part of my treatment of inductive skepticism. §5 argues that one typically judges that E→H without it seeming to one that E→H. So its seeming to one that P is not the same thing as being inclined to judge that P.)

5. Two-Alternative Forced Choices

I propose that one judges that E→H as part of a Two-Alternative Forced Choice (TAFC). TAFCs are a well-studied kind of decision-task. Choosing between two possible free gifts is an example of a 'value-based' Two-Alternative Forced Choice. The choice is 'forced' because one conceives of the decision-task in a way that rules out rejecting both gifts. The two options are 'alternatives' because one takes them to be mutually exclusive. Psychologists also classify certain belief-forming tasks as Two-Alternative Forced Choices. For example, Koriat (2012: 87) investigates how confident people are in their answers to general knowledge TAFCs like: "What actress played Dorothy in the original version of the movie The Wizard of Oz? [a] Judy Garland, [b] Greta Garbo." Bogacz et al. (2006) review and compare models of the mechanism by which people perform perceptual

thoughts are strong cues for what one's premises were. For views of self-knowledge like this, see Harries et al. (2000), Carruthers (2011), and Wilson (2002 chapter 5, though pp. 104–7 may open the door to Dogramaci's view).

TAFCs, such as whether the tendency of the dots on a screen is to move to the right or to the left.

These psychologists think that TAFCs form a unified psychological kind. They think similar mechanisms produce one's answer, and one's level of confidence in it, in perceptual TAFCs, general knowledge tasks, and value-based choices. Bogacz et al. (2007 §5) extend a model of perceptual choice to value-based choice. They assert that perceptual and value-based choices "involve a common selection mechanism" (2007: 1664), though that kind of mechanism is implemented in different regions of the brain in the two cases (p. 1669). Koriat gives a unified treatment of degrees of confidence in perceptually based answers (2011), answers to TAFC general knowledge questions (2012), answers to moral questions (Koriat and Aviv 2011), and in matters of personal preference (Koriat 2013). Koriat (2011) rebuts arguments that different mechanisms are employed in perceptual and general knowledge TAFCs.

Plausibly, some TAFCs have as outputs two mental states. Value-based decision-making is a matter of choosing between options, and at least some of the time, one picks one option and rejects the other *in one go*. Suppose one has difficulty picking between two job offers (an example junior philosophers may find fanciful). Eventually one comes to prefer the first job to the second. It would be strange to think the preference can only directly cause one to intend to accept the first job, which then causes one to intend to reject the second. Rather, the output of the decision-task can be both the intention to

accept the first job and the intention to reject the second. The two intentions are

outputted in one go.[20]

I suggest that when one is tempted to reason from E to H, wondering whether

E→H presents one with a Two-Alternative Forced Choice. The alternatives are: inferring

that H, versus refusing to judge that E→H. One takes the two alternatives to be mutually

exclusive, and rightly so. One thereby recognizes that it would be irrational to reason

from E to H, but yet refuse to judge that E→H. The choice is forced, because one takes

the two alternatives to be exhaustive. That is: it wouldn't make sense to refuse to reason

from E to H, and yet judge that E→H. Let's call this TAFC "Hume's Choice".

Usually, formulating such a TAFC does not undermine appeal of the inference

from E to H. We stick with the inference, and as that requires, we judge that E→H. For

example, I might draw the relevant inductive inference and also judge that if it has

snowed in NYC every December in the last 100 years, then it will snow in NYC next

December.[21]

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[20] A value-based decision can be affected by whether one focuses on picking one option, or on

rejecting one (Wedell 1997). One might think that in these cases, the two intentions are not

outputted in one go. That's not a problem for the argument in the text, as long as there are value-

based choices in which one focuses equally on picking one option and rejecting the other.

[21] There are cases in which considering whether E→H prompts one to be more skeptical.

Analogously, suppose I reason that since I parked my car on Pine Street, it is on Pine Street now.

Maybe considering the conditional causes me to think of the possibility of car theft, and hence I

retreat from flat-out judgement that my car is still on Pine Street to merely thinking it probable.

Put such cases to one side. We are interested in cases in which one does judge that E→H. (It is

puzzling what to make of cases in which considering a possibility of error causes one to retreat

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Let me suggest a mechanism by which people resolve Hume's Choice anti-skeptically. The only thing that affects the decision is the strong FOR attached to the representation of H, the conclusion. That FOR tilts the scales decisively towards inferring that H, and away from not judging that E→H. The output of the decision task is both the picking of the former option and the rejection of the latter. That is, the output is *both* a judgement that H *and* a judgement that E→H. Crucially for what follows, no FOR is generated that attaches to the judgement that E→H. The FOR attaching to the judgement that H does all the work of resolving the decision task. Call this psychological procedure: judging that E→H *as an accompaniment* to inferring that H.[22]

6. The epistemological claims

I want to make two epistemic claims about judging that E→H as an accompaniment to inferring that H: it can be rational to do so, and one can thereby come to know that E→H. Suppose that the inductive argument from E to H is a good one. (The doctor is on standby for anyone who doubts there are good inductive arguments.) That is, suppose that conditions are such that if S does not consider whether E→H, then it is rational for S

from a judgement. On this so-called lottery puzzle, see Vogel 1990 and Hawthorne 2004, amongst others.)

[22] Hume's Choice differs normatively from a general knowledge TAFC, such as whether Abraham Lincoln was a Republican or a Democrat. It is rationally permissible to remember that Lincoln was a Republican, and then infer that he was not a Democrat. By contrast, it is rationally impermissible to reason from E to H, and then infer that E→H by conditional proof. It is typically only permissible to settle that E→H by judging it as an accompaniment to inferring that H. I say more about this kind of normative claim in §6.

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to reason from E to H. Then in virtue of the same factors, it is also rational for S to judge that E→H as an accompaniment to inferring that H. If, on the other hand, one reasons irrationally from E to H, then one judges that E→H irrationally. This account does not say what makes it rational to reason from E to H. Instead, it says that whatever makes the inference rational also makes it rational to judge that E→H in the designated way.

Suppose that conditions are such that if S does not consider whether E→H, then S can come to know that H by inferring it from E. Then S can come to know that E→H by judging it as an accompaniment to inferring that H. Call this **knowledge by accompaniment** that E→H.[23]

Judging that E→H as an accompaniment to inferring that H is not a case of reasoning by conditional proof. In a conditional proof, one reasons from E to H while leaving it open at that stage of inquiry whether E→H (one settles that E→H at the following stage). When one judges that E→H as an accompaniment to judging that H, one does not reason from E to H while leaving it open whether E→H. So the current proposal does not deny statement (2) of the skeptical argument, which prohibits a conditional proof. The proposal rejects premise (3) instead, describing some other way of rationally judging that E→H. It also rejects (1), as I will now explain.

Statement (1) says that an inductive inference from E to H presupposes that E→H. The spirit of my proposal is that the inductive inference does not **pre**-suppose that E→H, but rather **co**-supposes it. In other words: (1) claims that one must settle that

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[23] What if S doesn't know that E? I'd like to say that S can still know that E→H. I don't have an account of the conditions under which that would be so. But it's enough to refute skepticism about inductive knowledge to consider the case in which S knows that E.

E→H ***epistemically prior*** to reasoning from E to H. The present proposal says that it is rationally permissible to judge that E→H as an accompaniment to inferring that H. Plausibly, doing so counts as: reasoning from E to H and settling that E→H ***at the same point epistemically speaking***. So on this view, one need not settle that E→H epistemically prior to reasoning from E to H; (1) is false.

In my view, notions like epistemic priority are ways of talking about a distinctive kind of epistemic rationality constraint on one's thinking (Jackson forthcoming §1). For example, it is rationally forbidden to: reason from E to H while suspending judgement on whether E→H. Performing a conditional proof that E→H violates this prohibition. It is not forbidden to: infer that H while ignoring the question of whether E→H. The important thing is that it is rationally permissible to judge that E→H as an accompaniment to inferring that H. We can say that doing so counts as 'inferring that H and settling that E→H at the same point epistemically speaking'.

It is not a strange or isolated claim that one can, indeed must, settle that E→H at the same point epistemically speaking as one reasons from E to H. It is independently plausible that one must settle that ***P*** and settle that ***one knows that P*** at the same point epistemically speaking. It seems impermissible to settle one matter epistemically prior to settling the other. One cannot reason, "P, but I wonder whether I know it. Well, I believe that P, and justifiedly so, and surely I am not in a weird Gettier case. So I know that P." Nor can one reason, "I know that P, but I wonder whether P. Well, knowledge is factive. So P."[24]

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[24] Things might be different in strange cases, such as if God told you that you know that P.

I've suggested that one must settle that E→H and infer H from E at the same point epistemically speaking. With this view articulated, I feel no residual intuition that (1) is true. (1) initially seems right because we see that it is impermissible to settle that E→H epistemically posterior to reasoning from E to H (say by conditional proof); we fail to see that there is a way to settle the two matters at the same point epistemically speaking; and so we erroneously conclude one must settle that E→H epistemically prior to drawing the inductive inference.

(It is permissible to infer that H under the scope of a mere supposition that E, and judge that E→H as an accompaniment to drawing that inductive inference. One thereby settles that E→H at the same point epistemically speaking as one inductively infers that H from the supposition that E. Suppose that one then learns that E, and infers that H by modus ponens (not inductively). One thereby settled that E→H epistemically prior to settling that H (by MP), and permissibly so. This casts no doubt on the claim that E→H must be settled at the same point epistemically speaking as one draws the ***inductive*** inference, be it from a belief or a supposition that E.)[25]

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[25] Suppose one settles that E→H as an accompaniment to inferring that H from the mere supposition that E, and one thereby comes to know that E→H. Is that knowledge a priori or a posteriori? I suspect there are cases of each kind. Much inductive reasoning is determined by the construction of a causal model, drawing on prior knowledge, but some inductive reasoning is not. (Sloman and Lagnado 2005: 111–3; Hayes, Heit and Swendsen 2010; cf. Lange 2004.) Maybe knowledge of E→H is a posteriori when the inductive inference draws on prior knowledge, and a priori when it does not. The following comparisons could be developed. Deductive inference gives rise to a priori knowledge by accompaniment of the associated conditionals. A mechanic or

On my proposal, it is rational to judge that E→H as an accompaniment to inductively inferring that H. The proposal tells us where to object to the skeptical argument: we should reject premises (1) and (3). I think the proposal also fulfils the final requirement on a satisfying solution to the skeptical puzzle: it explains why people typically overlook the proposed solution. In my view, people regularly judge that E→H as an accompaniment to inferring that H. However, they overlook that they thereby judged that E→H in a rational way. Why do people overlook that they judged E→H in exactly the right way?—because no FOR attaches to the judgement that E→H. That judgement is the result of the relevant TAFC being resolved by the strong FOR attaching to the judgement that H. Most judgements come with FORs attached; but judging by accompaniment is an exception. When a judgement that P Feels Right, the FOR will also cause one to judge that **one knows** that P,[26] and thus that whatever one did was sufficient to know it. For example, a judgement that nothing could be red all over and blue all over Feels Right, and so one will be satisfied that one knows, even if one can't tell much of a story about how one knows. But when one judges that E→H, the normal cause of a judgement that one has done enough to know is missing. In the absence of a FOR, one falls back on one's beliefs about one's knowledge-forming capacities to say whether one knows that E→H. But one doesn't already believe that there is knowledge by

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doctor makes a 'recognitional inference' when she takes a description of the symptoms and infers a diagnosis. The associated conditionals are known a posteriori.

[26] I claim that a strong FOR will typically cause one to judge that one knows (if one considers the matter). This is a modest extension of Thompson's claim that a strong FOR will cause a "judgement of rightness" (2009: 181, 186), which I take to be a judgement that one is right.

accompaniment. Knowledge by accompaniment never got added to the list of ways one believes one can come to know things, for the same reason one doesn't add it now: there were no FORs attached that would cause one to judge that one is forming knowledge. The ways of coming to know things that are on a typical person's list fail to explain how one could know that E→H. So it seems that there is no way for one to know that E→H, and for similar reasons, no way to rationally judge that E→H. It is irrational to combine judging that one can't know that E→H with judging that E→H. One falls into skeptical puzzlement, as one sees that it is irrational to reason inductively while suspending judgement on the relevant conditionals. Adding knowledge by accompaniment to one's list of ways one takes oneself to know things removes the source of skeptical puzzlement.

How does my treatment of the skeptical problem differ from one grounded in Phenomenal Conservatism? Phenomenal conservatism says that its seeming to one that P makes one justified in believing that P, given that one has no defeating beliefs.[27] On the view we'll compare to mine, it seems to you that E→H, and so you form a justified belief that E→H. Thus the skeptical problem is easily dealt with. I think my proposal is superior for two reasons. Firstly, the phenomenal conservative story makes it mystifying how the skeptical problem gets any traction in the first place. If it just seems true that E→H, why do we get worried that there's no way for us to know it? By contrast, my view is that it does **not** seem true that E→H. No FOR attaches to the representation that E→H. That's why people don't judge that they simply know that E→H, but instead wonder how they

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[27] Phenomenal conservatism is defended by Huemer (2001, 2007), amongst others. Tucker (2013b) and Moretti (2015) review recent work on the topic; Tucker (2013a) contains many useful papers.

could know such a thing.[28] Secondly, phenomenal conservatism makes it too easy to get justified beliefs. If President Trump's past behavior seems to you to establish that the America is about to be Made Great Again, then you are justified in believing it, according to phenomenal conservatism. By contrast, I did not specify a view about when an inductive inference is rational. I just said: if the inductive inference is rational then it is rational to judge that E→H as an accompaniment (and only then). My proposal lets you say whatever you like about which inductive inferences are rational.[29]

7. Moral uplift.

[28] Analysing seemings as representations with FORs attached earns its keep here. The reader would be puzzled if I merely said that one judges that E→H without it seeming true to one. There's nothing mysterious about the account in §5 of how one judges that E→H without a FOR attaching to it.

[29] The main challenge addressed by this paper is to say what's wrong with the argument (1)–(5). The following problem is closely related. How can one know that it is not the case that: though it seems to one that E→H, one is deceived by drugs or stupidity? A slightly different TAFC is involved. To consider and answer the new challenge, one frames a TAFC between judging that *one is right* that H, versus refusing to judge that one is not deceived in the relevant way about whether E→H. The strong FOR attached to the representation that H causes this TAFC to be resolved anti-skeptically, outputting two judgements. In this case, they are the judgement that one is right that H (see footnote 26), and the judgement that one is not deceived in the relevant way about whether E→H. Those two judgements are rational if it is rational for one to reason from E to H. The response to the new challenge continues paralleling §6. (This skeptical puzzle strongly resembles the problem of BIV skepticism, to which I give a similar treatment in Jackson 2015.)

You might be underwhelmed by my resolution of the skeptical puzzle. Other putative resolutions say exciting, deep things about the human condition. (Problems aren't deep **per se**, solutions are.) For example, one might reject the inference from (1) and (4) to (5), and assert the exciting moral that scientific knowledge is based on blind faith in the relevant conditionals. This would cast religious faith in a different light—heady stuff. According to the solution I've proposed, the skeptical puzzle gets its bite from a blind spot in our psychology. We overlook the possibility of knowledge by accompaniment because the relevant judgements do not have a FOR attached. But a judgement that E→H is neither a punt in the dark, nor something that you can give an argument for. You just need to stick with your inclination to reason from E to H, and in the appropriately related way, judge that E→H. Maybe the moral is that sometimes, you just need to stick to your guns. Unfortunately, people who stick to their guns are often being stupid. Sometimes doing your best is enough, sometimes it isn't. Hardly a conclusion that elevates the soul.

Let me suggest some reasons to value an unflashy solution to the skeptical problem. Firstly, philosophy can stand for reasoned inquiry, full-throated and unembarrassed. Surveying 250 years' worth of implausible responses to the skeptical argument, naïve thinkers might be tempted to conclude that there really is something fishy about inductive inference. Even if they don't fall into that trap, they might be tempted to draw another pernicious moral: thinking about anything too much leads to absurdity and quagmire. We wouldn't want those to be the take-home morals of Philosophy 101. Resolving the skeptical puzzle removes the support for such intellectual pessimism. Philosophy is thus better-placed to help spread respect for accumulating relevant evidence and drawing proper conclusions. Whether or not abstruse epistemology can better society, there is value in standing for what is right and against quackery in

health-care, cynical denial of climate change, and bone-headed economic and social policies. A resolution to the skeptical puzzle also has intrinsic aesthetic-cum-intellectual value. The skeptical puzzle confused us. Confusion is ugly. A satisfying resolution replaces intellectual ugliness with serene clarity. That is our aim. One may fall short and still say something stimulating and plausible. Such an essay, I hope, would not be entirely contemptible.[30]

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