A Defense of the Principle of Indifference

Forthcoming in the Journal of Philosophical Logic

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Abstract

The principle of indifference (hereafter 'Poi') says that if one has no more reason to believe *A* than *B* (and *vice versa*), then one ought not to believe *A* more than *B* (nor *vice versa*). Many think it's demonstrably false despite its intuitive plausibility, because of a particular style of thought experiment that generates counterexamples. Roger White [8] defends Poi by arguing that its antecedent is false in these thought experiments. Like White I believe Poi, but I find his defense unsatisfactory for two reasons: it appeals to false premises, and it saves Poi only at the expense of something that Poi's believers likely find just as important. So in this essay I defend Poi by arguing that its antecedent does hold in the relevant thought experiments, and that the further propositions needed to reject Poi are false. I play only defense in this essay; I don't argue that Poi is true (even though I think it is), but rather that one popular refutation is faulty. In showing this, I also note something that has to my knowledge gone unnoticed: given some innocuous-looking assumptions the denial of Poi is equivalent to a version of *epistemic permissivism*, and Poi itself is equivalent to a version of *epistemic uniqueness*.

1 What is the Principle?

The Principle of Indifference (Poi) is a conditional linking a state of *evidential symmetry* to a state of *belief symmetry*. It says that for any agent x, if x has no more reason to believe A than B and *vice versa*, then x ought not have a belief state leaning towards A over B and *vice versa*. It has an antecedent about evidence, and a normative consequent about the directionality (or lack thereof) of belief states. I'll say a bit more about Poi's three components: evidential symmetry, belief (or credential) symmetry, and the 'ought'.

Slightly modifying the terminology of Roger White [8], I use the symbol '$\approx$' to denote the relation between propositions that he calls 'evidential symmetry'. $A \approx B$ (for agent x) when x has no more reason to believe A than B and *vice versa*. Here 'reason' is meant to include all epistemically relevant factors, so it covers more than just, e.g., empirical evidence. It covers everything that's an epistemically rational reason for belief, and nothing else; the term 'evidential', then, is to be taken broadly. I use '$\prec_e$' and '$\succ_e$' to indicate evidential asymmetry in a particular direction, and these should be taken just as broadly as evidential symmetry, namely as indicating the directionality of the sum totality of all epistemically relevant considerations available to the agent.

I use the symbol '$\sim$' to denote the relation between propositions that I call 'belief symmetry' (sometimes I'll call it 'credential symmetry'). $A \sim B$ (for x) when x believes A no more than B and *vice versa*. I don't want the phrase "no more than" to

[1] I thank Eric Hiddleston, Joel Velasco, Susan Vineberg, Bruce Russell, Larry Powers, Elliott Sober, Sean Stidd, Roger White, John Norton, Kenny Easwaran, and participants at the 2009 Formal Epistemology Workshop, and two anonymous referees for helpful comments.

be taken as implying that what one ought to do with one's beliefs, when faced with evidential symmetry, is to give them degrees, and particularly *equal* degrees. To believe A more than B is just to have a belief state that's asymmetrically *tilted toward* A. There's more than one way for this to happen: outright belief in A together with outright disbelief in B; a higher degree of belief for A than for B; suspension on A with outright disbelief for B; and, in cases where A and B are not contraries, states like suspension of judgment on A plus outright belief in B, etc. Perhaps even combinations such as believing A outright with believing B to degree 0.6 count.[2] In any case, I'm appealing to an intuitive notion of a belief state that's *tilted*. I use '$\prec_b$' and '$\succ_b$' to indicate belief *a*symmetries. To be credentially symmetric regarding A and B is to have a belief-state that isn't tilted (or more exactly, to fail to have a tilted belief-state), and there are many ways for this to happen. Perhaps x has a total suspension of judgment, in which no degree of belief is granted to either proposition; or perhaps some degree of belief is granted, but each gets the same amount; or perhaps x outright disbelieves both A and B; or perhaps x has never even entertained A or B and hence has no attitude regarding either of them; or perhaps without a total suspension of judgment, one judges both A and B to be possible but nothing more—an epistemic shrug.[3]

I am purposely *not* assuming that degrees of belief ought rationally to conform to the probability calculus ("belief-probabilism"), that degrees of belief are the only interesting kinds of belief, or even that degrees of belief exist at all (Poi is consistent with the view that all belief is of the all-or-nothing type).

Poi, then, can be written thus: if $A \approx B$ then one ought to have $A \sim B$. The 'ought' here is the all-things-considered 'ought' of epistemic rationality. I don't have a theory on what that is, but I think we can leave that fuzzy to discuss Poi. This 'ought' implies 'can', even if there exist some types of epistemic 'oughts' that don't (I'll say more about this later). Sometimes I'll use '$\Box$' and '$\Diamond$' as sheer abbreviations for epistemic obligation and permission, respectively. For instance, Poi can be written $(A \approx B) \rightarrow \Box(A \sim B)$.

One might object that if '$\approx$' is taken as broadly as I intend, and 'ought' is taken how I've indicated, then Poi is a borderline, if not outright, tautology. For if '$\approx$' includes *everything* epistemically relevant, then anything that would allow any asymmetry in credential attitude *must* either already be washed out by other epistemic factors, or so the objection goes.[4] I don't see what's bad about this. *If* this is correct (as I discuss below, I don't think Poi is a tautology), then it would erase any worry that I'm defending a false principle. But that wouldn't render my project moot. For it would make it all the more important to see exactly what goes wrong in the commonly

[2] Thanks to an anonymous referee for raising this question.

[3] Or perhaps one shrugs like this regarding A and B while also leaning heavily in favor of $\neg A$ over A, and of $\neg B$ over B. This might describe one's belief state regarding the propositions that Ann wins the lottery and that Bob wins the lottery, when you know that the lottery is fair and that there is a large number of entrants but you don't have a clue as to the number of entrants beyond that. Without a range of numbers, it's absurd to suppose that you grant A and B anything like a precise degree of belief. You simply shrug regarding A versus B, i.e., have $A \sim B$ (since the lottery, however large, is fair), while at the same time you don't have an utter suspension of all attitudes related to A and B—you do after all lean heavily towards $\neg A$ over A and likewise for $\neg B$ over B.

[4] Thanks to Eric Hiddleston for raising this issue.

accepted anti-Poi arguments—which, if this objection is right, are widely accepted arguments against either a tautology, or against something in the neighborhood of one.

2 The Anti-Poi Argument

Demonstrations that Poi is false are varied but have a common form, so I'll pick one instance for illustrative reasons. (I'll show how the common form is instantiated in a pair of other such demonstrations in the Appendix). This first argument against Poi uses belief-probabilism as a premise; later ones won't. I'll follow White [8] in using the "Mystery Square Factory" case, which is an adaptation from one mentioned by van Fraassen [5].

I visit a factory that can make perfectly square, thin plates. The Factory's foreman tells me that the square the factory is about to produce has a side length between 0 and 2 inches, but I get nothing else: I have no relative frequency information (in fact, this may well be the first square they've ever produced), and no clues. The foreman brings to my attention two puzzles. In the first puzzle, he asks me to consider these two propositions:

L_1: the length of the square will be between 0 and 1 inches.

L_2: the length of the square will be between 1 and 2 inches.

Then he asks whether I have any evidential asymmetry between L_1 and L_2. Given my total lack of information it would seem that I don't. In the second puzzle, I'm to consider these four propositions:

A_1: the area of the square will be between 0 and 1 square inches.

A_2: the area of the square will be between 1 and 2 square inches.

A_3: the area of the square will be between 2 and 3 square inches.

A_4: the area of the square will be between 3 and 4 square inches.

Then he asks whether I have any evidential asymmetry among A_1, A_2, A_3, and A_4. Again, it would seem not.

Since I've got no relevant information at all about the Factory, except that it is about to produce a square with a side length between 0 and 2 inches, my answer to the first question is negative: $L_1 \approx L_2$. By parallel reasoning, $A_1 \approx A_2 \approx A_3 \approx A_4$. Now if I apply Poi to both of those strings of '$\approx$', I get that I ought to do the following with my degrees of belief: $p(L_1) = p(L_2) = 0.5$, and also $p(A_1) = p(A_2) = p(A_3) = p(A_4) = 0.25$. Since L_1 is logically equivalent to A_1—they describe exactly the same squares—the probability calculus makes me set $p(L_1) = p(A_1)$ and thus $p(L_1) = p(A_2)$. It then follows that $p(A_2) = p(L_2)$. But this is disastrous, for L_2 is logically equivalent to $A_2 \vee A_3 \vee A_4$, whence we have

$$p(A_2) = p(A_2 \vee A_3 \vee A_4).$$

This violates the probability calculus if, as in this case, $p(A_3) \neq 0 \neq p(A_4)$. In White's [8] presentation, the absurdity is different. It's that one is forced to assign different probabilities to the same proposition, e.g., $p(A_1) = 0.25 = 0.5$. While this is certainly absurd, I think it's not the *key* absurdity, as will become clear.

What gets the blame for the presence of contradiction? The Factory fans blame Poi, for it's what forced us to set probabilistically incoherent degrees of belief. They do not blame belief-probabilism (the view that beliefs are degrees and epistemically ought to be probabilistically coherent). In fact, Poi is sometimes formulated so that its consequent makes a prescription about personal probabilities![5] Nor do they blame the responses to the foreman's questions. There's nothing wrong with those responses, so the thought goes, unless and until Poi is added to the mix.

> *The Factory Argument*: Belief-probabilism plus the responses to the foreman imply that Poi is false.

One who likes Poi may think "this just shows the falsity of the view that degrees of belief must conform to the probability calculus", but one can't let matters rest like this. For dispensing with probabilistic degrees of belief doesn't by itself suffice to pull Poi from the flames.

3 A Deadlier, Probability-free Square Factory

Denying belief-probabilism, while necessary for freeing Poi from the foreman's clutches, is not by itself sufficient. For the Factory argument has an analog that operates without appeal to the full apparatus of probabilism. Indeed, only some relatively weak assumptions about the relation '$\sim$' are needed to cause trouble, if we suppose the evidential symmetries are in place to begin with.

Suppose that because of our utter ignorance in the Factory, both $L_1 \approx L_2$ and $A_1 \approx A_2$ are true. (The relation between A_3 and A_4, whether it's $\approx$, $\prec_e$, or $\succ_e$, plays no essential role in this argument; all that matters is that they're not viewed as ruled out).

By Poi, then, we have $L_1 \sim L_2$ and $A_1 \sim A_2$. If we suppose that propositions known to be equivalent must bear '$\sim$' to each other, we have $A_2 \sim A_1 \sim L_1 \sim L_2$. And if we suppose '$\sim$' to be a transitive relation, we have $A_2 \sim L_2$.

But A_2 implies L_2, because L_2 is true if and only if $A_2 \vee A_3 \vee A_4$ is true. Surely, if A_3 and A_4 are each still regarded as open possibilities, one is epistemically required to have $A_2 \prec_b (A_2 \vee A_3 \vee A_4)$! There are, after all, more ways (on the table) for the latter to be true. For any agent x and propositions P and Q such that (i) x realizes that P implies Q (ii) but not *vice versa* and (iii) $Q \wedge \neg P$ is still regarded by x as an open possibility, say that Q is *genuinely weaker* than P.[6] Contrary to the dictates of our

[5] Even White [8] formulates Poi thus. Keynes [1] (p. 42) coined the term 'Principle of Indifference', where the consequent is about "equal probability". One could take this to show that what I call 'Poi' is not the *real* Principle of Indifference. I think the other formulations simply result from conjoining Poi with belief-probabilism, the latter being usually taken as a background assumption beyond dispute. In any case, Poi and belief-probabilism ought to be disentangled for purposes of analysis.

[6] If I know nothing about what Russell's favorite color was, then 'his favorite color was green' is genuinely weaker than 'his favorite color was green or red'. If I know that his favorite color wasn't red, then no relation of genuine weakness holds.

prior assumptions, which led us to $A_2 \sim L_2$, one must set $A_2 \prec_b L_2$ because L_2 is genuinely weaker than A_2.[7]

There's no appeal to probabilities in this argument (though to be sure, it appeals to some *consequences* of belief-probabilism). There's a contradiction at the end, and it's clear that Poi *need* not be blamed. But if we put the blame on either $L_1 \approx L_2$, $A_1 \approx A_2$, or both, we seem to be saying that we have evidence for one member of a pair even when by hypothesis we have nothing at all that bears on the issue. *Prima facie* the blame should go to Poi, until there is some independent reason for questioning the double-tie. (White thinks he has just such an independent reason. I'll address his case below.).

Note that this leaner, meaner version of the Square Factory hinges on only the following assumptions:

1. $L_1 \approx L_2$ and $A_1 \approx A_2$.
2. A_3 and A_4 have not been ruled out.
3. The transitivity of '$\sim$' ($T_\sim$): if an agent x has $P \sim Q$ and $Q \sim R$, then x ought to have $P \sim R$.
4. Monotonicity of belief-asymmetry (M_b): if Q is genuinely weaker than P, then one ought to have $P \prec_b Q$.
5. The Equivalence Condition ($E_\sim$): If it's known that $P \dashv\vDash Q$, then you ought to have $P \sim Q$.

These five are sufficient to rule out Poi.[8] Since (2) is just a feature of the thought-experiment, we can focus on (1) and (3)–(5).

> *The Deadlier Factory Argument*: The responses to the foreman's puzzles, $T_\sim$, M_b, and $E_\sim$ jointly refute Poi.

One could also replace $E_\sim$ in (5) with $E_\approx$: If it's known that $P \dashv\vDash Q$, then $P \approx Q$. It doesn't matter too much which equivalence condition gets used, since I won't question either of them.

4 Distilling the Factory Argument

Belief-probabilism isn't essential to Factory-style arguments, for the Deadlier Factory dispenses with probabilities. But then what *is* the core of the Factory? We can distill things even further to expose the central nugget of this type of anti-Poi argument. In particular, we can ignore $E_\approx$ and $E_\sim$. This isn't because I disbelieve either of those principles; to the contrary they're the surest things floating around the Factory. But the

[7] This argument was inspired by a parallel one given by White [8] in which only evidential symmetry is under discussion and the conclusion is that not both $L_1 \approx L_2$ and $A_1 \approx A_2$ are true.

[8] In fact, M_b can be weakened so that its consequent reads 'one ought to have $P \not\succ Q$'. But since nobody would ever think that it should read 'one ought to have $P \succ_b Q$', we can go with the stronger formulation.

part of the Factory story that's really doing the heavy lifting doesn't appear until after we grant the foreman this proposition:

$$(\star):\ A_2 \approx L_1 \approx L_2.$$

From here, Poi yields $A_2 \sim L_1 \sim L_2$, the transitivity of '$\sim$' ($T_\sim$) delivers $A_2 \sim L_2$, which is inconsistent with M_b. The role of $E_\sim$, $E_\approx$, and the "two puzzles" is just to get us to arrive at ($\star$). I assent to not just $E_\sim$ and $E_\approx$, but to a pair of even stronger propositions:

> ($E^{+}_{\sim}$): If (i) one knows that $P \dashv\vDash Q$, and (ii) $Q \sim R$, then one ought to have $P \sim R$.

So not only ought equivalent propositions be credentially symmetric, but they ought to stand in all the same symmetry relations to other propositions. Likewise, I agree with

> ($E^{+}_{\approx}$): If (i) one knows that $P \dashv\vDash Q$, and (ii) $Q \approx R$, then $P \approx R$.

With the latter in hand, the responses to the foreman ensure arrival at ($\star$). I'll take $E^{+}_{\sim}$ and $E^{+}_{\approx}$ for granted in the rest of the essay.

The Deadlier Factory, flowing from ($\star$), is an instance of an argument schema. To see the schema, forget about squares and factories. Consider instead three propositions, A, B, and C. Suppose that (i) A and B are contraries, (ii) B and C are contraries, (iii) that C is genuinely weaker than A, and (iv) that all are contingent. Suppose also that (v) $A \approx B \approx C$ holds. I call a pair of symmetries like this, in cases where A, B, and C have the relations described in (i)–(iv), an *evidential bridge* (over genuine weakness). The bridge is visualizable like in Figure 1, where '$A \vDash^* C$' abbreviates 'C is genuinely weaker than A'. To continue the theme, I call a triple of

Figure 1:

$$\begin{array}{ccccc} & & B & & \\ & \rotatebox{45}{$\approx$} & & \rotatebox{-45}{$\approx$} & \\ A & & \vDash^* & & C \end{array}$$

propositions $\langle A, B, C\rangle$ meeting conditions (i)–(iv) the *underpinnings* of a bridge. When the pair of symmetries is added atop the underpinnings, a bridge results. In this essay I'll use 'A', 'B', and 'C' as names for the underpinnings of a bridge in the same way throughout, so that, e.g., C is always taken to be genuinely weaker than A, and B always forms the "peak" of the bridge.

The probability-free (and thus Deadlier) Factory-style argument against Poi, once distilled, can be summed up like this:

> *The Distilled Deadlier Factory Schema*: an evidential bridge, together with $T_\sim$ and M_b, imply that Poi is false.

Here are its details. Suppose we have an evidential bridge $A \approx B \approx C$. If Poi is true, we immediately get $A \sim B \sim C$ (this is a *credential bridge*—just like an evidential one except that it's *credential* symmetry doing the bridging across genuine weakness). $T_\sim$ applied to the credential bridge gives $A \sim C$, which violates M_b. The particular instance of this schema in the Square Factory makes use of ($\star$) as the evidential bridge.

This is a purer version of things, and reflects what happens in anti-Poi arguments other than the Square Factory. (See the Appendix for some examples). The situation is, simply, that Poi plus the details of the thought-experiments generate a credential bridge, while $T_\sim$ and M_b together require that there aren't any credential bridges (not just in the Square Factory, but *anywhere*). Since belief-probabilists buy $T_\sim$ and M_b, they must reject Poi if they think there exist evidential bridges. But it isn't just belief-probabilists who can make this argument; anyone who adopts the relatively weak principles $T_\sim$ and M_b can do it too. The price for retaining Poi is to give up the existence of evidential bridges (which seems to contradict the very hypothesis of the Factory thought-experiment), or reject at least one of $T_\sim$ and M_b.

5 White's Escape

Roger White [8] thinks Poi is unscathed in the Square Factory—whether we appeal to probabilism or not—because he denies that the pair of evidential ties $L_1 \approx L_2$ and $A_1 \approx A_2$ exist in the first place. In my terminology, White relieves pressure on Poi by denying that there is an evidential bridge in the Square Factory (or anywhere else). Rather than proving Poi false, the Factory foreman's puzzles provide a (vacuously) *true* instance of Poi instead.

His argument proceeds from two premises about '$\approx$' and '$\succ_e$' (though only one of the names, and neither of the abbreviations, are from White):

($T_\approx$) The transitivity of evidential symmetry:
$[(P \approx Q) \wedge (Q \approx R)] \rightarrow P \approx R$

(M_e) Monotonicity of evidential symmetry across genuine weakness: If Q is genuinely weaker than P, then $Q \prec_e P$.

These two principles about evidence entail the nonexistence of evidential bridges. Proof: suppose there is a bridge $A \approx B \approx C$. Transitivity yields $A \approx C$, which violates M_e. And if there's no evidential bridge, at least one of $L_1 \approx L_2$ or $A_1 \approx A_2$ is false—for White accepts $E_\approx$, which with $T_\approx$ would form an evidential bridge from these two. Without an evidential bridge, the Square Factory argument has nothing to rest upon. White's argument is refreshing because it attempts to wriggle out of the tight spot of having both $A_1 \approx A_2$ and $L_1 \approx L_2$ by appealing to simple and perfectly general features of evidential relations, instead of case-specific and obscure reasons why one of the foreman's puzzles was ill-formed, or why lengths take precedence over areas. (While White isn't alone in pinning the blame on our answers to the foreman, I think he has the best case for doing so).

This reply to the Square Factory Argument applies to the Deadlier Factory Schema too, but raises a tough question for those who believe Poi: if $A_1 \approx A_2$ and $L_1 \approx L_2$ are not both true, then in at least one of those cases we have a preponderance of "total evidence" in favor of a proposition, despite the apparent fact that we're completely ignorant of anything remotely relevant to either of those questions. And one who believes Poi is likely to be equally fond of a sister principle, which I'll call the ignorance principle (or 'Ig' for short):

> (*Ig*): For any contingent propositions P and Q, if one is ignorant of anything that bears on the question of which, if either of them, is true, then $P \approx Q$; that is, $i(P,Q) \rightarrow (P \approx Q)$.

This principle, coupled with the claims $i(A_2, A_1)$ and $i(L_1, L_2)$—and $E_{\approx}$, which I've assumed—deliver the evidential bridge $A_2 \approx L_1 \approx L_2$. (Or, in Distilled Factory terms, deliver $A \approx B \approx C$).

White's escape requires rejecting at least one of the following: Ig, $i(A_2, L_1)$, or $i(L_1, L_2)$. But the latter two are true by hypothesis in the Factory, and Ig looks every bit as plausible as Poi. If one is ignorant of anything relevant to the question of P and Q, then one doesn't *have* at that moment any epistemically relevant considerations to go on, in which case one doesn't have asymmetric considerations—which is just to say, $P \approx Q$. Since the epistemic normativity in Poi's consequent is supposed to tell us what to do with our heads, the 'ought' implies 'can'. We can only go with what we've got. If "reasons" exist that one doesn't know about, then they are irrelevant to one's deliberation on what to believe. Sherlock Holmes would be unaware that the culprit left traces of DNA at the scene; an epistemic evaluation of Holmes's detective reasoning here can't claim it's epistemically faulty in failing to take account of what he couldn't have. Inaccessible reasons might be relevant to externalist-style justification (or knowledge), but that would show that such justification (or lack thereof) is sometimes irrelevant to deliberations on what to do with our heads.

White's defense of Poi seems to me to give up too much. I'll attempt to keep Poi *and* the evidential bridges. This means I need to overcome the Distilled Deadlier Square Factory schema, and also to identify which of White's premises, $T_{\approx}$ or M_e, are faulty.[9] Fortunately, one type of thought-experiment refutes both $T_{\sim}$ and $T_{\approx}$, which defuses both the Distilled Factory and White's argument against evidential bridges.

6 Questioning Two Premises

'$\approx$' can be shown intransitive by appeal to sequences of pairwise indistinguishable options. Fitelson offers one something like the following.[10] You catch a glimpse of the getaway car as it drives away from a robbery. The police bring you to the station for a lineup. They show you two color swatches and ask "which one of these do you have more reason to think is the color of the getaway car?". You answer that there's no more reason for swatch #2 than swatch #1, because you can't tell the two shades apart (even though you've been assured by the policeman that they are distinct colors). Next comes the same question, but this time it regards swatch #2 and swatch #3. These are indistinguishable, so you plead evidential symmetry. After enough pairs, the policeman shows you swatch #1 and swatch (say) #1000. Now you can tell them

[9] I'm also thereby committed to denying belief-probabilism, but it would be far beyond the scope of this essay to canvas arguments for belief-probabilism and show why they're unsound. Instead I show how belief-probabilism, through some of its consequences, forbids what is obviously not forbidden.

[10] White cites both Fitelson and Sober as offering objections to transitivity based on Sorites-ish cases. I heard Fitelson give something like this case at the 2008 Formal Epistemology Workshop.

apart, and clearly have more reason to think that (say) swatch #1 is the color of the getaway car than that swatch #1000 is.

Examples like this can be multiplied.[11] As Fitelson (personal communication) points out, it doesn't hinge on vagueness since the relevant property is identity (of pairs of colors), not (e.g.) greenness. Moreover, I think examples almost exactly like these have equal refuting force against the transitivity of '$\sim$'. If the thought-experiment works, this isn't a happy result for belief-probabilists.

If these examples work, there's a false premise in both the Distilled Deadlier Factory Schema ($T_\sim$) and White's escape ($T_\approx$). Yet I can't rest my defense here, for three reasons.

First, I'm also suspicious of M_b and M_e. I'll address M_b later, but what about M_e? Its plausibility hinges on just how we understand the relation '$\approx$'. Just as there are many different ways to be in a state of credential symmetry, perhaps there are many ways for P and Q to be evidentially symmetric. For instance, if we read '$P \approx Q$' as 'any reason for P is a reason for Q and *vice versa*', then M_e is vacuously false in any situation in which we're utterly ignorant of any relevant reasons regarding P and a genuinely weaker Q. For then it's vacuously true that any reason for P is a reason for Q and *vice versa*, there being no reasons for either of them. I'm not saying this is the unique, correct reading of '$\approx$', only that it's not altogether crazy, so there are good reasons to doubt M_e. If there are many readings of '$\approx$', some of which imply M_e and some which don't, then White's defense of Poi would at best only cover those readings that satisfy M_e.

Second, one might take issue with the extent of transitivity failures for both evidential and credential symmetry. Perhaps they fail in Sorites-ish cases, but not generally; since the Square Factory isn't a Sorites-ish case, perhaps a weakening of $T_\sim$ can step in and cause just as much trouble. I'm unmoved by this objection, in part because I'd be suspicious of ascribing transitivity such a wide scope given that it's already failed. But the third and most important reason why I can't stop with antitransitivity arguments is that even denying both $T_\sim$ and M_b won't suffice to escape the Factory. So even if transitivity frequently fails outside the realm of the Sorites-ish, Poi isn't out of the woods yet. There's an Even Deadlier Factory argument.

7 Making the Factory Escape Harder

If I'm right about $T_\sim$, it might seem that the threat to Poi has dissipated. One can even leave M_b in place; without $T_\sim$ there wouldn't be a way to get from $A \sim B \sim C$ to the Monotonicity-violating $A \sim C$. And without that, it may seem that Poi is out of the woods.

So it may seem. Let me make the job even harder for myself: one can weaken the suppositions about belief that are needed to cause trouble for Poi *even further*, so that they are implied by $T_\sim \wedge M_b$ but are consistent with the denial of $T_\sim$, the denial of M_b,

[11] Here's a variation due to Fitelson. Instead of color swatches, imagine the police are asking you about who the robber is. They ask you to make pairwise comparisons between a man with a full head of hair and his clone with one hair plucked. Then between the one-hair lacking clone, and a two-hair-lacking clone, and so on. Eventually they'll ask you to compare the original, bushy-haired man with a completely bald clone.

and even the denial of both. Disaster (for Poi) can strike even if $T_\sim$ is false, and even if M_b is false, for there's a single principle that can do the work of their conjunction.

I call this principle 'Heredity' ('$H_\sim$'), for reasons that are about to become clear. Heredity says that for any contingent propositions P, Q, and R, such that R is genuinely weaker than Q: if $P \sim Q$ and P and Q are contraries, then one is epistemically required to believe P less than R (that is, have a belief state asymmetrically tilted towards R).

> ($H_\sim$): for any contingent P, Q, R, if $[(P \sim Q) \wedge (P \vDash \neg Q) \wedge (P \vDash^* R)]$ then $\Box(P \prec_b R)$.

P "inherits" some propositions than which it must be believed less, and it inherits them *via* its relation to Q. Moreover, Heredity rules out all *credential* bridges. For consider the underpinnings $\langle A, B, C\rangle$ of a credential bridge. If C is genuinely weaker than A, and $A \sim B$, $H_\sim$ says one must have $B \prec_b C$; but a credential bridge requires $B \sim C$. A credential bridge here would mean that B would fail to inherit the proper relation to C.

Heredity is logically independent of M_b and of $T_\sim$ when taken separately. The conjunction $M_b \wedge T_\sim$ implies $H_\sim$ (so long as $\succ_b$ is transitive too), but the reverse implication fails, so it makes for a stronger case against Poi.[12] In previous Factory incarnations, Poi crashed and burned because from $A \approx B \approx C$ it delivered $A \sim B \sim C$. From this, $T_\sim$ fashioned $A \sim C$, and passed this over to M_b for rejection. If we get rid of $T_\sim$ and M_b, things are a bit different. Poi delivers $A \sim B \sim C$ as before, but $H_\sim$ rejects it outright, without needing a prior commitment to $A \sim C$, and without relying on M_b.

> *The Even Deadlier Factory Schema*: an evidential bridge plus $H_\sim$ jointly refute Poi.

To have both Poi *and* the claim that there's an evidential bridge in the Factory (i.e., $A_2 \approx L_1 \approx L_2$), one is logically required to reject $H_\sim$. This is tough because $H_\sim$ has some initial plausibility even to those who aren't belief-probabilists; even someone who agrees that $T_\sim$ sometimes fails, e.g., in Sorites-ish cases, can assent to $H_\sim$. Nevertheless, $H_\sim$ is false, and this can be shown by counterexample.

8 Two Cases Against Heredity

Heredity (for beliefs) says that if $P \sim Q$ where P and Q are contraries, then one (epistemically) ought to have $P \prec_b R$ for any R genuinely weaker than Q. I don't think this is always true. There are *some* situations where it doesn't hold, even though it holds in plenty of other situations.[13]

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[12] If one strengthens Heredity by removing the conjunct of the antecedent that says P and Q are contraries, then the resulting principle would imply M_b, provided that $P \sim P$ for all P. Such a strong version is more than what's required, though.

[13] For instance, I believe 'the number of molecules in the Sun right at this instant is even' no more than I believe 'the number of molecules in the Sun at this instant is odd'; I'm credentially symmetric between them. I also believe, and *ought to believe*, the "oddness" proposition less than I believe 'The Sun is at this instant composed of molecules'; I'm credentially tilted toward the latter. Since the last proposition is genuinely weaker than the "evenness" proposition, this is a case where Heredity gets it right. A theory that explains when one ought and ought not obey Heredity would be nice, but that's far beyond the present scope.

One kind of failure has to do with ignorance. For some choices of P, Q, and R and some circumstances there's nothing epistemically wrong with violating Heredity. For instance, suppose that Descartes, while in the midst of meditating, is considering three propositions:

> **Normal** (N): There's an external world, and I'm not being systematically deceived.
>
> **Demon** (D): I am being systematically deceived by a demon.
>
> **Trickster** (T): I am being systematically deceived by some Trickster being, whether it's a demon, a goblin, a genie, etc.

After further meditation, suppose, he comes to have the following credential attitudes: $D \sim N \sim T$. This is a credential bridge. I don't think the bridge by itself means Descartes commits an epistemic sin here, despite the fact that T is genuinely weaker than D. Now maybe one thinks that Descartes only has a bridge because (say) he's focusing too narrowly on the evidence delivered by his senses, and that's a sort of sin (ignoring good reasons for belief). But that's a *different* sin, and is clearly independent of Heredity here.[14] Presumably, those who are not Cartesian skeptics about the external world are so because they think that $N \not\approx D$ in the first place. But the verdict for this case doesn't hinge on Poi (and anyway I make no claims about whether Descartes is faced with an *evidential* bridge). For if Heredity were true, Descartes sins *no matter how he got into that bridge*. Whatever his evidence, he can't wind up there. Even if he magically woke up that way in the morning, he's obligated to tear down the credential bridge once it's discovered.[15] That's not right; *if* Descartes sins here, it lies in how he wound up with a credential bridge, not in the bare fact that he's got one.

Notice that there's a credential bridge whether Descartes has $D \sim T$ or $D \prec_b T$. If he has the former, it's a violation of both M_b and Heredity; if he has the latter, he obeys M_b while violating Heredity. Suppose he winds up with the latter state, because he *followed* M_b and thought "Hmm, T is genuinely weaker than D, so I guess I believe T more strongly than D". Here again, I don't think Descartes sins by failing to conform to Heredity. (While one may think he sins by violating the transitivity of the "believes no less than" relation, I'm unmoved since $T_\sim$ is false, and and that means '$\succcurlyeq_b$' is not a transitive relation either). So a rescue of Poi that works by rejecting $H_\sim$

[14] He isn't ignoring extra-sensory evidence *because* he's violating Heredity, and he could violate Heredity without ignoring extra-sensory considerations. An anonymous referee worried that what matters is whether everyone who violates Heredity is irrational, not whether everyone who violates Heredity is *thereby* irrational. This doesn't seem right to me. Suppose we're interested in whether gum-chewing is immoral. Attempting to give an example showing the negative, I offer a case in which Jones chews gum blamelessly, but also kills Smith in a manner that some would call murderous. Since Jones's wrongdoing, if there is any, is confined to the killing, it would be mistaken to object that the issue is whether anyone who chews gum does something immoral rather than whether gum-chewing is itself immoral.

[15] One might insist that Descartes is epistemically obligated to obey Heredity, because he's obligated to wind up here: $N \sim T$, $T \succ_b D$, $N \succ_b D$. (Thanks to an anonymous referee for raising this worry). But he obviously isn't—at *minimum* he could suspend judgment on all three claims—and I can't see any reason why he would be so obligated without appealing either to Heredity itself or to M_b. The battle over Heredity might come down to a clash of intuitions on certain cases.

doesn't force one to abandon M_b. It doesn't even force one to abandon $T_\sim$, though it does force the abandonment of one of them.

This is not to say that Descartes can just *pick* whether he has $D \sim T$ or $D \prec_b T$. Which one he ought to have as his belief-state hinges on whether M_b is true, whether he's ignoring reasons, and so forth. The point is simply that violating Heredity is in itself not automatically an epistemic sin.

Here's another objection to Heredity. If we understand '$P \sim Q$' so that the relation '$\sim$' holds if (but not only if) judgment is suspended on P and on Q, then $H_\sim$ is demonstrably false. Suppose one suspends judgment on whether Russell wore a blue sweater on his fortieth birthday, and on whether he wore a red sweater on his fortieth birthday. Then one is in a state of belief symmetry regarding those propositions. There would be nothing wrong with also suspending judgment on 'Russell wore a blue top of some sort on his fortieth birthday', which is a genuinely weaker proposition than the first of the above. To do this is to be belief symmetric regarding the two. Yet $H_\sim$ says one is epistemically obligated *not* to do this, no matter one may or may not know about Russell. That's absurd. The same general thought also applies to M_b. One can easily (and without sin) suspend judgment on a proposition and also on something genuinely weaker than it, e.g., on 'Russell wore a blue sweater on his fortieth birthday' and 'Russell wore a blue sweater on his fortieth or forty-first birthday'.

(Interestingly, the relation of joint suspension, i.e., suspend-on-P and also suspend-on-Q, is transitive. So the problem for $H_\sim$ here seems independent of whether $T_\sim$ holds generally or only usually. However, the transitivity of joint suspension shows that in Getaway Car cases one isn't jointly suspending on each member of the pairs the police present. Rather, there's some other kind of intransitive credential symmetry going on that seems inherently comparative between contrary propositions; outright suspension, on the other hand, is usually not thought of as comparative except perhaps as a comparison between a proposition and its negation.)[16]

9 Monotonicity and Heredity

One might object here that although I've stressed that my rescue of Poi doesn't require renouncing M_b, all of my objections to $H_\sim$ happen to apply equally to M_b. (One might object this way because one can't get oneself to accept that Descartes is sin-free in his credential bridge unless one reads '$\sim$' as joint suspension, which violates M_b). Hence, unless there are other objections to $H_\sim$, this rescue of Poi really does involve rejecting M_b after all. But this is mistaken. There are further objections to $H_\sim$ that explicitly assume the *truth* of M_b, and use it as a premise in generating the conclusion that there are permissible credential bridges. (These objections must, of course, involve denying $T_\sim$). Fans of M_b can still reject $H_\sim$.

Here is such an objection. Suppose you meet the foreman's cousin outside the Factory. He says, "I'm thinking of contingent propositions P and Q that are contraries

[16] In fact M_b implies that one cannot outright suspend on P, suspend on Q, and suspend on $\neg Q$ at once when P and Q are contraries that aren't contradictories. Proof: M_b disallows joint suspension on a proposition and something genuinely weaker than it. Since P and Q are contraries, P implies $\neg Q$. Since P and Q are not contradictories, $\neg Q$ is genuinely weaker than P. So if one suspends on P and suspends on $\neg Q$, one violates M_b.

but not contradictories. I won't tell you what propositions they are. What's your belief-state like with regard to P, Q, $\neg P$ and $\neg Q$?" It's obvious that there is nothing even remotely epistemically wrong with informing the foreman's cousin that your state is like so: $P \sim \neg P$ and $Q \sim \neg Q$, where the symmetry comes not from joint suspension but rather from the kind of comparative shrug that appears in the Getaway Car cases. P implies $\neg Q$ since P and Q are contraries. And since P and Q aren't contradictories, $\neg Q$ doesn't imply P in return. Since you have nothing at all with which to rule out $\neg Q \wedge \neg P$, $\neg Q$ is genuinely weaker than P. By parallel argument $\neg P$ is genuinely weaker than Q. Now suppose M_b is true; it requires $P \prec_b \neg Q$ (because $P \vDash^* \neg Q$) and $Q \prec_b \neg P$ (because $Q \vDash^* \neg P$). It follows now that you're now obligated to have $P \sim Q$, on the assumption that belief asymmetry is transitive. (For setting $P \succ_b Q$ yields $\neg Q \succ_b Q$, contrary to hypothesis; likewise, setting $P \prec_b Q$ yields $\neg P \succ_b P$, contrary to hypothesis). You're now sporting a pair of credential bridges: $Q \sim P \sim \neg P$ and $P \sim Q \sim \neg Q$. If Heredity is true, you're in an epistemically impermissible state. But you are not. Therefore Heredity is false.[17]

(This argument has the additional virtue of putting to final rest the escape-strategy of denying, on the grounds that one puzzle description is more natural or appropriate, that there's an evidential bridge. Because you don't even know what propositions P or Q *are* in this example, such appeals are cut off.[18])

The falsity of $H_\sim$ leaves open whether M_b is true. But it's worth noting that M_b, $\neg H_\sim$, and the claim that '$\succ_b$' is a transitive relation jointly imply that there do exist credential *near*-bridges. [Proof: $\neg H_\sim$ means that there exist contraries A and B, and C genuinely weaker than A, such that $A \sim B$ but $B \not\prec_b C$. M_b guarantees that $A \prec_b C$. Either $B \sim C$ or $B \succ_b C$ must hold; but if it's the latter, the transitivity of '$\succ_b$' yields $A \prec_b B$, contrary to hypothesis. Hence $B \sim C$, whence $A \sim B \sim C$. This doesn't quite make a credential bridge, but only because $\neg H_\sim$ doesn't guarantee that B and C are contraries, i.e., doesn't guarantee that A, B, C are really *underpinnings*.]

So the Even Deadlier Factory-style argument, when stripped of $H_\sim$ but left with M_b, isn't worrisome. It no longer generates a ban on all credential bridges. It could still be, of course, that there isn't a credential bridge in the Square Factory; it could even still be that credential bridges generally are epistemically impermissible; but since permissible credential *near*-bridges must exist given $\neg H_\sim \wedge M_b$, it's hard to see

[17] One might object that in this argument, I appealed to Poi itself in support of the claim that your response to the foreman's cousin is epistemically kosher. The appeal is in the cousin's refusal to grant any information about P and Q, which grounds $P \approx \neg P$ and $Q \approx \neg Q$, which only ground the corresponding belief symmetries if I appeal to Poi. This objection is mistaken, since such an appeal to Poi would result in a claim that you're *required* to have those belief symmetries. But the example doesn't say this—it says you're not forbidden from having those belief symmetries. I claim here only that there are *some* cases of total ignorance in which the relevant belief symmetry *isn't forbidden*. This is not to say what Poi says, that in *all* cases of total ignorance, the relevant symmetry is *mandatory*. One doesn't need to buy Poi to find this case convincing. It's also unclear that I'm *ineliminably* appealing to ignorance in the first place. I could simply pose the question, "isn't it sometimes permissible, for some choices of contraries P and Q, to have $P \sim \neg P$ and $Q \sim \neg Q$?".

[18] Others (Norton [4], pp. 53–54; Gillies [3], p. 46) agree that such strategies are hopeless as a general solution, but that's because they think those strategies founder on von Mises's [6] wine-water paradox, which they think is posed in such a way that each puzzle is formulated in perfectly parallel coordinate systems. I agree, but I think the cousin's "arbitrary propositions argument"—which is really just an abstraction from, and generalization of, the wine-water paradox (see the Appendix)—makes the point more forcefully and simply.

why real bridges would be impermissible. If they are, the Factory fan now would need additional premises to show this. The original strategy would be finished. Defenders of Poi, then, *could* welcome M_b as an unexpected ally (though for reasons given above, I think this is a mistake).

10 Still More Deadly?

So far we've seen the Factory-style case against strengthened by successive weakenings of the premises. I started with belief-probabilism, then weakened that to $T_\sim \wedge M_b$, and then weakened that to $H_\sim$. (Strictly speaking, $T_\sim$ and M_b don't jointly imply $H_\sim$ unless belief-*a*symmetry is also transitive; this seems innocuous enough). Perhaps this process can go further. Is there anything logically weaker than $H_\sim$ but stronger than simply "there are no credential bridges" that will drive the Factory? There is not. The chain stops at Heredity.

Any principle X must, in order to ban credential bridges, say that whenever there are bridge underpinnings $\langle A,B,C\rangle$ and $A \sim B$, one must have $B \not\sim C$. Indeed, that just *is* a ban on credential bridges, and is equivalent to saying that either (i) all cases of underpinnings where $A \sim B$ are cases requiring $B \prec_b C$, or (ii) all such cases are ones forbidding $B \sim C$ yet some such cases at least permit (and maybe require) $B \succ_b C$. So we seek something stronger than this disjunction that's weaker than Heredity. The first disjunct is simply a statement of Heredity, so that leaves (ii). But (ii) is inconsistent with Heredity, and therefore not weaker than it. So while principles satisfying (ii) would equally well fit into the Factory-style pattern, they wouldn't be *weakenings* of the most recent link in the chain. (Plus, they would face all the same objections already given to Heredity).

There's an evidential principle corresponding to Heredity. Call it '$H_\approx$' to distinguish it from $H_\sim$.

> ($H_\approx$) for any contingent propositions P and Q: if $P \approx Q$ and $P \vDash \neg Q$, then $P \prec_e R$ (for any R genuinely weaker than Q).

Even if $H_\sim$ is false, might $H_\approx$ form a basis for a White-like escape, banning evidential bridges without needing $T_\approx$ or M_e? White is committed to $H_\approx$, because it follows from the conjunction of $T_\approx$ and M_e. I think $H_\approx$ is false because it is inconsistent with there being evidential bridges, the nonexistence of which conflicts with Ig and intuitive examples. The case of the foreman's cousin, e.g., generates a clear evidential bridge.

Moreover not every theory of what evidential symmetry consists in implies $H_\approx$. Some even imply its negation. For instance, Likelihoodism is the view that some evidence favors P over Q iff the probability of the evidence given P is greater than the probability of the evidence given Q. One could conjoin Likelihoodism to the view that $P \approx Q$ iff neither P nor Q are favored over the other by the total evidence in hand. If one did this, then $T_\approx$ would be true (for equality of conditional probability is transitive), but $H_\approx$ would be false (as would M_e). That's because it's possible for some proposition E to have the same probability conditional on 'the getaway car was red' as on 'the getaway car was green' as it does conditional on 'the getaway car was red or blue'. I'm not advocating this compound view; I'm only using it as an illustration of how nonobvious $H_{\approx}$ is, even for theories of evidence that lean heavily on probability.

Here's another example. John Norton [4] defends Poi by adopting invariance conditions for total ignorance that ensure the existence of evidential bridges; total ignorance can form a bridge over genuine weakness. He therefore must reject $H_{\approx}$. But interestingly, he builds into his framework for belief and evidential support the claim that $T_{\approx}$ holds whenever the evidential symmetry is due to total ignorance.[19] This commits Norton to denying M_e—if he affirmed it, it would combine with $T_{\approx}$ rule to ban evidential bridges.

Instead of M_e, Norton requires only that if Q is genuinely weaker than P, then $P \not\prec_e Q$. In other words, *either* $P \approx Q$ or $P \prec_e Q$. Call this condition 'Norton-monotonicity' (for evidence). Norton-monotonicity is weaker than M_e, and is taken as built-in to his framework. Likewise, Norton-monotonicity *for belief* is also built-in. This shows the break between Norton and White: for White insists on the full-strength M_e and M_b, while Norton must deny these.

11 Poi and Permissivism

There's a connection between Poi and another issue in epistemology. Consider a principle I'll call 'Extreme Permissivism' (this is a modification of White's [7] usage). Extreme Permissivism says that, for at least some agents, at least sometimes the sum total of one's complete epistemic state epistemically permits each of $P \succ_b Q$ and $P \prec_b Q$, where P and Q are contraries. Call any case like this an extremely permissive case. Poi implies that *if* Extreme Permissivism is true, then the extremely permissive cases don't occur when the propositions in question are evidentially symmetric. So Poi and Extreme Permissivism are, when restricted to cases of $P \approx Q$, logical contraries.

An opposing view (but not *the* opposing view) to Extreme Permissivism is 'Uniqueness' (see Feldman [2] and White [7] for related views). This is the view that there's always exactly one mandatory directional attitude regarding contraries P and Q; that is, in every evidential setting, either $\Box(P \succ_b Q)$, $\Box(P \sim Q)$, or $\Box(P \prec_b Q)$. The negation of Uniqueness I call 'Permissivism'. It's implied by, but does not imply, Extreme Permissivism. Conjoining Permissivism with the denial of Extreme Permissivism yields Moderate Permissivism.

I've departed from White's [7] usage here in saying that there are only three attitudes to choose from, and that they are, for lack of a better term, "merely directional" attitudes. Uniqueness, as I've described it, is consistent with it being permissible to believe P to degree 0.5 and Q to degree 0.2, and also permissible to believe P to degree 0.8 and Q to degree 0.02, so long as things remain tilted towards P. White makes no restriction to the "directional" attitudes.[20] He calls epistemologies more or less 'permissive' insofar as "they permit a range of alternative doxastic attitudes" (p. 445). In his central examples employed against permissive

[19] Norton (personal communication) is open to the idea that $T_{\approx}$ isn't generally true, and that it could fail in cases where we aren't completely ignorant; the Getaway Car cases would fit this bill.

[20] White's formulation of Uniqueness, then, is stronger than mine. Thanks to an anonymous referee for advising that I be more explicit about this.

epistemologies, he considers ones that permit both belief in P and belief in $\neg P$. In fact, White gives the following the name 'Extreme Permissivism':

> There are possible cases in which you rationally believe P, yet it is consistent with your being fully rational and possessing your current evidence that you believe not-P instead. (p. 445)

So my usage of 'Permissivism' and 'Extreme Permissivism' isn't *too* far off target, even though it doesn't completely line up.

I've also diverged from Feldman's [2] (p. 205) usage of 'Uniqueness'. There he holds that there are only three attitudes to choose from—believe P, disbelieve P, and suspend judgment on P—so for him the only way for an agent to have $P \sim Q$, when they're contraries, is to suspend on each individually. (This commits Feldman to $T_{\sim}$, but also to $\neg M_b$; for if I believe both P and some Q genuinely weaker than P, I have $P \sim Q$; and if I suspend on both, $P \sim Q$). I think there are only three *directional* attitudes, but that there are multiple ways to instantiate *all* of them. Also, Feldman's Uniqueness involves justification: it "...is the idea that a body of evidence justifies at most one proposition out of a competing set of propositions... and that it justifies at most one attitude toward any particular proposition." (205) My version makes no mention of propositions being justified, but only of what one ought (or is required) to believe. I leave open the nature of the relation between justification and belief.

Perhaps one would want to call my version of Uniqueness 'Directional Uniqueness' and White's version something like 'Cardinal Uniqueness' (and in parallel, 'Directional' and 'Cardinal' Extreme/Moderate Permissivism). For the sake of brevity I'll continue to omit the modifiers. One other note: Uniqueness and Permissivism as I understand them are theses about single agents. None of the five theses under discussion say anything at all about what two agents with "the same evidence" ought to do.[21]

When we consider only settings of evidential symmetry, Poi implies Uniqueness but the reverse implication fails (perhaps Uniqueness is true but sometimes when faced with $P \approx Q$ one is required to have $P \succ_b Q$; that violates Poi). With the same restriction in place, Poi and Extreme Permissivism are contraries but not contradictories. To see that they could both be false, consider the thesis that in those cases of evidential symmetry where Poi fails, leaning towards Q is forbidden but any other attitude is permitted; such a view is Moderately Permissive but not Extremely Permissive.

If we turn our attention to settings of evidential asymmetry, then it's clear that Uniqueness rules here. Since '$P \succ_e Q$' just *means* that the sum total of everything epistemically relevant points to P, one is epistemically required to have a belief-state that's tilted in favor of P. Any consideration that would serve as an escape clause, allowing one not to lean towards P, is by definition not epistemically relevant to the question of P and Q.

[21] This is, in the main, in accord with White's article. While he cites the question of interpersonal disagreement as a motivation for thinking about Permissivism (in his sense), his central anti-permissive arguments are about one person. On the other hand, Feldman [2] (p. 205) explicitly takes his Uniqueness Thesis to have implications for two agents who "have exactly the same evidence".

If this is correct, then the territory contested by Uniqueness and Permissivism (and by Poi and Extreme Permissivism) lies entirely within the realm of evidential symmetry. We needn't consider evidential asymmetry any longer in this essay while getting straight on the relations between Poi, Uniqueness, and the varieties of Permissivism.

Suppose that a further condition, called 'Anticoercion', holds:

> (*Anticoercion*): Whenever $P \approx Q$ holds, so do $\neg\Box(P \succ_b Q)$ and $\neg\Box(P \prec_b Q)$.

That is, when $P \approx Q$ one isn't required to lean towards P and isn't required to lean towards Q. On this supposition, Poi and Uniqueness are equivalent. Poi obviously implies Uniqueness here. Conversely, if Uniqueness is correct, Anticoercion ensures that the only available directional attitude to be mandated is '$\sim$'.

Is Anticoercion plausible? I think so. Suppose that one is epistemically obligated to lean in a particular direction, that is, obligated to have $P \succ_b Q$ (the other case is perfectly parallel). Then one's total evidence, in the broad sense—the grand total of one's epistemically rational forces—has obligated one to have $A \succ_b B$. But if one's total evidence has obligated one that way, it would never have been the case that $A \approx B$ in the first place, since by definition that could only be true if one's total evidence gives you no epistemically rational push either way. Therefore a case of $P \approx Q$ but $\Box(P \succ_b Q)$ is logically impossible, and the same goes for a case of $P \approx Q$ but $\Box(P \prec_b Q)$.

Given Anticoercion, then, any argument against Poi is automatically an argument against Uniqueness (and in favor of Permissivism). To my knowledge, no one has noticed this connection between Poi and Uniqueness-like views.

We can further tighten the connections. Suppose that something stronger than Anticoercion is true. Suppose that when $P \approx Q$, one is epistemically permitted to lean towards P if and only if one is also permitted to lean towards Q—i.e., one is either: (i) required to have $P \sim Q$, or (ii) permitted to lean in either direction and permitted to be on the fence, or (iii) permitted to lean in either direction but required to stay off the fence. These three prescriptions are *evenhanded*, or balanced, in the sense that they don't prescribe anything regarding P that they don't also prescribe regarding Q.

> (*Evenhandedness*): when $P \approx Q$, the correct prescription is evenhanded. Or equivalently: when $P \approx Q$ holds, so does $\Diamond(P \succ_b Q) \leftrightarrow \Diamond(P \prec_b Q)$.

Evenhandedness is consistent with both Poi and its negation, and with both Uniqueness and Permissivism; for two of the evenhanded prescriptions are inconsistent with both Poi and Uniqueness. It implies Anticoercion, since no evenhanded prescription requires a lean (in any direction). For Evenhandedness to fail, there has to be at least one instance of $P \approx Q$ in which the prescription isn't evenhanded. There are four such prescriptions: (iv) $\Box(P \prec_b Q)$; (v) $\Box(P \succ_b Q)$; (vi) required to have either $P \prec_b Q$ or $P \sim Q$ but permitted to choose which; (vii) required to have either $P \succ_b Q$ or $P \sim Q$ but permitted to choose which. Anticoercion says the first two are never prescribed in cases of evidential symmetry, but says nothing about the latter pair; Anticoercion is thus weaker than Evenhandedness. There are no other prescriptions, because $\sim$, $\succ_b$, and $\prec_b$ are the only possible directions. (Recall that "having no attitude at all" is a form of $P \sim Q$).

What's interesting about Evenhandedness is that it renders Poi and Extreme Permissivism into full-blown contradictories, and the same for Uniqueness and Extreme Permissivism. Therefore it also makes Permissivism and Extreme Permissivism equivalent, ruling out Moderate Permissivism.

But is Evenhandedness plausible? It does seem natural that if one's total evidence comes out symmetric between P and Q, then the dictates of epistemic rationality regarding the two should treat them the same. This is not to say that the *agent* must treat them the same, only that the *prescription* should do so. Treating them the same does not have to mean mandating credential symmetry; it may only mean that whatever is dictated about one is dictated about the other and *vice versa*, as is the case with prescriptions (ii) and (iii) above.[22] I'll consider a case that would make Evenhandedness false but leave Anticoercion intact. This will do the trick: $P \approx Q$, yet one is forbidden only from leaning towards Q. Where would the epistemic forbiddenness come from? It would have to come from the sum total of all epistemically relevant considerations. But those considerations have already come out *balanced*—that's what $P \approx Q$ means.[23] The total evidence here treats P and Q equally, so there *couldn't* be any prohibition of a lean towards Q that wasn't accompanied by a prohibition on leaning towards P.

If Evenhandedness is true, then Poi and Extreme Permissivism are contradictories, and Poi is equivalent to Uniqueness. Hence all arguments that fit any Factory Schema are automatically arguments in favor of Extreme Permissivism and against Uniqueness. For instance:

1. $T_\sim$ is true (transitivity of '$\sim$')
2. M_b is true too.
3. There are evidential bridges.
4. Therefore Poi is false.
5. Therefore Extreme Permissivism is true.

So what look like relatively weak *structural* assumptions about how '$\sim$' can be spread around can give rise to Extreme Permissivism, if only the existence of evidential bridges is granted. Here's another argument:

1. $H_\sim$, Heredity, is true.
2. There are evidential bridges.

[22] So to say that Evenhandedness is *natural* is not to assume Poi. This is why I don't think that Poi is a tautology like $P \vee \neg P$; there's room, even if just a little, to understand '$\approx$' as yielding balanced prescriptions instead of yielding a prescription of balance.

[23] One might be tempted to object that I'm defining the relevant terms in such a way that guarantee the truth of Poi, or at least of Evenhandedness. I answered this objection in an earlier footnote, but in this context the details of the reply are a bit different. If Poi is true by definition, then Uniqueness is true by definition. If Evenhandedness is true by definition, then Modest Permissivism is logically false. That should be surprising, and of interest, to those who deny Uniqueness or Evenhandedness.

3. Therefore Poi is false.

4. Therefore Extreme Permissivism is true.

That one uses weaker premises. Finally, we get to the barest bones:

1. There are evidential bridges.

2. There are no credential bridges.

3. Therefore Poi is false.

4. Therefore Extreme Permissivism is true.

Here the connection between the Factory schema and Uniqueness/Permissivism is the most clear. Proponents of Uniqueness *must* deal with the question of evidential and credential bridges. They can't countenance the former but eschew the latter. Whether there are credential bridges depends upon structural features of the directional credential attitudes $\sim$, $\prec_b$, and $\succ_b$. E.g., are they transitive? A defense of Uniqueness must wrangle with these issues, unless one has already denied that evidential bridges exist.

The Permissivists are under less pressure from this connection. They must deny Poi, of course, but that doesn't mean they have to think that Factory-style arguments are sound. Permissivists are also free to both deny or affirm the existence of both evidential and credential bridges.

12 Conclusion

The Principle of Indifference (Poi) has taken a beating. Belief-probabilism in the Mystery Square Factory, coupled with an assumption that there are evidential symmetries forming a bridge from the length hypotheses to the area hypotheses, allegedly refutes it.

Even rejecting belief-probabilism won't by itself help, since some of its consequences can still do the job for it. Roger White denied that those bridging symmetries are really there, and that relieves the pressure on Poi. But I think that's a Pyrrhic victory. Plus, White's premises that lead him to abandon the symmetries are false.

The pressure on Poi from the Factory case can be isolated even further, to a principle of Heredity. I argued against Heredity, thereby pulling Poi up off the mat, and without abandoning the bridging symmetries.

I also argued that, *modulo* the assumption of Evenhandedness, Poi is (i) equivalent to the negation of Extreme Permissivism (the thesis that at least sometimes one's total mass of epistemic reasons is such as to epistemically permit leaning toward P rather than its contrary Q, and also permit leaning toward Q), and (ii) equivalent to Uniqueness (the thesis that one's total mass of epistemic reasons always epistemically mandates exactly one merely-directional credential attitude with regard to a pair of contraries). Hence the Square Factory arguments are also arguments for Permissivism and against Uniqueness. If I have relieved the pressure on Poi from the Factory, I've also relieved some pressure on Uniqueness.

Appendix

I asserted that the Factory-style arguments share a common form. If that's true, then in each of them there must be a thought-experiment motivating a claim that an evidential bridge exists, and some premises banning credential bridges. I won't make an exhaustive canvas, but I do wish to uncover the bridges in a couple of cases.

Water and Oil. Von Mises [6] (p. 77) describes a puzzle involving the ratio of wine to water (I'll switch wine to oil so that labeling is easier). Here's a modified way to set it up, a mixture of von Mises's and Norton's [4] (p. 57) versions. You know only that the ratio of water to oil is somewhere between 0.5 and 2. That's equivalent to knowing that the ratio of oil to water is somewhere between 0.5 and 2. Here are the two puzzles designed to generate bridges. First, letting x be the ratio of water to oil, which of these two do you believe more:

W_1: $0.5 < x < 1.25$, or

W_2: $1.25 < x < 2$?

Second, letting y be the ratio of oil to water (i.e., $1/x$), which of these do you believe more:

O_1: $0.5 < y < 1.25$, or

O_2: $1.25 < y < 2$?

It would seem, in your complete ignorance, that $W_1 \approx W_2$ and $O_1 \approx O_2$. However, the underpinnings for two evidential bridges are in place: O_2 is contrary to W_2 is contrary to W_1, while $O_2 \vDash^* W_1$; plus, W_2 is contrary to O_2 is contrary to O_1, while $W_2 \vDash^* O_1$. The rest of the bridge comes from your complete ignorance: $O_2 \approx W_2$. (After all, you don't have anything supporting the claim that the ratio of water to oil is between 1.25 and 2 over the claim that the ratio of oil to water is between 1.25 and 2, or *vice versa*). Add Poi to the mix, and we have a pair of credential bridges; Figure 2 shows the two types of bridges. Credential bridges, as we've seen, are banned by $H_\sim$, and therefore

Figure 2:

$$\begin{array}{ccc} O_1 & {}^*\!\Dashv & W_2 \\ \wr\wr & \approx & \wr\wr \\ O_2 & \vDash^* & W_1 \end{array} \qquad\qquad \begin{array}{ccc} O_1 & {}^*\!\Dashv & W_2 \\ \wr & \sim & \wr \\ O_2 & \vDash^* & W_1 \end{array}$$

also by $T_\sim \wedge M_b$ and belief-probabilism.

One could object here that the claim $O_2 \approx W_2$ was gratuitous and not part of the original pair of puzzles. That would mean the water and oil objection to Poi doesn't (or at least needn't) go through an evidential bridge to derive a contradiction. So the Even Deadlier Factory schema isn't representative of *all* similar anti-Poi arguments.

My reply is first that whether the question of O_2 *versus* W_2 was part of the initial puzzle-set doesn't matter. If you're ignorant, you're ignorant, and don't need a riddler to bring it up. Secondly, even if I grant this portion of the objection and remove the leg $O_2 \approx W_2$, thereby eliminating both evidential bridges, there's no trouble caused for Poi unless one adopts conditions on '$\sim$' that ban credential bridges. Even adding $H_\sim$, $\neg M_b$, and $\neg T_\sim$ will not generate a contradiction from just the "vertical" legs $O_1 \sim O_2$ and $W_1 \sim W_2$ in the picture. $M_b \wedge T_\sim$ will generate trouble, but bans bridges (by implying $H_\sim$). The same is true of $H_\sim \wedge M_b$. In fact, M_b plus the transitivity of $\succ_b$ will make a the credential bridge from the picture reappear (even if there was no evidential one to start with); one would then need to add a further principle, such as $H_\sim$ to knock that bridge down. But I've already argued that there are credential bridges, so even if this objection is right that evidential bridges aren't necessary to cause trouble for Poi, the thing that *is* necessary for this has already been wiped away. Hence, the solution to all Factory-like anti-Poi arguments is the same: reject $H_\sim$.

The Water and Oil case is a good example of a Factory-style argument where the number of available options in each "puzzle" do not change. Norton [4] (p. 53) thinks such arguments are more threatening to Poi than ones like the Square Factory (where one puzzle presents two options and the other presents four), because in cases like the former it's much more plausible (to some) that there is an evidential bridge in the first place. That's because when each puzzle presents the same number of options, the harder it is to single out one of option-sets as "the one" across which evidential symmetry is *really* spread. When the number of options differs, it might be "…appropriate to exercise the principle of indifference in just one but not the other description…." (p 53).

This paradox is also a more detailed version of the "foreman's cousin" argument, with the detail being that in Water-Oil you *do* know the contents of the propositions in question. To see that Water and Oil is an instance of the foreman's cousin, note that P and $\neg P$ correspond to W_1 and W_2, and Q and $\neg Q$ correspond to O_2 and O_1, respectively. The two puzzles of Water and Oil are structurally identical to the foreman's cousin's puzzles; it's just that here you happen to know that the propositions are about water and oil.

Great Britain. This next example modifies one from Keynes [1] (p. 44). The murder suspect has fled North America for northwestern Europe. You have no information at all beyond that. So these propositions are pairwise evidentially symmetric: (i) the suspect's in England; (ii) the suspect's in Scotland; (iii) the suspect's in France; (iv) the suspect's in Belgium. By the same token, you have no more reason to suppose the suspect's in France than that he's in Great Britain, and no more reason to think he's in Great Britain than that he's in Belgium.

If that's right, there are *four* evidential bridges, all linked, and Poi would generate the four corresponding credential bridges shown in Figure 3. Anything that implies $H_\sim$ implies that *all four* of these apparent bridges are bogus.

References

[1] Keynes, J. M. (1962). *A treatise on probability*. (New York: Harper & Row).

Figure 3:

$$\begin{array}{ccccc} & & F & & \\ & & \wr & & \\ S & \models^* & GB & {}^*\Dashv & E \\ & & \wr & & \\ & & B & & \end{array}$$

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