

**How Do You Solve a Problem Like Induction?
Flip a Coin, Twice if Needed**

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How Do You Solve a Problem Like Induction? Flip a Coin, Twice if Needed

In 1777 David Hume propounded a problem so pervasive, seemingly simple yet difficult to solve that it altered the course of philosophy.¹

We can never learn from the past how the future will be, Hume suggested, for we have experienced only events unexceptionally conjoined – events, that is, with no evident 'causal connection' between them – and thus have no warrant to expect them to remain conjoined in the future. Why then do we act confidently upon the inductions that we make? Hume's answer was unequivocal: because we are constrained by custom (or habit) to do so, lack of reasons notwithstanding:

All belief of matter of fact or real existence is derived merely from some object present to the memory or senses and a customary conjunction between that and some other object; or, in other words, having found, in many instances, that any two kinds of objects, flame and heat, snow and cold, have always been conjoined together: if flame or snow be presented anew to the senses, the mind is carried by custom to expect heat or cold, and to believe that such a quality does exist and will discover itself upon a nearer approach. This belief is the necessary result of placing the mind in such circumstances. It is an operation of the soul, when we are so situated, as unavoidable as to feel the passion of love, when we receive benefits; or hatred, when we meet with injuries. All these operations are a species of natural instincts, which no reasoning or process of the thought, and understanding is able either to produce or to prevent.²

The logic of Hume's problem of induction, as Popper would afterwards insist, is one of universal instantiation and only derivatively of singular predication, commonplace suggestions to the contrary notwithstanding.³ To ask whether we are justified in

¹ The recollection of Hume's problem awoke Immanuel Kant from a "dogmatic slumber", as he put it, provoking him over a dozen years of pondering to construct his *Critique of Pure Reason* (with the 'Transcendental Analytic' at its core) that was in turn to inform every literate philosopher thereafter. For the remembrance, see the concluding paragraphs of the "Introduction" to his *Prolegomena to Any Future Metaphysics* of 1783 as translated by Paul Carus (Chicago, Illinois: Open Court Publishing Company, 1902 [Third Edition, 1912]).

² From Part I of Section 5: "Skeptical Solutions of These Doubts" of Hume's "An Inquiry Concerning Human Understanding" (1748, 1777) as reprinted in *David Hume: On Human Nature and the Understanding*, edited with a new introduction by Antony Flew (New York, New York: Collier Books, 1962), page 61.

³ See, for example, Popper's essay "Conjectural Knowledge: My Solution of the Problem of Induction" (reprinted in Karl Popper, *Objective Knowledge: an Evolutionary Approach* (1972). Oxford: Oxford at the Clarendon Press. pages 1-31.). Queries such as 'Will the book on my desk,

believing that the conclusion of an induction will prove true, or even to act as if it were so, is to ask whether we are justified in believing that, or acting as if, a sentence, universal in scope, hypothetical in form and without evident counterexamples, is true. The question, as Hume put it, is whether a "constant conjunction" will remain constant in the future.

Consider, then, the next object c that we shall encounter that satisfies a predicate F , if any there be, and a sentence (L) encompassing the predicates F and G to which no counterexamples have been observed.

$$(L) \quad (x) (Fx \text{ only if } Gx)$$

The problem of induction with respect to (L) has two facets, one epistemological, the other pragmatical.

The epistemological problem is whether we are warranted in believing that (L) is true.⁴ Hume argued famously that the answer is 'no', for the absence of evident counterexamples fails to preclude one or another of them from lurking as yet undisclosed somewhere within the universe. If we do in fact believe it, our belief, however natural and common, is unwarranted.

Let's assume that Hume was right: the epistemological problem of induction has no solution.⁵ What, then, of its pragmatical counterpart? Absent evident counterexamples, may we with warrant presume to *act as if* (L) is true when encountering c ? Hume, convinced that only justified beliefs can warrant actions, would have said 'no'. Were we to presume that we could, upon encountering c , act with reason *as if* (L) is true, our presumption, however natural and commonplace, would be equally unwarranted.

I believe, however, that Hume, though right with respect to the epistemological problem of induction, was wrong with respect to its pragmatical counterpart – wrong with respect to the second, indeed, *because* he was right with respect to the first.

heretofore heavy, be so tomorrow?' beg, trivialise or render unintelligible the questions upon which the puzzle rests, for if I may with warrant presume that the book of today will tomorrow be the same book, I may with equal warrant assume that it will be heavy as well.

⁴ I should for exactness add here and hereafter as appropriate the phrase 'or probably true'. For brevity, however, I omit it, commending readers to read 'is true' as if modified accordingly.

⁵ Though I shall presume within this talk that Hume was right, I remain respectful of the contrary convictions of Kant and of my teacher, Donald Williams. See his *The Ground of Induction* (New York: Russell & Russell, 1963). That, however, is matter for discussion on another occasion.

We are justified in preparing to *act as if* (L) is true *because* we are unjustified in believing it to be so.

How so? Consider our options for preparing to act upon encountering c.

Our Options for Acting

If Hume is right with respect to the epistemology of induction, we lack sufficient evidence to conclude either that (L) is true or that some object is a counterexample to it.⁶ We must nevertheless be prepared, upon encountering c, to act one way or the other. We can rationally do no better, therefore, than flip an unbiased coin and prepare to act accordingly.

If the toss shows heads, prepare to act as if (L) is true;

If the toss shows tails, prepare to act as if some object is a counterexample to it.

With the 1:1 odds between options, we might appear by flipping the coin to be only treading water rather than advancing toward warrant for preparing to act as if Gc.

A single toss of the coin, however, might well fail to conclude the game. How so? Were the tossed coin to show heads, no further playing would be required of us: we are to prepare to act as if (L) is true – as if, that is, Gc. If, however, the tossed coin were to show tails, obliging us to prepare to act as if some object is a counterexample to (L), we should have *two* options open to us rather than one.

We could opt to prepare to act as if c were a counterexample to (L); or

⁶ [Note added 22 April 2019] When this essay was presented in 1980, I had as yet to learn that the predicate 'is false' ought to be avoided, for it lacks definition (unlike, after Tarski, the predicate 'is true'). [See, for example, the essay "Filmmaking, Logic and the Historical Reconstruction of the World" within the 'Philosophical Enquiries' sub-section of the 'Evan Wm. Cameron Collection' of YorkSpace, the 'Institutional Repository' of the Library of York University. [<https://yorkspace.library.yorku.ca/xmlui/handle/10315/35778>] Consequently, I referred within the presentation to (L) as being 'false' rather than as having 'some object' as 'a counterexample'. Within this revision, I have for precision amended phrases accordingly but without change of substance.

We could with equal consistency opt to prepare to act instead as if G_c , for, though obliged by the toss of the coin to act as if *some* object is a counterexample to (L), the counterexample might be an object *other than c*.

Presuming with Hume that no evidence can assist us in making the choice, we can do no better than flip our coin a second time and yet again prepare to act accordingly.

If the second toss shows heads, prepare to act as if c will be a counterexample to (L).

If the second toss shows tails, prepare to act as if some object *other than c* is a counterexample to (L) (to act, that is, as G_c).

In summary, we can proceed no more rationally when preparing to encounter c than to flip an unbiased coin and, if needed, do so again.

If the first toss shows heads, prepare to act as if (L) is true (to act, that is, as if G_c).

If, instead, the first toss shows tails, flip the coin again!

If the second toss shows heads, prepare to act as if c is a counterexample to (L).

If the second toss shows tails, prepare to act as if some object *other than c* is a counterexample to it (to act, that is, as if G_c).

The Remarkable Consequence

The option of tossing the coin a second time may appear once again to have gotten us no closer to the goal of acting with warrant as if (L) is true. Upon closer examination, however, the option has shifted the odds of the outcome of the game dramatically from 1:1 to 3:1, for one of the ways of acting in response to the second toss of the coin is *equivalent* to acting as if (L) is true.

To prepare to act as if some object *other than c* is a counterexample to (L) is to prepare to act as if G_c ! – as if, that is, (L) is true.

When acting as rationally as possible, therefore, the odds of acting as if (L) is true are identical to the odds of acting as if G_c – namely 3:1.

Preparing to act as if G_c is more rational than preparing to act as if c will be a counterexample to (L), for were we to act in accordance with the tosses of an unbiased coin, we should with odds of 3:1 prepare to act as if G_c . Preparing to act as if G_c , however, is *equivalent* to acting as if (L) is true.

Given our options for preparing to encounter c , therefore, it is more rational by odds of 3:1 to *act as if* (L) is true than to prepare to act as if c will be a counterexample to it.

Had we a coin known to be unbiased, therefore, and were we by tossing it to decide how to prepare to act when encountering c in a manner 'than which no more rational can be conceived' while respecting Hume's insistence that we can never know (L) to be true), we ought to act – with odds of 3:1 – as if (L) were true.

What is the relevance of all of this to the problem of induction in the 'real' world – the world within which decisions must be made without recourse to tosses of unbiased coins? Decisively this:

Were we, before encountering c , to *act as if* (L) is true, we should be acting in accordance with the most rational choice that we could have made – the choice that tossing an unbiased coin would have determined for us with odds of 3:1, were such coins available.

Were we instead to prepare to act as if c would be a counterexample to (L), we should be acting with lesser odds (1:3) contrary to the most rational choice that we could have made.

The moral is clear:

If we wish to act as rationally as possibly, we ought to *act as if* (L) is true.

Conclusion

We have now solved the pragmatical problem of induction. Recall the question?

Are we justified in *acting as if* (L) is true?

The logic of the problem of induction compels us to decide whether we should act as if (L) is true or that some object is a counterexample to it. Had we an unbiased coin to toss (twice if needed), we could with odds of 3:1 confirm that we ought to act as if (L) were true. Having no unbiased coins but wishing to act most rationally, we ought therefore to act as nearly as possible in accordance with those odds.

We ought, that is, to *act as if* (L) is true.

As a postscript, let me dissolve an objection to the above argument that might at first glance prove distracting.

Objection: 'You have construed the options on the tosses of a coin in one way, but there are others less advantageous. Suppose, for example, one were instead to subsume the options of acting with respect to (L) as twofold under a single toss rather than fourfold under two of them.

If the toss shows heads, prepare to act as if G_c (as if, that is, either (L) is true or some object *other than* c is a counterexample to it).

If the toss shows tails, prepare to act as if c is a counterexample to (L).

This procedure is as effective as your own and respects equally Hume's claim that we can never know (L) to be true, but the odds of acting as if (L) is true (preparing to act, that is, as if G_c) are now no better than 1:1. Given such alternative construals, we have no warrant to prefer your own.'

The pragmatic response to this complaint is straight-forward. One may choose to act in accordance with any procedure with respect to (L) that is effective and conforms equally with Hume's prohibition. The one that I have proposed, however, is the only one known to me that solves the pragmatic problem of induction!

Absent an argument to its impotence, therefore, one ought – pragmatically speaking! – to act upon it rather than others, for its explanatory power is unmatched.

The pragmatic problem of induction is solvable because the epistemological problem has no solution. Who, then, needs an epistemological solution? We, contra Hume, can distinguish rational action with respect to the future without it, and rational action coincides with our behaving in accordance with our best-tested scientific conjectures.

Who could ask for anything more?