On the Possibility of Inductive Knowledge

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Abstract

In this paper, we utilize a disjunction of familiar inductive beliefs—the disjunction being deductively valid—to show that we most likely have inductive knowledge, the likelihood depending on the usual inductive considerations like size and robustness of the sample, etc., i.e. on what it should depend on, not the usual 'philosophical' culprits like the old and new riddles of induction. While this is in itself philosophically significant, the implications of this for a justification of induction are also explored. Induction will be found to be supported but not justified by the proposed example. Lastly, to address this lacuna, and deriving support from the example, an abductive justification of induction will be sketched.

Modern epistemology and philosophy of science have their roots in Plato’s Theaetetus and Aristotle’s Posterior Analytics respectively. Epistemology is concerned with the definition of knowledge, taking as a starting point Plato’s ‘justified true belief’ definition and going on post-Gettier to consider whether justification needs to be supplanted or supplemented in order to rule out cases of beliefs that are only accidentally true; a key question for epistemologists is whether under any proposed definition we can be said to know anything. Philosophy of science is concerned with what methods we must employ and the ways we must employ them in order to have scientific knowledge. Aristotle for example in different places considers deduction, induction and abduction (i.e. inference to the best explanation) as methods to use when doing science. Aristotle says ‘dialectic’ not abduction but it’s clear that dialectic for him is a tool for doing abduction.
The overlap between epistemology and philosophy of science is over the question of inductive knowledge, both subjects suffering from what might be called ‘deduction-envy’, or the way in which support for induction pales in comparison to the certainty of deduction. Epistemology asks whether inductive knowledge is possible and philosophy of science asks whether the method used in obtaining it—induction—is non-circularly or, as some would have it, circularly but virtuously-circularly, justified.

In this paper, we’ll argue we’re in possession of inductive knowledge. The definition of knowledge we will try to satisfy will be the familiar starting point since Plato, the JTB or justified true belief definition, though ‘tipping our hat’ to Gettier, we will note that part of the justification for our knowledge claim, being deductive, is 'Gettier proof'. Along the way we’ll sketch an abductive justification of induction.

In arguing that we’re in possession of inductive knowledge, we will not be concerned with questions like whether I know there is a table in front of me which is commonly regarded as inductive in the sense of not deductive. The sort of inductive knowledge we will be concerned with will be that the n+1\textsuperscript{st} A is a B given that the first n A’s have been observed to be B’s, i.e. the problem of projection. The connection between projection-type knowledge claims and claims like ‘I know there is a table in front of me’ can be traced at least to Aristotle’s inductive model of concept formation sketched by way of the 'sensations making a stand' metaphor of the \textit{Posterior Analytics}. We may note that this model, with the advent of theories like Chomsky’s generative grammar and Fodor’s modularity of mind, has become somewhat
discredited in favor of an emphasis on innate knowledge reminiscent of Plato without the latter’s idealism. Be that as it may, we will be concerned with projection-type knowledge claims based on universal generalizations which seem to fall squarely in philosophy of science’s camp. But we will not be primarily concerned with justifying induction in the sense of justifying the rules we follow in making any projection as others have attempted (Reichenbach for example). We will instead show that we deductively know one of our inductive beliefs is true before it’s exhausted. So we will have non-accidentally true belief. The justification component of our knowledge claim will be by way of the abductive justification of induction we will sketch. Thus we will have shown that we have inductive knowledge in the sense of a true, noncircularly-justified, inductive belief which is the payoff for epistemology.

The payoff for philosophy of science will be the abductive justification of induction we will have sketched along the way.

So without further delay let me state the example:

Let B be the conjunction of all my cherished inductively-supported beliefs (with the background b that I haven’t seen an exception to B yet).

Let P be the inductive proposition that I will not see an exception to B in my lifetime (this may’ve been inductively supported on a personal level by my not having seen any exceptions to B so far; or on a species-wide level by the knowledge that all prior human lives have ended
without seeing exceptions, at least to B, though over the years, human beings have certainly seen exceptions to other ‘cherished’ inductively-held beliefs);

Let S be the proposition that I will live to the next moment (this presumably is inductively supported by my having survived this many moments);

Then the disjunction P or S must be true because it is deductively valid. If P is false then I will have lived at least one more moment to see an exception to the conjunction of all my cherished inductively-supported beliefs—i.e. S is true. On the other hand, if S is false and I will not live to the next moment then I will not have seen an exception to my cherished inductively-supported beliefs in my lifetime—i.e. P would be true. Note: it is interesting to observe that something as strong as the conjunction of all inductive beliefs can be used here instead of any single induction like, ‘Given that the sun has risen in all human memory, it will rise tomorrow’. At any rate then to summarize we know P or S must be true because the disjunction P or S is a logical truth; or in other words, we know with complete epistemic as well as psychological certainty that at least one inductively-supported projection is true.

Some may take this in itself as sufficient reason to think we have inductive knowledge because both P and S are substantive inductive propositions, we believe them and we have a deductive justification for the claim one of them must be true. Needless to say, the justification being deductive is Gettier-proof in the sense that the claim is non-accidentally true. Here I should explain further what I mean by ‘Gettier proof’. Gettier took a justified but false belief
and disjoined it to a (accidentally) true belief, the disjunction also being believed. The disjunction then is a justified true belief that fails to count as knowledge. More recently, examples have been offered that don't use disjunction per se but rely on the justified belief being only 'accidentally' true as in the fake barn case first proposed by Goldman. In that case we're in fact looking at a real barn (i.e. our belief that we're seeing a real barn is true) but because we could've just as easily been looking at a fake barn being in 'fake-barn country', some would say we don't have knowledge though we have justified true belief. What I mean by 'Gettier proof' is that if we believe P and S, and we know the deductive reason why one of them must be true, at least one of our beliefs can't be only accidentally true; it is Gettier proof.

Still it should be noted however that the justification in question is of a slightly unusual sort being a justification of a disjunction rather than any one proposition. This indicates the need for a justification for each of P and S separately. If one was forthcoming, then we will have justified true belief which is Gettier-proof; we will have shown we have inductive knowledge. But before we sketch that abductive justification of induction which is the basis of our beliefs P and S separately, let's consider an example that seems to support the claim that we already have inductive knowledge.

Suppose Goldbach's conjecture (G) and Fermat's theorem before it was proved—we will call it Fermat's 'conjecture' (F)—were supported by inductive methods Mg and Mf respectively among a series of inductive methods Mi (in fact both G and F have been supported inductively by informed computer-aided sampling). Suppose further it was proved mathematically that
one of them had to be true, that is G or F was deductively valid. What would we know? We would know one of them was true. And if either Mg or Mf were independently justified, we could say we had inductive knowledge in the sense that at least one of our inductively-derived knowledge claims would be true. Moreover, we would be justified in investigating Mg and Mf more closely to the exclusion of the other Mi as one of them might in general lead to inductive knowledge, that is inductive mathematical knowledge if sense can be made of that. I.e. Mg and Mf would derive support from the proof that either G or F had to be true.

This is analogous to the present situation. The proof that P or S is deductively valid, supports the claim that we may be in possession of inductive knowledge. Still it might be alleged that we don't have inductive knowledge because we can't say what we know or which one of P or S we know. But this is not necessary: we can say we know both P and S; it just might be--though we have no reason to think so--that one of our assertions is false. Similarly, if we adopt the JTB definition augmented with the Gettier-motivated non-accidentally-true provision, we can say we know that we know both P and S; it just might be--though we have no reason to think so--that one of these assertions too may be false. Of course P and S will need to be independently justified for one of our assertions to count as knowledge but induction as a method may be said to derive support from the proof that P or S is valid. At any rate, the key purpose of the P or S example is to show deductively that one of our inductive beliefs is non-accidentally true. We just wait on a independent justification of P and S, that is we wait on a
justification of induction. But before we get to that, let’s make some further points about our example.

First, it should be further noted that this argument schema doesn’t prove too much, for example, it can’t be used to show we have abductive knowledge. If we let B be the conjunction of all our cherished abductively supported beliefs, the corresponding P (that we won’t see an exception to B in our lifetime) is not itself an abductively supported proposition; it is at best an inductively supported proposition, supported by the experience of not having seen an exception to B so far. Disjoining the new P with S again yields a deductively valid proposition for the same reasons as before, but once again what we’ve shown is that one of our inductively held beliefs must be true. What must be true is either that I won't see an exception to some appropriately characterized class of beliefs in my lifetime (given I haven't seen one so far) or I will survive to the next moment. Both of these are inductively-supported propositions.

Now we might wonder how a deductively-valid proposition could pack so much empirical ‘oomph’. Both P and S are significant inductive predictions, perhaps the most significant we’ll ever make. The answer is two-fold: part of the oomph factor is due to the skeptic’s concession of background b, namely the supposition that I haven't seen an exception to B yet which is a significant empirical proposition; the other factor is the fact that even if I die now I will (by dying before an exception to B is seen) have fulfilled an inductive prediction, a prediction based on the countless human lifetimes that have passed without seeing an exception to B. Without these factors, the disjunction only says 'I will die now or I will live to the next
moment’, which is as vacuous as we’re used to deductive truths being. P or S only follows if b is true, that is P or S is not deductively valid but 'if b then (P or S)' is or can be made to be by means of suitable assumptions about the meanings of the words used therein. But the inductive skeptic grants b, so we may assert P or S. Note: in what follows, we will just use P or S as our example and for convenience say it's deductively valid, meaning there is a valid argument leading to it as the conclusion.

This example though stated in the first person, can be made to have even more ‘bite’ by replacing the subjective ‘I’ in P or S with the wider ‘we’. The disjunction, ‘Either we will not see an exception to our most cherished inductively-supported beliefs in our combined lifetime as a civilization or we will survive to the next moment’ is a deductively valid statement, and, perhaps contrary to our philosophically trained expectations, P and S are apparently possessed of significant content. That it is deductively valid means one of the disjuncts must be true.

So what’s wrong? Surely this is too good to be true. P and S, at least on a personal level, are two of our most dearly-held inductive beliefs. We’ve just shown one of them must be true and that before either is enumeratively exhausted. There must be something wrong…

Perhaps one could point to the disjoining as the culprit. First, purely on a stylistic note, we should point out that if disjunctive definitions are OK for the inductive skeptic (for example, Goodman), disjunctive hypotheses for the inductive ‘faithful’ (the opposite of the skeptic) should be fair game. More seriously we disjoin hypothesis all the time: the meteorologist tells
us the precipitation will either come down as snow or icy rain; the author tells us in a book preface that no doubt at least one of the statements made in his book is false, which is really a huge disjunction; and so on. The disjoining of two or more inductive beliefs, yields a perfectly legitimate statement we might actually make, inductive as in the snow-icy-rain example or deductive as in P or S, and the preface example. It should be noted that the preface example, though deductive, is not entirely vacuous: the author genuinely believes each statement in his book as well as the disclaimer in the preface. The key difference between the author preface case and P or S—one which rules out the former as an instance of inductive knowledge—is that while both P and S are believed on purely inductive grounds; the disclaimer may be believed on purely deductive grounds.

Or again one may point out that the statement I’ve shown to be necessarily true is a deductive statement not an inductive one. Here I’m reminded of Aristotle’s famous ‘sea-battle’ puzzle. In De Interpretatione, Aristotle says that since it’s true today that there will be a sea-battle tomorrow or there won’t be a sea-battle tomorrow, one of the disjuncts is true today and we appear to have determinism on the cheap. Analogously to one solution to this puzzle, it may be said that all I’ve shown is: it is necessarily true that P or S; I haven’t shown it is necessarily true that P or it is necessarily true that S. To this, I only say that to show I have inductive knowledge, I have to show that necessarily some inductive hypothesis or projection is true, not that one must be necessarily true. Or in terms of the sea-battle debate, necessity need not distribute across disjunctions as long as truth does; i.e. from it is necessarily true that P or S,
we can safely conclude it is necessary that (P is true or S is true). Or in other words, it is necessary that at least one inductive hypothesis is true. The fact that truth but not necessity can distribute across disjunctions takes the ‘surprise’ out of Aristotle’s sea-battle example by defusing determinism, while here it permits the surprising—to philosophers—result that one of our inductive projections is true before it’s exhausted.

Then again someone may try a reductio along the following lines. There’s nothing extraordinary about my example. We often deductively prove the disjunction of two inductive propositions. Suppose we have good inductive reasons based on the presence of clouds and the suddenly cooler temperature to believe it will rain; but we also have good inductive reasons based on the barometric pressure and the absence of wind to believe it won’t rain. Then the disjunction it will rain or it won’t rain is deductively valid. Why can’t we conclude from this that at least one inductive hypothesis is true? I.e. aren’t we proving the existence of inductive knowledge too easily?

The difference between the preceding excluded-middle example and our P or S is that while we might have good inductive grounds to believe each proposition in an excluded-middle case, we can actually believe only one and it might be the other one that’s true. So to answer the question which ended the preceding paragraph, we can conclude from the rain-disjunction that at least one inductively-supported proposition is true before it's exhausted but not one inductive belief. And without belief we don’t have knowledge. Compare that with the case of P or S: we whole-heartedly believe both disjuncts; moreover both disjuncts can be (and
hopefully are) true. And as argued earlier, it can be demonstrated that one of P or S must be true before it’s exhausted.

Now we should be careful about proving too much in confirmation theory. It is like walking on railroad tracks without touching the proverbial ‘third rail’. The third rail in the subject of confirmation is proving an inductive hypothesis. Note: this I haven’t done, because P or S is a deductive statement not an inductive one; the fact that it’s deductive gives a deductive argument for the claim that at least one inductive belief is true before it is exhausted; it does this without giving a deductive justification, or any other justification, for any particular inductive belief; so the third rail hasn’t been touched since we’ve shown the existence of a true inductive belief without specifying what that belief is.

But we might wonder whether the proven statement alone yields incontrovertible support for an inductive hypothesis like either P or S separately. For example, since prob(P|P or S) > prob(P) and prob(S|P or S) > prob(S), we might wonder whether, having established P or S, we can go further and claim that it is evidence for either P or S separately. This might be the case if either of the inequalities in the preceding sentence were strict because prob(h|e) > prob(h) is commonly taken to be a necessary condition of evidence. In other words we might have evidence for the hypothesis that we will not see an exception to our cherished inductively-supported beliefs in our lifetime; or for the hypothesis that we will survive to the next moment. That would surely be proving too much; it might be a true reductio. Thankfully, this consequence does not arise:
\[ \text{prob}(P|P \text{ or } S) = \text{prob}(P \text{ or } S|P) \times \text{prob}(P) / \text{prob}(P \text{ or } S) \] (from Bayes Theorem);

\[ = \text{prob}(P), \text{ since } \text{prob}(P \text{ or } S|P) = 1 \text{ and } \text{prob}(P \text{ or } S) = 1 \text{ because } P \text{ or } S \text{ is a logical truth.} \]

Therefore \( \text{prob}(P|P \text{ or } S) \) isn’t greater than \( \text{prob}(P) \) and \( \text{prob}(S|P \text{ or } S) \) isn’t greater than \( \text{prob}(S) \).

Thus if \( \text{prob}(h|e) > \text{prob}(h) \) is a necessary condition for evidence, \( P \text{ or } S \) being a logical truth is not evidence for either \( P \text{ or } S \) separately—in fact, the preceding probabilistic argument shows that no deductively-valid proposition can be—surprise, surprise!—‘evidence’ for anything. So in particular, \( P \text{ or } S \) separately can’t draw any evidential support from the demonstrated truth, \( P \text{ or } S \) alone (though later we'll see how they do in the presence of abductive considerations of what it is rational to believe). For now they have to stand on their own.

This is where a point about Goodman's 'grue' needs to be made. Goodman in *Fact, Fiction and Forecast* asks us to consider the famous grue-predicate, where we say \( X \) is grue iff \( X \) is examined before some time \( t \) and found to be green or blue otherwise. Goodman argues that if instances confirm generalizations a la Hempel, ‘All emeralds are grue’ is as well confirmed by emerald observations to date as ‘All emeralds are green’. Nor does the appeal to simplicity help since if we take grue and an appropriately defined bleen as our base predicates, green and blue turn out to have ‘complex’ definitions.

Now we note that \( P \text{ or } S \) being deductively valid doesn't support 'All emeralds are green' any more than 'All emeralds are grue'. Both a green-theorist and a grue-theorist can claim to have
inductive knowledge, though they could have very different ideas about how to project any
given inductive hypothesis. That is as it should be: if we were a 'form of life' that found grue
more projectable than green, we would still know one of our inductive beliefs was true before
it was exhausted since the proposition 'we won't see an exception to 'All emeralds are grue' in
our lifetime or we will survive to the next moment' is still deductively valid. P or S is valid for
both the green-theorist and the grue-theorist yet surprisingly it does provide justification for
the claim that at least one inductive hypothesis is true before it’s exhausted.

So what have we shown? We have shown deductively that one inductive belief is true and
since deduction means that it’s not accidentally true, we have shown we have inductive
knowledge—that is if we can show P and S are independently justified!

A justification of induction that proceeds along the latter lines might ‘explain’ why induction
is generally a valid mode of reasoning; it may draw upon analysis of related concepts like
'causality', 'necessity', or 'law of nature', which have been affiliated with induction since
Hume; it might even be the abductive justification of induction we alluded to at the outset. If
so, I would bet that inductions such as P or S separately come out as valid under any such
rules. In any case, it's no wonder then that induction theorists from Hume have proceeded
along these lines which have generally yielded at best ‘skeptical solutions’, i.e. solutions
which explain why we believe in induction without being thereby justified in the belief. I
myself think induction can be justified but before we sketch the argument, let me step back a
bit and characterize or put into context this account composed of what the skeptic concedes and the example P or S.

In essence, the example makes a virtue of finitism: just as Goodman exploits the finite nature of inductive sample sizes to argue for his skeptical solution, so I have exploited the finite nature of lifespans, playing them off against the finite size of our inductive samples, to justify the claim that one of our inductive projections is true before being exhausted.

This point about finitism deserves to be explored further as it motivates our abductive justification of induction. As Hume or even Goodman might say, past successes condition us to believe future predictions. Nowadays, however, we’ve come to expect that any generalization about the world—even one so well ‘justified’ inductively as the sun will rise tomorrow—holds true only for a finite though perhaps a vast amount of time. This is sometimes taken to imply negative induction, which is the claim that successive instances can actually disconfirm a generalization. With that in mind we may say n observations of A’s that are B’s doesn’t justify ‘All A’s are B’s’ but it may well justify the belief that at least the next A is a B.

Now I should quickly point out that nothing I’ve said so far justifies this inference. So far I’ve only been concerned to deductively show that we know one of our inductive beliefs is true. But if this is taken to mean we have inductive knowledge, it would be odd if induction wasn’t in some sense justified. Thus a justification for induction in the limited sense of ‘at least the
next A’—perhaps an abductive justification—may be expected. Without further delay, let us sketch it.

That only the n A’s observed so far are B’s puts us in the unlikely position of being at the crux of a turning point in the course of time. That at least the next A is a B is a better explanation of the observed regularity than the ‘buck stops here’. It is better because it is more likely being a disjunction of infinitely many hypotheses, namely that the next A is a B and that the next two A’s are B’s, the next three and so on. Just n A’s are B’s (or rather this consecutive A, B series has only n instances) can come about only one way. Admittedly the proposition that at least n A's are B's is still more likely, being certain given the evidence, but this is not a projection. If we want to make a projection, the most likely one is that at least the next A is a B, that is we have a prima facie reason for such a supposition, at least till a contravening reason presents itself. And a projection must be made if we’re to have some explanation of why the n A’s observed so far have been B’s, the explanation being more pressing as n, the number of observations grows larger. The explanation would ultimately be that the n observations have come in the midst of a larger series of A’s that are B’s, the larger series itself perhaps explained by still larger series until we arrive at something we call a law of nature. This law of nature may be the metaphysical ground for our inductive projections just as the preceding probabilistic argument is ultimately the epistemological ground.

Now since probabilistic reasoning is used it might be tempting to flush this out with a rigorous mathematical, i.e. deductive treatment. While that may be illuminating I suspect it would
ultimately fall to the charge of being question-begging at least while it pretends to deductive
certainty. First there is the issue of whether a projection needs to be made at all. Remember,
the probabilistic reasoning of the preceding paragraph only is an argument that the next A is a
B if some projection about the next A must be made. Then there is the whole question of what
sort of probabilities are being assigned. They must be subjective since objectively how many
A's are B's is presumably determined and not stochastic. Then the question becomes what is
the basis of the subjective probabilities. Perhaps some appeal to the principle of indifference—
the principle that when possibilities are indistinguishable, equal probabilities may be assigned
to them—would help. But are exactly n A's that are B's equiprobable as n+1 A's, as n+2 A's
and so on? Without some assumption about their relative magnitude, the conclusion that at
least the next A is a B doesn't go through. The induction skeptic could say that a felicitous
arrangement of subjective probabilities is just what he's questioning. There is always the
possibility that the possibilities, though indistinguishable now, may turn out to be significantly
different. This is essentially the point that we have a prima facie reason to apply the principle
of indifference, at least until the possibilities distinguish themselves. No--it is best to
characterize this as an abductive account since as I contend the principle of indifference as
well as the need to make a projection in order to come up with an explanation of the observed
regularity are abductive considerations.

The above is our abductive response to the old riddle of induction. (Here we should emphasize
that P, though it says 'an exception won't be seen in our lifetime', can be put into the form of a
projection of just the n+1st case by letting the inductive support for P be all the lives that have passed without seeing an exception to B, the current life being the n+1st case.) At any rate, for either P or S to count as an instance of knowledge we need to answer the new riddle as well, at least as it applies to P and S. Whereas the old riddle asked us to justify the projection of an observed regularity, the new riddle asks us to distinguish that regularity from a contrary regularity that also fits the observations to date. While the abductive account sketched so far might address the first riddle, it cannot by itself solve the second for consider: both P and P’ where P’ is 'I won't see an exception to B till time t but will see at least one after t' are consistent with the evidence to date. The same goes for S and S’ where S’ is 'I have survived to t but won't survive to the next moment'. How can we claim to know P or know S if we can't rule out P’ and S’?

The answer is we can rule them out abductively. We've established P or S as deductively valid, but as we saw P or S can't confirm or disconfirm anything, in particular they can't disconfirm P’ or S’. So how do we rule them out? The answer is to consider what might be rational epistemic goals. We wish to maximize the probability that one of our beliefs is true while minimizing the probability that any of our beliefs are false. For the latter reason we don't countenance any contradictory beliefs. Now consider the set of propositions {P, P’, S, S’}. If we wish to avoid contradiction we can believe at most the following: {P, S}, {P, S’}, {P’, S} or {P’, S’}; taking all combinations of 3-at-a-time and 4-at-a-time would involve a contradiction, while taking only one won't be maximal, i.e. we would be missing an opportunity to believe a
truth where abductive considerations dictate it or its contrary be believed. Of the four 2-at-a-
time possible belief sets, only the first if disjoined (i.e. to maximize the probability that one of our beliefs is true) has probability 1; the rest are all less than 1. This shows it is rational to believe \( P \) and \( S \) over their grueified competitors \( P' \) and \( S' \).

The argument though formalized is essentially simple: we have to believe \( P \) or \( P' \) and \( S \) or \( S' \). (This is because, as the abductive argument which addressed the old riddle of induction indicated, we must make some kind of projection if we're to explain a regularity). Then it makes sense to believe \( P \) and \( S \) as that way at least one, and possibly both, of our beliefs would be true. And we'd be justified in believing \( P \) and \( S \) especially if a common method was used for arriving at \( P \) and \( S \), even if we couldn't as yet distinguish in an epistemically relevant sense that method from the method that could've been used to arrive at \( P' \) and \( S' \). (Here I should mention the possibility that \( P \) or rather \( B \)--the conjunction of all my cherished inductively-held beliefs--may be inconsistent. That is, like the preface paradox, it may contain the belief, itself inductively believed, that I will see an exception to \( B \) in my lifetime. For such a case, \( P' \) or \( S \) will also have probability 1, but then \{\( P, S \)\} and \{\( P', S \)\} would be indistinguishable.)

So while \( P \) may contain the belief that I won't see an exception to grue in my lifetime, \( P \) can't itself be 'grueified', or rather it can be grueified but the resulting \( P' \) and \( S' \) can't be disjoined to yield a valid proposition as can \( P \) and \( S \). This was to be expected since \( P \) or \( S \) is deductively valid. While an inductive proposition can be grueified to yield another inductive proposition, a
deductive proposition can't be grueified to yield a deductive proposition. What this shows is that there is an important distinguishing feature that P and S have that P' and S' lack: the former can be disjoined to yield a valid proposition; the latter can't. So we know one of P or S is true but we don't know if one of P' or S' is true. This is a relief since if we knew the latter that would make a mockery of the former as grue makes a mockery of the supposition that instances confirm generalizations.

Of course this is not a general answer to Goodman's new riddle. It only saves P and S from its ensnares, not for example green over grue. And needless to say, this justification of P and S, relying as it does on epistemic goals and what it is rational to believe, is like our answer to the old riddle, abductive.

Some may view an abductive justification of induction or inductive knowledge as akin to a proof of the consistency of arithmetic if we assume set theory--a case of justifying in weaker grounds the thing we're trying to prove. But we should be mindful of what we're trying to prove: a method that however carefully applied has led us astray in the past. So perhaps abduction though weaker than deduction is a stronger ground than induction. Perhaps we should be content to have non-circularly thereby given a partial justification of induction (our response to the old riddle), giving independent justification for believing P and S and thereby showing we have inductive knowledge. We have inductive knowledge because P and S are justified beliefs and at least one of them must be non-accidentally true. Here we should reiterate briefly why they are justified. They are justified inductively and here the strength of
the justification would depend on the usual considerations like the size and robustness of the sample, etc. The abductive argument we've sketched just (hopefully!) removes any of the 'philosophical' doubts we might've had about either P or S.

Some such abductive justification of induction may have been proposed before—the literature is so vast, I can’t be sure. It just can be taken more seriously now because before there was no non-question-begging reason to be justified in the belief that any inductive projection was true before it was exhausted. No doubt there may be other criticisms of this abductive account. I do not wish to go into them here. Suffice it to say that a deductive justification for the claim that one of our inductive beliefs is true as we've seen supports if not justifies, the above-sketched abductive account.

In summary then P or S being deductively valid shows that one of our inductive beliefs must be true. This can itself be taken to mean we have inductive knowledge or it may require the abductive justification of induction sketched herein. We might wonder then whether the example P or S has anything further to say about a justification for induction. Here I would say the usefulness of P or S as a skeptical solution shouldn’t be ignored. Some readers may indeed view it as a skeptical solution since it doesn't adjudicate between grue and green (though it does adjudicate between P and P' and S and S'!). As a skeptical solution, it’s clear that P or S is different from the skeptical solutions of either Hume or Goodman. While both habit and entrenchment look to the past, P or S ostensibly looks toward the future. And it could be a skeptical solution in the sense that our belief in P or S could persuade us that induction is
justified even if it should turn out that it’s not. After all, one common expression when we’re proposed an unlikely proposition (in this case that one of our cherished inductively-supported beliefs is false) is to say, ‘…I should live so long’, which is rather like the considerations that originally led me to formulate P or S.

But perhaps we shouldn’t be so pessimistic. Maybe the situation is like Fermat’s theorem: a valid non-intuitive proof will spur the search for a more satisfying, i.e. more intuitive, proof. So maybe now having demonstrated that at least one inductive prediction must be true before being exhausted, we can look forward to the day when an inductive hypothesis will be justified by giving a justification of the rules that went into our coming to believe it. Perhaps the abductive account sketched here, appropriately flushed out, can suffice to address philosophy of science's induction skeptic as I contend we’ve answered epistemology's skeptic about inductive knowledge.

Or, the situation might be like the one in mathematics after Godel’s incompleteness theorems: we know there are unprovable truths of mathematics (just as we now know for certain there are unexhausted inductive truths) but aside from those constructed for particular Godel-numberings (or ‘constructed’ disjunctions like P or S in the case of inductive knowledge), we might never know what they are.
References


