How (Not) to Justify Induction

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Abstract
A conceptual analysis of the problem of induction suggests that the difficulty of justifying probabilistic reasoning depends on a mistaken comparison between deductive and inductive inference. Inductive reasoning is accordingly thought to stand in need of special justification because it does not measure up to the standard of conditional absolute certainty guaranteed by deductive validity. When comparison is made, however, it appears that deductive reasoning is subject to a counterpart argument that is just as threatening to the justification of deductive as to inductive inference. Trying to explain induction in such a way that it satisfies a special justificatory requirement in contrast with deduction is therefore not the way to justify induction. An alternative approach is sought in a style of justification developed by Aristotle for the law of noncontradiction and by Kant for the conclusions of transcendental reasoning that with variations can be used to justify both deduction and induction. This strategy upholds a principle when the principle must be presupposed even to raise doubts about the principle's justification.

1 A Stock Objection

The problem of justifying induction purports to show that there is no noncircular validation of probabilistic inference. The standard criticism of inductive reasoning assumes that deduction sets a high requirement for correct inference that inductive reasoning cannot hope to satisfy. Induction, unlike deduction, must therefore make a special effort to validate its methods in the natural as opposed to formal sciences. David Hume, in the classic and still authoritative version of the problem, voices this kind of objection in *A Treatise of Human Nature*, Book I, Part III, section VI, when he writes:

Kriterion – Journal of Philosophy (2011) 24: 1–18.
http://www.kriterion.at

> "Our foregoing method of reasoning will easily convince us, that there can be no *demonstrative* arguments to prove, *that those instances, of which we have had no experience, resemble those, of which we have had experience.* We can at least conceive a change in the course of nature; which sufficiently proves, that such a change is not absolutely impossible. To form a clear idea of any thing, is an undeniable argument for its possibility, and is alone a refutation of any pretended demonstration against it [...]. According to this account of things, which is, I think, in every point unquestionable, probability is founded on the presumption of a resemblance betwixt those objects, of which we have had experience, and those, of which we have had none; and therefore it's impossible this presumption can arise from probability." (cf. [9, pp. 89f])

A. J. Ayer in *Language, Truth and Logic*, similarly argues:

> "The problem of induction is, roughly speaking, the problem of finding a way to prove that certain empirical generalizations which are derived from past experience will hold good also in the future. There are only two ways of approaching this problem, and it is easy to see that neither of them can lead to its solution. One may attempt to deduce the proposition which one is required to prove either from a purely formal principle or from an empirical principle. In the former case one commits the error of supposing that from a tautology it is possible to deduce a proposition about a matter of fact; in the latter case one simply assumes what one is setting out to prove."[1] (cf. [3, p.49])

Hume assumes that what is conceivable is possible. He argues that, without contradiction, we can always conceive that a future course of events might fail to resemble an established pattern of event regularities. It follows, if indeed conceivability entails logical possibility, that it is also logically possible for any established pattern of causal regularities to change at any point in time, even if in fact they never happen to do so. As a result, there can be no logical proof of the necessity that the future will resemble the past. Further, Hume claims that it is futile to try in the most general terms to justify the probability of a new experience conforming to previous experience by appealing to the fact that in the past such regularities have occurred. Any such method commits a vicious circularity by assuming without effecting to justify the presumption that the future will resemble the past.

Ayer's statement of the problem replicates Hume's dilemma according to which induction could in principle only be justified deductively or inductively. Induction, however, cannot validly be deductively justified, because by virtue of its conceivability it is always possible for the future not to resemble the past. This is another way of saying that it is deductively invalid to derive merely probable logically contingent propositions from logically necessary propositions, and that induction cannot be inductively justified on pain of vicious circularity. Thus, the problem of induction, with subtle variations and ingenious applications has been handed down to posterity.[23]

Simplifying the dilemma that underlies this common complaint against the logical legitimacy and epistemic correctness or reliability of induction, the stock objection to the justification of inductive reasoning can be reformulated in these terms:

(A) Against Induction (Hume-Ayer)

(1) Induction cannot be deductively justified. Pure deductive forms of reasoning are not sufficiently contentful validly to support the inference of any logically contingent proposition concerning a future occurrence or generalizations from a sample of a population to all its constituents. Deductive reasoning furthermore involves only logical truths, so that the attempt to deductively infer merely logically contingent probabilistic truths is bound to be deductively invalid.

(2) Nor can induction be inductively justified, since that would be viciously circular.

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(3) If induction can only be justified deductively or inductively, then induction cannot be justified.

The problem of induction, perspicuously in this formulation, as in its most widely discussed expositions, poses a special challenge for inductive reasoning. Deduction in contrast appears to be perfectly in order; it sets a gold standard of modally necessary and epistemically certain inference that induction cannot hope to attain. Induction does not enjoy the same status, but stands as a weak and watered down mode of logical implication that compares unfavorably with deduction; it is at best a poor second cousin to deductive reasoning, whose justification we may be disposed to think is nowhere in doubt.

The standard problem of induction has been so conceived as to place a special onus on probabilistic inference to establish its epistemic credentials because it is not as strong or absolutely reliable as deduction. Induction has a difficult task of accreditation because it fails to measure up to the demanding benchmark of valid deductive inference. Where the truth of a deductively valid argument's assumptions logically guarantees the truth of its conclusions, in situations where it is logically impossible for the assumptions to be true and the conclusions false, even the most strongly supported inductive inference offers no such guarantee in upholding the merely probable truth of its conclusions from the unqualified categorical truth of its assumptions. What is ultimately suspect about induction, the reason why it stands in need of justification which the problem of induction declares it can never adequately provide, is that it is not deduction, that it is not as good or strong, necessary, certain, or epistemically reliable, as deductive reasoning, and therefore needs to prove itself worthy of consideration as a legitimate way of expanding knowledge.[4]

The standard problem of induction presupposes that induction needs to be justified in ways that deduction does not, and that induction in one way or another falls short of the mark. Logicians and argumentation theorists who propose to distinguish between informal and symbolic logic on the basis of a presumed limitation of formal logics to deductive systems sometimes call attention to the problem of induction. Often, they want to show that inductive reasoning, despite the availability of sophisticated statistical mathematics formalizable within symbolic logic, is somehow part of informal critical reasoning rather than symbolic logic simply because it is supposedly not thoroughly deductive. That, in one sense, is why there is a problem of induction. If we think of the problem of induction as an unfulfillable need to justify the probabilistic mode of inductive inference measured against the unimpeachable certainty and necessity of deductively valid inference, then inductive reasoning will obviously never be able to live up to the semantic and epistemic advantages of its deductive cousin. Is the assumption correct, however? Is it true that deduction stands in no need of epistemic justification, but sets the standard against which induction is inevitably judged as comparatively unjustified, because it is not as strong and certain as formally valid deduction?

2 *Parallel Limitations of Deductive Reasoning*

The assumption that induction fares unfavorably in comparison with deduction, a key unspoken presupposition in the problem of induction, is unwarranted. On reflection, we can see that both induction and deduction can be described as limited in parallel ways. This implication in turn has interesting consequences for understanding the relation between inductive and deductive thinking, for efforts to justify inductive and deductive inference, and in attempts to justify induction in answering the problem of induction in light of the dilemmas offered among many others by Hume and Ayer.

Here is a parallel objection to deduction that mirrors the standard Humean criticism of the justification of induction:

(B) Against Deduction

(1) Deduction cannot be inductively justified. Induction offers only probably true conclusions that are not strong enough to uphold the necessity of deductively valid inferences.

(2) Nor can deduction be deductively justified – that would be viciously circular.

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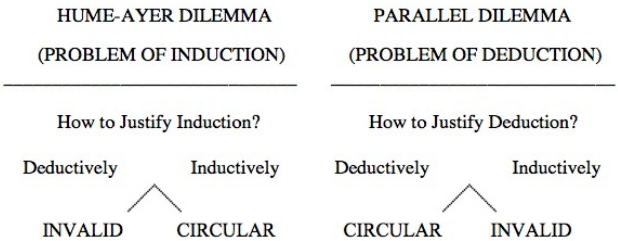
(3) If deduction could only be justified deductively or inductively, then deduction cannot be justified.

The collective force of arguments (A) and (B) might be paraphrased more simply as the conclusion that reasoning of any kind cannot consistently hope to justify itself. Put this way, the objections in (A) and (B) do not sound quite as startling or revolutionary as when only (A) is presented and the omission of (B) encourages the misleading impression that induction is at a particular justificatory disadvantage vis-à-vis deduction. We have now seen on the contrary that induction and deduction epistemically and justificationally are pretty much in the same leaky boat.

What remains is to ask what follows from the limits of trying to justify any mode of reasoning by itself or by appeal to another contrary mode of reasoning. How shall we understand such modes of reasoning and categories of inference to complement one another by virtue of dividing up the possibilities of justifying lower level kinds of propositions between them in a distribution of labor reflecting fundamental differences in their alethic, doxastic, and epistemic modalities? These are the inherent distinctions in the intended targets, the complementary purposes, of deduction and induction, and of deductive and inductive reasoning, that makes each unsuitable in efforts to justify the other, and leaves only viciously circular self-justifications in the second half of each dilemma to go immediately by the board.

The problem of deduction, as we are now entitled to refer to it, is the mirror image of the problem of induction, as we see in comparing the following dilemmas:



There are two possible directions in which inquiry might now proceed: (1) We could accept global skepticism concerning the possibility of justifying any mode or specimen of reasoning, admitting that no reasoning, deductive or inductive, or deductive or inductive ways of reasoning, can ever be justified. This would evidently be a drastic result. (2) We could try instead to articulate a common type of justification that might be applied with positive effect to both inductive and deductive reasoning.

Thus, if we are wondering how *not* to justify induction, we would be hard-pressed to find a more unpromising direction than to compare induction to deduction as inherently less semantically and epistemically secure, and then try to find ways within the narrow scope of deductive and inductive methods to bring induction up to the same inferential standards that are guaranteed by definition in the case of deduction. We cannot justify induction deductively on pain of invalidity, and we cannot justify induction inductively on pain of circularity. This looks very bad for induction indeed. The situation nevertheless takes on proper perspective only when we further reflect that neither can deductive reasoning be justified by a parallel dilemma. We cannot justify deduction inductively again on pain of invalidity, as we have seen; nor can we justify deduction deductively, on pain of circularity.

What, then, are we to do? We may after all have been mistaken in our unexamined assumption that deduction sets the standard for semantically correct and epistemically reliable reasoning, if, after all, it suffers from much the same problem of justification as induction. How, on the other hand, could there be a better certification of a method of reasoning than to say that deduction provides an unqualified one hundred percent guarantee that if the assumptions of an inference are true then so are its deductively derived conclusions? Shall we then hold firm to the view that deduction unlike induction stands in need of no efforts at justification but belongs to a privileged category of its own?

This, I think, would be a difficult position to defend. What's philosophically good for the goose should be good for the gander. How, in that case, are we responsibly to proceed? In light of the twin dilemmas for inductive and deductive reasoning, we might conclude that all reasoning is specious and surrender our intellects to some sort of universal skepticism at least with respect to the reliability of inference. In most, perhaps the vast majority, of applications, we nevertheless seem to reach semantically and epistemically acceptable conclusions both in our deductive and inductive reasoning. We must therefore be doing something right – but what? It will not do to say that the success of our deductive and inductive inferences is justified by its track record of success, since that would be trying to use induction to justify both induction and deduction. How might we then propose to avoid the erosion of proper deductive and inductive modes of inference presented by the dilemma of trying to justify both categories of methods exclusively by deduction or induction?

Here is a suggestion. Let us continue to look to deduction as induction's inferential ideal, and consider whether there is a way of understanding the justification of deduction that does not require either the doomed pedestrian efforts at justification offered by reasoning models pitched at the same level of inference as ordinary induction and deduction, which we know in advance by now to be disastrously inadequate to the task.

Aristotle, *Metaphysics* 1005^{b}19, endorses the following 'firm' 'first' principle of reasoning, when he maintains: "the same attribute cannot at the same time belong and not belong to the same subject and in the same respect".[5] Although Aristotle does not advance the inductive-deductive dilemma for justifying deductive principles of logic, he seems to recognize that trying to justify collectively the principles of logic by means of or appeal to logical principles is hopeless. Where we cannot derive we may need to presuppose. But what propositions are we right to presuppose? How can we tell if and when we are adopting the right presuppositions? Aristotle and Immanuel Kant millennia later in the *Critique of Pure Reason* with respect to the justification of synthetic *a priori* propositions of a scientific metaphysics offer a promising solution.[6] The method is to identify those principles whose truth we cannot even question without presupposing that they are true. The justification for such first principles of logic is then not merely that they are indispensable according to Ockham's razor, often uncertain in application when we are not exactly sure about what kinds of explanations we need to give and what entities or principles we absolutely need in order to make our explanations work, what reductions remain possible, and the like. Rather, the fundamental concepts and rules of logic and possibly other kinds of propositions are justified on the present proposal instead by virtue of their indispensability even in raising doubts about their truth or indispensability.[7]

This is probably not the place to investigate in detail how Aristotle's and Kant's methods of justifying the most fundamental principles of a science are supposed to work, and whether or not they deliver fully satisfactory justifications from one contemporary philosophical perspective or another. Our topic more particularly is the justification of inductive reasoning. Do Aristotle and Kant gesture toward an intuitively correct justification of induction? The idea of uncovering presuppositions that are strictly required even in order to cast doubt on the semantic integrity and epistemic reliability of inductive inference suggests the following words of justification for responsible inductive practices in the sciences and in philosophical logic and the philosophy of science. The application in the case of induction depends on whether in fact we need to presuppose the propriety of some principles of inductive reasoning in order even to question whether inductive thinking in general can possibly be correct.

Let us therefore ask what must be true in order for it to be possible for us to cast doubt on the semantic and epistemic credentials of inductive reasoning. What do we actually want to know in inquiring, and what must be true in order for us to be able to ask, about the justification of induction? A variety of things, perhaps; but we have learned from Aristotle and from Kant's method of transcendental reasoning to look more particularly in this case for inductive principles that must be presupposed even to question whether induction is justified. Do we find such inductive principles at the foundation of doubt about the justification of induction? I think that inductive expectations do indeed underwrite even the most severe criticism of induction, typically in contrast with deduction under its former halo of necessity and certainty, now tarnished at least somewhat by the dilemma for deductive reasoning that parallels the problem of induction. For what are we asking about in questioning whether inductive reasoning is justified? We want to know among other things whether if we rely on induction given its success in the past it will continue to serve us in good stead in the future. Casting a skeptical glance backward, we also presumably want to know of any past application of inductive reasoning whether it was justified in the sense of providing good reasons for the probabilistic conclusions it supports from probabilistic assumptions, and whether we would be right to do so in the future.

The questions we ask about the justification of induction are all questions as to whether induction succeeds or not, against a background of past data and present or future real world events, including the track record of whatever inductive methods are being considered. This is perhaps most transparent in Hume's original statement of the problem of induction. Hume expresses the problem as one of being able to conceive that the uniformity of nature might suddenly cease to hold true, thereby leaving especially our predictions and many of our explanations in the lurch, without the support of the facts expected on inductive grounds that would normally have occurred if the uniformity of nature had been preserved. The same is true although differently expressed in Ayer's and other formulations of the classical problem of induction. There too we ask especially whether the predictions we make on the basis of inductive principles such as the Bayesian equation will in fact turn out to be correct. If they do not, or if we can imagine that they do not, then we will consider ourselves obligated to withhold approval from whatever inductive principles we may have previously accepted or tried to test. Induction on this model, unlike deduction, must stand proof for itself every time it is used, and risks getting things wrong, depending on whether or not the uniformity of nature continues to prevail. Since we can have no valid deductive or noncircular inductive grounds for supposing that nature will always remain uniform, we never have good grounds for accepting inductive principles or using them in the pursuit of theoretical science and engineering projects in the physical world.

This way of looking at things has already been challenged by juxtaposing the problem of induction in the Hume-Ayer dilemma with a parallel dilemma for justifying deductive reasoning. Certainly, moreover, if we presuppose the uniformity of nature as essential to an effort to justify induction, then we will indeed be caught up in vicious circularity. Bringing in a naïve acceptance of the uniformity of nature will obviously not help resolve the problem of induction if we are trying positively to find reasons for confidence in inductive reasoning. Looking more carefully at the situation we are imagining with respect to a future turn of events in which the uniformity of nature breaks down disappointing our inductive inferences made up to that point nevertheless appears to presuppose inductive reasoning. For in that case we are in effect thinking of our use of inductive methods as hypothetical, and projecting a counterinstance to the truth of the conclusion of an inductive inference. Thus, we could at that point say, if the breakdown in the uniformity of nature is something we as thinkers could physically survive, that our inductive methods have worked fine up to time t, and now can no longer be relied upon. If that is the conceivable or otherwise logically possible situation that philosophers trying to cast doubt on induction's semantic and epistemic credentials need to project in considering whether or not induction is justified, then they are themselves applying inductive methods involving failed implications of a hypothesis in order to raise skepticism about the justification of induction. If induction must be presupposed even in order to question the semantic integrity and epistemic reliability of induction, however, then, as we have argued, precisely in parallel fashion with Aristotle's noninductive, nondeductive justification of the fundamental logical principle of noncontradiction, inductive reasoning stands justified as indispensable even to efforts at its own criticism. We cannot escape from reasoning inductively, in that case, even if a breakdown in the principle of the uniformity of nature were to disappoint our further attempts to apply any systematic inductive principles. We would need to reason inductively even in order to recognize a breakdown in the uniformity of nature, from which it seems to follow on the contrary that the uniformity of nature, while relevant to the success of inductive methods in ordinary cases, is rather a reflection of nature's uniformity than a logical or cognitive presupposition of inductive reasoning.

Although it would be rash to conclude that all efforts to raise skeptical questions about the justification of induction hinge on attributions to the inductive reasoner of a commitment to the uniformity of nature, the argument is not far-fetched when the details of particular doubts about induction are closely examined. What can be said less contentiously is that skepticism about the justification of induction generally projects a situation involving the logically contingent facts of the world in which the semantic integrity and epistemic reliability of inductive inference is frustrated, and that induction should be said to fail in such a scenario as a negative result for the hypothesis that induction is justified in all its applications. That entire line of thinking, however, in questioning the justification of induction, is itself inductive, imagining as it does a breakdown in inductive reasoning and invoking an inductive interpretation of the significance of the event, recalcitrant data for the hypothesis that induction will continue to yield correct probabilistic reasoning in evaluating the justified or unjustified application of inductive methods themselves. The line of reasoning we are asked to consider in questioning the semantic integrity and epistemic reliability of inductive reasoning is itself inductive. By parity with Aristotle's justification of the deductive principle of noncontradiction and Kant's transcendental justification of the synthetic *a priori* principles of critical idealism, we can then say that the justification of induction is demonstrated in the same way, when we appreciate the fact that we presuppose inductive reasoning even in intelligibly questioning its justification.

If this argument is correct, then induction is justified in the only possible way and to exactly the same extent and in the same way on different grounds as deduction. The justification of induction as indispensable even to raising doubts about the justification of induction nevertheless eliminates any sharp distinction between deductive and nondeductive reasoning on justificatory grounds as a basis for distinguishing the subject matter of symbolic logic from informal logic or critical reasoning. If informal logic and critical reasoning is going to maintain its distance from symbolic logic it will need to rethink its inclusion of inductive inference as inherently a part of the informal side of logic. It will now need to draw its distinction negatively in terms or whether or not a recognized part of reasoning is rightly categorized as nondeductive.

I personally think it is better for informal logic to disown inductive reasoning on those terms. Informal logic does not need to establish its territory negatively as what it is not, but rather of what it is and what it has to offer. It can cover many of the same topics as traditionally canvassed in the deductive logic curriculum, provided it does so in a distinctively useful or insightful way. This range of topics in my view should include deductive reasoning and inductive reasoning, as well as whatever other kinds of reasoning we can lay hands on, and however the two turn out to be related. As a matter of emphasis, if nothing else, in terms of its distinctive methods, it approaches in informal ways many of the same conceptual matters that are of interest to deductive logic. For, as Wilfrid Sellars has also shown, we can reduce inductive inferences to deductive inferences involving the same probabilistically qualified propositions taken as probably (to some definite degree) true assumptions, and, together with a choice of probability principles such as the Bayesian formula, *deduced* as probably (to some definite degree) true conclusions.[8]

If informal logic and critical reasoning do not own inductive inference as something inherently nondeductive, they nevertheless retain full title to understanding induction in a distinctive informal way, developing informal tests like Mill's methods in *A System of Logic*, which no deductivist to my knowledge has refuted or surpassed as practical informal ways of reaching sound inductive judgments from empirical evidence.[9] The deductive logician and informal logician or argumentation theorist can work side by side in their distinctive ways, in the course of which they might agree or disagree about even the most fundamental issues of their respective disciplines. Informal logic has no more need to abandon induction than it has to try to claim it as uniquely in its purview; it should explore the possibilities of understanding inductive reasoning as inference that takes place in everyday thought and language.

Colloquial inductive thinking might have a formally symbolizable undercarriage of deductive relations, but it also functions at a higher level of contentful expression as when we try to explain our reason for a decision on the grounds of our estimation of probable outcomes 'in our own words' and without making use of mathematics. Informal logic can help to complete the picture of inductive reasoning that symbolic logic and mathematical statistics only partly describes, and whose exact interrelation will no doubt continue to be a difficult subject in informal as in formal symbolic logic. We need to know how inductive reasoning functions at the level of informal rationalization as well as explicating its deep inferential and mathematical structure, in order to have a full conception of induction and inductive reasoning in all its dimensions. Thus, we need at least a competent informal and complementary competent symbolic logical theory of inductive reasoning if we are going to arrive at a complete philosophy of science and a sufficiently robust concept of induction to justify the reasoning in all of empirical science as we believe it to be properly practiced.

The problem of induction gets its force in large part from the fact that it focuses attention on the ultimate epistemic justification of all *a posteriori* knowledge. Our trust in the applied mathematics of engineering physics, as far as it goes, is owing in large part to the assumption that the future will resemble the past or that a certain uniformity in the laws of nature will continue to prevail into the foreseeable future, an assumption which in itself is deductively insupportable. All our practical reasoning as a result is at risk of lacking adequate epistemic justification to constitute the knowledge base from which we can rationally make decisions. If we lose all justification for the practical decision making and the successful actions we actually undertake, then we will give up more than the rational foundations of science and engineering and market transactions. For in that case we will also deprive moral reasoning of one of its most important presuppositions, that practical moral decision making is capable of being rationally justified.

If the problem of induction is truly insoluble, then, for starts, we cut the ground from under scientific and moral reasoning. If the situation is intolerable, as it certainly seems to be, then our only choice is to try to understand whether and exactly how inductive reasoning is supposed to be justified within our system of beliefs. If induction and inductive reasoning cannot be justified either by pedestrian appeal to deductive or inductive justification, but neither can deduction and deductive reasoning, then we may need to cast about for another type of justification such as that extracted from Aristotle's justification of the principle of noncontradiction, presupposed even by attempts to refute or question its truth or generality. The availability of justifications of deduction and induction as cognitively indispensable presuppositions, and even of such reasoning that questions the justification of induction or deduction, encourages our trust in the only kinds of explanation we can give ourselves or conceive of accepting or rejecting. If that is the right way to solve the problem of induction, however, it still remains to identify the right principles of inductive reasoning, just as we must also do for the principles of deductive reasoning.[10]

Notes

1 Ayer immediately prefaces the above characterization of the problem of induction with the words: 'It is time, therefore, to abandon the superstition that natural science cannot be regarded as logically respectable until philosophers have solved the problem of induction.' The reason why Ayer regards the problem of induction as no obstacle to the epistemic justification of natural science is provided in these terms, when he adds, p. 50: 'Thus it appears that there is no possible way of solving the problem of induction, as it is ordinarily conceived. And this means that it is a fictitious problem, since all genuine problems are at least theoretically capable of being solved: and the credit of natural science is not impaired by the fact that some philosophers continue to be puzzled by it.' Remarkably, after sensitively identifying question-begging appeals to the 'uniformity of nature' as falling onto the second horn of his dilemma as efforts to justify induction inductively, Ayer continues, p. 50: 'Actually, we shall see that the only test to which a form of scientific procedure which satisfies the necessary condition of self-consistency is subject, is the test of its success in practice.' This, too, Ayer's disclaimers notwithstanding, is evidently a proposal to justify induction less stringently but no less inductively.

2 My purpose in this essay is not polemical, and I do not propose to consider even a representative selection of commentary on Hume's problem of induction. It may nevertheless be worthwhile to mention at length and criticize a recent account of Hume's dilemma presented by Colin Howson in [8, especially pp. 28f]. Howson writes, in support of the view that deduction unlike induction requires no special justification, p. 28: "Suppose that some antecedent proof, using assumptions Σ, had established the soundness of *modus ponens*. Then it is true that from premises consisting of the statement that *modus ponens* is sound, and the statement S that A and 'If A and B' are true, we can infer by *modus ponens* that B is true. However, a general deductive principle called 'Cut' [...] tells us that there is a proof of the truth of B from Σ and S alone. Moreover, *this proof need not use modus ponens*. In other words, there is a deductive justification for detaching the conclusion of a *modus ponens* inference which [...] need not employ *modus ponens* at all. In fact, there are a number of familiar complete deductive systems, some of which have no rule in common (the tableau/tree system has none in common with either natural deduction or sequent or Hilbert-style systems [...]). Thus we can finally and successfully turn the *tu quoque* on its wielders: there are *independent* arguments for the soundness of deductive rules; that is to say, there are rules which are not, as they are in the inductive case, circular." On pp. 28–29, he adds: "The demand for a patent of trustworthiness – a soundness argument – for a putative rule, deductive or inductive, is not an idle or pointless one. It is not pointless because without it you have no reason for confidence in any reasoning which employs it, and this also goes for any 'justification' which employs that rule itself: if you can only argue for its soundness by appeal to the rule itself then you have shown nothing, or nothing worth having. And the demand is not idle because such an argument, at any rate in the case of deductive rules, can be given which is not circular: neither 'premiss-circular' or 'rule-circular'. It might still be objected that any justification of any piece of deductive reasoning itself will in its turn employ deductive reasoning: a demonstration of the joint soundness of a set of deductive rules will be some chain of reasoning in its turn and hence rest upon the implicit claim that the links in the

chain are themselves sound. It will also employ some non-trivial mathematics, in the form of some set theory and the principle of strong induction. So where, it might be asked, is the difference, in terms of the patent of security allegedly conferred, between a proof of deductive validity and an inductive argument [...]? Is there any difference in principle? / Yes, there is. I am not in any way defending an absolutist position with regard to logic [...]. But we have seen that in deductive logic there are independent arguments for any given logical principle, while there seems to be only one for [the inductive rule], that rule itself." The question throughout is what the arguments Howson mentions are supposed to be independent of, whether of deduction generally, which seems impossible, or of this or that particular deductive rule. The latter seems to be what Howson has in mind, and only such a limited independence has any plausibility, but it is inadequate to preserve particular deductive rules collectively from the charge of circular justification via some type of deductive reasoning. For the cut rule to which Howson refers is every bit as deductive as *modus ponens*. Even if they are two different rules of deduction, we are still using deduction to try in circular fashion to justify deduction if we are using one deductively valid rule to justify the deductive validity of another rule. We must also consider the overall effect of appealing to the cut rule, for example, to justify *modus ponens*, and then asking what justifies the cut rule. If the answer at any stage involves *modus ponens*, as it appears it must, then we are once again caught up in a vicious justificatory circularity in the counterpart of the second horn of Hume's original dilemma.

3 Inter alia, see [16], [4] and [5, pp. 247–268]. A useful recent collection of papers on related topics is found in [15].

4 I ignore for simplicity sake such putative alternative modes of reasoning as C.S. Peirce's concept of abductive inference or variations on the principle of inference to the best explanation. I consider abduction and inference to the best explanation to be specific forms of inductive reasoning. To the extent that a distinction can be drawn between abduction and induction, I am equally prepared to project concerns about the validity or reliability of deduction and induction also to abduction. The trilemma that arises in that case is that induction cannot be justified deductively on pain of invalidity, inductively on pain of circularity, or abductively on pain once again of invalidity. From the fact that an inference is made in accord with inductive protocols within a particular probability calculus it by no means logically or deductively follows that the inference itself or its conclusion constitute the best explanation of a phenomenon, nor that induction generally as a method is always the best explanation. We see this clearly in the limiting case where accidental correlations are inductively supported but where any choice of any such events obviously do not provide the best explanation of why accidentally paired events occur. Similarly, if abduction is not a special category of inductive reasoning, we cannot justify deduction inductively (invalid), deductively (circular), or abductively (invalid), nor can we justify abduction inductively (invalid), deductively (invalid), or abductively (circular).

5 [1] See also *Metaphysics* 1011^a3–17 and [2]: *Posterior Analytics* 72^b5—73^a20

6 [11, Axv–xvii, Bix–xi, A58/B82–A61/B86]

7 Similar considerations are raised by Arthur Schopenhauer in [13, especially pp. 32f]. See [7, p. 11], [6] and [10].

8 [14, pp. 83–103]

9 See [12, volumes 7–8, Book III, Chapter XI, Section 3]

10 A version of this essay was presented at the *Argumentation Group Research Colloquium*, University of Amsterdam, Amsterdam, The Netherlands, December 2, 2005. I am grateful to Frans van Eemeren for inviting me to deliver the talk, and to the Netherlands Institute for Advanced Study in the Humanities and Social Sciences (NIAS), Royal Netherlands Academy of Arts and Sciences (KNAW), for support of this and related topics in philosophical logic and philosophy of mathematics during my visit as Resident Research Fellow in 2005-2006.

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References

[1] Aristotle. *Metaphysics*, volume 2 of *The Complete Works of Aristotle: The Revised Oxford Translation.* Princeton University Press, Princeton, edited by Jonathan Barnes, 1984.

[2] Aristotle. *Posterior Analytics*, volume 1 of *The Complete Works of Aristotle: The Revised Oxford Translation.* Princeton University Press, Princeton, edited by Jonathan Barnes, 1984.

[3] Alfred J. Ayer. *Language, Truth and Logic.* Dover Publications, New York, 2nd edition, 1946.

[4] John Earman and Wesley Salmon. The Confirmation of Scientific Hypotheses. In Merrilee H. Salmon et al., editors, *Introduction to the Philosophy of Science: A Text*, pages pp. 55–66. Prentice-Hall, Englewood Cliffs, 1992.

[5] Ian Hacking. *An Introduction to Probability and Inductive Logic.* Cambridge University Press, Cambridge, 2001.

[6] D. W. Hamlyn. Schopenhauer on the Principle of Sufficient Reason. In G.N.A. Vesey, editor, *Reason and Reality*, Royal Institute of Philosophy Lectures 5, 1970-1971, pages pp. 145–162. Macmillan, London, 1972.

[7] D. W. Hamlyn. *Schopenhauer.* Routledge & Kegan Paul, London, 1980.

[8] Colin Howson. *Hume's Problem: Induction and the Justification of Belief.* The Clarendon Press, Oxford, 2000.

[9] David Hume. *A Treatise of Human Nature [1739-40].* The Clarendon Press, Oxford, 2nd edition, edited with an analytical index by L.A. Selby-Bigge, text revised with notes by P.H. Nidditch, 1978.

[10] Dale Jacquette. Schopenhauer's Circle and the Principle of Sufficient Reason. *Metaphilosophy*, 23:pp. 279–287, 1992.

[11] Immanuel Kant. *Critique of Pure Reason.* St. Martin's Press, New York, translated by Norman Kemp Smith, 1965.

[12] John Stuart Mill. *A System of Logic, Ratiocinative and Inductive (1843).* Collected Works of John Stuart Mill. University of Toronto Press, Toronto, edited by J. M. Robson, 1963–1991.

[13] Arthur Schopenhauer. *On the Fourfold Root of the Principle of Sufficient Reason, with respect to the problem of whether the principle of sufficient reason itself admits of justification.* Open Court, LaSalle, translated by E.F.J. Payne, 1974.

[14] Wilfrid Sellars. *Are There Non-Deductive Logics?* Synthese Library. D. Reidel Publishing Co., Boston-Dordrecht, edited by Nicholas Rescher on behalf of the editorial committee, Essays in Honor of Carl G. Hempel: A Tribute on the Occasion of his Sixty-Fifth Birthday, 1970.

[15] Friedrich Stadler. Induction and Deduction in the Sciences (Vienna Circle Institute Handbook), 2004.

[16] Georg Henrik von Wright. *The Logical Problem of Induction.* Blackwell Publishing, Oxford, 2nd enlarged edition, 1957.