

Notes on Hume's Argument(s) concerning Induction

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Hume's famous argument concerning induction appears three times in his works, with many potentially significant differences between the three presentations and clear evidence of a systematic development in his views. The detailed analysis below aims to highlight the most salient points.

1. The Argument of the *Treatise*

In the *Treatise*, the famous argument occurs within the context of Hume's rather rambling search for the origin of the idea of *necessary connexion*, which he has previously (T 1.3.2.11) identified as the key component of our idea of causation. Not having "any certain view or design" on how to trace the impression(s) that could account for this crucial idea, he sets off to "beat about all the neighbouring fields" in the hope that something will turn up (T 1.3.2.12-13). His first such "field" concerns the basis of the Causal Maxim "that *whatever begins to exist, must have a cause of existence*" (T 1.3.3.1), but after concluding that this Maxim cannot be "intuitively or demonstratively certain",¹ Hume quickly moves on to a related question, "*Why we conclude, that such particular causes must necessarily have such particular effects, and why we form an inference from one to another?*" (T 1.3.3.8-9). He soon narrows his focus onto what he considers the paradigm case of a causal inference, from a sensory *impression* of one "object" (e.g. we see a flame), to forming a belief – a lively *idea* – of its effect or cause (e.g. we expect heat). He then analyses such an inference into its component parts:

"First, The original impression. Secondly, The transition to the idea of the connected cause or effect. Thirdly, The nature and qualities of that idea." (T 1.3.5.1)

The remainder of Section 1.3.5 discusses the first component, then 1.3.6, entitled "Of the inference from the impression to the idea", comes to the second component, the causal inference itself.²

Hume's first move, in discussing this paradigm causal inference, is to insist that it cannot be made a priori, simply from observation of the cause:

"There is no object, which implies the existence of any other if we consider these objects in themselves, and never look beyond the ideas which we form of them. Such an inference ... would imply the absolute contradiction and impossibility of conceiving any thing different. But as all distinct ideas are separable, 'tis evident there can be no impossibility of that kind. When we pass from a present impression to the idea of any object, we might possibly have separated the idea from the impression, and have substituted any other idea in its room." (T 1.3.6.1)

Here Hume is appealing to the principle that if an inference is to be a priori, there must be an *absolute contradiction and impossibility* of conceiving things as turning out differently: an a priori inference has to yield total certainty. He also seems to be taking for granted that such a contradiction in conception implies a contradiction in fact, which is closely related to his Conceivability Principle that *whatever we conceive is possible* (which makes a more explicit entrance shortly, at T 1.3.6.5). Note also his appeal

¹ Hume does not *reject* the Causal Maxim, but says that it "must ... arise from observation and experience" (T 1.3.3.9), hinting that he will return to it later (though he never does). For detailed discussion, see Millican (2010) §§II, IV, VI.

² Section 1.3.7 will in due course move on to the third component, "the nature and qualities" of the belief-idea.

to what is commonly called his Separability Principle, that “all distinct ideas are separable” (cf. *T* 1.1.3.4, 1.1.7.3, 1.3.3.3), which plays a major role in the *Treatise* but disappears from Hume’s later writings.³

Hume has now established one of the most important results of his philosophy: “’Tis ... by EXPERIENCE only, that we can infer the existence of one object from that of another.” (*T* 1.3.6.2). And he immediately goes on to explain that the kind of experience which prompts such a causal inference is repeated conjunctions of pairs of “objects ... in a regular order of contiguity and succession”. Where we have repeatedly seen *A* closely followed by *B*, “we call the one *cause* and the other *effect*, and infer the existence of the one from that of the other”. Hume enthusiastically trumpets this relation of *constant conjunction* as the sought-for key to the crucial notion of necessary connexion, with a clear allusion back from *T* 1.3.6.3 to 1.3.2.11,⁴ and he celebrates the progress of his rambling journey of discovery. Admittedly there is still some way to go, because mere repetition of conjunctions doesn’t seem to generate “any new original idea, such as that of a necessary connexion”. But the line of investigation seems clear:

“having found, that after the discovery of the constant conjunction of any objects, we always draw an inference from one object to another, we shall now examine the nature of that inference ... Perhaps ’twill appear in the end, that the necessary connexion depends on the inference, instead of the inference’s depending on the necessary connexion.” (*T* 1.3.6.3)

This last sentence provides an elegant epitome of the link between Hume’s theories of induction and causation, anticipating the eventual outcome of his quest for the elusive impression of necessary connexion (which will come much later, at *T* 1.3.14.20). For present purposes, however, we can forget about that quest, and focus on the nature of inductive inference.

Having established that causal inference “from the impression to the idea” (e.g. from seeing *A* to expecting *B*) depends on experience, Hume goes on to pose the central question that his argument aims to answer, namely which *mental faculty* is responsible for the inference:

“the next question is, whether experience produces the idea by means of the understanding or imagination; whether we are determin’d by reason to make the transition, or by a certain association and relation of perceptions?” (*T* 1.3.6.4)

If the faculty of *reason* were responsible, Hume says, this would have to be on the basis of an assumption of similarity between past and future, commonly called his Uniformity Principle:

“If reason determin’d us, it wou’d proceed upon that principle, *that instances, of which we have had no experience, must resemble those, of which we have had experience, and that the course of nature continues always uniformly the same.*” (*T* 1.3.6.4)

So the next stage is to see whether there is any argument by which reason could establish this principle, and if there is not, Hume will conclude that reason cannot be the basis for our inductive inferences.

³ Hume continues to mention the imagination’s power to mix and separate its ideas (e.g. *A* 35, *E* 5.10), but the Separability Principle as such is never again invoked as it had been, very significantly, in the *Treatise* (e.g. *T* 1.1.7.3, 1.2.3.10, 1.2.5.3), arguably sometimes with absurd results (e.g. *T* 1.4.3.7, 1.4.5.5, 1.4.5.27, *Appendix* 12).

⁴ At *T* 1.3.2.11, Hume had stressed that (single-case) *contiguity* and *succession* are insufficient to characterise a cause and effect relationship, pointing out that “There is a NECESSARY CONNEXION to be taken into consideration”. Now at *T* 1.3.6.3, he reminds us that “Contiguity and succession are not sufficient to make us pronounce any two objects to be cause and effect”, and expresses satisfaction at having unexpectedly “discover’d a new relation ... This relation is their CONSTANT CONJUNCTION.” The link between the passages is evident both from the content and the capitalisation.

Following the standard categorisation deriving from John Locke (*Essay* IV xv 1, IV xvii 2), just two types of argument are potentially available, *demonstrative* and *probable*, and Hume now eliminates each in turn. First, *demonstrative* arguments proceed with absolute certainty based on self-evident (“intuitive”) relationships between the ideas concerned; these sorts of arguments are capable of yielding “knowledge” in the strict sense, and are mostly confined to mathematics.⁵ But no such argument can possibly prove the Uniformity Principle, because that would mean the principle is absolutely guaranteed, which the Conceivability Principle shows it cannot be:

“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.” (T 1.3.6.5)

As for *probable* arguments (i.e. arguments in which we draw conclusions – typically about things in the world of our everyday experience – with less than total certainty), these must be based on causal relations, because causation is “The only ... relation of objects ... on which we can found a just inference from one object to another” (T 1.3.6.7).⁶ But Hume has just argued that causal inference 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” (an argument that he recapitulates at T 1.3.6.6-7, echoing the discussion of T 1.3.4.1 to 1.3.6.4).⁷ And since probable inference relies on causal relations, “’tis impossible this presumption [of the Uniformity Principle] can arise from probability”, on pain of circularity.⁸ So neither demonstrative nor probable arguments can provide any solid basis for the Uniformity Principle, and Hume quickly concludes that *reason* cannot be responsible for causal inference:⁹

“Thus not only our reason fails us in the discovery of the *ultimate connexion* of causes and effects, but even after experience has inform’d us of their *constant conjunction*, ’tis impossible for us to satisfy

⁵ Humean *demonstration* corresponds to what is now called *deductive* reasoning, in the informal sense of an argument whose premises logically guarantee the truth of the conclusion. For more on this, see Millican (2007): §V.

⁶ This result comes from Hume’s theory of relations, at T 1.3.2.1-3 (for criticism, see Millican, 2017). In brief, T 1.1.5 enumerates what Hume takes to be the seven different kinds of relation, which T 1.3.1.1 then divides into two classes. The four relations “that depend solely on ideas” are the sources of strict “knowledge”, with *resemblance*, *contrariety* and *degrees in quality* amenable to intuition (T 1.3.1.2), and *proportions in quantity or number* the basis for demonstration. Of the three “inconstant” relations, *identity* and *relations of time and place* are amenable to perception (T 1.3.2.2), leaving *causation* as “the only one, that can be trac’d beyond our senses, and informs us of existences and objects, which we do not see or feel” (T 1.3.2.3). Hume thus identifies probable with causal reasoning, and the rest of Book 1 Part 3, entitled “Of knowledge and probability”, is accordingly devoted to “the idea of *causation* ... tracing it up to its origin” (T 1.3.2.4). Strangely the word “probability” does not appear at all in this Part before T 1.3.6.4, except in the title of the Part itself and of Section 1.3.2: “Of probability; and of the idea of cause and effect”.

⁷ Notice that causal inference is categorically stated to be founded on that presumption – there is no suggestion here of the conditionality that we had at T 1.3.6.4: “If reason determin’d us, it wou’d proceed upon that principle ...”. Nor is there any such conditionality at T 1.3.6.11, or in either the *Abstract* (A 13, 14) or the *Enquiry* (E 4.19, 4.21, 5.2).

⁸ T 1.3.6.7 expresses the circularity in causal terms: “The same principle cannot be both the cause and effect of another”, apparently in order to make a joke: “and this is, perhaps, the only proposition concerning that relation, which is either intuitively or demonstratively certain”. The *Abstract* and *Enquiry* make clear that the circularity is logical.

⁹ Before drawing this conclusion, Hume adds (what I have called) a “coda” to his argument (T 1.3.6.8-10), dismissing an attempt to get round it by appeal to objects’ powers. This attempt is refuted by the simple observation that induction needs to be presupposed to enable us to draw an inference from the powers of past objects to the powers of future objects. For discussion of this coda and its implications, see Millican (2002) §§9-9.2.

ourselves by our reason, why we shou'd extend that experience beyond those particular instances, which have fallen under our observation. We suppose, but are never able to prove, that there must be a resemblance betwixt those objects, of which we have had experience, and those which lie beyond the reach of our discovery." (T 1.3.6.11)

Instead, such inference must derive from associative principles in the *imagination* (T 1.3.6.12), and in particular, from a mechanism which Hume calls *custom* (e.g. T 1.3.7.6, 1.3.8.10) or *habit* (e.g. T 1.3.10.1). Experience of constant conjunction between *A* and *B* establishes an associative connexion between them, making my mind habitually move easily from the idea of one to the idea of the other. When I then see an *A*, the "force and vivacity" of that sense impression is transferred through the associative link to my idea of *B*, enlivening it into a belief. Hume accordingly goes on to define a belief as "A LIVELY IDEA RELATED TO OR ASSOCIATED WITH A PRESENT IMPRESSION" (T 1.3.7.5), and to expand on this theory of belief formation over the subsequent sections.

2. From the *Treatise* to the *Abstract*

Given the fame that it has subsequently enjoyed, Hume's argument in *Treatise* 1.3.6 is surprisingly inconspicuous. It occurs within a detour (at T 1.3.3.9) from a ramble through fields (T 1.3.2.13); the core of it occupies only six fairly short paragraphs (1-2 and 4-7); and its primary role seems to be to identify *custom* as the ground of causal belief – as a component in Hume's larger theory of belief – rather than to emphasise its own apparently sceptical conclusion. He does later remark on the striking nature of this conclusion:¹⁰

"Let men be once fully perswaded of these two principles, *that there is nothing in any object, consider'd in itself, which can afford us a reason for drawing a conclusion beyond it; and, that even after the observation of the frequent or constant conjunction of objects, we have no reason to draw any inference concerning any object beyond those of which we have had experience; ... and this will throw them so loose from all common systems, that they will make no difficulty of receiving any, which may appear the most extraordinary.*" (T 1.3.12.20)

But this again is within a context where his aim is to develop his theory of belief, this time focusing on inferences involving *probability* where the relevant past conjunctions are not constant.

Books 1 and 2 of the *Treatise* were published at the end of January 1739, but well before the end of that year, Hume seems to have radically reassessed the significance of his philosophy. By then he had written his *Abstract* of the *Treatise*, which appeared in print in March 1740, and which devotes eight paragraphs out of 35 (paragraphs 8 and 10-16) to the famous argument. From being a very small part of a much larger system, suddenly it becomes the prime focus of his philosophy, as it remained in the first *Enquiry* of 1748, which can indeed be seen as mainly constructed around the argument and its implications.

The declared purpose of the argument in the *Abstract* is to understand "all reasonings concerning *matter of fact*" (A 8), rather than limiting discussion to the paradigm case of a causal inference – "the inference from the impression to the idea" – which had been the topic of *Treatise* 1.3.6. But Hume then immediately states that all such *factual reasonings* (to coin a shorthand term) "are founded on the relation of cause and effect", thus making clear that causal inference is still the focus. However this initial move is helpful in both emphasising the generality of the argument and also

¹⁰ He also refers back to it in a footnote at T 1.3.14.17, feeding into his discussion of the idea of necessary connexion.

streamlining it, avoiding the need for the recapitulation of his treatment of causal reasoning which had occupied *T* 1.3.6.6-7. Now, in proving that all causal reasoning presupposes the Uniformity Principle, he will have proved at the same time that “all reasoning concerning *matter of fact*” – and hence all *probable* reasoning – has such a dependence.¹¹

To facilitate discussion, Hume introduces the simple example of one billiard ball striking another and causing it to move (A 9-10). He then presents a vivid thought-experiment, imagining the first man Adam, newly created by God, and confronted with such an imminent collision:

“without experience, he would never be able to infer motion in the second ball from the motion and impulse of the first. It is not any thing that reason sees in the cause, which makes us *infer* the effect. Such an inference, were it possible, would amount to a demonstration, as being founded merely on the comparison of ideas. But no inference from cause to effect amounts to a demonstration. Of which there is this evident proof. The mind can always *conceive* any effect to follow from any cause, and indeed any event to follow upon another: whatever we *conceive* is possible, at least in a metaphysical sense: but wherever a demonstration takes place, the contrary is impossible, and implies a contradiction. There is no demonstration, therefore, for any conjunction of cause and effect.” (A 11)

Compared to the equivalent passage in the *Treatise* (*T* 1.3.6.1), this is clearer and more straightforward, proving by direct appeal to the Conceivability Principle a general lesson which he states even more forthrightly elsewhere: “that to consider the matter *a priori*, any thing may produce any thing” (*T* 1.4.5.30, cf. *T* 1.3.15.1, *E* 12.29).

So experience is necessary to ground any causal inference (and hence any inference “concerning *matter of fact*”). And Hume goes on to explain that the type of experience relevant to his thought-experiment would be of “several instances” (A 12) in which Adam saw the collision of one ball into another followed by motion in the second ball. Such experience would condition him “to form a conclusion suitable to his past experience”, and thus to expect more of the same.

“It follows, then, that all reasonings concerning cause and effect, are founded on experience, and that all reasonings from experience are founded on the supposition, that the course of nature will continue uniformly the same.” (A 13)

So as in the *Treatise*, we reach Hume’s Uniformity Principle, and he now proceeds accordingly to consider what rational basis this principle could be given:

“’Tis evident, that *Adam* ... would never have been able to *demonstrate*, that the course of nature must continue uniformly the same, and that the future must be conformable to the past. What is possible can never be demonstrated to be false; and ’tis possible the course of nature may change, since we can conceive such a change.” (A 14)

As in the *Treatise*, we have an appeal to the Conceivability Principle to show that a change in the course of nature is possible, which in turn implies that uniformity cannot be demonstrated.

“Nay, ... [*Adam*] could not so much as prove by any *probable* arguments, that the future must be conformable to the past. All probable arguments are built on the supposition, that there is this conformity betwixt the future and the past, and therefore can never prove it. This conformity is a *matter of fact*, and if it must be proved, will admit of no proof but from experience. But our experience

¹¹ For discussion of some of the nuances of terminology for referring to this kind of reasoning, see Millican (2002) §3.1, which distinguishes between *probable inference*, *factual inference*, *factual inference to the unobserved*, and *inductive inference*. Hume generally takes for granted that all of these coincide.

in the past can be a proof of nothing for the future, but upon a supposition, that there is a resemblance betwixt them. This therefore is a point, which can admit of no proof at all, and which we take for granted without any proof.” (A 14)

Here the logical circularity of attempting to give a probable argument for the Uniformity Principle is more explicitly spelled out than in the *Treatise*. With both demonstrative and probable argument eliminated, Hume briskly concludes that “We are determined by custom alone to suppose the future conformable to the past. ... ’Tis not, therefore, reason, which is the guide of life, but custom.” (A 15-16).¹²

3. The Argument of the *Enquiry*

In the *Enquiry concerning Human Understanding* of 1748, the famous negative argument occupies virtually all of Section 4, with the positive account in terms of *custom* appearing in Section 5. Compared with the versions in the *Treatise* and *Abstract*, the argument is clarified and greatly expanded, leaving little doubt that Hume considers this his definitive presentation.

Section 4 starts with an important distinction now commonly known as “Hume’s Fork”, between *relations of ideas* – that is, propositions (notably from mathematics) that can be known to be true a priori, just by examining and reasoning with the ideas concerned – and *matters of fact* – that is, propositions whose truth or falsehood depends on how the world is, and so can be known (if at all) only through experience. Some matters of fact we learn directly by perception, and can later recall.¹³ But what of the rest? Hume sets himself to address this key question: “what is the nature of that evidence, which assures us of any real existence and matter of fact, beyond the present testimony of our senses, or the records of our memory” (E 4.3)? On what basis do we infer from what we perceive and remember, to conclusions about further, unobserved, matters of fact?

Hume calls such inferences “reasonings concerning matter of fact” (E 4.4), a term we saw introduced just once in the *Abstract* but which now becomes his standard way of referring to what he had previously called “probable arguments”. The reason for this terminological adjustment seems to be to avoid the infelicity of calling such inferences merely “probable” even when they are based on vast and totally uniform past experience that yields complete “moral certainty” (i.e. practical assurance). In a footnote to the heading of Section 6, Hume will accordingly draw a distinction – within the class of “reasonings concerning matter of fact” – between *probabilities* and *proofs*, the latter being “such arguments from experience as leave no room for doubt or opposition”, as when we conclude that “all men must die, or that the sun will rise to-morrow”.¹⁴

In *Enquiry* 4, the famous argument now proceeds much as it had in the *Abstract*, albeit greatly filled out. Millican (2002) lays out a structure diagram involving 20 stages (also reproduced in Millican 2012 and at the end of these notes), with the stages numbered according to the logic of the argument.

¹² The argument from T 1.3.6.8-10 is also very briefly summarised, in the last two sentences of paragraph 15. For more on this “coda”, see note 9 above.

¹³ Notice that Hume seems entirely happy to take perception and memory for granted here, fitting with an apparent strategy of allowing default authority to our faculties (as outlined in §1 of Millican 2012). Scepticism regarding the senses is addressed at T 1.4.2-4 and E 12.6-16, but Hume’s ultimate attitude to it remains far less clear than his position on induction.

¹⁴ This notion of a *proof* plays a major role in Hume’s argument concerning miracles in Section 10 of the *Enquiry*.

The same numbers will be followed here, within square brackets, to enable easy cross-referencing. First, we learn that [2] “All reasonings concerning matter of fact seem to be founded on the relation of *Cause and Effect*” (E 4.4), since [1] “By means of that relation alone we can go beyond the evidence of our memory and senses”. As in the *Abstract*, starting in this way has the virtue of streamlining the argument that follows, so that conclusions to be drawn about *causal* reasoning will automatically apply to the entire class of *factual* reasoning. The first of these conclusions, as before, is that [5] all knowledge of causal relations must be founded on experience:

“the knowledge of this relation [i.e. causation] is not, in any instance, attained by reasonings *à priori*; but arises entirely from experience, when we find, that any particular objects are constantly conjoined with each other.” (E 4.6)

Again we get a thought-experiment involving Adam, but this time with water and fire, illustrating the general truth that [3] “No object ever discovers [i.e. reveals], by the qualities which appear to the senses, either the causes which produced it, or the effects which will arise from it”. This is relatively easy to see when the phenomena are untypical or unfamiliar, such as the unexpected adhesion between smooth slabs of marble, the explosion of gunpowder, or the powers of a (magnetic) lodestone, where we have no temptation to imagine that we could have predicted these effects in advance (E 4.7). But with commonplace occurrences, such as the impact of billiard balls (E 4.8), we might suppose that the effect was foreseeable *a priori*. To prove that this is an illusion, Hume asks us to imagine how we could possibly proceed to make such an *a priori* inference, arguing that we could not, on the grounds that the effect is a quite distinct event from the cause (E 4.9), while many different possible effects are equally conceivable (E 4.10). Summing up [4]:

“every effect is a distinct event from its cause. It could not, therefore, be discovered in the cause, and the first invention or conception of it, *à priori*, must be entirely arbitrary. And even after it is suggested, the conjunction of it with the cause must appear equally arbitrary; since there are always many other effects, which, to reason, must seem fully as consistent and natural.” (E 4.11)

Note the strong emphasis on *arbitrariness*, making clear that it is not just the *conceivability* – or mere theoretical possibility – of alternative outcomes which makes any *a priori* inference from cause to effect impossible; it is the fact that from an *a priori* point of view, there is nothing to suggest one outcome over another.¹⁵

If causal relations cannot be known *a priori*, then factual inference cannot be *a priori* either (given [2] that factual inference is founded on causation). [6] “In vain, therefore, should we pretend to determine any single event ... without the assistance of observation and experience.” Hume now brings Part 1 of Section 4 to a close, with two very important corollaries for his philosophy of science. The first is that since we cannot aspire to a *a priori* insight into why things work as they do, the appropriate ambition for science is instead to aim more modestly for *systematisation* of those cause and effect relationships that experience reveals:

¹⁵ Thus there is no evidence here, as influentially claimed by Stove (1973: 50), that Hume’s method of argument shows him to be a “deductivist”, presupposing that only deductively valid arguments are legitimate. A similar point, though less obvious, can be made about the *Abstract* (“The mind can always *conceive* any effect to follow from any cause, and indeed any event to follow upon another”, A 11) and the *Treatise* (“When we pass from a present impression to the idea of any object, we might possibly ... have substituted any other idea in its room”, T 1.3.6.1).

“to reduce the principles, productive of natural phaenomena, to a greater simplicity, and to resolve the many particular effects into a few general causes, by means of reasonings from analogy, experience, and observation.” (E 4.12)

Then follows Hume’s most explicit account of applied mathematics (which he calls “mixed mathematics”), emphasising that although mathematical relationships are a priori, the laws through which they are applied to the world – his example is the Newtonian law of conservation of momentum – remain unambiguously a posteriori: “the discovery of the law itself is owing merely to experience, and all the abstract reasonings in the world could never lead us one step towards the knowledge of it” (E 4.13).¹⁶

Part 2 starts by summarising Hume’s results so far, and anticipating his eventual conclusion [20]:

“When it is asked, *What is the nature of all our reasonings concerning matter of fact?* the proper answer seems to be, that they are founded on the relation of cause and effect. When again it is asked, *What is the foundation of all our reasonings and conclusions concerning that relation?* it may be replied in one word, EXPERIENCE. But if we still carry on our sifting humour, and ask, *What is the foundation of all conclusions from experience?* this implies a new question ... I shall content myself, in this section, with an easy task, and shall pretend [i.e. aspire] only to give a negative answer to the question here proposed. I say then, that, even after we have experience of the operations of cause and effect, our conclusions from that experience are *not* founded on reasoning, or any process of the understanding.” (E 4.14-15)

Having established that experience is required for any factual inference, Hume goes on to explain how experience plays that role:

“we always presume, when we see like sensible qualities, that they have like secret powers,¹⁷ and expect, that effects, similar to those which we have experienced, will follow from them. ... But why [past] experience should be extended to future times, and to other objects, which for aught we know, may be only in appearance similar; this is the main question ...” (E 4.16)

This passage seems to be saying that [7] when we draw conclusions from past experience, we presuppose a resemblance between the observed and the unobserved, extrapolating from one to the other.¹⁸ Later, when apparently referring back to this passage, Hume confirms such a reading:

“We have said, ... that all our experimental conclusions proceed upon the supposition, that the future will be conformable to the past.” (E 4.19)

¹⁶ This case of applied mathematics (cf. also T 2.3.3.2) shows that Hume is quite comfortable with demonstrative, mathematical reasoning being applied to a posteriori premises. For discussion of this point, see Millican (2007): §V.

¹⁷ Hume’s talk of “secret powers” is new to the *Enquiry*, and seems to reflect a more sophisticated understanding of scientific reasoning than is evident in the *Treatise* and *Abstract*. In the *Treatise*, science is generally treated as involving predictions of discrete types of event based on previous patterns of conjunction or difference (as in the “rules by which to judge of causes and effects” of T 1.3.15). The *Enquiry*, by contrast, evinces an awareness (e.g. at E 4.13 and E 7.29 n. 17) that science more typically deals with events having continuously varying characteristics – such as the velocity of a billiard ball – whose prediction involves the interplay of mathematically determined forces.

¹⁸ Hume obviously means us to infer accordingly – though he does not explicitly state – that [8] all factual reasoning, since it has to be founded on experience, presupposes such a resemblance (i.e. the Uniformity Principle). See also note 23 below.

So his “main question” at *E* 4.16 concerns, in effect, the foundation of the Uniformity Principle.¹⁹ He repeats (cf. *E* 4.6) that [3] “there is no known connexion between the sensible qualities and the secret powers” of any object, and infers from this that [9] “the mind is not led to form such a conclusion concerning their constant and regular conjunction, by any thing which it knows of their nature” (*E* 4.16). So the Uniformity Principle cannot be established on the basis of anything that we learn directly through sense perception, in which case [10] any foundation for it will have to draw on past experience, which for the sake of the argument can here be taken as infallible:

“As to past *Experience*, it can be allowed to give *direct* and *certain* information of those precise objects only, that that precise period of time, which fell under its cognizance ...” (*E* 4.16)

The “main question” is then urged: how to justify the step from past experience to the assumption of future resemblance?

“These two propositions are far from being the same, *I have found that such an object has always been attended with such an effect*, and *I foresee, that other objects, which are, in appearance, similar, will be attended with similar effects*. I shall allow, if you please, that the one proposition may justly be inferred from the other: I know in fact, that it always is inferred. But if you insist, that the inference is made by a chain of reasoning, I desire you to produce that reasoning. The connexion between these propositions is not intuitive. There is required a medium, which may enable the mind to draw such an inference, if indeed it be drawn by reasoning and argument.” (*E* 4.16)

So because [11] the inference from past experience to future resemblance is not *intuitive* (i.e. not immediately *self-evident*), [12] there must be some *medium*, some “connecting proposition or intermediate step” (*E* 4.17) if indeed the inference is “drawn by reasoning and argument”.²⁰

The long paragraph that we have been discussing (*E* 4.16) includes steps that have no parallel in the *Treatise* and *Abstract*, where as we saw Hume simply takes for granted that if the Uniformity Principle is to be rationally well-founded, then this must be on the basis of some chain of reasoning, either demonstrative or probable. Here in the *Enquiry*, he explicitly rules out both *sense experience* and *intuition* as sources of foundation for the Uniformity Principle, and only then comes to consider *demonstration* and *probability*, which are in turn dismissed in the familiar way, but again with the structure of the argument made somewhat more explicit:

“[13] All reasonings may be divided into two kinds, namely demonstrative reasoning, or that concerning relations of ideas, and moral reasoning, or that concerning matter of fact and existence.²¹ [15] That there are no demonstrative arguments in the case, seems evident; since [14] it implies no

¹⁹ In *E* 4.16 itself, Hume oscillates between reference to the activity of *inference* from observed to unobserved, and to the *presupposition* of resemblance on which such inference is based. Indeed it seems that he takes the foundation of the *inference* to be the same as the foundation of the *presupposition* that it manifests. This supports an interpretation of the Uniformity Principle as implicit rather than explicit, a principle we *exhibit* by our inferential behaviour rather than one we always consciously consider. Such an interpretation nicely squares Hume’s repeated commitment to the Principle’s role in all inductive inference (see note 7) with his clear recognition at *T* 1.3.8.13 that we characteristically “draw inferences from past experience, without reflecting on ... that principle”. See also note 27 below.

²⁰ This suggests that if the inference *were* intuitive, it would count as “reasoning and argument” notwithstanding the lack of a “medium”. Indeed, as highlighted by Millican (2012) §3.1, in Hume’s day the terms “reasoning” and “argument” did not imply complex ratiocination.

²¹ Hume is fond of elegant variation, frequently using a variety of terms for the same concept. “Moral reasoning”, “reasoning concerning matter of fact and real existence”, “probable arguments”, and “arguments concerning existence” are all ways of referring to what we are here calling *factual* reasoning. See note 11 above.

contradiction, that the course of nature may change, ... Now whatever is intelligible, and can be distinctly conceived, implies no contradiction, and can never be proved false by any demonstrative argument or abstract reasoning *à priori*." (E 4.18)

As in the *Treatise* and *Abstract*, Hume appeals to the Conceivability Principle, though slightly differently: here he expresses it as the principle that what is conceivable *implies no contradiction*, rather than saying that what is conceivable *is possible*.²² Moving on now to *probability*:

"[16] If we be, therefore, engaged by arguments to put trust in past experience, and make it the standard of our future judgment, these arguments must be probable only, or such as regard matter of fact and real existence, ... But ... there is no argument of this kind ... We have said, that [2] all arguments concerning existence are founded on the relation of cause and effect; that [5] our knowledge of that relation is derived entirely from experience; and that [7] all our experimental conclusions proceed upon the supposition, that the future will be conformable to the past. [17] To endeavour, therefore, the proof of this last supposition by probable arguments, or arguments regarding existence, must be evidently going in a circle, and taking that for granted, which is the very point in question." (E 4.19)

Note in passing how Hume just assumes here some obvious inferences, linking [2] with [5] to deduce that [6] all factual inferences ("probable arguments", "arguments concerning existence") are founded on experience, and then combining this with [7] to deduce in turn that [8] all factual inferences "proceed upon the supposition" of the Uniformity Principle.²³ He also now leaves the reader to piece together the final stages of his argument.²⁴ First, since the Uniformity Principle cannot be established by either demonstrative or factual inference, it follows that [18] there is no good argument for the Uniformity Principle. Secondly, given [12],²⁵ it then follows that [19] the Uniformity Principle cannot be founded on reason, and finally, since [8] all factual inferences are founded on the Uniformity Principle, it follows that [20] no factual inference (i.e. no "reasoning concerning matter of fact and existence") is founded on reason. Hume had anticipated this conclusion at E 4.15, quoted earlier:²⁶

"I say then, that, even after we have experience of the operations of cause and effect, our conclusions from that experience are *not* founded on reasoning, or any process of the understanding." (E 4.15)

Also in the following section – most of which is devoted to sketching his theory of belief as based on "CUSTOM or HABIT" (E 5.5) – Hume refers back to this argument and states its conclusion explicitly, once

²² That he takes these to be equivalent was made clear by E 4.2, where he first explained the notion of a matter of fact.

²³ For an earlier occurrence of this last implicit inference, see note 18 above.

²⁴ As in the *Treatise* (note 9 above) and *Abstract* (note 12 above), Hume rounds off the argument in the *Enquiry* with a coda (E 4.21) in which he refutes the attempt to circumvent his argument by appeal to objects' powers. He also adds a parting shot at E 4.23 which emphasises the unlikelihood that peasants, infants or "brute beasts" should form their inductive expectations on the basis of "any process of argument or ratiocination". Though the point is well made, however, its philosophical significance is less clear, because those who take induction to be rationally well-founded need not be committed to supposing that animals (etc.) function purely rationally – see Millican (2002) §9.3.

²⁵ Recall that [12] is the claim that "There is required a medium, which may enable the mind to draw such an inference, if indeed it be drawn by reasoning and argument." (E 4.16) – that is, because the Uniformity Principle cannot be established directly through sensory perception or intuition, if it is to be established by reason at all, then this must be on the basis of some stepwise argument or ratiocination.

²⁶ The other implicit final stages are also stated explicitly elsewhere: [18] "we have no argument to convince us, that objects, which have, in our experience, been frequently conjoined, will likewise, in other instances, be conjoined in the same manner" (E 12.22); [19] "it is not reasoning which engages us to suppose the past resembling the future, and to expect similar effects from causes, which are, to appearance, similar" (E 4.23).

purely negatively and once alluding to his positive theory:

“... we ... conclude ... in the foregoing section, that, in all reasonings from experience, there is a step taken by the mind, which is not supported by any argument or process of the understanding; ...”
(E 5.2)

“All belief of matter of fact or real existence ... [is due merely to] ... a species of natural instincts, which no reasoning or process of the thought and understanding is able, either to produce, or to prevent.”
(E 5.8)

4. The Essential Core of Hume’s Sceptical Argument

Let us now try to distil the essence of Hume’s argument from these three different presentations:

- (A) The argument concerns all inferences to matters of fact that we have not observed: what the *Enquiry* calls “reasonings concerning matter of fact” (here *factual inferences* for short). Although the *Treatise* version starts with a narrower focus on causal inference “from the impression to the idea”, it later requires the lemma that *all factual inferences are based on causal relations* (stated at T 1.3.6.7). So the argument is improved both structurally and philosophically by starting with all factual inference, as in the *Abstract* and *Enquiry*, and then deriving this lemma as its first main stage (A 8; E 4.4).
- (B) Hume next argues that *causal relations cannot be known a priori, and hence are discoverable only through experience* (T 1.3.6.1, A 9-11; E 4.6-11). This is a major principle of his philosophy, wielded significantly elsewhere (e.g. T 1.3.15.1, 1.4.5.30; E 12.29).
- (C) From this principle, together with the lemma from (A), Hume concludes that *all factual inferences are founded on experience*, the relevant experience being of those *constant conjunctions* through which we discover causal relationships (T 1.3.6.2, A 12; E 4.16).
- (D) Factual inferences thus involve *extrapolation from observed to unobserved, based on an assumption of resemblance* between the two. Initially in the *Treatise*, Hume seems to suggest that such an assumption of resemblance – commonly called his Uniformity Principle (UP) – would be necessarily implicated only if *reason* were responsible for the inference (T 1.3.6.4). But his settled view, expressed in all three works (see note 7 above), is that *UP is presupposed by all factual inferences*,²⁷ simply in virtue of their taking for granted a resemblance between observed and unobserved.
- (E) Hume now proceeds to investigate critically the basis of UP itself. In the *Treatise* (T 1.3.6.4) and *Abstract* (A 14), he appears to assume immediately that any foundation in reason would have to derive from some *demonstrative* (i.e. deductive) or *probable* (i.e. factual) inference. In the *Enquiry*, however – which hugely expands this part of the argument from the cursory treatment in the earlier works – he considers demonstrative and factual inference only after first (E 4.16) explicitly ruling out any

²⁷ See note 19 above for the nature of this presupposition, which need not be conscious, but is implicitly *manifested* by the making of the inference. So UP need not take any very explicit or determinate form (contrary to the impression given by T 1.3.6.4), and is best understood as something like a general principle of *evidential relevance* between observed and unobserved, more in line with the expression of the *Enquiry*: “we ... put trust in past experience, and make it the standard of our future judgment” (E 4.19); we take “the past [as a] rule for the future” (E 4.21). This seems right: in taking such an inference to be better informed than an a priori inference, we are *ipso facto* presuming that what happened in the past provides evidence that is positively relevant to what will happen in the future (i.e. UP). For more on the Uniformity Principle and its presupposition, see Millican (2002) §3.2 and especially §10.2.

foundation in *sensory awareness of objects' powers*, or in immediate *intuition* (i.e. self-evidence).²⁸

- (F) Any demonstrative argument for UP is ruled out because a change in the course of nature is clearly conceivable and therefore possible (T 1.3.6.5; A 14, E 4.18). Any factual argument for UP is ruled out because, as already established at (D), such arguments inevitably presuppose UP, and hence any purported factual inference to UP would be viciously circular (T 1.3.6.7; A 14; E 4.19).
- (G) The upshot of this critical investigation is that *UP has no satisfactory foundation in reason*, though Hume expresses this in various ways:

“’tis impossible to satisfy ourselves by our reason, why we shou’d extend [our] experience beyond those particular instances, which have fallen under our observation. We suppose, but are never able to prove, that there must be a resemblance betwixt those objects, of which we have had experience, and those which lie beyond the reach of our discovery.” (T 1.3.6.11)

“This [resemblance between past and future] is a point, which can admit of no proof at all, and which we take for granted without proof.” (A 14)

“it is not reasoning which engages us to suppose the past resembling the future, and to expect similar effects from causes, which are, to appearance, similar.” (E 4.23)

- (H) Since UP is presupposed by all factual inferences (D), and UP has no foundation in reason (G), Hume finally concludes that *factual inference itself has no foundation in reason*. Again he expresses this conclusion in various ways (and note here the narrower focus of the *Treatise* on *causal* inference “from the impression to the idea”, as pointed out at (A) above):

“When the mind ... passes from the idea or impression of one object to the idea or belief of another, it is not determin’d by reason” (T 1.3.6.12)

“’Tis not, therefore, reason, which is the guide of life, but custom. That alone determines the mind ... to suppose the future conformable to the past. However easy this step may seem, reason would never, to all eternity, be able to make it.” (A 16)

“I say then, that, ... our conclusions from ... experience are *not* founded on reasoning, or any process of the understanding.” (E 4.15)

“in all reasonings from experience, there is a step taken by the mind, which is not supported by any argument or process of the understanding.” (E 5.2)

Note also that two of these quotations – from A 16 and E 5.2 – could just as appropriately have been cited as illustrations of (G), because both refer to that “step” which is precisely the presupposition of the Uniformity Principle. Because factual inference operates by extrapolation from past to future, Hume takes it to be obvious that the foundation of such inference must be the same as the foundation of the principle of extrapolation. Hence he does not consistently distinguish between (G) and (H), making the last stages of his argument less explicit than one might wish (cf. the end of §3 above).

5. The Nature of Hume’s Sceptical Conclusion

Hume usually expresses the conclusion of his famous argument in a way that seems to imply some *incapacity* on the part of human reason. The Uniformity Principle is something that we “are never able

²⁸ Moreover this sequence of argument seems to be entirely deliberate, because it occurs very explicitly twice, first within the main argument at E 4.16, and then again in the coda at E 4.21.

to prove" (T 1.3.6.11), and which indeed "can admit of no proof at all" (A 14). Because of this, "'tis impossible to satisfy ourselves by our reason" (T 1.3.6.11) concerning the inferential step from past to future, a step which "reason would never, to all eternity, be able to make" (A 16) and "which is not supported by any argument or process of the understanding" (E 5.2). Hume also frequently uses similar terms within the argument itself, when saying that various would-be proofs of UP are impossible, refutable, circular or lack any "just foundation" (T 1.3.6.5, 7, 10; E 4.18, 19, 21), denying that human knowledge "can afford ... an argument" that "supports the understanding" (E 4.17) in reasoning from past to future, and consequently denying that our factual inferences "are built on solid reasoning" (T 1.3.6.8). In both the *Treatise* (see §2.2 above) and *Enquiry* (see §1), he later glosses the conclusion of the argument in apparently very negative terms, as showing that "we have no reason" to draw any factual inference (T 1.3.12.20), and that "we cannot give a satisfactory reason, why we believe, after a thousand experiments, that a stone will fall, or fire burn" (E 12.25). In this light, it seems entirely appropriate that Hume should entitle *Enquiry* Section 4 "Sceptical doubts concerning the operations of the understanding", and describe it as appearing to give the sceptic "ample matter of triumph" (E 12.22).

However the issue of Hume's inductive "scepticism" is not so straightforward, and it is far from clear that he sees the acknowledged incapacity of reason to "prove" or "support" the Uniformity Principle as any sort of genuine *problem*. Certainly he does not infer from it (either in the *Treatise*, the *Abstract*, or the *Enquiry*) that induction is *unreasonable* in any pragmatic sense. And indeed the line of thought sketched in Millican (2012) §1, drawing on Section 12 of the *Enquiry*, somewhat suggests that he considers it inevitable that our most basic principles of inference – precisely because they are so basic – will lack any ultimate justification beyond their fundamental place in our mental economy. That being so, the central upshot of Hume's argument might be simply to identify the Uniformity Principle as a basic principle of this kind, and the sceptical flavour of his reasoning – in demonstrating reason's incapacity to prove UP – need not carry over at all into the theory of human inference that he draws from it. Nevertheless, the sceptical flavour of the famous argument itself would remain, in denying UP a source of rational support that more optimistic philosophers might have expected it to enjoy. And although the argument also delivers the important positive principle that *the Uniformity Principle is presupposed by all factual inference* [D], even in the *Enquiry* we have to wait until the final section (at E 12.23) to see this wielded as part of an effective *theoretical* defence against the "Pyrrhonian" sceptic.²⁹

²⁹ In the conclusion of Book 1 of the *Treatise*, Hume's attempt to meet the sceptical challenge says very little about the issue of induction, except as part of a general concern regarding the role of "the imagination, or the vivacity of our ideas" (T 1.4.7.3). There the more pressing problems for him are those that threaten inevitable error and contradiction (notably the existence of body, the metaphysics of causation, and the self-annihilation of reason), which the simple assumption of uniformity never does. The *Enquiry's* response to the Pyrrhonian sceptic, starting from a rejection of extreme *antecedent* scepticism, would not be nearly as effective against varieties of *consequent* scepticism that bring to light genuine contradictions – rather than simply lack of ultimate grounding – in our faculties, and this might explain why Hume very much downplays these more problematic topics in the *Enquiry*. His attitude to them seems to be that they are best left alone: for example, metaphysical enquiries into the nature of matter are likely to lead to contradiction or unintelligibility (E 12.14-15) unless, perhaps, we fall back on a notion of matter so empty as to be unexceptionable (E 12.16). Hume's final recommendation is for a *mitigated* scepticism that inspires a suitable degree of "doubt, and caution, and modesty" (E 12.24), and which also focuses our enquiries on "such subjects as are best adapted to the narrow capacity of human understanding" (E 12.25), notably those where we are able to progress either through mathematical demonstration (E 12.27) or induction from experience (E 12.28-31).

Works by David Hume

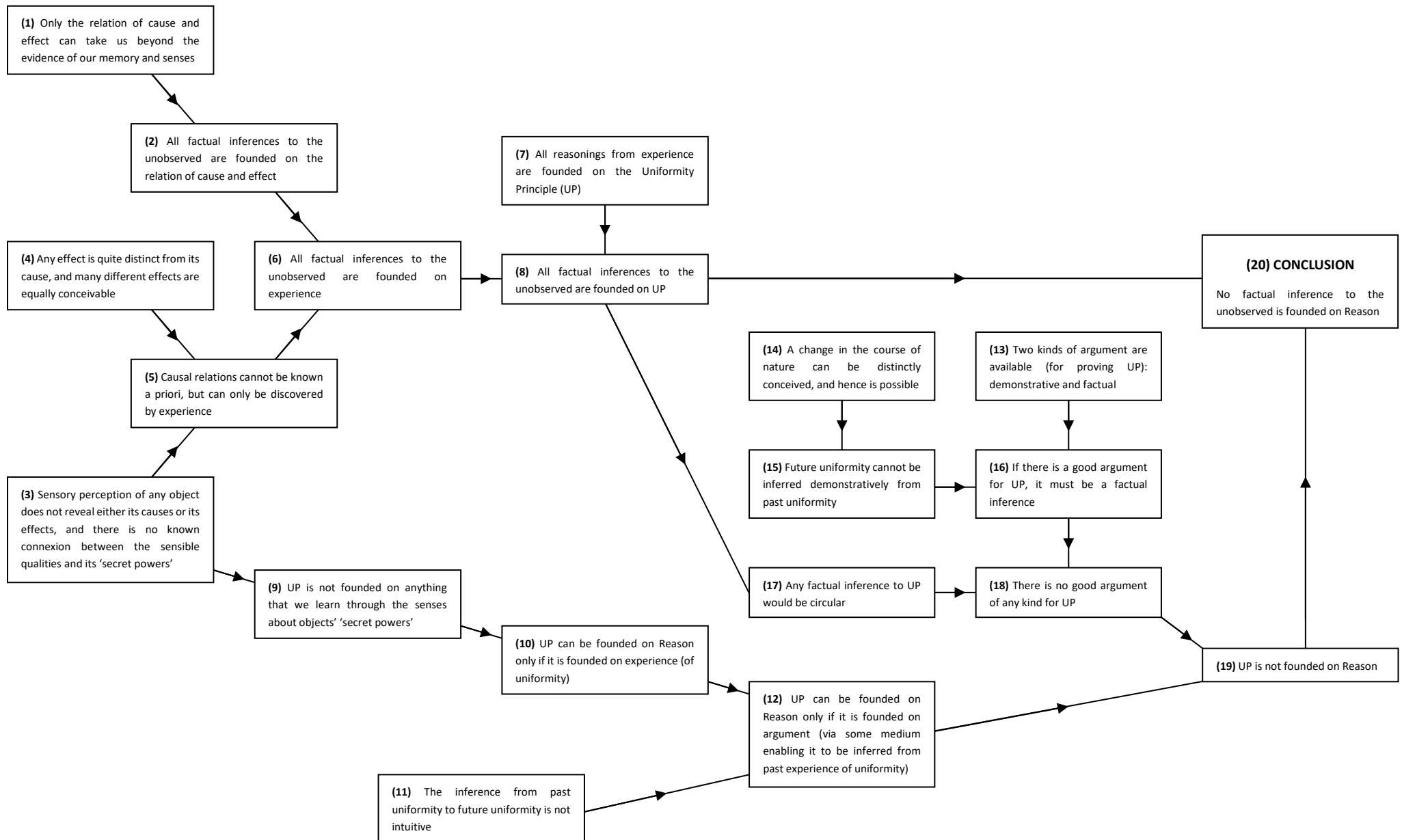
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These notes essentially reproduce text from Millican (2012) as referenced above, taking sections §2.1 (here §1), §2.2 (here §2), §2.3 (here §3), §2.4 (here §4), and §2.1 (here §5). §1 of that paper was also published separately in the student magazine *Vox* XV (2011), pp. 9-13, online at https://davidhume.org/scholarship/papers/millican/2011_VOX.pdf. It sketches my answer to the question “Is Hume an Inductive Sceptic?”.

Appendix: Hume's Argument concerning Induction (from Section 4 of the *Enquiry concerning Human Understanding*)



Hume's Own Statement of the Propositions Identified in the Structure Diagram

- (1) By means of [*Cause and Effect*] alone can we go beyond the evidence of our memory and senses. (E 4.4)
- (2) All reasonings concerning matter of fact seem to be founded on the relation of *Cause and Effect*. (E 4.4)
... all arguments concerning existence are founded on the relation of cause and effect ... (E 4.19)
... all our evidence for any matter of fact, which lies beyond the testimony of sense or memory, is derived entirely from the relation of cause and effect ... (E 12.22)
- (3) No object ever discovers, by the qualities which appear to the senses, either the causes which produced it, or the effects which will arise from it ... (E 4.6)

It is allowed on all hands, that there is no known connexion between the sensible qualities and the secret powers ... (E 4.16)
- (4) ... every effect is a distinct event from its cause. It could not, therefore, be discovered in the cause, and ... the conjunction of it with the cause must appear ... arbitrary; since there are always many other effects, which, to reason, must seem fully as consistent and natural. (E 4.11)
- (5) ... the knowledge of [cause and effect] is not, in any instance, attained by reasonings *à priori*; but arises entirely from experience ... (E 4.6)

... *causes and effects are discoverable, not by reason, but by experience* ... (E 4.7)

In vain, therefore, should we pretend to ... infer any cause or effect, without the assistance of observation and experience. (E 4.11)

... our knowledge of that relation [of cause and effect] is derived entirely from experience ... (E 4.19)
- (6) ... nor can our reason, unassisted by experience, ever draw any inference concerning real existence and matter of fact ... (E 4.6)

In vain, therefore, should we pretend to determine any single event ... without the assistance of observation and experience. (E 4.11)
- (7) ... we always presume, when we see like sensible qualities, that they have like secret powers, and expect, that effects, similar to those which we have experienced, will follow from them ... (E 4.16)

We have said, that ... all our experimental conclusions proceed upon the supposition, that the future will be conformable to the past ... (E 4.19)

... all inferences from experience suppose, as their foundation, that the future will resemble the past, and that similar powers will be conjoined with similar sensible qualities ... (E 4.21)
- (8) [This proposition is implicit in the inferential sequence:] We have said, that all arguments concerning existence are founded on the relation of cause and effect; that our knowledge of that relation is derived entirely from experience; and that all our experimental conclusions proceed upon the supposition, that the future will be conformable to the past. (E 4.19)
- (9) ... the mind is not led to form such a conclusion concerning [sensible qualities and secret powers'] constant and regular conjunction, by any thing which it knows of their nature ... (E 4.16)
- (10) [This proposition is implicit in Hume's transition from considering 'a priori' evidence for the Uniformity Principle to considering experiential arguments for it:] As to past *Experience*, it can be allowed to give *direct* and *certain* information of those precise objects only, and that precise period of time, which fell under its cognizance: but why this experience should be extended to future times, and to other objects, which for aught we know, may be only in appearance similar; this is the main question on which I would insist. (E 4.16)
- (11) The connexion between these propositions [*I have found that such an object has always been attended with such an effect* and *I foresee, that other objects, which are, in appearance, similar, will be attended with similar effects*] is not intuitive. (E 4.16)

- (12) There is required a medium, which may enable the mind to draw such an inference, if indeed it be drawn by reasoning and argument. (E 4.16)
- (13) All reasonings may be divided into two kinds, namely demonstrative reasoning, or that concerning relations of ideas, and moral reasoning, or that concerning matter of fact and existence. (E 4.18)
- (14) . . . it implies no contradiction, that the course of nature may change . . . May I not clearly and distinctly conceive [such a thing]? (E 4.18)
- (15) That there are no demonstrative arguments in the case, seems evident . . . (E 4.18)
 . . . whatever is intelligible, and can be distinctly conceived, implies no contradiction, and can never be proved false by any demonstrative argument or abstract reasoning *à priori* . . . (E 4.18)
- (16) If we be, therefore, engaged by arguments to put trust in past experience, and make it the standard of our future judgment, these arguments must be probable only, or such as regard matter of fact and real existence . . . (E 4.19)
- (17) To endeavour, therefore, the proof [that the future will be conformable to the past] by probable arguments, or arguments regarding existence, must be evidently going in a circle, and taking that for granted, which is the very point in question. (E 4.19)
- (18) . . . it may be requisite . . . to shew, that none of [the branches of human knowledge] can afford such an argument . . . (E 4.17)
 . . . we have no argument to convince us, that objects, which have, in our experience, been frequently conjoined, will likewise, in other instances, be conjoined in the same manner . . . (E 12.22)
- (19) . . . it is not reasoning which engages us to suppose the past resembling the future, and to expect similar effects from causes, which are, to appearance, similar . . . (E 4.23)
 . . . nothing leads us to [expect constant conjunctions to continue] but custom or a certain instinct of our nature . . . (E 12.22)
- (20) I say then, that, even after we have experience of the operations of cause and effect, our conclusions from that experience are *not* founded on reasoning, or any process of the understanding. (E 4.15)
 . . . in all reasonings from experience, there is a step taken by the mind, which is not supported by any argument or process of the understanding. (E 5.2)
 All belief of matter of fact or real existence [is due merely to] a species of natural instincts, which no reasoning or process of the thought and understanding is able, either to produce, or to prevent. (E 5.8)