

## Kant and Hume on Induction, Causation, and the Methodology of the Human Sciences<sup>1</sup>

This paper is divided into three parts. In the first, we discuss the cogency of Kant's arguments concerning causation and induction. Those arguments are spurious, we will find, because they all rest on the erroneous assumption that all non-empirical truths are trivial. At the same time, so we will also find, each of those arguments corresponds to a cogent argument that does not involve that assumption. In the second part, we discuss the viability of Hume's analyses of causation and induction. It is argued that those analyses are fallacious, and an attempt is made to identify the relevant fallacies. In the third part, we draw some of the epistemological consequences of our response to Hume.

### Part 1. The Cogency of Kant's Transcendental Arguments

I. By a "proposition" I mean the non-linguistic entity meant by a complete sentence. I do not mean the sentence itself. "La neige est blanche" and "snow is white" mean the same thing. This common meaning is what I will refer to as a "proposition".

Kant held that some propositions are both *synthetic* and also *a posteriori*. (We will soon define these terms.) This contention is the heart of the system of thought set forth in the *Critique of Pure Reason*.

I will now argue that this contention of Kant's is false and that his argument for it is spurious. But I will also argue that Kant's false contention can readily be turned into a correct one and that his spurious argument can readily be turned into a cogent one. Nothing more than a few terminological changes are needed to accomplish this. Let me now outline the arguments I will give.

First, I will argue that the premises of Kant's argument turn out to entail the *opposite* of the thesis that there are synthetic a priori truths. Those premises entail that there are virtually *no* a priori truths, let alone *synthetic* a priori truths. Kant turns out to be even more of an opponent of a priori truth than John Stuart Mill.

Second, I will argue that Kant's reasoning involves a confusion concerning the two different epistemological roles that mental imagery can play. On the one hand, mental imagery can serve as a vehicle for conceptual analysis. On the other hand, mental images are spatiotemporal phenomena in their own right, and can thus be the *object* of empirical study. Kant fails to distinguish the two quite distinct roles that mental images can have; and his views concerning the synthetic a priori are a reflection of that.

But I will also argue that, despite the problems just discussed, the important parts of the *Critique* are a success. Kant's astonishing claims about causality, personal identity, and rationality turn out to be correct and founded on cogent arguments. But if this is to be made apparent, Kant's reasoning must be "de-psychologized", i.e. his statements about psychology must be reinterpreted as statements about logic. For the most part, this can be done by making a few adjustments to Kant's choice of words.

§ Let us begin with some points about terminology. The word "concept" has two meanings – one logical, one psychological. Consider the sentence "Little Timmy doesn't have a concept of an irrational number." In this sentence, the word "concept" refers to a certain kind of psychological entity. Now consider the sentence "for any x, if x falls under the concept *triangle*, then x falls under the concept *closed figure*." In this sentence, the word "concept" obviously does not refer to a mental entity of any kind, but rather to some kind of *non-psychological*, presumably platonic, entity.

In this paper, I will typically use the word "concept" in its *non-psychological* sense; and when I describe a proposition as "conceptually necessary", I mean that it holds entirely in virtue of facts about concepts in the non-psychological sense of the word. Consider the proposition *triangles have three sides*. It is clear that the truth of that proposition has nothing to do with psychology, since it would be true in a world devoid of sentient beings. Further, its truth is guaranteed by the structures of the concepts composing it – the concepts *triangle*, *three*, and so forth – and is thus not contingent on anything that could possibly fail to be the case. The proposition *triangles have three sides* is therefore "conceptually necessary", as I will be using

this expression. Sometimes I will use the expression “conceptually true” as a synonym for “conceptually necessary.”<sup>2</sup>

As we will see, Kant recognizes a different category of necessary truth. In his view, some propositions are necessarily true in virtue of facts about our minds. When I wish to discuss *that* kind of necessity, I will use the term “representational necessity.”

II. Now we must say just what is meant by the terms “synthetic” and “a priori” and, therefore, what is meant by the conjugate terms “analytic” and “a posteriori.”

If a proposition is known to be true in some way *other* than through empirical work, Kant describes it as “a priori.” Consider the proposition  $1+1=2$ . To know that it is true, one doesn’t do empirical work; one doesn’t perform experiments or make observations.  $1+1=2$  is thus a priori.

For Kant, a priority is a property of our *knowledge* of propositions. Of course, Kant does describe propositions themselves as “a priori.” But when Kant does so, he is really making a statement about our *knowledge* of those propositions. For Kant, a proposition is a priori *not* in virtue of its intrinsic or strictly logical properties, but in virtue of facts about how one comes to know it. A consequence of this conception of a priority – one that Kant himself draws – is that a given proposition could, in principle, be a priori for one creature and a posteriori for another. As we will see, it is an essential fact about Kant’s system that, in it, the concept of a priority is understood in psychological (or epistemological), and thus *not* in strictly logical, terms.

For Kant, a proposition is “a posteriori” if it is not a priori. Consider the proposition *Smith weighs over 200 lbs.* To know that is true, one must do empirical work. So it is not a priori, and is therefore a posteriori.

Now let us turn to the expressions “analytic” and “synthetic.” Here we must be careful. These days the term “analytic” is often used to describe sentences. A sentence is “analytic” exactly if its semantics guarantees its truth. So “triangles have three sides” is analytic because, given what it means, it must be true. But this is not how Kant was using that term.

Kant uses the term “analytic” to describe propositions – not sentences, and not our knowledge of anything. Kant’s official definition of “analytic” is this: a proposition is analytic if “nothing is contained in the predicate which is not contained in the subject.” So *all tall males are males* is analytic because nothing is “contained” in the predicate (“males”) which is not “contained” in the subject (“all tall males”). A proposition is “synthetic” if it is not analytic.

As Quine pointed out, there are two problems with Kant’s definition of analyticity. First, the notion of containment is “left at a metaphorical level.”<sup>3</sup> Physical objects can contain other physical objects; but meanings don’t contain meanings, at least not in the same sense. Second, Kant’s formulation only applies to statements having subject-predicate form.<sup>4</sup> So it isn’t immediately obvious how to apply it to statements not having that form, for example:  $A=A$  or *if p implies q, then p implies anything that q implies*.

But it isn’t hard to adapt Kant’s formulation to meet these two objections. Consider the proposition: *a+b is larger than a*. This proposition is composed of various concepts –  $a+b$ , *larger than*, and so on. By themselves, the structures of these concepts guarantee that *a+b is larger than a* is true.

*a+b is larger than a* is in a very different category from *John and Mary like to play tennis*. Consider the concepts that compose the latter proposition – *John*, *Mary*, and so on. The structures of these concepts do *not* guarantee the truth of that proposition.

For Kant, *a+b is larger than a* is a paradigm case of an “analytic” proposition, and *John and Mary like to play tennis* is a paradigm case of a proposition that Kant would describe as “synthetic.” These facts suggest that, for Kant, a proposition is analytic exactly if it is “conceptually true”, i.e. exactly if it holds entirely in virtue of facts about the structures of concepts. It must be kept mind that, in this context, the concepts in question are not psychological entities.

It is easy to find support for this reconstruction of Kant’s view. Consider the proposition  $A=A$ .<sup>5</sup> Kant describes this very proposition as analytic. But in so doing, he is not being true to his official definition of analyticity, namely “the predicate is contained in the subject”. There is no clear sense in which this proposition has subject-predicate form, and there is no clear sense in which any constituent of this

proposition contains any other constituent. So if Kant's conception of analyticity were expressed by the definition just mentioned, then it would be inexplicable why he described  $A=A$  as analytic.

But in light of what we've said, it is clear what is motivating Kant. How is  $A=A$  different from *John and Mary like to play tennis*? The first is conceptually true; the second is not. In each case that Kant describes a proposition as "analytic", he believes that proposition to be conceptually true. In each case that Kant describes a proposition as "synthetic", he believes it *not* to be conceptually true. We may conclude that, for Kant, a proposition is "analytic" exactly if it is conceptually true – exactly if it holds entirely in virtue of the structures of the concepts composing it. A proposition is synthetic exactly if it is not analytic.

Now we can say what Kant means when he describes a proposition as both "synthetic" and "a priori." A proposition is a priori if it is known in some way other than through empirical work. A proposition is synthetic if its truth is not guaranteed by the structures of the concepts composing it. A proposition is synthetic a priori if it has both these properties.

III. According to Kant, the propositions  $7+5=12$  and *a straight line is the shortest distance between two points* are synthetic a priori truths.  $7+5=12$  is true a priori, in Kant's view, because no sense-experience is needed to know that it is true. It is synthetic because it is not true wholly in virtue of facts about the structures of the concepts composing it.<sup>6</sup> The same is true of *a straight line is the shortest distance between two points*.

But it very much seems that, contrary to what Kant says, both of these propositions are analytic. The truth of  $7+5=12$  seems to be guaranteed by the constitutions of the concepts 7, 5, +, and so on. For anything  $x$ , if  $7+x$  does not equal 12, then  $x$  is *ipso facto* not 5. For any operation  $O$ , if the result of applying  $O$  to the ordered pair  $\langle 7, 5 \rangle$  is not 12, then  $O$  is *ipso facto* not addition. So it is hard to see how  $7+5=12$  could possibly qualify as synthetic. Of course,  $7+5=12$  is not nearly as obvious as, say,  $1+1=2$ . But, apart from that, the two propositions seem to be comparable.

We find support for this line of thought in argument given by Arthur Pap.<sup>7</sup>  $1+1=2$  is clearly analytic, as Kant himself acknowledges.<sup>8</sup>  $7+5=12$  can be shown to follow analytically from  $1+1=2$  along with some other premises that Kant would regard as analytic.<sup>9</sup> Anything that follows analytically from an analytic proposition is itself analytic: the property of analyticity is hereditary with respect to the relation of logical consequence.<sup>10</sup> So given his premises, Kant *should* regard  $7+5=12$  as analytic, even though he doesn't. Kant is thus guilty not only of error, but of inconsistency with his own premises, in believing that  $7+5=12$  is synthetic.

What about *a straight line is the shortest distance between two points*?<sup>11</sup> It is hard to see how *this* could be synthetic. I don't know whether this proposition is *obvious*. But given that it is true, it is hard to see how anything other than the constitution of the concepts involved could make that proposition be true.

§ Let us now look more closely at Kant's reasons for regarding these propositions as synthetic, i.e. as *not* being conceptually true. Kant begins by saying that, when you think  $7+5$ , you don't necessarily think  $=12$ . Kant is right about this. When you think  $m+n$ , you don't necessarily think the sum of that operation. That is why we need calculators.

But at this point, Kant's reasoning becomes fuzzy. The fuzziness is due to the fact that Kant is not clear, either in his thinking or in his exposition, about whether he is using the term "concept" in the logical, or the psychological sense; he goes back and forth. It does not appear that he registered this distinction. But I think it is fair to reconstruct his reasoning as follows.

Given that you don't think  $=12$  when you think  $7+5$ , it seems to follow that *your* concept (i.e. your grasp) of  $7+5$  doesn't contain or include your concept  $=12$ . So in exercising your grasp of the concept  $7+5$ , you are not exercising your grasp of the concept  $=12$ . Therefore your grasp of the concept  $=12$  is altogether distinct from your grasp of the concept  $7+5$ .<sup>12</sup>

When you think *straight line*, you don't necessarily think *shortest distance between two points*. What you *think*, says Kant, is purely *qualitative*, not quantitative; you think of a line with a certain shape, not a line of a certain distance. So your grasp of the concept *straight-line* is distinct from your grasp of the concept *distance*.<sup>13</sup>

From this Kant apparently infers that *the* concept  $7+5$  is entirely distinct from *the* concept  $=12$ . But this inference involves a muddle of the two meanings of the word “concept”. *My* concept of  $7+5$  is distinct from *my* concept of  $=12$ . But, by itself, this doesn’t show that *the* concept  $7+5$  is distinct from *the* concept  $=12$ .

For Kant to make his case, he needs to appeal to some principle like the following: the structure of concepts (in the objective sense) of the word can be read off of the way in which they are represented in our minds. Facts about our *grasp* of concepts must parallel facts about the concepts themselves. So if my *grasp* of  $7+5$  doesn’t comprise my *grasp* of  $=12$ , then the first concept doesn’t comprise the latter.

Once that principle is granted, Kant’s argument goes through. But why grant it? What is the motivation for it? That principle presupposes that concepts are completely transparent: you cannot grasp a concept without at once grasping everything definitive of it. There is no more to them than meets the eye. Their *esse* lies in their *percipi*. It thus seems to me that the principle in question presupposes, and is probably motivated by, a kind of anti-realism or psychologism with regard to concepts. They are creatures of the mind, not entities in their own right.

Let us now close Kant’s argument. In Kant’s view, as we’ve just seen, the truth of  $7+5=12$  does not follow *wholly* from the concepts involved in that proposition: it is therefore synthetic. At the same time, Kant denies that it is an empirical truth: he denies that it is made true by what happens when apples are laid next to apples, when quarts of liquid are added to other quarts of liquid, and so on. Arithmetical truths are not inductive generalizations that we could, in principle, find to be false. You don’t know them *a priori*, not through empirical work. So such truths are *a priori* and synthetic. For analogous reasons, the same is true of *a straight line is the shortest distance between two points* and any other proposition that is non-empirical but (unlike  $A=A$ ) non-trivial.

The very existence of synthetic *a priori* propositions raises difficult questions. Such propositions do not hold wholly in virtue of facts about the structures of concepts. At the same time, they do not hold in virtue of the kinds of facts that can be discovered through empirical investigation. There thus doesn’t seem to be anything left to make them true. So in virtue of what do synthetic *a priori* propositions hold true, and how do we *know* them to be true?

IV. Let us now give Kant’s answers to the questions just posed. How do you know that  $7+5=12$ ? Not through conceptual analysis. Not through the senses. You learn it through an act of the imagination. You *imagine* seven objects laid next to five other objects, and then see that the resulting aggregate comprises exactly 12 objects.

How do you know that a straight line is the shortest between two points? Not through conceptual analysis. Not through the senses. You must have a certain kind of para-sensory experience: you must *imagine* a line connecting two dots. Kant refers to images of this sort as “intuitions.” So it is through “intuition” that you learn the truth of  $7+5=12$ .

It must be made clear that Kant is *not* using this term in the way it is used today. These days, philosophers usually use the term to refer to a putative insight into concepts (“my intuition is that killing someone is morally worse than passively allowing him to die”). This is not what Kant means. By “intuition” Kant means an act of *imaging*: a kind of para-perception.<sup>14</sup>

Let us continue with Kant’s story. How exactly do these para-perceptual experiences reveal the truth of  $7+5=12$ ? The idea seems to be as follows. First of all, these para-sensory experiences don’t show *conceptual* or *logical* necessity. Kant’s whole point is that the *concepts* involved in  $7+5=12$  do not, by themselves, guarantee its truth. Taken by themselves, those concepts are consistent with the truth of  $7+5\neq 12$ . So the para-perceptions that teach us the truth of  $7+5=12$  do not do so by apprising us of necessary relations holding among the components of that proposition.

At the same time, those para-sensory experiences don’t tell us anything about the external world: you can’t learn anything new about the external world through an act of imagination.

So, for Kant, these para-perceptual experiences show neither empirical truth nor conceptual necessity. What they show is *representational necessity*. They show us facts, not about the world or about concepts, but about how we must *sense-perceive* the world. These para-perceptual experiences show us what we can and cannot represent *in imagery*. We cannot form an image of a straight line between two points that is

longer than some other line between those two points. We cannot form an image of four apples that isn't also an image of two apples and two other apples.

Let us sum up. For Kant, recourse to "intuition" apprises us of what we can, and cannot, *imagistically* represent. So these "intuitions" apprise us of what we can, and cannot, represent in *perception*; they tell us how we must see things, in the literal sense of "see."

§ At this point, we must be careful. One might be tempted to ground these "representational" facts in conceptual facts:

*There can't be an image of four apples that isn't an image of two apples and two other apples because the concepts 2, + etc. are such that they don't permit this. It is a conceptual or logical truth that  $2+2=4$ , and this fact underlies the representational limitation Kant has in mind.*

This may be true. (In my view, it is true.) But it is just what Kant cannot, and does not, say. He thinks that  $7+5=12$  is such that its truth is *not* guaranteed by the concepts composing that statement. So the representational limitations he has in mind do *not* have a purely conceptual or logical foundation.

In Kant's view, these necessities are really of a *psychological* nature. Our "forms of thought" are such that we must see the world (literally see it) as being such that, in it, parallel lines don't meet, a straight line is the shortest distance between two points, two objects coupled with two other objects make four objects, and so on. We are wired in such a way that we (though perhaps not other life forms) must see objects as being in a space and time with a certain structure: a structure that does not permit parallel lines to meet, that does not permit  $2+2$  to equal 3, and so on. So "intuition", i.e. para-perceptual experience, shows us how we must sense-perceive the world.

IV. Is there any room in this picture for synthetic a priori *truth* or for knowledge thereof? Both questions must be answered with a "no". My argument for this owes much to Laurence Bonjour.<sup>15</sup>

For the sake of argument, let us concede a couple of key assumptions to Kant. First, let's concede that we do sense-perceive the world as being such that, in it,  $7+5=12$ , a straight line is the shortest distance between two points, parallels don't meet<sup>16</sup>, and so on. Second, let's concede that we learn these facts about how we perceive the world through "intuition" (some kind of para-perceptual experience).

Given only that we are psychologically compelled to see the world as being such that, in it, thus and such is the case, it doesn't follow that thus and such really is the case. A psychotic may be psychologically compelled to see pink elephants, but that doesn't mean there are pink elephants. So our para-sensory experiences don't tell us anything about the world, but only (at most) about how we perceive it. They tell us *not* that  $7+5$  *really* equals 12, but only that we are psychologically compelled to sense-perceive the world as being such that, in it,  $7+5=12$ .<sup>17</sup>

Actually, Kant himself admits this. These intuitions, he says, tell us about the "phenomenal" world, not the "noumenal" world. By Kant's own definition, the "phenomenal world" is just the world as it appears to us: it is how we see the world. The "noumenal" world is the actual world. So by Kant's own admission, these intuitions inform us only about how we see the world, not about how it is. We must see the world as being such that, in it, parallels don't meet. But whether this is true in the "noumenal" world is a totally separate issue. (Kant says that we simply cannot know whether they meet in the noumenal world or not.<sup>18</sup>) So intuition doesn't really tell us anything about the external world.

At the same time, for Kant, intuition doesn't tell us anything about the structure of concepts either. Intuitions are *not* insights into concepts. Kant is adamant about this. Intuition begins precisely where conceptual analysis ends.

So, on Kant's view, intuitions don't tell us anything about the spatiotemporal world and they don't tell us anything about concepts. Thus, given only that intuition tells us that a straight line is the shortest distance between two points, we simply have no reason to believe that straight line *is* the shortest distance between two points. At most, we can conclude that we are psychologically compelled to see the world as being such that, in it, a straight line is the shortest distance between two points.

So “intuition”, on Kant’s view, doesn’t give us *knowledge* of the fact that  $7+5=12$ . At most, intuition gives us only the knowledge that we are psychologically compelled to see the world as being such that, in it,  $7+5=12$  and parallels don’t meet. *A fortiori* intuition doesn’t give us *a priori* knowledge of the fact that  $7+5=12$ . If it gives us *a priori* knowledge of anything, it is of the fact that we must *perceive* the world as being such that, in it,  $7+5=12$ . But, as we’ll see in a moment, it doesn’t even give us *a priori* knowledge of this; it gives us, at most, *a posteriori* knowledge of that fact.<sup>19</sup>

V.  $7+5=12$  obviously *is* true, and therefore registers a fact about *something* or other. According to Kant, it does not register a fact about the structures of concepts (in the non-psychological sense). Further, it does not register a fact about our own psychology. Consequently, it must register some fact about the spatiotemporal world: all the other options have been exhausted. So on Kant’s view, followed to its logical conclusion, for us to know whether  $7+5$  *really* equaled 12, we’d have to learn some fact about the non-mental, non-platonic world (which, for reasons that are internal to Kant’s system, Kant says we cannot do).  $7+5=12$  thus becomes a kind of empirical truth. In any case, it becomes a truth that cannot be known in any way *other* than through examination of the external world. So, by any definition of *a priori*, it is not *a priori*.

Kant’s system has the same effect on *any* truth that we would characterize as *a priori*, apart from completely trivial ones (e.g.  $1=1$ ). If they can be known at all, it is through knowledge of the noumenal world. According to Kant, we can’t know anything about the noumenal world. Therefore we don’t have *any* knowledge of such truths, let alone *a priori* knowledge.

VI. One might make the following claim on Kant’s behalf:

*How could we learn the truths of geometry, if not through visual intuitions? In any case, whether or not we could learn them in some other way, we do learn at least some of them through intuition. This would seem to support Kant’s view.*

When you learn through mental imagery that a straight line intersects a circle at no more than two points, you are learning something that holds entirely in virtue of facts about the structures of the *concepts* CIRCLE and LINE, and so forth. You are not learning something that holds in virtue of facts about our cognitive machinery. Nothing about circles has anything to do with our cognitive machinery. When we *do* learn facts about geometry or perhaps arithmetic through an exercise of powers of imaging, we are engaging in *conceptual analysis*, the vehicle for which, in those cases, happens to be mental imagery. There is no reason why images should not mediate conceptual analysis. So given only that some truth is discovered through thought involving mental imagery, it doesn’t follow that it is synthetic.

What led Kant astray was a failure to distinguish the different roles that mental imagery can play in the acquisition of knowledge. Kant noted that mental imagery is a kind of para-perception. He concluded from this that, when mental imagery is involved in the discovery of some truth, that truth is synthetic – like those truths that we use *perception* to discover. The idea is that, if the truth in question were purely conceptual, then we wouldn’t need to use para-perception to ascertain it.

But that is simply false. If somebody asks me “what is the minimum number of sides a solid can have?”, I base my answer on a mental image that I produce.<sup>20</sup> I *imagine* trying to produce a solid out of four sides, then note that it doesn’t work, then try to do the same thing with five sides, and note that it *does* work. But surely the fact that a solid has to have a minimum of five sides is not synthetic. That proposition holds entirely in virtue of mathematics – in virtue of the structure of the concepts *five* and *solid* and so forth. It is true that I rely to some extent on imagery to learn this truth. But the imagery is a vehicle for *conceptual* analysis.

It might seem that Kant *did* show that we have *some* *a priori* knowledge: we have *a priori* knowledge of facts about the phenomenal world, i.e. about how we must perceive the world. We know *a priori* that the world, as we perceive it, is such that parallel lines don’t meet in it, triangles have interior angles adding up to  $180^\circ$ , and so on.

The truth is that, on Kant's account, even *this* knowledge turns to be a posteriori. As before, what led Kant astray was a failure to distinguish the two different epistemic roles that attention to our own mental processes can have.

As we've seen, mental imagery can sometimes serve as a vehicle for conceptual analysis. But it can also play a very different epistemic role. Suppose I want to find out facts about my own psychology. Suppose, for example, that I want to find out whether I can imagine a 17-sided figure. Here I will, of course, generate mental imagery, and attend to the content of that imagery. But in this case, the imagery is not serving as a vehicle for conceptual analysis. In attending to my mental imagery, I am doing *empirical* work, and the truth that I discover (that I cannot visualize a 17-sided figure) is as a posteriori as *Socrates was bald*. Here the mental imagery is the actual *subject-matter* of the truth-learned.

For Kant, you learn that you can't represent parallel lines as intersecting by *noting that you cannot imagine it*; you *observe* your own mental imagery. So you learn this putative fact about your representational powers through a kind of self-observation, and not through any kind of conceptual analysis. This knowledge turns out to be quite a posteriori. When Kant says that "in the phenomenal world" parallels don't meet, he is just saying that we cannot visually represent a world where parallels don't meet. So our knowledge of this fact about the phenomenal world turns out to be a posteriori.

Consider a point made by Leibniz about the role that imagery plays in the acquisition of mathematical knowledge:

*But I do not agree with you what seems to be your [Locke's] view, that some kind of general certainty is provided in mathematics by "particular demonstrations" concerning the diagram that has been drawn. You must understand that geometers do not derive their proofs from diagrams, although the expository approach makes it seem so. The cogency of the demonstration is independent of the diagram, whose only role is to make it easier to understand what is meant and to fix one's attention. It is universal propositions, i.e. definitions and axioms and theorems which have already been demonstrated, that make up the reasoning, and they would sustain it even if there were no diagram.*<sup>21</sup>

Diagrams serve as *vehicles* for a priori reasoning. The fact that I use a diagram to prove the intermediate value theorem or the Pythagorean theorem doesn't prove that either of those theorems is synthetic. They aren't synthetic. This point applies to mental imagery – to mental diagrams.

Leibniz's point was made more recently by Christopher Peacocke:

*When you come to know a logical truth by way of your having a proof of it, you may need to perceive the inscription of the proof, and you may need various perceptual capacities to appreciate that it is a proof. But the justification for your belief in the logical truth is the proof itself. Perceptual experience gives access to the proof, which provides an experience-independent justification for accepting its conclusion. By contrast, if you come to believe "That's Mikhail Gorbachev", when you see him at the airport, what entitles you to your belief is (in part) the perceptual experience by which you recognize Gorbachev. Your perceptual experience is not a mere means which gives you access to some experience-independent entitlement to believe "That's Gorbachev."*<sup>22</sup>

When you use a mental image to figure out whether a line can intersect a circle at more than two points, the image gives you the justification for believing a certain proposition, but the image is not *itself* a justification-- at least not in the sense in which seeing Gorbachev at the airport is justification for believing that Gorbachev is still alive.

VII. I should respond to a possible misgiving about our analysis:

You have belittled and caricatured Kant's views. Kant says we must see the world as being such that, in it, parallel don't meet, and  $7+5=12$ , and the area of a triangle  $\frac{1}{2} \text{ base} \times \text{height}$ , and so on; and he says that this due to our forms of thought. You have taken this to mean that, for Kant, our seeing the world as having these features is due to some merely psychological compulsion, comparable to a neurotic's compulsion to wash his hands twenty times a day. But this is to misunderstand the nature of the necessity Kant has in mind. The necessity that attaches to the proposition that parallels don't meet is epistemological, not psychological; transcendental, not empirical. That proposition describes a necessary precondition for our being able to have any experience at all of the world. Obviously the proposition PARALLELS DON'T MEET won't be made true by a mere psychological compulsion, just as pink elephants aren't brought into existence by a psychotic's hallucinations. But Kant in no way holds that the necessity attaching to PARALLELS DON'T MEET is psychological. In fact, he goes out of his way to make it clear that the necessity in question is non-psychological. In characterizing what is in fact transcendental necessity as mere psychological compulsion, you have misrepresented Kant's view, and made it far easier to destroy than it really is.

In the end, "transcendental" necessity reduces either to mere psychological necessity or to conceptual necessity. We cannot coherently think of a world where triangles have two sides or where  $2+2=3$ . That is because propositions like  $2+2=3$  and *triangles have two sides* are *conceptually* false and consequently draw a limit to what we can conceive of. What cannot be conceived cannot be perceived.<sup>23</sup> Conceptual necessities thus impose sharp limits on how the world can be visually represented. So it is clear how conceptual falsity translates into representational impossibility.

At the same time, if a proposition is conceptually possible, then it is hard to see why it would be representationally impossible to grasp it. Because we have certain cognitive machinery -- certain "forms of thought" -- we are compelled to see the world in a certain way. But unless those forms of thought embody *conceptual* necessities of some kind, I don't see why we couldn't, in principle, have different forms of thought.

We could obviously imagine having a cognitive architecture such that we could only see two different colors or hear two different pitches. Under those circumstances, given the forms of thought operative in our sense-perception, we simply *couldn't* see a third color or hear a third pitch. But obviously it is *conceptually* possible that there be more than two colors. (It is actual; so it is possible.) So it is representationally possible.

In conclusion, while there are limits to what our perceptual machinery can do, it is unclear why these limits could be necessary unless they were grounded in conceptual, i.e. strictly analytic, impossibilities.

VIII. There is an incoherence in Kant's thinking more radical than any mentioned so far. He rightly wants to hold that propositions like  $7+2=9$  and *the area of a (Euclidean) triangle is  $\frac{1}{2}$  the base  $\times$  height* are a priori. But he also says that we *sense-perceive* the world as being such that these propositions are true *in it*. Of course, if the world can be *seen* (literally *seen*) as being such that, in it,  $7+2=9$  is true, then  $7+9=12$  is *descriptive* of the spatiotemporal world. If  $7+2=9$  said absolutely nothing about the spatiotemporal world, then the truth or falsity of that proposition couldn't make any difference to how the spatiotemporal world seemed to us. So, on Kant's view, these propositions say something about the spatiotemporal world.

But, as Frege clearly stated,  $7+2=9$  doesn't say anything about the spatio-temporal world; it doesn't say that if you hold up two fingers and then hold up seven fingers, nine fingers are on display. For there could, in principle, be a causal law that falsified just that sort of statement -- a law that didn't allow more than five fingers to be simultaneously on display in a certain region.

The same is true of Kant's claim that we must sense-perceive the world as being such that, in it, straight lines are the shortest distances between pairs of points. The proposition *a straight line is the shortest distance between two points* says nothing at all about the spatio-temporal world; it *defines* a certain kind of space.<sup>24</sup> Of course, there are empirical propositions -- concerning light rays and point-masses -- that are analogous to that purely mathematical proposition. But surely Kant doesn't have these in mind when he says it is a *a priori* that a straight line is the shortest distance between two points.



So Kant's position is self-undermining. He needs mathematical propositions to be two things at once. They must be descriptive of the world: they must say something about beams of light. But they must also *not* be descriptive of the world: they must not be capable of falsification by anything having to do with beams of light and the like.

A Kantian might reply by saying:

*Contrary to what you say, propositions like  $7+2=9$  and A STRAIGHT LINE IS THE SHORTEST DISTANCE BETWEEN TWO POINTS do describe the empirical world. In fact, they describe necessary features of it. So  $7+2=9$  is like GRASS IS GREEN in one respect: it is descriptive of the empirical world. But  $7+2=9$  is unlike GRASS IS GREEN in another respect: it describes necessary features of the world. That is why  $7+2=9$  is a priori, unlike GRASS IS GREEN. There is no inference from P DESCRIBES THE WORLD to P IS AN EMPIRICAL AND CONTINGENT PROPOSITION. So the point you just made fails.*

But there is an inference from *P is necessarily true*<sup>25</sup> to *P doesn't describe the empirical world (in any way at all)*. If P is necessary, then P's being true in world 1 doesn't distinguish world 1 from world 2 or from world 897. P therefore doesn't say anything about the world that distinguishes it from other possible worlds. So P doesn't say anything at all about the world. A "description" of a thing that fails to distinguish that thing from other things in any way at all is no description at all.

IX. So far I've said a lot about why Kant is wrong. But I think that, with a few adjustments, Kant's position might possibly be correct.

Ultimately, there is one thing wrong with Kant's view: his conception of analyticity is much too narrow. Everything else that is wrong about Kant's position can be traced back to this one mistake. A corollary is that everything that is wrong about his system can be corrected by correcting this one mistake.

Kant grants analytic status *only* to propositions like

(a) *circles are round.*

He denies analytic status to propositions like

(b) *a circle is a class of points equidistant from a given point in a plane.*

Thus he says the following is analytically false:

(c) *circles are not round.*

But he denies that the following is analytically false:

(d) *a circle is not a class of points equidistant from a given point in a plane.*

His reasoning seems to be this:

*A proposition is analytic exactly if one is guilty of incoherence in virtue of countenancing its negation. One is guilty of incoherence if one thinks that (\*) is false. But one is not guilty of incoherence (though one is wrong) if one thinks that (\*\*) is false.*

*To be incoherent is to think in a way that is counter-conceptual. Thus (\*) is counter-conceptual. (\*\*) is not counter-conceptual.*

*An analytic proposition is one that is made true by concepts. An analytically false proposition is one that is made false by concepts: a counter-conceptual proposition. One can countenance the negation of (\*\*)*

*without being guilty of incoherence, and without countenancing a counter-conceptual proposition. Thus (\*\*) is not analytic.*

*But (\*\*) is a priori. So we must suppose that it is made true by facts about our conceptual machinery; it embodies a fact about our conceptual schema. That is why no empirical discovery could confute it.*

The word “coherent” has two entirely different meanings: a psychological meaning and a purely logical meaning. (As we noted earlier, the word “concept” is correspondingly ambiguous. There is no doubt that these facts are linked – that they both express a tendency to assimilate the logical to the psychological and *vice versa*.)

If you believe (d), you are guilty of *logical* incoherence: the proposition you believe entails a contradiction. But a perfectly *sane* person could believe the negation of (d). In virtue of believing it, one is perhaps guilty of stupidity, and of incoherence in the *logical* sense, but not of incoherence in the psychological sense.

By contrast, if you believe (c), you *are* guilty not just of logical, but of psychological, incoherence. You couldn’t possibly think that *circles* are not round; to think of something as a circle just *is* to think of it as round. So to think of something as a non-round circle – if such a thought is even possible -- would involve a kind of double-think, a fragmentation of the psyche.

The following story might be helpful. Somebody says to you:

*(e) a triangle is the area bounded by three straight lines such that any two of them intersect but not all three intersect.*

But you don’t immediately see the truth of that proposition. Initially, you reject you it; you say:

*(f) A triangle is not the area bounded by three straight lines such that any two of them intersect but not all three intersect.*

Are you guilty of *psychological* incoherence? It seems not. A perfectly sane person could believe (f). Belief in (f) constitutes mathematical, but not *psychological* incoherence.

But a sane person could *not* believe:

*(g) A triangle is not a three sided figure.*

If one believed (g), one would be guilty not only of logical, but of *psychological* incoherence. Thinking of x as a triangle *and* as not being three-sided would involve a fragmentation of the thinker’s psyche.

Logical coherence is a relation among concepts. Psychological coherence is a relation among our *grasp* of concepts.

All of the following are analytic:

*(a) circles are round.*

*(b) a circle is a class of points equidistant from a given point in a plane.*

*(e) a triangle is the area bounded by three straight lines such that any two of them intersect but not all three intersect.*

*(h) triangles have three sides.*

But (a) and (h) are different from (b) and (e). One is guilty, not only of logical, but of *psychological* incoherence in virtue of believing (a) and (h). One is guilty of logical, but not of psychological incoherence, in virtue of believing (b) and (e).

Let us set say that (b) and (e) are “hard analytic”, and let us say that (a) and (h) are “easy analytic”. It is *hard* to know that (b) and (e) are true. It is not hard to know (a) and (h) are analytic; a grasp of those propositions by itself suffices for a knowledge of their truth. (Kant describes such propositions as “apodictic.”)

What Kant refers to as “synthetic a priori” truths are nothing other than what we are describing as hard analytic truths. What Kant refers to as analytic truths are what we are describing as easy analytic truths.

Once it is recognized that (b) and (e) are analytic, albeit *hard* analytic, we must say that they hold entirely in virtue of facts about the concepts that compose them; and there is no longer any temptation to say that they are made true by facts about the mind. So that obliterates any possible warrant that might otherwise be had by Kant’s psychologistic analysis of those propositions.

§ But we must remember what Kant’s larger concern is. Kant’s main concern is *not* a taxonomy of propositions. That is incidental to what he is doing.

We have experience; we have sequences of thoughts and perceptions that cohere. The world is intelligible to us. We sense-perceive it and about it. Up to a point, our perceptions and thoughts are accurate. In Kant’s view, given the very fact that these things are true, we can deduce certain things about the structure of the world. Given *only* that we have coherent ideation, the world must satisfy *certain* minimal conditions.

Kant refers to those conditions as “transcendental”: they are the conditions that are necessarily satisfied by any world in which there are entities that have coherent, if not always accurate, thoughts and representations. The “necessity” just mentioned is not causal: it is of a deeper kind.

A “transcendental argument” is one having the form: given only that we have experiences of such and such a kind, it follows that the world must have thus and such features.

Kant gives transcendental arguments for many things. I think that some of these arguments are cogent, *provided* that we make some terminological changes. Where Kant talks about “synthetic a priori”, we should instead talk of “hard analytic.” This minor adjustment de-psychologizes Kant’s arguments, and enables them to go through.

I will argue that there is an *analytic* connection – a *hard* analytic connection, but an analytic connection no less – between the proposition *there exist beings who have the cognitive wherewithal to raise metaphysical questions* and propositions concerning the structure of the world itself.

I will also argue for another significant claim. Consider the following propositions: *any two events are related in space or in time; there are causal relations among states of affairs; objects are not mere bundles of properties, but are things in which properties inhere; human beings are not mere bundles of perceptions (or thoughts), but are things in which such entities inhere*. These propositions describe the world. I will argue that, just as Kant maintained, each of those propositions is entailed by the proposition *there exist beings who have the cognitive wherewithal to raise questions (of any kind at all)*.

§ One of Kant’s main objectives is to show that there are necessary connections among the events that we experience. Hume said that there are sequences and regularities of events, but that there is never any kind of internal connection holding among them. For event x to cause event y is just for the sequence consisting of x followed by y to instantiate a general regularity.

Hume’s analysis is counter-intuitive. It very much seems that pushing the button *makes* the computer turn on, that flipping the switch *makes* the light turn on. Understandably, Kant wanted to do justice to that intuition. He tries to justify this intuition with a transcendental argument. (Here I will give a transcendental argument for that view; whether it is Kant’s own argument, or even one he would consider credible, is an exegetical question I wish to avoid.)

Imagine a world where there is *no* causation, where there are merely sequences of events. Such a world would comprise nothing enduring. This is because persistence is itself a causal notion. If something

persists, there is *ipso facto* a causal sequence of some kind. So where there is no causation, there is no persistence. Where there is no persistence, there is no coherent ideation. For surely, as a matter of necessity, a coherent thought process involves some kind of persistence. So given only the fact that there are beings who have the ability to raise questions about anything, let alone about the necessary preconditions for experience, it follows that causal relations do not consist in mere sequences of events, but in internal relations of some kind.<sup>26</sup>

But notice that this transcendental argument turns on the existence of entirely *analytic* connections among propositions; no “synthetic a priori” is involved. Given the very *concept* of a rational thought process, it follows that analytically there are causal relations among events. The analyticity in question is *hard* analyticity, but it is analyticity no less. In the next section, I will attempt to show that Kant-style transcendental arguments are capable of settling some important questions concerning scientific explanation and knowledge in general.

## Part 2. The Analogue-Digital Distinction and the Strictly Logical Basis of Induction and Causal Explanation

I. We take it for granted that some events cause other events to occur. We also take it for granted that our knowledge of the past gives us a rational basis for forming beliefs about the future. Hume identified some puzzles that would have to be met by any attempt to justify these views. To this day, these puzzles have not been solved.<sup>27</sup>

Kant himself proposed solutions. But those solutions falsely presuppose that the world known to us and studied by science is a creation of our own mental faculties. Nonetheless, I will now try to show that the basis for tenable solutions to those puzzles can be found in the spirit, if not the letter, of Kant’s system.

II. Let us begin by stating the puzzles identified by Hume, beginning with the one concerning induction.

### *Hume’s argument concerning induction (modified)*<sup>28</sup>

Suppose that such and such has always happened in the past. How does our knowledge of that fact warrant our believing that such and such will happen in the future? The warrant is not deductive. Given only that such and such happened before time *t*, there is no *logical* contradiction in saying that it won’t happen after *t*. (The proposition *all copper before t conducts electricity* is compatible with *some copper after t does not conduct electricity*.) The justification for this inference would have to be empirical, not strictly logical. To have an empirical justification for that inference, we’d have to know that, in general, the future resembles the past and that, consequently, knowledge of the past gives us a rational basis for beliefs about the future. But that is itself an empirical thesis, whose only possible justification lies in our past experience. Of course, on the basis of our such experience, we know that *past* futures resembled *past* pasts. But how could that knowledge provide any rational basis for believing that *future* futures would resemble *future* pasts? For such a belief to have a rational basis, we’d need some assurance of the rationality of induction. But there can be no such assurance unless there is an assurance that the future resembles the past. We are evidently caught in an unbreakable, vicious circle.<sup>29</sup>

### *Hume’s argument concerning causality (modified)*

Now let us consider Hume’s puzzle concerning causality.<sup>30</sup> Given two distinct states of affairs, one is not guilty of self-contradiction if one affirms the existence of the one but denies the existence of the other. Since causality holds between distinct states of affairs, there is no strictly logical connection between cause and effect. Given this, we might say that a causal connection consists in the operation of some *force* that demands the existence of the one event, given the existence of the other. But this is not a tenable proposal. If by “force” is meant “causal necessity”, then that view is an innocuous triviality. If by “force” is meant

“logical necessity”, then that view is simply false, as we’ve just seen. If by “force” is meant some constituent of the spatio-temporal world, then there can be no legitimate reason to believe in its existence, as the following argument shows. We perceive events and regularities among events. If they exist, forces are connections among events, and are not events themselves. What we perceive gives us a basis for believing that certain kinds of events are likely to accompany certain other kinds of events. But what we perceive does not give us any basis for perceiving that things altogether different from events are likely to accompany events. Therefore there can be no empirical basis for a belief in forces. So if there is to be any rational justification for such a belief, it must be strictly logical or *a priori*. But that sort of justification is not an option here: being spatiotemporal entities, forces can only be known on empirical grounds. There are no necessary, and therefore no causal, relations between distinct events, or at least none we could have any legitimate reason to believe in.

III. Let us now examine these arguments, beginning with the second. Hume says that given any two distinct events, there is no strictly logical connection between them. This must be qualified. Logical relations hold, not between states of affairs, but between pieces of *information*. Typically, these pieces of information are held to be sentences or propositions. Once it is revised to accommodate these facts, Hume’s position becomes: “if A and B are distinct events, then there is no strictly logical connection between the proposition *A occurs* and the proposition *B occurs*.”

But this last statement, in its turn, is true only when subject to a heavy qualification. Depending on how we describe A and B, a proposition affirming the existence of the one *might* entail one affirming the existence of the other.<sup>31</sup> To take a trivial example, this would be the case if we described A as *the cause of B* or if we described B as *one of the successors of A*. For Hume’s argument to go through, we must find some non-tendentious way of describing A and B.

At first, this seems easy to do. Suppose I push the button and the elevator comes a moment later. Let A and B be these two events. Obviously the proposition

(\*) *the button is pushed at t*

does not entail

(\*\*) *the elevator comes at t\**.

But this is not enough to establish that there is no internal connection between those two events. Even if Timmy’s favorite number is three, the proposition *the square root of nine is larger than two* does not entail *Timmy’s favorite number is larger than two*. But it would be folly to conclude on those grounds that there were no necessary connection between being identical with the number three and being larger than two. All that can be concluded is that the propositions in question don’t include the relevant information.

For similar reasons, given only that (\*) doesn’t entail (\*\*), we cannot infer that A and B have only a contingent relation to each other. What we can infer is *either* that A is only contingently related to B *or* that (\*) and (\*\*) leave out the relevant data. I believe that (\*) and (\*\*) leave out the relevant data, and that the relation between A and B is in no way contingent.

§ Let us begin with a question that might initially seem irrelevant. Are there *instantaneous* states of affairs? Is there anything that exists in three, but not in four, dimensions?

Of course, we sometimes speak about instantaneous states of affairs. But, it is now generally held, such talk is elliptical for talk of arbitrarily short, non-instantaneous states of affairs.<sup>32</sup> When we say that such and such is what obtains at a given instant *t*, we mean that what obtains during smaller and smaller intervals containing *t* approximates arbitrarily well to such and such.

The most obvious illustrations of this principle involve statements about velocity. There can be no movement, and hence no velocity, *at an instant*. When we say that *x is moving with velocity v at instant t*, we mean that as we consider smaller and smaller intervals containing *t*, *x*’s velocity during those intervals

comes arbitrarily close to  $v$ .<sup>33</sup> But exactly similar considerations warrant the view that there can no instantaneous temperature, mass, color, shape, spin, and so on. There are no strictly non-dynamic spatiotemporal properties – no property such that possession of it doesn't involve movement. So for reasons exactly similar to those warranting the rejection of instantaneous velocity, we must reject the notion of anything instantaneous. A corollary is that there is no complete description of any state of affairs that does not say what happens over a stretch of time.

An argument exactly similar to the one just given establishes that no state of affairs occupies an unextended point. Of course, we say that such and such is the case at a certain point  $p$ . But that means that as we consider smaller and smaller regions of space intervals including  $p$ , what obtains approximates arbitrarily well to such and such. The statement “the temperature at point  $p$  is  $88^\circ$ ” is in the same category as “ $x$  is moving 54 mph at instant  $t$ .” Both are meaningless unless taken as elliptical for limit-statements of the sort just discussed.

Now let us turn our attention back to A and B. Consider all the events, down to the last electron-jump, that are involved in the button's being pushed. The pushing of the button is not one event, but billions upon billions, as it supervenes on innumerable displacements mass-energy. To give a complete description of the pushing of the button, we'd have to describe each of these displacements.

Focus on an arbitrary one of these mass-energy displacements. To give a complete description of this displacement, we must obviously describe what happens during some stretch of time, however short that stretch may be. For there are obviously no *instantaneous* displacements of anything. Suppose, then, that we confine our description to what happens within some interval -- call it *int* -- of time. Suppose, in other words, that we don't allow that description to be infected with talk of anything happening before or after *int*. Let  $D$  be the description in question, and let  $t$  be the instant at which *int* ends.

If we want  $D$  to constitute a *complete* description of what happens during *int*,  $D$  would have to include a complete description of what happens up until  $t$ . Here we have two choices. We can say that  $D$  includes a description of what happens up until, but not including,  $t$ . Or we can say that  $D$  includes a description of what is happening at  $t$  itself. Let us consider each case.

Suppose we say that  $D$  includes a description of what happens at  $t$  itself. As we have seen, that means that  $D$  includes a description of what happens during some interval *int*\* that includes  $t$  and thus stretches past  $t$  in time. In that case, a complete description of the occurrences during *int* would include a description of occurrences happening after *int*. So a complete description of the relevant mass-energy displacement (the relevant electron-jump or whatnot) would include a description of some *later* event  $E$ . This would have two consequences. First it would mean that any description of any given event *would* include a description of subsequent events. That by itself would shatter Hume's view that there is no necessary connection between any event and any subsequent event. Second, everything we said about *int* would apply (*mutatis mutandis*) to *int*\*. This means that to give a complete description of the occurrences during *int*\*, we'd have to describe the events in some neighboring, but subsequent region, of time *int*\*\* -- and on and on. By this reasoning, there is a strictly logical connection between (complete descriptions of) any two events that are connected by a continuous series of events. (For reasons already given, the parenthetical qualification does not trivialize our thesis.) Given any proposition completely describing event  $E$ , that description includes a description of what happens during each event connected to  $E$  by a continuous series of events. So there would be a strictly logical connection between the occurrences constituting the pressing of the button and those constituting the arrival of the elevator. (Or, more accurately, there would be a strictly logical connection between the propositions giving complete descriptions of those events.) Our belief that there is no such connection would have to be seen as a projection into the external world of cavities in our belief-system.

So if we are to hold onto Hume's view, we must *not* let  $D$  include a description of what happens at  $t$ , but only a description of what happens up until  $t$ . But this doesn't change anything. If  $D$  is to include what happens up until  $t$ , then for each time  $t^*$  within *int*,  $D$  must give a complete description of what happens at  $t^*$ . For the reasons we've given, any complete description of what happens at  $t^*$  will include a description of what happens later than  $t^*$ . This reproduces an exact analogue of the situation described a moment ago. Let  $D^*$  be a complete description of what happens at  $t^*$ . By reasoning exactly similar to that given earlier,  $D^*$

logically entails that some event  $E$  later than  $int^*$  occur; and a complete description of  $E_1$  will entail the occurrence of some event  $E_2$  occurring still later – and so on.

One might parry this by insisting that our description of  $int^*$  include everything up to, but not including,  $t^*$ . But that would only push the problem back. Even under that circumstance,  $D^*$  would completely describe what is happening at some time  $t^{**}$  (prior to  $t^*$ ); and for exact analogues of the reasons just given, that would shatter Hume's denial of necessary relations between distinct events. The only way to circumvent this is to keep on insisting that our descriptions not include what happens *at* the bounds of the relevant intervals. But by reasoning similar to that just given, that procedure fails, so long as the intervals have some non-null duration. We don't have to consider whether it works for null durations, since "null duration" is a contradiction in terms.

III. Hume's position, then, involves two blunders. First, it fails to recognize that logical relations hold among pieces of information, not among states of affairs. Second, it assumes that there are infinitely short, and infinitely small, states of affairs. But given *any* property  $F$ , it is nonsense – false on conceptual, as opposed to empirical grounds – to speak of  $F$ 's being instantiated in spatial or temporal point.

Admittedly, there are apparent exceptions to this. It might seem to be meaningful to say that  $x$  is a square *at* instant  $t$ . After all, squareness is (it seems) a three-, not a four-dimensional property. But this is not so. It would be meaningless to say that  $x$  was a square, but then to deny  $x$  any of the associated causal or kinematic properties. For  $x$  to have the shape of a square *is* for  $x$  to be a dynamic system of a certain kind.

Given a four-dimensional system whose behavior remains constant in some key respect, we tend to see that system as *non*-dynamic in that respect. But this involves a confusion of the having of four-dimensional properties with the gaining and losing of such properties. What we are inclined to describe as four-dimensional properties (e.g. acceleration) are really *changes* in four-dimensional properties and are thus properties of properties. What we describe as three-dimensional properties (e.g. mass, shape) are usually just first-level four-dimensional properties, as opposed to the hyper-properties just discussed.

We must also remember that motion and persistence are themselves causal phenomena. To say that  $x$  has endured for a certain period of time, or has moved from  $A$  to  $B$ , is to make a causal claim. It follows that no state of affairs can be described by a non-causal proposition, making it impossible even to articulate Hume's puzzle regarding causality in a way that doesn't presuppose its existence.

§ We have discussed how talk of infinitely short or small events is really talk of arbitrarily short or small events. I would go further, and say that talk of instants and points is *itself* talk of arbitrarily small, or arbitrarily short, occurrences. (Here I am following others, including Whitehead, Russell, and Einstein himself.) It isn't logically or epistemologically possible to start with empty points and instants, then fill them (so to speak) with states of affairs, and then build spatio-temporally extended events out of those. Instead, we must start with events and, on that basis, work our way backwards towards points and instants.

There are no minimal events. To say that space-time consists of points and instants, as opposed to granules of non-null size, is to say that events have an "analogue", and not a "digital", structure.<sup>34</sup> (A sentence is a digital representation: it has minimal units of significance. A photograph does not have minimal units of significance, and is thus analogue.<sup>35</sup>) That events have an analogue, as opposed to a digital, structure neither follows from, nor is rendered possible by, the fact that space-time consists of points and instants. Rather, space-time's consisting of instants and points *is identical with* events' not having a digital structure.

As we've noted, *linguistic* representations decompose into minimal parts. This seems to be a defining fact about language, at least of the languages we use in discursive contexts.<sup>36</sup> (Artistic expression often involves an analogue medium. So if, as some maintain, such media are actually *languages*, then there are non-digital languages.) This reflects the fact that it is *hard* for us to understand what we cannot digitize. (It is also a possibility that discursive understandings *consists in* digitization, at least up to a point.) It also reinforces a pre-existing tendency to associate understanding with deconstruction into minimal, discrete parts. The belief that space and time are *composed* of points strikes me as a projection into the physical world of this fact about language. The belief that temporally extended events must be built out of non-

extended events is sheer anthropomorphism, and is thus to be put in the same category as the view that rocks fall because being near the earth reduces their anxiety level.<sup>37</sup>

IV. Once it is granted that discourse about points and instants<sup>38</sup> is elliptical for discourse about extended (but arbitrarily small or short) events, the problem ceases to be how to establish a necessary connection between distinct events, but rather how to *prevent* any two events from having such a connection.

Hume assumes that there are entirely *non*-causal descriptions of states of affairs. Billiard ball X rolls into billiard ball Y. X stops, and Y starts rolling. The causal connection, says Hume, consists only in the fact that the situation just described is an instance of some regularity. What Hume doesn't realize is that each of the statements involved in describing that scenario is replete with causal content. X's rolling is causal; so for that matter is Y's standing still (relative to the pool-table). The persistence of each of those objects is itself a causal fact.<sup>39</sup>

We tend to think of causation as involving some sort of disruption. The mere persistence of Y is not, we feel, sufficiently disruptive to involve any kind of causality; neither is the mere rolling of X. The problem with this viewpoint is that the concept of a disruption has only a psychological or pragmatic significance. From a purely physical standpoint, the transference of motion from X to Y is no more disruptive, no *greater* a change, than X's rolling or Y's persistence. This is not to mention that, given the relativity of motion, what counts as mere persistence as opposed to motion is framework-relative.

Hume's puzzle thus presupposes a highly anthropomorphic conception of causality: there are causal relations only where there are events that are *psychologically* disruptive. But such a conception is no basis for any analysis of causality.

Given a correct conception of what instants and points are, we may conclude that, given a complete description of A and B, those events turn out to be no less contingently related to each other than are the square of three and the predecessor of ten. The considerations generally cited to the contrary are artifacts of tendentious descriptions of the events in question.

Hume's analysis of the concept of "force" is beyond reproach. But that analysis is moot since, contrary to what Hume held, we don't need forces to connect cause and effect.

Hume is also right that there is no necessity other than logical necessity.<sup>40</sup> Philosophers have had one of two reactions to this. Either they've rejected it, on the grounds that there is such a thing as nomic necessity and that it is not logical necessity, or they've denied the existence of nomic necessities (this was Hume's reaction).

But both reactions are false. There is obviously some principled connection between the pushing of the button and the ascent of the elevator. (Attempts to reduce such connections to constant conjunctions have not fared very well, though they persist to this day.<sup>41</sup>) The apparent absence of a logical connection between the two is an artifact of the impoverished descriptions of those events employed by philosophers attempting to demonstrate the irrationality of induction. Further, those descriptions are typically embedded within discussions that involve a conception of space-time that has been questioned since Leibniz, and that has been decisively refuted over a hundred years ago.<sup>42</sup> Finally, those descriptions never mention the fact that the data that motivates (and, so I will argue, justifies) our inductive beliefs is never, in the final analysis, propositional. That data is perceptual, and thus doesn't decompose into permutation-friendly entities like propositions and sentences, and is thus less likely to reinforce the false view that space-time is comparably permutation-friendly and thus incapable of hosting events that have internal connections to one another. (We will soon develop this last point.)

V. The viewpoint developed so far is not hard to corroborate. These days it is generally accepted that:

(O) E precedes E\* in time exactly if there is some (possible) causal process, e.g. a light ray, beginning with E and ending with E\*.<sup>43</sup>



This suggests that temporal order is itself a causal notion. Obviously there is no atemporal description of anything spatiotemporal. It follows that any description of anything spatiotemporal is itself a causal description. If that is right, then it is not possible even to articulate Hume's objections to causality.

Recognition of (O) was forced on us by empirical discoveries, in particular by Relativity Theory. But is (O) itself an empirical statement? I think not. If there is no possible causal connection between E and E\*, then it makes little sense to say that they have any spatial or temporal position with respect to each other. If there is no conceivable way that anything could travel from the place of E to the place of E\*, then it is unclear what it would mean to say that E and E\* were separated by such and such a distance.<sup>44</sup> Similar considerations make it hard to believe that, absent some kind of causal relation between them, one of those events could be meaningfully described as coming before the other. It seems, then, that (O) is less like *all and only rhenates are chordates* than it is like *all and only triangles are regions bounded by three coplanar lines such that any two of them, but not all three, intersect*.

VI. Hume famously argued that there are no strictly logical grounds for the view that every event must have a cause – that there are no *ex nihilo* events.<sup>45</sup> His argument is simple: propositions alleging uncaused events, e.g. *the newspaper spontaneously combusted*, are not self-contradictory. Since what is not self-contradictory is possible, *ex nihilo* creation and change is therefore possible.

This is a corollary of the view that propositions assigning causal relations to pairs of events never have a strictly logical foundation. It is therefore to be expected that Hume's argument for the possibility of *ex nihilo* creation involves the fallacies we've just been considering.

For E and E\* to be spatio-temporally co-located *is* for them to be causally related. The spatio-temporal manifold would comprise *ex nihilo* (uncaused) events only if it comprised events that were not co-located with other events – only if it comprised events that it didn't comprise.

I believe that Hume's analysis of induction is bound up with his belief in the logical possibility of *ex nihilo* creation. As we've just seen, the latter belief is itself an application of his digital conception of spatio-temporal reality. In a moment, I will argue that, when we appropriately de-digitize this conception, Hume's analysis of induction crumbles. I will also argue that this de-digitization involves little more than distinguishing between, on the one hand, the sensory data that motivates our inductive and theoretical judgments and, on the other hand, the propositions we use to model that data.<sup>46</sup>

#### *Summary of sections I-VI.*

By "spatio-temporal continuity", I propose to mean the kind of continuity had by series of states of affairs -- as opposed to, say, series of numbers. Henceforth the term "continuity" will be elliptical for "spatio-temporal continuity."

With the help of this new terminology, we may now sum up our findings. Hume's conception of causality involves a falsely "digital" conception of spatiotemporal reality.<sup>47</sup> In his view, each region of space and of time is a distinct box that can be filled with a state of affairs. If the contents of one of those boxes are replaced or annihilated, that has no ramifications as far as the other boxes are concerned. The spatio-temporal world is thus, almost by definition, completely permutation-friendly. Given this viewpoint, it becomes trivially impossible to establish any causal relations between distinct events. The permutation-friendliness definitive of spatio-temporal location, as Hume understands it, *is identical with* the absence of causal connections between distinct states of affairs. But this conception of spatio-temporal relations cannot be sustained, as the following argument shows.

Persistence is a causal phenomenon. Spatio-temporal continuity is a form of persistence. Consequently, continuity is a causal phenomenon. By definition, continuity has no place in a digital system. Hume's "demonstration" that there are no causal relations (or that such relations reduce to regularities) is thus an artifact of his assumption that space and time have a structure comparable to that of an array of digits.<sup>48</sup> But that assumption question-beggingly presupposes the very conception of causality that Hume is trying to defend.

I said that “continuity involves persistence.” At first this seems false. Imagine an object that is changing continuously in every respect – mass, motion, shape, and so on. Surely, we will be told, *that* doesn’t involve persistence. But it does. The chair you are sitting on is a paradigm case of persistence. But it is now changing along all those dimensions. *Every* case of persistence is a case of continuous change. What we *describe* as changes are actually *changes in the manner of change*. They are higher-order changes. So there is no continuity without persistence, just as our argument supposes.<sup>49</sup>

VII. Hume’s tendency to digitize blinds him to the logical basis of induction, since induction, as I will now argue, consists in positing exactly those continuities that would “de-digitize” our description of reality.

Hume is, of course, entirely right to say that

(a) *every swan I’ve ever seen is white*

does not entail

(b) *the next swan I will see will be white.*

But this does not have the consequences that Hume believes it to.<sup>50</sup> Hume’s argument presupposes that our grounds for (b) consist in (a), or perhaps in (a) conjoined with a finite number of other propositions, say:

(a<sub>2</sub>) *in my past experience, there is little or no variation in respect of feather-color within a species of bird;*

(a<sub>3</sub>) *in my past experience, if members of a species significantly vary in one respect (e.g. the color of their fur or plumage, or the nature of their reproductive organs), then they are likely to vary in some other respect (their body-size, their behavior towards predators);*

(a<sub>4</sub>) *in my past experience, differences in plumage or fur-color vary with geography only when special conditions are met, none of which are met in this case.*

And so on.

Our knowledge of propositions like (a)-(a<sub>4</sub>) is certainly *part* of our grounds for inferring (b). But there are other grounds. In fact, we are subtly misrepresenting our grounds for believing (b) when try to propositionalize (and thus digitize) them. Strictly speaking, it is *not* our knowledge of (a)-(a<sub>4</sub>), or of any other *propositions*, that motivates and justifies our inductions: what does so is the sensory data that those propositions so schematically model. Hume’s argument is *supposed* to concern the data that warrants (or is supposed to legitimate) our inductions. In actuality, his argument concerns certain models of that data. In some cases, it harmless to confuse the model with the thing modeled. This is not one of those cases, as I will now argue.

VIII. Ultimately, our perceptions are, as Hume himself insists, our only source of information about the spatiotemporal world. Hume is therefore right to say that, like all other empirical beliefs, our inductions can be justified only by sensory experience.

Where Hume goes astray is in his failure to register a crucial fact about sensory information. The content of a perception doesn’t decompose in the same way as the content of the propositions that we would typically use to report those perceptions. If I see a swan, I will say “I see a swan; it is white; it is eating a fish...” But my perception doesn’t have a corresponding breakdown. It isn’t as though a single part of my perception corresponds to the concept *swan*, another to the concept *eating*, and so on. What is reported by such a proposition is not the content of the perception itself, but rather a judgment about the content of that perception. Describing such propositions as “data” is like identifying a court’s finding of guilty with the actuality of guilt.

There is thus a sense in which (a)-(a<sub>4</sub>) are *not* the data that motivate (or legitimate) belief in (b). (a)-(a<sub>4</sub>) are not data, but meta-data. We cannot work backwards from meta-data to data. That is like trying recover the subtle inflections of a person's speech from a court-stenographer's transcript. (In fact, that would be a special case of the principle we are considering.) The logical basis for induction is precisely what is lost in the process of digitization involved in embodying one's knowledge in (a)-(a<sub>4</sub>).

When you see a white swan, what your perception gives you is a continuous state of affairs. When you induce, on the basis of your perceptions, that all swans are white, you don't have in mind the sort of "data" embodied in propositions like (a)-(a<sub>4</sub>). You have in mind the kind of data that *leads* to, but is quite distinct from, a belief in such propositions. The data that actually motivates your belief in (b) is embodied in analogue representations. What is given to you in such representations is never a discrete state but, at most, a *relatively* discrete state of affairs.<sup>51</sup>

Any given perception presents a continuous reality. It is a datum that what is given to you in a given perception is spatio-temporally co-located with what is given to you in other perceptions. (It might seem that this "datum" itself presupposes the legitimacy of induction and is thus no datum at all. In due course, I will argue that it is in fact a datum or, at least, is a belief whose legitimacy doesn't presuppose that of induction.)

For reasons already considered, this means any two non-simultaneous states of affairs are causally related. This, in turn, means that they are connected by a continuous series of events: no *ex nihilo* changes are involved. It also means, as we've seen, that a correct and complete description of an empirical state of affairs permits a deduction of the events<sup>52</sup> in its neighborhood. We've seen that, for an arbitrary event E, if D is a *complete* description of E, then D *does* entail the occurrence of events that, by ordinary standards, are distinct from E.<sup>53</sup>

IX. In light of this, let us consider some counter-inductive inference, e.g.

(A) *this time, when I open my hand, the rock will not fall, but rather will sprout wings and fly away.*

To make such an inference is, implicitly, to hold that the scenario described by (A) is a logical consequence of a complete description of any of the events in its neighborhood, in particular, the complete descriptions of the events composing your hand, the rock, physical media involved, and so on. This means that, in making such an inference, one is committed to holding that the state of affairs described by (A) would be continuous with the events in its neighborhood.

Superficially, it seems as though that state of affairs *would* be no less than continuous with those events than would the event described by the inductively acceptable proposition:

(B) *This time, when I open my hand, the rock will fall.*

But remember that the state of affairs described by (A) must be continuous with the states of affairs described by every proposition we know to be true. We must also remember that the state of affairs described by (A) would have a much richer structure than (A) itself. The rock's flying away would not be an ultimate, primitive event. It would supervene in innumerable others -- some perceptible, some not. The propositions describing some of these constituent states of affairs would involve rather obvious discontinuities with the events in their neighborhoods.

(A) itself seems innocuous. There doesn't seem to be any problem fitting the event it describes into a coherent narrative.<sup>54</sup> Such a viewpoint, I think, confuses the proposition with the reality. Propositions have discrete, easily replaced parts. States of affairs do not. Hume holds that counter-inductive beliefs like (A) involve unusual, but otherwise acceptable, permutations of objects and properties. I would agree that (A) itself can be so described. But states of affairs cannot be understood in combinatorial terms; they don't consist of discrete, replaceable parts. They don't consist of parts whose replacements can even coherently be *thought*.

When we say that we can coherently *think* some such replacement, we are, I believe, making a statement about the logical properties of the corresponding *propositions*. This means that we are

tendentiously stripping our representations of those states of affairs of information that, if left in, would render such intersubstitutions logically impermissible.

§ It is tempting to think that (A) is logically incompatible with the existence of known facts, like that described by:

(C) *no stone known to anyone has ever sprouted wings.*

Hume rightly said that (A) and (C) are compatible *propositions*. But this says very little about either the states of affairs corresponding to those propositions or about the *non*-digital (analogue) data schematically represented by those propositions.

We must distinguish between digital- and analogue-compatibility. We must distinguish what is permissible, given propositions like (A) and (C), from what is permissible given the analogue data of which (A) and (C) are schematic representations.

For the sake of argument, suppose that somebody actually saw the state of affairs described by (A). Let (A\*) be the information embodied in that visual perception, not the hyper-schematic work-up of that information embodied in (A). Now let (C\*) be the information embodied in the perceptions that lead to our believing that stones never sprout wings. For reasons already considered, (C\*) must be distinguished from the schematic work-up of that information embodied in (C). So given only that (A) and (C) are logically compatible, it cannot be inferred that the same is true of (A\*) and (C\*). Further, I would suggest that when we reconsider the data leading to belief in propositions like (C), i.e. when we consider (C\*), we find that all kinds of discontinuities and perforations of the space-time manifold would be involved in a belief in (A).

§ We must also remember that (A) must be logically consistent not only with the data represented by propositions like (C), but with *all* the data. When this constraint is taken into account, the logical permissibility of inferences like (A) becomes more questionable than Hume makes it out to be.

A metaphor from music may help. Given any short sequence of notes, there are innumerable many musically feasible combinations of notes may follow it. But in a musical composition, it is not enough that each bar not clash with the bar preceding it; any two bars have to fit with the bars flanking them; and those four bars must fit with the two bars flanking *them*; and so on.<sup>55</sup> What is musically possible given any one bar is usually not possible in a broader context.

There are many ways to replace bar 58 of Mendelssohn's *Italian Symphony* without ruining bars 57-58. But, as we've just seen, it would be absurd to infer from this that there are equally many ways to replace bar 58 without ruining the whole symphony, or even there are *any* viable replacements. Hume's conception of induction involves a similar fallacy. When we say that (A) is merely counter-inductive, we are excluding two types of information. First, we are considering only propositional data (we've already considered the effects of this). Second, the propositions we select for special attention are not the only ones that embody that relevant data. We focus only on the ones that we believe to be important, given our erroneous *theories* about our inductive practices. I will spend the next section delineating this obscure statement.

X. If you ask Bob why he fell in love with Mary, he will probably give you an answer that is either wrong or ridiculously incomplete. He may say "I liked her smile" or perhaps "we both like to dance." Those answers may have some validity. But the psychological mechanisms responsible for them are less directly connected to the forces that actually shaped Bob's feelings than to Bob's simplistic and possibly defensive *views* about those forces.

Just as Bob has instinctive beliefs about why he loves Mary, so we have instinctive beliefs about why we *think* we believe that the pan is hot. I am not talking about our beliefs as to why the pan is hot. In my view, such first-order beliefs are typically cogent. I am referring to our beliefs as to why we have those beliefs. Those meta-beliefs can no more be regarded as authoritative than can Bob's stated answer about why loves Mary. If you ask Bob "why do you believe that the fire is hot?", he will say "because every other fire I've seen turned out to be hot", or some such. (To simplify discussion, I am assuming that Bob is

reasonably articulate, and doesn't answer with a shrug or a circularity like "I don't know, I guess because fire is hot.") The answer that Bob would give would, in fact, not be very different from the answer that a Hume or a Karl Popper would give. If that answer were accurate and exhaustive, then Bob's belief would indeed have no rational basis. But the psychological mechanisms that generate that answer are less directly connected to the forces that shaped Bob's belief than they are to Bob's Pavlovian *theories* about why has that belief.

Part of the reason one believes that future fires will be hot is that past fires were hot. But the reason one gives *weight* to that fact is to be found in *other* pieces of knowledge in one's cognitive background. (This background comprises tacit or sub-personal knowledge – not knowledge that can readily be articulated.)

Here are some of the truths that, I propose, are stored in this background. Mediating between the present and the past are continuous processes. Temporal and spatial relations involve continuity, persistence, and causation. Where there is *ex nihilo* creation, there is an absence of causality and, therefore, of spatio-temporal relatedness. So far as a hypothesis posits such breaches, it is inconsistent with the datum that everything we experience – our inner-states and their external counter-parts – are spatio-temporally (or, at least, temporally) co-located. Counter-inductive hypotheses implicitly involve such breaches. Therefore such hypotheses are not to be countenanced.

Hume wrongly saw our theories as created by associative mechanisms. But it is our *theories* about our theories, not the theories themselves, that are created by such mechanisms. What Hume falsely said about our thinking -- that it consists entirely of a kind of Freudian free-association<sup>56</sup> -- is true of Hume's thinking about our thinking. When you try to articulate the grounds for an inductive belief of yours, you tend to access the relevant data by way of associative mechanisms. The question "why do think that fire is hot?" triggers associations. It is obvious to us that *some* of these associations are irrelevant. But, with that qualification, our answers typically don't go much beyond what those associations give us. So we answer such questions with fatuities like "because other fires are hot" or "because fire looks like magma, and magma is hot." From Hume to the present, our theories about induction have only been elaborations of those association-based answers.

§ Our associative mechanisms track psychologically pregnant disruptions, and thus skip over the continual changes mediating between such disruptions. It is not that those associative mechanisms give us the *wrong* information. They typically point us in the right direction: my psychological association of fire with heat grounds a correct belief. But our associations refer us to singularities, and not to underlying continuities. Given that association is an affect-driven process, it is to be expected that it will refer us to emotionally pregnant breakdowns in the uptake of perceptual information, and not to the smooth flow of information mediating between such cataclysms.

Of course, there is no way to work backwards from such decontextualized data-points to the logical underpinnings of our theories. When we try to do so, we run into the problems identified by Hume. But this doesn't mean that there is no logical basis for induction; it corresponds only to the trivial fact that we can't recover the logical basis of our inductions from degenerate representations of that basis -- representations that highlight what is emotionally (or affectively) significant, and leave everything else out.

Our experience gives us smooth curves. Our sentential representations of our experience ("past fires have been hot") give us isolated points that are compatible with infinitely many different curves. On this basis, Hume and others say that there is no logical basis for induction. But that doesn't follow, since the justification for our inductions lies in the smooth curves of experience, and not in the jagged edges of our descriptions thereof.

Hume's views on induction are thus artifacts of his own methods. Given an association-driven review of our inductive-practices, it is indeed going to be impossible to recover the logic that underlies them. By their very nature, such associations leave out emotionally sterile, but logically crucial, connecting information.

Hume's empiricism as a whole is a study of artifacts. Since, in his system, knowledge is identified with sequences of images, it follows trivially that reality must be understood in terms of the associative-mechanisms governing such sequences. Being affect-driven, such sequences track disruptions, skipping over the emotionally neutral periods that intervene. A reality seen through the lens of such processes will

inevitably consist of singularities – as breakdowns in the conditions that permit causal and inductive explanation.<sup>57</sup>

XI. Here are some points that, I believe, are crucial to a correct understanding of induction. A given proposition (e.g. *John is eating chicken*) has a structure that is not remotely comparable to that of the corresponding reality or to that of the perceptual data through which we learn about that reality. Causation is bound up with continuity – with the very features of reality that resist the sort of digitization associated with sentences. Finally, the viability of induction is bound up with the existence of causal mechanisms linking states of affairs.

All of this is obvious. It therefore follows from what is obvious that the logical relations holding between two propositions will not typically do justice to the relations of necessitation (causal and explanatory) holding between the corresponding states of affairs. There must, I would therefore suggest, be a purely emotional basis our failure to see this, and for our subsequent willingness to accept Hume's otherwise unpalatable nihilism regarding causation and induction. In a moment, I will try to identify that emotional factor. But first I would like to identify another symptom of it.

Throughout its history, logic has been identified with the logic of *sentences* or of para-sentential entities like propositions. But, as we've seen, not all data is embodied in sentences. The existence of digital representations, like sentences, is parasitic on that of non-digital representations. So *ultimately* data is always embodied in media that are not only not sentences, but lack the defining feature of sentences: namely, decomposability into minimal units of significance. The concept of information is inseparable from concepts like entailment and compatibility. So obviously logical relations hold among analogue-information, and are not confined to sentences. Sentence-logic is therefore but *one* kind of logic and, in light of the derivative nature of digital information, is a fairly superficial kind of logic. The identification of sentence-logic with logic as a whole is so obviously false that we must wonder what induced us to acquiesce to it.

I believe that acquiescence to be motivated, at least in part, by a wish to rationalize the tendentious and emotion-driven conception of reality embodied in Hume's empiricism. Our acceptance of Hume's analyses of causation and induction, despite their obvious discordance with everything we believe, is a special case of that acquiescence and is thus an expression of that same wish. The compartmentalizations embodied in a digital conception of reality give legitimacy to associative mechanisms that have an emotional basis and in which we therefore have an emotional investment.

### *Summary of sections VII-XI.*

Given the non-digital structure of the spatiotemporal world, there are purely *logical* limits as to what hypotheses can be coherently entertained. So far as we think otherwise, it is because we are wrongly identifying that data that motivate our hypotheses with the propositions that we use to model that data.<sup>58</sup>

Logical relations are generally seen as holding between digital representations – between sentences and para-sentential entities like propositions. We have seen that logical relations hold among *non*-digital, and therefore non-propositional, data. The principles governing these relations have yet to be articulated, and *a priori* resist articulation within a digital medium like language.

Correct inductions are analogue-logically valid inferences from the data embodied in our sense-perceptions. Counter-inductive inferences are analogue-logically invalid inferences from that same data.

### Part 3. Some Consequences of our System

I. Here is the classical argument for skepticism about the external world. If you know anything about the external world, such knowledge is derived from your sense-perceptions. But the proposition that there is no external world is logically consistent with the existence of those perceptions, as is the proposition that there is an external world bearing having little or no correspondence to what those perceptions allege to be the case. We beg the question if we respond by saying that our perceptions *probabilify* our empirical beliefs, while not giving them 100% certainty. To know that x is probable given y, we must know that events

relevantly like x accompany events relevantly like y. Unless we already have some assurance that our perceptions are veridical, we cannot know that events of the appropriate types ever accompany our perceptions, let alone that they do so with enough regularity to warrant our views about the external world. But of course it is precisely that assurance that the skeptic's scenario prevents us from having.

II. We may be in a position to shed some light on this matter. The skeptic's position involves the view – actually, it *is* the view – that our perceptions are *ex nihilo* creations, having little or no continuity with events in their vicinity. Because such discontinuities are incompatible with the datum that our perceptions are temporally co-located, it is illogical, and not merely counter-intuitive, to believe in their existence. So far as philosophers believe otherwise, it is because they are conflating the data given to us in experience – the data *constitutive* of experience, in fact – with our propositional schematizations of it.

Let us begin our defense of this with an innocuous background point. It is a datum that our mental events are temporally co-located. It is a datum that the itch I felt a moment ago is on the same time-line as the twinge I am feeling right now.

We saw earlier temporal succession is a causal notion. Where there is a fissure or discontinuity, there is no temporal succession, unless some other continuous sequence of events steps into the breach. Suppose that the elevator doesn't come after I push the button, since somebody has severed the wire that is supposed to transmit the signal. Does that mean that *no* continuous series of events connects the state of my finger at t with the state of the state of the elevator at t\*? No -- it means only that *one* such series has been interrupted. Countless others such series connect those systems. (We may ignore as irrelevant the fact that those other series are not very useful to somebody who wants to use the elevator.)

Given two *completely* disconnected events, it cannot significantly be said that one precedes the other. Of course, events that are *relatively* disconnected can be related in time. My current bodily condition may not have any explanatory, or otherwise significant, connection with that of some long gone dinosaur. (If I wanted to explain my current bodily state, I would mention the fact that I didn't sleep enough last night; I would not mention any dinosaur.) But that means only that our current theoretical and pragmatic concerns don't force us to pay attention to the various series that obviously do connect me to the dinosaur.<sup>59</sup>

The world of the skeptic is discontinuous on a number of levels. Sleep obliterates consciousness. So if the skeptic is right, then every awakening is a case of *ex nihilo* creation. But sleep and unconsciousness would not be the only sources of *ex nihilo* creation in the skeptic's world, since many discontinuities are internal to the state of wakefulness. One's waking visual experience is subject to constants interruptions, as when one closes one's eyes to relax or reflect. A skeptic must say that each resumption of visual experience is a case of creation *ex nihilo* and that each cessation of it is a case of annihilation. In fact, even if we confine our attention to an uninterrupted stream of visual experience, we find that it too involves innumerable discontinuities – qualia come into existence out of nowhere, and just as abruptly vanish into oblivion.

It is a datum that our experiences are temporally co-located. For reasons we've discussed, it follows that any two experiences are connected by a continuous series of states. Therefore the discontinuities described a moment ago are merely apparent. If those discontinuities reflected the ultimate structure of reality, then there would be no *temporal* connection between the experiences of the person who wakes and the one falls asleep. It is a datum that there is such a connection, and that there is no real discontinuity.

Obviously the mental realm cannot furnish the requisite continuities, and must therefore be supplemented by a non-mental realm. If the occurrences in that non-mental realm are to furnish the needed continuities, they must have a character at least approximating to that suggested by our perceptions. We saw earlier that counter-inductive hypotheses are *logically* incompatible with the data embodied in our experiences, even though they are compatible with the more obvious propositionalizations of that data. There are thus strictly *logical* reasons why, given that data, it is not an option to countenance counter-inductive hypotheses as to the nature of the non-mental events that establish the continuities presupposed by our experience. So there are strictly logical reasons why we must say that it is the activity of rocks and trees, muons and quarks, and not of a capricious demon, that accounts for the existence and specific character of our mental lives.

In conclusion, supposing that our cognitive processing of the information embodied in our sense-experience is logically valid, the datum that our experiences follow one another in time is logically inconsistent with the skeptical proposal that reality is exhausted by one's mental states, and also with the proposal that there is an external reality having little significance correspondence with our perceptions. It must be kept in mind that the logical validity just mentioned is *analogue*-logical validity. It must also be kept in mind that any propositionalization of our experience is a model of our experience, and not the experience itself. Consequently, if we attempt to justify (or dismiss) inductive beliefs on the basis of such propositionalizations, we are committing the same fallacy as a juror who gives more weight to a defense-lawyer's theory than to a video-recording of the defendant committing the crime.

III. It is often said that a "brain in a vat" could have exactly the experiences we do. I agree. It is inferred from this that our perceptions needn't be veridical to any degree. I do not think that this inference is warranted.

Suppose that a scientist, or even a series of random occurrences, is stimulating brain B in such a way that B has a flow of experience qualitatively just like yours. B would have many false beliefs. In particular, it would have the belief that it *wasn't* a brain in a vat whose experiences were the fall-out of scientific tomfoolery or of random events.

But we must remember that the behavior of the scientist (or of the random series of events) would have the *formal* properties supposed by B to be had by the external world. Suppose we fool someone into believing that they are in Hawaii by placing outside their window a giant computer monitor showing scenes from that tropical paradise. That person does indeed have the wrong beliefs – he wrongly believes that he is witnessing people frolicking on a sunny beach in Hawaii. But he has those wrong beliefs only because the images on the monitor have much the same *structure* as the sort of beach-side revelry that he wrongly believes to be occurring outside his window. That person therefore has a great deal of *formal* knowledge about what is going on outside his window, even though his interpretation of this formal data is in error.

It is true that, from a social or pragmatic viewpoint, that person's beliefs are quite wrong. But that person -- call him Smith -- knows much more about the occurrences outside his window than our best physicist know about the sub-atomic world. Our belief that Smith has *no* knowledge embodies our tendency to think in emotional, rather than strictly epistemological, terms.

Let us illustrate this with a bit of fiction. Smith has a gift for abstract thought. He is thus able to give a formal description of what he sees, and can leave out the emotional or pragmatic pseudo-information that would constitute almost the entirety of an ordinary person's discourse. So Smith's description doesn't contain emotional extrapolations like: "my prayers are answered! I no longer have to suffer the torment of those long Chicago winters!" Smith's description is a conservative and accurate description of what he *actually* sees -- certain patterns of mass-energy displacements. In terms of richness and accuracy, Smith's description of what is going on outside his window would dwarf our best descriptions of the sub-atomic (or even the sub-molecular) world.<sup>60</sup> So when we say that Smith's views are "completely wrong", what we are saying is completely wrong, unless there is an implicit relativization to some irrelevant social or emotional context.

Systematic deception always involves making certain allowances for the formal structure of the realities being misrepresented.<sup>61</sup> For this reason, Smith is, in absolute terms, quite well-informed about the occurrences outside his window. It is true that our initial impulse is to say the exact opposite. But that is because our initial impulse is to speak not in narrowly epistemic, but in broadly emotional and sociological terms.

For exactly similar reasons, envatted brain B would, in absolute terms, be quite well-informed as to the nature of the reality lying beyond its experiences. Of course, B would be quite wrong about everything that had any emotional significance. B would be wrong to think that he had fallen in love with Mary, that he had finally stood up to his brutal boss, and that he had discovered true goodness beneath the gritty exterior of his cousin Fred. These friends and foes would all be non-entities, along with his house on tree-lined Maple street and his loyal dog Skippy. B's real home is a sterile plastic tank monitored by disaffected scientists, and his only true companions are the electrodes connecting him to some computer console.



But if we confine ourselves to the formal aspects of B's world-view, and leave aside its (in this context) meaningless emotional projections, we find that B knows incalculably more about the external world than we do about anything beneath the molecular level. The presumption that B knows nothing about the external world incorporates an irrelevant pragmatic or emotional perspective.

The natural response is to say that, in order for B to have those experiences, it isn't strictly necessary for those events to be caused by anything having even a formal resemblance to them – that talk of a scientist who is deliberately deceiving B is just an illustrative device.

For reasons we have already discussed, that is not the case. Absent a scientist, or some surrogate (e.g. Descartes' evil demon), our skeptical scenario would involve the breaches and discontinuities incompatible with the temporal co-locatedness of B's experiences, and thus impossible on strictly logical grounds.

Another skeptical response to our analysis is to say that, although the events vanishingly close to B's nerve-endings may have a certain isomorphism with B's experiences, that isomorphism dwindles to nothingness as we move away from the relevant neural contact-points.

We've already seen how to respond to this. Causation involves continuity. Given how rich and articulated our sensory experience is, and given that every aspect of it must arise by way of continual changes from external realities, it is logically out of the question that the correspondence between our perceptions and external reality should be confined to our bodily surfaces. As we've seen, once it is settled how the world is in one small area of space-time, the rest of the world is locked in. So once it is granted that there is *some* correspondence between perception and reality, the scope of that correspondence cannot be trivialized.

§ This is not to say that all knowledge is analytic. No knowledge of the external world, or even of the internal (psychological) world, is analytic.<sup>62</sup> As we saw in our discussion of Kant, all spatio-temporal knowledge is empirical and therefore synthetic a posteriori. Moritz Schlick's slogan "no synthetic a priori" is a simple truth.

Nonetheless, *given* the data embodied in our states of consciousness, some theories are permissible and some are not; some theoretical articulations of that data are logically valid (i.e. analogue-logically valid) and others are not. *Given* our experiences, it analytically follows that there is an external world having a character not entirely at odds with that suggested by our perceptions. Indeed, it follows that there is an external world corresponding, at least approximately, to the theoretical superstructure we impose on the data of experience, at least in so far as that superstructure doesn't involve any purely logical blunders.<sup>63</sup>

IV. Hume's counter-intuitive analysis of causation presupposes that spatio-temporal relations are non-causal, and thus that space and time are empty vessels whose properties are wholly invariant with respect to those of the events populating them. Such a viewpoint is indefensible on purely conceptual grounds, granting that certain empirical developments were needed to make us receptive to this fact. Once it is acknowledged that temporal co-locatedness must be understood in causal terms, we have no trouble finding a purely logical foundation for our inductive practices.

I believe that the system we have just described is a de-psychologized, de-idealized version of that described by Kant. Where Kant talks of psychological necessity, I speak of logical necessity. As we saw, Kant's austere conception of logical truth required him to regard as psychological what were in fact strictly logical necessities. This same conception forced Kant to deny any objective basis for our beliefs concerning induction, causality, and spatio-temporal reality itself. Under Kant's system, all those beliefs could be correct only if relativized to "phenomena" (perceptions, appearances) and denied any connection with "noumena" (non-psychological realities).

But once it is granted that not all analytic truth is trivial, and that there are *deep* analytic connections, there ceases to be any need for this psychologocization of epistemology. So the system described here is, at some fundamental level, in agreement with Kant's.

§ Supposedly, empirical beliefs are merely probable. My belief that there is a table in front of me is *likely* to be correct. But, we are told, given the data on which that belief is based, it *could* be false. Given this, if we take it for granted that we have *knowledge* of the external world, then we must say that knowledge is belief that is (inter alia) *likely* to be correct.

Given this, let us consider a bit of fiction. A million people buy tickets to a certain lottery. I am aware of this, and also of the consequent fact that (ceteris paribus) any person *x* has a 99.9999% chance of losing. I know that Smith has purchased a ticket, and on this basis predict (correctly, as it later turns out) that Smith doesn't win. Given only these facts, it is obviously false to say that I *know* that Smith won't win.

Thus, even if motivated in the right way by the right sort of evidence, a belief that is very likely to be correct is *not*, in virtue of that fact, knowledge. Given this, and given the supposed fact that our empirical beliefs are, at best, probable, it follows that we have *no* empirical knowledge. This is sometimes referred to as the "lottery paradox."

We've seen what the fallacy here is. Our knowledge of the external world is *not* merely probable. Our beliefs concerning the external world analogue-logically valid inferences from the data of experience.

V. I would now like to systematize some remarks made earlier concerning the concepts of spatial and temporal location.

We saw that space and time are themselves causal notions. This implies, I believe, that if there is a *possible* causal connection between *E* and *E\**, then such a connection *actually* exists. My life post-dates Caesar's because there are causal processes beginning with the last events of his life and ending with the first events of mine.

One might reject this line of thought, saying that for *E* to precede *E\**, it is enough that there *could* be a causal sequence beginning with *E* and ending with *E\**. But the only conceivable grounds for such an assertion would be the presence of an *actual* causal process beginning with the one and ending with the other. I don't merely mean (though it is of course true) that no human observer would have any grounds for saying that the one preceded the other.<sup>64</sup> I mean that there would be *no* grounds of any kind – no true proposition, whether knowable or not – that would warrant the assertion that

(#) *E* preceded *E\**.

The only *conceivable* grounds for believing (#) to be true, other than a knowledge of the truth of (#) itself (or some trivial variant if it such as *either* (#) *or there are square circles*), would be a proposition to the effect that some actual causal process connected those events. If we choose to say that (#) could be true in the absence of any connection between *E* and *E\**, then we are saying *E*'s preceding *E\** is a bare fact – a primitive. This is, of course, what Hume would have said. But if we say that the truth of (#) is a primitive, then the truth of (O) and (P) would acquire an accidental status; the tight connection between temporal order and causality would become a kind of coincidence. To avoid the theoretical arbitrariness associated with such a position, we must say that (#) is true exactly if there is some *actual* causal process beginning with *E* and ending with *E\**, the same being true of any other statement regarding temporal (or, for exactly similar reasons, spatial) order.

Given this, here is the system I would propose. We start by taking the notions *event* and *cause* as primitive. For *E* to come before *E\** is for *E* to be a cause<sup>65</sup> of *E\**. For those events to be simultaneous is for neither to be a cause of the other.

At first, it might seem absurd to take the notion of a cause as primitive. But a moment's thought shows it to be *de rigueur* and also exposes another cavity in Hume's reasoning. Obviously the concept of causality is embedded within the concept of an event. As we saw earlier, there are no instantaneous events: if *E*<sub>1</sub> has no causal relation to *E*<sub>2</sub>, then (unless they are simultaneous) they are *ipso facto* not parts of the same event. So if we take the concept of an event as primitive – and we must, given the points made a moment ago about space and time – then we must do the same with the concept of a cause.

§ This brings us to the analysis given by Whitehead and, later, by Russell.<sup>66</sup> Since E and E\* are simultaneous exactly if there is no causal connection between them, we may say that an instant in time is the class of all events such that there is no causal connection between any two of them.<sup>67</sup> In fact, unless we take the position just described, it becomes an accident, as opposed to a conceptual necessity, that there are no causal connections between simultaneous states of affairs. Conceptual, i.e. analytic connections, betoken an identity, or overlap, of content. Given this, we must follow Whitehead and Russell in *identifying* instants with classes of non-interacting states of affairs.

For two distinct events to be in different places, it is sufficient that neither be a cause of the other. At the same time, that is obviously not necessary, since events in different places can be causally related. (I push the button in place p, and the elevator starts moving in place p\*.)

For this reason, if we are to complete our analysis of the concept of location, we need to take into the fact that location is relative to a framework. Relative to the earth, I have been in the same place for the last ten minutes. Relative to the sun, I have moved several miles. Whenever we talk about “the same place”, we must identify the relevant framework. This means that we *stipulate* that some causal process – say the Earth or a beam of light – is to constitute a given place.

In this way, we can complete our analysis of the concept of location. Two distinct events E and E\* are in different places exactly if either

(C<sub>1</sub>) neither is a cause of the other

or

(C<sub>2</sub>) There is some event E\*\* such that two conditions are met: first, where one of E or E\* is concerned (say E), E\*\* is in the same place as E; second, neither one of E\*\* or E\* is a cause of the other.

(C<sub>1</sub>) says that events are in different places if neither has any effect on the other. My body right now is in a different place from yours because nothing that is happening to my body right now has any effect on anything happening to your body right now, or *vice versa*. Since it is *conceptually* (as opposed to merely empirically) impossible for simultaneous events to have any effect on each other, there is no barrier to saying that absence of a causal relation *constitutes* difference of place.<sup>68</sup> (It is a sufficient, but not a necessary, condition for difference of place.)

Intuitively, (C<sub>2</sub>) says that E and E\* are in different places if E is in the same place as some event E\*\* that is in a different place from E\* according to the criterion embodied in (C<sub>1</sub>). (C<sub>2</sub>) may seem circular since it includes the expression “in the same place.” But the circularity is merely apparent since, in this context, the phrase “x and y are in the same place” is simply short-hand for “x and y are both segments of the causal sequence that defines the relevant framework.”

Of course, the concept of location is presumably not disjunctive; so it is incumbent on us to reduce (C<sub>1</sub>) and (C<sub>2</sub>) to a single condition. This is easily done:

(C<sub>3</sub>) Relative to causal process C, distinct events E and E\* are in different places exactly if three conditions are met: (i) one of those events (say E) is a part of C; (ii) for some event E\*\*, E\* has no effect on E\*\* or *vice versa*; and (iii) E\*\* is a part of C.

(C<sub>3</sub>) leaves it open whether E is identical with E\*\*, unifying (C<sub>1</sub>) and (C<sub>2</sub>) into a single non-disjunctive condition.

If we take the notions of *event* and *cause* as primitive – as we are inclined to do anyway – we can successfully construct the framework that Hume, taking the concepts of space and time as primitive, failed to construct.<sup>69</sup>

VI. I believe that Hume's positivism has cast long and dark philosophical shadows.<sup>70</sup> In what remains of this paper, I would like to identify, and then suggest alternatives to, some of the fallacies that Hume's thought has generated.

It is commonplace in epistemology that the *cause* of a belief must be distinguished from the *justification* for it. Suppose you believe that  $3+3=6$  because you were told this by the leader of the cult to which you belong. In that case, the experiences that caused you to have a certain belief do not justify your having it. Now suppose that you believe that  $3+3=6$  because you have performed the requisite computations. In that case, the experiences that caused you to have that belief *do* justify your having that belief.

The distinction between the cause and the justification of a belief is obviously a legitimate one. Whenever a belief is irrational, its cause fails to constitute a justification. But thanks to the influence of Hume's thought, this distinction has been over-extended, resulting in some implausible and sterile views concerning the acquisition of scientific knowledge.

Newton's innovations resulted from his having certain experiences. Did those experiences justify those innovations or did they merely *lead* to them? If we say that they merely led to them, then we are saying that Newton was not being *rational* in formulating the conclusions that he did formulate; we are saying that he is in the same category as a cult member who blindly accepts everything that the cult-leader says. But surely this would not be an accurate characterization of Newton's thought-process.

A number of thinkers – Kant, Chomsky, and Jerry Fodor among them<sup>71</sup> – respond to this by saying, in effect, that Newton *innately* knew the physical principles that he appeared to derive from experience. They don't deny that experience has an important role in Newton's becoming aware of these principles. But they say that, for the most part, experience merely *triggered* the activation of the relevant, innate cognitive structures.<sup>72</sup>

Fodor admits that it *seems* as though this knowledge is in fact derived from experience.<sup>73</sup> (To my knowledge, Kant and Chomsky do not address this issue. But Fodor has, I believe, done an excellent job of making it clear what they are *committed* to saying, given their views.) But he says that this is because the experiences that trigger the activation of these cognitive structures happen to be ones that have, or at least seem to have, a certain similarity in respect of content with the knowledge that is embodied in the aforementioned structures.<sup>74</sup> (Given that mental causation so often travels along associative channels, it is presumably in virtue of this similarity that those cognitive structures are causally – not to say rationally – sensitive to those experiences.) Fodor also says that the same knowledge could, in principle, have been triggered by *any* experiences – that it is a kind of accident, albeit one that may have deep biological roots, that Newton's conscious discovery of, for example, the inverse square law was triggered by experiences whose contents were *relevant* to that principle.<sup>75</sup>

The Kant-Chomsky view is given by the statement: "our innate cognitive structures *almost* encode a knowledge of all the theories we will ever produce (experience is needed only to *activate* those structures)." Superficially, the Kant-Chomsky view is opposed to Hume's empiricism. Both of these thinkers explicitly state how they regard their work as being an attempt to undermine Hume's empiricism. But the truth is that Kant and Chomsky are really operating within a Humean framework, and are presupposing the truth of Hume's epistemological nihilism. Kant and Chomsky are really saying that, leaving aside the knowledge acquired *directly* from sense-perception, you *can't* acquire any knowledge of the external world.<sup>76</sup> When it *seems* as though we are learning about the external world, we aren't: we are merely becoming aware of what we already know. Either knowledge is innate or it is derived strictly from perception. Apart from that, there is no knowledge.

§ Supposing that Kant and Chomsky are right, what explains the fact that we have all of this innate knowledge? Chomsky's answer is: "evolution." It is thanks to 500 million years of evolution that our innate cognitive structure is so closely hewed to the objective structure of the world.

Kant's answer is that we don't have any knowledge, or even any experience, of any genuinely objective (non-psychological) reality. The world that we experience is a world of our own making. The innate so-called knowledge we've been speaking of has no objective counterpart, and thus isn't knowledge at all.

Kant's answer is hard to accept. It seems a datum that we have knowledge of the external world. At first, Chomsky's answer seems better than Kant's. But this, I believe, is an illusion. Given only that evolution has deposited certain ideas in our physiological structure, it doesn't follow that those ideas are *knowledge*. That would follow only if the act of depositing were mediated by some kind of rational cognitive process (unless, of course, one advocates an extremely revisionist conception of knowledge, whereby knowledge is the result of a long run of dumb-luck). But if there were such a process, then it wouldn't be necessary to appeal to evolution to explain our ability to make correct extrapolations from our sensory data. If there existed a process of the sort just discussed, ontogeny could do what, according to Chomsky, is done by phylogeny (evolution). But in that case, it would be unnecessary to bring phylogeny into the picture at all.

If there is no way to acquire inductive and theoretical knowledge except by having the right innate ideas, then evolution is no more capable than the individual in side-stepping the obstacles identified by Hume. Chomsky's nativism is really a way of passing the buck from the individual onto evolution. But it is left unexplained how evolution can discharge that function.

Chomsky does give a kind of solution to this problem. The individual lives only a few decades, whereas evolution has been going on for hundreds of millions of years. Therefore, even though there is, in this context, no *principled* difference between the individual's personal and his ancestral experience – even though the difference has to do solely with the amount of time involved, and has no systemic basis -- evolution is nonetheless better equipped than personal experience to whip us into epistemic shape.

But this viewpoint is no better than Hume's at giving our theoretical activity any *rational* basis or, therefore, in accounting for the fact that we have any *knowledge* at all. As we noted earlier, Chomsky's rationalism is just Humean irrationalism displaced from the individual onto the species. Hume's view is that, apart from analytic and strictly perceptual beliefs, *no* beliefs are justified and that, consequently, there is *always* a difference between justification and causation. Chomsky actually agrees with Hume, with the qualification that Chomsky says about the individual's *evolutionary* past what Hume says about the individual's *personal* past.

Obviously facts about evolution *do* explain why we are able to know so much. Surely we have evolution to thank for the fact that we know more than jellyfish. But the explanation for this is that evolution gave us the right cognitive tools, not that, thanks to evolution, there is some kind of pre-established harmony between our thoughts and the world (where the suffix "pre" refers to the individual's evolutionary, as opposed to personal, past).

§ This exposes one of the ironies of empiricism. Historically, one of the motivations for empiricism was the desire to give our beliefs a better foundation than what Scripture (or some other comparable source) could provide.<sup>77</sup> But if we are thorough-going empiricists, God must be re-introduced as a source of knowledge, at least after a fashion. Empiricism – at least Hume's version of it -- eliminates induction as a source of knowledge. This, in turn, makes *all* non-analytic knowledge impossible. But, of course, everyone believes (rightly) that there is non-analytic knowledge. Consequently, evolution has to take over the epistemological role previously filled by God – namely, that of creating a concordance between our ideas and reality that simulates, but doesn't constitute, empirical knowledge. Evolution becomes an all purpose explanatory stop-gap, much as God used to be. And just as it wasn't questioned how *God*, unlike everything else, could be an unmoved mover, so it isn't questioned how *evolution*, unlike personal experience, can give our theories a rational basis. In this context, the only difference between the appeal to evolution and the appeal to God is that the former has a false sheen of scientific rigor lacking to the latter.

I do not deny that there is innate knowledge. It seems an empirical fact that many animals (including human beings) have innate knowledge relating to, among other things, food and safety. But it is one thing to say that we are born knowing that breasts provide milk. It is quite another to say, with Kant and Chomsky, that we are, in effect, born knowing Newtonian mechanics.

§ If the evolutionary (pre-established-harmony) story were the right one, we would have no epistemic plasticity at all. Because, in actuality, the individual's epistemic relation to the world involves the mediation of rational cognitive mechanisms, he can easily make allowances for changes in the stream of data that he is

constantly uploading through his senses. But if, as the evolutionary story would have us believe, the individual's epistemic relation to the external world were *merely* causal, he would be epistemically paralyzed the moment he stepped outside of the specific experiential corridors within which evolution allowed his cognitive mechanisms to operate.

We are not subject to such instantaneous paralyses. Obviously our biological structure imposes strict limits on our intellectual development. But even after we allow for this fact, we are not cognitively frozen in the way that the Kant-Chomsky would have us be. No matter how unusual the circumstances, and no matter how little evolutionary precedent those circumstances have, our ability to make at least minimally adequate inductive inferences never vanishes. We are not given to the kind of inductive black-outs that, if the evolutionary story were the right one, would pepper our cognitive lives.

In the final analysis, Chomsky and Kant say that, give or take a few nuances, we are born knowing everything we will ever know.<sup>78</sup> Experience merely activates latent knowledge<sup>79</sup>; its role is purely causal, never rational. But this is a way of saying that we have *no* knowledge.

We can avoid this less than satisfying position if we see induction as a logical process. Our theoretical knowledge is obviously not limited to the stock of ideas that we are *born with*. Nobody was born knowing the inverse square law. Induction involves intelligence. Humean empiricism is inconsistent with this; and so, despite first appearances, is Chomskyan-Kantian nativism. Their nativism is not rationalism; it is species-empiricism, as opposed to individual-empiricism; and, notwithstanding the appearance of scientific rigor associated with the hallowed term "evolution", their position is as incapable as Hume's in allowing us to have any theoretical or inductive knowledge.

§ We have uncovered yet another irony of empiricism – or, at least, of Hume's version of it. In rendering induction defunct, Hume makes it impossible to acquire any knowledge that transcends the deliverances of one's senses at a given moment. (In fact, as Hume himself points out, even this knowledge is jeopardized.) The result is that *all* knowledge must be innate. Since we can't *learn* anything, we must be born knowing everything that we ever come to know. Kant, Chomsky, and other illustrious rationalists have all unwittingly acquiesced to this aspect of Hume's thought.

On our view, it isn't necessary to posit vast stock-piles of innate scientific knowledge. To be sure, there is innate knowledge. In fact, there are two quite distinct kinds. There is the innate contingent knowledge discussed earlier (e.g. the knowledge that breasts provide milk, that animals with fangs are to be avoided, and so on). But there is another – in this context, much more important – kind of innate knowledge. The cognitive machinery through which we acquire empirical knowledge would seem to embody knowledge of conceptual truths. After all, *some* kind of knowledge is needed to see relations of bearing among empirical data and, thus, to synthesize such data into theories (and even – I believe, following Kant and David Marr – into perceptions). But the kind of knowledge that enables one to delineate the logical consequences of the information at one's disposal is entirely analytic and non-empirical. So to explain our ratiocinative prowess, it isn't necessary to suppose that we have any innate *empirical* knowledge. It therefore isn't necessary to agree with the implausible view of Kant and Chomsky<sup>80</sup> that we innately know Newtonian mechanics, and need only a modicum of sense-experience to activate this latent knowledge.

Fortunately, it isn't necessary to posit so much innate empirical knowledge to explain our success at forming theories. As we discussed earlier, it is probable that we have at least some empirical knowledge. But it is unlikely that our empirical knowledge includes the discoveries made by modern physicists. It is to the credit of our analysis of induction that it doesn't *require* us to have any innate knowledge, being consistent with the possibility that we do not no less than with the possibility that we do.

There are obviously some cases where the cause of a belief is distinct from its justification. But it is hard to believe that the thought-processes that lead to scientific innovations are *categorically* examples of this. If we accept Hume's views on induction, then this is exactly what we are forced to say. On Hume's view, *no* inductive belief has any justification. It follows vacuously that, given that view, the cause such a belief is *never* a justification for it. Theories are never justified and the thought-processes that produce them are never rational.

VII. Hume's analysis has cast other shadows. On Hume's view, nothing causes anything. Instead of causation, there are only regularities. To explain an event is thus to show only that it is an instance of some regularity.

One problem with this conception of explanation is that it very much seems *not* to be true of psychological explanation. To explain a person's conduct is to make that conduct intelligible; it is to show that it makes sense. To explain why Jim went to the bank is not to show that his doing so is an instance of some regularity. It is to show why, given the operative conditions, it *makes sense* that Jim went to the bank. (Jim needs money to buy medicine for his ailing mother. His money is at the bank. He knows that he must go to the bank if he is to be able to use that money to fulfill his desire to buy medicine for his mother...)

Of course, Jim's behavior may well be an instance of many important regularities.<sup>81</sup> It may well be true that everybody in circumstances relevantly like Jim's engages in behavior relevantly like Jim's. But, if so, the regularities in question presuppose, and merely express, the intelligible connections identified in psychological explanations like the one given a moment ago. The *reason* such regularities exist is that each of the specific situations in question is *already* amenable to the sort of explanation just discussed.

People can understand their own conduct, at least within limits. (I say "within limits" in acknowledgement of the discoveries made by Freud, Chomsky, and other investigators of the unconscious.) You know, at least up to a point, why you just turned the light on, why you are now pushing certain buttons on a certain phone, why you are now angrily hanging up said phone, and so on. Your having this knowledge doesn't involve your subsuming your behavior under general regularities. Of course, such regularities exist. But, first, you can, at least to a non-trivial extent, understand your behavior without having great stores of sociological knowledge and, second, the existence of sociological regularities is obviously a mere reflection of the internal connections of which you are already aware.

§ As just noted, it is fairly obvious that Hume's conception of explanation is inapplicable to psychological phenomena. But it is less obvious that it fails to apply to non-psychological phenomena. In fact, practically every investigator has, to some degrees or other, accepted Hume's conception of physical explanation.

This has led to a controversy regarding the nature of psychological explanation. On the one hand, there are those who attempt to understand the mind in purely Humean terms – I am thinking of, among others, Carl Hempel, John Stuart Mill, and Henry Buckle.<sup>82</sup> On the other hand, there are those who more or less accept Hume's conception of physical explanation, but rightly think it inapplicable to the mental sphere. According to the latter group of thinkers – I am thinking of Dilthey in particular -- there is a fundamental difference between psychological and non-psychological explanation. Psychological explanation, it is said, consists in entering into the subjectivity of the person or persons studied. Psychological explanation thus involves replacing one's own subjectivity with that of another.<sup>83</sup> By contrast, non-psychological explanation consists in discerning comprehensive regularities.

It is clear, I think, that these two kinds of "explanation" are so different that it is inappropriate to use the same term to mark them both. So unless one is willing to take the empirically false approach of saying that psychological explanation consists solely in the discovery and application of regularities, a consequence of Hume's position is that the sense in which Jim's conduct is explained is entirely different from the sense in which the behavior of a billiard ball is explained.

But the word "explanation" is not ambiguous – it is not like the word "bank". Obviously there are important *differences* between psychological and non-psychological explanation, just as there are differences between biological and astronomical explanation. Differences in subject-matter tend to be reflected in differences in methodology. But, granting these facts, when you explain Jim's behavior you are doing the same thing that you are doing when you explain why the vase broke or why the spider is building its web. In both cases, you are showing why it *makes sense* that some event occurred.

There is thus some *one* concept associated with the word "explanation." But so far as it doesn't coerce us into accepting an obviously artificial scientism regarding psychology, Hume's view demands that psychological "explanation" be something that is antithetical to explanation in any ordinary sense. Typically, "explanation" connotes a gain in objectivity – an assimilation of the singular to the universal. The sort of

psychological “explanation” espoused by Dilthey is a surrender to subjectivity, a relinquishment of objectivity.

According to the view proposed in the present paper, explanation always consists in showing a logical and principled relation between initial and terminal conditions. There is no need to reduce psychology to statistics or to create some artificial division between the human and the natural sciences. The debate between Dilthey and Hempel is a tempest in a teapot, being entirely internal to Hume’s erroneous purely statistical conception of explanation.

§ The conception of explanation demanded by Hume’s analysis has another unwholesome feature. As we discussed a moment ago, given any event, there are infinitely many regularities of which that event is an instance. At time  $t$ , you flip the switch. At time  $t^*$ , the light turns on. Let  $s$  be this sequence of events.  $s$  is an instance of the following invariable concomitances:

(1) *for any  $x$ , supposing that  $x$  is a switch that is 12.786 km from the northernmost part of Washington D.C., if  $x$  is touched at time  $t$  by a mammal, then for any  $y$  such that  $y$  is light-bulb within ten feet of  $x$ ,  $y$  turns on at time  $t^*$ .*

(2) *for any  $x$ , if  $x$  is a region that is touched by the finger of the person who was junior class president at Alan Hancock High School in 1993, and  $y$  is a light-bulb that is being seen by a person wearing a red-shirt on the day after that person bought his mother a mother’s day card for the first time in  $x$ ’s life,  $y$  turns on.*

(3) *for any  $x$ , if  $x$  is an area containing an object that was screwed into the ceiling by a former quarterback for the Pittsburgh Steelers last week, and  $y$  is a person who owns a cactus, then if  $y$  does ten push ups in  $x$  at  $t$ , it will follow that every glass object in  $x$  will light up at  $t^*$ .*

And so on *ad infinitum*.

Exceptionless though they are, these regularities are obviously explanatorily irrelevant. The *relevant* regularity is something like this:

(n) *for any  $x$ , if  $x$  is a bulb consisting of such and such material and is connected by such and such wires to switch  $y$ , and the temperature in the area in question falls between such and such a range, and  $y$  is flipped with such and such force at time  $t$ , then  $x$  becomes luminescent at time  $t^*$ .*

The problem is: how do we rule out (1)-(n-1)? How do we rule out those infinitely many explanatorily irrelevant regularities? Why are certain properties explanatorily relevant (e.g. the property of being made of copper), whereas others are not (e.g. the property of being touched by a former junior class president)?

Hume’s answer is that the right properties can be selected on purely statistical grounds. There are cases of light-bulbs that turn on in the absence of class presidents, but not (*ceteris paribus*) in the absence of the right sort of copper-wiring.

But the very concept of a property is explanatorily pregnant, and cannot be used in this context without begging the question. As Clarence Lewis stressed in *Mind and the World Order*, for something to be *copper* (or water, or a table, or a bar of soap...) specifically *is* for it to have the right inductive and explanatory properties. Also, as Nelson Goodman showed, given any explanatorily useful property  $x$ , we can construct an explanatorily useless property  $y$ , such that  $x$  and  $y$  are indistinguishable from the viewpoint of any purely statistical conception of induction.<sup>84</sup> Let us say that  $x$  is made of *plopper* exactly if  $x$  is either a piece of copper before the first instant of the year 2007 A.D. or  $x$  a piece of plastic after that time. Given the data that we’ve experienced thus far, i.e. as of the year 2006, there are no purely statistical grounds for preferring the hypothesis *all copper (past, present, and future) conducts electricity* to the hypothesis *all plopper (past, present, and future) prefers electricity, and some copper after 2006 fails to do so*.



This exposes a certain circularity in Hume's reasoning. Properties like *copper*, *wet*, *soap*, *cotton* – the properties in terms of which we understand the world – are not inductively or causally innocent, and do not correspond to purely phenomenal or otherwise theoretically uncommitted categories.<sup>85</sup> The moment you describe something as copper, you are making various inductive and causal claims. So Hume's arguments regarding causation and induction becoming tautologically false if they are stated in terms of any of the properties that we ordinarily use. Hume could avoid that problem by stating his arguments in terms of bent, Goodman-style predicates ("grue", "ploppe") or, perhaps, in terms of purely phenomenal properties. But, in that case, those arguments would establish only the vacuity that inferentially inert expressions are inferentially inert. Once we acknowledged the triviality that predicates are either are, or are not, inductively and causally committed, we see that Hume's arguments either establish tautologies or involve blatant self-contradictions.<sup>86</sup>

In *Empiricism and the Philosophy of Mind*, Wilfred Sellars showed that purely phenomenal states are representationally and epistemically empty except in the context of knowledge concerning the conditions under which they are experienced.<sup>87</sup> But the relevant contextual information can be given only in inductively and theoretically committed terms. ("There is an *oak table*, next to a upright *piano*, on top of which there is a *lamp* that is missing a *lamp-shade*..." The italicized terms are replete with predictive, even theoretical, content.) If Hume's position regarding induction is stated in terms of such expressions, it becomes trivially false; if not, then (if we are charitable enough to suppose that it can even be articulated under those circumstances), it becomes a triviality, from which nothing can be inferred as to the efficacy of induction.

One lesson of this discussion is that, contrary to what Hume alleges, explanation is not a purely statistical concept, since the terms in which the relevant statistics are articulated will inevitably be explanatorily committed.

§ Carl Hempel famously proposed the so-called deductive-nomological conception of explanation.<sup>88</sup> Event E is explained exactly if L conjoined with  $C_1...C_n$  entails E, where L is a proposition describing a natural law and  $C_1...C_n$  are propositions describing the conditions operative in the relevant area of space-time.

What does Hempel mean by the term "law"? If he means a *principled*, i.e. an explanatorily significant, relationship, then his analysis is an empty tautology, as it amounts to this: E is explained exactly if there is an explanatorily significant regularity of which E is an instance. If his analysis is to be anything more than a tautology, Hempel must use the term "law" to denote a *mere* regularity. (This is, in fact, how Hempel meant it to be taken.) But in that case, his analysis runs into exactly the problems that we just pointed out.

But even if we side-step this last problem, the Hempel-Hume analysis still fails. The physical world is characterized by many regularities (leaving aside the explanatorily sterile ones just discussed). But presumably these regularities *express*, and do not *constitute*, the existence of principled relationships. It is true that, given a light-bulb x that has a certain structure and is connected to a switch y by wire composed of a certain kind of material...if y is displaced by a certain amount at time t, then x will become luminescent at time t\*. Our intuitive feeling is that this regularity is a consequence, and not the substance, of the some kind of principled relationship holding among the properties involved. If Hume's analysis is right, this presumption is wrong. But if this presumption is wrong, then (despite the arguments to the contrary of many empiricists<sup>89</sup>) the existence of this regularity becomes a coincidence of unspeakable proportions.

For reasons already discussed, this problem vanishes if, instead of vainly and counter-intuitively trying to understand the concept of explanation in purely statistical terms, we give weight to our pre-Humean belief that explanations expose principled relationships. Our inhibitions to doing so vanish once we acknowledge the two main points of this paper, namely: propositions are merely models, and bad ones at that, of the analogue data given in sense-perception; and, second, space and time are not causally innocuous concepts.

VIII. Until the early 1960's, the philosophy of science was dominated by the following viewpoint. Science organizes empirical data. Hypotheses are pictures or models of facts. Their correspondence, or lack thereof, with the facts can be decided rather straightforwardly – in essentially the same way that the veracity of a

drawing can be decided. In some cases, a creative leap is needed to produce the right hypothesis. But that has nothing to do with the logical structure of the sciences. (Creative leaps are needed to see how to prove number-theoretic statements. But that doesn't warrant any kind of subjectivism in regards to the concept of mathematical proof.) In a word, the results of scientific endeavor are embodied in general statements that either do or do not correspond with the facts, and what the facts are is to no degree a function of how we think or of how we represent those thoughts to one another (except, of course, in the special case where the facts in question concern our psychological occurrences or symbolic practices).

In his book *the Structure of Scientific Revolutions*, Thomas Kuhn proposed a different picture. First of all, we must distinguish "normal" from "revolutionary" science. Revolutionary science consists in producing a new "paradigm": a new framework within which research is to be conducted. A paradigm is not exactly a theory; it would be better described as a kind of meta-theory – a general outlook within which the construction of theories takes place. Normal science consists in fleshing out a paradigm. "Facts" and "data" are internal to paradigms. Given that facts must be understood in terms of the categories picked out by expressions like "cotton", "wood", "square" – i.e. given that facts must be understood in terms of the categories corresponding to our expressions – the paradigm-internal nature of facts reflects the truth (noted earlier) that empirical expressions are theoretically committed, and thus presuppose paradigms; and it also reflects the related truth that the methods we use for conducting research presuppose the truth of certain theories and, therefore, of paradigms. For example, we use mercury-thermometers because we have theories about the relative thermal co-efficients of expansion of various different substances.

In Kuhn's view, since facts are all internal to paradigms, empirical facts cannot warrant the acceptance or rejection of a given paradigm. Paradigms are to be accepted or rejected entirely on non-epistemic grounds. Einstein's paradigm is not better than Newton's, or even than Aristotle's. It is just preferable on non-epistemic grounds – grounds comparable to those on which Bach's music is preferable to Telemann's.

Given a paradigm, says Kuhn, data can be marshaled for or against a hypothesis. (A hypothesis is a proposed, i.e. as of yet unconfirmed, theory.) So the picture proposed by Kuhn's predecessors – scientific activity is regulated by a knowledge of what the relevant data are – may be true of activity *within* a given paradigm. But it is not true of the activity on the basis of which paradigms themselves are accepted or rejected.

If Kuhn is right, then once a paradigm is accepted, all the important issues have been decided in advance. So once a paradigm is accepted, scientific research consists in delineating the consequences of what is, from the viewpoint of someone operating *within* that paradigm, some trans-empirical and thus *a priori* set of categories. Thus, if Kuhn is right, we must reject the presumption that theories are true or false. Kuhn's view is therefore a kind of recrudescence of Kant's a priorism.

§ Let us now evaluate Kuhn's system. Kuhn is generally seen as a great iconoclast – as somebody who dared to challenge the supremacy of a positivist, Humean conception of scientific explanation. But Kuhn's work actually *supports* the very positivism that he aspires to overthrow. Kuhn is saying: *given* that the positivist picture is wrong, it follows that scientific endeavor isn't a rational process. But this is just another way of making the falsely dichotomous claim that *if* you want to see scientific endeavor as being rational – in other words, *if* you want to accommodate the obvious fact that scientific endeavor *does* yield knowledge -- then you must be a positivist; you must advocate the essentially Baconian conception of science found in Hume's (and Mill's and Carnap's...) work. In other words, Kuhn is saying that, if you want to hold onto the idea that science is *rational*, you must be a positivist. So he is really saying: you must be a positivist. Despite his intentions, Kuhn is therefore arguing *for* the very positivism that he has supposedly overthrown.

Kuhn says that there are no "neutral givens", i.e. no theory-neutral data; that exponents of different paradigms "live in different worlds" (in an evidential, not a literal, sense); that it is only *within* paradigms that one theory can be empirically preferable to another; and that, with that qualification, no theory is better than any other (so Einstein's theory isn't better than Aristotle's, except in some non-epistemic sense). These claims are constitutive of Kuhn's viewpoint, and are not mere rhetorical flourishes.

But does anyone really believe any of this? Here is what we do believe. Einstein's physical theories are closer to the truth than Aristotle's. Some theories are better than others; and theory T is better than

theory  $T^*$  exactly if  $T$  is more accurate than  $T^*$ . Freud was either right to say that there is unconscious mental activity, or he was wrong to say this. The question is one of fact, not of our choice of paradigms, or forms of representation, or anything of the sort. Scientific growth is regulated by canons of rationality. There are principled ways of settling disputes between advocates of different paradigms. Although some data is theory-internal, there is still a great deal of theory-neutral data. Einsteinians and Newtonians use the same thermometers. Freudians and anti-Freudians can both agree that patient X has just attempted suicide.<sup>90</sup>

There is no denying that Kuhn's work is deeply important and that *at some level* what he is saying is true. But so far as his contentions are accurate, Kuhn has obviously over-stated them.

The debate between Kuhn and the positivists parallels the debate regarding psychological explanation between Dilthey and Hempel. On the one hand, we have a sterile and implausible descriptivist conception of scientific explanation: theories are statistical generalizations; to explain an event is to subsume it under such a generalization. On the other hand, we have a seemingly bold, but actually timid, irrationalism: scientific theories aren't true or false; rationality has only a marginal role in scientific endeavor. We have an apparently revolutionary, but actually hyper-reactionary, viewpoint (Dilthey's subjectivist nihilism in regards to psychological explanation, Kuhn's subjectivist nihilism in regards to scientific explanation as a whole) being contrasted with, and thus falsely presented as the only viable alternative to, a one-dimensional explanatory literalism. Kuhn's and Dilthey's theories are really ways of arguing *for* the theories with which they are supposed to be opposed.

The villain here is Hume's conception of induction. Induction doesn't consist in irrational leaps into the unknown. It consists in analogue-logical inferences from perceptual data. Inductive explanation consists in finding principled relationships among data. The relevant logical principles are embodied in analogue-content, and thus resist articulation within the more familiar digital-propositional logic on which we focus in philosophical discourse. The reaction had by Hume – and, following him, Mill, Carnap, Hempel, and many others – was to say that induction is unprincipled, and that theories are can be justified only in relative sense (*relative* to the futility of finding any rational basis for our theories, some theories have a better basis than others). This viewpoint has been expressed in the unnecessary polarizations that we've been discussing. On the one hand, we have a sterile descriptive conservatism (Mill, Carnap). On the other, we have an equally sterile nihilism (Kuhn, Feyerabend, Dilthey). But neither viewpoint is necessary. So far as we have thought otherwise, it was only under the influence of an acceptance of Hume's inductive and causal nihilism, and of his subsequent hyper-empiricist, and radically counter-intuitive, conception of explanation.

IX. I would like to end with a few miscellaneous points concerning the consequences of Hume's system. There are obviously causal relations between facts about bodies and facts about minds. But it is a mystery how psychological states could arise in a world of atoms and molecules. It is a mystery why a kick in the shins should lead to *feelings* of any sort, or why a desire for chocolate ice-cream should lead to movements in one's arms and legs.

Hume said that there is no mystery.<sup>91</sup> All explanation, and thus all de-mystification, consists simply in discovering invariable concomitances. Mind-body relations are obviously characterized by such concomitances. *Given* the very fact that such regularities exist, there is nothing to explain: there is no mind-body problem.

This viewpoint, it can safely be said, is quite artificial. Hume's statistical conception of explanation is false; and so, therefore, is his solution to the mind-body problem.

§ Let us end this paper by discussing a very different topic. The sphere of conscious mental activity is characterized by discontinuities – by a pattern of *ex nihilo* creations and subsequent annihilations. Freud proposed that conscious psychological episodes are installments in sequences of events large portions of which are constituted by *unconscious* psychological activity. If this is right, then psychological reality is continuous and law-governed, notwithstanding the erratic and discontinuous nature of activity within the sphere of consciousness.

It has been said on a number of occasions that theories positing the existence of unconscious mental activity are categorically false.<sup>92</sup> But given what we have seen in regards to causation and explanation,

Freud's analysis would seem to be an entirely logical, if not positively mandatory, application of sound scientific methodology. Whether Freud's theories are to be accepted is a strictly empirical question that is to be resolved wholly on the basis of the accuracy of the specific contents of those theories.

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## Notes

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<sup>1</sup> I wish to give my deepest thanks to Bridget Dempsey Pumphrey for her superb proof-reading job, and also for her moral support during my struggle with these titanic issues. This paper is dedicated to her.

<sup>2</sup> If there were no sentient beings, it would still be true that triangles have three sides. Therefore it would still be a truth that that triangles have three sides. Therefore it would still be a true proposition that that triangles have three sides. If we try to say that truths and falsehoods come into existence with the onset of awareness, we must say that – even though there are no truths *per se* in a world devoid of mind – nonetheless such a world provides the *grounds* for truth. Though there were no truths a billion years, the *grounds* were still present for the truth that there were a certain number of planets. That is why, when a mind enters such a world, it finds itself surrounded by objective truths.

But to say that the *grounds* for truth are present is just to say that the truths themselves are present. So I don't see that the foregoing argument eliminates the existence of mind-independent truth.

<sup>3</sup> Quine (1990: 26).

<sup>4</sup> Richard Montague (1974) showed how to convert any sentence into one of subject-predicate form, and thus showed that any proposition is given by some sentence of that form. So the trouble with Kant's definition isn't exactly that it presupposes that all sentences (or propositions) are of that form. But after we use Montague's method to convert (say) "if P, then P" into subject-predicate form, Kant's definition of analyticity turns out to be false. After the conversion, that sentence becomes "if\* <P, P>", where "if\*" denotes a function assigning truth to an ordered pair of propositions exactly if the second proposition is a consequence of the first. So the subject becomes the ordered pair <P, P>, and the predicate becomes the

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second-level function denoted by “if\*”. But this doesn’t help Kant. There is no sense, not even a metaphorical one, in which  $\langle P, P \rangle$  is “contained” in the concept denoted by “if\*”.

<sup>5</sup> Strictly speaking,  $A=A$  is not a proposition. What *is* a proposition is *for all A*,  $A=A$  or *Smith=Smith*. When I talk about “ $A=A$ ”, I mean some specific proposition of that form or the proposition that all propositions of that form are true.

<sup>6</sup> Kant (1965: 52)

<sup>7</sup> Pap (1958).

<sup>8</sup> But this reasons for thinking this were wrong. In Kant’s view,  $I+I=2$  is analytic because one cannot think  $I+I$  without thinking  $=2$ . It may – or may not – be true that one can think  $I+I$  without thinking  $=2$ . But it is irrelevant to the question whether that proposition is analytic.

<sup>9</sup> See Pap (1958).

<sup>10</sup> One can deny this only by psychologizing the concept of analyticity – by assimilating it to the concept of obviousness. But it is a datum (one that Kant accepted) that analyticity is a strictly logical feature of statements.

<sup>11</sup> To avoid irrelevant mathematical technicalities, let us consider the proposition *in a Euclidean space a straight line is the shortest distance between two points*.

<sup>12</sup> Kant (1965: 52-54)

<sup>13</sup> Kant (1965: 52-54)

<sup>14</sup> Kant 1965 (53)

<sup>15</sup> See Bonjour (1998: chapter 1).

<sup>16</sup> Reichenbach (1958) denies this assumption. He thinks that the data of sense-perception are neutral between Euclidean and non-Euclidean geometries and that, so far as we think otherwise, we are guilty of smuggling theoretical commitments into our descriptions of our sense-experiences. I agree with Reichenbach.

<sup>17</sup> Bonjour (1998: 23) makes this important point.

<sup>18</sup> This point is made very clearly in Bonjour (1998: 25).

<sup>19</sup> See Bonjour (1998: 20-26).

<sup>20</sup> Arguably, a talented mathematician wouldn’t *have* to base his answer on this kind of play of imagery. Instead he might be able to use his knowledge of correspondences between geometry and number-theory: just as number-theoretic truths can be learned through spatial intuition, so perhaps geometrical truths could, in principle, be learned through number-theoretic intuition. But this only reinforces my point: usage of imagery is a mere *vehicle* for some kind of conceptual analysis.

For the record, I myself *don’t* think that geometrical reasoning could ever be completely “arithmetized”. I don’t mean to deny the existence of any objective correspondence between those two disciplines. I mean only that, by definition, if one is really thinking about geometry, one eventually has to relate one’s results to *shapes*. Even though shapes can be represented by sets of numbers, one isn’t thinking of a thing *as* a shape if one thinks of it as a set of numbers. Geometrical thought eventually involves thinking of something *as* a shape. So, in my view, geometrical thought does ineliminably involve *some* component of

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visual intuition (though given enough mathematical acumen, there is no limit to how marginal that component can be).

At the same time, even in geometrical thought, the element of visual intuition is still a vehicle for conceptual analysis; it is a way of analyzing the relevant geometrical concepts. It doesn't have the quasi-empirical role that Kant attributed to it. So even though Kant may have been right to insist that geometrical thought necessarily involves visual imagery, the conclusion he drew from that – geometry teaches us about our forms of thought, not about objective relations among concepts -- was quite wrong.

<sup>21</sup> Quoted in Burge (2000: 32).

<sup>22</sup> Peacocke (2000: 255).

<sup>23</sup> Of course, what cannot be *perceived* can sometimes be *conceived*: e.g. sub-atomic particles that do not reflect light. But if something cannot be *conceived*, then surely it cannot be *perceived*. The conditions something has to meet to be perceptible are *stronger* than those it has to meet to be *conceivable*.

<sup>24</sup> Russell emphasized this point in the first chapter of the *Principles of Mathematics*.

<sup>25</sup> Here when we talk about necessity, we are focusing on epistemic necessity – that is the only kind Kant recognizes.

<sup>26</sup> I develop this idea in another publication. See Kuczynski (1999).

<sup>27</sup> Bonjour (1998) gives an excellent summary of all the attempted solutions, and makes it clear why all of them (except for Bonjour's own) are inadequate. Bonjour has thus spared me the task of having to say why all the proposed solutions – apart from his own – are unsatisfactory. For reasons of space, we cannot give Bonjour's own solution the attention it deserves, limiting ourselves to the following brief discussion.

Bonjour's own solution is this. Obviously

(a) *all past F's are G's*

does not logically entail

(b) *all future F's will be G's*.

But the connection between those two propositions, while not one of entailment, is still analytic or *a priori*. It is not an empirical fact that *if* (a) is true, then *ceteris paribus* (b) is probable. If we know that (a) is true, then on that basis alone, we know that (b) is more probable than it would otherwise have been. Being an analytic relationship (though not one of entailment), the relationship between (a) and (b) is thus no more in need of an *inductive* grounding than the relationship between *x is a triangle* and *x has three sides*.

Some problems with Bonjour's analysis become apparent when we consider one of the well-known differences between entailment and confirmation. Entailment is an absolute matter. If P entails Q, then for any proposition R, [P and R] entails Q. Sometimes this is expressed by saying that entailment is "monotonic."

Confirmation is famously *not* monotonic. If P confirms Q, it is not true that, for any R, [P and R] entails Q. Here is the stock example. *The match is struck* confirms *the match is on fire*. But the latter is not confirmed by *the match is struck and it is wet*.

The fact that entailment is monotonic reflects the fact that whether one statement entails another is entirely a function of the *contents* of those statements. Since entailments are rooted in meanings, they cannot be displaced by matters of contingent fact.

By the same token, the fact that confirmation is non-monotonic reflects the fact that whether one statement entails another is *not* entirely a function of the contents of those statements. If relations of confirmation were entirely analytic, i.e. if they were rooted entirely in meaning, then they would withstand the onslaught of new empirical information. But they don't, and this is inconsistent with Bonjour's analysis.

Here is another way of looking at the matter. Statements about confirmation always involve *ceteris paribus* clauses. *Ceteris paribus* (a) confirms (b). But we could acquire some new piece of information (c) such that the conjunction of (a) and (c) disconfirms (b). Here is an example. The statement *before the year 2000, every member of religious sect x has visited temple y at least once in his or her lifetime*. This statement confirms *Smith, who is a member of sect x, will at some point visit temple y*. But this last statement is *disconfirmed* by the first statement conjoined with *a government dominated by a rival sect has destroyed that temple and has surrounded the city where the temple is located with an impenetrable wall patrolled by armed guards*.

This suggests that what confirms (b) is not really (a) itself, but rather (a) conjoined with everything else we know. The words “*ceteris paribus*” mean that, *holding certain background assumptions constant*, (a) confirms (b). *Ceteris paribus* jogging is good for one’s health. This means that jogging will improve his health if we make certain reasonable assumptions (the jogger doesn’t have a heart abnormality, he doesn’t go jogging in a war zone or on a busy freeway...). But this means that it is not (a) *per se*, but rather (a) conjoined with various background data, that confirms (b).

Leaving aside cases where one statement gives 100% probability to another, i.e. leaving aside cases of logical entailment, every confirmation statement involves a *ceteris paribus* rider. It would be nonsense to say that P confirms Q but that there is no statement R such that [P and R] disconfirm Q. That, it is easily demonstrated, would be tantamount to saying that P gives 100% probability to Q, i.e. that P entails Q. But obviously that is not the relationship that holds between *all past F’s are G’s* and *all future F’s are G’s*, and is thus not the relationship that attempts to justify induction are concerned with.

We must conclude that, in the relevant sense of the word “confirm”, every statement of the form *P confirms Q* involves a *ceteris paribus* clause. As we saw a moment ago, this means Q does not receive confirmation from P alone, but rather from P conjoined with various empirical beliefs. Thus it is *not* analytic that, taken by itself, P confirms Q; indeed it is not even true. The reason that *P confirms Q* might seem analytic is that we so take for granted those empirical beliefs that we hardly notice they are there, creating the illusion that P confirms Q all by itself -- in a vacuum. (This is yet another case where deeply entrenched empirical beliefs are mistaken for a priori truths.)

There is another reason to doubt the veracity of Bonjour’s analysis. Consider the statement:

(\*) Fx is 80% probable, given that Gx.

It is a matter of considerable debate what exactly is meant by (\*). According to one proposal, (\*) says that 80% of G’s are F’s. But the expression “80% of G’s” is ambiguous. It could mean either *80% of G’s, known and unknown (past, present and future)* or it could mean *80% of known G’s*. If the former is meant, then we have no argument against Hume, since Hume’s very point is that we have no way of knowing if the relevant class has the right composition. If the latter is meant, then relevant notion of probability wouldn’t warrant any inferences as to the future, in which case it is quite useless. So Bonjour’s argument comes out false under the widely accepted “frequency” interpretation of probability.

There are other delineations of (\*). But I don’t think that Bonjour’s proposal fares any better on any one of them.

<sup>28</sup> My exposition is not *entirely* accurate. But the inaccuracies are completely irrelevant. A more precise exposition is given in Ayer (1972).

<sup>29</sup> Hume shows that an exactly similar argument bedevils the attempt to show that information about the past can warrant *probabilistic* judgments about the future. Suppose that, in the past, 99% of the swans that I’ve encountered are white. If this is to warrant the induction that *it is 99% likely that the next swan I encounter will be white*, then I need some assurance that the future will resemble the past. I cannot have such an assurance unless I have some assurance of the rationality of induction. But now we are locked in a circle, since any assurance that the future will resemble the past presupposes the legitimacy of induction.

<sup>30</sup> As before, my exposition will not be strict exegesis, but will involve some amendments that, in my view, help to bring out the logic underlying Hume’s view.



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<sup>31</sup> Ayer (1972) makes this point. Ayer's discussion anticipates much of what I say in this paragraph, and also the following two.

<sup>32</sup> See Russell (1927) and (1948).

<sup>33</sup> See Quine (1960: 248-257).

<sup>34</sup> I believe that this point is found in Russell (1927), though not expressed with the terms "analogue" and "digital."

<sup>35</sup> See Kuczynski (2003).

<sup>36</sup> We can certainly imagine "analogue" systems of communication. Indeed, such systems of communication seem to be in use. (Documentary films are, in large part, analogue-communications.) But analogue-systems of communication are so different from languages like English and Spanish that we would merely render the term "language" ambiguous by using it to apply both to systems of communication like Spanish and also to systems of analogue-communication.

<sup>37</sup> The relevance of this line of thought to Zeno's paradoxes is obvious. So far as I know, none of the attempt solutions acknowledge these facts about points and instances.

<sup>38</sup> Strictly speaking, we should say *point-instants*, if we are to be true to what Relativity Theory teaches us,

<sup>39</sup> See Russell (1927), who refers to this sort of causation as "intrinsic" causation.

<sup>40</sup> Actually, it was Wittgenstein who explicitly said this (in the *Tractatus*). But it is Humean in spirit.

<sup>41</sup> See Mackie (1974) for an excellent discussion of such attempts.

<sup>42</sup> This is odd because those discussions are often authored by people who have internalized the relevant developments in regards to the structure of space-time.

<sup>43</sup> Reichenbach (1958).

<sup>44</sup> This is not the sort of Bridgeman-style instrumentalism or operationalism that was refuted in the middle of the last century. (See Hempel (1966) for a discussion of the inadequacies of these viewpoints.) I am not saying that motion is defined by the way we measure it. I am saying that location is to be understood in terms of motion, leaving it open that there may be no single operational characterization of motion.

<sup>45</sup> His view is taken to have some support in contemporary quantum physics. For reasons I discuss elsewhere, that is not the right conclusion to draw.

<sup>46</sup> Quantum physics is widely seen as vindicating Hume's views on *ex nihilo* causation. Supposedly, quantum physics shows that *no* events are strictly determined by antecedent conditions. Even macroscopic systems are indeterministic, though the margin of indeterminism is vanishingly small where they are concerned.

Quantum physics is an extremely well-corroborated and fruitful doctrine. For this reason, and also for the sake of argument, let us concede that it is correct. Does that vindicate Hume's views on *ex nihilo* causation? There are a few points to make here.

First, it is unclear whether the indeterminism is merely epistemic – merely a matter of interference effects limiting the extent of our knowledge – as opposed to lying in the phenomena themselves. Von Neumann famously argued that the indeterminism is entirely objective – that there is no way to introduce hidden parameters that would permit a deterministic description of the phenomena. It is now known that von Neumann's argument is flawed. But, of course, it doesn't follow that he was wrong to regard the

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indeterminism in question as being objective, and not (at least not entirely) epistemic. This issue has yet to be resolved. See Bohm (1957) Bell (1987)

For the sake of argument, suppose that the quantum-universe *is* indeterministic. In that case, I would argue (as many physicists do) that, to that extent, temporal and spatial order breaks down and that, contrariwise, there is determinism so far as there are determinate spatio-temporal relations. Thus, *given* that our experiences are temporally co-located, we have, as we have seen, all the resources we need to make our case against Hume.

<sup>47</sup> Hume actually believed that space-time and decomposed into distinct, though adjacent, granules. I believe that Hume is guilty of the psychological projection discussed a few pages back – of an *a priori* assumption that reality conforms to our linguistic categories.

It must be said that Hume himself takes great pains to give an empirical argument for his views on space and time. According to Hume, experience reveals the existence of minimum “visible”. Thus, there is no experiential basis for the belief that space is continuous. Thus there is no basis of any kind for that belief. Hume gives an analogous argument regarding the structure of time.

But it is not hard to see an *a priori* belief-system lurking beneath this supposedly empirical demonstration. When I reflect on my own visual experience, I am struck by the *absence* of minimum *visible*. My visual experience is not pixilated (or so it seems to me when I reflect on it). I am not opposed to saying that, given a compelling enough theory of visual information, I might possibly be able to *find* the minimum *visible* that Hume discusses; I do not wish to say that Hume’s theory is positively *refuted* by the phenomenological data. But it is clear that, absent the mediation of some extraordinary theoretical apparatus (whose very existence would probably not fit well with Hume’s hard-line empiricism), the phenomenological data provides no positive support for it either, and provides some support for its negation. Hume’s argument thus strikes me as a tortured attempt to empiricize an *a priori* viewpoint.

<sup>48</sup> See the previous footnote.

<sup>49</sup> Our argument involves the assumption that persistence is a causal phenomenon. A Humean might say that this assumption begs the question. How, then, would a Humean analyze persistence? He would have to say that persistence reduces to a regularity of some kind. For the chair to last is for there to be certain concomitances, nothing more: supposing that R and R\* are regions occupied by the chair, the degree of resemblance between the events in R and those in R\* comes arbitrarily close to 100% as the values of R and R\* converge. So the chair’s persistence reduces to similarities among events in neighboring places and times.

But each of the relevant regions is of non-null size; and, as we’ve seen, we cannot decompose lasting states of states of affairs into instantaneous ones. (The decomposition happens in the opposite direction: instantaneous states of affairs are decomposed, as it were, into lasting ones.) Given any one of these regions, there will be persistence and continuity within it. If a Humean tries to use the method just described to reduce these persistences to regularities, the same problem will recrudescence for the relevant sub-regions. The Humean cannot reduce persistence to regularities holding among *instants* (or point-instants) since, as we’ve seen many times, point-instants no more exists than “the average man”: for “the average man” to have 2.3 children is for 2.3. to be the number that results when the total number of children had by all *actual* men is divided by the number of men. Similarly, for such and such to occur at some “point-instant” is for the inaccuracy of “such and such happens at R” to approach zero as we choose smaller and smaller values of R. The regularity account of persistence is thus a failure, as it presupposes the existence of persistence that cannot be explained in terms of regularity.

<sup>50</sup> Here the Kantian basis for my views is going to become apparent.

<sup>51</sup> Of course, we must fall back on propositions when we justify our beliefs to others, unless we happen to have a video-recording or some such. But surely we mustn’t put too much epistemological stock in this sociological fact. That would be like identifying moral with legal innocence.

A number of philosophers of science, e.g. Carnap (1934), have stressed the need for data to be *public* if it is to have any scientific standing. If by “public” is meant “capable of being experienced by different people”, then perhaps scientific data must indeed be public. (I say “perhaps” because nobody can

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experience *my* pains, even though such pains are obviously admissible data. But, of course, nobody can have *my perceptions* either. The concept of publicity is presumably meant to apply not to the individual datum, but to the *class* to which that datum belongs. But, at this point, the need for data to be public starts to sound trivial.) But sometimes what is meant is that only data capable of being embodied in certain public media, like language, count as scientific. That, I believe, is an error.

<sup>52</sup> Or, strictly speaking, of propositions affirming those events.

<sup>53</sup> The relevant conception of “completeness” is not one that renders this result trivial; by a “complete” description of E we mean one that corresponds to our intuitive conception of what it is for a description of E not to omit anything of empirical import. We haven’t *defined* a “complete” description as one that entails the occurrence of distinct events. Rather, we’ve shown that, if we begin with an intuitive and non-tendentious conception of completeness, we are led by a series of natural steps to the conclusion that events like the pushing of the button and the arrival of the elevator are internally related. In other words, given an intuitive conception of what it is for a description to be empirically accurate and exhaustive, causally related events turn out to have just the sort of relationship that Hume claimed they do not have.

<sup>54</sup> I am using the word “narrative” in the extended sense in which it is used in literary criticism.

<sup>55</sup> It might be thought that if you ensure for each pair of bars that it is musically feasible, it would follow that the composition as a whole was feasible. That does not follow. Nothing is easier than to produce three bars A-B-C such that A-B sound good and B-C sound good, but such that A-B-C does not sound good.

<sup>56</sup> Freud distinguished two very different kinds of mental activity. (See chapter 7 of the *Interpretation of Dreams*.) He described the one kind as “primary processes” and the other as “secondary processes.” Primary processes are affect-driven, impulsive, and not inhibited by logic. The associations described by Hume are examples of primary processes, as are the free-associations that Freud (and, following him, contemporary therapists) use to access the patient’s unconscious. Secondary processes are those that are governed by consideration of logic, and embody a rational, conceptually articulated world-view. (The distinction is not absolute. No mental process is *completely* a primary process or *completely* a secondary process; it is always a question of more or less, not of either/or. In fact, much of Freud’s work consists in his showing that what we believe to be *exclusively* secondary processes are actually, in some respects, primary.) I believe that Kant’s description of the mind is a correct description of Freud’s *secondary* processes, and that Hume’s is a correct description of *primary* processes. So, in this context, there is no real opposition between those two philosophers, as they were simply talking about different things, or at least different aspects of a given thing.

<sup>57</sup> It may be useful to pursue the analogy with music a bit further. If we wish to say why a sequence of two bars is or is not musically satisfactory, it is often possible find a rule of composition that is on point. But the same can almost never be done with a sequence of eighty bars. This tempts us to say that there are *no* relevant rules.

But that is not as innocuous a position as it is usually taken to be. Mozart’s work obviously satisfies structural desiderata not satisfied by the work of inferior composers. That is why we prefer Mozart’s music to that of other composers. This preference would have no objective basis if there weren’t a principled distinction between good and bad music: in that case, we could not find any fault with someone who no more enjoyed Mozart than the sound of a jack-hammer. But it is a datum that fault is to be found with such a person, even though some aesthetic theories deny this datum -- just as erroneous moral theories deny the obvious truth that it is objectively wrong to kill innocent people, saying it is just a matter of “how we feel”. It is interesting that Hume himself pioneered the view that morality is just a matter of “how we feel.” We have thus discovered a certain revisionism -- I dare say a certain *a priorism* -- to be inherent in this thought and, ironically, in empiricism itself.

Here is another way of looking at the matter. Mozart’s decision to write an F as opposed to a G in a given place is obviously principled. He didn’t *just* want to write an F. Of course, he did want to do so. But this desire was grounded in a sensitivity to the relevant aesthetic principles. Musicologists may not be able articulate those rules. But that is irrelevant. What is relevant is the obvious fact that those principles exist.

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Let us relate these points to the problem of induction. Hume says that (A) is merely counter-inductive, not illogical. Of course, Hume is right that (A) is logically compatible with (C). But nothing of substance can be concluded from that fact. Given only that a composition satisfies the requirements spelled out in some musicological theory, we cannot infer whether it is good or not. Similarly, the logical compatibility of (A) and (C) could mean *either* that the events described really are compossible *or* that, like a bad musicological theory, (A) and (C) fail to capture the relevant information.

<sup>58</sup> In any case, this is an arguable position that has never been explored. Everyone has acquiesced to Hume's premises and, indeed, to his highly propositionalized conception of reality.

Kant is generally seen as being an opponent of Hume's in this context. But, as Bonjour said (though not in connection with this exact topic), the exact opposite is the case. Kant's outlook is an extreme form of such acquiescence to Hume's views. According to Kant, Hume's views could be dealt with only by accepting idealism – only by denying the existence of an external world or, at any rate, of a knowable external world. So Kant is really saying:

(K) Hume is right about the external world, but not about the mental world. In the mental world, every event is caused; induction is easily justified; and so on.

But (K) is just a way of saying:

(H) Hume is right.

Suppose I say:

(\*) In the external world, Smith has a million dollars, whereas I am bankrupt. But I am still the richer man; for in the mental world (or, at least, in my mental world) I am a billionaire, and Smith is my manservant.

Obviously (\*\*) is just a way of saying:

(\*\*\*) In the external world, Smith has a million dollars, whereas I am bankrupt – end of story.

Later in the present paper, we will see how many viewpoints that claim to be anti-Humean actually concede all of Hume's major epistemological claims.

<sup>59</sup> Suppose that physical states  $E_1$  and  $E_n$  are *completely* separated – that there is *no* continuous series of states of mediating between them. On what grounds could it be said  $E_1$  preceded  $E_n$ ? I am not asking what *evidence* there would be for such a claim. The answer to *that* question is obviously “none”, since the existence of such evidence would re-establish the very continuity we are supposing not to exist. What I am asking is whether there are *any* true propositions – not necessarily any that we could know – such that, given those propositions, it would be anything other than arbitrary to see  $E_1$  preceded  $E_n$ . The answer to that is plainly “no.” This means that we must see spatio-temporal relations as primitive. But in that case, as we will discuss later, their tight connection with causal notions becomes completely accidental: there ceases to be any *conceptual* foundation for the relationship between causality and temporal order. To avoid this theoretical arbitrariness, we must do what intuition and contemporary physics urge us to do anyway: to regard causal relations as constitutive of spatio-temporal relations.

<sup>60</sup> See Russell (1927) and (1948).

<sup>61</sup> This point is found in Davidson's important work. See Davidson (2001).

<sup>62</sup> The obvious response to this is to say that knowledge of propositions like *there either is or is not an external world* is analytic. But such propositions are not really about the external world in any significant sense, since they don't tell you anything about it. As Wittgenstein said, you don't know anything about the weather if you know only that it is raining or not raining.

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<sup>63</sup> The other side of the coin is that logical blunders are much *harder* to avoid than previously thought. Once we broaden the concept of logical truth to include analogue-logic, and therefore to rationalize our inductions, we make it much easier than before to make strictly logical errors. In fact, every false hypothesis would embody such an error.

<sup>64</sup> Of course, the existence of anyone who had information about both those events would *ipso facto* involve a causal connection between them. So the absence of a causal connection would entail the non-existence of any such person.

<sup>65</sup> “Cause” means “partial cause”, of course, where total causes are taken to be limiting cases of partial causes.

<sup>66</sup> Russell (1948).

<sup>67</sup> This is a classic case of “definition by abstraction.” Of course, the most famous application of this procedure is Frege’s analysis of number: a number is the class of all sets equipollent with a given set. (Frege himself invented the technique of definition by abstraction.) It was (supposedly but not actually: see below) discovered that Frege’s objection involves the dubious “axiom of infinity.” If there are only five objects in the world, then Frege’s analysis cannot distinguish between any two numbers larger than five. (This could be remedied by invoking possible worlds. But presumably a conservative mathematical analysis shouldn’t involve such a dubious metaphysical supposition. In any case, we will soon consider a better proposal due to Arthur Pap.)

Whitehead’s analysis of the concept of an instant doesn’t involve anything comparable to the axiom of infinity. That axiom would be required only if there were some *a priori* reason to believe that there must be *infinitely* many instants. But that is precisely what is rejected (on independent grounds) by the conception of spatio-temporal relations presupposed by this analysis. Someone who believes in absolute space and time *might* perhaps have an *a priori* reason for believing this. But, by definition, such a person wouldn’t try to analyze the notion of an instant in terms of the notion of an event; after all, an absolutist about space and time says that the properties of those things do not supervene on those of the events occupying them. It is easily verified that Whitehead’s analysis doesn’t suffer from any of the other problems facing the reduction of arithmetic to set-theory.

As I parenthetically indicated earlier, I don’t think that Frege’s theory really does require the axiom of infinity. My reasons for this are to be found in an article by Arthur Pap. (I read it long ago, and have been unable to locate it.) According to Pap, if we replace classes with properties, then Frege’s analysis no longer involves objectionable existence assumptions. So the class of all couples would be replaced with the *property* of a being a class C such that for some x, some y, such that y is distinct from x, y and x are both members of C, and such that anything z is a member of z iff it is identical with either x or y. Obviously that *property* exists in a universe where there is only one object – though it wouldn’t be instantiated in such a universe – and, for the same reason (*mutatis mutandis*), so does the property needed for the existence of each other number. As far as I can tell, the only objection to Pap’s proposal is that it involves the “metaphysical” view that uninstantiated properties exist. But I cannot think of a single science that does not use that view. I therefore believe that Pap’s proposal is sound.

<sup>68</sup> Usually events are seen as individuated by their times and places. In my system, we forfeit this method of individuation. This seems like a heavy price to pay. But it isn’t – or, rather, it is a price that we must pay anyway, though some systems of thought hide this fact. When we individuate events by their times or places, we are individuating them by their causal relations, since all spatio-temporal relations are causal relations, as we have seen. So my system exposes the fact that when we individuate events by their times and places, we are *presupposing* a prior individuation of events in causal terms.

<sup>69</sup> I urge readers to look at Russell’s work *Human Knowledge: Its Scope and Limits*, especially the section entitled “The Postulates of Scientific Inference.” Much of what I have said here is anticipated there and also in Russell’s *Analysis of Matter*.

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<sup>70</sup> I am borrowing and modifying an expression of Peter Strawson's (1950). Strawson was speaking not of Hume's theories, but of the subject-predicate distinction.

<sup>71</sup> Chomsky (1975).

<sup>72</sup> See Fodor (1981) for a superb discussion of the concepts of innateness and a priority. Much of this part of the paper borrows heavily from Fodor's insightful clarifications of these concepts.

<sup>73</sup> Fodor (1981).

<sup>74</sup> See Fodor (1981).

<sup>75</sup> These consequences of the doctrines of Kant and Chomsky are clearly drawn by Fodor (1981).

<sup>76</sup> As Hume himself shows, Humean empiricism, with its commitment to the spuriousness of induction, doesn't even allow one to have *directly* perceptual knowledge.

<sup>77</sup> Chomsky (1974) makes this point.

<sup>78</sup> Fodor (1975) *explicitly* accepts this thesis. Fodor has been severely criticized for this. But he is merely being consistent with premises that everyone else accepts but whose consequences others have been less acute than Fodor in seeing.

<sup>79</sup> Except in so far as our knowledge is *strictly* perceptual, i.e. is confined to what one is seeing, hearing, and so on, *at that very instant*.

<sup>80</sup> And perhaps also Leibniz and Plato.

<sup>81</sup> Actually, any event is, trivially, an instance of infinitely many regularities. But leaving this aside, there are, no doubt, many explanatorily significant regularities instantiated by Jim's behavior.

<sup>82</sup> See Hempel's discussion of Dilthey in Hempel (1965).

<sup>83</sup> Hempel (1966) puts forth a superb analysis of Dilthey's views.

<sup>84</sup> Goodman (1955).

<sup>85</sup> Clarence Lewis makes this point in *Mind and the World Order*.

<sup>86</sup> I believe that that the contents of this paragraph are found, in some form, in Ayer (1972).

<sup>87</sup> Incidentally, George Berkeley made the same point two hundred and fifty years earlier in *A New Theory of Vision*. As I argue elsewhere, Berkeley's argument is in many ways superior to Sellars'.

<sup>88</sup> Hempel (1965) and (1966).

<sup>89</sup> I am thinking mainly of van Fraassen (1989).

<sup>90</sup> It is a possibility, however, that what I am describing as "theory-neutral" data is really data that is internal to some theory that *all* people have – a theory that is hard-wired into our cognitive, and in some cases even our perceptual, apparatus. Even if this is the case (and I myself believe that it is), it is enough to warrant at least a modification or softening of Kuhn's position. That position, after all, is that there is no theory-neutral data in the *traditional* sense of the term "theory". So there is no data that is neutral between Einstein's and Newton's theories. But is obviously false. Otherwise, we must take the historically false

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position that the Michelson-Morley experiment was entirely question-begging, and that they were discovering what was merely an artifact of their own theoretical commitments.

<sup>91</sup> Hume (1748).

<sup>92</sup> Searle (1992).