Scientific realism without rigid designation in Kant's analogies

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Abstract: In *Kant, Science, and Human Nature*, Robert Hanna argues against a version of scientific realism founded on the Kripke/Putnam theory of reference, and defends a Kant-inspired *manifest* realism in its place. I reject Kriple/Putnam for different reasons than Hanna does, and argue that what should replace it is not manifest realism, but Kant's own scientific realism, which rests on a radically different theory of reference. Kant holds that we picture manifest objects by uniting manifolds of sensation using concepts-qua-inferential-rules. When these rules are demonstrated to be invalid, we replace the picture of the macroscopic world with a picture of the microscopic entities of theoretical science that unites *the very same* manifolds using different rules of inference. Thus, we refer to "unobservable" theoretical entities in the same way that we do manifest ones: by specifying both their determinate location in space and time and the concepts by which they are understood.

Keywords: Scientific Realism, Reference, Analogies, Kant, Kripke, Inferentialism

Resumo: Em Kant, Ciência, e Natureza Humana, Robert Hanna argumenta contra a versão de realismo científico fundada na teoria da referência de Kripke/Putnam, e defende um realismo manifesto inspirado por Kant em seu lugar. Eu rejeito a teoria de Kripke/Putnam por razões diferentes daquelas de Hanna, e argumento que o que deve substitui-la não é um realismo manifesto, mas o próprio realismo científico de Kant, que se apoia sobre uma teoria da referência radicalmente diferente. Kant defende que nós imaginamos objetos manifestos através da união do diverso da sensação utilizando regras concepts-qua-inferential. Quando essas regas são demonstradas como sendo inválidas, nós substituímos a imagem do mundo macroscópico com uma imagem de entidades microscópicas de ciência teórica que une o exato mesmo diverso utilizando regras de inferência. Logo, nós nos referimos a entidades teóricas "não-oberváveis" da mesma maneira que nós fazemos outras manifestas: especificando a localização determinada no espaço e tempo de ambas e os conceitos pelos quais elas são entendidas.

Palavra Chave: Realismo científico, Referência, Analogias, Kant, Kripke, inferencialismo

In Chapter 3 of *Kant, Science, and Human Nature* Robert Hanna argues for his own brand of Kantian manifest realism by arguing against a version of scientific realism constructed on the infamous Kripke/Putnam account of reference and rigid designation. That form of argument is a dangerous one insofar as were there a brand of scientific realism constructed on a more plausible theory of reference the inference from the falsity of Kripke/Putnam essentialism

to the truth of Hanna's manifest realism would be invalidated. Happily, this is not the only argument that Hanna presents in support of manifest realism, and so even were there such a *tertium quid*, its mere existence will not be enough to undermine Hanna's own view. That said, it is the possibility of such a position—a scientific realism constructed on a theory of reference other than the Kripke/Putnam one—that I want to explore, in part because I have recently tried to articulate and defend just such a view.[1]

To begin, here is a brief overview of the dialectic. Hanna raises a number of objections to the Kripke/Putnam theory of reference, the most important of which for current purposes is the claim that that theory violates certain very basic epistemological principles. Specifically, the Kripke/Putnam account makes the standard of truth of any picture of the world a set of entities and relations to which we do not have any epistemic access, even in principle. Here is a representative quotation in which Hanna makes this point, here also expanding the scope of this charge to include a scientific realist with an entirely different kind of theory of reference— Wilfrid Sellars—who you might surmise as I go on, I take to be hero of this story.

> Indeed, even Sellars's root idea that the microphysical conception of the natural world constitutes a meaningful ''image'' is put seriously at risk here. For, in order for images to make sense, there must be isomorphisms, analogies, or some other sort of basic similarity of properties between the image and imaged object. But, as cognizers with our specific sort of sensibility and our specific sort of sensibility-funded conceptual capacities, we are not cognitively equipped to bring about *any* sort of significant mapping from the microphysical order into the macrophysical order. This is not therefore an issue of scale or scope, or of the empirical regress or progress of perceptual experiences in space—which are in effect merely matters of technological or evolutionary ''engineering.'' (Hanna 2006, pp. 161-162).

If one holds the Kripke/Putnam theory of reference, the referents of our terms can be any sort of unimaginably bizarre microphysical entity, and consequently the truth of many of the claims that we make will depend on states of affairs far outside the bounds of anything that we could even in principle come to know. That is bad.

As Hanna knows, though, Sellars does not hold a Kripke/Putnam theory of reference. Rather, his account of the representation of theoretical entities essentially depends on precisely the conditions that Hanna here accuses him of violating: Sellars is *notorious* for

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[1] Landy (2015).

holding a picture-theory of representation. Folks like Rorty and Brandom have long accused him of doing so despite his own insight into the importance of normativity in rejecting the representationalist hegemony in favor of a "pure pragmatics". At the center of Sellars' philosophical system is the notion of our pictures of the world being replaced by *analogical extensions* of what is available in the manifest image. So, whereas Kripke and Putnam might open themselves to the objection that the objects of scientific theorizing are completely beyond our conceptual capacities, Sellars does not.

Regardless, though, the point here is that Hanna rejects the Kripke/Putnam theory of reference on the grounds that what it aims to represent is, as Kant would put it, epistemically *transcendent*. To an extent, I think that Hanna is onto something here, but the objection itself needs to be pushed deeper to reveal its real bite. After all, if it turned out that we *could* refer to unknowable entities without having to describe them at all—a consequence of their theory of which Kripke and Putnam are quite proud—then so be it. It is not really enough just to *modus tollens* Kripke/Putnam's *modus ponens*. To see the real issue here, it is important to discern just where their argument goes wrong. Let me take a quick shot at that.

I will not be the first one to notice that Kripke does not *really* provide a theory of reference *simpliciter* at all.[2] What he gives is a two-part account of what he calls *semantic* reference: how a name—specifically qua linguistic entity—refers. The second part of that theory is a woefully inadequate and generally misguided and hopeless account of reference *transmission* that gestures at the "causal relations" between uses of a name, but which does not specify *which* causal relations are the relevant ones, and could not do so non-circularly. The first part of the theory is where reference is meant to be *established*, though, and it is where the rubber ought to meet the road for any such theory. Before we can turn our attention to reference transmission, we need to understand how it is first *established*. According to Kripke, semantic reference is secured via a "baptismal event" wherein an object is first given its name. To my ear, that sounds more like a description of the problem than a solution to it. What we want to know is *how* a name, in the first instance, comes to refer to that object to which it is given. In fairness, Kripke is aware of this issue and does attempt to address it. Such baptismal events fix reference by way of what he calls *speaker* reference, and so the account of the reference of our words itself depends on an

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[2] I would direct the reader to Rosenberg (1994), which is an unjustly neglected, but insightful and instructive treatment of Kripke's entire philosophical system and his argumentative methodology in supporting it.

account of the reference of our thoughts.[3] That might be all well and good except for the fact that this is precisely where Kripke's story ends: the primitive intentionality of thought. So, I don't think that the Kripke/Putnam "theory" of reference is really a theory at all. Instead it is a two-part *description* of some of the circumstances in which reference occurs, without the attendant *explanation* of how this is possible that would make it philosophically illuminating.

So, the most fundamental reason to reject Kripke/Putnam is not that it implies that the objects of reference are transcendent, but rather that it gives no account at all of how this could be true. The Kripke/Putnam theory of reference does not *imply* that we can refer to entities without being able to conceive of them. It merely asserts that this is true. Insofar as there is anything to the *theory* at all, it is merely the suggestion that our theory of reference should be backward looking. Our terms refer to their ultimate *causes*. Hanna is certainly right to notice that this way of thinking is not new to Kripke and Putnam, but was certainly held by Locke, and in a different way by Hume.[4] One of *Kant's* most radical proposals is that this approach to reference is entirely wrong-headed. Kant holds that a theory of reference ought to be *forward* looking. The reference of our terms is fixed, not by the causes of those terms, but instead by the procedures that we would use to *find* the objects about which we are making claims. Space and time are the forms of our intuition because they allow us to determinately *locate*, and thereby individuate, the objects of our conceptual descriptions (Think Max Black's bronze spheres, Strawson's chessboard.)[5] Concepts are necessary for reference because they allow us to specify what *kind* of object will be found at such-and-such a location, and to *picture* those objects as being related to one another according to causal laws (which is the proximate end of representation for Kant).[6] What matters for *reference* is not what causes us to form the intuitions that we do—although there is an important story to tell there too—but rather how we subsequently track information about the objects of those intuitions and change the judgments that form the picture of the world that we use to represent them. Now I have gotten ahead of myself. More on all of this later. For

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[3] Kripke (1977).

[4] Nb. Hanna's own account of *non*-conceptual content is also backward looking in this way—the content of a non-conceptual representation are the features of the object that causes such representations to have the content that they have—but that is a bone that I pick in another venue. See Landy (forthcoming).

[5] See Black (1952) and Strawson (1959, pp. 123).

[6] The distal end of representation being to conceive of oneself as the single subject of experience persisting through time. Thus, "the analytical unity of apperception is only possible under the presupposition of some synthetic one"(*KRV* B134).

now, I want to return to Hanna's objection, and the genuine theory of reference that he adopts in light of the failure of Kripke/Putnam.

Hanna rejects Kripke/Putnam because they make the objects of reference epistemically transcendent. One natural reaction to that failure is seek out a theory that limits reference to manifest objects alone, and that is exactly the theory that Hanna develops. Of course, there are other desiderata that a specifically Kantian theory of reference must accommodate, and Hanna is good enough to list some of those for us.

> Individual material things and natural kinds […] are essentially determinate positions or determinate roles in a maximally large relational structure or system of empirical nature as a whole. (Hanna 2006, pp. 149).

I am not sure that I agree that *natural kinds* are determinate positions or roles in empirical nature—I do not think that Kant's ontology includes kinds at all—but that too is a point for another venue.[7] Hanna is surely right that material things, or objects, are just as described: determinate positions or roles in the causal structure of nature. It is not implausible to think of Kant as having something like a process ontology, with "objects" being limits on these processes in the same way that he argues in the Axioms of Intuition that mathematical points are limits on lines or space itself. The important point here, though, is that the structure in which objects play this role is a specifically causal one. Here is Hanna again.

> Kant's mature Critical theory of matter is fully metaphysical structuralist in character, but also overtly causal-dynamic in its direct appeal to attractive and repulsive forces acting at a distance, and, above all, it is explicitly anti-atomistic and radically macrophysicalist. (Hanna 2006, pp. 149).

Notice that there are two different claims here. The first is that Kant's mature theory of matter is fully metaphysically structuralist, causal dynamic, and anti-atomistic. I agree. The second claim, though, is that it Kant's theory is also macrophysicalist, and that is a very different claim that requires a very different kind of support. Why? Well, because there is nothing *prima facie* incoherent about a philosopher's holding a position that is fully metaphysically

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[7] See Landy (2016, chapter 2).

structuralist, causal dynamic, anti-atomistic, *and microphysical*. In fact, there is good reason to think that this is exactly the position that Kant holds.

To see this, consider that the structure in which objects play their essential role is a specifically *causal* one. That claim is important here because, for Kant, it is not *macro*physical objects that stand in causal relations at all! That is a thesis that comes out most clearly in the Analogies, and while it is perhaps the Second Analogy that is most relevant here, this thesis is easier to discern in the First. So, let's consider Kant's argument there.[8] We can start with Kant's distinction between change (*Wechsel*) and alteration (*Veränderung*). A change, as Kant understands it, is the event of something's coming to be or ceasing to exist. 'Change' refers to an event that marks a difference in the ontological make-up of the world. In autumn when the green of a leaf ceases to exist and its orange begins to exist, the color of the leaf changes. Alteration, on the other hand, is "a way of existing that succeeds another way of existing of the very same object"(*KRV* A187/B230). So, while the color of the leaves change—the green ceases to be, and the orange comes to be—relative to these colors the leaves undergo alteration. They exist first as green, and then as orange. Kant's thesis in the First Analogy is that all ostensible change, all seeming ontological difference, is actually mere alteration. Strictly speaking, there are no changes in the world, nothing comes to be or ceases to be, there are only alterations of the one, sempiternal substance.

> All appearances contain that which persists (substance) as the object itself, and that which can change as its mere determination, i.e., a way in which the object exists. (*KRV* A182).

All apparent change is, in fact, mere alteration of the one, sempiternal substance.

Kant's use of the term 'substance' to refer to this one omnipresent matter in which all alteration occurs is in line with a certain historical tradition that runs through Kant's early Modern predecessors: Locke, Descartes, Spinoza, Leibniz, Berkeley, and Hume. This is a distinctly ontological sense of 'substance'. There is another sense, however, of 'substance' stemming from a historical tradition tracing its roots back to at least Aristotle. This is the sense of a substance as the single subject of multiple predicables. While Aristotle and others draw ontological consequences from this use of 'substance', in itself it is an essentially

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[8] What follows reproduces with some changes material from Landy (2014) and chapter 5 of Landy (2016).

representational use of that term. Especially for Kant, these two senses of substance are not unconnected. In fact, he explicitly connects them.

> What cannot be thought [intuited] otherwise than as subject does not exist otherwise than as subject, and is therefore substance. (*KRV* B410).

What is an Aristotelian substance, the single subject of multiple predicables, is also a Lockean substance, the one, omnipresent matter that underlies all apparent change. This connection is significant here because it offers us a test to determine whether or not a purported Lockean substance, bit of matter, is in fact a genuine substance. If it can only be thought as subject, then it is; if it can be thought otherwise than as a subject, it is not. What is really interesting about Kant's argument in the First Analogy is that it implies that most of the objects that one might assume constitute the substance of the world—e.g., tables, chairs, elephants, planets—in fact, fail this test, and so according to Kant are not genuine substances. Such substances are mere determinations of the one, omnipresent substance. More on that in a moment.

For now, what we need to do is see how it is that Kant arrives at this audacious conclusion. To do this, it will be helpful to first consider a quick reconstruction of Kant's argument, along with a classic objection to this version of the argument. It will turn out that Kant himself has already considered this objection, and has a telling response to it. So, we can begin with the following quick-and-dirty version of Kant's argument in the First Analogy.

1. (In order to represent oneself as a single subject of experience persisting through time),[9] one must represent time as a unity.[10]
2. Time itself is not perceived.[11]
3. Therefore, one can only represent time by *marking* time on the objects of experience.[12]

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[9] "Now experience rests on the synthetic unity of appearances, i.e., on a synthesis according to concepts of the object of appearances in general, without which it would not even be cognition but rather a rhapsody of perceptions, which would not fit together in any context in accordance with rules of a thoroughly connected (possible) consciousness, thus not into the transcendental and necessary unity of apperception." (*KRV* A156/B195)

[10] "Different times are only parts of one and the same time" (*KRV* A32/B46)

[11] "Now time cannot be perceived by itself" (*KRV* A181/B225)

[12] "Consequently it is in the objects of perception, i.e., the appearances, that the substratum must be encountered that represents time in general"(*KRV* A181/B225). This does not strictly speaking follow from (2). One way to arrive at (3) would be to offer an argument that the two options listed here—that time is perceived and that time is marked on the objects of experience—exhaust the possibilities for representing time. Kant does not offer such an argument, but

4. Therefore, to represent time as a *unity*, one must mark time on a unitary substance.[13]

5. Therefore, we must represent the world as containing a single, sempiternal substance (which is neither created nor destroyed, and of which apparent changes are actually mere alterations).

The idea here is that since the only way to represent time is by representing the changing states of the world, if one is to be able to represent time as unity, it cannot happen that there should be a time at which nothing exists. Were such a state to come to pass, the timeline that was marked on the objects before this state and the timeline that would be marked after it, could not be related to one another by any intermediate time because there would, *ex hypothesi*, be no objects in existence during this intermediate span on which to mark the time between the end of the previous timeline and the beginning of the new one. So, there can be no time at which nothing exists. Melnick offers the following example to illustrate the point, to which we will see Van Cleve object in a moment.

> Suppose that the action (mechanism) of an ordinary faceclock is used to determine the magnitude of a time interval t_1 to t_2. We assume that at time t_1 the hands on the clock read 4:00 A.M. and that at time t_2 the hands on the clock read 4:05 A.M. We thus measure the time interval t_1 to t_2 as the time it takes for the action (the mechanism) to move the hands of the clock from a 4:00 reading to a 4:05 reading. Suppose that the clock that reads 4:00 at t_1 does not have an uninterrupted existence up to time t_2, i.e., suppose we have the following situation: At time t_2 clock A reads 4:00. At time t' between t_1 and t_2 clock A goes out of existence. At some time t" between t' and t_2 (where t" does not equal t') clock B comes into existence and at t_2 clock B reads 4:05. In order to determine the time interval between t_1 and t_2 we must be able to determine the interval between t' and t". It will not do in determining this interval to say, e.g., that since the last reading of clock A (at t') was 4:02:25, and the first reading of clock B (at t") was 4:02:27, that the interval t' to t" was 2 seconds […] Thus, there can be no interval no matter how small (because we could not determine how small) between the times t_1 and t_2 at which there is a lacuna in the mechanism, if this mechanism is to be that in virtue of which we determine the magnitude of the interval t_1 to t_2. (Melnick 1973, pp. 66).

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we might at least grant him that these are the two most obvious live options, and that the more obscure ones can be dealt with in turn.

[13] "Consequently that which persists, in relation to which alone all temporal relations of appearances can be determined, is substance in the appearance, i.e., the real in the appearance, which as the substratum of all change always remains the same." (*KRV* A181/B225) The objection that we are about to consider concerns the inference from (3) to (4).

Since there is no substance in existence between t' and t", there is no way to mark the interval that passes between these two times. Thus Melnick earns for Kant the conclusion that in order to represent time as a unity, there must at all times, exist some substance. As Van Cleve astutely points out, however, this principle is not the same as, and does not imply, the principle that in order to represent time as a unity, there exists some *single* substance that exists at *all* times. That is, it seems that if the kind of example that Melnick presents is all that there is to Kant's argument, then Kant is guilty of a simple confusion regarding the scope of his quantifiers. Van Cleve proposes the following counterexample to make this clear.

> We could still measure the interval from t_1 to t_2 provided there were *another* clock that existed, say, from 4:02 until 4:03. This would enable us to verify that all three clocks were synchronized and to measure the interval from t' to t" by means of the third. (Van Cleve 1979, pp. 158).

In this example, at every time there exists a clock by which to mark the time, but it is not the case that any single clock exists at all times, and it does not seem that there is any reason to believe that some such sempiternal clock must exist in order to bridge the gap in Melnick's example.

Despite its initial plausibility, Kant seems to have anticipated this kind of example and provided an argument against this sort of objection.

> Substances (in appearance) are the substrata of all time-determinations. The arising of some of them and the perishing of others would itself remove the sole condition of the empirical unity of time, and the appearances would then be *related to two different times*, in which existence flowed side by side, which is absurd. For there is only one time, in which all different times must not be placed simultaneously but only one after another. (*KRV* A188-9/B231-2, emphasis added).

Call the interposing clock from Van Cleve's example Clock C. In that example we mark time first on the Clock A, then on both Clock A and Clock C for some time, then just on Clock C, then on Clock C and Clock B for some time, then on just Clock B.
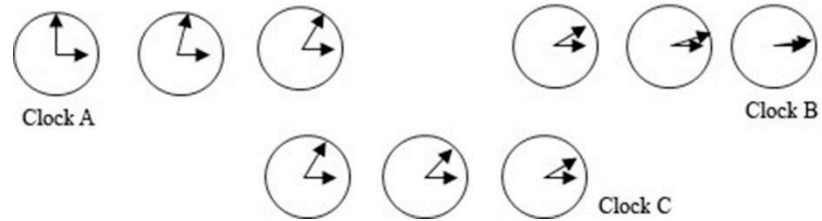
The argument that Kant quickly articulates in the above passage concerns what we are to make of the intervals in which we are marking time on two different clocks: "the appearances would then be related to two different times, in which existence flowed side by side, which is absurd." The problem that Kant is anticipating here is one of coordination. If time is being marked on two different clocks, or substances, then we have no criteria by which to judge that a time being marked on, e.g., Clock A is the same time that is being marked on Clock C. What we are tempted to say is that the hands on Clock A pointing to 4:02 occurs at the same time as the hands on Clock C pointing to 4:02, but this is to make precisely the mistake against which Kant warns: if the *only* way we have to mark time is by those clocks, then to the claim that the positions of the clocks match at a time, is to say that two times occur at the same time, which, as Kant points out, is absurd.

By way of illustration, consider the infamous meter-stick in Paris that serves as the standard against which all lengths are measured. In the classic example, a meter is *defined* as whatsoever is the length of that particular stick.[14] So, just as time cannot be marked except by the changing of substance, in this example there is no way to measure length independently of the meter-stick. To see the absurdity to which Kant alludes in the above passage, consider a scenario in which there was not one such meter-stick, but two. This would mean that a meter would be defined as whatsoever is the same length as those *two* sticks. An example will help to bring out the absurdity of this situation. Consider a length of string that was first held up to one of these meter-sticks and then against the other. Suppose further that the string measured exactly one meter according to the first stick. It is, then, one meter long. Now consider, however, what happens when we go to hold the string up against the second meter stick. Either it too will measure the string as being a meter long or it will not. Suppose, for example, that according to the second meter-stick, the string is half of a meter long. It is, then, half of a meter long. Of

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[14] See. Wittgenstein (1958, §50) and Kripke (1980, pp. 55).

course, what one is tempted to say here is that the two sticks are of different lengths. If, however, length itself is measured *only* by comparison with these two sticks, then that is not a thesis that is available: they are each, by definition, one meter long. So, in this case, the string would be two different lengths. Surprisingly, things are not much better in the alternate case, where the string measures a meter according to both sticks. That is because in that scenario, while the length of the string can be measured consistently, that it can is, in some sense, entirely *contingent*. That is because, as we have just seen, while there is a sense in which the two meter-sticks are necessarily the same length, one meter, there is another sense in which this is entirely an accident. It *could* have been the case that the string was measured differently by each meter stick, and this contingency itself is absurd. Most importantly, however, each of these absurdities follows from the more basic one that is the analog of Kant's claim about time: namely, that *the length of a given magnitude would be determined by two different standards*. The very idea of a *standard* of length against which all other lengths are measured itself precludes the idea of having *two* such standards.

Back to the clocks: if time can only be represented via the alterations of substance, then in the situation that Van Cleve describes, in which he suggests we could represent time via overlapping substances, each such substance would have to serve as something like the meter-stick. We would then, however, be left in the situation as above: we would have two standards against which to judge time—Clock A and Clock C—and no way to reconcile, even in principle, the times that they each deliver. It would make no sense to say that Clock A reads 4:02 at the same time that Clock C does in just the same way that it would make no sense to say that both meter-sticks are the same length, or that a centimeter on one stick is the same as on the other. Length is measured against those sticks; time is marked on those clocks; each stick is necessarily one meter long; each clock necessarily reads 4:02 at 4:02. There is no sense to be made of both readings occurring at the same time because there is no standard of time apart from those clocks.

Thus, Kant's argument does not proceed via a simple mistake in the scope of his quantifiers from a step that establishes that, (a)every apparent change is a mere alteration of some substance to the conclusion that, (a)there is some single substance of which every apparent change is a mere alteration.

Rather, Kant concludes that the need to represent all of time as a unity requires that one represent the world as consisting of a single sempiternal substance that can never be created or destroyed because only a single such substance can provide the single standard needed on which to mark this time. If substance is the only possible standard of marking time, then there can be only one such standard. The only way to ensure this is to guarantee, not only that there can be no time at which no substance exists, but also that no two substances can ever "coexist". Thus, to represent time as a unity, we must represent the world as consisting of a single, sempiternal substance (that is never created or destroyed).

To return to the rough version of Kant's argument that I gave earlier, the line of reasoning that we have been pursuing validates the inference in that argument from

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To

4. To represent time as a *unity*, one must mark time on a unitary substance,

on the grounds that the unity of time that is required is not only the unity of earlier times with later ones, but also the more general unity appropriate to representing a single continuous timeline (rather than one with multiple "concurrent" branches, which as Kant points out is absurd). Given that we can only represent time by marking it on the objects of experience, representing this more general kind of unity does, in fact, require a single substance that acts as the single standard on which we do just this.

Of course, we can, in more ordinary circumstances, represent two clocks as displaying the same reading at the same time. Kant's thesis is that we do so by representing the movements of both of those clocks against the background of the single, sempiternal substance. And it is here that we can gain our first glimpse into the problem that I earlier anticipated for Hanna. What Kant's thesis in the first Analogy implies is that it is not *the clocks*, or manifest objects at all, that are the substance of nature—because they can be destroyed, whereas substance cannot—but rather the underlying sempiternal substance that is. That is, the real in nature is represented via a theoretical-explanatory posit. *Prima facie*, though, this does seem odd,

as Kant says nothing about, and we seem to know nothing about, what this single, sempiternal substance is, or is like. It is not as if we have one clock here, another there, and hold them both up against substance to make sure that they each display the same reading at the same time. One may wonder, then, what exactly Kant takes himself to have argued, and this is precisely the moment when Locke/Kripke/Putnam would make an appeal to an unobservable, unknowable, un*represent*able *via negativa* that could only be referred to but not described. That is not what Kant has in mind at all, though.

What the First Analogy calls for is that we represent all apparent ontological change as the mere alteration of the one sempiternal substance, and while this can certainly look like a demand for representing substance as a kind of object distinct from, say, the colors of the leaves or the wood that is burnt or the clocks that may come and go, it is not. What I want to suggest is that we represent substance not by forming a representation that is *distinct* from the representation of ordinary objects, but by representing these objects *as* alterations of substance. O'Shea puts it nicely:

> The reference to permanent substance is not a reference to some further content posited behind or beneath the changing contents of perception (the 'accidental determinations' of substance). Rather, the concept of substance is the rule that the changing contents encountered in sense experience must themselves be conceived as the successive constitutive characters of an identical substance that persists through such changes. (O'Shea 1996, pp. 73).

The way that we represent this sempiternal substance, without knowing its nature, is by committing ourselves to the rule prescribed by the First Analogy: that all apparent change be represented as the mere alteration of such a substance. We have already seen, in our earlier examination of Kant's conclusion, at least one feature of such a rule. The single, sempiternal substance of which all apparent change is merely an alteration cannot be represented other than as subject, i.e., it cannot be predicated of anything else. As we noted earlier, the converse of this principle is at least equally important. If a potential substance can be predicated of something else—the color green can be predicated of the leaf—then it is not a genuine substance. Similarly, if a potential substance can be created or destroyed—the piece of wood can be burnt—it is likewise not a genuine substance, but a mere alteration of genuine substance. What Kant argues in the First Analogy is that we are committed to representing the world as consisting of a single,

sempiternal substance, and that we do so by committing ourselves to rules of inference corresponding to these conditionals, which constrain the picture of the world that we thereby form.

Here is Kant noting that this is an important difference between the results of the Analogies and the other Principles: while the other Principles deliver rules that are constitutive of what it is to represent an object, the Analogies deliver only regulative imperatives about what such representations creatures like us ought to use.

> Things must be entirely different with those principles that are to bring the existence of appearances under rules *a priori*. For, since this existence cannot be constructed, these principles can concern only the relation of existence, and can yield nothing but merely regulative principles. (*KRV* A179/B221).

Kant's point here is that whereas the Axioms and Anticipations straightforwardly determine what it is for a representation to be a representation of an object at all—they must represent something of a determinate quantity and quality—because the Analogies deal with the relations between objects (or, strictly speaking, alterations of substance), they are not constitutive of such representations, but rather regulative. The Analogies provide rules for the *adequacy* of our representations of the world. Thus, we do not represent substance itself, but rather we represent the manifold of appearances as alterations of substance, and we do this by subjecting the object-concepts that we use to the above rules.

Consider again the question: how does the single sempiternal substance serve as the measure of time? Kant's answer is that there is a sense in which it does so in what should be a familiar way. To represent time's passage, we give a certain order to our representations by employing the concept 'clock': the clock read 4:00 a moment ago, now it reads 4:01, etc. We conceive of our representations as being representations of the alterations of the state of this clock. These local acts of ordering, though, are part of a more far reaching, and necessarily prospective, project of ordering all possible representations along a single, continuous timeline. Likewise, the concept 'clock' is part of a similar and connected project of representing *nature* as the sum total of all objects. It is by subjecting our representations of objects to the regulative concept 'substance' that we commit to carrying out both of these projects. We mark time by giving order to our representations using object-concepts; we represent time's unity by committing to the prospective global unity of the objects so represented. The alterations that we

now conceive as the alterations of these objects will ultimately be reconceived as the alterations of a single, sempiternal substance that can never be created or destroyed.

What I want to do now is draw out a consequence of this reading of the First Analogy that has been largely overlooked. What we have seen thus far is that Kant's conclusion in the First Analogy is that certain meta-cognitive rules are necessary for representing the world in the way that we must in order to conceive of oneself as a single subject of experience persisting through time: such rules demand that in certain circumstances, one change the first-order concepts that one uses to represent the world. So, for instance, if one had been employing the concepts 'green' or 'piece of wood' as object-concepts, once one sees that greens and pieces of wood can be destroyed, one is committed to representing these each as mere alterations of some other substance. This implies that Kant holds a kind of theoretical-explanatory realism.

> Consequently that which persists, in relation to which alone all temporal relations of appearances can be determined, is substance in the appearance, i.e., *the real* in the appearance, which as the substratum of all change always remains the same. (*KRV* A181/B225, emphasis added).

What is real in appearance is substance. We represent substance by replacing one set of object-concepts with another upon discovering that the predecessor set could not accurately meet the demands placed on it by the nature of our representative powers, and with the expectation that the successor set will more accurately picture the world. Compare this with a statement of the thesis of scientific realism by twentieth-century advocate of both scientific realism and a picture-theory of representation, Wilfrid Sellars, regarding the language of physical science:

> [T]he Scientific Realist need only argue […] that in principle this language could replace the common-sense framework in all its roles, with the result that the idea that scientific theory enables a more adequate picturing of the world could be taken at its face value. (Sellars 1967, pp. 146).

According to Sellars, the thesis of scientific realism—that the theoretical-explanatory posits of the best scientific theory accurately represent the ontological make-up of the world, and that the material rules of inference used to structure these representations accurately represent the laws of nature that govern these worldly objects—can be cashed out entirely in terms of an

adequate account of the process by which we replace one conceptual-scheme, qua picture, with another.

Of course, Sellars elsewhere recognizes that to make this form of realism tenable, one must supplement this kind of picture theory of representation with an account of the sense in which successive such pictures converge towards a limit that can plausibly lay claim to being the correct picture of the world. Thereby hangs the tale of the debates over the possibility and nature of rational theory succession that dominated philosophy of science for the middle portion of the previous century. It is not Kant's purpose in the *Critique* to enter into that fray—in part because it hadn't yet occurred—except in the most general way. What the thesis of the First Analogy does is provide one very general constraint on this process: since no theory is acceptable that takes as its basic entities objects that can be created or destroyed, all such theories ought to be abandoned in favor of a successor theory that can account for these substances as the alterations of another substance that itself cannot ever be created or destroyed. This criterion is applied most straightforwardly to the replacement of our ordinary conceptual scheme according to which the world consists of many middle-sized dry goods by an atomic theory according to which these objects are in fact mere configurations of a much greater number of atoms whose individual and combinatory properties account for the properties that we had attributed to the objects of common sense. When we later discover that these atoms, too, can be created and destroyed, these in turn are reconceptualized as mere alterations of a still more fundamental substance, and so forth. Clearly not all theories will fail of this criterion, but likewise not all theories will pass its muster—the requirement, for example, that the appearance of ontological change be reconceptualized as mere alteration is not a trivial condition of a successor theory.

Farther along in the *Critique*, in the Appendix to the Dialectic 'On the Regulative Use of the Ideas of Pure Reason,' Kant describes in a more general way how he envisions this procedure as unfolding.

> Accordingly, this idea [that of the form of a whole of cognition] postulates complete unity of the understanding's cognition, through which this cognition comes to be not merely a contingent aggregate but a system interconnected in accordance with necessary laws. One cannot properly say that this idea is the concept of an object, but only that of the thoroughgoing unity of these concepts, insofar as the idea serves the understanding as a rule. Such concepts of reason are not created by nature, rather we question nature according to these ideas, and we take our cognition to be defective as long as it is not adequate to them.

Admittedly, it is hard to find pure earth, pure water, pure air, etc. Nevertheless, concepts of them are required (though as far as their complete purity is concerned, have their origin only in reason) in order appropriately to determine the share that each of these natural causes has in appearance; thus one reduces all materials to earths (mere weight, as it were), to salts and combustibles (as force), and finally to water and air as vehicles (machines, as it were, by means of which the aforementioned operate), in order to explain the chemical effects of materials in accordance with the idea of a mechanism. For even though it is not actually expressed this way, it is still very easy to discover the influence of reason on the classifications of students of nature. (*KRV* A645-646/B673-B674).

The unity of nature—including its unity through time as in the First Analogy, and its unity according to *causal laws* as in the Second Analogy—serves as a regulative ideal of all of our representative activity. It is that unity that we aim to picture by employing the object-concepts that we do. Thus, we "take our cognition to be defective" insofar as it does not allow for representing this unity, and we replace those cognitions, those object-concepts, that are found to be lacking in this way. To use the example that Kant does here, on our first encounter with the world, we find it to consist of ordinary objects, but such objects do not admit of the kind of systematization that is required by the unity of nature. For one, they appear to be created and destroyed. For another, they seem to be independent substances existing "simultaneously". So, we posit that these objects are, in fact, mere alterations of some more orderly and unified substance—in Kant's example, pure earth, pure water, pure air, etc.—and we represent these as being related to one another in ways that can explain the properties and behaviors of the ordinary objects of our predecessor conceptual scheme. What justifies this replacement of one set of object-concepts with another (and the corresponding set of inferential rules with another) is precisely the requirement that nature be conceived of as a unity. It is as part of this regulative ideal that 'substance' serves as the kind of meta-level conceptual norm that we have been outlining, and the result of deploying this norm is a reconceptualization of the ontological makeup of the world. First we think of it as being composed of ordinary objects, then when that conceptual scheme fails, we think of it is as being composed of pure earth, pure air, pure water, etc. And each set of successor concepts, as Kant understands them, gets closer to representing the real substance of nature.

Thus, what Kant offers in the First Analogy is a very general, transcendental form of scientific realism according to which one represents the real substance of the world by replacing

one picture of this substance—constituted by a certain set of concepts-qua-material-rules-of-inference connecting intuitions to one another via judgments—with another in any case in which the predecessor conceptual scheme takes as its objects anything that can be created or destroyed and the successor scheme can reconceptualize such ontological changes as mere alterations of a single sempiternal substance.

Now, once one concedes that that substance of the First Analogy is neither manifest nor transcendent, it follows fairly straightforwardly that the causal relations of the Second Analogy, and those objects that are defined relative to those causal relations, are the same.

> Now since all effect consists in that which happens, consequently in the changeable, which indicates succession in time, the ultimate subject of the changeable is therefore that which persists, as the substratum of everything that changes, i.e., the substance. (*KRV* A205/B250).

The ultimate subject of the changeable, and therefore of causal laws, is that which persists, i.e., substance, i.e. the *substratum*. So, just as we represent substance as such by adopting certain meta-inferential principles of concept change, the case will be exactly the same viz. representing the particular causal laws that govern the alterations of such substance. These laws themselves will be represented via concepts (qua-material-inferential-rules), and what the Second Analogy supplies is a regulative principle for adopting such concepts. Crudely put, the argument of the Second Analogy runs as follows.

1. Representing oneself the single subject of experience persisting through time requires representing events as occurring in a determinate temporal order.
2. Representing events as occurring in a determinate temporal order requires representing those events as bearing necessary relations to one another.
3. We represent events as bearing necessary relations to one another by *picturing* them: by relating representations of the events to one another via concepts-qua-material-inferential rules.
4. Thus, when such concepts license inferences that are proved by experience to be invalid, one must adopt a new conceptual scheme, etc.

What is pictured by our conceptual schemes are the necessary relations among the alterations in substance, and it should be clear that with the adoption of each successive conceptual scheme, we move farther and farther away from picturing manifest objects. Table legs can break off, and so there is no necessary connection between table legs and table tops.

Thus, we adopt a conceptual scheme that represent the parts of tables, e.g. atoms, and their necessary relations to one another, etc. i.e. that redescribe the very same set of experiences as being subject to different causal laws, and thus as being experiences *of* difference objects.

Again, what is important to notice about this procedure, and that of the First Analogy, is that neither concern manifest objects alone, but also that neither makes use of a theory of reference that calls for referring to transcendent objects while employing no descriptive resources. Rather, the objects of empirical science at which *Kant's* theory of representation aims, are pictured by uniting manifolds of sensation according to concepts-qua-inferential-rules—so they are *not* transcendent because they *are* described by the concepts that structure these pictures—but are also not identical to manifest objects, which are pictured by an entirely different—and *failed*—set of conceptual norms. To put in the terms of Hanna's central example, Hanna is right to defend Kant's claim that 'gold is a yellow metal' is analytic, but wrong to think that gold exists anywhere in the world.

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