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Armstrong, Cartwright, and Earman on *Laws and Symmetry*

BAS C. VAN FRAASSEN
Princeton University

PRECIS

All three commentaries have challenged me to confront new issues. I want to thank Professors Armstrong, Cartwright, and Earman especially for not limiting this discussion to the confines of the book, but pushing it into areas where I had feared to tread.[1] To some extent my commentators are also each others' target. What Earman thinks we can hope for by way of an account of laws and science is in clear contradiction, it seems to me, to Cartwright's *How the Laws of Physics Lie*. His preferred starting point, the Mill-Ramsey-Lewis account, is of just the sort subjected to scathing critique in Armstrong's *What is A Law of Nature?* Armstrong's and Cartwright's current focus on singular causal statements makes them allies today, in opposition to views Earman has forcefully expressed elsewhere. But for Armstrong, this yields a way to explain what laws are. Cartwright's diagnosis of how I misconceive laws ("it is not laws that [explain, necessitate]; it is causes") is an indictment of what I thought I had learned from Armstrong. I should not take too much comfort from this (is the opposition divided? or am I being attacked from all sides?) but perhaps it means that we are all each others' allies in some respects. I am very happy to find such allies.

Earman and Cartwright are strong critics of traditional concepts of law, and especially of what Earman calls the "vast introverted and reflexive" philosophical literature on law. On the other hand, both Armstrong and Cartwright make a strong case against the Humean supervenience view, the idea that everything supervenes on the vast mosaic of local matters of particular fact, in David Lewis' striking metaphor. In contrast, Earman seems to warmly embrace that view. Here I am at least closer to Earman's way of thinking, in that I think of possibility and necessity as deriving in some way from models and language. In the second part of my Reply, I will put forward a very tenta-

[1] The papers by Cartwright and Earman are revised, shortened versions of their commentaries at the APA, Pacific Division, March 1991. Armstrong's commentary is a sequel to our interchange in the *Australian Journal of Philosophy*, 1988.

tive idea about how this way of thinking might still respect the role of causal discourse.

REPLY

PART ONE. THE THREE COMMENTARIES

Armstrong's and Cartwright's challenge to take causation more seriously will lead me farthest afield; I shall therefore begin with Earman's commentary.

1. Earman in defense of laws

As I see it, the concept of law of nature is vestigial. It played an important role in scientific thinking in the 17th and 18th century (and cognates did before that). But that concept survives today only in usages that have lost their content, remaining as wheels that turn no other wheels. The term "law" turns up as an endorsing epithet in such passages as Stephen Hawking's reflection on the possibility of a 'theory of everything' which Earman quotes ("... the search for the ultimate laws of nature"). There are undoubtedly hierarchies on the side of theory (some principles are deeper, farther-reaching, and historically more stable than others in the evolving body of science), but the terminology of laws honors them with the name of a presumed hierarchy in nature.

I think that Earman really agrees with this. As he says, his main examples of laws—Einstein's field equations, Maxwell's equations—are not called laws in the scientific literature.

If someone asks "What are some examples of laws of nature?", the kindly physicist will first perhaps interpret it as terminological, and look for cases where the title "law" is used. In that case the answer will be "Ohm's Law, Newton's Laws of Motion," and not "Pauli's Exclusion Principle"—no one ever says "Pauli's Exclusion Law." S/he may secondly interpret it as asking for very basic principles in today's physics, principles that belong to the foundations which will remain stable for the foreseeable future. Then the answer is "Schroedinger's Equation, the Exclusion Principle" or whatever, but not "Ohm's Law."

So Earman is calling us to a more meaningful philosophical enterprise, some significant way to illuminate the mysteries of physical science:

> for me the question "What is a law of nature?" is first and foremost a question of how the concept of law structures actual scientific practice. (Earman this issue, p. 413)

This question has a presupposition: that there is a concept of law which does in fact structure actual scientific practice. As the question is posed, it envisages—or so it seems—a situation in which the philosopher knows what the (relevant) concept of law is, and then sets off to investigate how this concept plays a role in shaping scientific practice.

Personally, I believe that this presupposition is not true. But Earman is right to point out that it is not shown to be false by my main arguments. For I concentrated on showing that concepts of law which have been elaborated or rationally reconstructed by philosophers are deeply flawed and cannot be playing such a role in scientific practice. That does not rule out that there is another concept—not equatable even with any cluster concept within the scope of the philosophical literature—that does structure scientific practice. But should it be anything like the concept of a law of nature?

I am in strong agreement with Earman's motives. Yes, by all means, let us turn to inquiries into science that are more likely to be illuminating. To that enterprise I tried to contribute with the second half of the book. While symmetries and the conservation laws they engender do not serve to fill the traditional role of laws of nature, they are a far superior clue to the structure of scientific theories and scientific theorizing. They are only one such clue, not a philosopher's stone or alchemist's key, but they guide us to what I call "laws of the model" as opposed to "laws of nature," and *that* I believe to be the right guidance.

It seems to me therefore that Earman and I are at one in our enterprise, enamored of the same philosophical strategy, differing only on tactics. Earman gives reasons for thinking that symmetry by itself will not suffice for our quest. It will allow us to reach much (as he points out with telling examples both from cosmology and quantum mechanics), but not as much as we can hope for. And this I grant.

We differ however with respect to his proposed starting point, the notion of law defined within the Mill-Ramsey-Lewis tradition. The misgivings I have about this are not only ones internal to the philosophical discussion, and certainly not only the ones that I share with Armstrong. In *Laws and Symmetry* (Chapter 3, section 6) I tried to show how very much at odds it is with any tenable view of science. The Mill-Ramsey-Lewis laws purport to be what science aims at finding, but a closer look at science shows that they cannot be that at all. Indeed, to think of science as engaged in that search would not only make it unlikely to succeed, but leave us incapable of judging its success today.

It does not seem to me that we have reached the impasse which Earman sketches at the end. After describing the conditions under which the laws in the sense of David Lewis would *not* be what Earman himself takes science to be after, he writes:

> I take David Lewis to be saying that in our current state of knowledge we have reason to hope that such cases do not in fact arise in the actual world. And I take actual scientific practice to be a practical expression of this hope. I take van Fraassen to be saying that this hope is a vain one. How do we settle the issue? (Earman this issue, p. 418)

What I want to ask here is: "John, if you were to suppose for a moment that Lewis' hope is vain, then would you immediately conclude therefrom that the science we have and are developing is a failure?" Imagine that those unlikely conditions obtain, and science is definitely not on the road to delivering to us the laws of this world in the sense of Lewis. Under that supposition, wouldn't you still say that the science we have is a worthwhile and very successful enterprise, and not a failure? In the larger paragraph I just quoted from, two sets of circumstances are described—one entails that the body of laws of this world, in Lewis' sense, gives little or no information about it. The other entails that whether science can reach those laws is a question that will have different answers for different people. Do you care? Doesn't science in fact succeed in giving us something which is very informative about the world, and which has value independent of anyone's preferred standards of simplicity? As David Lewis himself might say: I think, and so do you...

2. Armstrong and Cartwright's "Whiteheadian" turn

Already by the time *Laws and Symmetry* came out, both Armstrong and Cartwright had begun to focus strongly on causation and causal laws as opposed to laws generally. In his commentary Armstrong shows how for him this is a natural elaboration of his earlier account, and argues that it allows him to escape the "identification or inference" dilemma.

The position that singular causation is a pervasive part of the empirical world, and that we directly perceive causings was ably, perhaps I should say paradigmatically, defended by Alfred North Whitehead in a lecture series at the University of Virginia in 1927, published as his *Symbolism: Its Meaning and Effect.* Its phenomenological analysis of experience is vivid and convincing. Its criticism of Hume is incisive and, to my mind, devastating.

It does describe the character and structure of my immediate experience to say that I see the cat lapping up the milk, and also *see that* the cat is lapping it up. That is phenomenologically very different from the type of experience in which I see the process merely as a sequence of stages continuous in time and space. Indeed, in this example we are probably incapable of the contrasting type of experience if we aren't high on something, or in a yoga or meditation-induced altered state of consciousness. As Sartre and Merleau-Ponty also showed vividly in their discussions of psychological experiments, description of experience in terms of spatio-temporally combined sense-data either misdescribes or over-abstracts from perceptual experience. Like Armstrong and Cartwright today, Whitehead added that perceptual experience not only has the phenomenological character in question, but *discloses* what is there:

> The bonds of causal efficacy arise from without us. They disclose the character of the world from which we issue, an inescapable condition round which we shape ourselves. (Whitehead, p. 58)

I do not accept that part of the view. Neither shall I take the contrary metaphysical view that we project this structure onto the perceived world. Before I say more about this very large issue, however, I want to address Armstrong's and Cartwright's more specific arguments.

3. Armstrong on the Identification-or-Inference dilemma

The four-dimensional scenery, says Armstrong, exhibits many regularities, including ones whose instances are causal sequences. To say that a sequence is a causal sequence does not mean that it exhibits a certain kind of structure or instantiates a certain type of regularity. It means rather that it is a sequence of a certain kind of events: causings, so to speak. Perception of causings is, Armstrong says, "as epistemically primitive as any other perception."

An example he gives is that a striking (by a rock, say) causes the glass to shatter. There are many sequences of this type, and we detect in them a pattern of regular succession. In each case we tend to explain what happens by saying that there is a causing (*this* glass shattered because of *that* striking). But what about the regularity exhibited by all these cases, "the same sort of causes bringing about the same sort of effect"? Armstrong continues:

> May we not seek to explain this? May we not hypothesize that this uniformity holds *because* something's being F *brings it about* that that same something becomes G? This latter is not a 'general fact' ... Rather it is supposed to be an 'atomic fact', albeit a higher-order fact, a relation between the universals F and G. (Armstrong this issue, p. 422)

To the first question we all reply: *yes*, indeed. To the second I would say: you may so hypothesize, and offer that as explanation, but it is not satisfactory as an explanation. Note what this explanation is:

1. Each instance of striking/being struck causes shattering
2. That (i.e., 1.) is because the universal *striking/being struck* 'brings it about' that what instantiates it shatters, i.e., 'brings along with it' the universal *shattering*

As Armstrong says, we have two relations here. The first is referred to by "causes" in 1, and holds between individual, concrete events. Let us call that relation C_1. The second relation, call it C_2, holds between universals. It is described in two different ways. The first I quoted from Armstrong's paper, the second ("F brings G along with it") from his earlier writings. At first sight, the two relations are very different: for example, it is not the universal *strik-*

ing/being struck, but the event which is the individual striking, that causes the shattering.

My challenge was: please identify that relation C_2; and then show why we should infer that individual F-ings are accompanied by individual G-ings from the fact that F bears C_2 to G. I contended that these requests cannot be jointly honored. But Armstrong continues the above passage with:

> It is at this point that, I claim, the identification problem has been solved. The required relation is the causal relation, the very same relation that is actually experienced in the experience of singular causal relations, now hypothesized to relate types, not tokens. (Armstrong this issue, p. 422)

I suppose it is no use to reply that C_2 cannot be C_1, because they relate different sorts of entities. After all, the words we use to express C_1—"causes," "brings about"—might always have referred to a single relation, C_1-or-C_2. And indeed, since different descriptions of relations need not have different denotata, Armstrong can maintain that $C_1 = (C_1\text{-or-}C_2) = C_2$.

So there is no logical obstacle to this.[2] But the concessions I just made do not suffice to support Armstrong's assertion that the identification and inference problems are thereby simultaneously solved.

Armstrong says there is now no inference problem: "For if a certain type of state of affairs has certain causal effects, how can it not be that the tokens of this type cause tokens of that type of effect?" He really loses me there. If a relation holds between two types, and is the sort of relation that can also hold between their tokens, it still does not follow that their tokens are indeed so related. Romeo and Juliet's fathers hated each other but their children did not.

Suppose F bears C_1 to G; how does it follow that instances of F bear C_1 to instances of G? I imagine that any answer will have to capitalize on what C_1 is, but I don't see what aspect of C_1 could be cited here. Universals bear many relations to each other which do not transfer to their instances—why does this one? My doubt here is not predicated on a disinclination to identify C_1 and C_2; *replace* "C_1" by "C_1-or-C_2," and the problem is just the same.

Secondly, is the identification problem really solved by Armstrong's "postulation that recommends itself because of its explanatory power"? Armstrong holds that I am acquainted with C_1 because it appears in my perception of individual causings. Granting that $C_1 = C_2$, it follows that I am acquainted with C_2 as well. The statement that C_2 is C_1 is certainly an identification, *yes*. But identification by postulate may not be satisfactory in other respects.

Here is an analogy. I have often heard views that appear to universalize responsibility. Chernobyl and Dachau are the shame of the whole human race,

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[2] However, philosophical English needs to be changed. For at present, the sentence "The universal *striking/being struck* causes (brings about) the universal *shattering*" appears to be wrong, but turns out to be right if the two described relations are the same. But our terminology can be regimented anew.

not just of the immediate perpetrators; We cannot look at the wretched of the earth without guilt, if we ourselves have what we need. To some extent these views are obviously true, but they can also be pressed to metaphysical extremes. Suppose, however, someone said the following. We are all familiar with the relation expressed by the assertion that each person is responsible for his own actions. Call this relation, which holds at least between a person and his own actions, R_1. It is analytic that if X bears R_1 to Y, and Y is bad, then X is guilty of something bad. Now there is also a relation R_2 between persons and others' actions. Of course there are many such relations, but I have in mind a very specific one. That X bears R_2 to Y explains why X is guilty if Y is bad, although Y was done by someone else. This is puzzling: what relation could that be? The sense of puzzlement disappears (?) if we hypothesize that $R_2 = R_1$.

The objection to this story is *not* that it entails the false conclusion that we are all guilty of every bad act ever done. The objection is rather that $R_2 = R_1$ *appears* to entail that, and is offered as entailing and thereby explaining that putative fact—but fails therein. For in fact, as soon is this identity is asserted, the concept of responsibility loses its moorings, and is set to float freely, ceasing to have the very conceptual stability that tempted us to try and appropriate it to a different role in the first place.

4. Cartwright's location of causings with photons

Most of the stuff of physics—photons, quarks, gravity-waves, even space-time itself—belongs to those parts of its models which do not correspond to anything observable. Some of those parts do not lend themselves to concrete visualization, and some not even to the idea that they represent putative concrete entities (whether visualizable or not): objects, events, processes. Here I am thinking not of elementary particles but of, for example, the space-time manifold and probability measures, both of which are easily found in models, but which I think definitely do not correspond to anything real. (I do not make such autobiographical assertions of disbelief about photons or quarks—that would be irrelevant to the philosophical discussion.) Most of all, of course, I do not think that any hierarchy we may spot in the models will reflect a hierarchical structure of facts, reflecting laws-of-nature versus mere regularity. (See *Laws and Symmetry*, Chapter 9, section 3 and *Quantum Mechanics*, Chapter 1, section 4.)

Nancy Cartwright's *How the Laws of Physics Lie* strongly reinforces my conviction on this point. But now she raises the question: why not allow causings in the models, why think worse of them than of photons?

To me the question is moot. The reason is that, as far as I can see, the models which scientists offer us contain no structure which we can describe as putatively representing causings, or as distinguishing between causings

and similar events which are not causings. Cartwright says that if models contain [parts representing] ordinary objects around us (such as cats, and cats lapping milk) then they contain [parts which represent] causes. The question will still be moot if the causes/non-causes distinction is not recoverable from the model. Some models of group theory contain parts representing shovings of kid brothers by big sisters, but group theory does not provide the wherewithal to distinguish those from shovings of big sisters by kid brothers. The distinction is made outside the theory. If Cartwright herself draws, extra-scientifically, a distinction between causes and non-causes, she can describe models furnished by science in terms of that distinction. But it may be a "hidden variable" description. She may be thinking of the structures scientists use to model data as themselves parts of larger, more articulated structures that carry the distinctions she makes.

Of course, this point is addressed in her later book and recent papers. I won't turn the tables on her by continuing this critical inquiry into the case she makes. Rather I should address the more serious point that the scientific image is a world picture of the sort she and Whitehead describe:

> When science constructs a picture of a bit of the world, the image is far richer... The scientific image of nature is no more devoid of cause and causings than is our everyday experience. The appearance to the contrary arises from looking only at science's abstract statements of law, and not how those are used to describe the world. (Cartwright this issue, p. 426)

Although I think that the main work is done by their assertions that certain models are adequate in certain ways, I do take the point that when scientists describe the world they do so in causal discourse. This is not surprising, since half of science is applied science. The language used even in the other half is adapted from the pre-existing forms of discourse that grew out of our practical dealings with the world. But I do not believe that we can do justice to that fact about scientific discourse by reifying its terms, or devising an ontology of causes, any more than of laws.

Cartwright agrees with my criticisms of what she calls Lewis and Armstrong type programs. But she thinks that I bought into their metaphysical starting point, and that the dilemma to which they fall prey will not affect someone with her different ontology:

> They, all three [Lewis, Armstrong, van Fraassen] start out from the late British empiricist tradition that thinks it has stripped nature of all causings. But Lewis and Armstrong, unlike van Fraassen ... try to do the job of causality with a surrogate they locate in some *non*natural place... They then fall prey to the tension [between] identification and inference.
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> By now it is clear what I want to say about all this. There is no nature stripped of its causings and there are no demodalized sensible properties ... and the this-worldly causality we have does not suffer from the dual problems of identification and inference. (Cartwright this issue, p. 429)

I am not so sure that the dilemma does not arise for her in some way, *mutatis mutandis*. But I am not at present in a position to outline the next project she challenges me to undertake, of showing "what is wrong with the natural locutions," i.e., her this-worldly causality.

Instead I will do something more constructive and more dangerous. Cut to the quick by her charge (similar to the charge in Kockelmans (1987)) that my empiricism is itself a variety of 18th century metaphysics, I will try to sketch possibilities for a stance on these issues which involves no metaphysics. While I have no settled position on any of the issues I will now discuss, I will try to point to alternatives to both Humean and Whiteheadian metaphysics.

PART TWO. NATURAL PHILOSOPHY WITHOUT METAPHYSICS[3]

There are many ways in which, in my opinion, excessive attention to language has misled philosophy of science in our century. There are points however where I consider recourse to philosophy of language to be imperative. We need to resist the temptation to reify concepts, fostered by uncritical regard for our language in use. The main examples concern properties and universals, modalities of all sorts including probability and necessity, propensities *and causation*. Turning our attention to language does not by itself keep us from entering upon the paths of pre-Kantian metaphysics. We must consistently do philosophy in a new way.

1. Epistemology and perception.

As support for the primacy of singular causation, Armstrong and Cartwright make the same epistemological point. Armstrong says that we "regularly perceive that one thing causes another," and that some such perceptions are "as epistemically primitive as any other perception." Cartwright endorses this with her analogous discussion of "You see me working," and says that "our everyday experience" is not "devoid of cause and causings." This was, as I noted, a main theme of Whitehead's *Symbolism*.

Two things I must grant at once. If the event of my cat (of beloved memory) lapping up its milk is a causing, then I have seen causings. Even on that supposition, of course, it does not follow that I saw that one thing caused another. In *The Scientific Image* I took "observable" to be a term that classifies (putative) concrete entities: objects, events, and processes can be observable, but not properties, propositions, or numbers. The cat I observe, also the lapping; both are observable.

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[3] I have addressed the possibility of empiricism without (pre-Kantian) metaphysics in a very different way in my "Against Naturalized Empiricism." At this moment, I cannot yet unify these two approaches, and I beg the reader to see what follows as a tentative, defeasible try at something more constructive and less defensive, which I hope to improve on in the future .

But do we observe that one thing caused another? If Cartwright teaches me her way of speaking, and I learn to speak it as well as a native, then I will also be able to respond spontaneously to my experience by saying "I just saw that ... caused ...." She will point out, I think, that I was already using causal discourse before I knew her. I did say things like "Aspirin relieves headaches" and "I saw him breaking the window with a stone." My opinion already came expressed irreducibly in causal discourse. This is the second point I grant; I will address it below. What I want to deny here is the metaphysical move which adds: so you observed *something more* than the concrete entities aspirin, stone, glass, breaking, and the person-breaking-glass event.[4] What more could there be to see?

I do not see properties. When I see that the cat is grey, the only object I see is the cat; I do not see greyness or cathood. As Quine pointed out in "On What There Is," the truth of "The cat is grey" does not entail the existence of any property at all. Similarly, the truth of "I see that the cat is grey" does not entail the seeing of any property. It follows of course that "seeing that such and such" is not reducible to "seeing thing 1, event 2, process 3, ..." Rather than continue the epistemological discussion here, let us look more closely at the special case of causal discourse.[5]

2. *A telling analogy for causal discourse*

Cartwright quite rightly points out that causal discourse is irreducible. That is also true of psychological discourse, what is sometimes so quaintly called "folk psychology": discourse that mobilizes the concepts of person, intention, goal, purpose, value, emotion, thinking, perceiving, meaning, saying, acting, loving, community, and so forth. This is irreducible not only to physicalist discourse, but also to the hygienic discourse of the Humean belief and desire psychology, which we find unblushingly used in so much philosophy of mind today.

This irreducibility does not preclude eliminative materialism. Paul Churchland, for example, is famous for the conviction that this ordinary psychological discourse is deeply infected with bad and outdated theory. This conviction can also be expressed in the material mode: beliefs, desires, intentions, and emotions do not exist, any more than phlogiston.

Let us imagine an opponent of eliminative materialism who argues as Cartwright does about causes. She will first of all point out that our perception of persons does not have a lesser epistemological status than seeing

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4 I cannot join Cartwright in dividing occurrences into modalized and demodalized—that makes sense in her ontology and in Humean ontologies, and so on, but not for me. For me occurrences are not modal or non-modal, but only *described* by modal and non-modal language.

5 See further my elaboration of the concept of observability in "From vicious circle to infinite regress, and back again."

rocks or trees. Moreover, the shape our experience takes is intimately tied to psychological categories: we see that someone is angry, we see people work, wash dishes, make coffee to quench their thirst. To say that we see them pursuing and realizing goals is only a slightly more abstract way of putting that.

This imaginary opponent of eliminative materialism might then say that there is no good or intelligible analogue to Hume worlds. A world which is just like ours except that intentions do not exist in it, would not be just like ours. For example, John Earman would not exist in that world, because he is a person, and nothing can be a person unless it has intentions. None of the persons we know would exist in such a world. Obviously the eliminative materialist would respond that John Earman would exist there, but that to call him a person is to apply a defective concept. Our current way of describing him is irreducible to non-psychological discourse, but that does not affect him or his existence.

I do not agree with eliminative materialism. Churchland argued in *Scientific Realism and the Plasticity of Mind* that the whole of our language used for all purposes of expression and communication, can in principle and without loss be replaced by a language devoid of folk-psychological modes of discourse. One can imagine a similarly radical view about causal discourse. In fact I do not propose that view either with respect to causal or psychological discourse. In my opinion, the loss would be severe in both cases. But the status I assign to both (and note: they overlap considerably) makes them important for everyday life and applied science, but not for theoretical science.[6]

It may be a good idea therefore to reflect for a moment on how it is possible to resist an eliminative materialist. It is no use saying to him that our world is so rich that he cannot describe it adequately. For he will only counter that our modes of thinking, speaking, and describing are too rich for him, while the world we live in is the same. What he loses he counts well-lost. We had better admit that within the goals he can set or even express for himself, his language is adequate. But that is where we locate his loss. We can resist him if we can grant his adequacy unto himself, and to the many interactions with us which he can conceive, without feeling that we thereby indict or undermine our own position. We are in no way diminished by our inability to convict him of loss in his own terms, or by the respect we show for his position as adequate by his own lights. Cartwright may similarly say that at best, she will find my position coherent but impoverished in comparison

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6 This does not imply that pure science is in principle incomplete, in the sense that there are, so to speak, facts which cannot be scientifically described. For example, Rorty's and Churchland's eliminative materialism derive from the position of Sellars, who took it that the language of physics is in principle sufficient for all factual description, but needs to be supplemented with resources for the expression of intentions. See further my "From vicious circle ..." and *Quantum Mechanics*, pp. 465–66.

to her own. Yet I feel that in philosophy of physics, our concerns are shared to such an extent that she will feel the need to establish more than that.[7]

3. Causal discourse: a cue from Collingwood

The example of psychological discourse gave us a useful analogy. Now I want to go further: I submit that all the need we feel for causal discourse comes from the way we think of ourselves as persons, agents with goals and intentions, engaged in effective action. This covers the entire subject of applied science and therefore also such topics as prediction and explanation (which I classify as applications of science), as well as control and manipulation. Each of those so-called causal terms is, in its primary use, a psychological as well as a causal word. (The eliminative materialist eliminates also the concept of applied science and all its cognates.)

While I could cite Whitehead's *Symbolism* as the paradigmatic case made for the world-picture in which causation is fundamental, so I can point to Collingwood's *Essay on Metaphysics* for my own. (I do not mean that I accept Collingwood's position, any more than I meant to classify Armstrong and Cartwright as disciples of Whitehead.) The Whiteheadian sort of world picture typically comes with a certain hierarchy. I relieve my headache by taking aspirin: that is an event 'on the surface.' This is a causing: my action caused relief. But that was so because aspirin relieves headaches (one level down). That kind of causing in turn derives from a 'lower' one: presence of asalicyclic acid in the bloodstream causes the vessels to dilate. That in turn derives from causings which are chemical interactions, and those from something more fundamental yet: causal connections between events involving individual molecules, atoms, electrons and protons, quarks. The surface and in general higher level events are causings derivatively, *because* of the causings going on at the most fundamental level. The most important concept of causation is that of causal connection between fundamental physical events.

Collingwood proposed to turn the hierarchy upside down. He was convinced by Russell's writings that causation is found nowhere in the most fundamental description of nature by modern physics. When physicists start describing the world of physics to laymen, they will use language which is a metaphorical and analogical extension of the discourse of applied science and everyday life, i. e., human agency. The most basic causal discourse is that of folk psychology, in which "I relieved my headache by taking aspirin" signals that I engaged in intentional action, had goals, made choices, found my expectations fulfilled. This description of what happened is not reducible, as far

[7] In philosophy of mind I do not have the same sense of shared concerns with eliminative materialists. That is all the more worrying because it concerns matters much closer to our hearts than theoretical physics.

as meaning goes, to the language of physics—nor to any language devoid of concepts cognate to personhood.

Except for derivative uses and analogical extensions, causal discourse is part of psychological (intentional) discourse. That aspirin relieves headaches is not a fact of physics. We assert it because we relieve headaches by means of aspirin. That asalicyclic acid dilates—causes to dilate—the blood vessels, is not a fact of physics. We assert that because we can bring about the dilation by doing something which places that substance in the blood stream. On the earlier hierarchy of course, this "bring about" is a relation which in the first instance relates purely physical happenings. On Collingwood's view, it carries its basic meaning only when the subject term denotes a person. That the rock's striking the glass brought about the shattering is a metaphor [metaphorically imputing agency to the rock] or an analogy [to a person shattering the glass by doing something to it] or derivative from the more basic assertion that we shatter glass in various ways [of which throwing rocks at it is one].

If Collingwood is right then a lot of literature on action theory looks very perverse. Apparently the authors thought they could dissect what a person does into elements describable in psychological language (he intended, ...) and elements describable in non-psychological, even physicalist, terms (he brought it about that ...). But the dissection was illusory, for the latter terms do not belong to a purely physicalist language either.

If Collingwood is right, then it is also easy to understand why such analyses of causation as Reichenbach, Suppes, and Salmon have offered just don't succeed. Nancy Cartwright is one of the authors who has exhibited their failures most strikingly. Perhaps they did come up with good notions of causal models, or of the nearest there is to causation in the models of physics—but that is doomed to fall short of the real subject of causation.

I realize that this idea of Collingwood's is not much more than an idea. I do not have the wherewithal to carry it beyond that stage. I am not in a position to write the book Nancy Cartwright asked for. But the above sketches how I would like to write that book if I could.

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