

PART II

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**STANDARD  
APPROACHES TO  
CAUSATION**

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## CHAPTER 7

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# REGULARITY THEORIES

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### 1. INTRODUCTION

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David Hume has made available a view of causation as it is in the world that can be called the *Regularity View of Causation* (RVC). His famous first definition runs thus: ‘We may define a CAUSE to be ‘An object precedent and contiguous to another, and where all the objects resembling the former are plac’d in like relations of precedency and contiguity to those objects, that resemble the latter’ ([1739] 1978: 170).

More generally, we can present the kernel of RVC thus:

RVC

$c$  causes  $e$  iff

- i.  $c$  is spatiotemporally contiguous to  $e$ ;
- ii.  $e$  succeeds  $c$  in time; and
- iii. all events of type  $C$  (i.e. events that are like  $c$ ) are regularly followed by (or are constantly conjoined with) events of type  $E$  (i.e. events like  $e$ ).

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On RVC, the constitutive elements of causation are spatiotemporal contiguity, succession, and regularity (constant conjunction). Causation, that is, is built up from non-causal facts, more specifically two particular facts and one general. A corollary of RVC is that there is no extra element in causation which is of a fully distinct kind, like a necessary connection or a productive relation or what have you—something, moreover, that would explain or ground or underpin the regular association.

RVC has been espoused by many eminent philosophers and has been taken to be the official *Humean* view. I believe the Humean view was *Hume's* view too, give or take a bit; for more on the reasons why, see Psillos (2002: ch. 1). However, there is strong opposition that has painted a picture of a new Hume: Hume was a causal realist, albeit a sceptical one. This interpretative line was inaugurated in the early 1970s—see John P. Wright (1973). (For an excellent recent discussion of Hume's theory of causation, advancing a projectivist interpretation of his views, see Beebe (2006a). See also Chapter 4 of this volume.) In any case, as shall argue in sect. 3.1, the first serious advocate of Humeanism was the Scottish philosopher Thomas Brown.

In this chapter I will articulate RVC with an eye to two things: first, its conceptual development; second, its basic commitments and implications for what causation is. I have chosen to present RVC in a way that respects its historical origins and unravels the steps of its articulation in the face of objections and criticism. It is important for the explication and defence of RVC to see it as a view of causation that emerged in a certain intellectual milieu. RVC has been developed as an attempt to remove efficiency from causation and hence, to view causation not as a productive relation but as a relation of dependence among discrete events. In particular, the thought that causation is regularity is meant to oppose metaphysical views of causation that posit powers or other kinds of entity that are supposed to enforce the regularities that there are in the world or to explain the alleged necessity that there is in causation.

Challenging the plausibility (and viability) of these metaphysically thicker accounts of causation has always been (and still is) part of the conceptual arsenal of RVC. By the same token, RVC is *not* fundamentally opposed to other theories that view causation as a relation of dependence and can certainly draw on their resources to develop a fully adequate account of causation. (For the distinction between causation as a relation of dependence and causation as a productive relation, see Psillos 2004 and 2007.) This means that the counterfactual theory of causation, or the probabilistic theory, are not, from the metaphysical point of view, rivals of RVC, though there are significant differences between them and they may well compete for which is the best account of causation among those that do not take it to be a productive relation.

RVC might well need supplementation to be an adequate theory of causation. But it is a central claim of the defenders of RVC that this won't remove the basic

metaphysical credo of RVC, namely, that there is no necessity in nature and that, ultimately, causation depends, in some sense or other, on regularities. RVC should not be seen as a theory of the meaning of causal statements. Rather, it should be seen as a theory of what causation is in the world (better: a theory about the worldly component of causation)—but a theory whose metaphysical contours are constrained by epistemology. RVC has always been motivated by the claim that the theory of causation should facilitate causal inference. It has also been motivated by the claim that causation has to be the basis for ‘recipes and precautions’, as Mackie (1974: 141) has put it.

## 2. REGULARITY AND REALISM

Is RVC a realist theory of causation? If realism implies commitment to (a) the reality and (b) mind-independence of the entities one is a realist about, RVC is not inconsistent with realism. Almost all of the defenders of RVC have taken it to be the case that the regularities that are constitutive of causation—the cement of the universe—are real *and* mind-independent: they would exist as (perhaps very complicated) patterns among events even if there were no minds around. One may wonder: in what sense is a regularity real if only some part of it has been, as it were, actualized?

That’s a fair worry. A regularity is *not* a summary of what has happened in the past. It is a universality—it extends to the present *and* the future; it covers everything under its fold. So one may naturally ask: what grounds the regularity? What is the truth-maker of the claim that *All As are B*? This is a tough issue and it invites me to swim in waters deeper than I can handle. But it seems that a regularity is best conceived as a perduring entity, since it cannot be said to be wholly present in different regions at different times. That is, a regularity has temporal (and spatial) parts. This view, conjoined with eternalism (the view that past and future objects and times are no less real than the present ones) makes it possible to think of the regularity in a sort of timeless way, *sub specie aeterni*. More specifically, one might think of a regularity as the mereological sum of its instances (that is, its parts), where instances at other times and at other places are temporal and spatial parts of the regularity. Here again, the mereological sum is characterized by the unity of a pattern. The point of all this is that we should distinguish the epistemic question of how we come to know the presence of a regularity, given that our evidence for it has always to do with past and present instances of it, from the metaphysical question of what kind of entity a regularity is.

## 2.1 Causal Realism

Galen Strawson (1989: 84), defines ‘Causation’ (with capital ‘C’) in such a way that to believe in Causation is to believe: ‘(A) that there is something about the fundamental nature of the world in virtue of which the world is regular in its behaviour; and (B) that that something is what causation is, or rather it is at least an essential part of what causation is’ (1989: 84–5). We might think of it as a thick view of causation: there is something—call it *X*—which grounds/explains the regularity; hence causation is: regularity + *X*. If this is what causation is, RVC would fail not because it fails the dual realist commitment noted above (reality and mind-independence), since it does not, but because it leaves out some allegedly essential element of causation. But then, the disagreement between Causation and RVC is not about realism but about what the correct view of causation is.

Is this thick view of causation the right one? Couldn’t we get by with a thin view of causation, which dispenses with the extra *X*? Strawson (1987) argues that it is rationally compelling to posit the existence of something other than the regularity to explain the regularity. The basis of this compulsion is what might be called the *ultimate argument against RVC*—what we may also call ‘the terminus of explanation’ argument: RVC leaves unexplained something that requires explanation, namely, the existence of regularity in nature. Strawson claims that either there is an explanation of regularity or the presence of regularity becomes a matter of chance—a coincidence. It is then alleged that there is need for a deeper explanation of regularity. This is a popular view, though there is disagreement as to what this deeper explanation should consist in. Some appeal to powers (e.g. Mumford 1998, 2004; Ellis 2001; Molnar 2003), others (including Strawson 1989) posit a force-based productive relation; others appeal to thick laws of nature: that is, laws that are not, ultimately, regularities. (See e.g. Dretske 1977; Tooley 1977; and Armstrong 1983. For a development of the standard criticism of this view, see Psillos 2002: ch. 6. See also Psillos 2006a, 2006b.)

It’s hard to see why a deeper terminus of explanation would be more natural or more preferable. After all, there must be some terminus of explanation—hence, there must be unexplained explainers. Positing an extra layer of ontically distinct facts behind (or below) the regularities will itself be an unexplained explainer. The question ‘what explains the regularity’ is just pushed back: ‘what explains the productive relation (or whatever)?’ There is not much gain here, because we should either take the presence of this extra layer of regularity-enforcing facts as self-explanatory or we should just push back the terminus of explanation. As Wittgenstein aptly put it: ‘a nothing could serve just as well as a something about which nothing could be said’ (1953: §304). And that’s exactly what the advocates of RVC should point out: one supposed mystery (the presence of regularity) is not explained by positing another mystery (a supposed productive relation or the like). (See Beebe 2006b.) What is more, the positing of an extra *X* like Strawson’s productive forces (or some kind of

conomic necessitation) does not *eo ipso* yield regularities: there could be powers or forces or whatever without there being any regularity in the world.

The presence of regularities in nature, an advocate of RVC would say, can be explained by appeal to other, more fundamental (and in this sense *deeper*) regularities. So their presence is not a matter of chance. But some regularities, the ultimate and fundamental ones, must be taken as brute: their presence admits of no further explanation. This does not imply that they are a matter of chance. Indeed, admitting that they are a matter of chance would amount to offering a further explanation—a chancy one—of their presence. The friends of RVC firmly deny the alleged need to appeal to a different ontological category (something which is *not* a regularity but has metaphysical bite) to explain the presence of regularities.

It is worth stressing that for an advocate of RVC the key issue is not so much to add something to regularity in order to get causation, but to avoid (and block) the addition of specific ontic features such that they would compromise the fundamental commitment to regularities and their metaphysically irreducible nature. Advocates of RVC would not object (and have not objected) to calls for making the regularity view more robust. But they have persistently argued against the addition of *powers* and other metaphysically heavyweight means to enforce the existence and operation of regularities. An advocate of RVC would view the world as consisting of regularities *all the way down*—this would be its metaphysical blueprint; and yet she would also accept that these regularities are *real and mind-independent*.

Michael J. Costa (1989: 173) has introduced a useful distinction between *causal objectivism* and *power realism*. The former is the view that ‘causes are objective in the sense that causal relations will continue to hold among events in the world even if there were no minds to perceive them’ The latter is the view that ‘objects stand in causal relations because of the respective causal powers in the objects’. RVC clearly denies power-realism. What then of causal objectivism?

Here we need to exercise caution. The regularities that exist in the world are (or can be conceived of as being) mind-independent in the sense that their existence is independent of the presence of minds: there would be regularities (for example, planets would move in ellipses) even if there were no minds. Yet, *what causes what* is not a *fully* objective matter, namely, it is not a matter that is fixed by the world and it alone. Why this is so will become clear in sects. 5 and 6, but the gist is this: on RVC, causation is constitutively dependent on likeness in that it requires that events *like c* (the cause) are followed by events *like e* (the effect). Likeness, though based on objective similarities and differences among events in the world and patterns of dependence among them, is also a matter of respects and degrees of similarity, which are, at least partly, of our own devising. Placing events in similarity classes is the joint product of the world and humans—though it seems that as we go down to the level of fundamental physics, the similarity classes (what we may call *natural* classes) are the product of the world alone.

### 3. REGULARITY VS. POWER: BROWN VS. REID

The revolt against powers and the concomitant defence of a regularity view found its clearest expression in the writing of the Scottish philosopher Thomas Brown (1778–1820). Brown's main contribution to the philosophy of causation was his book *Inquiry into the Relation of Cause and Effect* (1822).

The intellectual milieu within which Brown operated was dominated by Thomas Reid's power-based account of causation (Reid 1788: Essay 1). Reid spoke freely of active powers and took it that (a) the very concept of power is simple and undefinable; (b) power is *not* something we either perceive via the senses or are aware of in our consciousness (we are conscious only of the *operation* of power and not of the power itself); (c) power is something whose existence we infer by means of reason based on its operation/manifestation; (d) power is distinct from its manifestation/exertion in that there may be unexerted powers; (e) the idea we have of power is relative, namely, as the conception of something that produces or brings about certain effects; (f) power always requires a subject to which it belongs: it is always the power *of* something, the power that something *has*; and (g) causation is the production of change by the exercise of power. Though we are not conscious of powers, Reid insisted that we are conscious of their exertion when our own mental active powers are exercised, as when we decide to raise our hands. Hence, we can conceive of how a cause can exercise its powers because (and only because) we are conscious of how our own active powers are exercised.

Reid was a vocal critic of the view that causation amounts to regular succession. The claim that was to become famous was that Hume's doctrine implies the absurdity that the day is the cause of night and the night is the cause of day because they have constantly followed each other since the dawn of the earth. As Reid characteristically put it: 'Furthermore, when x occurs before y, and x-type events are constantly conjoined with y-type ones, it isn't always the case that x causes y; if it were, Monday night would be the cause of Tuesday morning, which would be the cause of Tuesday night (ibid. Essay 4 ch. 3).

Here is how Brown (1822: p. viii) sums up his own view:

It is most satisfactory, therefore, to know, that the invariableness of antecedence and consequence, which is represented as only a sign of causation, is itself the only essential circumstance of causation; that in the sequence of events, we are not merely ignorant of any thing intermediate, but have in truth no reason to suppose it as really existing, or if any thing intermediate exist, no reason to consider it but as itself another physical antecedent of the consequent which we knew before.

Brown's motivation for the regularity view was based on the folk epistemic intuition (he would call it a *fact*) that invariable sequence is a sign of causation and in particular on the claim that we would not *call* a sequence of events causal



unless it was invariable. This claim, however, is consistent with the further thought that causation has some other essential characteristic in virtue of which it is exemplified in regular sequences of events. Brown's strategy was precisely to demonstrate that regularity is all there is to causation; it 'is itself the only essential circumstance of causation' (ibid.).

This strategy was two-pronged. On the one hand, he developed a series of arguments against powers—advancing what might be called the identity-theory of powers: powers are nothing but the regularity, the uniformity of sequence. On the other hand, he articulated a number of arguments aiming to show 'the sources of various illusions' that have led philosophers to posit powers and to consider causation something more 'mysterious' than regularity. These, according to Brown, include the use of a number of metaphorical phrases used when we think of causation, such as 'connection' and 'bond'. (For more on this, see Brown 1822: Second Part.)

What Brown firmly denied was the idea that between the cause and the effect there is something else (an 'intermediate tie' or an 'invisible bondage') that connects them or binds them together; in particular something of a radically distinct metaphysical nature. Powers, according to Brown, were supposed to be inherent in objects and yet distinct from them; they were supposed to account for the efficiency of causation. According to his identity-theory, 'power is [the] uniform relation [between cause and effect] and nothing more' (ibid. 26). Hence to ascribe a power to an object is to assert that in similar circumstances it will do similar things. This theory is based on a number of arguments, mostly aiming to show that there is no need to posit powers over and above the regularities.

First, powers are mere abstractions (cf. ibid. 19–21). A causal sequence is a concrete sequence between events. It is *causal* in virtue of the fact that it is invariable (it exhibits regularity of order), namely, its antecedent (the cause) has been followed, is followed, and will be followed by its consequent (the effect). When we consider this relation (*this* is always followed by *that*) abstractly, we render the '—is always followed by—' as '—has the power to—'. This move is supposed to unravel the form of causation, namely, what several concrete causal sequences have in common and in virtue of which they are causal. This move, for Brown, is akin to the hypostatization of substantial forms and suffers from exactly the same problem: it converts an abstraction to reality, thereby creating the further problem to explain what this kind of new entity is and does (See also Brown 1851: 35).

Second, powers are the products of double vision (Brown 1822: 28–9). There are substances and they stand in causal relations to each other (that is, in relations of invariable succession). If we knew all these invariable sequences, we would know everything there is to know about what causes what. If we added that these substances have the *power* to produce certain changes, we would not gain any further information about the world. If we thought of power as distinct from these invariable sequences, it would be possible that we could have information about invariable sequences without knowing a single power.

Third, powers are not needed for the explanation of action (ibid. 5–7). Action amounts to making a difference. An object does not act on anything if its presence or absence makes no difference to anything. But this difference-making can be understood as invariable sequence. Objects that act and are acted upon (that is, causes and effects) are ‘truly, in certain circumstances, the reciprocal and immediate antecedents and consequents, in a series of changes’ (ibid. 56–7).

*Fourth*, powers do not explain the regularities. The existence of regularities in nature is not rendered ‘less wonderful’ by an appeal to powers (cf. Brown 1851: 36).

Brown made an extra effort to neutralize Reid’s objection to RVC. He argued that Reid’s example of night causing day either does not describe a case of regular and invariable succession or, if it does, it can be fully captured by the regularity view of causation (Brown 1822: 170–1). All depends on how exactly the event-types that are supposed to constitute the regular succession are identified. Given a ‘vulgar’ (that is, coarse-grained) description of the event-types that are supposed to be in a relation of invariable succession, there is no invariable succession and hence no causation. The night, understood as various degrees of *darkness*, is not invariably followed by day, understood as various degrees of *light*: ‘they . . . rather appear to follow each other loosely and variously, like those irregular successions of events, which we denominate Accidental’ (ibid. 171). Given, on the other hand, a fine-grained description of the event-types, there is regularity and hence causation. Strictly speaking, night and day are not events—they are not even single phenomena, but series of phenomena grouped together by reference to some similarity and difference: degrees of darkness and degrees of light. If we focus on ‘the successive *pairs* of that multitude of events, which we denominate night and day’ (ibid. 170), and if, further, we take these events to be the positions of the earth in relation to the sun during its rotation around its axis, the motion of the earth immediately before the sunrise does cause the subsequent position of the earth in which the sunlight directly reaches the ground. In this way, the succession of night and day is explained by being reduced to a more complex regularity (picked by a more appropriate description of the causal *relata*). Brown was fully aware of the fact that an advocate of RVC can claim that an invariable succession between *A* and *B* need not imply that *A* causes *B* or that *B* causes *A*, since *A* and *B* might be the effects of a common cause *C*.

Brown turns on its head the problem raised by Reid. Precisely because regularity constitutes causation, where there is no causation there must be an explanation in terms of the *absence* of regularity; and where there is causation, some regularity must be present, though the grounding regularity need not be described in the vocabulary in which the causal claim is described. Hence, Brown identified the claim that the advocates of a Regularity View of Causation should make: the regularities that constitute causation need not be read off directly from the description of events that constitute the *relata* of a certain invariable sequence; but in so far as there is causation, there is a suitably described underlying regularity.

As he nicely put it: ‘The generalisations of language are already made for us before we have ourselves begun to generalise.’ And this may well lead us ‘to suppose a physical relation in many cases where there is none, and to neglect it as often where it truly is’ (ibid. note M).

#### 4. CAUSES ARE CONDITIONS: MILL

The programmatic view of RVC, namely, that there is no need or room for a deeper metaphysical story to be told about causation, has been shared by many empiricists. John Stuart Mill put forward the view that there is no difference between cause and antecedent condition in that causes *are* antecedent conditions for effects, and in particular that causes are *sufficient* conditions for their effect. Given that there is, normally, a cluster of factors that constitutes a sufficient condition for an effect, there is no real distinction between the cause and the (standing) conditions among the factors that constitute the invariable antecedent of the effect. Accordingly, causal relations relate several factors *C, F, G*, etc. with an effect *E* such that the conjunction of all these (call it *CFG*) is sufficient for *E*. Following Mill, let’s call these factors ‘positive conditions’. Strictly speaking, Mill adds, negative conditions, namely, the *absence* of several factors, are also required for the effect *E* invariably to follow. Hence Mill (1911: 217) argues: ‘The cause then, philosophically speaking, is the sum total of the conditions positive and negative taken together; the whole of the contingencies of every description, which being realised, the consequent invariably follows.’ The real cause is ‘the whole of these antecedents’ (ibid. 214), namely, the full sufficient condition. It might be objected that the Millian account fails because it allows the inclusion of irrelevant factors in the antecedent condition that was sufficient for an effect *E*. If *CFG* is sufficient for *E*, then so is *ACFG*, where *A* might be totally irrelevant to *E*. But Mill is on safe ground here. There can be many factors coexisting with the causal antecedent of an effect, but they are not part of this causal antecedent because they are not invariably connected with the effect. In effect, the cause should be the minimally sufficient antecedent condition. Another objection can be that Mill’s denial of the difference between causes and conditions might lead him to accept *trivially* relevant causal factors. Suppose that a person died *after* drinking arsenic. Why shouldn’t we include in the conditions of her death the fact that she was human and not, say, a robot, or the fact that she was a woman and not a man, or indeed the fact that she was alive before her death? Here too, a Millian can accept Mackie’s (1974: 63) notion, implicit already in Mill (1911: 214–15) of a ‘causal field’. This is the *context* in which the conditions of an effect occur. The causal

field should be taken to be the *background* ‘against which the causing goes on’ (Mackie 1974: 63). This background would be there even if the specific conditions that are sufficient for the occurrence of the effect were absent.

Like Brown before him, Mill tried to meet Reid’s counterexample head-on. But unlike Brown, he thought that some new condition is called for if RVC is to meet this counterexample. According to Mill, regular association (or invariable succession) is not sufficient for causation. What must be added to invariable succession to get causation is ‘unconditionality’. Mill does not explain this notion in great detail, but what he has in mind is that for *B* to be the effect of *A* it is not enough for *B* to follow *A* invariably, as a matter of fact; it is also necessary that *B* follows *A* under *any* circumstances. Hence, the dependence of *B* on *A* should be such that it is not conditional on the presence of other factors—say *C*—which are such that they are sufficient for *B*: given *C*, *B* follows irrespective of whether or not *A* is present. Mill’s (1911: 222) reply to Reid was that day does not follow night unconditionally. As he characteristically put it:

There are sequences, as uniform in past experience as any others whatever, which yet we do not regard as cases of causation, but as conjunctions in some sense accidental. Such, to an accurate thinker, is that of day and night. The one might have existed for any length of time, and the other not have followed the sooner for its existence; it follows only if certain other antecedents exist; and where those antecedents existed, it would follow in any case.

A clear case in which there is no unconditionality is when two events are joint effects of a common cause (ibid. 252–3). Though there is invariable succession, event  $E_1$  (or  $E_2$ , for that matter) would follow given the presence of the cause *C* irrespective of the occurrence of the other effect. A clear case in which unconditionality is ensured is when the cause is also necessary for the effect. Unconditionality is, for Mill, the valid residue of the traditional claim that there is necessity in nature. According, then, to his version of RVC (ibid. 222), ‘We may define, therefore, the cause of the phenomenon to be the antecedent, or the concurrence of antecedents, on which it is invariably and *unconditionally* consequent.’

Mill takes it that a sequence of events is unconditional if it falls under a law of nature. Laws of nature capture the valid residue of the traditional conception of necessity: ‘That which is necessary, that which *must* be, means that which will be, whatever supposition we may make in regard to all other things’ (ibid. 222).

It can then be said that for Mill, the correct statement of RVC is something like this:

M-RVC

*c* causes *e* iff

- i. *c* is spatiotemporally contiguous to *e*;
- ii. *e* succeeds *c* in time; and
- iii. *it is law of nature* that all events of type *C* (i.e. events that are like *c*) are regularly followed by events of type *E* (i.e. events like *e*).

## 5. REGULARITIES AND LAWS OF NATURE

The view that laws of nature are regularities can be called the *Regularity View of Laws* (RVL). This is meant to be a metaphysical thesis about lawhood: the worldly stuff that laws consist of is regularities. RVL denies that laws, as they are in the world, are anything over and above stable patterns of events. Programmatically, RVC ties causation to the presence of regularities: to call a sequence of events *c* and *e* causal is to say that this sequence is a part of (instantiates) a regularity, namely an invariable (and unconditional, according to Mill) succession between event-types *C* and *E*. But not all regularities are fit to capture causal connections. Let us follow Mill (and customary usage) and call *accidental* (or accidents) those regularities that are not laws of nature. Then, the proper statement of RVC should be taken to be:

causation is lawlike regularity.

RVL asserts that:

laws of nature are regularities.

If laws are *merely* regularities, there is no distinction between law and regularity; then, *all* regularities are lawlike; hence causation is *merely* regularity. But this is exactly what Mill's version of RVC (M-RVC) has aimed to avoid. Hence, laws of nature should be regularities plus something else, something sufficient to distinguish an accidental regularity from a lawlike one. RVL\* is the thesis that

laws of nature are regularities + *Y*.

RVL\* shares with RVL the basic metaphysical commitment to regularity. But one should be careful here. Staying within the bounds of a Humean view of causation depends on what the differentia *Y* is. More specifically, it should not be anything such that it introduces (or implies) any metaphysically distinct, and deeper, kind of entity, anything like powers or potencies and the like that are meant to ground or explain the regularity. Nor should it imply commitment to any kind of natural necessity (or relation of necessitation) that is repugnant to Humeans. Let's call this extra *Y* the property of lawlikeness. What can it be?

There have been a number of candidates. (For more detailed discussion see Psillos 2002: ch. 5.) But the most promising attempt is the *web of laws* view. According to this view, the regularities that constitute the laws of nature are those that are expressed by the axioms and theorems of an ideal deductive system of our knowledge of the world, and in particular, of a deductive system that strikes the *best* balance between simplicity and strength. (If there is no unique best deductive system, the laws are expressed by the axioms or theorems that are common to all deductive systems that tie in terms of simplicity and strength.)

Simplicity is required because it disallows extraneous elements from the system of laws. Strength is required because the deductive system should be as informative as possible about the laws that hold in the world. Whatever regularity is not part of this *best system* it is accidental: it fails to be a genuine law of nature. The gist of this approach, which was advocated by Mill, and in the twentieth century by Ramsey (1928) and Lewis (1973*a*), is that no regularity, taken in isolation, can be deemed a law of nature. The regularities that constitute laws of nature are determined in a kind of holistic fashion by being parts of a structure.

The Mill–Ramsey–Lewis view has many attractions. It solves the problem of how to distinguish between laws and accidents. It shows, in a non-circular way, how laws can support counterfactuals since it identifies laws *independently* of their ability to support counterfactuals. It makes clear the difference between regarding a statement as lawlike and its being lawlike. It respects the major empiricist thesis that laws of nature are contingent: a regularity might be a law in the actual world without being a law in other possible worlds, since in these possible worlds it might not be part of the best system for these worlds. It solves the problem of uninstantiated laws: these are proper laws in so far as their addition to the best system results in the enhancement of the strength of the best system, without detracting from its simplicity.

The best candidate, then, for RVL\* is the Mill–Ramsey–Lewis view. Laws are regularities (this is their worldly stuff) and the differentia *Y* is ‘being expressed by an axiom or theorem in the best deductive system’. It seems, however, that this differentia cannot be fully objective. That a statement is implied or not within a deductive system is an objective matter, something that obtains independently of our knowledge of it. But what statements are (objectively) implied depends on the *way* the deductive system is organized, something that is not necessarily objective (in that there may be a lot of freedom in picking the axioms). Even if we fixed the slippery notion of simplicity, there seems to be no objective way to strike a balance between simplicity and strength. Nor is it guaranteed that there is such a balance. Hence, what regularities will end up being *laws* is based, at least partly, on epistemic criteria and, generally, on our subjective desideratum to organize our knowledge of the world in a deductive system.

There is something to this objection, but it should not be overstated. The worldly stuff that laws consist of are regularities and they are not mind-dependent: they characterize the world irrespective of our knowledge of them and of our being able to identify them. The feature, however, that renders some regularities laws at the expense of some others (the accidents)—the property of lawlikeness—is *not* worldly. It is broadly subjective, though not arbitrary. It seems that this is a price the Humean has to pay in order to avoid certain metaphysical commitments.

The repercussion for causation is obvious. RVC (in its sophisticated Millian version M-RVC) takes it that causation is *lawlike* regularity; if the lawlikeness of a regularity is not something fixed by the world (even if the regularity is), RVC

cannot be fully objective—it rests on a broadly subjective (but not arbitrary and whimsical) circumscription of the regularities that constitute causation. The regularities themselves are mind independent, but what causes what is not.

There is another route to the same point, which is relevant to what follows. As Nelson Goodman (1983) has shown using the famous predicate ‘is grue’ (defined as: observed before 2010 and green or not observed before 2010 and blue), the very idea of lawlikeness requires a theory of what *predicates* can be constituents of lawlike statements. Quine (1969) and others (including Goodman) took it that the predicates suitable for lawlike statements (statements that express laws of nature) must pick out natural kinds. Exactly the same need arises in connection with the Mill–Ramsey–Lewis view of laws. It is perfectly possible that the simplest and strongest deductive systematization may be effected by ‘unnatural’ predicates, that is, predicates that do not pick out natural kinds. Then all sorts of odd regularities would end up being laws, since they would be captured by axioms or theorems of the ‘best system’. All this means that the prospects of a theory of lawlikeness are tied with the prospects of a theory of natural-kind predicates.

How exactly a natural kind is circumscribed is not a very straightforward issue (at least for someone who is not an essentialist) but the least that is involved in the characterization of a *kind* of entities is that they are *like* each other in relevant degrees and respects. What respects of likeness are relevant to kind-membership? Here, the obvious answer would be: those respects in virtue of which entities have similar nomological and causal behaviour. This would create an air of vicious circularity since it seems that for a regularity to be a law it should constitute a pattern among natural kinds (expressed by ‘natural kind’ predicates) and conversely for a kind to be natural it should part of a nomological pattern. But this kind of circularity seems inevitable. There is an intimate connection between the issue of what laws of nature are and the issue of what kinds are natural: one cannot be delineated without the other.

Some conception of similarity becomes necessary in thinking about which regularities are laws. As we have already seen, this very idea of classes of resembling events enters constitutively into RVC. If similarity is not a fully objective relation—in that the respects and degrees of similarity are not fixed by the world—this is another entry-point for subjectivity into causation. Perhaps, as we go down to the level of atoms and elementary particles and their properties, this element of subjectivity is diminished. At that level, it seems there are fully objectively circumscribed natural classes: not only are the similarities and differences between types of elementary particles objective, but also the respects and degrees in which they are similar and different are fixed by the way the world is.

Actually, one might want to follow Lewis (1984; 1986a: 50–2) and posit the existence of natural properties (or classes) that are distinguished from each other by objective sameness and difference in nature. Natural properties, it might be said, carve nature at its joints; they provide an objective classification—hence they are

fully objective. There is a lot to be said for this view, and it shows the way an advocate of RVC has to go if she wants to avoid buying into a lot more subjectivism about causation and lawhood than she is willing to accept. This notion of naturalness is hard to define—Lewis takes it as an unanalysed, yet indispensable, primitive. Indeed, and for our purposes, if we try to explain similarity as sharing of natural properties, then we cannot analyse naturalness in terms of (objective) similarities. According to Lewis, the inventory of perfectly natural classes (properties) is (or will be) delivered by fundamental physics. But even allowing for perfectly natural properties, naturalness, as Lewis himself argues, is a matter of degree. Some properties are more natural than others (say, mass or charge relative to colours and colours relative to gruesome properties). But the very idea of degrees of naturalness implies that as we move away from the ‘perfectly natural’ end of the natural–unnatural continuum and towards the ‘highly unnatural’ (disjunctive, gerrymandered) end of it, similarity judgements become less and less objective and more and more dependent on us (our categories and classificatory schemes).

## 6. REGULARITY AND SIMILARITY: VENN

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Causation implies similarity. This is something already present in Hume’s first definition of causation, we may recall. What John Venn saw clearly was that this dependence on similarity has important repercussions for RVC. In its sophisticated (Millian) version, RVC takes the antecedent of a sequence to be the complete cluster of factors that constitute a sufficient and a necessary condition for the effect. Venn added that the full statement of the regularity should in fact be a disjunction of conjunctions such that it is necessary and sufficient for the effect. Given that the cause is a conjunction (or cluster) of factors and that there can be a plurality of causes for a certain effect, the regularities should be captured by the following logical form:

$$(ABC) \text{ or } (DFG) \text{ or } \dots \leftrightarrow E.$$

This way of putting the regularity implies that the effect is an event-type, devoid of its individuality. If the effect were fully specified in all its detail, its cause would have been a complex concrete event too—but then hardly any repetition would be possible. It would be *this* causing (or being followed by) *that*. The move from *this* causes (or is followed by) *that* to *this-type* causes (or is followed by) *that-type*, a move which for Venn is necessary for the very possibility of inductive inference, relies on classifying events under similarity classes. As Venn put it, ‘No two objects



or events in nature are alike in all their details, and therefore if we want to secure repetition we must submit to let go some of the characteristics' (1889: 57). Differently put, that there are laws that cover causal sequences of events follows from the fact that there are similarities among the objects/entities/events that are involved in these sequences. If there were no similarities, if each sequence were unique, the very fabric of inductive inference would be disrupted.

This reliance on similarity (*events of type C are followed by events of type E*) introduces, according to Venn, a subjective element to causation. Similarity has an objective and a subjective aspect. The crafting of the event-types whose joint recurrence marks a regularity is done jointly by nature and us in that it is up to us, in the final analysis, which of the elements that compose the antecedent of a sequence must be omitted, abstracted away and the like so that the repetition of the thus-constituted antecedent event-type is safeguarded. As Venn (1889: 98) nicely put it:

Such repetitions as we actually find set before us are the results of two factors, one contributed by nature the other partly contributed by ourselves. . . . Nature . . . as Leibniz was fond of insisting, never exactly repeats herself. But she does the next best thing to this for us. She gives us repetitions—sometimes very frequent, sometimes very scarce, according to the nature of the phenomena—of all the important elements, only leaving it to us to decide what these important elements are.

A more systematic way to put Venn's problem is this. If the reference-classes of the causal relata were unit classes, we would have absolutely precise and (trivially) exceptionless causal claims, but scarcely any repetition. If, on the other hand, the reference-classes in which the causal relata belong were broad, there would be repetition but the relevant causal claims would be less precise and not necessarily exceptionless. RVC does not tell us how the reference classes (that is, the similarity classes) in which the causal relata are put are picked; for RVC to work there must be a way (or a theory) to do this. As Arthur Pap (1952: 660) pointed out, RVC faces a dilemma: either all sequences are coincidental (since, if the causal relata are specified in a coarse-grained way, the sequences are not exceptionless) or all sequences are causal (since, if the causal relata are unit-classes of events, all sequences are trivially exceptionless).

To avoid this dilemma, RVC must find the golden mean between a very fine-grained and a very coarse-grained description of the causal relata. The events whose pattern of joint recurrence constitutes a regularity should belong to similarity classes that are neither too broad to allow exceptions nor too narrow to bar repetition. As noted at the end of the last section, there is need to appeal to natural classes. Perhaps, the needed golden mean is achieved primarily at the level of elementary particles and their interactions. At this level, it can also be plausibly said that, by virtue of being perfectly natural, the similarity classes are fully objective.

## 7. REGULARITY VS. SINGULARITY: DAVIDSON

What then is the correct statement of the Regularity View of Causation? The answer to this question has found its *locus classicus* in Donald Davidson's writings, though the gist can be found in Pap 1952. The key thought, which motivates Davidson's view too, is that RVC does *not* offer a recipe for (or a rule of) translation of singular causal statements into general causal ones. Take any singular causal claim, for example '*c* caused *e*'. The aim of RVC is not to translate this singular statement into a general one. Rather, RVC is committed to there being a law such that events described as events of type *C* (where *c* is one of them) are followed by events described as events of type *E* (where *e* is one of them). The existence of the law is assured, but its description (and its exact statement) does not directly follow from the descriptions used to identify the *relata* of the singular causal statement.

The gist of RVC, we have seen, is that a sequence of events is causal only by right of its membership in a class of similar sequences. This is important because though the causal relation seems to have the same surface structure with other relations, its deep structure is vastly different, if RVC is right. On RVC, whether or not a particular sequence of events (*this* billiard ball moving *that* billiard ball after colliding with it) is causal depends on things that happen elsewhere and elsewhere in the universe, and in particular on whether or not this particular sequence instantiates a regularity. It depends, that is, on whether event-tokens *c* and *e* fall under suitable event-types *C* and *E* such that all events of type *C* are regularly associated with (or, regularly followed by) events of type *E*. '*c* causes *e*' has the same structure as '*x* loves *y*' (or '*x* is taller than *y*'); but, it would be absurd to say that whether or not '*Mary* loves *John*' is true depends on anything other than *Mary*, *John*, and their (local) properties and relations. This, of course, is another way to put the claim that causation is extrinsic to its *relata*: it depends on *general* facts; on what happens at other places and at other times.

A different view has emerged in the twentieth century, mostly in the writings of Curt John Ducasse. This, like RVC, is metaphysically lean. It does not posit powers and the like to explain causation. It differs from RVC in taking causation to be a singular relation, fully captured by whatever happens there and then between two concrete events in their full individuality. On this singularist view, if there were no repetition in nature, there would still be causation, in so far as there were change in nature. Causal laws may well exist in nature, but only because there are causal facts in their own individual right; (causal) laws are generalizations over causal facts and not (as RVC would have it) constitutive of causal facts.

We shall not go here into the details of this view. But some very general points are important for the proper defence of RVC. According to Ducasse's (1951, 1968) account, an event *c* caused an event *e* if and only if *c* was the only difference in *e*'s environment before *e* occurred. To put it more precisely, suppose we have a

concrete state of affairs  $S(a, b, c, d, e, f)$  and a (single) change  $C(a, b)$  of features  $a$  and  $b$  of  $S$  which is followed by a change  $C(e, f)$  of features  $e$  and  $f$  of  $S$ . Then,  $C(a, b)$  was the cause of  $C(e, f)$ . As Ducasse (1951: 108) put it, ‘a cause is always a *difference* occurring in a state of affairs  $S$  in which the effect is another and later *difference*’. There are obvious problems with the epistemology of this view, but leaving them to the one side, we may ask: how is this very idea of *difference* to be understood? Similarly, what changes (that is, differences) are relevant to the effect? To answer these questions, there is need to ascend to the level of event-types, that is, to descriptions of the events not in their full concrete individuality (whatever that means!) but to descriptions that bring out in what respects events have changed or remained the same.

When the baseball shattered the window, the canary in the nearby cage had just started singing. In its full concrete individuality, the cause of *this* breaking of *this* window was the full antecedent state (including the airwaves of *this* canary song hitting the window at the moment *this* baseball hit it). What Ducasse does not seem to appreciate is that the very idea of difference, even when it comes to difference in events in their concrete individuality, requires appeal to general facts of similarity and difference. He notes that when it comes to concrete events in their full determinateness, we can only use designators such as ‘whatever is occurring here and now’ and the like (1951: 152–3). But, of course, for whatever-is-occurring-here-and-now to be considered as a difference (or as a change) it has to be classified in certain way, leaving out some part of it (whatever-remains-the-same) and focusing on whatever has changed (from being some way to being some other way). To consider a concrete event qua an instance of an event type is to concede that there are general patterns under which events fall; and if this is the only way to make sense of differences and similarities among events, the very idea of causation as difference-making (*changes*) implicates general—and not singular—facts.

A version of the point above has been stressed by Davidson (2005). Davidson aims to show how *both* Humeans and singularists need to rely on similarity in their accounts of causation; Humeans in order to say when events are similar to each other and singularists (Ducasse in particular) in order to say when events are relevantly *dissimilar* to each other. According to Davidson, in order for Ducasse to claim that a *c*-change caused an *e*-change, there must be event types  $C'$  and  $C$  (and event-types  $E'$  and  $E$ ) such that the change of *c* from being  $C'$  to being  $C$  caused the change of *e* from being  $E'$  to  $E$ , that is, there must be a *c*-like event (meaning an event-type of the form: *has changed from  $C'$  to  $C$* ) and an *e*-like event (meaning an event-type of the form: *has changed from  $E'$  to  $E$* ) such that *c*-like events are followed by *e*-like events.

Davidson (2005: 212) takes all this to show ‘that singular causal statements imply the existence of covering laws: events are changes that explain and require such explanation’. This is simply to reinforce his old and well-known point that all causation is nomological.

As is well-known, Davidson (1967) argued that there is room for reconciliation between the singularist and the Humean. When we pick the descriptions of the events that enter a causal statement, the descriptions may be such that they entitle us to *deduce* the singular causal statement from a lawlike statement together with the assumption that the events referred to in the statement occurred. So we can subsume the singular causal statement under a causal law. His suggestion (ibid. 83) is that if ‘*c* causes *e*’ is true, there must be descriptions of events *c* and *e* such that they fall under a law from which it follows that the first event caused the second, even if this law is unknown to those who use the singular causal statement, and even if the law is not stated in the vocabulary of the singular causal statement.

Davidson has managed to bring together (and in line) the two key points on behalf of RVC made by Brown and Venn. Brown noted that though where there is causation, there is regularity, the underpinning regularity might be much more complex than the one implied by a face-value reading of the causal claim: there are descriptions of the events that constitute the causal sequence such that they fall under a regularity. Venn noted that what goes into the description of events so that repetition is ensured relies on judgements of similarity. Davidson’s point is that precisely because of this there will be laws that underpin causal assertions—causation is always a matter of law.

## 8. REGULARITY AND EXPLANATION

The idea that causes are nomologically sufficient for the effects was the kernel of the Deductive-Nomological model of explanation (henceforth, DN-model), advanced by Carl Hempel and Paul Oppenheim (see Hempel 1965; for details of the DN-model and a qualified defence of it, see Psillos 2002: ch. 8). According to it, a singular event *e* (the *explanandum*) is explained if and only if a description of *e* is the conclusion of a valid deductive argument, whose premisses, the *explanans*, involve essentially a lawlike statement *L*, and a set *C* of initial or antecedent conditions. The occurrence of the *explanandum* is thereby subsumed under a natural law. Schematically, to offer an explanation of an event *e* is to construct a valid deductive argument of the form:

(DN)
Antecedent/Initial Conditions $C_1, \dots, C_i$
Lawlike Statements $L_1, \dots, L_j$
event/fact to be explained ( <i>explanandum</i> ) <i>e</i>

Hempel took his model to provide the correct account of causal explanation. As he put it, ‘causal explanation is a special type of deductive nomological explanation’

(1965: 300). This does not imply that all DN explanations are causal. The thesis is that all *causal* explanation is DN-explanation, which means that for *c* causally to explain *e* it should be the case that there are relevant laws  $L_1, \dots, L_n$  in virtue of which the occurrence of the antecedent condition *c* is nomologically sufficient for the occurrence of the event *e* (cf. *ibid.* 349). In elaborating this view, Hempel (*ibid.* 350) noted that when we say that event *c* caused event *e*, 'the given causal statement must be taken to claim by implication that an appropriate law or set of laws holds by virtue of which [*c*] causes [*e*]'. Thus put, the claim is not far from Davidson's (1967: 84) point made in the previous section: true statements of the form '*a* caused *b*' imply commitment that 'there are descriptions of *a* and *b* such that the result of substituting them for "*a*" and "*b*" is entailed by true premises of the form [the relevant law] and [initial conditions]'.

According to both Hempel and Davidson, causation is a matter of nomological sufficiency: *c* causes *e* iff there is a *law* that connects events like *c* with events like *e*. But, being interested in causation, Davidson denied that the covering law should be specified or searched for. Being interested in explanation, Hempel insisted that the causal explanation is incomplete unless the DN-argument is fully spelt out and the nomological statement is made explicit. There cannot be a deduction of the *explanandum* from the *explanans* (and hence an explanation of it) unless the *explanans* is fully specified and is such that at least one law is stated. This simply means that the *explanandum* (the effect) and the *explanans* (the cause and the law in virtue of which it operates) must be described in shared vocabulary: the law should ultimately be read off from the description of the causal relata (perhaps with some help from bridge principles). Hempel thought, rightly, that when the law is not explicitly offered in a causal *explanation*, the explanation is incomplete. It is like, as he said, being given 'a note saying that there is a treasure hidden somewhere' (1965: 349). But then again, the treasure might turn out to be fool's gold if the generalization that is supposed to do the explaining is not a proper law. The problem that Davidson identified is precisely that there is no simple and straightforward way to go from a singular causal statement of the form '*c* caused *e*' to a general statement that is a covering *law*. The DN-model oversimplifies this move. Even accidentally true generalizations can play the 'covering' role. So there is a need for a sharp separation between those regularities that are laws and those that are accidents. Besides, there can be non-strict, non-exceptionless generalizations that are explanatory nonetheless, even though they cannot function as premisses in a DN-argument. *Ceteris paribus* generalizations can, that is, be explanatory.

Laws constitute the link between RVC and the DN-model of explanation. On RVC, where there is causation, *there are* covering laws; and yet, what exactly these laws are is a different matter. On the DN-model of explanation, this different matter does matter. Causal explanations are arguments and for the argument to be deductively valid and explanatory it is required that (descriptions of) laws should among its premisses. The *explanandum* and the *explanans* must share vocabulary.

However, the laws that render a sequence of events causal need not be captured by the lawlike statements in virtue of which an explanation of this sequence of events proceeds. For instance, the law that all metals expand when heated may be plausibly used to explain why a certain piece of iron expanded when it was heated, and yet it may be the case that the causal law that underpins this sequence of events is too complex to be neatly captured by the statement ‘All metals expand when heated.’

## 9. COMPLEX REGULARITIES: MACKIE

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Singular causal statements do not imply specific lawlike statements—if the sophisticated Davidsonian version of RVC is right, what follows is that *there is* a law under which they fall. But singular causal statements do not imply the presence of a productive relation either. From the ordinary meaning of singular causal statements we cannot draw any conclusions about what causation is. They are simply neutral on this matter.

John Mackie (1974) suggested that regularities do play some role in causation as it is in the world in the sense that singular causal statements are *grounded* in regularities (even though they do not imply any regularities). Mackie actually held no brief for RVC. He thought there is a lot more to causation than regularity. But he did emphatically deny that this more would imply anything like substantive commitments to powers or necessary connections or nomic universals. The attraction of the regularity view is precisely that ‘it involves no mysteries’ (ibid. 60) and that it makes vivid how causal facts can be known and how causal inference works.

What kinds of regularity ground causation? Mackie argued that these are *complex* regularities. Typically, effects have a plurality of causes: a certain effect can be brought about by a number of distinct clusters of factors. Each cluster is sufficient to bring about the effect, but none of them is necessary. A house, for instance, catches fire and gets burned to the ground. There are a number of clusters of factors that can cause house-fires. One cluster includes the occurrence of a short circuit along with the presence of oxygen, the presence of inflammable material in the house, the absence of a sprinkler system, and so on. Another cluster includes the presence of an arsonist, the use of petrol, the presence of oxygen, and so on. Yet another includes the eruption of fire in a neighbouring house etc. Each cluster is a logical conjunction of single factors. The disjunction of all such clusters (conjunctions) captures the plurality of causes. Each conjunction of factors is sufficient for the fire, but none of them is necessary, since another conjunction of factors can be

sufficient for the fire. To simplify matters a little, let us suppose that the regularity has the form:

$$AX \text{ or } Y \leftrightarrow E,$$

where  $AX$  and  $Y$  are clusters of factors that are minimally sufficient for  $E$ . To say that  $AX$  is minimally sufficient for  $E$  is to say that  $AX$  is sufficient for  $E$  and that none of its conjuncts ( $A$  and  $X$ ) are redundant: none of them, taken on its own, is sufficient for  $E$ . The conjunction  $AX$ , however, is not necessary for  $E$ .  $E$  can occur if  $Y$  occurs. Each single factor of  $AX$  ( $A$ , for example) is related to  $E$  in an important way. It is, as Mackie has put it, an *insufficient* but *non-redundant* part of an *unnecessary* but *sufficient* condition for  $E$ . Using the first letters of the italicized words, Mackie has called such a factor an *inus* condition. Causes, then, are at least *inus* conditions.

Causes are *at least inus* conditions. On Mackie's version of RVC, causes can also be either sufficient conditions or necessary conditions, or both. A causal regularity can have any of the forms:

- i.  $A \leftrightarrow E$
- ii.  $AX \leftrightarrow E$
- iii.  $A \text{ or } Y \leftrightarrow E$
- iv.  $AX \text{ or } Y \leftrightarrow E$ .

Of these forms, only (iv) has  $A$  to be an *inus* condition for  $E$ . According to (i),  $A$  is a sufficient and necessary condition for  $E$ ; according to (ii)  $A$  is an insufficient but necessary part of a sufficient and necessary condition for  $E$ ; and according to (iii)  $A$  is a sufficient but not necessary condition for  $E$ . Mackie's improved version of RVC entails that the generic claim to which this view is committed is this:

For some  $X$  and for some  $Y$  (which may, however, be null), all  $(AX \text{ or } Y)$  are  $E$ , and all  $E$  are  $(AX \text{ or } Y)$  (cf. *ibid.* 71).

This view has a lot of merit. It shows how RVC can deal with exceptions. If there was a short-circuit but there was no fire, it must be because some of the other conditions that were necessary for the *inus* condition to cause the effect were not present. It also shows how causal inference can work. If we know that an effect of the type  $E$  has occurred, and if we also know that the set of factors  $Y$  was not present, we can conclude that the set of factors  $AX$  was present and, in particular, that  $A$  was present. More importantly, Mackie's approach allows '*elliptical* or *gappy* universal propositions' (*ibid.* 66). Suppose the regularities in the world are of the complex disjunction-of-conjunctions type that Mackie (and Venn) have envisaged. Our knowledge of these regularities will be, for the most part, gappy or incomplete. If Mackie's version of RVC is correct, there must be a full universal proposition that completes the gappy or elliptical one. The more the latter is filled in, the more we know about the full complex regularity.

## 10. ASYMMETRIES

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Among the problems faced by RVC, even in Mackie's sophisticated version, two stand out. The *first* is that it fails to distinguish between genuine causes and mere joint effects of a common cause. Mackie (ibid. 84) discusses in some detail Russell's well-known example in which the sounding of the hooter in Manchester is an *inus* condition for workers in London leaving their work. The structure of a counterexample of this sort is this: suppose there are two effects  $E_1$  and  $E_2$  such that they both have  $C$  as an *inus* condition:  $CX$  or  $Y$  is necessary and sufficient for  $E_1$  and  $CZ$  or  $W$  is necessary and sufficient for  $E_2$ . The complex condition  $E_1 \& \text{not-} Y \& Z$  is sufficient for  $E_2$  and the complex condition  $((E_1 \& \text{not-} Y \& Z) \text{ or } W)$  is necessary and sufficient for  $E_2$ . So,  $E_1$  is an *inus* condition for  $E_2$ . More generally, it may well be that an effect of a cause can be part of a set of sufficient conditions for another effect of the same cause. Mackie saw in this type of problem a reason that the regularity view is far from being a complete account of causation as it is in the world. His remedy was based on the notion of causal priority (which is not the same as temporal priority).

One interesting suggestion, on behalf of RVC, has been that spurious correlations can be seen as implicating some nomic connection between the correlated events which, however, is *less direct* than the nomic connection between a common cause and the correlated events. This thought has been explored by John F. Clendinnen (1992). How exactly to understand the idea of a more direct nomic connection is complicated. An example might help. The drop in the barometer is correlated with the subsequent storm, but does not cause it—the common cause of both is a drop in the atmospheric pressure. In this set-up, it is clear that the barometer-storm (B-S) nomic connection is *less direct* than the pressure-storm (P-S) nomic connection. The P-S connection is there even if the B-S connection is not (as an experiment can testify). The P-S connection can be subsumed under more basic laws without this being dependent in any way on the B-S connection. The scope of the P-S connection is greater than the scope of the B-S connection. This leaves us, among other things, with the need to explain when a law is more basic than another. We are not totally in the dark here—the M-R-L view (see sect. 5) can offer some help.

There is no straightforward way out of the joint-effects problem for RVC. If, for instance, we appealed to the absence of direct causal processes between the joint effects, or the absence of counterfactual dependence among them, the solution would be much neater. But the situation is not entirely hopeless for RVC. There will be cases in which there is indeterminacy as to what causes what and, occasionally, there will be joint-effect structures that may pass as causal. But many of them will be resolvable into more complex patterns of nomic dependence.



The *second* problem is that the very idea of causation as having to do with necessary and sufficient conditions blurs the distinction—that is, the asymmetry—between cause and effect. This has led many (including Lewis 1973*b*) to claim that RVC is almost beyond repair. The problem of the direction of causation is vexing and intricate and has had no fully satisfactory solution so far on the basis of *any* account of causation. Hence the fact that RVC cannot solve it should not be taken as a fatal blow against it. The standard answer is that the causal direction is simply the temporal direction: causes *precede* effects in time. This is taken to be problematic because (a) it blocks backward causation on a priori grounds and (b) it lands in a circle, if the direction of time is analysed in causal terms. Neither objection seems to be fatal. Be that as it may, could there be a more informative answer on behalf of the advocate of RVC?

Let us think for a minute of the way Lewis (1973*b*) tries to solve this problem within his counterfactual theory of causation. There is an asymmetry between the past and the future: the former is *fixed*, whereas the latter is *open*. This asymmetry is accounted for in terms of the asymmetry of counterfactual dependence. The past is ‘counterfactually independent of the present’, since it would remain the same whatever we did now. But the future is not. It depends counterfactually on the present: on what we do now. Lewis argues that this asymmetry of counterfactual dependence is the result of a *contingent* fact, namely, that every event is excessively overdetermined by subsequent events, but very few events are overdetermined by their history. Couldn’t a parallel point be made on behalf of RVC? To simplify matters, suppose that the complex regularity has the form:

$$AX \text{ or } Y \leftrightarrow E$$

This exhibits an interesting asymmetry. The effect does not determine which disjunct was present, but each disjunct is sufficient for the effect. Because of the complex form of regularities, the causes ‘overdetermine’ their effect but not vice versa. Here again we talk about a contingent fact, namely, that regularities have this complex form. The cause and the effect are nomologically dependent on each other, but there is an ‘inferential’ asymmetry: the presence of the effect can be inferred provided some of its causes are there, while the presence of a specific cause cannot be inferred from the presence of the effect. (A version of this reply is in Baumgartner 2008.) This move will not work if regularities do not have this complex form—in such cases, there can be no judgement of asymmetry. It may be objected this ‘inferential’ asymmetry is not metaphysically robust in that there is no reason why the world should consist of complex regularities. The friend of this move can reply that though this may well be so, the inferential asymmetry is still important precisely because it puts a non-trivial constraint on causal claims—where it fails, there can be no causal attribution and/or explanation. (Interestingly, Hausman (1998) has aimed to account for the asymmetries of causation in terms of a condition of independence that holds contingently, namely that every event that has any cause has at least *two* independent causes. As Hausman (*ibid.* 64) notes this

kind of condition should at least be taken to impose a necessary condition for the possibility of making causal claims and for offering causal explanations. If it does not hold, no claims of causal asymmetry can be made.)

## 11. CONCLUDING REMARKS

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To the best of my knowledge, there is no theory of causation that is free of counterexamples. Nor is there any theory of causation that tallies best with all our intuitions about what causes what. Nor are these causation-related intuitions always clear-cut and forceful. Perhaps, this is reason enough to make us sceptical about the prospects for a single and unified metaphysical account of causation—of what causation *is* in the world. Perhaps, what we are trying to figure out—*causation*—is not one single condition with a determinate nature. I have tried to substantiate this sceptical stance and to advance causal pluralism (see Psillos 2008). Be that as it may, we can only engage in a cost–benefit analysis of the several competing theories (and perhaps rely on our own intuitions and epistemological preferences). To me then, RVC is the next best thing. A full appraisal of the prospects of RVC would require a more systematic comparison with all other metaphysically thick theories of causation than can be given in this chapter. The important thing, it seems to me, is that RVC is metaphysically lightweight while going a long way towards explaining the epistemology of causation.

As I noted already, it would be wrong to think of RVC as being a rival to other accounts that take causation to be a robust relation of dependence between discrete events. The substantive rivalry is between dependence accounts of causation and production ones. Why, then, couldn't a sensible defence of RVC appeal, say, to counterfactual conditionals? Would the employment of counterfactuals, say in dealing with the problem of joint effects, imply that RVC has been abandoned? In a very strict philosophical sense, the answer is positive—we would appeal to conceptual resources that seem to fall outside the scope of RVC. In a more liberal sense, the appeal to counterfactuals could be seen as a legitimate move, since it does not put in danger the metaphysical agenda of RVC (and its key denial of an extra layer of regularity-enforcing facts). In a similar fashion, the existence of less-than-perfect regularities (say, statistical regularities) is not detrimental to RVC. Probabilistic causation can actually be seen as a completion of RVC—an extension of the key ideas to stochastic phenomena. Here again, the important thing is that the programmatic metaphysics of RVC is not compromised.

In all probability, RVC will need a little help from its friends (that is, other dependence accounts of causation) to sustain its rivalry with its enemies

(production approaches). Still, the message is clear: causation does not need a thick metaphysical underpinning.

## FURTHER READING

The Regularity View of Causation is not currently very popular among philosophers, so it is hard to find recent papers and/or books that have mounted serious defences of it. Criticism, on the other hand, abounds. Fair critical presentations of the basic tenets of RVC can be found in Paul Horwich, *Asymmetries in Time* (1987: ch. 8) and Daniel Hausman, *Causal Asymmetries* (1998: ch. 3). Perhaps the classic statement and critique (almost a qualified defence) is J. L. Mackie, *The Cement of the Universe* (1974), especially ch. 3. David Lewis, 'Causation' (1973*b*) presents some central problems that RVC faces as a way to motivate his own counterfactual approach. But Helen Beebe, 'Does Anything Hold the Universe Together?' (2006*b*), has persuasively argued that Lewis's counterfactual theory can be seen as a sophisticated version of the regularity view. Beebe's paper also presents a sophisticated and creative defence of some key metaphysical features of the regularity view. Michael Baumgartner, 'Regularity Theories Reassessed' (2008), makes some headway in the technical articulation of RVC. Clendinnen, 'Nomic Dependence and Causation' (1992), is a suggestive defence of nomic dependence accounts of causation. Chapters 1 and 2 of my *Causation and Explanation* (2002) present my own account of Hume's version of the regularity view and its development by Mill, Mackie, and others. James Woodward, *Making Things Happen* (2003), offers a systematic analysis and criticism of many competing theories of causation and explanation. The most philosophically sophisticated attack on the metaphysics of RVC can be found in Galen Strawson, *The Secret Connexion* (1989). Several entries on theories of causation that appear in the *Stanford Encyclopedia of Philosophy* (ed. E. N. Zalta, <<http://plato.stanford.edu>>), written by participants in the current debates, such as Christopher Hitchcock and Phil Dowe, touch on elements of RVC.

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