adopt Lewis's arguments against this solution, the fact that his own account does not seem free of difficulties[67] suggests that we need to turn to the problem that provided Lewis's original motivation: the problem of causal asymmetry.

We devote Chapter 6 to this problem. We there conclude that the defect Lewis finds in the regularity theory's account of causal directionality is no essential part of the theory. Indeed, arguments that the heroic Humean musters against some forms of the law-accident distinction are even more attractive in the context of problems of causal directionality. This outcome is to be expected, since much of the initial plausibility of the attribution of necessity to causal sequences rests on our firm conviction of their directionality. The Humean account of this directionality is very much a part of its complete treatment of law, accident, necessity, and counterfactuality.

67. Lewis's solution to the problems of epiphenomena and of preempted potential causes involves the same considerations as his treatment of the problem of effects.

5
Contiguity and Succession

HUME'S ARGUMENTS about causation early in the *Treatise* are intended to show that contiguity and succession are individually necessary conditions of causation.[1] These arguments and their aims have generally been ignored or misinterpreted. In particular Hume's claims about the spatial and temporal contiguity of causes and effects have been taken for epistemic strictures about causal knowledge and its employment. In the first four sections of this chapter we argue against these interpretations and ex-

1. The pertinent passages in Hume's writings are found exclusively in the *Treatise* and its *Abstract*. (EHU only incorporates succession into the definition of "cause." However, as we shall see, "contiguity" and "succession" contain an important similarity of meaning in Hume's arguments. Also, Wade Robison has offered reasons for believing that Hume's *second* definition of "cause" Df_2 does not include the relations of contiguity and succession. "Hume's Causal Scepticism" in G. P. Morice, ed., *David Hume: Bicentenary Papers* [Edinburgh: University of Edinburgh Press, 1977], p. 165, note 12.) There is evidence in the *Treatise* that he takes these criteria of causation seriously, despite the brevity of his arguments and his notorious remark that if his argument for succession is not satisfactory "the affair is of no great importance" (T, 76). The criteria of contiguity and succession appear early in the analysis of causation, reappear in his discussion of natural and philosophical relations, and emerge again in his two definitions of "cause" (T, 75–77, 93f, 170–72). These passages acknowledge that there are three ways in which the temporal relation between causes and effects might conceivably be construed: (i) as separated by some interval of time; (ii) as perfectly contiguous, so that the effect succeeds the cause in the very next period of time; (iii) as perfectly contemporaneous, existing during the same period of time. Hume defends (ii) and denies both (i) and (iii). In this chapter we contend that, when properly qualified, this position is correct.

hibit the compatibility of contiguity requirements with causal assumptions commonly considered incompatible with them. We then analyze Hume's claims about the temporal succession of effects and causes, revealing unnoticed connections to the contiguity requirements and defending his views against counter-arguments. Our discussion of these problems is continuous with our treatment of the problem of causal asymmetry, to which Chapter 6 is wholly devoted.

I

Let us first consider Hume's general pronouncements about contiguity. He maintains that contiguity in *time* is an essential feature of all causal relations, while contiguity in *space* characterizes only such relations as can properly be denominated spatial.[2] His rather compressed argument for this general thesis consists largely in an appeal to the maxim that "nothing can operate in a time or place, which is ever so little removed from those of its existence" (T, 75). While he recognizes that proximate causes are commonly distinguished from remote causes, he seems to reject the idea that remote items can be *causes*. On a literal interpretation of his text, each member of a set of conditions forming a causal chain is a cause only of that succeeding member with which it is connected contiguously; all noncontiguously related members are not causally related. Hume, then, seems to hold that:

> For all x and for all y, x is a cause of y only if:
>
> (i) x is temporally contiguous with y,
>
> and (where relevant)
>
> (ii) x is spatially contiguous with y.

This claim is certainly controversial, for it does not conform either to ordinary or to scientific causal judgments. We commonly attribute causality to events that are spatially distant or that occurred hours and even years prior to their effects. We

2. Hume holds that there are nonspatial, nonquantitative, causally related objects. Passions, moral reflections, sounds, etc. are examples. These objects are "nowhere" and so have "no particular place" (T, 235f).

readily grant, for example, the truth of such general and singular causal statements as the following:

(1) Cirrhosis of the liver is often caused by a protein deficiency in childhood.
(2) Hypnotic suggestion caused him to pull the trigger that resulted in death.
(3) Planetary activity causes the tides.

According to a strict reading of Hume's theory, based on condition (i) above, each of these three claims is false, because the alleged cause and effect are not contiguous. Indeed the second example states a doubly false causal judgment. The hypnotist did not cause the trigger finger to move, and neither the hypnotist nor the triggering-agent is the cause of death. If Hume is interpreted literally, the hypnotist causes a state of mind and the trigger finger's motion causes the trigger to move—no more, no less. If a person lingers after the bullet passes through his body, then even the bullet is not a cause of death, though its effect might be a cause. Hume's contentions seem false because our everyday concept of causation has a flexible character, allowing the remote relatedness he seems to repudiate. For this reason, his contiguity criterion initially strikes us as *ad hoc* and legislative.

The first pertinent question is whether the counterintuitive character of Hume's claim is significant. As we have observed in previous chapters, Hume is not concerned to analyze the ordinary concept of causation, nor does he attempt to provide a descriptive definition of "cause." Accordingly, criticisms that presuppose the adequacy of reports about the ordinary concept of causation stand in danger of begging the question. Before these matters can be decided, however, both Hume's motivation to hold this view and his arguments for it must be considered. This procedure may help us understand why his position seems intuitively implausible and why he is led to embrace what some regard as counterintuitive conclusions.

Two reasons lead Hume to stipulate that contiguity is a necessary condition of causation. First, he has in mind the model of explanation advocated by the natural science of his period, according to which contiguity seems to be a requirement

of the causal relation.[3] This model leads him to think that because a *causal chain* can have no gaps, a *cause* must therefore be contiguous with its effect (T, 75). The inference is of course eccentric when judged by the standard of common causal judgments. On many occasions both scientists and the common man would certainly refuse to submit to Hume's seemingly extreme stipulation, as examples (1) and (3) illustrate. Cirrhosis of the liver is not caused merely by a sudden attack, nor the tides by immediately contiguous conditions. These conditions are known scientifically to be causally insufficient (though perhaps they are sufficient for certain explanatory purposes). Moreover, it is usually difficult to isolate *any* relevant contiguous conditions for effects that either have an enduring character or have indeterminate boundaries—whether or not they are events subject to explanation by natural science. The difficulty in specifying contiguous conditions, and sometimes the irrelevance of doing so, is evident in the case of such effects as the gradual collapse of a financial empire, being late because one forgot to set an alarm, the glowing of a steel rod recently removed from a heat source, and population decreases caused by plagues. Such examples naturally lead us to be sceptical of Hume's conclusions.

Second, Hume is influenced by his enthusiasm for the maxim that nothing "ever so little removed" can be causally efficacious. From this notion he seems to reason that an event or object at all removed from an effect is never really its cause, though we often believe removed events to be causes—much as he thinks we do not really see external objects yet believe we do. Here Hume once again departs from ordinary causal language, and this departure creates the paradox that remote "causes" cannot be *causes*. Our sense of paradox is deepened by our awareness that even in science, contiguous conditions are not requisite for causal laws. Consider, for example, laws in psychology. A physiological psychologist may explain a duck's behavior at any given moment in terms of temporally contiguous brain conditions, but

3. For an orientation to the relevant scientific background of Hume's contiguity criterion, cf. M. S. Kuypers, *Studies in the Eighteenth Century Background of Hume's Empiricism* (New York: Russell & Russell, 1966), Chapters I–IV; *The Leibniz-Clarke Correspondence*, ed. H. G. Alexander (Manchester: Manchester University Press, 1956); and A. Koyré, *From the Closed World to the Infinite Universe* (New York: Harper & Row, 1958).

a behavioral psychologist must often cite more remote conditions in framing laws. The phenomenon of "imprinting" provides an illustration.[4] Whenever, in the twenty-four hours following hatching, normal baby ducks are exposed to a moving decoy duck—one bearing only a vague resemblence to an adult duck—the ducklings proceed to follow the decoy. If such objects are first presented later than twenty-four hours after hatching, no such result occurs; imprinting can happen only within a strictly limited temporal period. Of interest here is that the imprinting stimulus comes to have prepotent effects during the subsequent life of the affected duck. During early adulthood, for example, it will choose a cardboard decoy as a sexual partner rather than an adult duck of the opposite sex. The causal conditions that explain the duck's later behavior are remote, not contiguous; and they exert an influence even in the face of more proximate antecedents. Whereas physiological laws incorporate contiguous antecedents and consequents, behavioral laws often incorporate no contiguous conditions. Yet both may genuinely be causal explanations that invoke causal laws, by Hume's own regularity account of causation. For reasons not unlike those presented through this example, Thomas Reid and Richard Taylor (but not their usual ally C. J. Ducasse) have contended that Hume's contiguity criterion is absurd and irrelevant to the analysis of causation.[5]

But are Hume's claims irrelevant and absurd in the light of such criticisms? We think not, for two reasons. First, quite apart from the important consideration that Hume's analysis is revisionary of the concept of causation, his requirement of contiguity need not entail the actual falsity of statements 1-3 above. Hume can consistently be understood as claiming that these statements are *true only if there exist interval-less causal chains* linking remote antecedents to their later consequents. On this reading, which is textually more plausible than any previously

4. E. H. Hess, "Imprinting," *Science* 130 (1959), pp. 133–41.

5. Cf. Taylor's representative statement in the first three chapters of *Action and Purpose* (Englewood Cliffs, N.J.: Prentice-Hall, 1966). For Ducasse's view, cf. *Causation and the Types of Necessity* (Seattle: University of Washington Press, 1924; New York: Dover Publications, 1969), pp. 43–50; *Nature, Mind, and Death* (La Salle, Ill.: Open Court, 1951), pp. 133–38; " 'Cause' and 'Condition,' " *Journal of Philosophy* 63 (1966), p. 239.

mentioned interpretation, Hume intends only to deny that there can be action at a distance through which there exists no causal chain; he does not deny remote causation *per se*. As we show in the next section, the natural science of his period and his self-styled appropriation of the Newtonian method together led Hume to this conclusion.

Hume merely holds that wherever there is causation there is contiguity, either immediately between cause and effect or mediately through links in a causal chain; causation never involves action at a distance. He gives many examples of causal relations that conform to this model. The following passage hardly admits of an alternative interpretation:

> Two objects are connected together in the imagination, not only when the one is immediately resembling, contiguous to, or the cause of the other, but also when there is interposed betwixt them a third object, which bears to both of them any of these relations. This may be carried on to a great length; tho' at the same time we may observe, that each remove considerably weakens the relation. Cousins in the fourth degree are connected by *causation*, if I may be allowed to use that term; but not so closely as brothers, much less as child and parent. In general we may observe, that all the relations of blood depend upon cause and effect, and are esteemed near or remote, according to the number of connecting causes interpos'd betwixt the persons. (T, 11f; cf. T, 427ff)

Hume hesitates to use the term "causation" here because contiguity is not strictly required in order that causal statements about blood relatedness be true. But he allows such statements to be causal when it is recognized that there are "connecting causes." His point concerns not merely the imagination in its role as the faculty of causal judgment; it is a point about causation, as the last sentence makes clear. Hume states his position even more explicitly later in the *Treatise* when he turns specifically to the question of causal contiguity:

> Tho' distant objects may sometimes seem productive of each other, they are commonly found upon examination to be link'd by a *chain of causes*, which are contiguous among themselves, and to the distant objects; and when in any particular instance we cannot discover this connexion, we still presume it to exist. We may therefore consider the relation of CONTIGUITY as essential to that of causation. (T, 75; italics added)

When Hume comes to his final discussion of causation in the *Treatise* ("Rules by which to judge of causes and effects"), he never argues that a noncontiguous "causal" condition is not a cause. Rather, he argues that it is "not the *sole* cause of that effect, but requires to be assisted by some other principle. . . . [When noncontiguous] these *causes* are not compleat ones" (T, 174, italics added). The same theme is reiterated in the first *Enquiry*, where Hume says the relation of cause and effect "is either near or remote, direct or collateral" (EHU, Sec. 22).

Second, statements such as 1–3 above are usually cited for purposes of causal *explanation*. But causal explanations that describe remote causes are perfectly compatible with an account of temporally and spatially contiguous links in a causal chain required for causation *per se*. Explanatory exigencies direct investigation to particular links or sets of links in a causal chain, and these may well be remote links. Protein deficiencies in childhood do indeed *explain* the occurrence of cirrhosis of the liver, but it is a dubious inference from this truth to the claim that what is *now causing* a person's cirrhosis is an earlier diet. The contemporary cause is the diffuse fibrosis destroying the normal lobular architecture of the liver tissue. It is when we want to know why *this* phenomenon is occurring that we begin to trace the sources (through a series of causal chains, if they can be reconstructed) back to a protein deficiency, and perhaps even beyond to the level of predictive medicine that studies the effect of the mother's dietary habits on the fetus. No one seriously thinks that there are periods without causal chain connections between fetal protein deficiencies and a much later condition of cirrhosis. Hume would certainly agree that causal laws may correctly report regular conjunctions between remote sets of events and may be useful for explanation; but he would not concede that there need be no interlocking causal chain each link of which can, in principle, similarly be explained. Indeed he would deny the legitimacy of an explanation that did not at least allow for such links. If this interpretation of Hume's view of causal chains is correct, then he is not subject to the criticisms offered above and is probably not even subject to the claim that his contiguity requirements are counterintuitive.

While Hume's commentators seem not to have noticed that the interpretation defended here is *textually* plausible, it has not

gone unnoticed that the position is a *philosophically* tenable one. Ernest Nagel, for example, could scarcely be in closer agreement:

> The event frequently picked out as the cause is normally an event that completes the set of sufficient conditions for the occurrence of the effect, and that is regarded for various reasons as being "important." . . . [But] the relation holds between events that are spatially contiguous, in the sense that the [cause and effect] occur in approximately the same spatial region. Accordingly, when events spatially remote from each other are alleged to be causally related, it is tacitly assumed that these events are but termini in a cause-and-effect chain of events, where the linking events are spatially contiguous. . . . [Also] the relation has a temporal character, in the sense that the event said to be the cause precedes the effect and is also "continuous" with the latter. In consequence, when events separated by a temporal interval are said to be causally related, they are also assumed to be connected by a series of temporally adjacent and causally related events. And finally, the relation is asymmetrical. . . .[6]

Nagel's appeal to causal chains helps tie Hume's temporal contiguity claim about events to the view that causal explanations of effects need not explicitly appeal to temporally contiguous events. The legitimacy of such explanations requires the existence of intervening events (known or not) between the explananda-conditions and the explananda-phenomena. We shall return to this problem later in the present chapter, again in Chapter 7, and for a final time in Chapter 8.

II

Let us turn now exclusively to Hume's views on *spatial* contiguity. Hume's insistence on contiguous spatial relations poses a threat to his empirical theories of language and knowledge, for this insistence leads him to deny that gravity or any other natural phenomenon can be understood in terms of causal action at a distance unless a connecting medium is postulated:

6. Ernest Nagel, *The Structure of Science* (New York: Harcourt, Brace & World, 1961), p. 74. See also his statement of a motivation similar to Hume's, p. 171. Hume's account of contiguity, succession, and causal chains is adopted virtually unaltered by A. J. Ayer, in *Probability and Evidence* (New York: Columbia University Press, 1972), esp. p. 135.

> When we talk of gravity, we mean certain effects, without comprehending that active power. It was never the meaning of Sir Isaac Newton to rob second causes of all force or energy; though some of his followers have endeavoured to establish that theory upon his authority. On the contrary, that great philosopher had recourse to an etherial active fluid to explain his universal attraction. . . . (EHU, Sec. 57n)

This passage betrays the regulative power of the belief in causal chains. No scientifically oriented philosopher in Hume's time wished either to return to earlier conceptions of occult forces from which science had been liberated by mechanical philosophies or to postulate an intuitively repugnant remote causation. Hume follows, apparently without reservations, what he takes to be Descartes's and Newton's requirement of contiguous causation. On this basis he declares the notion of noncontiguous causation scientifically unacceptable. Because he accepts Newton's view that the idea of action at a distance involves "so great an absurdity" that no "competent philosopher could ever believe it,"[7] he is disposed to agree that "an ethereal active fluid" or some other "second causes" must be assumed. Indeed the action-at-a-distance controversy was so prominent at the time that it should probably be regarded as the paradigm for Hume's postulation of "second causes." This postulation renders Hume epistemologically inconsistent, however, for he is insisting, without empirical warrant, that there *must* be connecting causes (continuous media), even if they cannot be observed. Theoretical constructs thus replace perceptual evidence in explaining observed planetary motions; but this explanation is no more empirically justified than the Cartesians' resort to the "sole efficacy of the Deity," which Hume delights in denouncing (EHU, Sec. 57n; T, 157–59).[8]

Were his empiricism given overriding significance, Hume should maintain that laws of gravitation express universal empirical regularities between distant objects. All assumptions

7. *Isaac Newton's Papers and Letters on Natural Philosophy*, ed. I. B. Cohen (Cambridge, Mass.: Harvard University Press, 1958), pp. 302f.

8. Indeed, Hume seems guilty of the *a priori* causal legislation for which he censures rationalists as well as of the "enquiry beyond the senses" he everywhere denounces. He does occasionally mention our "profound ignorance" in such matters (EHU, Sec. 57; T, 638f). But this again strikes him as good grounds for deriding Cartesianism.

concerning continuous media should be rejected. Belief in gravitation as a causal phenomenon commits him, as an empiricist, either to believe in noncontiguous causation or to suspend any commitment to contiguity other than as a regulative principle. On either alternative he must deny that spatial contiguity is an *essential* criterion of causal relatedness between extended objects. The same could be said of magnetic phenomena where cause and effect might be thought more "observable" than gravitational phenomena, even though the observed connection is not contiguous. Just as Berkeley was led by his empiricist principles to dismiss the concept of absolute space because it was unperceivable, so Hume should have dismissed the notion of an ethereal medium.[9]

While this rebuke is deserved and reflects an inconsistency in Hume's thought, it is not a telling criticism against his philosophy of causation. The objection rests on an assumption that Hume must be unyielding in the protection of his empiricist demand that for every idea there exists a corresponding impression. This assumption can easily be overemphasized in the philosophical assessment of Hume's work. Discerning critics have never regarded his primitive empiricist epistemology as an ideal to be protected at all costs, and his most important contribution to philosophy, the theory of causation, ought not to be tarred with the brush of his defective theories of knowledge and language. If Hume's empiricist strictures against theoretical entities are qualified or ignored, then he is left free to accept the existence of the ether or some other entity as a *theoretically justified* belief.

This line of defense is certainly not implausible, especially in light of later developments in mechanics. Historians of science have often maintained that the ultimate rejection of the ether theory led to the overthrow of the Newtonian notion of gravitation, in favor of Einstein's conception. The entire sequence of events thus supports Hume's rejection of action at a distance, as well as his commitment to the existence of causal chains underlying apparently noncontiguous causes. It is his insistence on the

9. Berkeley, *Principles of Human Knowledge*, Secs. 110–17. In *Siris*, Berkeley also rejects postulation of an ethereal medium for causal transmission as unproved and gratuitous. Cf. *Works* (London: Thomas Nelson and Sons, 1948), ed. A. A. Luce and T. E. Jessop, Vol. V, pp. 108–18.

latter point about the relations between causes and their effects that determines his unwillingness to accept explanations of gravitational phenomena dependent on the possibility of action at a distance. Here again, admissible causal explanations are governed by the character of the causal relation, and not vice versa.

III

As we have reconstructed his arguments, Hume's position can be paraphrased in the following way. Although we do cite spatially and temporally distant happenings as causes, and even as *the* cause, philosophical reflection reveals that we do not admit distant events to be solely sufficient for their effects. At least one contiguous standing condition can always be uncovered and shown to be causally relevant, though such conditions may not themselves be sufficient causes, if by "sufficient" is meant solely sufficient.

Two potentially important objections might be lodged against this position. First, the claim that a contiguous causal condition or event could always be uncovered may not be defensible in the light of quantum mechanical considerations, if quantum mechanics is understood as permitting noninstantaneous action at a distance where no energy exists in the space across which the action occurs. Indeed, Ernest Nagel, whom we earlier cited in defense of Hume's criterion of spatial and temporal contiguity, hints at a possible scientific need to dispense with the criterion:

> It is even debatable whether the [spatial and temporal contiguity] conditions just mentioned are in fact fulfilled in alleged illustrations of this notion of cause . . . when the illustrations are analyzed in terms of modern physical theories. Nevertheless, however inadequate this notion of cause may be for the purposes of theoretical physics, it continues to play a role in many other branches of inquiry.[10]

It is always open to the Humean who believes in continuous media to insist that, at every level of inquiry, apparent action at a distance must ultimately be explicable in terms of "second causes" in an as yet unobserved medium. But, if Nagel's admission is taken seriously, then this Humean strategy is subject to a

10. Nagel, *op. cit.*, pp. 74f.

rebuttal having more or less the same force as the Humean gambit: a believer in noncontiguous causation can always reply that contiguous causation is merely apparent at present levels of inquiry and that research into the yet uncharted depths of quarks and antiquarks will reveal that these subtle elements and their aggregates conform to macroscopic models of action at a distance. Thus, there seems to be an empirically unresolvable, metaphysical stand-off.[11]

This quantum-mechanical problem was, of course, undreamed of in Hume's age. Like the quantum-mechanical considerations that seem to undermine Hume's regularity requirement, vast interpretative difficulties stand in the path of broaching these matters, and their presence leaves the Humean many options. One may, for instance, invite an opponent to explain why at a certain microphysical level a feature like contiguity, otherwise present in cases of causal relations, should cease to be. The admission that it is simply absent, and that this absence is fundamental and inexplicable, should raise the Humean question of how microphysical causal but noncontiguous relations invariably aggregate into spatiotemporally contiguous ones at the level of macroscopic objects.

The answers to these questions may ultimately satisfy the Humean that spatiotemporal contiguity is in fact not a fundamental feature of the causal relation "in the objects" alone, but rather depends on the perceptual faculties of creatures who observe causal relations only at macrophysical levels of aggregation. This outcome would be consistent with the way Hume analyzes causal necessity, for he makes an appeal not just to the objects of causation, but also to the observer's capacity for generating impressions of reflection. So analyzed, the requirement of spatiotemporal contiguity would continue to play a regulative role in causal inquiry, and would remain an essential feature of causal relations beyond the level of microphysics.

A second objection is that interpretative reliance on causal chains raises the well-known dilemma that a sufficient cause may be nothing less than the entire set of causal links pro-

11. We have borrowed much of this objection from Mary Hesse, *Forces and Fields* (London: Thomas Nelson and Sons, 1961), pp. 279–86, and "Action at a Distance and Field Theory," *The Encyclopedia of Philosophy*, Vol. I, p. 13.

ductive of its effect. This conclusion seems to many philosophers ridiculous, as each sufficient cause (or causal chain) potentially includes the entire sequence of events in the history of the universe. Yet we never regard such lengthy and complex chains as causes, however revisionary our analysis. If the requirement of contiguity leans heavily on the appeal to causal chains and if these chains lead backwards without end, requirements of contiguity preclude citation of *the* causes for any effects.

This objection, like others, fails to distinguish Hume's aims in analyzing causation *simpliciter* from the quite different objectives of those who analyze causal *explanation*. As we have previously noted, Hume is analyzing the causal relation, not the language of "cause" and not the structure of causal judgment. There exist many prudential, scientific, moral, legal, and historical reasons for citing as causes some particular links in causal chains, while excluding other links. Our purposes in doing so are usually those of explanation and accountability (the determination and ascription of responsibility). Such reasons, and their governing principles of selection, have been appropriately analyzed in the accounts of causation offered by Collingwood, Hart and Honoré, Gasking, Gorovitz, Hanson, and many others. But from the fact that we isolate in justifiable ways certain links or causal conditions, while excluding others, it would be an egregious *non sequitur* to infer that there are no other links. The need to account for these links is no doubt one of the main reasons Hume introduces the contiguity criterion.

The distinction between causes and conditions first emerged in the literature of causation in order to distinguish not only causally relevant conditions from causally irrelevant ones, but also to distinguish conditions that are *merely* causally relevant from *the* cause, where "the cause" judgments are determined by principles of explanation and accountability (including "the cause" judgments in history, "the cause" judgments in law, etc.). Even Collingwood, an ardent devotee of this method of analyzing causation, points out that our explanatory purposes determine which links in the chain of causal events can properly be cited, *except* where we have in mind the scientific or Humean "sense" of causation (as distinct from its practical senses). In this case Collingwood agrees that the connections are "tight" and nonrelative. He even argues that *actio in distans* is non-

sense in this (Humean) sense of "cause" and that it is perfectly consistent to say that most of our causal *judgments* are governed by explanatory purposes while at the same time insisting that there exists a chain of contiguous causes.[12] This unexpected defense of Hume seems to us essentially correct.

Unfortunately not all of Hume's opponents are so agreeable as Collingwood. Norwood Hanson has developed a position that, if correct, would invalidate the account of causal chains underlying our defense of the contiguity criterion. We turn next to Hanson's arguments, for it is with them that the illicit assimilation of issues surrounding causation and contiguity to those involving causal explanation reaches its contemporary apogee. While we shall reserve a more extended discussion of causal explanation and its relation to causation *simpliciter* to Chapters 7 and 8, it is important to make clear at this juncture how the Humean views the general relation between these two matters.

IV

Hanson directly links Hume's epistemology to both the criterion of contiguity and the causal chain account.[13] He argues that Hume and his followers make major mistakes in conceiving of causes and effects as chains of sequential events and in requiring that cause and effect be logically distinct, individually describable items. Hanson argues that a close look at actual causal language reveals it to be "theory-loaded." His point is that the concepts used to identify an item as a cause or as an effect of a certain type tacitly incorporate semantic connections, which presume a background of theory, between any cause and effect items of that type. Hanson holds that, without background knowledge of the linkage, no request for an effect item would be intelligible.

Hanson points out that in statements such as "The scar on his arm was caused by a wound he received when thrown from

12. R. G. Collingwood, *An Essay on Metaphysics* (Oxford: Clarendon Press, 1940), pp. 304–7, 313f. A substantially similar point is made in Hume's spirit by C. J. Ducasse, in " 'Cause' and 'Condition,' " *op. cit.*, pp. 239f.

13. Norwood Hanson, *Patterns of Discovery* (Cambridge: Cambridge University Press, 1958), Chapter 3, "Causality." (Cf. also Hanson's earlier article, "Causal Chains," *Mind* 64, pp. 255ff.)

his carriage," an effect can be understood only in terms of its cause. "Wound" is an explanatory word, and "scar" denotes the explained item. To see something as a scar is already to diagnose it through at least an embryonic knowledge of pathology. The identification itself, says Hanson, commits one to a causal judgment. In other contexts these words might function differently; and in the present context other theory-loaded concepts might provide an explanation of the scar. Hanson proposes that there are as many *causes* of the scar as there are *explanations* of it. Which word is a cause-word and which an effect-word is determined by a specific context of explanation. "Causes certainly are connected with effects," says Hanson, "but this is because our theories connect them, not because the world is held together by cosmic glue."[14]

He ascribes to the chain analogy a pervasive influence affecting the central issues in the analysis of causality. Specifically, the analogy's alleged implications include the following: (1) it suggests that causal relations can be detected by "normal vision" independent of theory; (2) it gives singular sequential occurrences (to which causal chains exclusively apply) an unwarranted place among the topics of scientific inquiry; (3) it leads us to misunderstand the role of theories and theoretical notions in the detection of causes; (4) it fails to accommodate differences in "theoretical level" between a cause and its effect; and (5) it obscures a continuum of theoretical "richness" that moves from higher to lower levels in a causal hierarchy. We think that the notion of causal chains is innocent of these alleged crimes; but clearly the charges deserve careful examination.

Hanson first alleges that Humean causal chain explanations are unsatisfactory because they make causes out to be "visual data *simpliciter*": "The chain model encourages us to think that only normal vision is required to be able to see" a causal connection, while in fact causes and effects "are not simple, tangible links in the chain of sense experience. . . ."[15] Hanson nowhere substantiates this charge, and the question remains open whether there is such a connection between causal chaining and normal vision. Hanson's "normal vision" theme may reflect

14. *Ibid.*, pp. 54, 59.

15. *Ibid.*, p. 54.

oversimplified treatments of causation in terms of pairs of events, taken one pair at a time. But these interpretations are not committed to the chain analogy, nor is the chain analogy committed either to isolated pairs or to explication in terms of "normal vision." For example, in order to explain why an elastic gas-filled container expands on heating, one recounts a chain of events, one that includes items quite outside the reach of "normal vision" (molecules, in this case). Even if causal chain accounts were taken to imply that all causal connections are to be appreciated by an analogy with the connections displayed in paradigm cases of observable causal relations, such as the collision and recoil of billiard balls, Hanson's original charge would not follow.

Hanson wants to show that the alleged reliance of the chain analogy on the view that causes and effects are visible data is a defect. He thinks it obscures the fact that "what we refer to as 'causes' are theory-loaded from beginning to end. They are not simple, tangible links in the chain of sense experience, but rather details in an intricate pattern of concepts."[16] Literally taken, Hanson is saying that *events,* the relata of causal relations, are "theory-loaded" and that events are "details in an intricate pattern of concepts." He must mean that the *terms* in which a causal explanation is offered or the terms in which a causal relation is expressed are theory-loaded and are details in an intricate pattern of concepts. But if this interpretation of his account is correct, his larger argument fails. One can hold his conceptual theory without surrendering the view that causal relata fall into chain-like sequences that causal explanations describe. We shall return to this problem in Chapters 7 and 8.

Another of Hanson's charges is that chain-like accounts are suited only to singular occurrences, to what he calls fortuitous accidents. "The chain analogy," Hanson says, "is appropriate only where genuine causal connexions cannot be expressed." This is another *non sequitur.* Even if Hanson were correct in claiming that the analogy works only when there exists "a series of striking accidents," this contention would not entail that the causal chain model cannot express genuine causal relations and explanations. Accidents themselves are the results

16. *Ibid.,* p. 54.

of perfectly genuine causal connections and have equally genuine causal explanations, both for ordinary observers and for scientists. (Consider Hanson's own remarks about the work of Kepler, Boyle, Faraday, Röntgen, and Curie.)[17]

Hanson also charges that the causal chain analogy, partly because of its alleged reliance on visible data, obstructs us from appreciating the role of theories in the detection of causes: "Galileo can say what causes [the clock] to do what it does, because the blind Galileo has . . . a knowledge of horological theory. Though the apprentice has what Galileo lacks, normal vision, he cannot detect the cause of the clock's motion."[18] This charge is no more telling than the others. Whether theory would provide Galileo with an advantage in detecting every sort of cause is doubtful; but let us admit that his horological notions enable him to detect a cause not detectable by his apprentice. It hardly follows that Galileo's findings cannot be expressed in a chain-like account. Nor does it follow that if we express his findings in a chain-like account we shall be obstructed from appreciating the role of Galileo's theoretical insight in detecting the cause.

Hanson also complains that the chain analogy fails to accommodate the difference in "theoretical level" between a cause and its effect. Hanson says that causal connections can only be expressed in languages that are "many-leveled" in their explanatory power. But what is a "level" in this context? Suppose e_1 is on a different theoretical level from e_2, which e_1 causes. In turn e_2 may be a cause of e_3. Does this fact elevate e_2's theoretical status? If only two levels are allowed, does it follow that e_2 is on the same level as e_1, or that it is both on that level in one context and not in another? If the latter, then presumably Hanson would not reserve a higher, more exclusive status for e_1 except in contexts where it is the cause-event. Perhaps in his view there is a general hierarchy of levels to which events are assigned, with cause-events always assigned to a level higher than the effects to which they directly relate—the difference being that causes explain effects, but not the other way around. Alternatively, there may be such a hierarchy for all the types

17. *Ibid.,* pp. 59 and 190, n. 3.
18. *Ibid.,* p. 59.

of events within the scope of a given theory. As they stand, both of these suppositions seem consistent with the chain analogy.

Causal relata, Hanson supposes, are always hierarchically ordered: events on the causal level can only be described in a language theoretically richer than events at the effect level. Consider complex servomechanisms and feedback loops. These organic, electronic, or mechanical systems are composed of causes and effects that can satisfy Hanson's hierarchy requirement only on pain of contradiction. In such systems e_1 causes e_2, which causes e_3, where e_1 and e_3 are not the same event, but are identified and described in a language of identical theoretical richness. On Hanson's view e_3 is at once on the same theoretical level as e_1 and below it, a description that is plainly nonsensical. Consider a specific mechanical example, an account of the automatic control of a steam engine:

> One of the oldest devices for automatic control is the governor . . . invented by Watt (1788). When the engine runs too fast [event e_1], balls [attached to the drive shaft] move outward [event e_2], and by doing so they tend to close the throttle [event e_3], thus slowing down the speed of the machine [event e_4]. And when the engine runs too slowly, the balls tend to open the throttle.[19]

The types of events in this example—e_1 . . . e_4, connected in a feedback loop—can be represented as linked in a causal chain. Such applications of the chain analogy suffice to counter Hanson's allegation that the chain model fails to accommodate the fact that there is always a decline in theoretical richness as we move along a causal series. There simply is no such fact. In our example there are genuine causal connections leading from e_1 to e_4. But temporal priority aside, there is no hierarchy in which e_1 is richer or higher than e_4. Theoretically e_1 is the same type of event as e_4; they both amount to changes in the rate of revolutions per minute of the drive shaft. Moreover, returning to an earlier point, the causal chain explanation of the self-regulation of the engine is not an explanation of a merely singular or fortuitous occurrence.

Hanson's charges against causal chains largely rest on their alleged connection with Hume's ideas/impressions empiricism.

19. Mario Bunge, *Causality* (Cambridge, Mass.: Harvard University Press, 1959), p. 154.

If our discussion in Section II is accepted, then Hanson's accusations could hardly be correct. In that section causal chains were cited, together with what Hume calls "second" and "secret" causes, in order to show how Hume's claims about contiguity can be separated from and preserved against objections that wed these claims to his strictly empiricist accounts of language and knowledge. By showing in this section that arguments such as Hanson's should give us no pause, we further support the spatial contiguity condition as Hume originally offered it.

We turn now from the spatial to the temporal contiguity criterion, which will lead directly to a consideration of Hume's succession criterion.

V

Hume commonly refers to causes and effects both as objects and as events,[20] but even when he uses the language of objects it is easy to interpret his referents as events. (Cf. Chapter 7 for a fuller discussion of events as the relata of causation.) Presumably such events take time and are divisible into earlier and later stages. As normally conceived, time is a continuous and not a discontinuous magnitude in which events occur. Because events take time, they have duration, do not occur merely instantaneously, and are infinitely divisible without termini unless there are discontinuous atomic causal units.[21] The question we must now consider is whether earlier segments of cause-events are either less productive of effects than later segments, or perhaps not parts of the cause at all. Are we to say that an event

20. Cf., e.g., EHU, Sec. 59: "When any natural object or event is presented, it is impossible . . . to discover . . . what event will result from it." In the *Treatise* Hume even speaks of "bodies, motions, or qualities" as causes (88). That he is indifferent to which terms are used is obvious from his mixing of categories in the same passage. For example: "[The mind must] imagine some event, which it ascribes to the object as its effect" (EHU, Sec. 25).

21. Hume does defend a doctrine of "indivisible parts" of space and time, though these arguments are weak and hard to understand. The temporal discontinuity thesis would now be almost universally rejected by philosophers; but, as Ducasse points out, their claims are *a priori* hypotheses, and one could assume (*a priori*) a discrete time series, as Hume apparently does (cf. T, 29–31; EHU, Sec. 125). See Ducasse's comment in *Causation and the Types of Necessity*, p. 45n. We shall eventually show that nothing of importance turns on these arguments.

is a real cause only if it exists in (and perhaps perishes in) the instant directly adjoined to the instant inaugurating the effects? If so, is the real cause itself divisible into earlier and later stages? If not, do we ever experience real causes?

Hume provides no direct answers to these questions. He does at one point say that "extended things" are contiguous *by degrees* and that this idea is one which "custom and reflection alone make us form" (T, 235). This remark is obscure. If Hume means to endorse a looser sense of contiguity, meaning more or less near by, he thereby weakens his position so severely that the only important matter is whether cause and effect are sufficiently proximate that the imagination is able to make a connection. This conclusion would be tantamount to jettisoning contiguity as a necessary condition of causation, for it would permit temporal gaps between a cause and its effect.

Let us suppose, however, that Hume means strictly what he elsewhere says and so accepts the strong rather than the weak sense of contiguity, viz. that there can be no interval between a cause and its effect. One reason sometimes proffered in support of this claim is that if cause and effect were not contiguous, some factor could intervene and prevent the effect, even though "the cause" had occurred. Cause and effect must, then, individually represent the latest and the earliest respective segments of two processes, segments that yet occur *at the same instant;* or, following the interpretation we have been developing, the two causally related events must at least be connected by a chain of events standing in this temporal relation. Presumably this conclusion is required because point-instants are not stretches of time but rather are the durationless, indivisible limits of time-stretches. Since the series of point-instants is dense, there exists an infinite number of instants between any two instants. Accordingly, in order to avoid the problem of temporal gaps, it must be maintained that, at a minimum, contiguous causes perish and their effects begin in the *same* instant. That is, the terminal instant and the commencement instant must be identical.[22]

22. This analysis of causation and time is explored, but not necessarily endorsed, by Bertrand Russell, "On the Notion of Cause," in *Mysticism and Logic* (New York: Doubleday, 1917), pp. 178–82; C. J. Ducasse, *Nature, Mind, and Death* (LaSalle, Illinois: Open Court, 1951), pp. 133ff; and W. Kneale, *Probability and Induction* (Oxford: Clarendon Press, 1949), pp. 62–64.

But if the Humean were to take this route, he would have to confront its damaging implications for the criteria of contiguity and succession. Some philosophers have argued on virtually identical grounds that causes and effects occur simultaneously—not successively, as Hume requires. These philosophers first point out that in the familiar example, a billiard ball does not move until the moment it is hit by another. They claim that nothing that happens prior to the moment of impact is in fact *the cause* of the effect, even if it is causally relevant; and they conclude that all causal relations must so be analyzed. This thesis is generally supported by the following line of thought, which we shall call the *Simultaneity Paradox*:

(1) An effect takes place only at the instant the final condition C_f of a jointly sufficient set of conditions occurs.
(2) If there is the slightest interval T between occurrence C_f and the effect, then there must be some other condition C_n still to take place after C_f (in which case C_f is not the final condition at all). Otherwise: (a) the effect would occur immediately upon the occurrence of C_f (in which case there is no intervening period T); (b) something might occur in the environment to prevent the effect during T (in which case C_f is not a causal condition).
(3) Therefore, cause and effect must be perfectly simultaneous.[23]

This argument makes it increasingly difficult to differentiate cause from effect. Suppose, for example, that what causes a downward hurtling beer stein to break is simply its final impact with the floor. If this latter event is the only one cited, and both the owner's inebriated and somnolent condition and the distance of the fall are ignored, we not only fail to adduce a relevant cause for purposes of explanation, we seem to achieve nothing beyond designating the effect itself (breakage on the floor). This conclusion is even clearer in cases such as cutting

23. The argument, as we have stated it, seems to be held by: Richard Taylor, "Causation," *Monist* 47 (1963), pp. 311–12; William H. Riker, "Causes and Events," *The Journal of Philosophy* 55 (March 1958), pp. 281–91; and Russell, *op. cit.* Unfortunately, Russell's analysis is complicated by the fact that he is operating with a definition of "cause and effect" that he rejects. The argument is carefully analyzed by Ducasse, *Causation and the Types of Necessity, op. cit.*, pp. 44ff.

cheese by moving a knife, where the terminal point of one event seems identical with the starting point of another.

Hume would certainly be dissatisfied with this example and with the above conclusion (3). To endorse such an argument would apparently be to contradict his claim that successiveness is a necessary condition of causal relatedness. Accordingly we must first understand Hume's argument for succession before we will be in a position to assess the paradox as an objection to the temporal contiguity requirement.

VI

What position is Hume defending with the argument that it is "absolutely necessary" that an effect succeed its cause (T, 75f)? He holds that *experience* "in most instances" confirms that temporal succession is a necessary condition of causation, and he provides a complex metaphysical argument in support of this claim. This argument does not directly establish the temporal precedence of causes. Rather, it is a nullifying argument pretending to show an absurdity in the supposition that effects are contemporaneous with causes:

> 'Tis an establish'd maxim both in natural and moral philosophy, that an object, which exists for any time in its full perfection without producing another, is not its sole cause; but is assisted by some other principle, which pushes it from its state of inactivity, and makes it exert that energy, of which it was secretly possest. Now if any cause may be perfectly co-temporary with its effect, 'tis certain, according to this maxim, that they must all of them be so; since any one of them, which retards its operation for a single moment, exerts not itself at that very individual time, in which it might have operated; and therefore is no proper cause. The consequence of this wou'd be no less than the destruction of that succession of causes, which we observe in the world. . . . For if one cause were co-temporary with its effect, and this effect with *its* effect, and so on, 'tis plain there wou'd be no such thing as succession, and all objects must be co-existent. (T, 76)

This argument is atypical of Hume, for it is both obscure and ill-arranged. It must be reconstructed and analyzed before any question of its merits can be broached.

The structure of the argument is that of a *reductio ad absurdum* purporting to prove that if it were possible for even a single event to be both truly a cause and perfectly contemporaneous with its effect, then any cause that did not act contemporaneously with its effect would not be a proper or sole cause, for any proper cause acts as soon as possible. The conclusion is that all causes, under such an assumption, would be contemporaneous, which is absurd because all temporal succession would thereby be eliminated. The argument is divisible into two stages, the second of which is dependent upon the important conclusion reached in the first.

Stage One:
Consider first the idea of *imperfect contemporaneity* of cause and effect. Here cause and effect overlap, the cause being partially prior in time. According to this notion certain causes, at the peak of their strength, exist for some duration unaccompanied by their alleged effects. Some degree of succession is admitted, because effects occur later than some phases of their causes. But, according to an established maxim, such precedent objects are not *sole* causes. Indeed, they are not causes *at all* unless assisted from their inactivity by some additional causal condition or else aided by the removal of some retarding condition so that they act *at that particular time* on the effect and not previously. Only then, when the effect is being produced, would they become, properly speaking, causes. (All preceding conditions, if any, are noncausal.) Hence, if causes are contemporaneous with their effects, they are, *qua* causes, perfectly contemporaneous.

Stage Two:
Consider then the idea of *perfect contemporaneity*. Any object that is properly a cause (following Stage One) exerts its causal influence only at the instant when it is actually producing the effect; i.e., it brings its effect into existence nonsuccessively. Accordingly, all events linked in a whole causal chain are perfectly instantaneous, for all possibility of succession has been cancelled by their perfect contemporaneity. This conclusion is obviously absurd, since we observe the succession of causes and effects.

While this two-stage outline clarifies Hume's argument, the strategy behind the argument is still unclear. The argument is a *reductio* best stated in the form of a dilemma where an Axiom is presupposed:

Axiom ("Established Maxim"): Sole or proper causes act as soon as is possible.

Suppose C: "One or more causes are contemporaneous."

Then, either

(A) Causes are perfectly contemporaneous with their effects.

or

(B) Causes are not perfectly contemporaneous (and exist for some period during which they are unaccompanied by their effects).

If A, then all causes and effects are contemporaneous and there is no succession, which is plainly absurd.

If B, then the cause's duration unaccompanied by its effect is noncausal (and, if the cause is at full strength, would require assistance to become causal). This means it is a proper cause only when the effect is actually being produced, in which case it is perfectly contemporaneous and reduces to A.

Therefore, one must either accept the absurd conclusion of Hypothesis A or accept precisely the same absurdity by following B.

And therefore, not-C: It is not the case that some causes are contemporaneous. Hence, all causes are successively related to effects.

Hume supposedly proves the necessity of succession by assuming C (contemporaneity) and deducing the false statement A. Accordingly, he thinks it best to recognize the intrinsic absurdity of the very notion of contemporaneous causation and to exclude it as an element in the *idea* of causation.

The "established maxim" axiom is the locus of any remaining opacity in Hume's argument. This maxim leads him to conclude that sole or proper causes act to produce effects *as promptly as is possible in succession.* But what is the sense of "succession" in this argument? The term appears to be restricted quite rigidly in meaning; and the meaning involved renders the argument similar to the previously examined *contiguity* argument against temporally remote, noncontiguous causation. In both cases, if an apparent cause is retarded but acts later or remotely, then Hume claims its prior action is not, properly speaking, a cause of the effect-event. The reason is that there is some interval in the chain during which the cause is "retarded" from producing

the effect (efficacy being contingent upon the addition or removal of other conditions). The term "succession" thus refers strictly to the *noncontemporaneity of events where there is interval-less contiguity between the events.* We shall hereafter refer to this relation of contiguity and succession between the events as "conjunction," for it is precisely the relation that Hume has in mind when he adds the element of invariability and uses the favored term "constant conjunction."

It is not surprising that in Hume's philosophy the notion of temporal succession entails that of temporal contiguity. The separate maxims cited in support of the criteria governing these notions are strikingly similar. The first maxim, supporting contiguity, says "nothing can operate in a time . . . which is ever so little remov'd from those of its existence" (T, 75). The second maxim, supporting succession, says that any cause "which retards its operation for a single moment, exerts not itself at that very individual time" (T, 76). Hume appends to the first the note that "whatever objects" are causes are not temporally removed, and he adds to the second that anything so retarded is not a "proper cause." The locutions "retarded for a single moment" and "ever so little removed" both indicate that there must not be an interval between a cause C and its effect E during which intervening conditions either could prevent E or could themselves serve as causes of E—hence denying the remote object any real causal efficacy. The presumption in each case is that a set of conditions is causally sufficient, and thus the cause of E, only if there is no temporal interval between that set and E.

This clarification of the meaning of the terms "contiguity" and "succession" nonetheless leaves our account deficient. The two terms are not *identical* in meaning, and their differences remain obscure. We must now return to the *Simultaneity Paradox* as an objection to Hume in order both to assess its power and to understand these differences in meaning.

VII

Bertrand Russell and Richard Taylor have exploited the *Simultaneity Paradox* to argue that causes cannot be temporally contiguous with their effects. Russell's argument, the more rigorous of the two, is stated in the following way:

> No two instants are contiguous, since the time-series is compact; hence either the cause or the effect or both must . . . endure for a finite time. . . . But then we are faced with a dilemma: if the cause is a process involving change within itself, we shall require (if causality is universal) causal relations between its earlier and later parts; moreover, it would seem that only the later parts can be relevant to the effect. . . . Thus we shall be led to diminish the duration of the cause without limit, and however much we may diminish it, there will still remain an earlier part which might be altered without altering the effect, so that the true cause . . . will not have been reached. . . . [On the other hand, it cannot be accepted] that the cause, after existing placidly for some time, should suddenly explode into the effect, when it might just as well have done so at any earlier time, or have gone on unchanged without producing its effect. This dilemma, therefore, is fatal to the view that cause and effect can be contiguous in time.[24]

The moral Russell and others apparently draw is not that all causes and effects are contemporaneous. Rather, they maintain that Hume's criterion of contiguity and his two assumed axioms are so rigid that, when conjoined with normal assumptions about the continuity of time, they entail that all causes and effects are either contemporaneous or separated by a finite time-interval—the very possibilities that Hume denounces as absurd.

The *Simultaneity Paradox,* however, contains conceptual presuppositions rendering it innocuous as an argument against Hume. The term "instant" as it appears in the argument presumably means a durationless point or indivisible slice of time in which no event, however infinitesimally small, could occur. Instants in this sense cannot be said to be contiguous, as Russell correctly observes, because there is an infinity of instants between any two instants. This much of the argument is definitional, and may be accepted without reservation. But it follows neither that *events* do not take time (they do, by definition—just as instants do not), nor that events cannot be contiguous *at* an instant (they obviously can be), nor that any two events cannot be both contiguous and successive if the first begins at instant t_1 and ends at instant t_2, while the second begins at t_2.

24. Russell, *op. cit.,* pp. 184f. Cf. Taylor's argument by examples, *op. cit.,* esp. pp. 311f. Russell's argument continues to be influential. J. R. Lucas, for example, seeks to avoid Hume's account of contiguity in time on grounds of the "impossible paradoxes" demonstrated by Russell. "Causation," *Analytical Philosophy,* Second Series, ed. R. J. Butler (Oxford: Basil Blackwell, 1957), p. 38.

If this account of temporal conjunction is accepted, then the *Simultaneity Paradox* vanishes. The paradox can be resolved in the following way: Causes are events (as Russell rightly supposes), and events take time (by contrast with instants, which do not); the succession of causes and their effects in the time order occurs when the instant of the cause-event's termination is temporally *identical* with the instant of the effect-event's commencement. Cause and effect do occur at the same time in the sense of "at the same instant," and in this respect they are simultaneous; but they do not each occur in the same temporal interval, and in this respect they are nonsimultaneous.

While this line of argument seems sufficient to defeat the *Simultaneity Paradox,* as sketched in Section V above, it is not sufficient to defeat Russell's extended position. Russell goes on to argue that, because the duration of the "cause" can be diminished without limit (an early and alterable part remaining *ad infinitum*), neither the true cause nor the true contiguity relation is in principle reachable. But this argument has its own problems, including certain conceptual presuppositions that are fatal. Russell's view assumes that there are events (as when he speaks of "a process involving change within itself"); yet one consequence of his argument is a denial that events exist. Consider the following paraphrase of the argument, where "event" is substituted for "cause": "If the event involves changes within itself, we shall require (if time is universal and continuous) earlier and later parts of the events—parts that are themselves events. Since the later parts are needed to complete the events, yet are themselves infinitely divisible into earlier and later parts, there always will remain an earlier part required for the later part, and therefore events cannot in principle attain completion." On Russell's own grounds, then, the duration of an event is always diminishable so that an earlier part could be altered in such a fashion that the event could not be completed. It follows that we can never have true events, just as Russell thinks it follows that there are no contiguous cause-effect pairs—and, as part of the larger argument in his essay, that there are no causes.

As we note in Chapters 3 and 6, there may be quantum-mechanical grounds for denying that causes exist: sheer indeterminism will obliterate the distinction between causal sequences and accidental ones. But we cannot imagine what

argument would show that there are no events with beginnings and endings. We again follow Hume: the *experience* of events in succession provides our primary grounds for rejecting this extended part of Russell's argument—though we would agree that if there are no events, then we have neither refuted Russell nor successfully defended Hume. The assumption that events exist seems to us minimal in the present connection; but it nevertheless is an obviously important assumption. If events are not infinitely incompletable, then neither are causes (being events), and Russell's argument fails.

Our position enables us to see not only the deficiencies of the *Simultaneity Paradox* but also why "temporal contiguity" and "temporal succession" are not identical in meaning in Hume's philosophy, even though they are broadly similar. In using the term "contiguous" and explicating its temporal meaning as "not in time ever so little removed," Hume means that two contiguously related events occur at the same instant in their respective last and first phases. The relation of temporal contiguity, then, is one kind of relation of identity—viz. overlaps of time, or partial simultaneity. This meaning is not shared by the term "succession." Hume denies that there can be "retardation for a single moment" and yet insists that the cause-event and the effect-event are not contemporaneous. This specification seems to entail that despite being contiguous in their respective last and first phases (a logically necessary condition of their being immediately successive, in Hume's sense, though not logically sufficient), the events take time, and one has a "*priority* in time" over the other. This difference in meaning resolves the problems mentioned at the end of Section VI.

While our interpretation does introduce a distinction between contiguity and succession not specifically mentioned in Hume's text, we do not know how to understand either his arguments or why he would think contiguity different from succession unless this distinction marks the difference. Moreover, the interpretation is consistent with Hume's language and his examples. In explicating contiguity he speaks of the cause and effect as having "touched" one another where "there was no interval betwixt them." In the same passage he says the "motion, which was the cause, is prior to the motion, which was the effect" (A, 12). Since motions are events that take time, Hume's choice of words conforms to our account of his meaning. But most importantly this construal of his theory renders his arguments impervious to the *Simultaneity Paradox*.

VIII

A surprising conclusion follows from our findings. Far from Hume's argument being thoroughly antagonistic to the *Simultaneity Paradox,* the two arguments share certain conclusions. Hume argues for two main theses: (a) a cause cannot be perfectly simultaneous ("co-temporary") with its effect; and (b) any temporal interval whatever between cause and effect is a delay that violates the established maxim(s). Thesis (a) requires event-nonsimultaneity and preserves temporal succession, while (b) states a thesis found in the *Simultaneity Paradox*.

Hume's contentions, however, are not paradoxical in the way those of the *Simultaneity Paradox* are, despite their shared thesis. Indeed Hume's criteria of contiguity and succession conform to many common views about causation. This feature of Hume's account is clearly expressed through an example and explanation offered by R. G. Collingwood:

> If I set fire to one end of a time-fuse, and five minutes later the charge at its other end explodes, there is said to be a causal connexion between the first and second events, and a time-interval of five minutes between them. But this interval is occupied by the burning of the fuse at a determinate rate of feet per minute; and this process is a *conditio sine qua non* of the causal efficacy ascribed to the first event. That is to say, the connexion between the lighting of the fuse and the detonation of the charge is causal in the loose sense, not the tight [Humean] one. If in the proposition "*x* causes the explosion" we wish to use the word "cause" in the tight sense, *x* must be so defined as to include in itself every such *conditio sine qua non*. It must include the burning of the whole fuse; not its burning until "just before" that process reaches the detonator, for then there would still be an interval to be bridged, but its burning until the detonator is reached. Only then is the cause in sense III [Hume's sense] complete; and when it is complete it produces its effect, not afterwards (however soon afterwards) but then. Cause in sense III is simultaneous with its effect.
>
> Similarly, it is coincident with its effect in space. The cause of the explosion is where the explosion is.[25]

25. Collingwood, *op cit.*, pp. 314f.

Collingwood oversteps his premises by arguing for simultaneity and coincidence in space. As we have seen, it makes a major difference how one analyzes "*when* the cause is complete." Otherwise the passage stands.

If our contentions throughout this chapter are correct, then Hume's insistence on the necessity of contiguity and succession in the causal relation seems unrefuted, and his arguments in favor of these claims undamaged. This conclusion further supports positions discussed in earlier chapters. Hume relies heavily on the description of causes and effects in purely spatiotemporal terms to substitute for the dramatic terms "necessity," "power," "force," "impact," "collision," etc. If the latter terms can be reduced to purely spatiotemporal ones, Hume's opposition to necessity theories and his reliance on the relation of constant conjunction are strengthened. We do not conclude, however, that every major problem connected with causal contiguity and succession has now been resolved. Hume's claims require the adoption of what he described as "established maxims of natural philosophy," maxims he never troubles to substantiate. Without them he cannot infer that no causes are simultaneous with their effects merely from the falsity of the claim that all causes are simultaneous with their effects. Furthermore, we may question Hume's argument that if all causes and effects were simultaneous there would be no succession at all. His argument has not excluded the possibility of the noncausal, temporal succession of events that indeterminism, for example, would allow.

Such problems raise the larger issue of how time order and causal order are related. These issues are especially important for Hume because so many philosophers have taken him to believe that causal priority or directionality is determined exclusively by temporal priority. If this received interpretation is correct, then Hume's principles preclude some types of simultaneous causation, and Hume is apparently committed to the independence of time and the temporal order from causation and the causal order. We think there are good reasons for rejecting this understanding of Hume. But since in the next chapter we treat exclusively the problem of the direction of causation, this interpretative issue can temporarily be postponed.

6
The Nature of Causal Directionality

ONE FEATURE of causation upon which almost all philosophers have agreed is the asymmetrical character of the relation: if the singular causal claim "*a* causes *b*" is true, then it must be false that *b* causes *a*. Philosophers have not agreed, however, on what constitutes this directionality or asymmetry, or how it can be detected. Hume seems to have claimed that causal directionality consists wholly in the temporal priority of the cause to its effect. The last chapter examined the arguments he offered for this claim, and this chapter takes up a number of contemporary alternatives to his account.

These alternatives have been developed by Douglas Gasking, G. H. von Wright, J. A. Aronson, J. L. Mackie, and David Sanford. Their accounts of causal priority reflect a range of conceptions of causality widely different from Hume's. In assessing them we must consider whether they surmount problems that Hume's treatment of causal priority allegedly cannot overcome, and whether they solve other problems better than Hume's theory does. Accordingly, before turning to these recent accounts, we will present general criteria of adequacy for alternatives to Hume's temporal priority condition. We argue in the early and middle sections of this chapter that the several philosophical accounts we consider either fail to satisfy these criteria or give incorrect answers about particular cases of causal directionality. In the later sections we reexamine Hume's original account and advance a novel suggestion about its implications and defensibility.