

# **Causal Explanation and Historical Meaning: How to Solve the Problem of the Specific Historical Relation between Events**

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## I. Introduction

Histories are not mere chronicles of events, or so emphasizes Arthur Danto in his book *Analytical Philosophy of History*. Even a so-called Ideal Chronicler who knows whatever happens the moment it happens, and has the gift of instantaneous transcription, would be unable to tell a history because he would be unable to construe the historically relevant relations between the events. Nevertheless, he can describe the course of each event's occurrence in full detail. The issue Danto is pointing out through his fictional Ideal Chronicler and his concept of narrative sentences – this means, sentences in which one event is described from the perspective of another temporally later event – is obviously relevant to the problem of explanation in history in that past events have a property, which we can call their historical meaning, and this historical meaning can change throughout the course of events – simply because of what happens afterwards. And this fact, the fact that the historical meaning of past events can change over the course of time, challenges the thesis that historical events can have a causal explanation because if an event's historical meaning can change in virtue of what happens afterwards, then it seems to be that we have to accept the possibility of backward causation if we want to insist that this historical meaning is a real property, which is causally determined and therefore can be causally explained. Now, some philosophers are convinced that some kind of backward causation cannot be conceptually excluded; I think, however, that the relevance of causal explanations in history could not and should not depend on the controversial possibility of backward causation.

Therefore, my goal is to show that the historical meaning of past events can be causally explained without supposing backward causation, but instead by revising or expanding the concept of counterfactual causality. First, I will discuss Danto's well-known example of two scientists who are supposedly formulated the same scientific theory independent of each other and with great temporal distance between their respective actions. Second, I attempt to clarify the concept of a historical meaning by stressing the underlying problem in Danto's discussion, which in my opinion, is the distinction between the historical meaning of events on the one

hand and the semantic meaning of linguistic expressions and sentences on the other hand. In the third section, I argue for a counterfactual theory of causality assuming that these arguments are free of the particular problem of a specific historical connection between events that I am concerned with. Lastly, I will end by coming back to this problem and proposing how it can be solved by revising in two respects the traditional counterfactual analysis of causality proposed and developed by David Lewis.

## II. Danto's Scientists

Arthur Danto's example of the two scientists is set within the context of his discussion about the characteristics of an Ideal Chronic. An Ideal Chronic entails about every event every possible piece of truth and information which can be transcribed in the moment it happens. This means that the Ideal Chronic describes every event in full detail but without reference to earlier or later events. It represents, as you may put it, the happenings one by one over the course of time, including only the information that is true for the events in the moment that they occur. Such a Chronic is both very rich and very poor and it seems to be clear why a Chronicler's transcription of happenings cannot tell a history: Histories essentially represent the relations between events, describing events not one by one, but events as within their relations. It is exactly this essential property of histories that Danto's fictional Ideal Chronic cannot possess.

Danto's puzzling example of two scientists formulating the same theory independent of each other articulates these conceptual correlations: „Suppose, for example, that a scientist S discovers a theory T at t-1. S perhaps does not publish T. At some later time t-2, a different scientist S\* independently discovers T, which is now published and taken into the body of accepted scientific theories. Historians of science subsequently find out that S really hit on T before S\*. This need take away no credit from S\*, but it allows us to say, not merely that S discovers T at t-1, but that S *anticipated* at t-1 the discovery by S\* of T at t-2. This will indeed be a description of what S did at t-1, but it will be a description under which S's behaviour could not have been witnessed and it will be an important fact about the event which accordingly fails to get mentioned by the Ideal Chronic.“<sup>1</sup>

What is going on here? What is the problem and what has this problem to do with causality? The puzzling issue is the fact that the first event, the formulation of T by the first scientist, S, seems to acquire a new property, the property of being the anticipation of T, in virtue and only in virtue of the occurrence of a later event, namely, the formulation of T by the second

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<sup>1</sup> Danto 1965, p. 155/156.

scientist, S\*, at t-2. At t-1, when S discovers T, this act of discovering *is still* not an anticipation. It only *becomes* an anticipation when S\* rediscovers T. It is not an anticipation at t-1 because it also would have not been an anticipation at t-2 if S\* had not have rediscovered T at t-2. Because and only because S\* rediscovered T at t-2, the first event becomes an anticipation and therefore, it could not be an anticipation at t-1.

Does all this mean, however, that the past can actually change? And does all this mean that the second temporally later event is a cause or a kind of cause of the former event? Danto confesses that there is a sense in which we could say that the past is changing. However, what Danto explicitly wants to exclude is backward causation: „ ... there is a sense in which we may speak of the past as changing; that sense in which an event at t-1 acquires new properties not because we (or anything) causally operate on that event, nor because something goes on happening at t-1 after t-1 ceases, but because the event at t-1 comes to stand in different relationships to events that occur later.“<sup>2</sup>

Now, Danto's the discussion, as far as I understand it, starts getting rather complicated and very unclear. Danto formulates that there is no sense in which anything can in any way causally operate on past events. Yet he also says that it is possible that these past events form different relationships with events that occur later. How shall we understand this last assertion? What could these „different relationships“ be unless causal relationships if the past could change in virtue of these different relationships? Although Danto rejects the possibility of backward causation, he nevertheless introduces the distinction between necessary and sufficient conditions for events and contends that if a former event, E-1, at t-1 is a necessary condition for a later event, E-2, at t-2, then it follows that E-2 at t-2 is a sufficient condition for E-1 at t-1. However, in so far that such so-called conditions are really conditions *for events*, we have to understand them as factual conditions and that means we have to accept them as causal conditions. But this seems to suppose that we have two different concepts of causality in the discussion, namely, causal conditions and proper causes. Now, the question would surely be: What is the criterion to make this distinction? Danto does not formulate and therefore does not answer this question. He does emphasize instead the connection between such conditions and the level of description. And it is exactly this shift in Danto's discussion, the shift from the factual level and the question of whether the past itself can be changed, to the level of description which is, in my opinion, not coherent. To illustrate again, the relevant quotation in full detail: „A sufficient condition for an event may thus occur later in time than the event. We cannot readily assimilate the concept of cause to the concept of necessary and

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<sup>2</sup> Ibid., p. 155.

sufficient conditions unless we are prepared to say that causes may succeed effects. So it is difficult to suppose that E-2 *makes* E-1 happen. But at the very least it permits a *description* of E-1 under which E-1 could not have been witnessed and which, accordingly, could not have appeared in the Ideal Chronic.<sup>3</sup>

Danto is surely right to say that our descriptions of past events are becoming richer and richer over the course of time simply because of what happened afterwards. But the crucial question in his puzzling example of the two scientists is whether the earlier event, E-1, can really acquire new properties in virtue of the occurrence of E-2 at t-2. It is unquestionable and therefore, not very interesting that the truth of our description of E-1 as an anticipation of T hangs on the occurrence of E-2 at t-2. Simply, it would be false to describe E-1 as an anticipation of T if E-2 never happens. However, the interesting question is whether E-1 really gets into, as Danto himself puts it, different relations to later events, that is, whether E-1 really acquires new relational properties at the time of the occurrence of E-2.

Maybe it is a little bit unfair to accuse Danto of having confused the factual level with the level of description because it seems that all Danto wants to show with his puzzling example is that the Ideal Chronicler cannot use words that express causal relations. Causes, as he emphasizes, „cannot be witnessed *as* causes.“<sup>4</sup> Danto mentioned that David Hume pointed this out long ago. However, Hume’s argument for this contention is very different from the reason why the Ideal Chronicler is unable to use the word „cause“ or other synonymous expressions. Hume insisted that all what we can really observe are mere regularities; but the Ideal Chronicler who transcribes the occurring events instantaneously is even unable to describe regularities, whatever sorts of regularities there may be. And my crucial point is: all this leaves the question open as to how we can conceptualize the fact that past events can change their relational properties over the course of time and in virtue of the occurrence of later events.

### III. Historical and Semantic Meaning

„Being the anticipation of a later famous theory’ is, in my opinion, a typical example of the historical meaning of an event. Other examples are ‚being the final trigger of the war’, ‚being the first democratic election in this country’, ‚being the beginning of political disturbances’ or ‚being a great discovery’. I accept and want to defend the thesis that such historical meanings are real properties of events or are real properties of, more or less, complex connections of events. I also want to argue for the thesis that the historical meaning of an event is determined

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<sup>3</sup> Ibid., p. 155.

<sup>4</sup> Ibid., p. 157.

by the causal role that this event occupies. The causal role is in turn determined by the totality of the causal relations this event holds to other events, that is, by the totality of causes and effects concerning this event. Every event stands in at least some causal relations to other events. Thus, one can roughly say that the event's historical meaning is especially ample and important if this event is causally related to many other events and if these or some of these connections are temporally and spatially rather far-reaching. For example, the shooting of Archduke Franz Ferdinand in Sarajevo, considered as one trigger of the beginning of the First World War, surely has an important and decisive historical meaning exactly because its causal scope was so varied and far-reaching. If these shots can really be justified as a necessary but not solely sufficient cause of the First World War, then this event is causally responsible for a war that lasted for four years and was characterized by an until that time unknown extent of cruelty in warfare. That is, that the event's historical meaning simply consists in the event's causal relations.

This realistic thesis concerning the historical meaning of past events stands in sharp opposition to narrative constructions of the concept of history. Arthur Danto is sometimes considered to be a kind of mentor of such narrative constructions which Hayden White and Frank Ankersmit prominently hold. In my opinion, however, the metaphysical consequences of Danto's discussions about the concept of history and the problems of explanation in the science of history are far from being clearly antirealistic. The realistic picture I want to defend is at least compatible with Danto's view of a history.

Although Danto speaks of necessary and sufficient conditions for events itself on the one hand and at the same time of necessary conditions for events being correctly describable as causes on the other hand, he is, as I understand him, very conscious of the fact that descriptions depend on the occurrence of the events they are describing and not vice versa. He explicitly emphasizes that only the occurrence of E-2 from our example permits a description of E-1 as an anticipation of T. But what does this „permission“ of the description imply? Is it also adequate to say that the occurrence of E-2 itself makes the description of E-1 as an anticipation of T *true*? Nothing that can be observed or witnessed during the occurrence of E-2 would show that this event is a *rediscovery* of T. However, to describe E-2 as a rediscovery of T seems to be a precondition for describing E-1 as an anticipation of T. Only in relation to E-2 is E-1 an anticipation of T and vice versa: only in relation to E-1 is E-2 a rediscovery of T. This is so because ‚being an anticipation‘ and ‚being a rediscovery‘ are relational properties that imply causal relations, even if, as it is supposed in Danto's fictional example, the respective scientists do not know anything about each other and their respective theories.

This means that the truth of the description of E-1 as an anticipation of T depends not only on the occurrence of E-2, but also on the relation held between E-1 and E-2. 'Being an anticipation' is a property that is determined by the relational, which means, by the causal properties of the event possessing such a property. For 'being an anticipation' necessarily implies that there is a connection to another, different event. And how can we conceptualize this connection as anything other than a causal relation?

At this point you may object that I am simply stipulating that there is a real relation between E-1 and E-2 at all which is established by the occurrence of E-2. Wasn't this exactly the questionable issue in Danto's example? Narrativists surely would contend that there is no *real* connection, but that we, as historians, are only construing such a relation by describing the first event as an anticipation and the temporally later event as a rediscovery. I would contradict this. Suppose, for example, that no one in any way ever observed or witnessed the first scientist formulating a theory at t-1, which some hundred years later, after E-2 at t-2, becomes a published and famous theory. The first scientist's detailed notes lay for years undiscovered in a shed, which unfortunately, burns down many years before the second scientist formulated his theory. Nobody knows and nobody could ever come to know anything about the first scientist's pioneering work. It would nevertheless be perfectly true that he had achieved this pioneering work. That the theory's first formulation was an anticipation and that the second formulation of the same theory was a rediscovery is true independent of what we or anyone else know or could know about the two events. This means that the historical meaning of past events is independent of our descriptions or interpretations. Our descriptions do not construe any historical relations, but they do refer to such relations, which are determined by the causal relations of the respective events and exist independently of what we know or assert about these events or their relations. To reject this thesis is, in my opinion, tantamount to confusing the property of historical meaning, which is a property of events, with the property of semantic meaning, which is, of course, a property of linguistic expressions.

Until now I have said nothing at all about the concept of causality that I hold and want to defend. Therefore I will now address this issue before I return to the special problem of the connection between causal and historical relations.

#### IV. The Concept of Causality

The question of whether and in which sense causal explanations are relevant in the human- and social sciences have evoked controversial debates since the first theories in these sciences were developed. I have the impression that in the last years the significance of causal explanations has been gaining ground. Much of the former or still existing scepticism against the importance of causality in the human- and social sciences is justified with the characteristic that these sciences are mostly concerned with the explanation of human actions and that actions have special features, which leads to the consequence that they cannot be causally explained. Of course, the events in Danto's example of the two scientists also consist in actions, namely, the respective intentional formulation of a theory by two rational persons. I would contend that all historical events are action events because the concept of history is essentially connected with real possibilities, and this in turn, presupposes that historical events have an essential connection to the phenomenon of intentionality. However, time does not permit me to develop this line of argumentation in today's lecture. Before turning to the general problems concerning the concept of causality, it is nevertheless worthwhile to briefly discuss some of the main suspicions against the importance of causal explanations, which are provoked by the supposed characteristics of intentional actions. The first of these suspicions refers to the problem of regularity, the second to the question of whether causality consists in a kind of causal mechanism, and the third is represented by the so-called logical connection argument.

The problem of regularity has an overwhelming significance in the debate about the possibility of causal action explanations. The often emphasized objection here is that human actions may show some kind of regularities, but certainly not strict and lawlike regularities. It is said, that the behaviour of rational persons can be prognosed at least with some probability, but there is no possibility of a certain prediction. This objection, however, presupposes a specific concept of causality, namely, David Hume's view of causality as strict regularity. Hume has argued that causality is nothing more than regularity because if we are trying to observe causal relations, all that we can really observe are mere regularities between types of events. And these regularities must be strict or lawlike regularities because the criterion to distinguish between causal and, for example, temporal regularities in Hume's opinion is necessity. However, today even in the natural sciences, it is widely admitted that concerning natural events strict regularity also is a requirement which cannot be met by all types of events. In the philosophy of natural sciences, this admission does not have the consequence of rejecting the concept of causality altogether. Instead it provides a platform from which to develop new approaches that lay beyond Hume's contentions. This means that the discussions

in the philosophy of natural sciences are showing that the problem of regularities is a general problem, which does not impose any *special conceptual* problems on the explanation of actions.

The second objection is rooted in the intuition that causality is or represents a kind of blind mechanism being located on the deepest supposed level of reality, namely, on the physical level alone. The causal course of events is understood to be a mere course of unconscious happenings, whereas actions have reasons and are performed by persons who have desires, wishes and intentions. A. I. Melden, for example, has expressed this intuition by saying: „The agent confronting the causal nexus in which such happenings occur is a helpless victim of all that occurs in and to him.“<sup>5</sup> Donald Davidson responded to this claim with a kind of desperation: „Why on earth should a cause turn an action into a mere happening and a person into a helpless victim?“<sup>6</sup> Davidson suspects that Melden’s view implies a kind of doubling of the agent. He argues that although agency surely requires an agent, there are agentless causes, and that the states and changes of states in persons are exactly such causes. Melden, however, would not have been convinced by this critique. He would have insisted that precisely these states and changes in persons, which are causes, transform the agent into a helpless victim. I think that the only way that Melden’s concern can be rejected is by arguing that causality is no blind mechanism because it is no mechanism at all. What should a general causal mechanism consist of? To suppose the existence of such a mechanism is identical with the senseless attempt to search a cause for a cause. Of course, there are various kinds of ‚mechanisms‘, meaning causally efficacious properties, operating or functioning in various types of events at various levels of natural and mental phenomena. However, to describe such mechanisms in more or less full detail is nothing more than to redescribe the event itself and to describe it as a cause.

The third objection is also particularly connected with A. I. Melden’s name, but others have also supported it, for example, Georg Henrik von Wright.<sup>7</sup> The so-called logical connection argument asserts that there can be no causal relation between actions and their reasons because there is a logical connection between them and the existence of a causal relation presupposes that the relata of such a relation are logically independent from each other. It was often emphasized in the discussions about this argument, that it is far from clear how we should understand the respective claims of necessary logical connectedness or independence. I think, the underlying fault in this argument concerns the distinction between logical relations

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<sup>5</sup> Melden 1961, p. 129.

<sup>6</sup> Davidson 1980, p. 19.

<sup>7</sup> See von Wright 1971, p. 93 ff.



of concepts and essential relations of events. If there is a logical connection or interdependence between concepts, then it is nevertheless not the case, as the argument is supposing unspokenly, that the essential connection between the respective events or states covered by these concepts cannot be distinct from each other. I confess that actions are essentially connected with their reasons; moreover, I would say that actions are essentially connected with their intentions, which means, that every action is caused by a proper intention which is conceptualized as a distinct mental state. Essentially connected states or events, however, can nevertheless be temporally and spatially distinct and can therefore perfectly well occupy the roles of causes and effects. That the concept of action implies that every action has a reason, is only to meant to say that there can be no action without any reason. From this it does not follow at all that the reasons of actions cannot be causes.

I will now turn to the question of which view or theory of causality should convince us. And I want to stress one aspect of this question which, as far as I can see, is often underestimated in the debate: What is our intuition concerning causality? What is the generally or commonly supposed sense of the concept of causality? You may think that this approach to the problem is not very original or witty. However, I have the impression that the scientific discussions about the concept of causality are too much influenced by the special problems, efforts or requirements within the different sciences. The reason for my approach is not really that philosophy often starts with intuitions. The reason is that one can easily realize that our ordinary thinking as well as our ordinary language is overwhelmingly characterized by causal considerations and explicit or implicit causal expressions. The Philosophy of science should take this fact earnestly. This does not mean that we should reanimate an old-fashioned ordinary language philosophy, but instead means that we first of all have to understand the general and common sense of our concept of causality. The discussions on special scientific problems should draw on such a common understanding instead of ignoring it.

If the question is put in this way, there are two main competitors for an answer, namely, the regularity thesis and the counterfactual theory of causality. I think that other theoretical approaches, for example, probabilistic causality, the manipulation theory or the dispositional account, are all different forms of either the regularity or the counterfactual sense of causality. David Hume unintentionally pointed out these two possible senses in his famous definition of a cause: „... we may define a cause to be an object, followed by another, and where all the objects similar to the first are followed by objects similar to the second. Or in other words where, if the first object had not been, the second never had existed.“<sup>8</sup> Nowadays, there is

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<sup>8</sup> Hume 1902, p. 79.

agreement on the point that Hume's „other words“ actually did not introduce any synonymous formulation to the first mentioned regularity thesis but instead defined a very different concept, that is the counterfactual concept of causality. I want to propose two arguments in favour of the counterfactual conception.

The first argument revolves around the question of whether the regularity thesis can provide any coherent sense of causality at all. This question seems to be surprising in view of the triumphal march of the regularity thesis, especially within the natural sciences. However, if we remind ourselves that in his deductive-nomological model of explanation Carl Hempel converted the causal explanation to be a case of a more broadly understood nomological explanation, then the relevance of this question is more obvious. The most urgent problem for the regularity theory of causality, which simply reduces the sense of causality to the sense of regularity, is to find a convincing criterion for drawing a distinction between causal regularities and other regularities, for example, mere temporal regularities. Hume himself was, of course, very conscious of this challenge for his approach. His proposal was to suppose that only causal regularities are necessary regularities. But is this proposal convincing? Can the modal category of necessity make a real difference? This would only be the case if necessity always consists of nomological necessity. Hume's answer would only be satisfactory if it were correct to say that necessity necessarily implies regularity. But this is obviously false. It would conceptually exclude the possibility of singular relations, which are nevertheless necessary and this corollary is untenable. I can see no other possible criterion to distinguish between causal and other regularities unless we turn to Hume's „other words“, meaning to the counterfactual view of causality.

The second argument therefore stresses the point that the counterfactual view can well represent our intuitions concerning causality. David Lewis emphasized this in his argumentation in favour of the counterfactual analysis: „We think of a cause as something that makes a difference, and the difference it makes must be a difference from what would have happened without it.“<sup>9</sup> In fact: it is essential to our understanding of causality that causes are responsible for real differences and changes in the course of events, moreover, that they are responsible for the fact that there is a course of different and distinct happenings at all. And if we want to know whether a certain event A is a cause of another event B, we are actually asking whether B would also have occurred if A had not existed. So, as Lewis says, „We do know that causation has something or other to do with counterfactuals.“<sup>10</sup> However, if it is correct that causation has something to do with counterfactuals, why should we not take

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<sup>9</sup> Lewis 1986, p. 160/161.

<sup>10</sup> Ibid. p. 160.

the bull by the horns and simply take the route to reduce causal relations between events to counterfactual relations between statements? To say that A is a cause of B simply means that the corresponding counterfactual „If A had not occurred, then B would not have occurred“ is true.

The reason for some theorists' reluctance towards this solution is well-known: it is difficult to formulate a satisfactory and convincing semantic for counterfactuals and for subjunctive conditionals because this attempt implies a paradoxical task. We have to find a criterion for the truth conditions of counterfactuals although their antecedent assertion is or could be false. However, the truth conditions we are longing for should be, of course, truth conditions in our actual world. That means that we have to define actual truth conditions for non-actual situations. The solution for this, at first glance, impossible task is to take possibilities seriously. „If A had not occurred, then B would not have occurred“ is true if and only if a possible world where A has not occurred and B also has not been the case, is more similar to our actual world than another possible world where A has not occurred but B nevertheless has. The assertion „If Barack Obama had not been elected as president, there would be no Tea Party movement in the U.S. today“ is true in our actual world if and only if a possible world where Barack Obama has not been elected and no Tea Party movement exists is more similar to our actual world than another possible world where such a movement does exist although Obama has not been elected.

Let us grant for the sake of argument that Lewis' semantic or some other version of a possible world semantic is convincing. We should grant this, in my opinion, not because my uneasiness concerning possibilities and possible worlds is perhaps not as great as yours, but because we understand counterfactuals in our ordinary communication very well. We should have one semantic or other that provides a theory for this actual linguistic ability. Nobody would respond to the assertion „If Barack Obama had not been elected, the Tea Party movement would not exist“ with the words: „What? I don't understand what you're saying!“ On the contrary, everybody would understand what this assertion means, namely, that the election of Barack Obama as president is a cause for the formation of the Tea Party movement.

The counterfactual analysis for being a cause can be summarized as follows:

A is a cause of B iff

- (1) A occurred and B occurred.

(2) If A had not occurred, but everything else being equal, then B would not have occurred.

#### V. Danto's Scientists Revisited

The proposed analysis implies that the existence of regularities between types of A and types of B is, of course, not excluded, but not presupposed as well. Whether regularities can be observed or not depends on the types of events. It also implies that causes are necessary but not necessarily sufficient causes. If a historian contend that the shots in Sarajevo were a cause of the First World War, then she is asserting that this event was counterfactually necessary for the First World War. This means that the shots were certainly not the only cause of the war, but if the Serbian assassin had not murdered the Austrian heir to the throne, then this war would not have occurred.

Nevertheless, this would be a rather strong historical assertion. Additionally, this rather simple analysis does not help us at all with regard to Danto's puzzling example and the problem of the specific historical relation between past events. To repeat: this problem consists in the fact that the historical meaning of an event is a relational property, which is essentially influenced by events happening afterwards. At the time of Obama's election as president, no one could foresee that his election and, of course, his subsequent policy, would provoke something like the Tea Party movement. One day, maybe, historiography will come to the conclusion that the election of the first black president had the consequence of dividing the American people rather than bringing them together. History is related to its respective future, moreover, one can say that history depends on its respective future. The German historian Reinhart Koselleck expressed this connection by calling history a „Past Future“.

Danto's example, however, is more puzzling than the consequences of Obamas election. On the day when he was elected, it was at least possible to speculate about the question of whether this event could really reconcile the American people or would, quite the reverse, deepen the rift between the political camps. This means that it is very natural to suppose that there must exist a causal connection between Obamas election and the subsequent events, although the historical meaning of his election is not determined on the day he was elected. But if we accept the supposition in Danto's fictional example that the two scientists do not know anything about each other and have formulated the very same theory independent of each other, then the case seems to be that no causal relation can exist. However, how can we

understand and explain that the occurrence of the second, temporally later event is responsible for the fact that the earlier event has the property of being an anticipation?

I have already argued that rejecting the realistic thesis that the historical meaning is a real property of events is not a possible way out, nor would be supposing that causes can temporally follow their effects a possible solution. Instead, I want to propose to revising the counterfactual analysis of causality in two respects. First, the time of the occurrence of the respective events is mentioned in the formulation of the conditions. This revision shall exclude backward causation and make the entire proposal more subtle and more adequate in regard to historical explanations because in history the time of an event's occurrence can be a very important fact. Secondly, I will allow calling an event a cause if its efficacious force only concerns particular properties of the effected event and not the occurrence of the other event itself. The consequence of this second revision is that the temporally first event in Danto's example is a cause of the temporally later event and not vice versa. Here is the formulation of the conditions:

A is a cause of B iff:

- (1) A occurred and B occurred.
- (2) A occurred at time  $t-1$  and B occurred at time  $t-2$ , i.e. A and B are standing in a temporal relation to each other and A occurred earlier than B.
- (3) If A had not occurred at time  $t-1$ , but everything else being equal, then the following holds: either (a) B would not have occurred at time  $t-2$ , or (b) at least one essential property of B would exist, which B would not have possessed, that is, C would have occurred.
- (4) If (b) in condition (3) is the case, then it also holds that A and C would stand in the same temporal relation as A and B.

According to this analysis, the earlier event in Danto's example can be seen as a cause of the later event because condition (b) in (3) is met. For, the later event would not be a rediscovery of a theory if the earlier event would not have happened. The earlier event is causally responsible for the later event having a particular essential property. In this sense, and only in this sense, the earlier event changes its causal properties at time  $t-2$  actually. This means that the later event is causally dependent on the earlier event because the following counterfactual conditional is true: If E-1 at time  $t-1$  had not occurred, then E-2 at time  $t-2$  would not have

had the property of being a rediscovery. In this sense, and only in this sense, E-1 is a cause of E-2.

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