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Ephemeral Mechanisms and Historical Explanation

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Abstract

While much of the recent literature on mechanisms has emphasized the superiority of mechanisms and mechanistic explanation over laws and nomological explanation, paradigmatic mechanisms—e.g., clocks or synapses – actually exhibit a great deal of stability in their behavior. And while mechanisms of this kind are certainly of great importance, there are many events that do not occur as a consequence of the operation of stable mechanisms. Events of natural and human history are often the consequence of causal processes that are ephemeral and capricious. In this paper I shall argue that, notwithstanding their ephemeral nature, these processes deserve to be called mechanisms. Ephemeral mechanisms share important characteristics with their more stable cousins, and these shared characteristics will help us to understand connections between scientific and historical explanation.

Hempel (1942) argued that historical explanations, if they were to be truly explanatory, must have the same form as scientific explanations – namely, they must be covering law explanations. Covering law explanations explain by deducing the explanandum from statements describing particular facts and background conditions together with covering laws. Philosophers have raised serious questions about the adequacy of the covering law model, but the question of how scientific and historical explanations are related remains.

To clarify the question of this paper, I must say something about what I understand by the term 'historical explanation'. I will take it to be the defining characteristic of an historical explanation that it explains the occurrence of some *particular* event or state of affairs by describing how it came to be. Given this characterization of what constitutes an historical explanation, historical explanation is equally the province of those concerned with human and with natural history. It is certainly true that many or even most explanations given by historians would be historical in my sense: a historian seeking to explain the causes of the rise of Greek city states or the collapse of the British Empire would be providing an explanation of how certain particular events came to occur. But at the same time, people we typically call natural scientists offer explanations that are historical in this same sense; these range from ecological explanations of extinctions to geological explanations of the formation of particular features of a landscape, or astrophysical explanations of the formation of the solar system. What unites these forms of explanation across the natural and human

sciences is their narrative character: they provide stories about how something came to pass.

There is a second way in which we might understand the term 'historical explanation'. We might take it simply to refer to the set of explanatory forms and practices utilized by the discipline of history. Construed this way, 'historical explanation', like 'scientific explanation' refers not to a particular kind of explanation but to a collection of activities in need of philosophical explication. If we consider what delineates the work of professional historians it is not so much a particular explanatory (or other) methodology, but a subject matter. Professional historians are not concerned with the history of just anything, but with the history of human beings – their politics, their culture, their technology and so on. When we contrast historical and scientific explanation in this way, it brings to the fore an important philosophical question concerning the relationship between the natural and human sciences (*Natur-* and *Geisteswissenshaften*). Some philosophers maintain that the fact that human beings form the primary subject of history and the other human sciences has profound implications for how practitioners can or should explain phenomena in their field of inquiry. According to this view, sometimes called anti-naturalism, explanations in human history require reference to concepts such as agency, intention and meaning that do not admit of naturalistic reduction and are not necessary or appropriate in explanations of natural phenomena.[1] The contrary view, naturalism, holds that, at least ideally, the subject and methods of the natural and human sciences should be continuous. Hempel's attempt to find a function for general laws in history falls within this naturalist tradition. Regardless

[1] The argument for the supposedly distinctive character of the natural and the human sciences goes back to the hermeneutical tradition of the nineteenth century, especially to the work of Dilthey. A classic contemporary statement of the position is given by Taylor (1971).

of what view one holds with regard to this debate, it should be clear that both the natural and human sciences sometimes offer explanations that are historical in the first sense of explaining how particular events occurred, and that there may be interesting common features of historical explanations across the natural and human sciences.

My primary focus in this paper is on providing an analysis of historical explanation in the first rather than the second sense, but I will want to say something about how the two senses of historical explanation are related. For the sake of simplicity in exposition I shall reserve the term 'historical explanation' for the first sense, and I shall use the term 'human-scientific explanation' for the second sense. I do not need or want to get involved in boundary disputes about what counts among the human sciences or how clear the distinction between the natural and human sciences is. It is enough that we understand the human sciences to include history and the natural sciences to include disciplines like biology, geology and physics.

Given these stipulations regarding terminology it should be clear that historical explanation should be contrasted not with natural-scientific explanation but with ahistorical explanation. Ahistorical explanations abstract from particular events at particular places and times in order to explain recurrent patterns of phenomena. If one seeks to explain how stars generate energy, how meiosis works or why proteins fold, one does not explain a particular event, but some sort of repeatable phenomenon. While there may be subtle differences in particular instances, the same explanation works for potentially countless instances of that kind of phenomenon. While arguably professional historians tend to focus more than scientists on the explanation of particular events, ahistorical explanation need not be the exclusive province of natural scientists. An

historian who seeks a generalized explanation of some recurrent phenomenon in human history is concerned with ahistorical explanation

To clarify the relation between historical and ahistorical patterns of explanation, I will consider the relationship between three approaches to explanation, all of which are in some ways reactions to covering law approaches. The first two approaches are both sometimes called causal-mechanical. One, developed chiefly by Salmon (1984; 1990) seeks to explain events by locating them within what Salmon calls the "causal nexus." I shall refer to this as the causal-nexus approach. The second, developed by a number of philosophers with special interests in the life sciences (Glennan 2002; Bechtel and Abrahamsen 2005; Craver 2007), explains events as products of robust and regular systems and processes. I'll refer to this approach as the mechanistic systems approach. The third approach is the tradition of narrative explanation, which has traditionally been considered a foundational theory of historical explanation (Danto 1985). I will argue that certain problems that beset narrative explanation are closely related to those that trouble Salmon's process approach. The problems in both cases can be solved by borrowing elements of the mechanistic systems approach. In particular, I'll argue that narratives are descriptions of what I'll call ephemeral mechanisms. By understanding the relationship between ephemeral mechanisms and their more robust cousins, we will gain a better understanding of the relationship between historical and ahistorical forms of explanation.

The Causal Nexus

In his groundbreaking *Scientific Explanation and the Causal Structure of the World* (1984), Salmon repudiated the covering law model of explanation. Though a sympathetic expositor of Hempelian approaches to explanation, Salmon concluded that

the DN model and its successors could not meet well-known counterexamples. His diagnosis was that, contra Hempel, explanations should be about causes rather than laws, and that a proper explanation involved not an argument that showed that the explanandum was to be expected given the truth of certain statements about laws and initial conditions, but rather involved a description of the causal processes and interactions that bring about the event whose explanation we are seeking.[2]

On Salmon's view, to explain show something is to describe its place in the causal nexus. The causal nexus (or the causal structure of the world as he sometimes calls it) is conceived of as a vast network of intersecting causal processes. When two causal processes interact and produce changes in each other, this is called a causal interaction.

We can visualize the causal nexus in terms of the figure below:

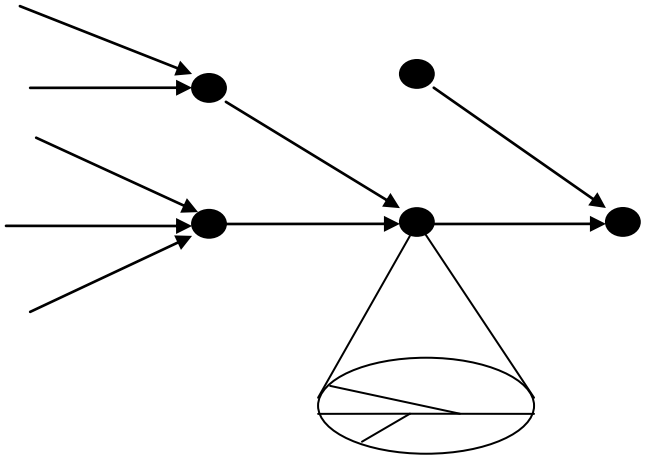

Figure 1: The Causal Nexus

Reading from left to right in the diagram, we see processes developing through space-time. Points of intersections are causal interactions between these processes,

[2] For a thorough history of the development and ultimate failure of the covering law approach written from Salmon's point of view, see his (1990).

where the processes are changed or marked by their interaction. The vertical dimension represents levels of analysis. Depending upon the grain of description, a region in space-time may be described as a single event (the intersection) or a complicated and spatio-temporally extended region of further intersecting processes. We can, for instance, conceive of the firing of a neuron as a point event precipitated by interactions with other neurons, or we can look at the mechanisms at work within the cell and synapse, and give a spatiotemporally extended account of the relevant processes.

Salmon suggests that we explain things by locating them within the causal nexus. Because the causal nexus is immensely complicated, involving enormous numbers of events extending indefinitely back in time, no actual explanation can be complete. Pragmatic considerations will determine what portions of the causal nexus are actually described in some request for an explanation.

Salmon takes explananda to be events, where these are changes in processes occurring in particular regions within space-time. The explanations of these events are in an important sense historical. One explains by describing events and connecting processes within the explanandum event's past that ultimately were causally related to the occurrence of the event. The historical character of Salmon's approach suggests that the model might be applicable not only to the sorts of examples Salmon uses (explaining why the baseball broke the window or what caused the mayor to get paresis), but could also be used to offer explanations of more typical target explananda in natural and human history (e.g., the death of the dinosaurs or the fall of the Roman empire).

While there is an extensive literature that raises questions about Salmon's account, I want to focus on a pair of related criticisms that are particularly relevant for

understanding the relation of Salmon's view to the systems and narrative approaches I will turn to next. The first of these has been formulated most pointedly by Christopher Hitchcock (1995). Hitchcock's view is that Salmon's account fails to solve the problem of explanatory relevance. To illustrate his claim, Hitchcock asks us to consider a simple explanation of a certain event, an eight ball landing in the corner pocket. The player strikes the cue ball with the cue stick, the cue ball begins to roll in the direction of the eight ball, striking it and thereby imparting to it the necessary momentum to land it in the corner pocket. For Salmon, causal processes are paths through space time of entities that maintain stable structures and which are capable of transmitting marks (changes in their properties) through space-time. The eight ball at rest is a causal process, as is the cue ball that moves towards it. Causal interactions occur when processes intersect and transmit marks to each other. So in this case, the moving cue stick interacts with the cue ball; the cue ball begins to roll; the cue ball strikes the eight ball and it beings to roll; the eight ball strikes the back of the corner pocket and ceases rolling.

It might seem that Salmon's account works very well here. We explain the location of the eight ball by describing just these processes and interactions, locating the event within the causal nexus. But Hitchcock adds this small complication. Prior to striking the ball, the player chalks the cue stick, and when the cue stick strikes the cue ball, the cue ball receives a blue mark. Thus, in the region where cue ball and cue stick interact, there are two changes to the cue ball. Which one matters? Hitchcock explains:

> The intuitive relation of explanatory relevance does not hold between regions of space-time: it holds between the *properties* instantiated in certain regions of space-time. We judge that the linear momentum of the cue ball is relevant to the

> final *location* of the eight ball, but that the blue color on … the cue ball is not. … Nonetheless, Salmon's explanations do not seem to cite these properties (Hitchcock 1995, 310).

As Hitchcock points out, this is essentially the same problem that haunted the DN model in counterexamples like Kyburg's example of hexing salt before dissolving it in water. Salmon's account can identify events and processes in the past history of the explanandum, but it can't identify which features of those events are relevant to the production of the explanandum.

The second problem for Salmon has to do with the grain at which events in the causal nexus are described. As we have already observed, the causal nexus is not just characterized horizontally by development of processes through space-time, but vertically by constitutive relations between entities and events at different grains. It is a common observation in discussions of explanation that proper explanations must describe processes at a grain which captures the explanatorily salient features. In explaining why the spy was captured, we cite the fact that the mole in the CIA gave information to the KGB. What matters for the explanation is simply that the information was transmitted, and not exactly what the medium of transmission was. It doesn't matter if the information was written, spoken or transferred on a flash drive. As in the cue ball case, choosing the wrong grain involves identifying factors that are explanatorily irrelevant.

This problem is perhaps most evident if we consider a revision Salmon made to his theory of causal processes and interactions (Salmon 1994). Responding to concerns that his account of processes and interactions contained an inappropriate counterfactual element, Salmon adopted a definition of a causal interaction in which interactions were

defined as intersections of processes involving exchange of physically conserved quantities. I will not discuss the merits of this approach here, but it is at least clear that this characterization of an interaction takes us away from the explanatorily salient features of events. The phone call to the KGB may involve exchange of conserved quantities, but that's not why the spy was captured.

Mechanistic systems

While Salmon sometimes called his account of explanation mechanistic, he offered no definitions of mechanisms as such. The more recent mechanistic systems approach, explicitly characterizes mechanisms as robust systems or processes consisting of interacting parts.[3] The position has been championed in the last decade by Bechtel, Craver, Darden, Glennan and Machamer, but has its roots in earlier criticisms of covering law model. The mechanists argue that scientists (especially in the biological and social sciences) seldom frame their discoveries and explanations in terms of laws of nature, and commonly do so in terms of mechanisms. Accordingly they believe that explanations in these areas should be understood as providing descriptions of the mechanisms that produce the explanandum phenomenon.

Mechanisms are systems that produce some phenomenon, behavior or function. The system may have the capacity to produce that behavior in virtue of deliberate design: the washer is designed to wash clothes; or natural selection: the eye is, in virtue of natural selection, able to detect light within a certain frequency range; or it may behave that way simply as a matter of historical contingency: Old faithful has the capacity to produce

[3] See Glennan (2002) for a more extended discussion of the relationship between causal nexus approach and the mechanistic systems approach. In that paper, I characterize the former approach as the process approach and the latter approach as the systems approach.

geysers at regular intervals. Given a target phenomenon, one can ask what mechanism produces it, regardless of how the mechanism came to be.

Mechanisms behave in regular but not exceptionless ways. The washer could break; the eye could go blind; geologic changes could make Old Faithful less faithful. The behavior of mechanisms can be described by what Craver (2007) calls "mechanistically fragile generalizations." These are generalizations that are robust and non-accidental, but hold in virtue of the fact that they describe the behavior of the mechanism. That mechanism is a system with a stable spatial, temporal and causal structure in which the parts of the mechanisms act in regular ways to produce the mechanism's behavior. Just as the behavior of the mechanism as a whole is regular but not exceptionless, so is the behavior of the mechanism's parts. Glennan (2002) suggests that the interactions between parts of mechanisms can be characterized by "invariant change-relating generalizations." These generalizations are counterfactual supporting generalizations that describe how a change in a property of one or more parts produces a change in the property of another part. Like the generalizations describing the behavior of the mechanism as a whole, these generalizations are mechanistically fragile. This is because in general the parts themselves will be complex structures, and the interactions between parts will be mechanically explicable and subject to breakdowns (see Glennan 1996). A mechanistic explanation of the human body's capacity to deliver oxygen to the brain will describe the various parts of the respiratory and circulatory systems that bring oxygen into the lung, transfer it to the blood stream and carry it to the brain. But the parts of this system (e.g., the heart, the lungs, the red blood cells) will themselves have

parts, and the behavior of these parts and the way that they interact with each other will be explained by describing lower-level mechanisms.

The most important difference between the causal-nexus and the systems approach is that mechanistic system explanations explain regular or type-level phenomena, whereas Salmon seeks in the first instance to provide explanations of particular events. Mechanists are interested in descriptions of how *kinds* of mechanisms work: for instance, what is the mechanism by which neurons signal across synapses? Whatever this mechanism is, there are countless such neurons in organisms on this planet, and those neurons fire countless times.

While on this view mechanisms are stable and organized systems of parts, the operation of these mechanisms give rise to processes; in this example the operation of the synaptic mechanism is a process of neuron firing. But because these processes are regular and repeatable, they are different from the sort of processes Salmon appeals to in his explanations. On Salmon's account the explanandum is a particular event occurring ia a particular region in space-time, and the explanation consists of describing in part the set of processes and interactions in that space-time region that produce that event. On the systems mechanist view, one explains events by showing them to be the product of the operation of some type of mechanism on some occasion.

The systems approach avoids the difficulties concerning explanatory relevance that trouble Salmon's account.[4] Interactions between parts of mechanism are not characterized by some generic property like mark transmission or exchange of conserved quantities, but by generalizations describing about how changes in properties of one part

[4] See Craver (2007) and Glennan (2002, 2009) for more detailed accounts of how mechanistic explanations solve the relevance problem.

bring about changes in properties of another part. For instance, specific neurotransmitters bind with specific types of receptors in virtue of the biochemical properties of those molecules. They also avoid the grain problem. The hierarchical aspect of the systems mechanism approach guarantees that the decomposition of a system into parts is done at a level that is required to characterize the causally relevant interactions between parts.

Systems mechanisms have a historical dimension in the sense that the generalizations describing the behavior of these mechanisms are true only in virtue of the particular organization and interaction of parts, and of the historical processes that brought them about. All of the myriad mechanisms at work in the life of organisms exist only in virtue of those organisms' evolutionary and developmental history. The laws one finds in biology, such as they are, are as Beatty (1995) says "evolutionarily contingent." But while the fact that there will always be a history that explains why a certain mechanism exists and behaves as it does, one need not know that history to explain how the mechanism works. For instance, one needs no account of the evolutionary significance of meiosis, in order to describe the mechanism of meiosis. Thus, mechanistic explanations themselves appear to be ahistorical. They describe the regular operations of reliable mechanisms. It is for this reason that this approach needs modification to serve the needs of historical explanation.

Narrative Explanations

Historical explanations are typically narratives. Richards tells us "[n]arratives fix events along a temporal dimension, so that prior events are understood to have given rise to subsequent events and thereby to explain them" (1992, 23). Narratives are often described as sequences as events, but they are perhaps better characterized as a branching

tree of events with the root of the tree being the terminating event of the narrative, and the object of explanation. So described, we can see an obvious similarity between historical narratives and Salmon's explanation by description of the causal nexus. The branches converging towards the explanandum event look just like those in figure 1.

Philosophers interested in historical narrative have focused on a variety of issues in the theory of narrative, but perhaps the chief among them is the problem of how the events in the narrative chain are linked. Hempel (1942) argued that any narrative, if it were to be truly explanatory, would have to have each link in the chain established by a covering law explanation (either deterministic or statistical). A proper narrative would show how each link in the narrative chain is, to use a phrase of Salmon's, nomically expectable. The view can be criticized on a number of grounds, many of which are familiar from critiques of covering law models in the natural sciences. First, many would argue that there are few if any lawful generalizations that can cover these explananda; second, we may be suspicious of Hempel's requirement that the explanation should show that the event was to be expected (the so-called high probability requirement); third, we may wonder more generally if narrative explanations get their explanatory force from connection to laws.

Richards' brief characterization of narrative implies what defenders of narrative take for granted – that the links in the narrative chain describe causal links between events. And in some part, the negative reaction to Hempel is a reaction to Hempel's Humean view that causal claims must be reduced to claims about regularities. What the historian denies is the connection between causation on the one hand and generality on the other. Richards suggests that "the historian … will recognize lawlike generalizations

only after events have been laid out in temporal sequence and understood immediately as productive" (Richards , 45)

The key notion here is causation as productivity rather than generality. But if one does not by appeal to generality, the question remains of how one recognizes intersecting processes as productive of events. This is Salmon's problem of causal relevance, reappearing in the context of narrative explanation. The task of the historian is to construct a narrative in which the events described are causally relevant, but the theory of narrative so far described gives us little account of how we establish causal relevance.

A second problem is again analogous to a problem for Salmon's account, and that is the problem of explanatory grain. One of the curious but recurrent features of historical narratives is their sometimes rapidly shifting scales. For instance, in giving a narrative explanation of the Confederate defeat at Gettysburg, it is commonplace to describe the details of the psychological state of commanders, and at the same time to describe the actions of much larger grained entities (regiments, divisions and corps). While intuitively we understand this practice, a theory of narrative needs to explain why these shifting scales are explanatory.

Ephemeral Mechanisms

Mechanists solve the causal relevance problem that plagues both Salmon's causal nexus approach and the narrative approach by characterizing causal interactions between parts of mechanisms in terms of robust, though contingent and mechanically explicable generalizations about the regular relationships between changing properties of the mechanism's parts. But because the mechanistic approach focuses on types of systems that exhibit regular and repeatable behavior, it must be modified to provide an

explanatory model adequate to the singular causal sequences that characterize historical narratives.

It is not a stretch to use the term ‘mechanism’ in connection with the explanation of singular occurrences. What was the mechanism or mechanisms responsible for the death of the dinosaurs or the fall of the Roman Empire, for instance? But if this locution is not strained, we should expect some connection between the mechanistic approach and historical explanations. What seems to distinguish mechanisms in this historical sense from mechanistic systems is that the circumstances that bring together the various entities whose interactions constitute the narrative are ephemeral. The difficulty of predicting the future course of history stems from the dependence of historical outcomes on chance conspiracies of circumstances, but once we have identified what those circumstances are, a good narrative explains by showing how, given those circumstances, there was a likelihood or necessity to the outcome.

To explore the ephemeral character of narrative, consider a narrative explanation of a particular event, the death of the French literary critic, Roland Barthes. Barthes died in 1980 at the age of 64. Barthes had been invited to a luncheon with then president Francois Mitterrand, and was struck by a laundry truck while crossing a Paris street on his way home. Barthes was an important figure in French letters, and arguably the history of literary theory was significantly changed by Barthes’ untimely meeting with the laundry truck.

Barthes’ death was caused by what I’ll call an ephemeral mechanism. Specifically, I take an ephemeral mechanism to be a collection of interacting parts where:

1. the interactions between parts can be characterized by direct, invariant, change-relating generalizations
2. the configuration of parts may be the product of chance or exogenous factors
3. the configuration of parts is short-lived and non-stable, and is not an instance of a multiply-realized type.

Condition one, the idea that mechanisms are collections of parts that interact in accordance with direct, invariant, change-relating generalizations comes from (Glennan 2002). Conditions two and three loosen certain constraints on the relationship between parts that are implicit in calling mechanisms systems or robust processes.

Applying this definition to the mechanism responsible for Barthes' death, we note that the parts include among other things Barthes, Mitterrand and the other attendees at the luncheon, a host of physical objects with which Barthes interacted on his journey (stoplights, sidewalks, etc.), and a laundry truck. Condition two suggests that these parts must have come together in the places and times they did in virtue of chance or exogenous factors. This is not meant to exclude some historical mechanisms in which there are non-chance factors. If the truck driver and the waiters at the lunch are both working for a conspiracy of rival critics intent on bringing about Barthes' demise, then that interaction would not be by chance. But regardless of whether the death was an accident, the mechanism of death meets condition three. The configuration of parts is short-lived and non-stable. Barthes does not regularly go to lunch with Mitterand or regularly get run over by laundry trucks. Had the timing or locations been off by just a bit, Barthes would not have died. Moreover, the mechanism of Barthes' death is not an

instance of a multiply realizable type. Unlike guillotines, laundry trucks do not regularly kill French citizens.

The fact that ephemeral mechanisms meet conditions two and three make it inappropriate to call such mechanisms systems. There is nothing systematic in the operation of the mechanism that caused Barthes' death. But if this is so, what is the connection between ephemeral mechanisms and mechanistic systems? The connection lies in the constraints imposed by condition one. The same sorts of generalizations which characterize the interactions between parts of ordinary mechanisms also characterize interactions between the parts of ephemeral mechanisms. The appeal to these generalizations captures the robust and reliable nature of the interactions between parts of the ephemeral mechanism.

I would suggest that we construe narrative explanations as descriptions of ephemeral mechanisms. So for instance, in giving a narrative account of the death of Barthes, we describe the mechanism responsible for his death. My contention is that by seeing narratives in this way, we can solve the problems of causal relevance and explanatory grain that pose problems for narrative explanation.

In ephemeral mechanisms, while the manner in which parts come together is chance or unpredictable, how they will interact with each other is not. We can describe the interaction between Barthes and the laundry truck as an instance of a change-relating generalization involving persons and laundry trucks, or persons and large vehicles. The laundry truck injures Barthes in virtue of certain causally relevant properties (notably its solidity and momentum) and not in virtue of other of its properties (for instance, the name of the laundry service painted on the side). We know this because we can identify

counterfactual supporting generalizations describing how interactions between entities with the causally relevant properties of the laundry truck bring about changes in the functioning of human bodies.

This appeal to change-relating generalizations is reminiscent of Hempel's requirement that the links in narrative chains be explained by appeal to covering laws. The difference, however, is that these generalizations are not exceptionless universal generalizations, but are instead mechanically explicable and subject to breakdowns. For instance, if we were to describe how changes in the general's plan led to changes in the position of a regiment on a battlefield, we could appeal to a generalization about how orders from generals affect regiments. When generals order regiments to march, they typically march. But this is no law of nature. It is true only in virtue of the operations of mechanisms of command and control, and these mechanisms can break down in a variety of ways – for instance through garbled communications or mutinies.

The mechanistic approach also helps us understand explanatory grain. Why is it that we focus on Barthes and the laundry truck, rather than say parts of Barthes and the laundry truck's bumper? In the first place, the laundry truck and Barthes are objects (cf. Glennan 1996), in the sense that the are spatially localized seats of properties which are generally stable in the absence of interventions. Bumpers are (in contexts like this) attached to the rest of the truck, accelerate with the rest of the truck, etc. Moreover, the generalizations invoked in characterizing interactions between parts will be at the grain of these objects. The fatal effect of the laundry truck has principally to do with the massiveness and inelasticity of the whole truck. Unattached truck bumpers do not have

the sort of momentum that is productive of the kinds of injuries that result from collisions with whole trucks.

In the *Poetics*, Aristotle develops a theory of plots that is much like the theory of narrative I am proposing. Aristotle says the best plots must exhibit unity of action, necessity and peripity. Unity of action for Aristotle is essentially a demand that the events in the plot (or narrative) are causally relevant to the outcome, and the demand for necessity is a demand that the events in the narrative chain are causally linked. Peripity, which Aristotle claims is the feature of the best tragedies, involves sequences of events that occur "unexpectedly and at the same time in consequence of one another" (1452a). Aristotle is talking about imaginative plots, but we can see that this peripity will also be characteristic of the best historical narratives. Such explanations will take events that are surprising or mysterious, and show how they arise probably or necessarily out of some sequence of events.

But the demand for probability or necessity might, it could be argued, be too strong. To see this, consider a narrative explanation of the demise of an unfortunate graduate student. In a relatively short space of time, the graduate student's mother dies in an accident, his girlfriend leaves him, and he fails his comprehensive exams. In a fit of despair, he commits suicide. But while we'll suppose that these events occasioned the student's suicide, the student's decision still surprises us. To put it another way, unlike the case of the interaction between Barthes and the truck, there is no robust generalization that whenever students are confronted with these circumstances they will commit suicide. While we are sometimes offered narratives in which the links of the narrative do not seem to reliable generalizations, I do not think it requires us to give up our account of

narrative explanation. I would argue that to the extent that a narrative fails to show the necessity of the outcome, it fails to explain. And this certainly seems the case with our hypothetical student. For in such a case, while we might grant that the traumatic events occasioned the suicide, we really have no explanation of what about the particular circumstances necessitated the action.

Explanatory Patterns and Generalized Narratives

The historical explanations I have been considering are singular causal explanations of particular events. I have argued that these explanations are narrative explanations, and that narratives should be construed as descriptions of ephemeral mechanisms. Even if one accepts that this is an illuminating analysis of historical explanations of particular events, it would be, as I suggested at the outset, a mistake to suppose that this is the only sort of explanation one finds in history and the human sciences. One sort of activity that is clearly of interest to many historians is finding recurrent patterns in history, and seeing how a particular sequence of events follows a pattern often is explanatory. In this section I'd like to say something about how these explanatory patterns are connected to mechanistic explanations, ephemeral and otherwise.

Let us consider how to explain the events in the fall of 2008 that led to the global stock market crash. Arguably there are at least two ways to explain this event. One way would focus on providing a narrative of the particular events that led to panicky sell-offs of particular stocks and the demise of particular companies. Such a narrative would focus on particular decisions of the U.S. Treasury Department, the Federal Reserve and other parties, like the decision not to bail out Lehman Brothers. An explanation of this

sort is, according to the analysis I've offered, a description of an ephemeral mechanism. The second way of explaining the market crash would be to show how it exemplifies a familiar pattern of economic behavior. At the simplest level, the crash was the result of a speculative market bubble. Market bubbles are a recurrent feature of economic systems throughout modern history – from the speculation in shares of the French Mississippi Company in the 1720s to the dot com bubble of the late 1990s to the real estate bubble of 2008. Viewed from this perspective, the stock market crash of 2008 is not the product of an ephemeral mechanism, but of a mechanism of a more robust and predictable sort.

Explanations of this sort actually fit nicely within the systems conception of mechanism. A market is a mechanism consisting of a number of parts – buyers, sellers, products, money, etc. The actions of and interactions between these parts can be described by change-relating generalizations – for instance, generalizations describing changes in buying behavior in response to changes in price of products. Collectively, the structure of and interactions between these parts entail that the mechanism will behave in regular and predictable ways. An explanation of how a market works in general and how it will under a variety of conditions give rise to a bubble is not an historical explanation in the narrow sense that I stipulated at the beginning of this paper, but it is nonetheless a sort of explanation that historians are interested in. Explanations of this sort are analogous to mechanistic explanations in science where a scientist seeks to explain a repeatable phenomena (photosynthesis, annealing of metals, etc.) by showing it to be the product of a certain sort of mechanism of which there are many instances that operate on many occasions.

While such explanations are general and not historical in the sense of this paper, they still have a narrative structure. As I suggested above, a mechanistic system like a synapse gives rise to a regular process like neuron firing. The various activities and interactions of the parts of the mechanism that constitute this process do, to use Richards' characterization of narrative, "fix events along a temporal dimension, so that prior events are understood to have given rise to subsequent events and thereby to explain them." But the narratives involved in such explanations are *generalized narratives*. The neuroscientist is not concerned with explaining how a particular neuron fires but how in general neurons fire. Similarly, an economic historian may be interested in explaining how in general a market system gives rise to a process that creates a market bubble, without seeking to explain a particular bubble. In both cases, we achieve understanding in part by recognizing how particular events within generalized narratives. We come to understand a particular event by recognizing it as an instance of "the same old story." Explanations of this sort bear some resemblance to covering law explanations. We do see that a particular case falls under a generalization, but this generalization though is historically contingent and mechanistically fragile.

How ephemeral are the events that historians seek to explain? There is no general answer to this question, but we can observe that how one answers this question in a particular case depends to a significant degree upon the grain of explanation one seeks to provide. Historians of World War I frequently claim, first, that the war's outbreak was caused by the assassination of Archduke Franz Ferdinand of Austria and, second, that World War I was essentially inevitable given the political alliances and enmities in Europe, the arms race, the system for mobilizing reserves, and so on. The first

explanation that cites the assassination of the Archduke is highly ephemeral in the sense that the "parts" involved in the mechanism came together in a way that was chance and unrepeatable. The second claim holds that the event of World War I was not the product of an ephemeral mechanism, but of a complex and stable system of governments, alliances and militaries. But there is no real contradiction here. We simply have two different kinds of explanations of the same explanandum. If one describes the outbreak of the war in a sufficiently fine-grained way – as a particular conflict that began on a particular date at a particular place – then the only explanation available is quite ephemeral. But one can describe this same event at a courser grain – as an outbreak of a war between the great powers in Europe, for instance – and argue that an event of this kind was expected product of the operation of a quite stable mechanism.[5]

But while sometimes different assessments of the degree to which historical events are ephemeral is a function of different choices of explanatory grain, the question of how ephemeral an historical event is can also be a quite substantive one. Consider two examples – one from human history and another from natural history. Many historians of the World War II argue that Allied victory was more-or-less certain once the United States entered the War. On this view, the decisive fact in explaining the outcome of the war was that the United States had enormous industrial resources that were safe from destruction by its enemies. According to this view, the industrial dominance would guarantee that the same basic outcome would have occurred, even in the face of significant variations in facts such as strategic and tactical decisions of generals, battlefield outcomes and technological advancements. The alternate view holds that the

[5] This sort of explanatory pluralism is not just a feature of human history. Sterelny (1996) makes a parallel case for evolutionary biology, distinguishing between what he calls actual sequence and robust process explanations.

Allied victory was a near thing that depended upon a set of circumstances that were highly ephemeral and (from the Allies' point of view) fortuitous. For instance it might be argued that the outcome of the war in the Pacific was determined by the battle of Midway, an unlikely allied victory that was determined by, among other things, the fortunate fact that American aircraft carriers happened to be on maneuvers when the Japanese hit Pearl Harbor and the luck and skill of a couple of pilots who landed the crucial bombs on Japanese aircraft carriers. Turning to natural history, consider Stephen Jay Gould's argument concerning the Cambrian explosion – the rapid appearance of a great variety of animals in the Cambrian period. Gould argues that fauna during the Cambrian period were remarkably diverse compared with those that survive in the present day. He argues moreover that the pruning of the tree of life depended a great deal upon luck. There is nothing more fit about the species whose lineages have survived to the modern era than those who don't. Gould's target in his argument are the so-called 'adaptationists' who argue that natural selection strongly constrained evolutionary outcomes. According to Gould, if you were to "rewind the tape" small and chance variations in circumstances could lead to profound differences in the earth's fauna.

We need reach no particular conclusions about these examples to see the implications for our understanding of the role of ephemeral mechanisms in human and natural history. The degree to which a historical outcome is contingent is a consequence of the degree to which the mechanism that produced it was ephemeral. To some degree, how ephemeral the mechanism is will be a function of how finely grained the description of the outcome is. At the same time, even given a fixed grain of description, some events will be the product of mechanisms that are more ephemeral than others. It is part of the

business of those interested in historical explanations – natural or human – to debate just how ephemeral the mechanisms are.

Conclusion

My goal in this paper has been to suggest that there is a closer connection between explanations in the natural sciences and history than is commonly realized. In the first place, I have argued that we should recognize that many explanations in the natural sciences *are* historical in the sense that they seek to explain, like explanations offered by political or cultural historians, the causal processes that give rise to particular events at particular times. Second, I have argued that the structure of these explanations (whether they be explanations from human or natural history) are narrative in character and are connected to a sort of explanation--mechanistic explanation --that can be used to provide ahistorical explanations within both the natural and human sciences.

Collectively, these similarities in explanatory forms might seem to provide evidence that the anti-naturalist position described at the beginning of this paper is incorrect. As I have described it, the anti-naturalist is committed to the view that special features of human beings and their culture – agency, intention and meaning – are crucial to understanding in the human sciences. The question I would like to conclude with concerns whether these features are somehow incompatible with the mechanistic form of explanation I have described.

In the first place it should be evident that explanatory narratives often make reference to the actions of agents guided by belief, reason and intention. If narratives of human history are descriptions of ephemeral mechanisms, people must be parts of mechanisms and their beliefs, intentions and reasons must be among the properties of

these parts that are invoked in describing the mechanism. The naturalist sees no problem with this. These kinds of properties can figure in generalizations describing the relationship between parts of mechanisms just as easily as properties of objects described in the natural sciences. The sort of necessity involved in the narrative is in no way different. Hume, one of the earliest proponents of a naturalist position, puts the point this way:

> When we consider how aptly *natural* and *moral* evidence link together, and form one chain of argument, we shall make no scruple to allow that they are of the same nature, and derived from the same principles. A prisoner who has neither money nor interest, discovers the impossibility of his escape, as well when he considers the obstinacy of the jailor, as the walls and bars with which he is surrounded; and, all attempts for his freedom, chooses rather to work upon the stone and iron of the one than upon the inflexible nature of the other. (Hume 1777, 90)

The defender of the anti-naturalist view may argue that in historical explanation we seldom have so determinate relationship between the beliefs, desires and intentions of human beings and the actions that determine historical outcomes, but this, the naturalist will conclude only reveals our ignorance of the true causes of events.

I am sympathetic with the naturalist's position because I think that great progress has been made in recent years in providing a naturalistic and mechanistic conception of meaning and agency -- one that is even compatible with human autonomy and dignity. But even if the anti-naturalist is right that there is something irreducibly special about

human agents, they will remain parts of the mechanisms that explain what happens in human history.

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