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The topic I will explore in this essay aims to answer if scientific explanations of particular events as causal or non-causal explanations, focusing on Lewis' counterfactual theory of causation. I want to assess the truth of a counterfactual argument. Additionally, I want to examine potential counterexamples such as Lange's idea of 'really statistical explanation' and those discussed by Lewis, and compare it to Lewis' counterfactual theory of causation. The question I would like to address is 'Are scientific explanations of particular events always causal explanations' The readings from the course that I will draw are *Causal Explanation* by Lewis, D. (1987) and *Really Statistical Explanations and Genetic Drift.*by Lange, M. (2013) . The conclusion that I will argue for will be that of a causal explanation theorist. I will assess the argument presented by Lewis on the counterfactual theory of causation by explaining his two steps; causal dependence and probabilistic dependence to determine causal history. I will then examine Lewis' causal theory of explanation and his argument to the following question, 'are scientific explanations of particular events always causal explanations'. Next, I will present the argument made by Lange on really statistical explanation and his objection to scientific explanations being of the causal sort. Lastly, I will argue in favour of Lewis and show a rebuttal against Lange for his argument on really statistical explanation.

Lewis states "a causal history has the structure of a tree, but not quite; the chains may diverge as well as converge" (2015). Lewis describes the world that has "a long and complicated causal history" (214). He gives the definition of causal history being that of a relational structure in which its relata, or connections, are "the events that are of local matters of a particular facet that may be cause or be caused" (216). He gives the example of events such as conversation, strolls, kisses, and includes events in a broader sense, such as an object continuing to move (216). He goes on to define causal dependence which are causal relations in which "an event depends on others, which depend in turn on yet others" (216). He describes "causal dependence to be counterfactual dependence" (216), giving the example of Hume, "if the first.. had not been,

the second never had existed" (216). Additionally, Lewis goes on to claim that "our world is thoroughly indeterministic and chancey, its causal histories must be largely or entirely structures of probabilistic causal dependence" (217). Probabilistic dependence, according to Lewis "obtained when the objective chances of some events depend counterfactually upon other events" (217). Furthermore, "if the cause had not been, the effect would have very much less probable than it actually was" (217). To conclude, Lewis explains the basis of his thesis which is that "the causal history of a particular event includes that event itself, and all the events which are a part of it, further, it is closed under causal dependence meaning that anything on which and event in the history depends is itself an event in the history" (217). Now that I have explained causal history, causal dependence and probabilistic dependence. In the next paragraph I will explain Lewis' main thesis on explanation as information and the argument presented by Lewis on the counterfactual theory of causation as it relates to scientific explanations of particular events.

Lewis main thesis is "to explain an event is to provide information about its causal history" (217). He coins the term "explanatory information" (218) as "information about the causal history of some event" (218). He comes to the conclusion that "information about what the causal history includes may range from the very specific to the very abstract" (220). Lewis states that there is no such thing as a "non causal explanation" (221) and explains three cases of it. Focusing on one of the cases, the Pauli Exclusion Principle, it follows that "a star has been collapsing, but the collapse stops because it's far as it can go, any more collapse state would violate the Pauli Exclusion Principle because there was no such state for it to get into" (222). According to Lewis, this type of information about the causal history of stopping is of the negative sort, coined "negative information" (222). Negative information is defined by Lewis as, "information about what the causal history does not include" (220), he goes on to explain that "there is a variety of explanatory information and that all explanatory information is of equal worth" (221). Moreover, what can be taken from Lewis argument here is that even information that scientific explanations of particular events are always causal explanations, non-causal

explanations don't exist and causal explanations can be used to explain theories of physics like the Pauli Exclusion Principle.

Lange argues that "really statistical explanation is a hitherto neglected form of scientific explanation and that, in particular, explanations in population biology that appeal to drift (aka. "Genetic drift", "random drift") are RS explanations" (169). He advocates for RS explanations being "noncausal" (169) in nature and "shows the result to be mere statistical fallout" (169). He uses the example of "regression towards the mean" (170) to explain why "students with the lowest scores in the first exam tend not to be the students with the lowest scores on the second exam" (170). Lange explained that "extreme scores in one variable tend to be associated with less extreme scores in the other variable (so there tends to be 'regression toward the mean' from the extremes" (170). This would, according to Lange be a "statistical" explanation (171). Lange stands in objection of an event being explained by its causal history. He states that "an explanation need not describe the result's actual causal history to qualify it as causal, as long as it explains by virtue of supplying relevant information regarding the world's network of causal events" (172). He gives the example of water boiling in the flask and explains the flask's cracking because of "the collision between a water molecule and the flash" (172). According to Lange, "had the given collision between a water molecule and the flask not occurred, another collision would almost certainly have done so" (172). Hence, Lange states that information about the premped "cause", aka. the given collision between a water molecule and the flask, "does not describe the crack's actual causal history" (172). This information, as maintained by Lange, "describes the world's causal network" (172). Moreover, Lange argues that the point of an explanation is to "exhibit the result as arising from successive runs have a statistical relation" (173) and other "facts have no place in the explanation since the explanation does not derive its power to explain from its describing relevant features of the result's causal history" (173). Furthermore, in comparison to Lewis, Lange objects causal history and maintains a view that, "a scientific explanation is not responsible for explaining the facts in its own explanans" (174). **

I agree in favor of Lewis on that causal explanations are needed as they "provide information about it's causal history" (217). Lange's argument on the RS explanations in my

opinion don't give a complete explanation to the causal history of the event. Going back to Lange's example of boiling water in the flask. I disagree with Lange on that the premped "cause", aka. the given collision between a water molecule and the flask, "does not describe the crack's actual causal history" (172). In my opinion, the collision would describe the crack's actual causal history because it is crucial to the crack occurring. The collision would be, according to Lewis, a causal dependence, or a "causal relation in which an event depends on others" (216). Had the collision not occurred, the crack would not have formed. Moreover, Lange argues that the point of an explanation is to "exhibit the results" and that "other facts have no place in the explanation" (173). Lange stated that, "Selection and drift involve different kinds of explanations, not different kinds of causal processes" (170). I disagree with Lange on that those facts "aren't relevant features of the result's causal history" (173), because those facts do describe the results and are especially relevant for scientific explanation. For example, when explaining genetic drift it's important to describe variants of genes associated with traits that would make one progeny more susceptible to genetic drift. These "describing relevant features of the result's causal history" (173) are important to understanding the results especially in a scientific setting when the results are analyzed. To conclude, scientific explanations of particular events are causal explanations that provide explanatory information about it's causal history.

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