A Biologically Disposed Theory of Causation

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Causation in Context

Most philosophical theories of causation are informed by theoretical physics. This area is characterised by its extensive use of idealised models and theoretical abstractions. Any causal interaction is typically considered within a clearly defined and closed system.

Theoretical physics thus bears little resemblance to the macroscopic world with which we are familiar. In the real world idealised situations do not exist, and it is impossible to abstract away from all interfering factors. The engineer must apply physics to a less than ideal reality.

In contrast to theoretical physics, the world of biology is best understood in context. Also here we use idealisations and abstractions. But the phenomena under investigation will always be a living thing, placed in an environment.

The causal role of a gene, for instance, must be considered in the context of a cell, which is placed in an organism and a certain environment and eco-system. Context is everywhere and the causal interactions are vastly complex.

While theoretical physics seems perfect for a theory of causation that embraces law-like regularities, necessity and causal determinism, biology seems to require something radically different. I here offer such an alternative: a dispositional theory of causation.

Tendencies, not laws

Instead of strict laws of nature, governing the behaviour of objects, a dispositionalist emphasises that things have real causal powers. They behave the way they do in virtue of their own dispositional properties, not because of external laws (Mumford 2004).

Typical examples of dispositions are fragility, solubility and fertility. A disposition can have various intensities. Something can be more or less fragile, soluble or fertile.

Dispositions bring with them real potencies or tendencies. This is a modality that is short of necessity but more than pure possibility. Dispositions tend towards their manifestations only. Dispositionality is the modality needed for causation (Mumford and Anjum 2011, ch. 8).

A cause is something that tends towards its effect without guaranteeing it: smoking tends towards cancer, but not everyone who smokes gets cancer. A tendency can be counteracted by other tendencies: a healthy diet tends away from cancer.

Many philosophers admit of a type of causation that is short of necessity. All laws that give less than perfect regularities would then be probabilistic laws. The first is often associated with deterministic causation and the second with indeterministic causation.

With tendencies there is a better alternative that keeps the question of determinism or indeterminism separated from causation. Example: Half of all smokers will die from it. This is a statistical fact and less than a perfect correlation. For any two smokers there is the possibility that one dies from smoking while the other doesn't.

This is explained without statistics or probability. There might be a difference in their diet, lifestyles or biological dispositions. Contrast this with cases of genuine chance as some believe coin tosses and dice rolls to be.

Causation itself is neither law-like nor probabilistic. It is about real tendencies, and such tendencies can hold universally even if they are not manifested in every case. In order to deny a causal connection, one can therefore not look for counterexamples. Most people who smoke don't get cancer. Instead one must deny the tendency itself; that there is such a disposition of smoking.

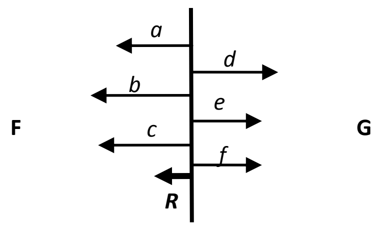
Whether a tendency will manifest will depend on its intensity and other factors involved. This is because of causal complexity.

Complexity

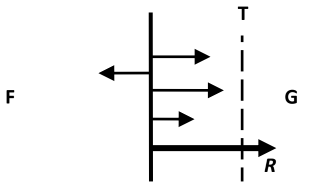
Causation is polygenic or complex: an effect is produced by many causal factors working together and sometimes against each other (Molnar 2003: 194).

Causal complexity is often assumed but abstracted away from, leaving most of the causes to the background conditions. We might focus on a particular gene or trait, tacitly assuming everything else that contributes to the production of the trait. But this misrepresents the actual situation and leaves us thinking that the gene is the only, or at least the most important, cause.

The vector model can illustrate causal complexity, where each causal factor disposes towards or away from the effect (Mumford and Anjum 2011, ch. 2). In the figure below the overall situation disposes towards F.



An effect typically occurs when causes come together and accumulate to reach a certain threshold effect T. A threshold is a stage in the causal process that we have an interest in. It can for instance be a point where a certain change occurs, such as a symptom for an illness.



To manifest, powers have to meet the right partners and form a *mutual manifestation* partnership. And the way powers compose is not a matter of simple addition. They can do so in a variety of different ways: *compositional pluralism*.

Some further aspects of causation

We can now explain a number of features that are often treated as problems of causation.

Extreme context-sensitivity: Two similar causal situations can have vastly different outcomes. A small addition in the cause might be all that is needed to tip the situation over a threshold. Think of a single virus making an otherwise healthy person ill, or a tiny sperm changing your whole life.

Interference: Any tendency can be counteracted by other tendencies, which leaves the possibility of causal interference and prevention. There are two forms of causal interference: subtractive (quit smoking) and additive (medication, antidote).

No necessity: The possibility of additive interference shows how a cause cannot be sufficient for its effect. We can have a cause (or a whole set of causes) that in one situation succeeds in producing an effect, but in another situation with something added would not. Example: poison and antidote, sex and contraception.

Limited prediction: Because of the context-sensitivity and possibility of causal interference, our predictions might fail. All causal laws must therefore come with a *ceteris paribus* qualification. This is because our predictions are limited by the number of causal factors that we take into consideration. Predictions of actual outcomes are therefore always fallible. What we can predict instead is tendencies.

Causes versus conditions: In counterfactual theories of causation everything that was a necessary condition for F was a cause of F. The Big Bang is thus a cause of me falling on the ice and someone dying of a heart attack was caused by their birth. If causes are dispositions, however, only what disposes towards the effect is a cause of it. The Big Bang does not dispose towards or away from me falling on the ice.

Reductionism

A similar point can be made concerning biological reductionist theories, such as sociobiology, Darwinistic medicine, evolutionary psychology, evolutionary economics, etc. In these theories it is assumed not only that biological processes are a pre-condition for psychological or social behaviour, but that they *causally determine* such behaviour.

An example of this is when the principle of natural selection is taken out of its biological context of evolution and used to explain individual choices in light of reproductive success. This is to confuse conditions and causes.

That we survive as a species is clearly a *sine qua non* condition for human agency, but it's not a cause of it. The survival of the species does not itself tend towards (or away from) any particular behaviour in individuals. Our psychological and social properties are themselves causally efficient, even if they are realised by a biological base.

As John Dupré says in his *Spinoza lectures* (2007: 52):

> ...from the point of view of behaviour, most of biology can be taken as given. The question why my arm goes up when I decide to raise it is an enormously difficult one for physiology, and a perpetually intriguing one for philosophy, but it can be taken for granted by most scientific students of behaviour.

Dupré notes there can certainly be some biological causes of behaviour. Having severe lung problems will tend away from me having a very active lifestyle, for instance. But this does not make *any* higher-level process caused by a lower-level process.

A biologically disposed theory of causation

I have tried to show that a dispositionalist theory of causation not only allows but also emphasises a number of features that other theories take as problems.

It explains why causation is complex, less than law-like, more than statistics, highly context-sensitive, and vulnerable to interference and fallible predictions. I hope this is a picture that biologists can recognise and find of some use.

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References

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