GST 81 — Cause, Effect and Causal Continuity

Formal Description

Causality is commonly represented as a relationship in which a cause produces an effect. However, causes and effects are not particular kinds of entity or event. They are epistemic roles attributed to portions of causal reality when those portions are selected and represented for explanatory purposes.

A causal phenomenon may therefore be an effect in relation to preceding causality and a cause in relation to subsequent causality. Causal reality consequently forms continuing causal networks rather than naturally dividing into independent cause-and-effect pairs. Individual cause-and-effect relationships are useful representations of selected portions of those wider networks.

Causation may produce a change of state, but causal influence need not always result in an obvious change. Causal processes may also maintain an existing state where continuing causal activity counteracts processes that would otherwise change it. The causal question is therefore broader than simply asking what caused something to change.

The boundary placed around a cause-and-effect relationship depends partly upon the purpose of the investigation and the level of detail required. The same underlying causal reality may therefore be represented differently for different explanatory purposes. For example, rainfall may be represented as a cause of increased river flow in one investigation and as a more distant cause of property damage in another. The underlying causal organisation has not changed; the portion selected for representation has.

Plain English Explanation

We often talk as though the world consists of separate causes followed by separate effects:

Cause → Effect

That is a useful simplification, but reality does not normally stop when the effect occurs. What we call an effect may itself influence something else and thereby become a cause:

Cause → Effect/Cause → Effect/Cause → Effect

Imagine heavy rain falling over a catchment. The rainfall contributes to runoff. The runoff contributes to increasing river flow. Increasing river flow raises the water level. The rising water may eventually cause flooding, and the flooding may damage property.

We could describe any part of this sequence as a cause-and-effect relationship. We might say:

Heavy rainfall caused increased river flow; or

The rising river level caused flooding; or

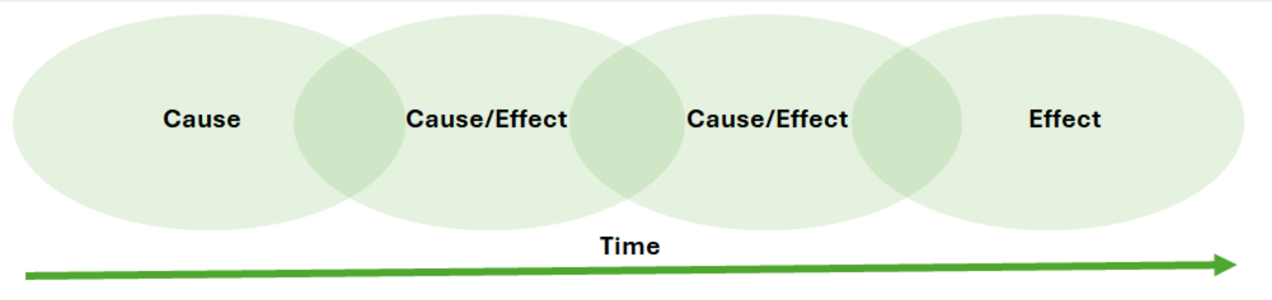
Flooding caused property damage.

All three statements may be useful. But the divisions between them are principally divisions in our descriptions. The causal reality continues through them.

This is why *cause* and *effect* are best understood as roles. Something is a cause of something, and something is an effect of something. The same phenomenon can occupy both roles. Increased river flow is an effect of water entering the river but can subsequently be a cause of rising water levels.

This also means that there is no single correct size for a causal explanation. “Heavy rainfall caused the flood” may be adequate for one purpose. If we are trying to prevent future flooding, however, we may need to look much more closely at rainfall, infiltration, runoff, drainage, river flow, water levels and overtopping. This movement towards greater causal detail is known as causal decompression.

The important distinction is therefore between causal reality and our representation of causal reality. The reality exists independently of our investigation. We select which parts to call causes and effects according to what we are trying to understand.



From Cause and Effect to Causal Continuity
Cause and effect are relational roles within continuing causal reality. An effect of preceding causality may become a cause of subsequent effects.

Examples
Consider a row of dominoes. One falling domino causes the next to fall. That second domino is an effect in relation to the first domino, but becomes a cause in relation to the third. Continuing this distinction through the row makes it clear that cause and effect describe positions within a causal sequence rather than fundamentally different kinds of things.
A biological example is eating food. Eating produces subsequent digestive processes, which make nutrients available for absorption. Absorption affects the availability of materials to cells, and cellular processes subsequently contribute to many further effects. Where we place the beginning and end of our causal explanation depends upon what we are trying to explain.
Maintenance provides a slightly different example. A refrigerator may remain at approximately the same temperature even though causal processes are continuously occurring. Heat enters from the surroundings while the refrigeration system removes heat. The relative stability of the temperature should not be mistaken for an absence of causality. Continuing causal activity may be responsible for maintaining the state.
Finally, consider the following example involving rainfall:
Rainfall → runoff → river flow → rising water level → flooding → property damage
If we are interested in river hydrology, we might concentrate upon the relationship between rainfall, runoff and river flow. If we are investigating damage to a house, our immediate causal focus might instead be upon flooding and property damage. Both investigations concern portions of the same wider causal reality.

Provenance and Links
The distinction between observed regularities and underlying causation has a long history in philosophy of science. David Hume famously questioned whether causal necessity could be observed directly, helping establish the enduring distinction between observed succession or association and causal connection. In the twentieth century, Roy Bhaskar's Critical Realism argued that causal mechanisms and powers belong to reality and should not be reduced to recurring

patterns of observed events. These course modules adopt this realist orientation: causal organisation is treated as existing independently of the particular way in which an observer represents it.

Modern causal analysis also distinguishes statistical association from causation. Judea Pearl's work on causal inference provides an important contemporary example, emphasising that observed associations alone do not demonstrate causal influence. Thee course modules similarly treat recurrence and correlation as possible starting points for causal investigation rather than as proof of causality.

The particular formulation developed in these modules, i.e., that cause and effect are epistemic roles assigned to selected portions of a continuing causal reality, is a distinctive feature of the present framework. It leads to the further proposition that an effect in one causal relationship may subsequently occupy the role of cause in another, so that individual cause-and-effect pairs are best understood as representations of portions of wider causal networks.

Related concepts developed in later modules include physical causal transfer, causal chains and networks, PTP and TPT representation, and causal decompression.

Practical Exercise

In this and subsequent modules, you will progressively analyse the example of a town experiencing local flooding after heavy rainfall. As you learn additional concepts, you will return to the example and develop an increasingly detailed representation of its causal organisation.

For this first exercise, begin with the following deliberately simplified causal sequence:

Heavy rainfall → surface runoff → increased river flow → rising water level → flooding → property damage

Take increased river flow as the phenomenon you wish to explain. Identify which preceding phenomenon you would describe as its cause. Explain why you have placed the boundary of your causal explanation there and consider whether you could reasonably extend the explanation further backwards.

Now change the purpose of your investigation. Imagine that you are an insurance investigator primarily interested in explaining property damage. Identify the phenomenon you would regard as the immediate cause of the damage. Then identify which other phenomena in the sequence could be regarded as more distant causes. Consider why changing the purpose of the investigation has changed which parts of the causal sequence receive your attention, even though the underlying causal sequence itself has not changed.

Next, select one of the intermediate phenomena, such as rising water level. Explain how the same phenomenon can be regarded as an effect in relation to what precedes it and as a cause in relation to what follows it.

Finally, consider the statement: “Heavy rainfall caused the property damage.”

Decide whether this statement is necessarily incorrect or whether it can instead be understood as a compressed representation of a longer causal sequence. Write a short explanation of your reasoning.

Then imagine that the purpose of your investigation changes again. Rather than merely explaining why the property was damaged, you have now been asked to identify possible ways of preventing similar damage in the future. Consider what additional causal detail you might need to investigate and why a more decompressed causal representation could be useful for this purpose.

At this stage, concentrate upon cause, effect, causal continuity, explanatory boundaries and causal decompression. You are not yet required to identify the physical processes and transfers connecting the different parts of the sequence. These will be introduced in the next module: The Physical Basis of Causality.