GST 92 — Causality, Configuration and Assembly

Formal Description

This module introduces the connection between physical causality and assembly. It explains how transfers link sources and recipients, and why considering entities together or arranging them in space and time does not necessarily organise them as components of an assembly. These distinctions provide a starting point for explaining system formation through physical mechanisms.

In Foundational Causality, a causal relationship involves a transfer from a source to a recipient. The transfer may comprise matter, energy or physically embodied information. The terms source and recipient identify the roles of causally related entities: the former acting as a cause and the latter experiencing its effect. An entity can receive one transfer and subsequently produce another. Connected relationships can therefore form more extensive causal processes.

A **collection** consists of entities considered together. A **configuration** describes their arrangement in space and time, including position, orientation and timing. Configuration can enable or constrain interactions without itself establishing an assembly. For example, placing two pipe ends opposite one another can make connection possible, but it does not make the joint.

Assembly occurs when causal processes organise previously separate entities as components of a more extensive entity. The word also names the resulting entity: **an assembly** is an organised entity comprising two or more components. Their participation depends upon the relationships established through the assembly process, rather than merely upon location or inclusion in a list.

A transfer may involve a whole component, a lower-level constituent or an entire source entity. Under the terminology used here, **whole-entity transfer** occurs when the entire source becomes incorporated with the recipient into a more extensive assembly. The transferred entity may retain its identity and internal organisation while acquiring a component role.

Whole-entity incorporation need not require spatial relocation. If interactions establish organised participation between entities already suitably positioned, then assembly can occur where they are. The important change is their component relationship, although physical transfers and interactions are needed to establish it.

The same whole-entity transfer can be represented as A joining B or B joining A. These are alternative perspectives on their incorporation into a more extensive entity; they do not reverse the physical direction of a particular transfer. Nor do they require a third, pre-existing recipient.

By the end of the module, the learner should be able to identify sources, transfers and recipients, distinguish collection and configuration from assembly, and explain whole-entity incorporation without confusing it with spatial movement.

© John A Challoner, 2026.

Plain English Explanation of Causality and Configuration

Imagine a town where flooding has revealed a damaged section of a drainage network. The authority obtains replacement pipes and arranges for them to be installed. We can use this familiar situation to separate several questions that might otherwise become confused.

First, consider an ordinary causal transfer. A warm object passes energy to a cooler one, or an installer speaks instructions to a colleague. In each case there is a source, a physical transfer and a recipient. The information in the spoken instructions is carried by physical sound; it is not something detached from the physical interaction.

The same pattern can be followed during installation. An installer uses a tool to transfer energy to a fastening. The tool and fastening occupy source and recipient roles in that relationship. The resulting change may help establish a connection between the pipe sections.

Now consider the pipes before installation. If they are entered together on an inventory, then they form a collection. This is because they have been selected and considered together. The inventory does not tell us how they are positioned or whether they have been connected.

Alternatively, imagine the pipes laid beside the excavation. We can describe their spacing and the directions in which their ends point. We are now describing a configuration. If their ends are suitably aligned, then making the joints may be easier. On the other hand, if one pipe obstructs access to another, then the arrangement may prevent the necessary work.

Configuration therefore matters. It changes the circumstances in which the existing capabilities of the pipes, tools and installers can operate. However, suitable alignment is not the same as an established joint. The pipes have not become assembled merely because their ends face one another.

The distinction also applies to arrangements through time. Two compatible entities may be available at different times and so fail to encounter one another. Alternatively, their simultaneous availability may allow an interaction to occur. Timing can therefore enable assembly without itself supplying the interaction that establishes component participation.

A configuration can also possess a property that no individual entity possesses alone. Three objects arranged in a triangle provide a simple example. Nevertheless, the triangular arrangement does not, by itself, show that the objects have become an assembly.

So, collection and configuration tell us different things. A collection identifies the entities considered together, while a configuration describes their arrangement in space and time. We still need to ask what establishes their participation as components of an organised entity.

© John A Challoner, 2026.

Plain English Explanation of Assembly and Whole Entity Transfer

Return to the drainage network. The installers join the pipes and secure them in position. Physical interactions and transfers establish connections between the sections, so that they participate as components of assembled pipework. Water can then pass along the connected route when suitable inputs and conditions are present.

We use the word assembly in two related ways. The installers carry out assembly as a process. The connected pipework is an assembly as an entity. This is why it is useful to distinguish what establishes the organisation from the organisation that results.

A complete pipe section can become a component of that pipework without being destroyed. Similarly, a bolt becomes a component of a machine when it is inserted and fastened. Its relocation alone would not establish assembly: the fastening interactions establish its new role.

Whole-entity transfer describes incorporation of the entire source entity. From the perspective of the separate bolt, the whole bolt joins the machine. From the perspective of a larger storage assembly, such as a package of bolts, that same bolt might be a departing component. So, whether we describe a transfer as involving an entity, a component or a lower-level constituent depends upon the organisational level being examined.

Movement is not the defining criterion. Suppose two compatible pipe sections are already aligned and supported. If a joint is then made between them without relocating either section, then their organisational relationship changes where they are. Previously separate entities become components of connected pipework through the interactions establishing the joint.

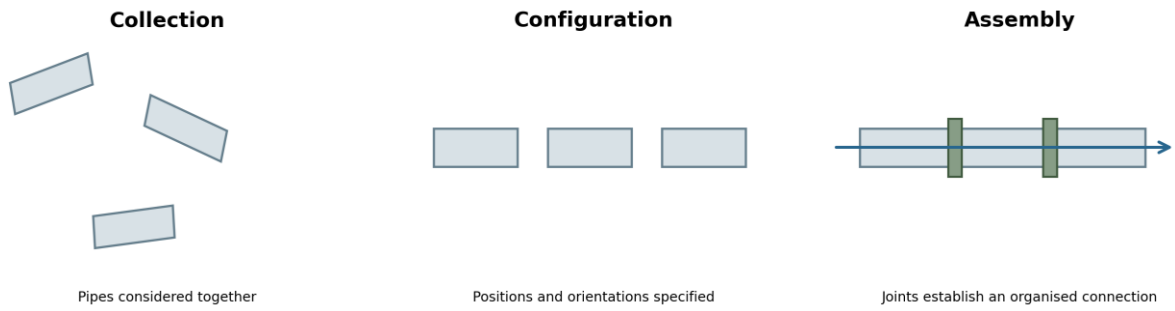
We can describe this as A joining B or B joining A. In both accounts, the result is the same assembly, AB. Neither account requires another entity to exist beforehand as a container for the pair. However, changing our viewpoint does not mean, for example, that an actual transfer of energy has changed direction.

The new relationships can change what the components can do together. In a drainage network, they establish a connected route for water, while also restricting its movement. Thus, assembly can enable some interactions and constrain others without necessarily changing the internal organisation of each pipe section.

Assembly does not necessarily require deliberate human action. Atoms can become incorporated into molecules through physical interactions under suitable conditions. People can establish an organisation through communication, agreement and coordinated participation. The mechanisms differ, but in each case we can ask how the component relationships are established.

An assembly can also remain assembled between occasions of use. Empty pipework does not cease to be an assembly simply because water is not passing through it. What maintains its organisation, and what capabilities that organisation supports, are further questions developed in later modules.

© John A Challoner, 2026.



Collection Configuration and Assembly

The diagram compares what is established about the pipes: their selection, their arrangement and their organised connections. They need not represent three separate stages in every case. The arrow indicates a possible water transfer through the assembled pipework.

Examples

Collection and configuration. All the red cars in a car park can be considered together as a collection. The positions and orientations of those cars also form a configuration. If some block the exits of others, then their arrangement constrains movement without turning them into components of a larger assembly.

Mechanical assembly. Shelving parts may be selected and laid out before being fastened together. Their arrangement makes particular interactions possible; fastening then establishes the component relationships. Similarly, placing a bolt beside a machine differs from incorporating it through fastening.

Chemical assembly. Atoms occupy changing configurations as they move. Under suitable conditions, interactions can establish a molecular assembly. Thus, an encounter can provide an opportunity for assembly, but the particular interactions determine whether the atoms become bound.

Social assembly. People waiting independently at a railway station share a location. Alternatively, some may establish a volunteer group through communication, agreed responsibilities and coordinated activities. If those relationships are established, then their organised participation can continue even when they are no longer in the same place.

The general questions are shared across these examples, but their mechanisms are different. We therefore need to identify both the entities and the interactions that establish their particular organisation.

An existing assembly can still be considered as a collection, and its components also possess a configuration; these descriptions are not mutually exclusive.

© John A Challoner, 2026.

Provenance and Links

This module draws upon *Foundational Causality* and *Causal Assembly Theory: Assembly and Disassembly as Causal Processes*. The former supplies the source–transfer–recipient account of physical causality. The latter explains how that account connects with the formation of organised component relationships, including whole-entity incorporation (Challoner, 2026a, 2026b).

The distinction between collection, configuration and assembly separates three questions: which entities are considered together, how they are arranged, and what establishes their participation as components. This helps us to investigate organisation through physical processes rather than treating proximity or a descriptive grouping as sufficient evidence of assembly.

The importance of organisation has a long history in General Systems Theory. Von Bertalanffy (1968) examined systems as organised wholes. Causal Assembly Theory develops the causal question of how those organised relationships are established, maintained and changed.

The name Causal Assembly Theory distinguishes this account from the Assembly Theory developed by Cronin, Walker and their collaborators. Their work examines construction histories, selection, evolution and complexity (Sharma et al., 2023). The approaches address related questions, but their uses of assembly should not be assumed to be identical.

The drainage, shelving, parking and volunteer-group examples are illustrations of the distinctions. They show what to investigate, rather than providing empirical tests of every wider application. The broader hypotheses of the theory require testing through identification of the actual participants, interactions and organisational relationships involved.

Challoner, J. A. (2026a). Causal assembly theory: Assembly and disassembly as causal processes. Rational Understanding.

Challoner, J. A. (2026b). Foundational causality. Rational Understanding. https://rational-understanding.com/efgst/

Sharma, A., Czégel, D., Lachmann, M., Kempes, C. P., Walker, S. I., & Cronin, L. (2023). Assembly theory explains and quantifies selection and evolution. Nature, 622(7982), 321–328. https://doi.org/10.1038/s41586-023-06600-9

von Bertalanffy, L. (1968). General system theory: Foundations, development, applications. George Braziller.

© John A Challoner, 2026.

Practical Exercise

Consider the drainage network described in this module. Six replacement pipe sections have been selected. Two remain at the depot, three are aligned beside the excavation with gaps between their ends, and one has been joined to the existing drain. Treat these as observations in a hypothetical case.

First, explain what can be described as a collection, a configuration or an assembly. Give reasons for each judgement. Remember that an assembled entity can also be considered as a collection and described by its configuration.

Now identify a source, transfer and recipient during the work. For example, follow an energy transfer from an installer's tool to a fastening. Explain what changes and how that change contributes to establishing component participation. Then identify a different example involving physically embodied information.

Draw the loose aligned sections and the joined section. Mark an orientation, spacing or access condition that enables the work, and identify the physical interaction establishing a connection. Explain why the condition and the interaction play different roles.

Suppose two loose sections briefly knock together during unloading. Their contact involves an interaction, but it does not establish the joined drainage route. What additional relationship would you need to identify before describing them as components of that assembly?

Alternatively, suppose two supported sections are already in their final positions. If a joint is made without relocating either section, then what changes? Explain how this can constitute assembly even though spatial movement of the whole sections is unnecessary.

Choose a separate bolt becoming part of a machine. Explain why the whole bolt can be treated as the transferred entity. Then consider that bolt as a component leaving a package. How does changing the organisational level affect your description of the same entity?

Represent two entities becoming assembled as A + B → AB. Explain the perspectives A joining B and B joining A. Why do these accounts describe the same result without implying that a particular physical transfer has reversed direction?

Finally, write a short explanation from your own experience. Identify the entities, their configuration and the interactions through which they become components. Use your example to explain why spatial proximity or evidence of an interaction alone would not establish organised component participation.

© John A Challoner, 2026.