GST 23 Pattern and the Recurrence–Causality Principle

Formal Description

This module examines the concept of pattern and develops one of the central propositions of the General Systems Theory framework: recurrence requires causality. The module distinguishes between artificial patterns, configurational patterns, and causal patterns, and explains why recurring organisation ultimately depends upon causal relationships or causal constraints. The module also explores examples such as crystal structures, closely packed spheres, and planetary orbits in order to examine the relationship between geometry, causality, and recurrence.

Pattern may be understood as the observable manifestation of recurring causal organisation.

Pattern may appear in:

- artificial configurations (artificial patterns);
- organised configurations (configurational patterns);
- or recurring causal networks (causal patterns).

Configurational patterns arise from causal patterns because recurring organised configurations depend upon recurring causal organisation.

Artificial patterns are also most likely manifestations of underlying causal organisation, even where the resulting regularity appears geometric, spatial, or constraint-based rather than obviously generated through direct interaction.

This leads to a central proposition: Recurring pattern requires causality. That is, patterns can occur only where causal relationships or causal constraints exist that produce their reappearance in space-time.

Without causal organisation:

- configurations remain transient and non-recurring;
- and causal networks fail to show recurring organisation.

Pattern therefore does not arise from arrangement alone, but from causal organisation.

Plain English Explanation

Patterns are repeating forms of organisation.

We often recognise patterns visually:

- waves on a beach;
- repeating crystal shapes;
- spiral galaxies;
- or regularly recurring behaviour.

At first sight, some patterns may appear purely geometric or “acausal”. For example, closely packed spheres naturally form regular geometric arrangements. Likewise, planetary orbits exhibit recurring regularity.

However, closer examination suggests that these patterns still depend upon underlying causal organisation.

In the case of packed spheres:

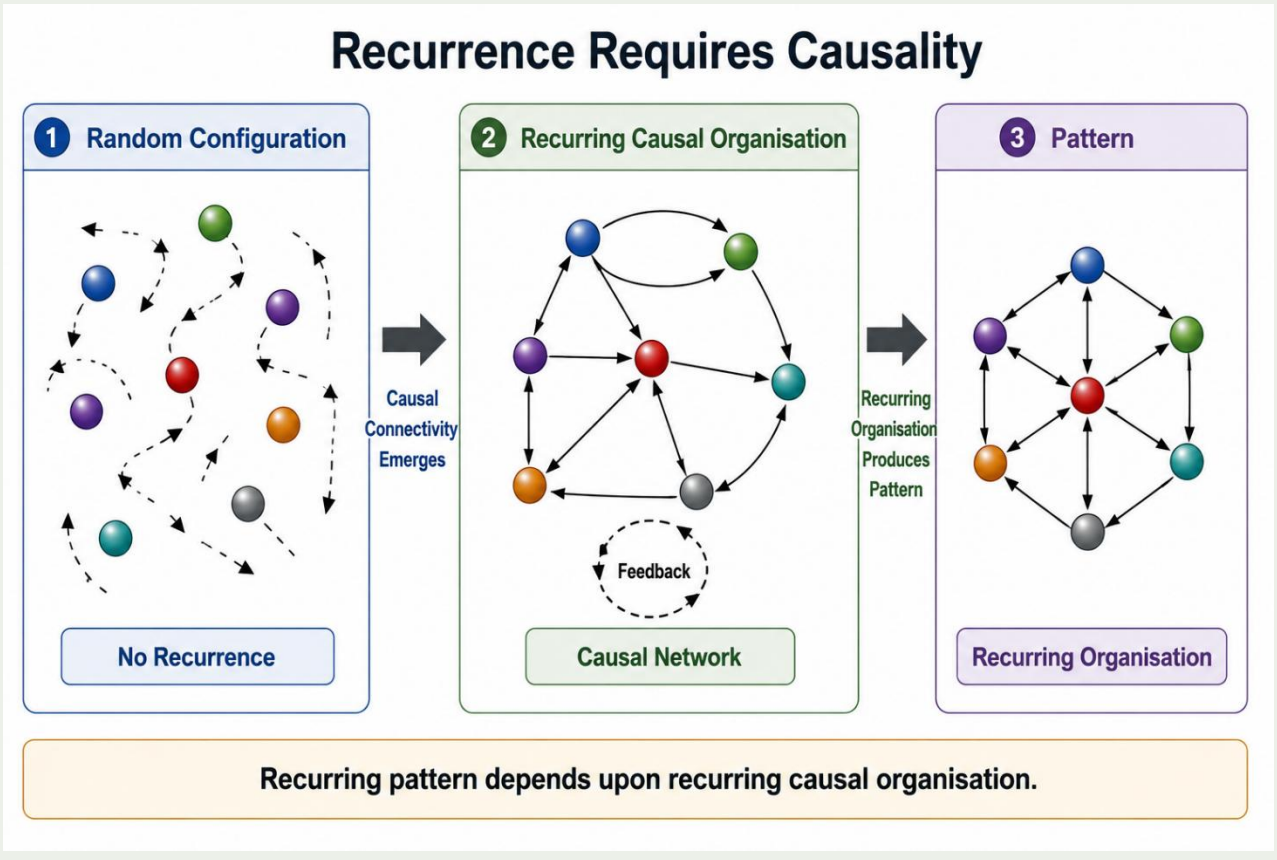
- agency;
- motion;
- contact;

- pressure;
- gravity;
- and boundary conditions

all contribute to the resulting arrangement.
Similarly, planetary orbits arise either through:

- gravitational interaction in the transfer sense;
- or through the constraint imposed by curved space-time.

In both cases, recurring organisation depends upon lawful causal organisation rather than arrangement alone.
This leads to one of the central ideas of the theory: Recurrence requires causality. Without causal processes or causal constraints capable of reproducing organisation across time, recurring pattern cannot exist.



Example 1 — Crystal Structures
Crystal structures form repeating geometric arrangements because of recurring causal interactions between particles.
Example 2 — Packed Spheres
Closely packed spheres form regular geometric arrangements. Although the resulting pattern appears geometric, it still depends upon causal interactions and physical constraints.

Example 3 — Planetary Orbits
Planetary orbits exhibit recurring regularity arising either through gravitational interaction or through the causal constraints imposed by curved space-time.
Example 4 — Traffic Patterns
Recurring traffic flows arise through repeated interactions between drivers, road layouts, and movement constraints.

Provenance and Links
The concept of pattern developed in this module draws particularly upon systems theory, thermodynamics, physical causality, emergence theory, and complexity science. Across these traditions, recurring organisation has been recognised as a fundamental feature of physical and systemic reality. Thermodynamics and statistical physics, particularly through the work of Boltzmann (1877) and later Prigogine and Stengers (1984), explored how organised regularities may emerge and persist within physical systems despite underlying variation and instability. Complexity theory and studies of self-organisation similarly examine how recurring patterns arise through distributed causal interaction and constraint (Mitchell, 2009). The present framework builds directly upon earlier discussions of configuration, structure, organised configuration, and dynamic structure by arguing that recurrence itself requires causal organisation. This proposition extends beyond direct transfer interactions to include agency and forms of causal constraint operating through geometry, organisation, and constrained trajectories. The module therefore establishes one of the central propositions of the GST framework: recurring organisation requires causal organisation. It also prepares the conceptual basis for later discussions of information, landscapes, attractors, constrained system trajectories, and the thermodynamic foundations of organised physical reality.

Practical Exercise

- Explain the difference between:
  - Artificial pattern;
  - configurational pattern;
  - and causal pattern.
- Describe why recurring organisation requires causality.
- Give three examples of recurring patterns generated through causal interaction.
- Explain why apparently geometric regularities may still depend upon underlying causal organisation.