GST 79 – Recursive Organisation

Formal Description

Recursive organisation is the repeated occurrence of the same fundamental principles of causal organisation at successive levels within a systems hierarchy. Through recursive organisation, systems become components of larger systems while retaining their own organised causal organisation and emergent properties, behaviours and functions.

Plain English Explanation

One of the most remarkable features of the natural and social worlds is that similar patterns of organisation appear repeatedly at many different levels.

Atoms combine to form molecules. Molecules combine to form cells. Cells combine to form tissues. Tissues combine to form organs. Organs combine to form organisms. Organisms combine to form societies and ecosystems.

At every level, the same general principles apply. Components interact through organised causal processes. New emergent properties, behaviours and functions appear. The resulting system may then become a component of an even larger system.

This repeated application of the same organisational principles is known as recursive organisation.

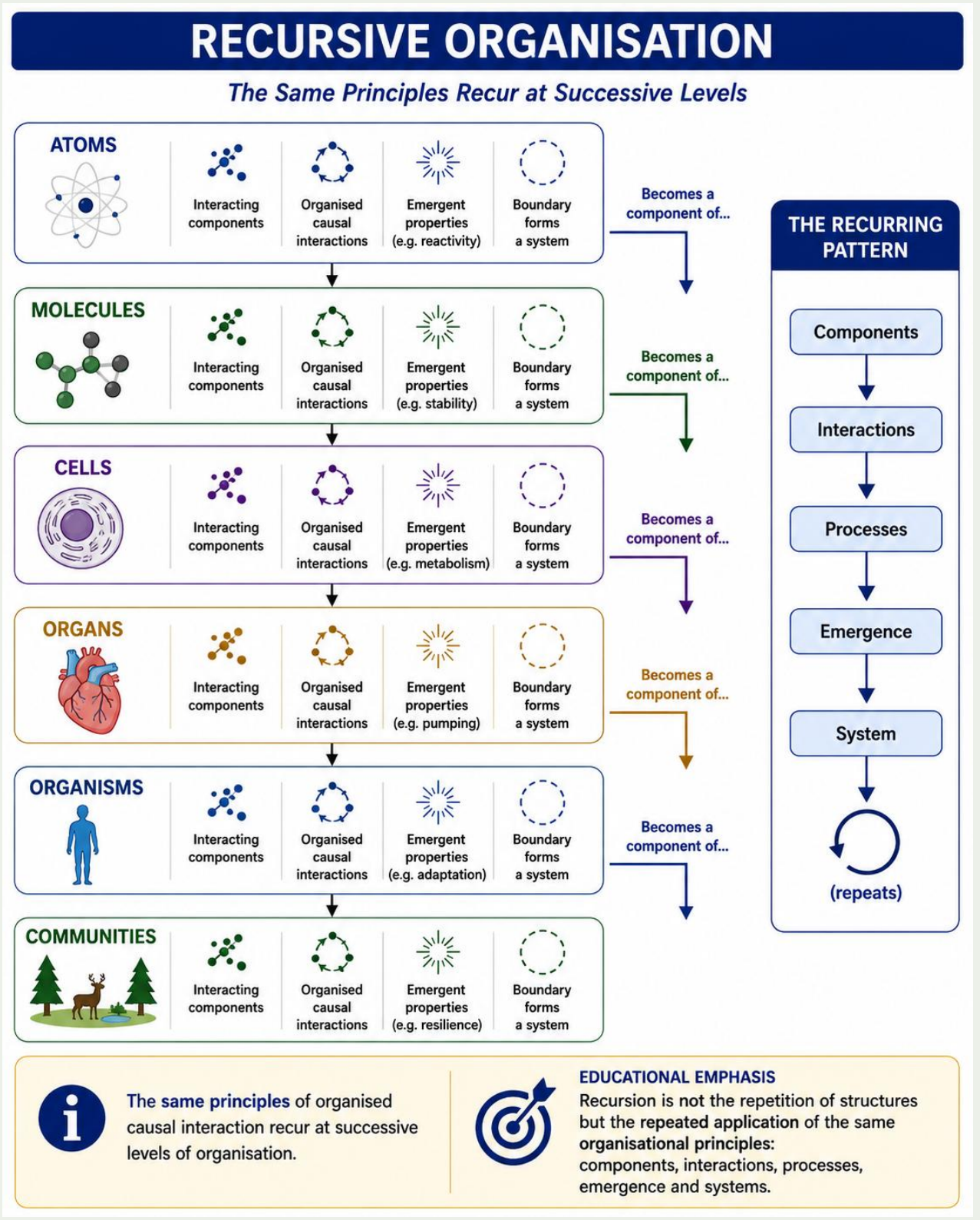
Recursive organisation differs from a systems hierarchy. A systems hierarchy describes the arrangement of nested systems at a particular point in time. Recursive organisation explains how that hierarchy comes into being and why similar patterns occur repeatedly at different levels.

Recursive organisation also explains why General Systems Theory is *general*. The concepts introduced throughout this course—entities, interactions, processes, systems, emergence, environments, functions and behaviour—are not limited to any particular scale or discipline. They recur whenever organised causal interactions produce new systems.

This does not mean that every level is identical. Each level possesses its own emergent properties and often requires its own specialised concepts. Nevertheless, the underlying organisational principles remain recognisably similar.

Recognising recursive organisation enables us to transfer understanding from one domain to another. Insights developed in biology may illuminate social systems, engineering may inform ecology, and organisational principles discovered at one level may provide useful hypotheses at another. This ability to recognise recurring patterns is one of the principal strengths of systems theory.

Recursive organisation explains why the same organisational principles recur throughout the natural, engineered and social worlds. In the final module we shall draw these ideas together and explain why this recurring organisation gives General Systems Theory its general applicability across disciplines.



Examples

The human body illustrates recursive organisation. Molecules form cells, cells form tissues, tissues form organs and organs form the organism. At every level, organised causal interactions generate new emergent properties while preserving the underlying principles of systems organisation.

A business organisation also exhibits recursive organisation. Individuals form teams, teams form departments, departments form divisions and divisions form the organisation as a whole. Each level develops its own functions, behaviours and emergent capabilities while contributing to the functioning of larger organisational systems.

Provenance and Links

Recursive organisation has long been recognised as a characteristic of complex systems. General Systems Theory explains how similar principles of organisation recur across multiple levels of complexity, enabling systems to be analysed using common conceptual frameworks despite differences in scale or domain. Recursive organisation provides one of the principal foundations for the general applicability of systems theory.

Practical Exercise

Choose a familiar system such as a biological organism, a business, a transport network or an ecosystem.

Identify at least four levels of organisation within that system.

For each level:

- Identify the principal components.
- Describe the organised causal interactions between those components.
- Identify one emergent property, behaviour or function that appears at that level.
- Explain how the resulting system becomes a component of the next higher level.

Finally, identify one organisational principle that appears to recur at every level and explain why this supports the idea of recursive organisation.