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An aerial photograph of a city, likely Sheffield, showing a dense urban area on the left and a large, green, forested area on the right. A river flows through the center, and a winding path or road is visible in the forest. The image is rotated 90 degrees clockwise.

Interweaving architecture and ecology

A theoretical perspective

Or: *What can architecture learn
from ecological systems?*

Why can the study of ecology be beneficial for architecture?

1. Practically (sustainability)
2. Conceptually (connectivity, flexibility, dynamics)

The distinction between the artificial and the natural must lie not in their source – human or not – but in their characteristics, in the way they relate to the world around them
(Postrel, 1998: 148)

Ecology – the relation of organisms to one another and to their physical surroundings

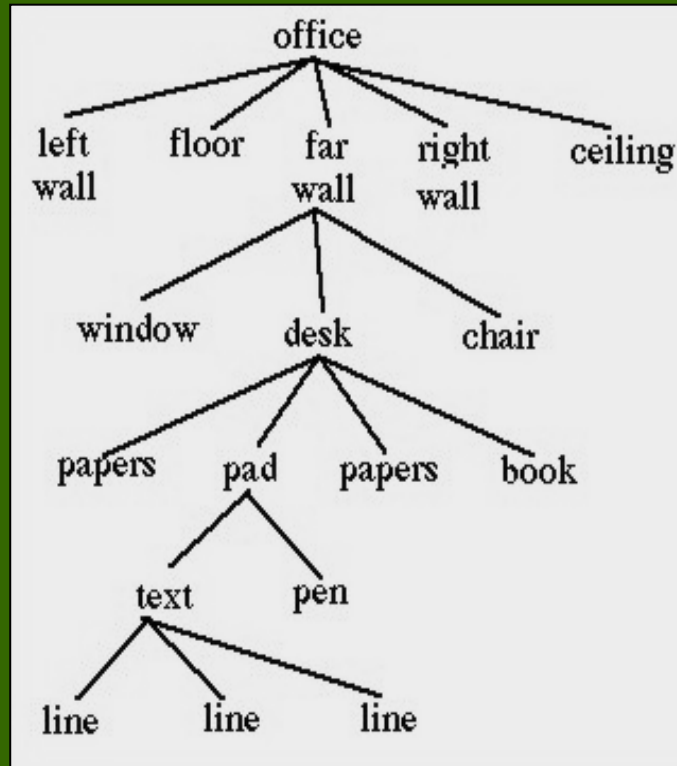
Comparison between mechanism and organism

(Elisabet Sahtouris, 2000)

Allopoietic Mechanism

- Is assembled
- Rules given
- Hierarchic
- Is reinvented
- Is repaired

Architecture



Comparison between mechanism and organism

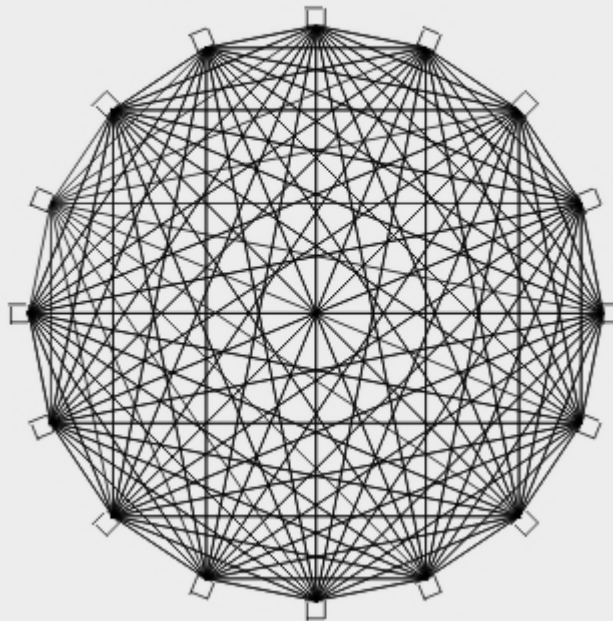
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Allopoietic Mechanism

- Is assembled
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Architecture

HOLARCHIC (PART/WHOLE) ORGANIZATION



Autopoietic Organism

- Grows itself
- Rules itself
- Holarchic
- Evolves
- Repairs itself

Ecological systems

Three ecological principles which define the organization of living systems:

- 1. *Fluctuations*** – *the action or condition of passing more or less rapidly and suddenly from one state to another.*
- 2. *Stratification*** – *the formation, by natural process, of strata or layers one above the other.*
- 3. *Interdependence*** – *the fact or condition of depending each upon the other; mutual dependence.*

1. Fluctuations – the action or condition of passing more or less rapidly and suddenly from one state to another.

Dynamics → **Adaptation** → **Resilience**

a) Self-maintenance: self-renewal, healing, homeostasis, adaptation.

b) Self-transcendence: learning, development, evolution.



Embryo at 4-cell stage



Embryo at 64-cell stage



Embryo at 256-cell stage

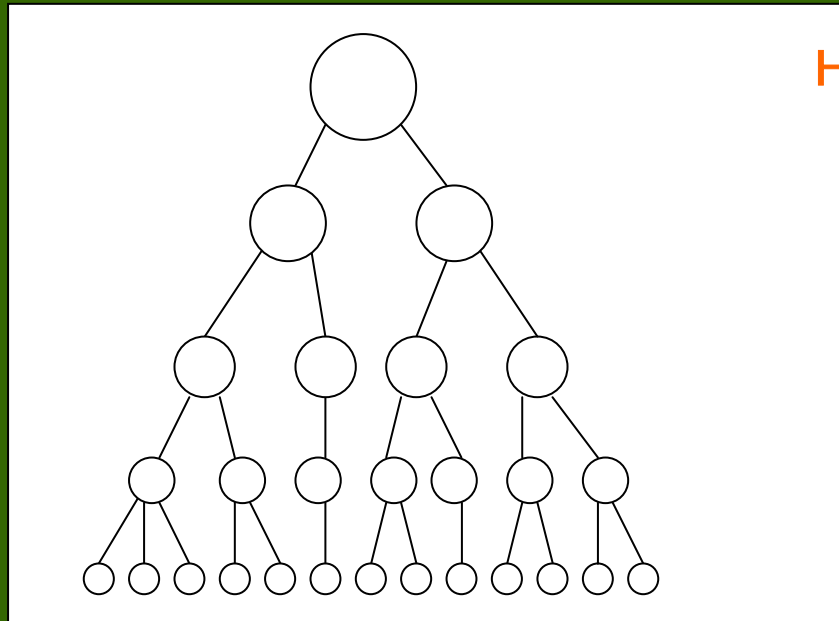


Embryo separated from the Yolk

Blue king crab embryo: *embryo formation process as an evolutionary process of self-transcendence in organisms*

2. Stratification – the formation, by natural process, of strata or layers one above the other.

The organization of complexity



Hierarchy Top-down

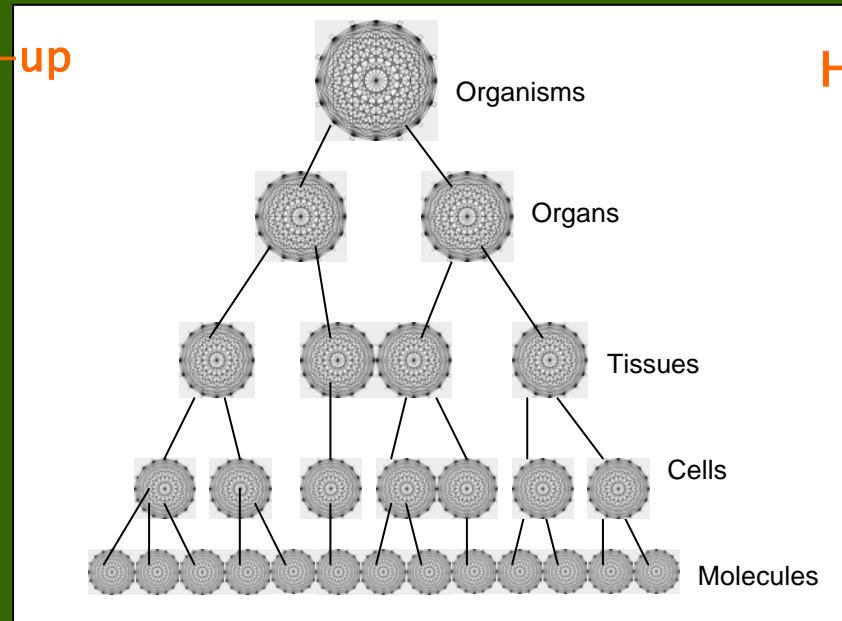
All components exist in order to maintain an overall 'goal'. The 'goal' of individual components is irrelevant or nonexistent.

2. Stratification – the formation, by natural process, of strata or layers one above the other.

The organization of complexity

Holarchy Bottom-up

Each individual component is a 'subsystem', is a whole in itself. All of the subsystem's individual 'goals' function together to maintain an overall goal of the bigger system.

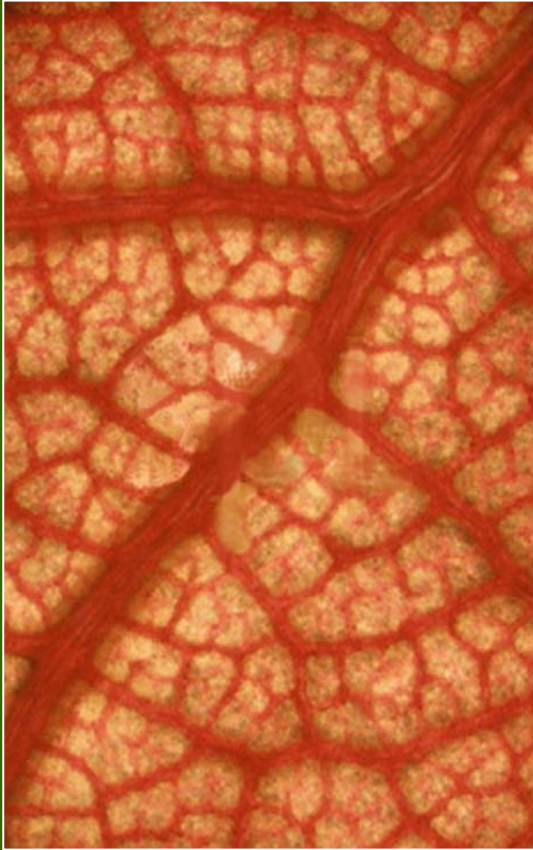


Hierarchy Top-down

All components exist in order to maintain an overall 'goal'. The 'goal' of individual components is irrelevant or nonexistent.

Emergent properties – properties that occur as a result of the interactions between the components in the system.

3. Interdependence – *the fact or condition of depending each upon the other; mutual dependence.*



Feedback loops:

- Positive feedback: recurrent influence reinforces initial change.
- Negative feedback: reaction is opposite to initial action.

Second order cybernetics:

- The observer is part of the system.
- The system is a vehicle for information, meaning is generated by the observer.

“The connectivity drives the system: in order to create the whole, the connections grow and proliferate, using the components as anchoring nodes for a coherent network” (Salingaros, 2004: 48).

Fluctuations Stratification Interdependence

→ ? *Designing places*

Three possible methods of application of the ecological principles in architecture:

- *Metaphorically* – using ecological principles as a general concept that can enhance the meaning of architecture.
- *Analogically* – certain aspects of the ecological principles can be compared to certain aspects in architecture and by this reveal differences and similarities.
- *Literally* – a direct analysis and transformation of the ecological principles into architectural systems.

An aerial photograph of Central Park in New York City. The park is filled with trees, some of which are bare, and a large number of bright orange fabric gates are arranged in a circular pattern on the grass. In the background, the dense Manhattan skyline is visible under a clear sky.

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Photos- <http://christojeanneclaude.net/>

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