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Title: *Education for Sustainability:* ***Lessons from Living Systems Governance.***
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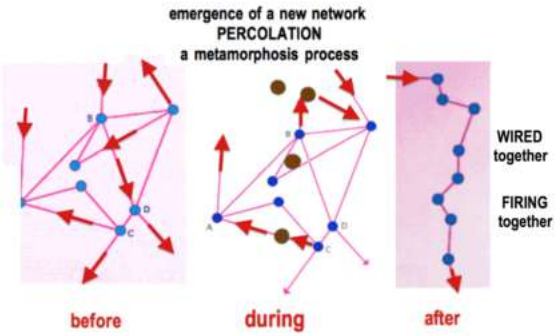
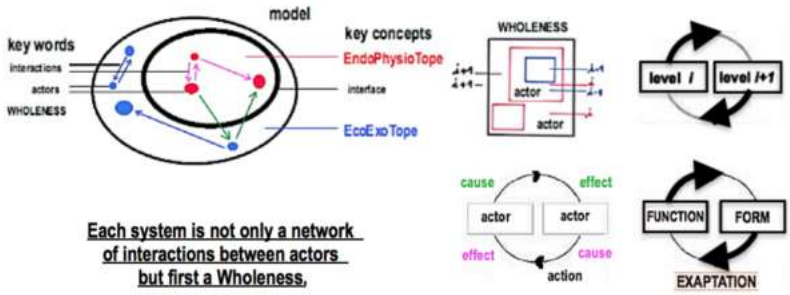
abstract
To survive that is to eat and not to be eaten. Whatever its spatial and temporal level of organisation, every living system owns 7 invariant capacities (**the gauge invariance paradigm**). Emerging by embedments and juxtapositions of previous systems, every living **system-of-systems** is both dependent and independent from its new global level of organisation and past and present local situations of emergence. **Mass growth governs growth phase duration**. Local actors, modules of past, present and new modules of modules become mutually integrated (**the percolation process of network metamorphosis**) into a new Whole through their merging into an emerging ARMSADA (**Association for the Reciprocal and Mutual Sharing of Advantages and DisAdvantages**). Reversely (**the systemic constructal law**) the global Whole is integrating the local parceners. Whatever **the organisation level**, the living systems obey the same principle of evolution and emergence, the volume and time of generation of the adult system obey a correlation: The mass controlled duration of acquisition of the reproductive capacity and the volume at its acquisition are linked by a 3/2 exponent power law (**a Universal allometric scaling law**). This dynamic fractal law is invariant, between and within levels of organisation. **Brownian motion** is the basic phenomenon of growth control: ***Matter and energy are exchanged at a constant flow rate. A Pareto-like relationship governs limits and limitations:*** Mutual survival depends on **reciprocal limitations**, through interactive feedbacks, for the best and for the worst. To survive that is to transform disadvantages into advantages and to avoid advantages turn to disadvantages, in order to itself survive its self.

7 functional capacities are mutually necessary and sufficient for to be a living system (Bricage, 1991).

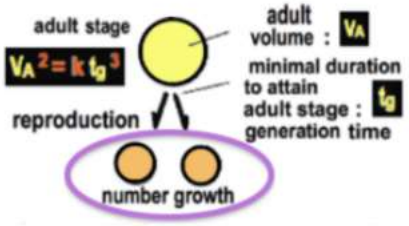
The capacity of
1. MATTER and ENERGY FLOWS CONTROLS
2. MASS GROWTH
3. REACTIONS TO external and internal STIMULATIONS
4. INNER SPACE-TIME ORGANISATION (action-space-time ontogeny)
5. OUTSIDE INTEGRATION into an ecoexotope of survival [*exo*, external, *tope*, space-time, *eco*, of inhabitation]
6. MOTION (external or internal, passive or active, movements)
- CAPACITIES FOR THE SURVIVAL of the endophysiotope [*endo*, internal, *tope*, *space-time*, *physio*, of functioning]
- IN ORDER TO *"ITSELF SURVIVE ITS SELF"*:
7. REPRODUCTION,
with or without NUMBER GROWTH



The Systemic Constructal Law : interaction is construction



Each system is not only a network of interactions between actors but first a Wholeness,



made of 3 types of entities: - actors, - interactions (links) between (and within!) actors, - the Wholeness.
Due to the juxtaposition and embedding of the actors, a system is always a system of systems, in which the endophysiotope (endo: internal, tope: space-time, physio: of functioning) of a i level of organization is the ecoexotope (exo: external, tope: space-time, eco: of inhabitation) of adjacent $i-1$ levels.
Due to the retro-actions of actors (and levels of organization) on each others:
"interaction is construction and construction is interaction."

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