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[ Learning from Simulations: Why Natural Evolution is NOT an Optimizing Process ] 🧵

In my scybernethics journey, I have learned one important thing: that you can test general complex *principles* about life and cognition, like "emergence" or "evolution"

by simulating them and not only grasping them abstractly. This is crucial because there is two things that we can't think directly intellectually: complex distributed systems and evolutionary ones.

Moreover, while a simulation can only be a reductionist simplification of any real phenomena, by simulating them one can gain very valuable insights and intelligibility tools about,

not the details but *the principles* at play in these two dimensions of our own conception of cognitive and living processes.

I will illustrate it here with the example of natural evolution. A classical algorithmic translation of Darwinism (a simplification of Darwin ideas) is what is called metaphorically and heuristically a "genetic algorithm". Its iterative principles are quite simple:

1. A diversity generator: usually a fake "genetic coding of functional traits" represented by a linear stable memory container which is then coupled with some more or less random "mutations" and with "sexual crossover" between simulated "agents" at each generation.

2. A process of "selection" based on the agent performance relatively to a specific task (the "problem" that we want to solve).

This selective process is carried-on by a function (we are in the functionalist realm of understanding), called the "fitness function", which evaluate the differential to a perfect resolution.

So the virtual logic of such design is the following: at each "generation", a pool of agents is generated, based on their "genetic code", leading to a functional variety in regard to the potential solutions of "the problem" that they represent functionally.

Each agent is then tested against its performances and ranked in accordance. The "best" agents/solutions are selected, the worse eliminated and replace by a random breeding of the best performers.

The power of the algorithm rely on many iterative steps which converge to an optimized solution of the problem. It act as a search algorithm which explore and select the best solutions in the dynamical "problem space".

This algorithmic process is *limited to a specific space problem* and rely in its principle on the key *top-down* representationalist definition of the "fitness function" related to a specific "functional trait" that one want to optimize. It is a control algorithm.

Today it has become scientifically obvious that even if such numerical simplification are intellectually and rhetorically seductive, they forget half of the problem: the autonomy of the living which very probably play the first constraining role in the evolutionary process.

Natural evolution is much more creative than simply only "adaptive", contrary to what the actual socio-economical imperatives try to formate us to think.

In summary, one can easily understand how a simplified theoretical representation of natural selection is, based only on these easy principles, in fact reduced to a simple *optimizing process*,

which was not so intellectually obvious if one only see the theoretical presentation without simulating it to see its inevitable consequences.

The same logic hold for distributed and quasi-parallel simulations: the so-called "artificial neural nets"/"Deep learning" models. Evolutionary and Parallel Distributed Processes models are *epistemological tools* (dynamic epistemology)

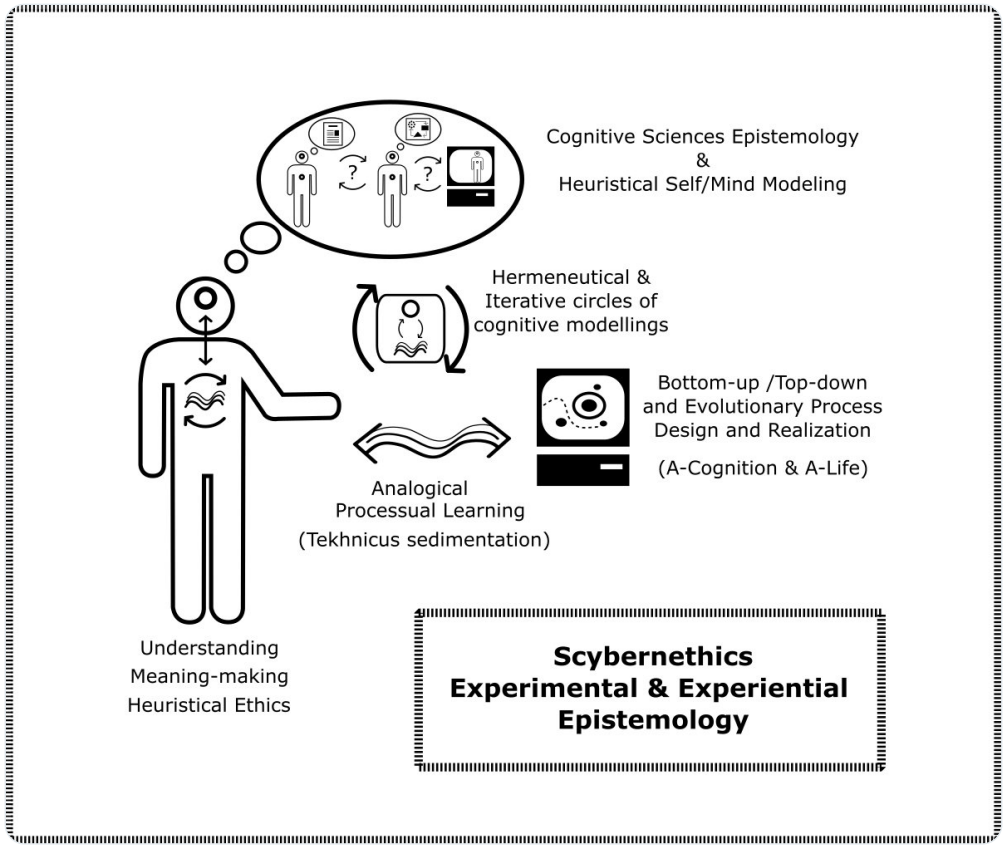
useful to extend our intelligibility of complex processes, i.e. to better understand the logical consequences and production of simplified mechanical processes that we couldn't have guessed (because they are emergent / enacted),

and make sense of, only intellectually or even mathematically (both being linguistically, that is formally, biased).

Practical design (procedural knowledge) and observations (formal declarative knowledge) of computer simulations of complex phenomena, helped me to gain interesting epistemological insights about the nature of these processes,

and so also about the functioning of my own mind, of my own conceptualization processes.

This is what I have called, coupled with a phenomenological (self)-inquiry, "Experimental and experiential epistemology", or cognitive sciences and technologies / technophilosophy applied to myself.




*** Disclaimer about "evolutionary" algorithms: of course any resemblance with a current social process of evaluation or with a social ranking/credit system can only be coincidental.

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