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[The Selfless Selves] □ Part I: Background

Unfortunately not having been able to join the workshop organized by the CELab on this critical subject, I make this thread.

A popular article by @drmichaellevin :

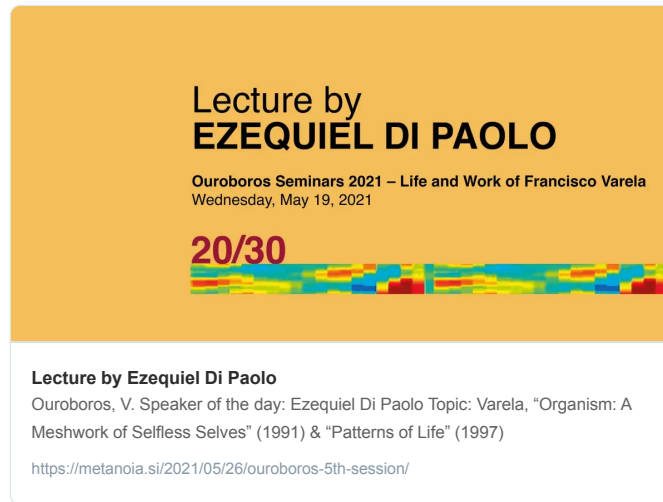


In expounding the enactive paradigm, Varela developed the *heuristic* idea of "Selfless Selves" to capture the idea of how (relative) organizational closure gives rise to specific dynamical phenomenologies centered on biological unity as seen from "the interior",

and this at multiple levels of biological organization, and whose integration at the level of the organism enact for the organism the perspective of a self which simultaneously brings forth a world.

REF: Organism: A Meshwork of Selfless Selves, Varela, 1991.

See also this wonderful presentation, with all the context, by Ezequiel Di Paolo:



Part II: the hermeneutical nuance

It is important to understand that this action represents an essential tipping point in the way of accounting for the reality as living experience, including by scientists themselves: the logic of the self is experienced and legitimate

only by the organism or the individual as such, that is to say at the level of the observer-actor.

Neither the subsystems of the organism nor the forms of social organization can ethically be considered as selves in their own right, but they can be considered heuristically

as "selfless selves" to approach their inner dynamical phenomenology and analogically develop our understanding of the perspective of their "view from within".

Part III: making the idea scientifically operational

The challenge is therefore to scientifically account for this phenomenological perspective "from within", which the mechanistic approach (also heuristical, if needed to say) tends to ignore,

to find a middle path, a dynamical mutually enriching hermeneutical circulation, between these two complementary and legitimate modeling styles.

This is a ChatGPT 3.5 raw and basic answers, so one could may be do better with more specialized knowledge and better use of LLMs (embeddings, fine-tunings on critical enactive texts on the subject). It's just heuristical...

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In Varela's paradigm of enaction, operational and organizational closure play an important role. After quickly defining these terms, imagine a practical way to measure operationally these parameters in a biological system.



In Francisco Varela's paradigm of enaction, operational and organizational closure are fundamental concepts that describe the self-contained and self-maintaining nature of living systems. Here are brief definitions of these terms:



1. **Operational Closure:** Operational closure refers to the idea that a living system is operationally self-referential and self-sustaining. It means that the processes within a living system are interconnected in such a way that they continually maintain the system's identity and functionality. In other words, the system's activities and processes are organized to support its own existence and integrity.
2. **Organizational Closure:** Organizational closure refers to the specific configuration or arrangement of the components within a living system that enables it to maintain its operational closure. It's about how the parts of the system are structured and interact in a way that contributes to the system's overall functioning and stability.

To measure operational and organizational closure in a biological system, you would need a practical method that can assess the system's ability to maintain its identity and self-sustaining processes. Here's one possible approach:

Practical Measurement Approach:

1. Identify Key Processes: Begin by identifying the key processes and components that are central to the biological system in question. These processes should be critical for the system's survival and functionality. For example, in a cellular context, processes like metabolism, gene regulation, and cell division would be essential.

2. Perturbation Experiments: Conduct controlled perturbation experiments on the biological system. This involves introducing specific changes or disturbances to the system and observing how it responds. These perturbations could include altering environmental conditions, inhibiting certain molecular pathways, or introducing mutations.

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3. Measure System Response: Measure the system's response to these perturbations. Focus on indicators of the system's ability to maintain its operational closure and organizational closure. These indicators could include:

- **Homeostasis:** Assess whether the system can return to a stable state after perturbation, indicating operational closure.
- **Robustness:** Measure the system's ability to withstand variations and disturbances without losing its essential functions, indicating organizational closure.
- **Feedback Loops:** Analyze feedback loops and regulatory mechanisms within the system that contribute to its self-sustaining properties.

4. Quantify Resilience: Develop quantitative metrics to assess the degree of resilience of the system. This could involve measuring the time it takes for the system to recover to its original state after perturbation or quantifying the extent to which it can adapt to changing conditions.

5. Comparative Studies: Compare the results of these experiments and measurements with those of control groups or reference systems that lack operational or organizational closure. This comparative approach can help highlight the unique characteristics of closure in the biological system.

Overall, the practical measurement of operational and organizational closure in a biological system would involve a combination of experimental techniques, data analysis, and the development of relevant metrics. This approach can provide insights into the system's capacity for self-maintenance and self-organization, which are central concepts in the enactive perspective on life and cognition.

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Using already existing metrics?

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Which already existing metric could be used?



Measuring operational and organizational closure in biological systems can be challenging, and there may not be well-established, standardized metrics specifically designed for these concepts. However, researchers often use a combination of existing metrics and experimental techniques to indirectly assess aspects of closure. Here are some existing metrics and methods that can be applied to evaluate aspects of operational and organizational closure:

1. **Homeostasis Metrics:**

- **Steady-state analysis:** Assess the stability of key variables (e.g., pH, temperature, ion concentrations) within the biological system over time. Deviations from steady states can indicate a breakdown in operational closure.

2. **Robustness Metrics:**

- **Sensitivity analysis:** Determine how changes in parameters or components affect the system's behavior. A robust system will show a limited response to perturbations.
- **Fitness landscapes:** Construct fitness landscapes to visualize how genetic or phenotypic variations affect an organism's fitness. A rugged landscape may indicate greater organizational closure.

3. **Network Analysis:**

- **Graph theory:** Analyze the connectivity and topology of molecular interaction networks (e.g., protein-protein interaction networks, metabolic pathways) to understand the organization of biological systems.

4. **Resilience Metrics:**

- **Recovery time:** Measure the time it takes for a system to return to a stable state after perturbation. A shorter recovery time suggests greater operational closure.
- **Response to environmental changes:** Assess how the system adapts to changing environmental conditions. A system that maintains its functions in diverse environments may exhibit higher organizational closure.

5. **Information Theory Metrics:**

- **Entropy and mutual information:** Calculate entropy to quantify the system's disorder or uncertainty. High entropy may indicate a lack of closure, while low entropy suggests more organization.
- **Mutual information:** Assess the degree of interdependence between components within a system. Strong dependencies may imply organizational closure.

6. **Feedback Loop Analysis:**

- **Feedback loop identification:** Identify feedback loops and regulatory circuits within the system. The presence of well-maintained feedback loops can indicate operational closure.

7. **Comparative Studies:**

- Compare the system of interest with simpler or less autonomous systems. For instance, compare the closure properties of a single-celled organism to those of a non-living chemical system.

8. **Modeling and Simulation:**

- Develop computational models that simulate the behavior of the biological system under different conditions. These models can be used to explore how closure properties emerge.

While these metrics and methods can provide valuable insights into the properties of operational and organizational closure in biological systems, it's important to note that the assessment of closure is often context-dependent and may require a combination of approaches. Researchers in the field of systems biology and enactive cognition continue to refine and develop new methods to better capture and understand these complex concepts in living organisms.

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