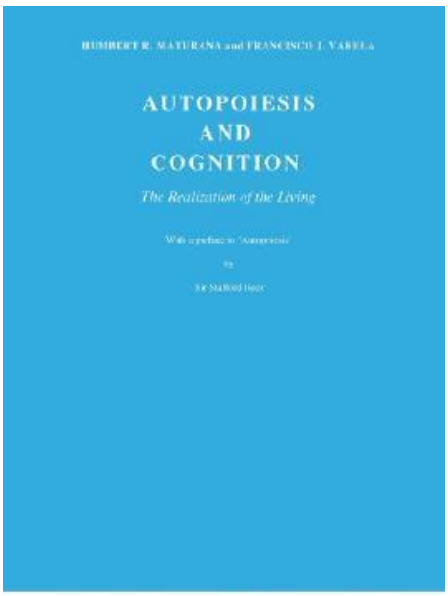

Autopoiesis and Cognition: The Realization of the Living

Humberto R. Maturana , Francisco J. Varela

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Autopoiesis and Cognition: The Realization of the Living Humberto R. Maturana , Francisco J. Varela This is a bold, brilliant, provocative and puzzling work. It demands a radical shift in standpoint, an almost paradoxical posture in which living systems are described in terms of what lies outside the domain of descriptions. Professor Humberto Maturana, with his colleague Francisco Varela, have undertaken the construction of a systematic theoretical biology which attempts to define living systems not as they are objects of observation and description, nor even as in teracting systems, but as self-contained unities whose only reference is to them selves. Thus, the standpoint of description of such unities from the 'outside', i. e., by an observer, already seems to violate the fundamental requirement which Maturana and Varela posit for the characterization of such system- namely, that they are autonomous, self-referring and self-constructing closed systems - in short, autopoietic systems in their terms. Yet, on the basis of such a conceptual method, and such a theory of living systems, Maturana goes on to define cognition as a biological phenomenon; as, in effect, the very nature of all living systems. And on this basis, to generate the very domains of interac tion among such systems which constitute language, description and thinking."

Autopoiesis and Cognition: The Realization of the Living Details

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From Reader Review Autopoiesis and Cognition: The Realization of the Living for online ebook

Claudio says

Libro denso pero interesante. (Des)Afortunadamente basta con leer las dos introducciones (de Varela y de Maturana) para quedar enterado de todo. En realidad son 3 ensayos en uno: el de ambos (que originó todo), el de Maturana (explicando qué cree que debiera entenderse del libro) y el de Varela (colocando las cosas en perspectiva y haciendo una crítica al original). A mi juicio, vale la pena por el ensayo de Varela.

Jonathan Isaac says

Very dense read -- Something I will revisit again and again.

Juan says

Incredible Maturana a Surprising Genius!

Ante says

It was one the first Book related to autopoiesis! I did read it 30 years ago, exprcting that authors and other will connect it with religion (Gid is the most autopoietic person, almost only He), philosophy (Plato, Spinisa, specially Hegel and Heidegger are nearer to autopoietic concepts than Maturanata and late Varela, who before death started to learn Indiana philosophy), specially i did expect it in psychology, economics, and law? Only Luhmann who i met 1992 satisfied my interest! Anyway autopoiesis is for me the greatest concepts! I am waiting the better books!

Satyajeet says

The work is as philosophical as it is scientific, even in discussions of neurophysiology, which was particularly refreshing aspect of the book. It has a very interesting framework, and there are number of pragmatic problems that are handled in a connected manner. Also some people might feel a bit of 'Kant' in it. The one downside is, it over explains 'What autopoiesis is not.'
I definitely recommend this book.

Laura says

Profound and rich. A thrilling blend of biology and philosophy. Just my cup of tea. Also very influential.

Leonardo says

De acá es la definición de sistemas autopoiéticos.

Una máquina autopoiética es una máquina organizada (definida como una unidad) como una red de procesos de producción (transformación y destrucción) de componentes que: (i) a través de sus interacciones y transformaciones continuamente regeneran y realizan la red de procesos (las relaciones) que los han producido, y (ii) la constituyen (la máquina) como una unidad concreta en el espacio en el que ellos (los componentes) existen especificando el dominio topológico de su realización como tal de una red. (pág.78)

Mauro says

The anatomical and functional organization of the nervous system secures the synthesis of behavior, not a representation of the world (*p. 22*)

Joe Falchetto says

Un testo non facile, ma estremamente importante per chiunque ami interrogarsi sulla vita e su tutti i grandi temi dell'esistenza.
Cambia per sempre tutto ciò che di ingenuo ci hanno insegnato i libri scolastici di biologia, nei riguardi delle caratteristiche della vita. Un libro che amplia una visione filosofica sulla realtà in modo estremamente convincente.

ralowe says

i was confused because i disbelieve in unities, save perhaps a single collective cosmic one, i guess. i get nervous even guessing that. unicity stays in question for me since one would need to convince the observer of an impermeable border. whether or not you're sold on the idea of a unity it's still useful to see how the idea is worked out here, and to consider the portability of this philosophical tool. i've heard the term "autopoiesis" float around for a while so reading this for me has been a long time coming. i keep daring myself to read hard science texts, it just takes me forever to get through and i understand like less than half of it. reading this it felt increasingly untenable to disagree that autopoiesis could be anything other than interdependence, as it is observed here that an individual autopoietic organism can become a component in a higher order system's autopoiesis. reading this i realize i need to check out bertalanffy, but how many times must i make myself read something my poststructuralist mind dissents to?

Gregory says

A hard read, but ultimately worth it, will change the way you view living systems.

DJ says

Wow, I've never felt so mentally humbled in the shadow of a biologist. In the realm of arrogant physicists and mathematicians, biologists are seen as the housewives of science - keeping things clean and tidy while the real men do the work. I've met enough intelligent biologists to know that this is only the case *most* of the time, but Maturana is a giant. I feel no shame in admitting that this was one of the most difficult books I've slogged through and that I'd often spend 10-15 minutes on a single page. That said, it was worth the slog.

My reactions to this book are a mixture of the following three three-letter phrases: "wow!", "duh...", and "wtf?!" The "wow!"s were accompanied by large-scale synaptic migrations as my paradigms regarding life and cognition were scrambled. The "duh..."s were my response to Maturana's incessant repetition of ideas only a Baptist alligator wrestler from the Deep South would argue with - evolution is a blind and local process, biological systems are recursive, blah, blah, blah. This might, however, be as unfair as accusing Shakespeare of adhering to every stereotype in Western literature, as I'm pretty sure Maturana was an early pioneer in the still fledgling field of theoretical biology and that many works I've read since are derived from his ideas. The "wtf?!"s were in response to Maturana's needlessly complicated lexicon of undefined terms. It seems like he and Varela went off and lived in a forest for 20 years, shielded from civilization, and developed their own strange and impenetrable vocabulary that only they understand.

The "wow!"s occurred almost exclusively during the first essay of this book: "The Biology of Cognition". I was *much* less impressed by "Autopoiesis", probably because the central idea of this book, recursion, has since spawned a closet industry of books ranging from masterpieces of human thought to crackpot theories on how Gödel’s theorem proves that God invented the internet.

As usual for books that woo me, I'll reserve my fifth star for another few weeks/months to see if my infatuation with the ideas in this book is nothing more than a teenage fling or something truly special and lasting.

Finally, the following are the main ideas I drew from the two essays. These notes are mainly to aid my aging memory, but you're free to treat it as a poorly executed synopsis. My criticisms of the text follow afterwards.

Cyclical (Autopoietic) Systems

A living organism is a cyclical system whose pieces provide for their own synthesis and maintenance (call this process "autopoiesis").
The disruption of this cycle destroys the organism.
This cycle relies on the environment; it continually makes predictions about the environment by requiring and expecting certain resources. If these predictions fail, the organism may die.
One goal of an organism is to expand its environmental requirements (and thus predictions) into broad classes rather than very specific conditions. In this way, the organism becomes more robust to environmental change.
These cycles (autopoietic systems) may be nested, smaller cycles being the components of larger ones. There may even be level-mixing in which interactions play roles on multiple levels.
There is some wiggle room in which an autopoietic system can be perturbed and yet still carry out its autopoietic self-genesis. That wiggle room constitutes the cognitive domain. It is the space of biological deformations that do not destroy an organism.

As autopoiesis defines an organism, the *relations between* the components that constitute that organism are far more important than the components themselves.
Organisms are fundamentally ontogenic. Development is not a process that culminates in an organism. The organism *is* the entire spatio-temporal pattern that *includes* development.

Domain Distinction

An organism's niche is *not* a subset of the environment an observer describes. The niche is defined in terms of the *organism's* domain of interactions with its environment. The observer necessarily describes the environment in terms of *his own* domain of interactions. This is a major barrier to explanation and understanding.
An organism may interact with its environment in ways unobservable to others.
An organism may (perhaps dysfunctionally) interact with its environment in ways unobservable to it, but observable to others.
Communication is the orienting of one organism to a particular internal state by another organism. Note that the cognitive domains of the two organisms are different, so it makes no sense to speak of "information transferred" in the absolute.
Absolute denotation of communication exists only in the mind of an observer who notices a relation in his simultaneous interactions with both organisms.
Two organisms may only communicate if their cognitive domains have significant overlap. Otherwise, they are incapable of orienting one another to corresponding appropriate internal states.

Neural Systems

Only that which leaves a signature on the nervous system may enter the cognitive domain. That which does not affect the brain is invisible to the organism.
Interactions that leave the same neural signature are indistinguishable to an organism, be they between the organism and its environment or between internal cognitive states. It is possible, however, that an external observer may be differentially affected by similar interactions and be quite capable of distinguishing them.
Neural systems can give a representation to "pure relations", expanding the cognitive domain to include abstract ideas. With this, pure relations may begin to independently interact with one another.
Interesting view of a neuron: spatial system of possibly overlapping affector and collector areas
Neural systems function in the present. The past only plays a role to the extent that it leaves a signature in the brain that carries on to the present. In general, for the past and predicted future to play a role in cognition, they must be abstracted and represented.
The brain is local in interaction but not representation. Computation proceeds physically via matter affecting matter (interaction is local). Ideas, stimuli, and other neural states are distributed across the brain (representation is not local).
Internal states represent spatiotemporal interactions with an organism's sensory service and subsequent internal activity.
There are at least three time scales to consider:

Immediate - stimuli transiently affect neural activity
Lifetime - (repeated) stimuli more permanently affect the organization of a neural system (learning)
Evolutionary - evolutionary pressures affect the "base genetic model" that prescribes an organism's development

Neural systems change continuously and non-predictively. For a system to evolve between two states, the intermediate states must be accessible and viable.
Interesting domain in which to study neurons: the I/O domain

Fix I, vary parameters, and watch O change

Fix I/O, examine reduced parameter space that preserves that particular I/O relation

Questions

What are the fundamental units of the nervous system? What are the fundamental units of *any* information-processing system? That is, what should we treat as primitives in order to explain what neural systems do?

That said, the 40-year old essays do contain some outdated material, namely the (oft repeated) doctrine that neurons are deterministic. Neurons are *not* deterministic. Their input-output mappings are pretty friggin' stochastic, owing at the very least to the fact that channel dynamics dip into the quantum world of chemical reactions.

I also suspect that the reason Maturana and Varela resort to such a tangled web of undefined jargon is that many of their ideas are less developed than the Olsen twins (warning: my bag of pop culture references has not been replenished since the mid-90s). First, how exactly does autopoiesis define unique topological boundaries for an organism? If the autopoietic cycle that defines an organism is so deeply interwoven with the environment, how does one separate organism and environment? Every organism relies on its environment for resources. How to draw structural boundaries is obviously much clearer to Maturana and Varela than it is to my feeble brain. Second, Maturana and Varela stress that our descriptions of the functioning of organisms are fundamentally flawed due to the domain distinction problems mentioned in the notes above. Why is their description of autopoiesis immune from these mistakes? Why are they so certain that autopoiesis is the definitive characteristic of life when they argue throughout the text that the true character of organisms is forever unknowable in our restricted cognitive domains?

Víctor Bermúdez says

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