



# **SEMIOSIS, SENSE-MAKING, AND THE BEING OF THE BETWEEN**

**INTEGRATING AUTOPOIETIC ENACTIVISM AND BIOSEMIOTICS THROUGH RELATIONAL BIOLOGY**

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# STRUCTURE OF TALK

- Introduction: Biology of Cognition and Autopoietic Enactivism
- Bayesian Brains , Predictive Processing and Autopoiesis: The Controversy over Mind-Life Continuity.
- Biosemiotic Enactivism: Mind-Life-Meaning Continuity Thesis.
- Conclusions and future directions.

# OBJECTIVES OF TALK

- 1. To reconcile the tension present in autopoietic theory's mind-life continuity thesis.
- 2. To make a convincing case that Peircean and sign-based approaches have much to offer cutting edge debates in philosophy of mind and cognition.

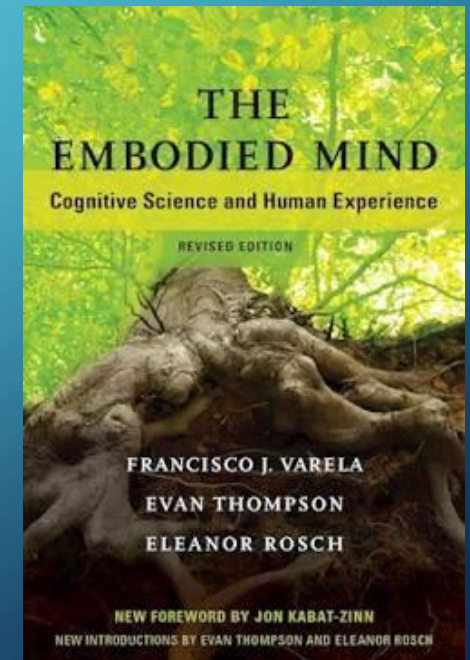
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# SECTION I

BIOLOGY OF COGNITION, ENACTIVISM & MIND LIFE CONTINUITY.

# BIOLOGY OF COGNITION: VARELA, MATURANA AND MERLEAU-PONTY.

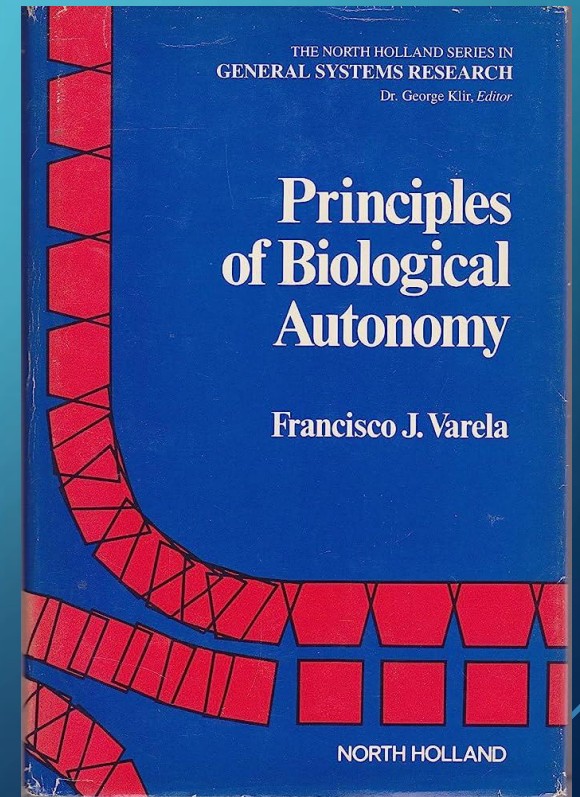
- Enactivist philosophy of cognition (officially) begins in 1991: *The Embodied Mind*. Mind is dependent on *embodiment*.
- Body is also a phenomenological body: Body is not an objective phenomenon, but the outward expression of subjectivity and meaning. Counters information processing views of the old school.
- Two key ideas at heart of enactivism's biology of cognition: Autopoiesis, and Merleau Ponty's vital norms.





# BIOLOGY OF COGNITION: AUTOPOIESIS

- Varela's biology of cognition, and life, is centered on *autopoiesis*. Greek for "self-production"
- The basic unit of life, the cell, is simultaneously means and end. Brings forth own organizational structure, demarcates the cell in individual space, but semi-permeable membrane facilitates interaction with world.
- **Circular causality:** Metabolism produces membrane, membrane facilitates on going metabolism.



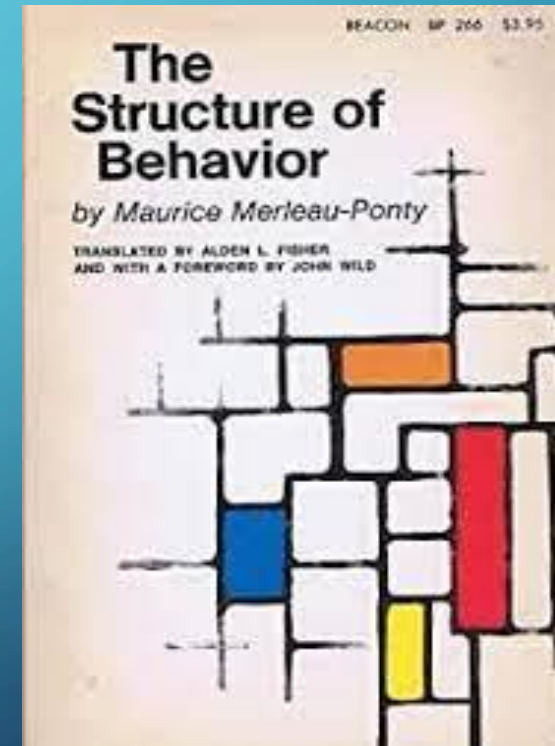
# BIOLOGY OF COGNITION: AUTOPOIESIS

- Metabolism is also theorized to engender further radical differences to inanimate nature: A sense of being an individual and co-constitution of organism and its environment construed as *world*.
- Metabolism is also said to make the world a place of *intrinsic meaningfulness* for the organism. Things have a significance relevant to biological autonomy.
- The second key element of enactivism's biology of cognition is the theory of *vital norms*.



# BIOLOGY OF COGNITION: VITAL NORMS

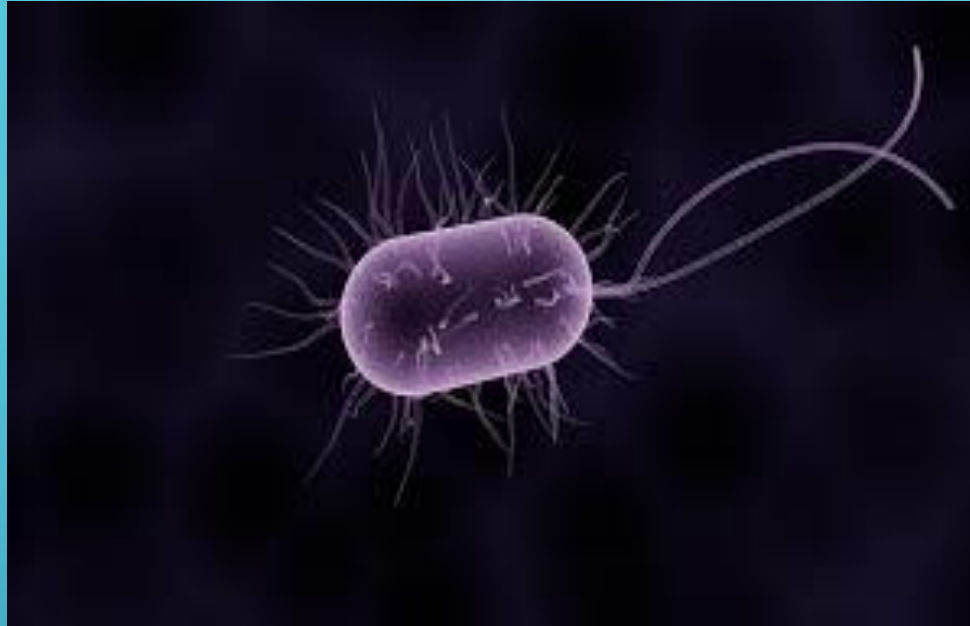
- Biology of cognition begins with idea that normativity and significance once a self-organizing system begins adapting to an environment.
- Merleau-Ponty also explores this in his early work. For him, it is the concept of Gestalt or vital norms.
- Matter, life and mind all unequally participate in the nature of form. Each level emerges from predecessor, but attains more coherent unity and inter-relatedness.
- This is also a very Peircean idea of causation (explored later).





# BIOLOGY OF COGNITION: JONAS' BIOPHILOSOPHY

- Hans Jonas biophilosophy elucidates the joint theories of Varela, Maturana and Merleau-Ponty.
- As was seen, self-organization and circular causality the *sine qua none* of cognition: The cell establishes a *meaningful point of view* on the world it encounters.
- Autonomy perspective entails a certain way of looking at information and meaning: Always context-dependent and agent-relative, determined by history, structure and needs of organism.
- Old school (cognitivism and connectionism) explains prototypical cognition as *representations*: An objective world exists out there, represented by internal functions. This is by contrast, the *heteronomy* perspective.
- So the “classical sandwich” (input-processing-output) is spurned in favour of the *dynamical systems* perspective.



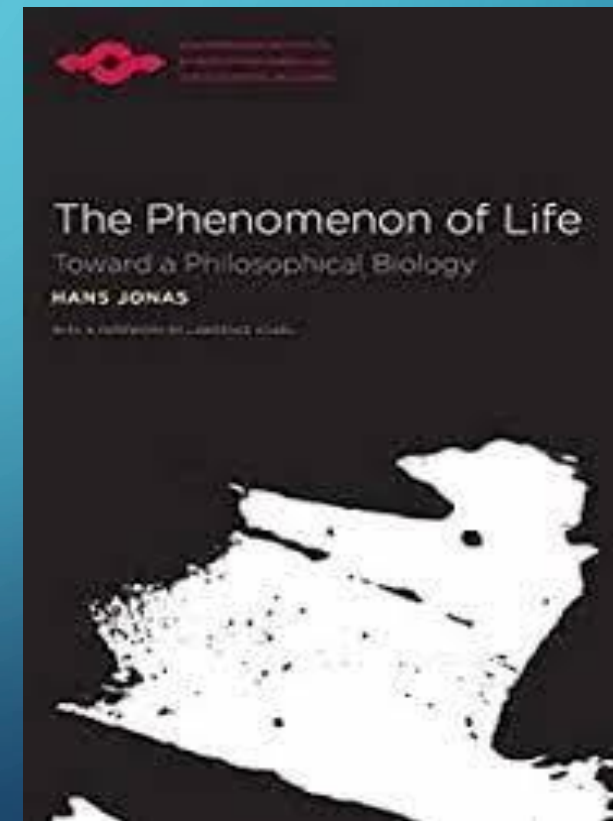
The bacterium serves as an example: It senses presence of sucrose in its environment and swims toward it, and swims away from repellent. For autopoietic theory, this creates a meaningful coupling with the environment which is the basis of minimal cognition.

Sucrose acquires its status as a nutrient by virtue of a relation between itself and a metabolic network that incorporates it, hence, an equivalency between life and cognition.

Circular causality is relational between organism and environment: The *Umwelt* emerges in between them as a dialectic, and this is the differentiation between inanimate nature and life. Life behaves with norms internal to system, not laws imposed from beyond.

# NATURAL PURPOSES: KANT AND JONAS

- Hans Jonas claims vital norms are their own project and end. Metabolism is proto-intentionality and proto-self when it turns towards what is Other.
- Takes inspiration from Kant. Organism is necessarily teleological because it is a self-organizing being.
- Not amenable to mechanism, so no “Newtown of the grass blade”.
- There is also the two-fold nature of biological space and time: Self-concern drives the organism forward in time as it organizes its activity, simultaneously driving it through space towards the Other, via whatever in the world is meaningful to survival.
- For autopoiesis, Merleau-Ponty and Jonas, no chasm between inanimate nature and human subjectivity: Life is an ascending gradation of sense-making. From brute sentience to human culture.



“Translated to biology this means that cells would now engage in intentional activities: their activities would not simply refer to the outer world but would do so only in a contextual setting of their internal self-referential system, the genomic system. Living entities became intentional systems—subjects in a sense—because they had established channels for integration of other-reference, through surface receptors, with self-reference. At first they were of course only marginally intentional but this new dynamic principle, semiosis, would have a self-perpetuating logic to it, so that semiotic freedom started to grow. And this growth may well be the inner core of evolution”



- Novel forms of behaviour and emerging complexity in organisms is semiotic freedom: The degree of interpretative behaviour a lifeform can exhibit.
- Biosemiotics has its own continuity thesis: Life is continuous with semiosis/meaning.
- An ontology of nature richer than Newtonian laws is a natural point of contact between Merleau-Pontyan phenomenology and Peirce’s semiotics. We need phenomenology to understand our ontological commitments vis-à-vis the phenomenon, and Peirce to extend enactivist phenomenology beyond biology to the physical and complexity sciences.



# ENACTIVIST EMERGENCE

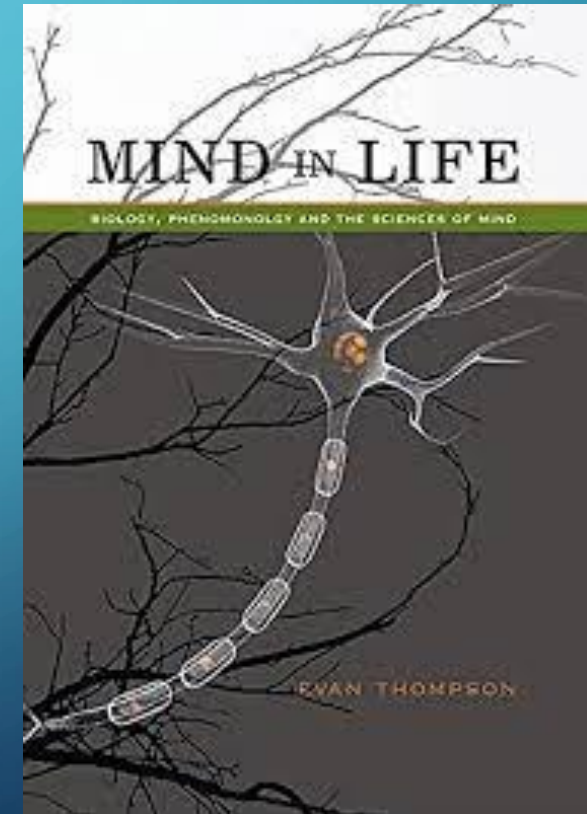
- These pivotal issues revolve around the notion of *emergence*. For enactivism, there is tension between enactivist emergence and vital norms/anticipatory behaviour.
- Rationale for adopting a Peircean approach well suited to this objective and pays conscientious attention to metaphysics of complexity and dynamical systems theory.
- Ultimately, this talk proposes to move from autopoiesis to a Peircean theory of self-organization.
- If the gap between life and cognition as alleged by free-energy and predictive processing theorists yields to a satisfactory solution with biosemiotics resources, mind-life continuity is restored.

# ENACTIVIST EMERGENCE

- Complexity and systems theory offered novel perspectives on causality and emergence. Mind and consciousness can be causally effective with naturalistic continuity.
- Donald Campbell's 1974 paper: Higher levels become *selective*: Determine or select from one of the possibilities afforded by the lower levels. E.g Circular shape of wheel enables rolling, but square wheels too severely constrain possibility space.
- Mind-life continuity thesis follows similar logic: Consciousness and life follow same pattern of emergence: Mind selects for possibilities inherent in bodily organization.

# DYNAMICAL CO-EMERGENCE

- Evan Thompson develops enactivist theory of emergence in *Mind in Life*.
- Dynamical co-emergence: Wholes not only arise from parts, but give rise to parts. Neither analysable as discrete elements.
- Process heterarchy: There is no hierarchy or supervenience in Nature. Up and down are context-relative terms to describe phenomena of varying scale and complexity.
- Phenomena are relatively stable *processes*, not entities or substances.
- Co-evolution of process, structure relation, law etc. is basically Peirce's doctrine of synechism. Not yet recognized by Thompson or any other enactivist.
- But still, no explanation of how biophysical processes, no matter how complex, non-linear or self-organization create subjectivity and cognition.
- Terrence Deacon: Emergence is more of a promissory note, if only a step in correct direction.



# BIOLOGY OF COGNITION: SHORT SUMMARY

- **1<sup>st</sup> idea:** Two aspects of autopoietic enactivism's biology of cognition: Autopoietic self-organization, Merleau-Ponty's vital norms.
- But is there a disharmony? Can mere fact of autopoiesis explain meaning and norms? Emmeche: Prototype fallacy. Abstractions don't do justice to rich meaningful milieu of organism.
- **2<sup>nd</sup> idea:** Enactivist emergence: Dynamical co-emergence – downward causation and needful freedom. Complex organisms gradually free themselves from instinctual past to exert more meaningful control over their own physiology.
- A more promising path to lessen gap between mind and nature, but more needs to be said about the metaphysics of emergence and the relation to significance and meaning.



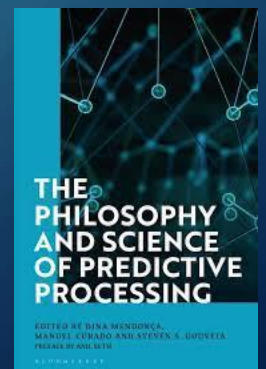
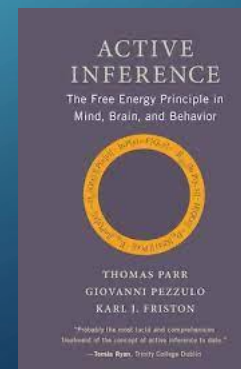
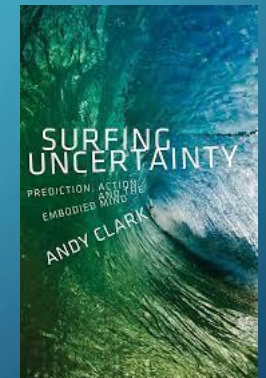
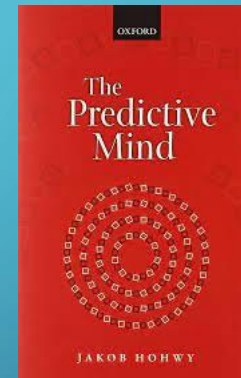
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# SECTION II

BAYESIAN BRAINS, PREDICTIVE PROCESSING AND BIOLOGICAL ANTICIPATION

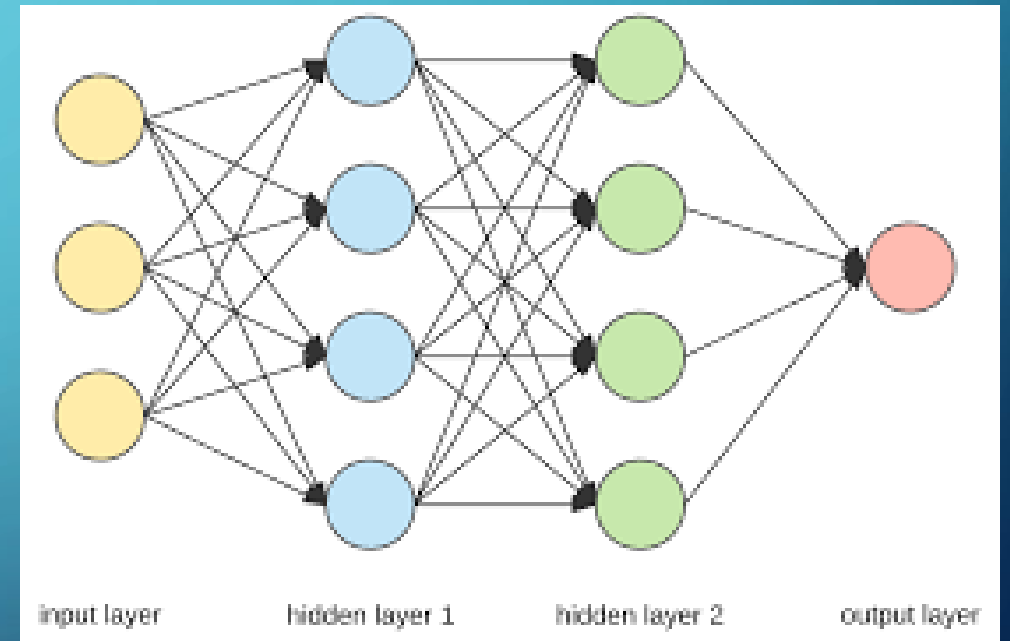
# BAYESIAN BRAINS AND PREDICTIVE PROCESSING

- Bayesian Brain and Predictive Processing theories rapidly moving paradigms in philosophy of mind and cognition.
- Tenuous relation with enactivism: Some ideas compatible, others claim Bayesian Brain is superior (Hohwy).
- This section explores the claims of the paradigms, but suggests there are underappreciated risks in adopting the theory.
- Rather, I suggest a semiotic reconciliation of autopoiesis gets us the best of both worlds.



# FREE ENERGY PRINCIPLE AND PREDICTIVE PROCESSING

- Free Energy/Predictive Processing theories began as a theory of neurophysiology.
- Partly inspired by Kant and Helmholtz. In that, we impose an intelligible structure on our experience, and perception is *unconscious inference*.
- Cognition on this view, is about staying in far from equilibrium states by avoiding surprise and remaining in limited number of states.
- Uses dynamical system theory, familiar to both enactivism and biosemiotics.



# FREE ENERGY PRINCIPLE AND PREDICTIVE PROCESSING

- The theories cast the phenotype in two ways: Intrinsic and extrinsic information geometries: Intrinsic: Information length specifying self-organizational dynamics of system. Extrinsic: Informational distance amongst probabilistic beliefs about external states (probabilities its representational model assigns to states about the environment).
- Rationale for existence of organism is to dispel entropy, brain and nervous system operate by *Bayesian inference*: Minimize prediction errors about states of world, and acting accordingly.





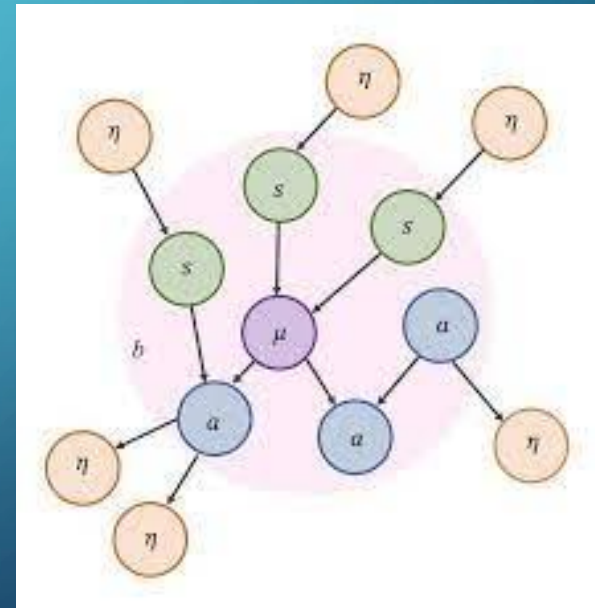
What am I  
seeing?

What am I  
expecting to  
see?

The core of the Bayesian Brain theory can be simply understood by picturing the brain as constantly asking itself two questions: 1. What am I seeing? And 2. What am I expecting to see?

# MARKOV BLANKETS

- Predictive Processing's central theoretical concept is the *Markov Blanket*. It is a statistical boundary, defined as a set of random variables.
- A methodological tool introduced by Judea Pearl in the context of machine learning, to separate nodes in a graph network
- Markov Blanket separates a node/variable from a more complex set of variables for statistical analysis. It was intended as a heuristic expedient.
- Example: A meteorologist is interested in predicting the weather. They have a large amount of data about the environment. The Markov Blanket would separate variables of interest ( air pressure, temperature, humidity etc.) for analysis.



# PREDICTIVE PROCESSING: GENERATIVE MODELS

- The theories are mostly information-theoretic. Organisms make inferences from *generative models*. An internal model about relations between causes and consequences. Alternatively, it is a model about “hidden” causes which bring about our sensory data.
- The brain is constantly updating its models based on sensory data. If there’s a mismatch between sensation and prediction, it elicits actions to reduce the discrepancy.
- The brain is a *hypothesis generator*: Cognition is optimizing the fit between generative model (top down anticipation) and environment (bottom up sensory input)
- Some proponents put forward a version of life-mind continuity.

# AUTOPOIESIS AND FREE ENERGY: MIND-LIFE DISCONTINUITY.

- The paradigm is a broad church, like enactivism and biosemiotics. Runs the gamut from strict representationalism to enactivist-friendly approaches.
- I examine the forms which offer a life-mind continuity thesis. Michael Kirchoff and Tom Froese.
- They have an organism wide FEP, active inference is likened to an affordance/sign. Use active inference to maintain internal states of Markov Blanket (interior of the system).
- The Markov Blanket justifies their life-mind continuity thesis. It defines both living and minded systems.

Article PDF Available

Autopoiesis, free energy, and the life–mind continuity thesis

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# MIND-LIFE DISCONTINUITY

- Kirchoff and Froese offer two reasons for preferral of FEP over autopoiesis:
- It stresses self-preservation over self-production. Autopoiesis is based on self-production which negates the role of the environment. That could be seen as internalist in form. Recalls concerns of several thinkers who critique autopoiesis.
- Autopoietists say their view is relational in nature, but can they justify that?
- FEP argues self-preservation incorporates the environmental niche, and externalist explanation accommodates adaptive behaviour. As that necessary for mind, it is touted as the superior theory.
- FEP allows an organism to act on the environment via active inference. This has implications for life-mind continuity.

# LIFE-MIND CONTINUITY: MINDS NEEDS MORE.

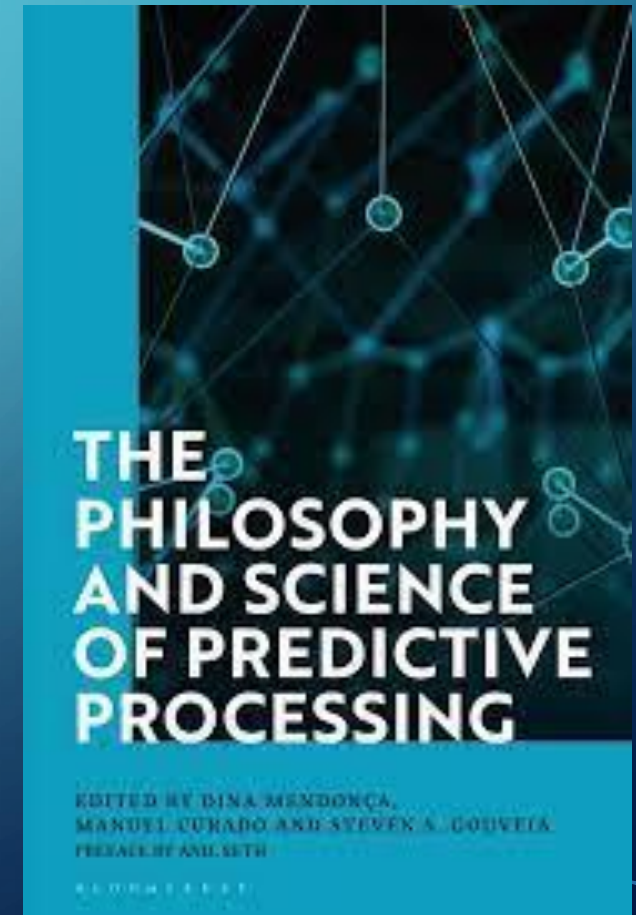
- This is where it is alleged continuity breaks down for autopoietic theory. Cognition seems to require *anticipatory*, future oriented behaviour. I.e Relational feature allowing for adaptive behaviour.
- But life must foreshadow cognition as per the continuity thesis. If life and mind don't share the same set of properties, autopoiesis faces a theoretical problem.
- Why FEP is preferred is because it incorporates adaptivity.

# FREE ENERGY PRINCIPLE: CAVEATS AND CONTROVERSIES

- FEP explains adaptivity and future-orientation. But how robust is the philosophical platform for the theory?
- Here I look at some problems, mostly related to metaphysical underdetermination.
- This prepares for the way for the preferred path of biosemiotics and relational biology.

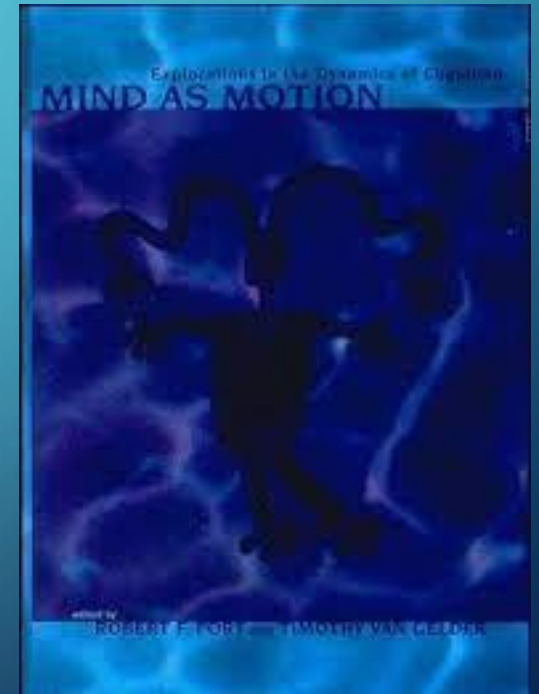
# ARE MARKOV BLANKETS EVEN REAL?

- The major concern is whether the highly technical nature of the theory is licensing unjustified ontological claims.
- Do Markov Blankets really distinguish living systems?
- Karl Friston's usage: Boundaries which separate internal and external states. Could theoretically be applied to *any* system with internal/external states, sufficiently random and ergodic.



# ARE MARKOV BLANKETS EVEN REAL?

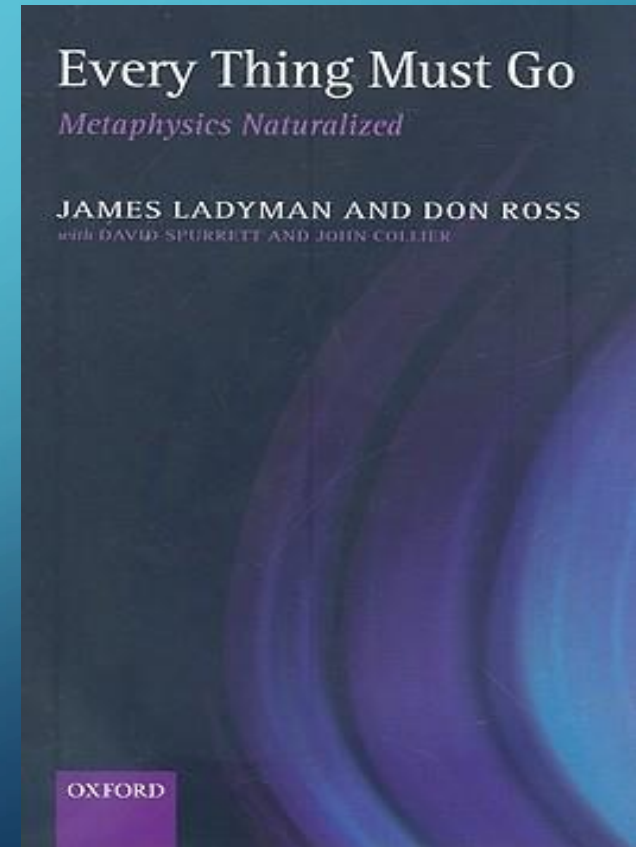
- Construed this liberally, it raises the spectre of panpsychism. This is a very liberal conception of cognition. Capacity to be modelled by a Markov Blanket doesn't exclusively capture a living system.
- Van Gelder's depiction of Watt governor amenable to such an analysis, but it isn't alive.
- But *emergence* is our preferred theory, so we must strike any hint of panpsychism off our agenda.
- Judea Pearl's conception of Markov Blanket is a statistical technique, simply not intended for debates about metaphysical boundaries of mind.





# STATISTICS OR METAPHYSICS?

- Suffice it to say, this puts FEP into controversial territory. How can statistical concepts do metaphysical work?
- Papers by Richard Menary, Colombo and others: Using a heuristic concept for metaphysical work can license some strange positions.
- Ontic structural realism ala James Ladyman (world is literally structure/data), scientific anti-realism, even Pythagorean –type commitments to real existence of statistical and mathematical entities.
- Is that a price worth paying *just* to account for anticipation? Or could there be a third option?



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# SECTION III

BIOSEMIOTIC ENACTIVISM AND RELATIONAL BIOLOGY

# BIOSEMIOTIC ENACTIVISM

- So far: The foundations of autopoietic enactivism, its shortfalls.
- The competitor in Bayesian Brain/Free Energy, and its shortfalls.
- The conundrum: Autopoiesis doesn't account for anticipation and future orientation. Bayesian Brain is metaphysically indeterminate.
- We can look at resolving this conundrum if we find a proper platform for emergence, self-organization, meaning etc.

# A SEMIOTIC METAPHYSIC

- Stuart Kauffman says constraint based causation in complex systems entails a concept by which system explores its possibilities.
- This is the adjacent possible. This is a Peircean idea at heart (synechism and tychism) which will underpin a new theory of self-organization.
- Living systems exist in between current context and the next context.



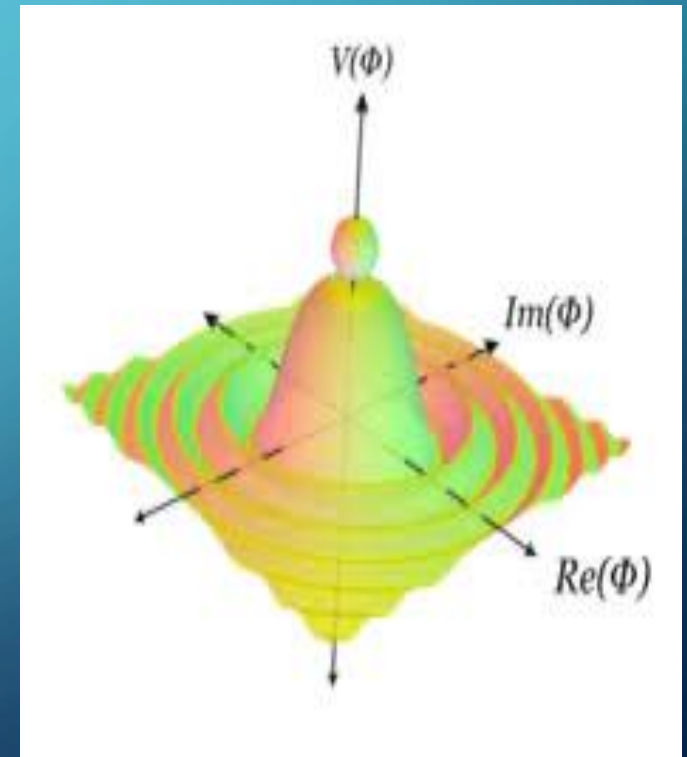
# PEIRCE'S THEORY OF SELF-ORGANIZATION

- Enactivist emergence is stochastic process of interacting parts and wholes, in particular, the *relational* properties between parts and whole.
- Varela et al are of the Kantian stripe, inherent design arises from internal automatic principles. Cybernetics an early influence (Dupuy), but still mechanistic. Inadequate treatment of meaning and signification.
- By neglecting Peirce's influences on cybernetics, more powerful theory of self-organization not adopted, one inclusive of meaning and signification.
- This can be recovered, with some help from Kauffman, Deacon etc. to modernize.



# PEIRCE'S THEORY OF SELF-ORGANIZATION

- Self-organization ala Peirce begins with asking how difference comes from sameness.
- Pushes Aristotelian and Kantian thought further towards naturalization: No need of designer or self.
- Chance, chaos and fluctuation as the source of organizational order.
- Surprisingly prescient: Similar to physics' idea of symmetry breaking. How do ordered structures emerge out of chaotic diversity via habit formation?



# FROM CHANCE TO COGNITION

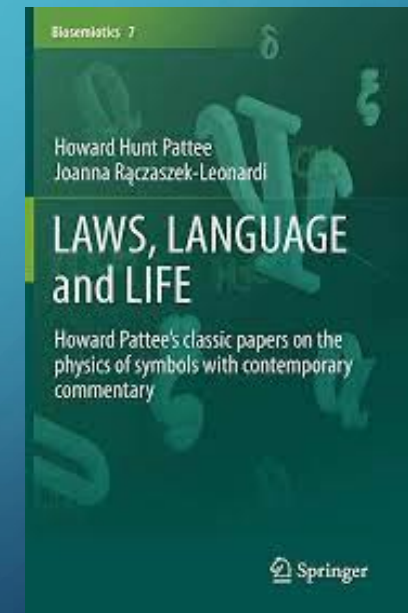
- “Design and chance”: Peirce explains how chance over time elicits in built biases.
- His example: A million gamblers wagering a dollar a million times. Eventually, they separate into those who win, and those who lose, faster and faster.
- No design, only appeal to chance.
- Better platform in scientific metaphysics, but how to get to cognition?

# FROM CHANCE TO COGNITION

- Design and chance and law of mind are working towards argument for self causation.
- Chance is spontaneity tempered by regularity.
- Organization behaves in mind like way when constraining biases- Thirdnesses- group similar things together. Minded things behave with similar things. Biases tend a system towards habitual behavior. Stigmergy, for example.
- Applying biosemiosis can help us understand how this process becomes interpretative.
- This extends autopoiesis towards physics of dynamical, chancy systems.
- Life and mind co-emerge because they're continuous with emergence of the *sign*.

# BIOSEMIOSIS, TELEOLOGY, AND THE ORIGIN OF LIFE.

- Kauffman: efficient cause inadequate. Formal cause law.
- Salthe: Exoscientific perspective not well suited to semiotic systems interpreting environment. Dichotomy between observation of system and system itself.
- Pattee's epistemic cut. Third person study of origin of life very difficult. So we probe the origin of interpretation.



Interpretation is teleological. For *general* types of outcome.

- An analysis not requiring semiotic terminology:
  1. An entity has property of undergoing change of state in response to stimulus.
  2. Each change of state increases propensity for a general type of outcome.
  3. Non-entailing relation between sign and object, this mightn't happen.
  4. Property of changes of state increases propensity of responses to elicit general outcomes.

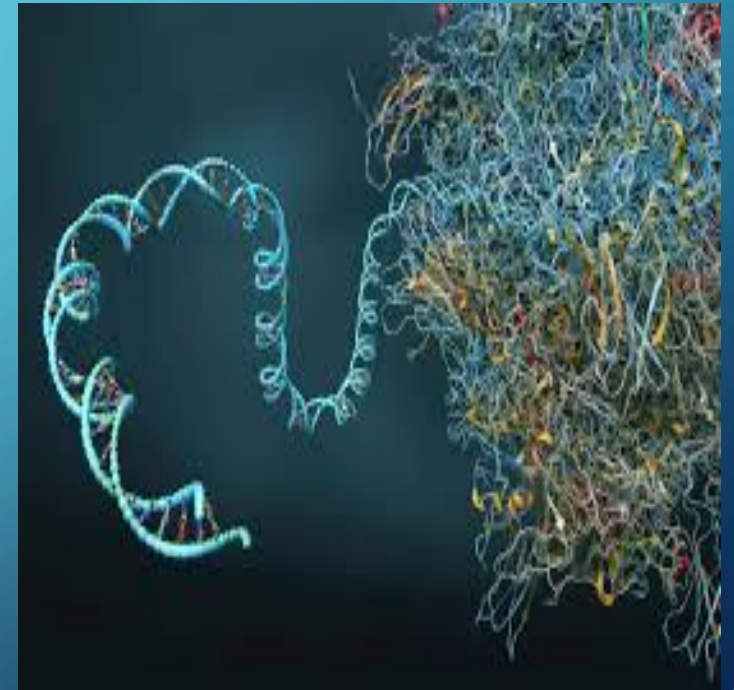
This differentiates between interpretative and non interpretative response: A thermometer doesn't interpret, since the relation is dyadically causal, and propensity doesn't increase.

This also extends autopoietic theory into origin of life research: Can we test for where minimal interpretation begins in nature?



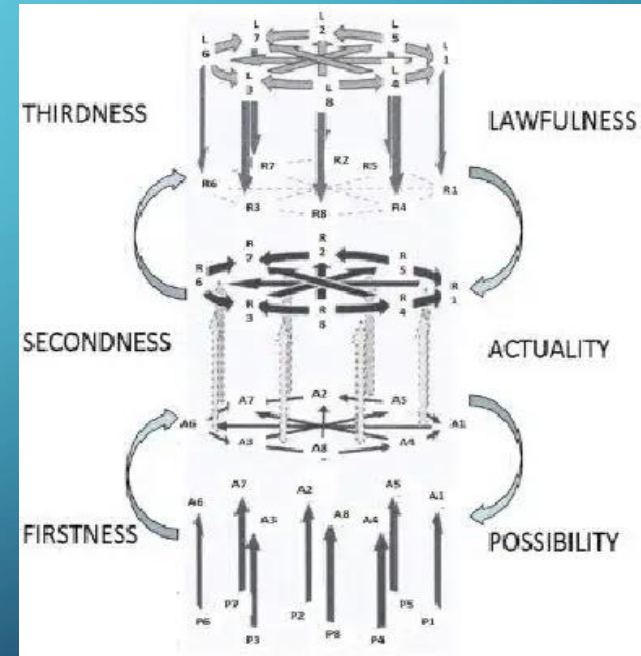
# BIOSEMIOTICS AND THE ORIGIN OF LIFE

- Exoscientific perspectives focus on metabolism and reproduction. Interpretation might be seen as too philosophical a concept.
- But basing the life-mind continuity thesis on the sign, we might have an empirical footing for our theory.
- The RNA molecule: Does it interpret the presence of magnesium ions?
- Biosemiotics major contribution is transcending niche in cognitive science.
- How do we put all this together to resolve self-organization and anticipation?



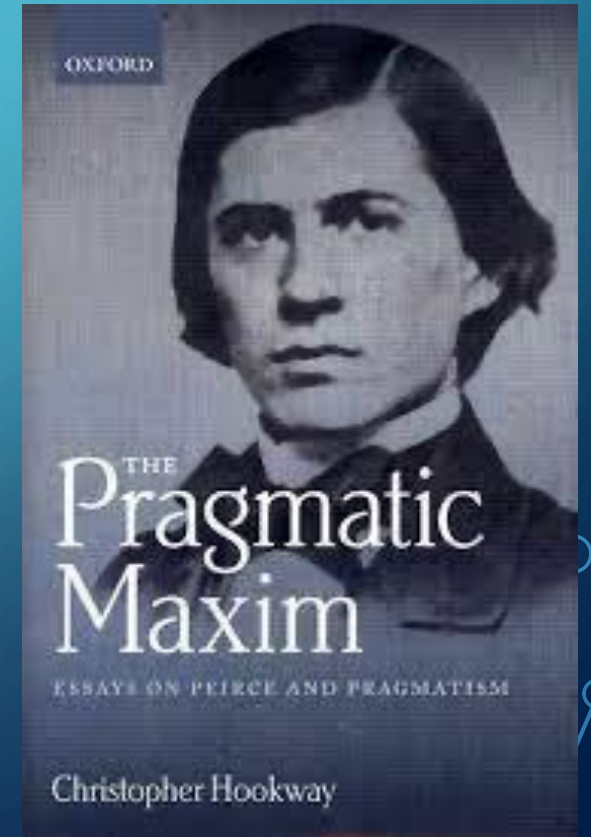
# SIGNS AND THE ADJACENT POSSIBLE

- Return to Kauffman's adjacent possible.
- Peirce cosmology a continuum of emergent lawfulness: dynamic interaction of possibility, actuality and mediation.
- Laws are like habits, not entailing.
- Interplay of *res extensa* and *res potentia*. Potentia a key element of semiotic realism.
- The pragmatic maxim: “consider what effects conceivably have practical bearings”



# THE BEING OF THE BETWEEN

- Res Extensa and res potentia: *Potentia* is a key tenet of semiotic realism and pragmatic maxim.
- Refuses a naïve realism, and borrows from Scholastic realism: Signs are relational phenomema, co-determined by structure of world and the consumer.
- "Conceivably practical bearings" : Sign as a non-dual, triadic existent. Perception/cognition is both actuality and potential relations inherent in objects.
- *Res potentia* are uncovered through an organism's exploratory activity in the world. Steps can be walked up, branches can be swung on etc.
- John Deely: Difference between object and thing: The object requires a relation to a *knower*, something that cognizes it.
- **The loss of the being of relation is one of modernity's major oversights.**



# COLLAPSING THE WAVE FUNCTION OF POTENTIALITY.

- How do organisms self-organize via the Relevant Next, make actual one of the possibilities?
- It is informed by values *internal* to the system, considered as signs, deriving from its *embodied habits* (biological need, systemic constraints, past interpretations etc.)
- Judith Rosen (daughter of Robert Rosen): Living systems have a foot in the past *and* the future, both are equally powerful causal forces as the present.
- Stanley Salthe: Standard emergence ignoring environmental embedding organism/environment are the one system: Scalar hierarchy also final causality. Constraints from above not only self-organizationally select, but *pull system into its future* at same time (emphasis mine).



# COLLAPSING THE WAVE FUNCTION OF POTENTIALITY.

- Jesper Hoffmeyer : semiotic causation not efficient causation, but brings things about via interpretation in context.
- Combine this with Kaufmannian terms: When a system responds to a sign, it does so with respect to *res potentia*: the relevant next.
- Interpretation collapses the waveform of possible into one state of actualization. Interpretant is never purely present; simultaneously formed out of current context and next context. Organisms grasps its present situation *whilst* moving into the Relevant Next.
- This also beats internalism and idealism; relational nature of sign gives causal role to environment and never sequesters one away from extra-mental reality (they constrain how signs can faithfully denote. Poor interpretants are not long for this world).
- Problem with autopoietic enactivism: It only considered one half the functional circle (the internality of the organism, which is its *past*).
- We also need to explain the organism's *future*, which is the coupling to the environment. Systems interior locates *habit*, but the environment offers *possibilities*. Biosemiotic enactivism has the complete functional circle.



## SECTION III SUMMARY

- This section has explained how biosemiotics enactivism explains self-organization, cognition, relation etc.
- It is a recapitulation of Merleau-Ponty's vital norms but now explicitly connected to dynamical systems theory's notion of downward causation (relations and systemic constraints)
- Peirce foresees complex systems ideas of causation and also process metaphysics/vital norms/autopoiesis. Seamlessly connects organization to anticipation.

# CONCLUSION FOR TALK

- Threefold fashion for talk: **Section I:** What is biology of cognition? Autopoiesis and vital norms still in tension. Mind life continuity theory.
- **Section II:** Bayesian Brain/Predictive Processing winning minds over, due to stronger continuity thesis. Explains anticipation/future orientation.
- That is a Pyrrhic victory: Fraught with metaphysical indetermination and controversial commitments. Is purchasing anticipation worth that price?
- **Section III:** Biosemiotic enactivism: Move to a sign based theory of self-organization. Stronger grounding in physics and metaphysics of complex systems (with some help at modernization from Deacon/Kauffman etc.).
- Mind-life continuity restored by basis in the sign. Self-organization and anticipation restored.
- Makes a philosophical contention empirically testable and falsifiable.



Overall? Biosemiotics has much to offer cutting edge debates in orthodox philosophy of mind and cognition. This dialogue should continue and I've only scratched the surface.

Further research: Non-anthropomorphic phenomenology, Bayesian Brain/Peircean abduction, biosemiotics take on semantic content (Millikan), reconciling dynamical systems approach with old school representationalism etc.

**This is a powerful argument against its unfair marginalization.**

