Towards Pattern Literacy

The Biosemiotic Underpinnings of Patterning & Languaging

Helene Finidori – GST & Systems Philosophy SIG
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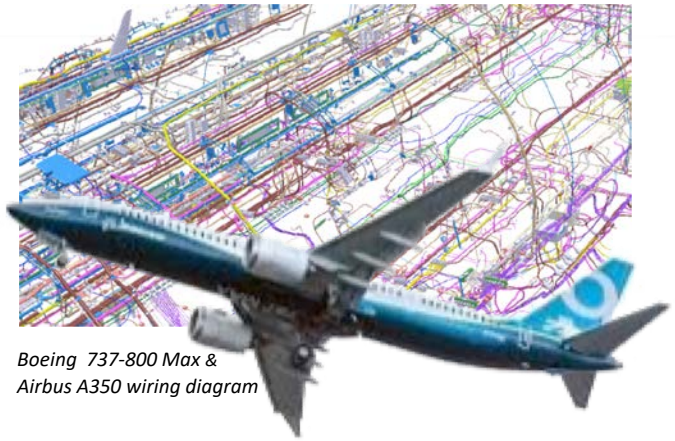
Objective

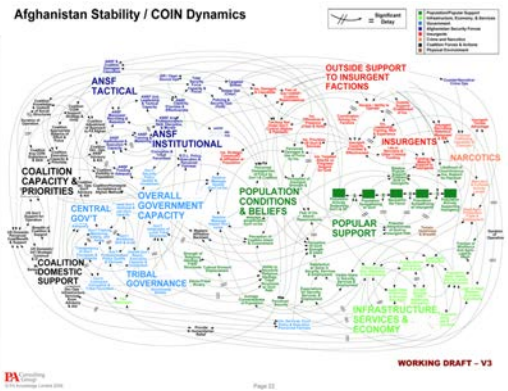
Exploring the role of semiosis & patterns
in the emergence of human cognition & language
from an evolutionary biology perspective
&
Investigating the limits of language as coordination tool
for addressing complexity & knowledge fragmentation

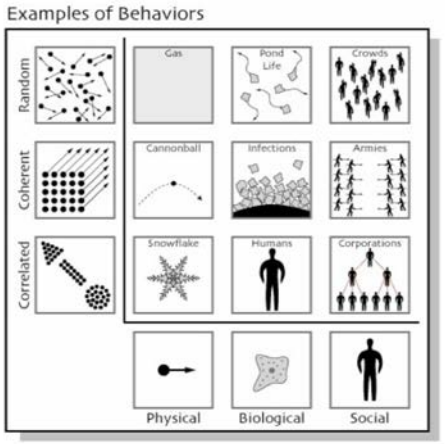
This presentation is part of a broader doctoral research on
Pattern Literacy in support of Systems Literacy

Increasing Complexity & Knowledge Fragmentation



Boeing 737-800 Max & Airbus A350 wiring diagram





Yaneer Bar-Yam (1997)

Humanity is confronted with:

An ever increasing detail and dynamic complexity and interactions among different types of systems, with different degrees of agency of their parts or wholes.

A high and increasing interdependence of multidimensional factors to make sense of; interactions ‘at a distance’ of biophysical, socio-cultural & technological ‘causes & effects’, without a higher order vantage point to look from; incompatible knowledges that aren’t curated and integrated fast enough (Heylighen).

In brief, we are faced with a greater intrication of the ‘problem’ field, and greater fragmentation and incommensurability of the ‘solution’ field.

Working across Disciplines and Domains

➢ Using language to find shared references, values, vision, discourse...
… not as effective as expected. Why?

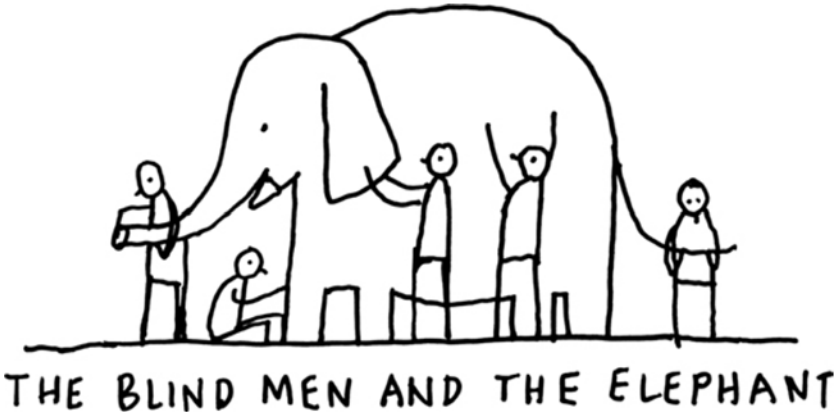
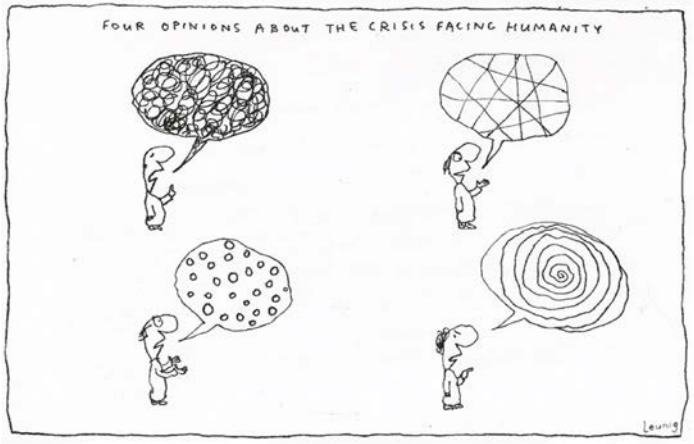


Illustration Dave Gray



Cartoon Michael Leunig

We are trapped within our own worldviews / mental frames & assumptions

Differences are broader than we realize
Same words can mean different things

➢ Can we 'talk each other' into 'alignment?

➢ How can we get to the whole Elephant while keeping our operational focus?

Controversies about Language… a ‘Panacea’?

Is language ‘all there is’ ?

We know more than we can tell (Polanyi)

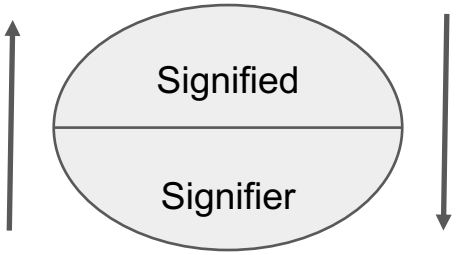
What is Language?

- A sudden mutation? The result of an evolutionary trajectory?
- Innate? Culturally or socially acquired?
- An arbitrary code? Something grounded in experience?
- A system of signs? A process of cognitive construction?
- A tool for ‘representation’ of thought and/or ‘reality’?
- A blessing or a curse?

➢ Looking from the perspective of biosemiotics and biology of cognition can help sort some of this out.

Photo: Galaxy Brain

Semiosis > “Making” Sense > Patterning



Saussurean Semiotics
Language/discourse focused

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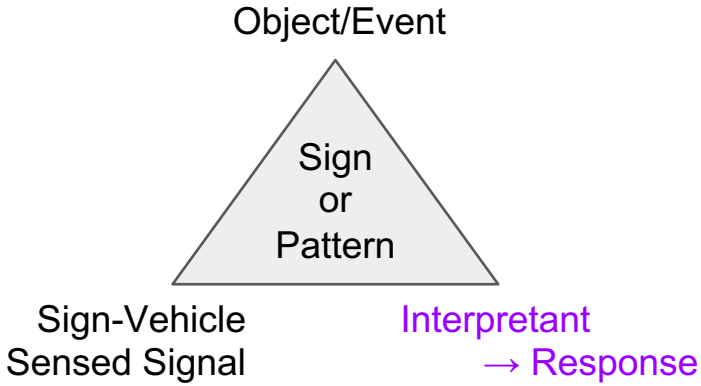
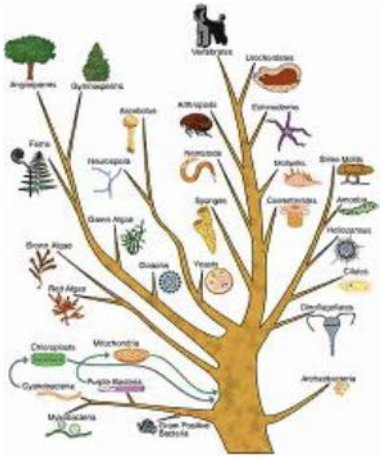


Peircean Semiotics
Cognition/action focused

- There is more to semiotics than Saussure and the signified / signifier relation
- With the Peircean interpretant, the ‘observer’ or ‘agent’ and therefore its cognitive frames and the way they are constructed are brought into the semiotic process, grounding human discourse into perceived reality and experience.
- Peirce extends the sign process to non-intentional communication, applicable to all living organisms. Peirce-based biosemiotics connect sign relations, meaning and teleology.
- From a biosemiotic perspective, semiosis is a sign process that allows an organism to operate effectively in its environment; it is linked to cognition (Sebeok, Maturana).

Figures: adaptations H. Finidori

Key Features of Semiosis in Living Systems



Living systems are sophisticated networks of semiotic controls whereby biochemical, physiological and behavioral processes become tuned to the needs of the system across various levels (Hoffmeyer).

- Semiosis mediates matter & energy exchanges through sensorimotor processes; it coordinates & orients behavior.

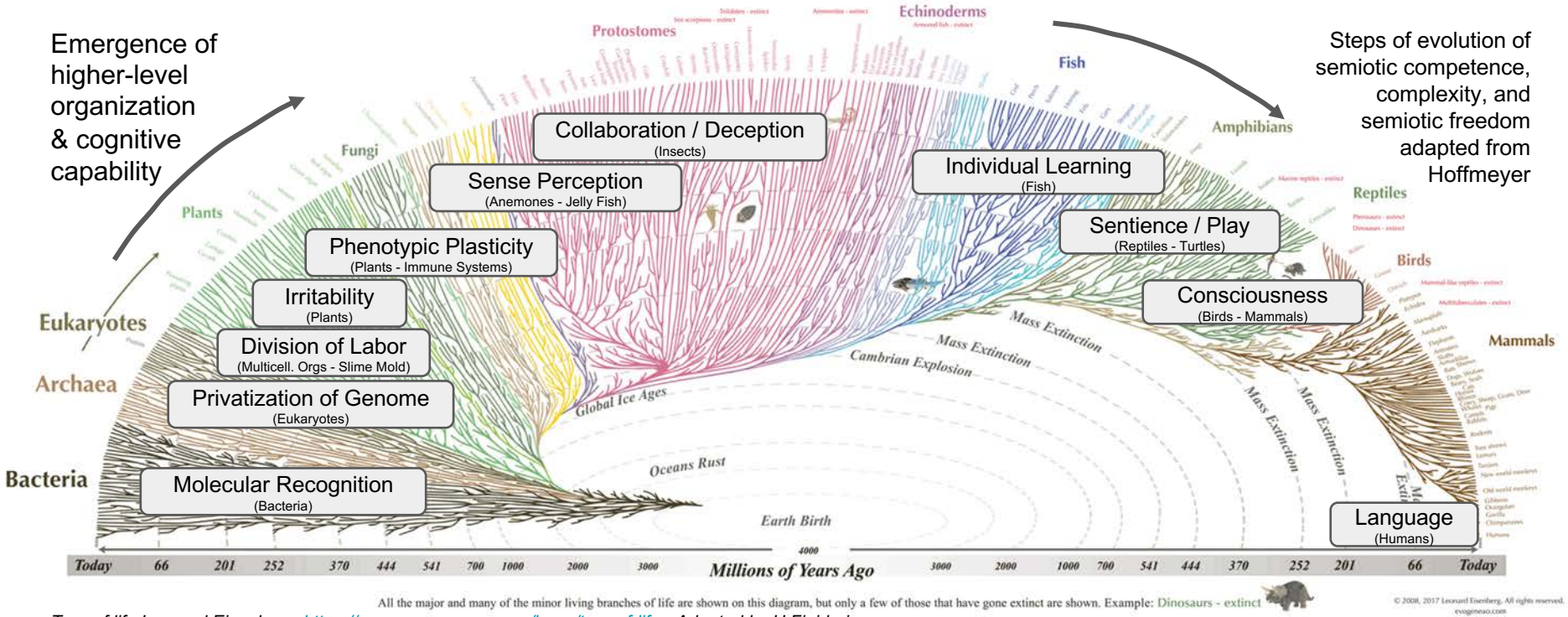
- Signals are possibilities for interpretation actualized into responses which become signs for next interpretations: a recursive / cybernetic process key to adaptation & evolution.
- Nervous systems manage priorities & conflicts when variety and volume of relationships and possibilities are involved, providing increased 'semiotic freedom'/possibility & agency.
- Cumulative experience generates habits, making same or next signal anticipable, enhancing learning and fostering the emergence of new capabilities within existing structural boundaries. It can also channel / format behavior…
- Congruence of habits among structurally coupled organisms fosters the formation of semiotic niches, where organisms co-adapt & co-evolve, constructing 'consensual cognitive domains' (Maturana). Co-adaptations are eventually genetically integrated.

Image: NBII

Signs are at the Basis of Life and Evolution

Semiosis generates the capacity for a species to produce and comprehend the specific types of models it requires for processing and codifying perceptual input in its own way (Sebeok).

Because semiotic processes are directly linked to the teleological property of life (striving for survival: feeding, escaping predation and reproducing), natural selection can be seen as a result of this process (Hoffmeyer).



Tree of life Leonard Eisenberg: https://www.evogeneao.com/learn/tree-of-life - Adapted by H.Finidori

Sign Process at the Cellular Level

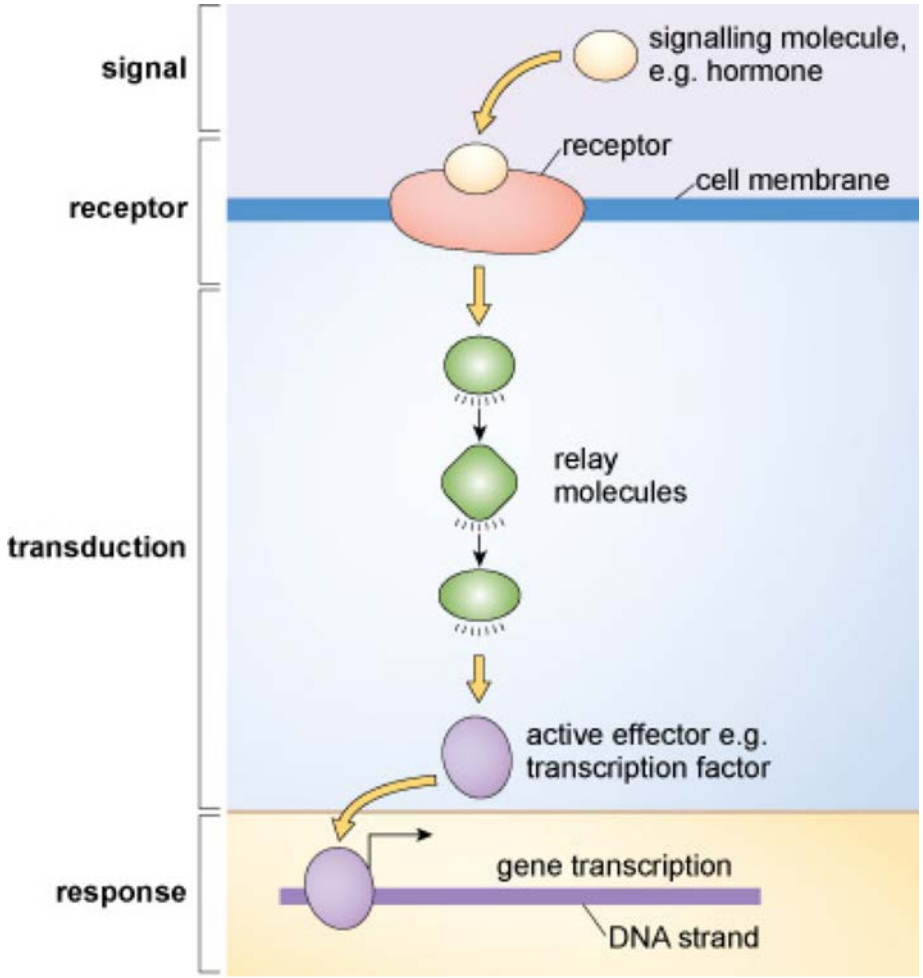
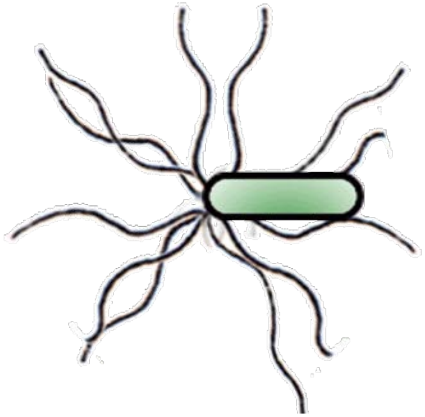


Figure: open.edu

- Every living organism has sensory surfaces (sensors) that can be triggered only by the specific perturbations (signals) that they can structurally cognize or recognize.
- These are coupled with motor surfaces, capable of producing movement or effects (effectors).
- Cells interpret molecules or changes in chemical substances as signs.
- An interpretant is formed as a context sensitive response to an event.
- Responses are not always the same: history, i.e. former experience, influences the interpretive process.
- Example: nerve cells or eye ganglia.

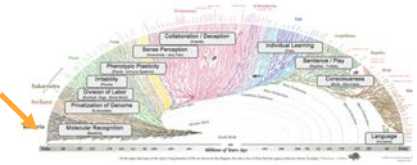
Molecular Recognition - Simple Cells



In the the bacteria e.coli, the sensor is also the effector.

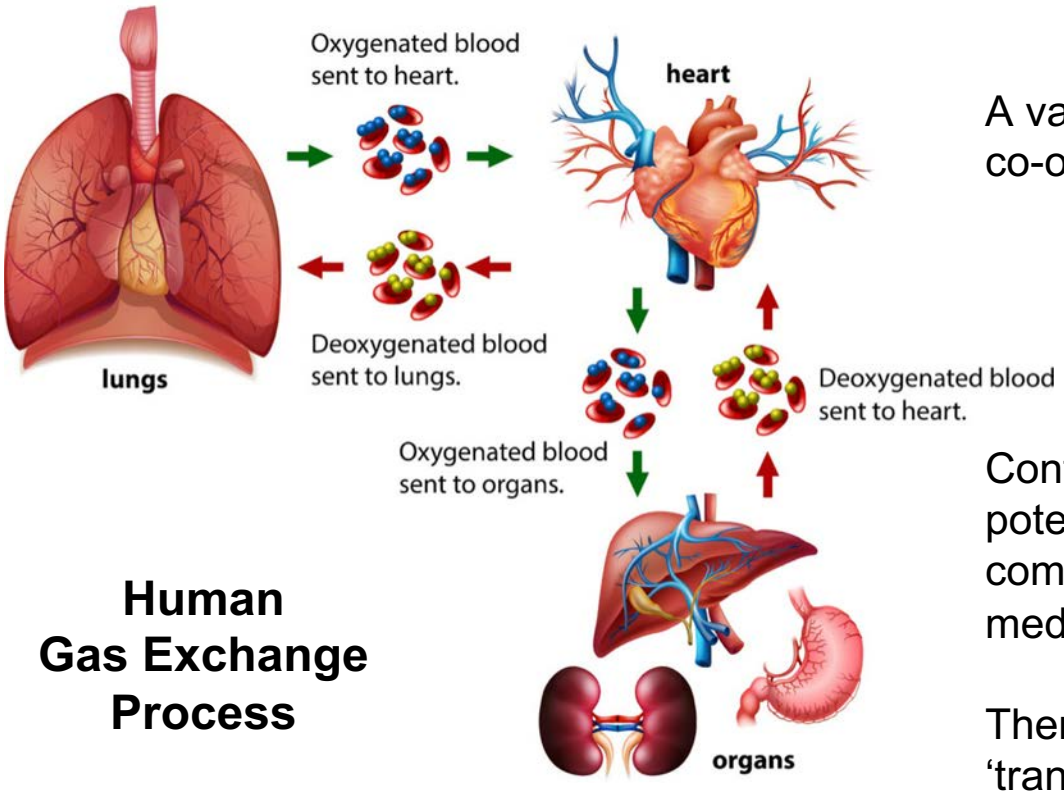
The flagella measure the concentration in sugar, and direct the swimming, i.e. change in the flagellar movement, towards the food source.

The interpretant is the change in movement.



Gif The Information Philosopher: http://www.informationphilosopher.com/freedom/biology/

Division of Labour - Coordination of Cells and Organs



Human Gas Exchange Process

A variety of sensors and effectors co-operate among their parts.

Contradictory impulses and potential conflicts from more complex sensorimotor activity are mediated by nervous systems.

There is no ‘storage’ or ‘transmission’ of information...

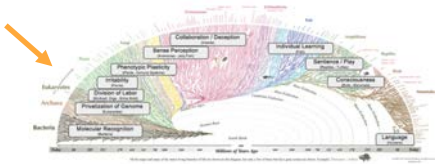


Image dreamstime.com

Between Independent Organisms - Collaborating Insects

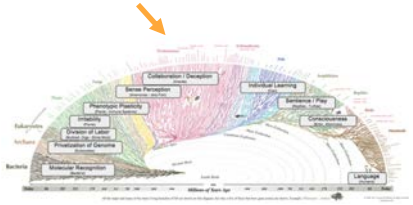
Within a species, or inter species in interaction with their environment: a variety of exchanges take place across different sensory organs and systems –not only chemical.

Collaborative Insects:

Here ants exchange signs via their antennas using pheromones.

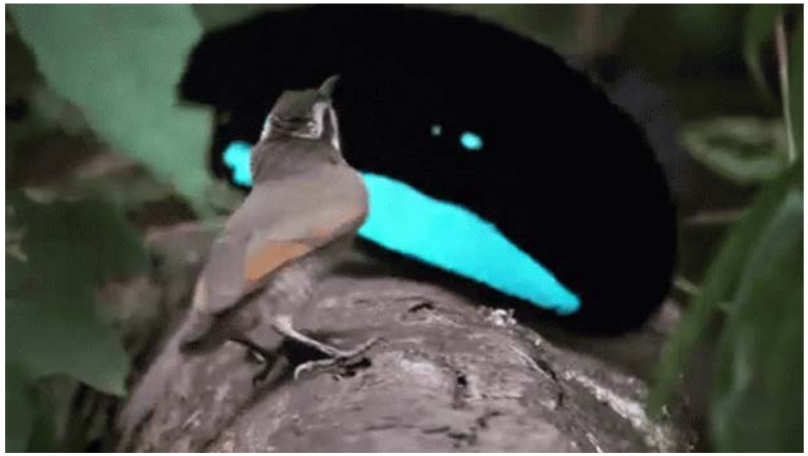
They also 'inform' each other in deferred ways by leaving pheromone trails that others follow. This exchange process is also known as stigmergy.

More elaborate, the bees' waggle dance, indicates the direction and distance of flower patches or new potential nest. This involves physical motion, chemicals, electric fields…



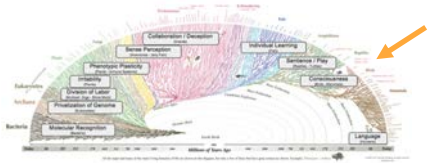
Between Independent Organisms - Bird Courtship

Striving to be noticed…



… or playing

...to ensure reproduction



Between Independent Organisms - Vervets Alarm Calls

Vervets emit one different call per type of predator, triggering appropriate responses to hide for safety.

There is an ‘education’ during child rearing, i.e. errors are identified and rectified.

This is the closest to ‘human’ sign systems…

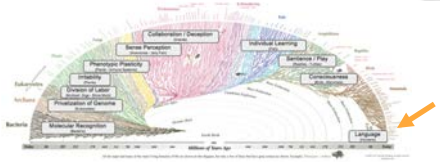
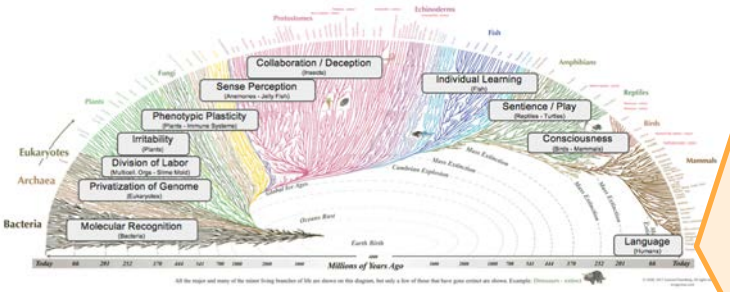


Figure: João Queiroza & Charbel El-Hanib

Human Language - Where did it come from?



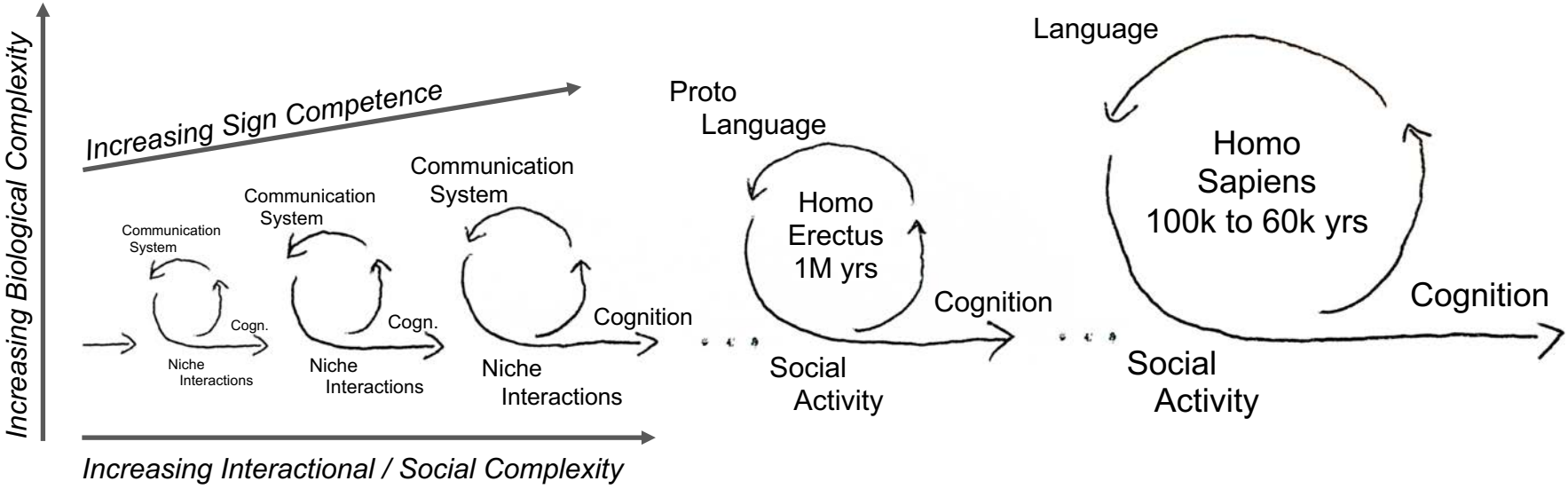
Many concurring factors

- **Contextual:** geological & climate changes, more running in the open, different risks
- **Physiological:** bipedalism, freed hands, development of larynx, premature babies with 'plastic' brains
- **Social:** pooling knowledge for tool making, hunting & aiming; alarm calls, grooming & socializing; mimetism and reciprocity
- **Cognitive:** larger plastic brains affording more neural connections; learning ex-utero

None is sufficient as a 'cause'. The larynx and plasticity of brains were key, and 'exapted' for language, i.e. used for a function they were not initially meant for.

Evolutionary Dynamics

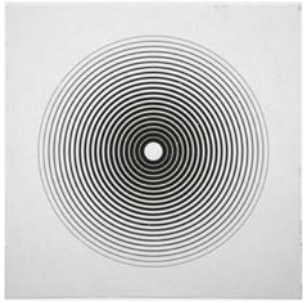
- Within each semiotic niche: increased cognitive/semiotic competences (biology) enhanced sign systems (culture), enabling more complex interactions (social), generating out of equilibrium conditions and new evolutionary pressures, leading to further cognitive improvements at each generation, and further recursions, which were eventually epigenetically & genetically integrated (Dessalles, Bickerton).

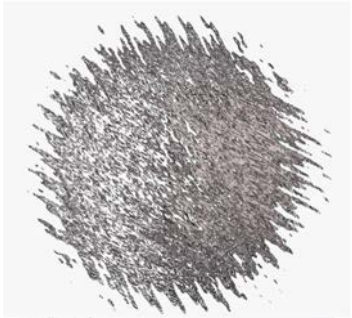


- Biosemiotics allow a bio-constructivist perspective that links nature and culture in a continuum of nested and/or forked micro and macro evolutions.
- There is some consensus that human language appeared in two steps starting with Homo Erectus 1 million years ago.

Figure: H. Finidori

The 2 steps of Human Language Emergence





Step 1. A Symbolic System - ‘compression’ of signals:
A shift from pragmatic/inferential reference (gestures, calls, scenic signaling), to symbolic reference. Pressure: delayed accounts requiring to deal with longer thoughts and greater volumes of information (Dessalles, Bickerton) > Protolanguage.

Step 2. A Syntactic system - spatio-temporal ‘mapping’:
The addition of a digital mechanism based on a recursive combinatorial of discrete elements. Pressure: a need for argumentation and verifiability of longer more complex accounts (Dessalles, Jackendoff) > Language as we know it.

➢ Providing infinite creative possibilities and exponential learning, and pushing limits of interpretation, understanding & knowledge.

Images: Visualmelt, Cal Lomax/Bēhance, Adobe Stock

Focus on the Human Symbolic Sign System

Indexical reference

Iconic reference

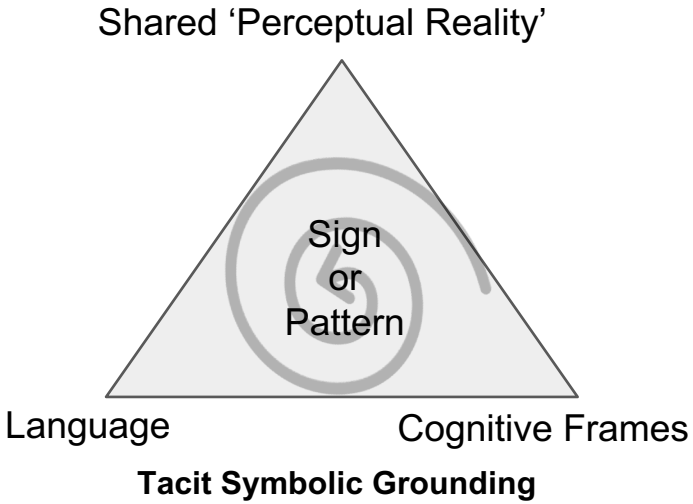
Three types of sign reference
Peirce

Buffalo

Symbolic reference

- With protolanguage, sign relations shift from indexical -denotative, pointing to- and iconic -figurative/analogical-, to symbolic –connotative-. The latter do not bear in themselves the ‘clues’, easily inferable, intrinsic to iconic or indexical references (Deacon).
- Freeing from the ‘here and now’, symbolic references allow multiple recursion and bring freedom to the thought process (Deacon, Kravchenko).
- But they are ‘detached’ from the “perceptual groundedness of language as an orientational activity in a consensual domain of interlocked conducts” (Kravchenko on Maturana).

Grounding within Consensual Cognitive Domains



Tacit Symbolic Grounding

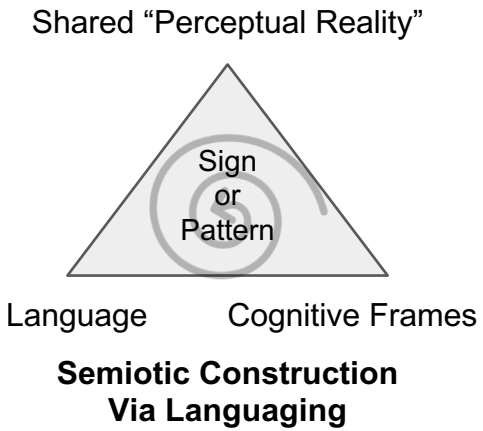
Cognitive Domain =
Domain of shared experience
and co-operation

Con-sensual =
Felt/sensed together
Not necessarily consciously and intentionally

- The symbolic system's form is socially acquired, in a given context / semiotic niche. Its 'grounding' into 'perceptual reality' is externalized in the collective memory, tacitly understood and reproduced through a history of personal and social experience.
- The tacit grounding that enables the detachment is operated during child development via successive construction of higher level indexical and iconic relations at multiple integration levels, which ultimately give place to the symbolic reference (Deacon).
- Interpretation is supported by an ongoing familiarity with symbolic semiotic relations, re-enforced through learning, recursively shaped by and shaping the frames through which interpretation is made, constructing the consensual cognitive domain.

Figure: adaptation H. Finidori

Languaging as Effective Coordination Mode



Semiotic Construction Via Languaging

For Maturana:

Language behavior is the *consensual coordination of action within a cognitive domain*,

Languaging, which focuses on language behavior as object of coordination, is the recursion of it, i.e. *the consensual coordination of the consensual coordination of action*

Within consensual cognitive domains:

- focus can be set on language behavior -the semiotic process in Peircean terms- as object of coordination
- languaging shapes and ‘perfects’ language behavior and shared systems of signs
- language can focus on itself as already grounded in a socially constructed shared reality that becomes ‘transparent’ to the observer / agent... Fish in water… Cultural ‘bubble’…
- languaging is or can be effective for coordination of action: nuances can be worked out...

Figure: adaptations H. Finidori

Across Cognitive Domains? Escaping the Babel Curse...

But why can't we 'talk each other into' alignment or shared visions, values or languages across identity, experience, and knowledge domains? Across cognitive frames and language systems?

Two errors are usually made:

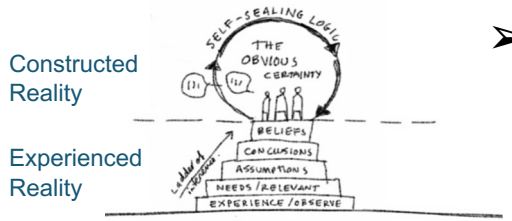
- Conflating language as human-wide semiotic capability (phylogenetically acquired), and language as context/milieu dependent (ontegenically acquired)
- Viewing language as representational and denotative, i.e. pointing out to an external world all can refer to (Winograd & Flores, Mingers)

➢ Outside of shared experience contexts there is no shared perceptual reality, no tacit 'grounding' of language, no support from historic shared experience, no ground for translation, no recursive habit that helps reflect, integrate and change. Languaging is not effective as factor of coherence transcending contexts.

➢ There is a need -an evolutionary pressure?- for reciprocal grounding across symbolic systems using human's advanced semiotic competences, processes and relations (patterning) in order to coalesce different forms of agencies and knowledges.

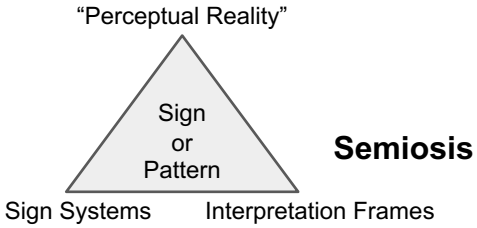
Photo: The Tower of Babel - Pieter Bruegel the Elder /Wikimedia

Ways Forward - Directions for Future Work



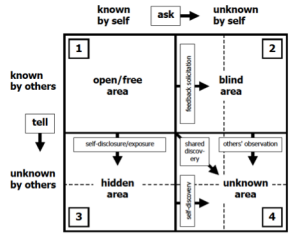
The Unknown
Illustration Dave Gray'

- Distinguish the philogenetic (patterning) and ontogenetic (languaging) aspects of language. Develop philosophical frameworks that deal with intersubjective boundaries: languaging within subjective worlds, patterning across intersubjective worlds and for co-discovering the unknown.

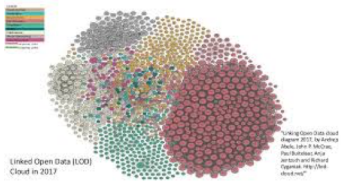


- Work deeper, directly at the semiotic process level: Study sign processes and relationships, patterns and their formation. Re-construct the sign relations and grounding at the foundation of symbolic representations. Develop a pattern literacy based on patterning processes.

The Johari Window



- Use patterns as boundary objects, and patterning methods to confront and relate ways of knowing, perceiving, evoking and interpreting different or shared perceptual realities.



- Build tools to identify, map and navigate semiotic networks, and relative positions in the action and cognitive spaces.

From [Patterns as Connectors of Multiple Realities Finidori ISSS 2018]

Thank you

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