

Symbolic Forms

An Epistemological Approach

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Where we are going

1. Information gives form
2. From *border* to *frontier*
3. A dynamics of form: semantic forces
4. The four causes, revised
5. The semantic engine (Uexküll → Varela)
6. Living symbolic forms
7. Mathematical forms: grain vs. continuum

A philosophy of nature.

Information and form

Information gives form

Two definitions (CNRTL)

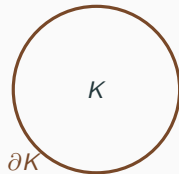
Information is what gives form. *Form* is the set of traits by which a reality — concrete or abstract — is recognised.

Every form is made of **symbols**. We picture a form as a *body* K enclosed by a *border* ∂K that carries the information about it.

In the **discrete** regime, Hartley's measure quantifies the individuated symbolic form:

$$I = \log_2 |K|.$$

$g : \kappa \rightarrow \mathcal{I}$ is a morphism: $g(K_1 \times K_2) = \log_2 K_1 + \log_2 K_2$.



A form: body K , border ∂K .

From discrete to continuous Hartley

Treating the symbol count K as a *real* variable makes Hartley differentiable — the passage one already performs in fractal (box-counting) dimension and in Boltzmann's $S = k \ln W$ under continuous volume/pressure changes:

$$dI = d \log_2 K = \frac{1}{\ln 2} \frac{dK}{K}, \quad d^2 I = -\frac{1}{\ln 2} \frac{dK^2}{K^2}.$$

Dynamic quantity of information

The *variation* of an element of information:

$$S = \frac{dI}{dt} = \frac{dI}{dK} \cdot \dot{K}.$$

A variation of symbolic information makes *connotation* — a new sense — emerge, together with a concomitant shift of the denoted.

Border and frontier

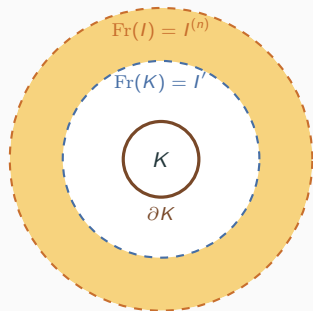
The frontier extends beyond the border

For a hybrid form K with border $\partial K = I$, describing $I \circ K$ demands a *new* amount of information $I' > I$: a **negentropy of composition**. I' becomes the *frontier* $\text{Fr}(K)$ — distinct from the border.

Iterating builds a sequence $I^{(n)}$ that converges to a frontier where information *saturates*. Between border and frontier lies a *crown*: the form's *space of operation*.

Two spaces on a situs in depth

Space-in-itself (inside ∂K) and *space of operation* (the crown $\text{Fr}(K) \setminus \partial K$).



The hybrid case: body, border, frontier.

A dynamics of form

Semantic forces: from statics to dynamics

Generalising Newton's $F = \dot{q}$ beyond the material point: any dynamic quantity q (whose “charge” may be null) obeys a *generalised* fundamental relation of dynamics.

Fundamental relation of the dynamics of information

$$F = \dot{S} = \frac{dS}{dK} \cdot \dot{K}, \quad F = \frac{1}{\ln 2} \frac{\dot{K}}{K^2}.$$

Writing $\delta I = I^{(n)} - I$: the increments

$$\Delta I^{(n)} = S^{(n)} \quad (\text{sense}), \quad \Delta^2 I^{(n)} = F_S^{(n)} \quad (\text{semantic force})$$

act on the *varieties* of the form and generate its dynamics — vibration, oscillation, wave propagation, scission, transport.

The four causes, revised

Aristotle's four causes — assigned by role, not symmetry

Material — *what it is made of*

The corporeal symbolic form K : the substrate.

Formal — *what it is*

The pure symbolic form I : its essence, its *eidos* (the arrangement, as A, B arranged into the syllable BA).

Efficient — *whence the change*

The informational force $F_S = \Delta^2 I$ — the agent, the “sculptor” of the form. *Not* the border.

Final — *that for the sake of which*

The frontier $\text{Fr}(K)$ as *state of saturation*: the limit of the $I^{(n)}$ toward which composition tends.

The border is not a cause

A contour *separates* and *individuates*; it produces nothing. ∂K is the *condition of individuation* — what makes the form one, countable, Hartley-quantifiable — not its efficient cause.

The semantic engine

The semantic engine: a lineage from Uexküll to Varela

Uexküll — the *Umwelt* and the functional circle

Every organism inhabits a *self-world*: a *Merkwelt* (perception) and a *Wirkwelt* (action) closing into the *Funktionskreis*.

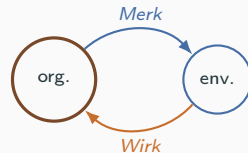
Meaning governs the whole; the organism is a *subject*, not a machine. $\Rightarrow$ this *is* our border $\rightarrow$ frontier passage.

Maturana & Varela — autopoiesis

The system actively produces its own *boundary* (operational closure) while structurally coupled to its environment. That coupling *confers sense*.

Varela — *sense-making*

To stay viable, a system must make sense of its world from the perspective of its own identity.



The functional circle: perception–action loop.

Our contribution: quantifying sense-making

The enactive tradition leaves sense *qualitative*: one says the organism “makes sense” without *measuring* it. Our apparatus supplies the missing magnitude.

Definition — Semantic engine

The capacity of a system to produce *sense-bearing strategies* relative to its environment — i.e. to *make sense* in Varela’s sense — **whose yield is measured** by the negentropy of composition it extracts from its informational coupling.

- Uexküll’s functional circle → we measure its *negentropic yield*.
- Varela’s emergence of meaning → we quantify its *intensity* via $F_S = \Delta^2 I$.

Assumed analogical extension

Applying this below the autonomous organism — to a DNA strand, to Canetti’s crowds — is a *deliberate* analogical extension, not a settled claim.

Living forms

The pattern “information passes from border to frontier” recurs across biological scales — nucleus, organelles, cell, organ, body.

DNA

Described symbolically (bases, codons, genes). Its *semantic* information — replication, deformation, transcription, partial reconstruction — composes a genuine semantic engine, triggered by the negentropy of composition of genes over codons.

Cell, body, collective

A cell turns over in the crown between its border and frontier: its *operational space*. At the human scale, Hall's proxemic zones and Canetti's crowds show the frontier *overflowing* the body.

The frontier of the immune system exceeds the border drawn by its lymphocytes.

Mathematical forms

Mathematical forms: grain vs. continuum

The linear continuum has cardinal $2^{\aleph_0}$, so its Hartley content is $\aleph_0$ — the $\aleph_0$ binary digits after the point.

Why work in grains

Passing to the point-symbol *dissipates* the symbol irreversibly: information is lost. In grain theory the symbol is *kept*, with degrees of fineness — one may differentiate and integrate, so qualitative properties of the continuum become *quantified* while symbolic information is preserved.

A dimension-1 continuous form carries *more* than Hartley: its qualitative, structural part — captured via Fourier — is the frontier exceeding the border. Grains keep a homogeneous total in bits:

$$I_{\text{total}} = I_{\text{support}} + I_{\text{structure}}.$$

The reals *transcend* the ring defined by the grain: a Platonic reality on the *other side* of space.

Information gives form; its *variation* gives sense;
the *frontier* that exceeds the border is where a form becomes a *semantic engine*.

Formalisms as structuring metaphors — a speculative philosophy of nature.