# A SIMPLIFIED *A Priori* THEORY OF MEANING –NATURE BASED AI 'FIRST PRINCIPLES'–

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Paper under double-blind review

## ABSTRACT

This paper names **structural fundaments** in 'information', to cover an issue seen by Claude Shannon and Warren Weaver as a missing "theory of meaning". First, varied informatic roles are noted as likely elements for a general theory of meaning. Next, Shannon Signal Entropy as a likely "mother of all models" is deconstructed to note the signal literacy (logarithmic Subject-Object primitives) innate to 'scientific' views of information. It therein marks GENERAL intelligence 'first principles' and a dualist-triune (2-3) Pattern. Lastly, it notes 'intelligence building' as named contexts wherein one details *meaningful* content—**rendered** via material trial-and-error—that we later extend abstractly. This paper thus tops today's vague sense of Open World 'agent intelligence' in artificial intelligence, framed herein as a multi-level Entropic/informatic continuum of 'functional degrees of freedom'; all as a mildly-modified view of Signal Entropy.

## 1 INTRODUCTION AND BACKGROUND: 'GENERAL INFORMATION'

Many roles fill our eternally-dynamic simple-to-complex cosmos. One corner of that cosmos holds Life where 'agents' adapt to **directly**-imposed selection forces via **indirect** 'referential' means or expire. Human agents notably adapt via *indirect* 'informatic abstraction' of *direct* events.[1] Here, agent INFORMATION is always 'about *something*', seeking to convey knowledge or intelligence about direct/real events, where better detail on 'How things work and fall apart' has more value/meaning. In this informatic enterprise, we make 'psychological artifacts' (ideas) into myriad material forms for better survival, using 'tools'—a *process* driving today's 'techno-cultural ecology'.

As humanity's main adaptive path, detailing that GENERAL 'informatic process'—onto today's artificial intelligence and beyond (AI/AGI)—is this paper's focus.

In grasping at a general 'scientific view' of *information* a key issue has been noted across disciplines, by varied individuals:
- "solving intelligence", Demiss Hassabis, Google Deep Mind (Burton-Hill, 2016),
- "de-risking science", Edward Boyden, MIT Media Lab (Boyden, 2016),
- "do submarines swim?", Edsger Dijkstra (1984), Eindhoven University, computer science,
- "symbol grounding problem", Stevan Harnad (1990), Université du Québec, cognitive science,
- "theory of meaning", Claude Shannon and Warren Weaver (1949), information theory, and more.

Each such 'gap' holds its own sense of the matter, but all can be seen as and reduced to one key informatic lapse. Shannon and Weaver were first to see this as a missing "theory of meaning" but it has since held many roles (as above). These 'gaps' arise due to a singular/universal **statistical** view of information in Claude Shannon's *A Mathematical Theory of Communication*, versus base notions of information as 'meaningful/semantic content'. But, Shannon and Weaver (1949) soon saw *Theory of Communication* abuse (now being called 'information theory') would lead to "disappointing and bizarre" results, where a missing "real theory of meaning" (ToM) showed the theory being "ballooned to an importance beyond its actual accomplishments" with "an element of danger" (Shannon, 1956)—due to Signal Entropy's[2] "missing" *meaningful content* and odd "surprising" statistical role.

[1] Informatic: energy-matter events as '**direct** functions' (object interactions), each posing an 'agent chance' for sign/signal perception, creation, exchange, or processing, as '**indirect** information' or data about *functions*.

[2] See Figures 1 and 2 for a brief description and discussion of Signal Entropy.

This paper offers a new approach. For example, deeper study shows differences in how we view *(S)ubject* information (raw percepts/data, object relations, 'qualia') and *(O)bject* information (self-evident matter, quantity, firm truths, etc.), hereafter (*S*) and (O), and S-O. Shannon (1948) used this split view to develop Signal Entropy, claiming "*[S]emantic aspects* ... are irrelevant to the *[O] engineering problem*" (emphasis added) in order to isolate and model the latter role. If we accept this split view, (*S*) and (O) must also apply to a ToM, with *(S)emantic aspects* as a 'missing something'. But the terms (*S*)ubject and (O)bject are used variably, as are 'information' and 'intelligence', never truly detailed in relation to the other. They instead remain 'un-reconciled', driving the cognitive quagmire we have today (Dennett, 2013). With no uniform S-O base, myriad "disappointing and bizarre" (Eco, 2014; Shannon & Weaver, 1949) informatic notions instead abound—the central issue this paper targets, toward better focused AI and related ensuing 'sciences'.

To better see an S-O split, mathematics seems 'purely objective' said to omit subjective roles from its arguments as an intellectual ideal (theoretical mathematics). But mathematics without *subjective elemental facts* as initial conditions (base data on 'primitives') is a "fact-free science" of little practical use (Feynman, 1964; Smith, 1995). Only if (*S*) and (O) roles are **joined** do predictive models arise as 'functionally reconciled' *applied mathematics*. If we look for other firm (O) views, the Standard Model of particle physics and Periodic Table are good candidates. But their 'objective success' often ignores that they arose from a line of *(S)ubjective elemental observations*, normalized (functionally reconciled) via experiment and peer review. Only after enough 'primitive evidence' was *subjectively discerned* and *subjectively named* by varied individuals, in many experiments, over decades, were models posited and *subjectively agreed* as being innately (O)bjective. Such *meaningful* '(*S*)teps' drive a sense of *general* 'informatic intelligence' or **functionally verified** S-O inter-relations.

Thus, the claim made here is that GENERAL/LOGICAL S-O (*S*)teps—detailed below—help correct 'gaps in meaning', and further support a sense of GENERAL INTELLIGENCE[3], along with *informatic* 'first principles' needed for firm AI/AGI/agent gains. But **Objectified**-*Subject* (**O**-*S*) roles like the Standard Model and Periodic Table are so accepted we forget their (*S*)ubjective origins. 'Objectivity' itself cannot even be implied if not first *subjectively sensed*, 'discovered' or 'imagined' by someone, before airing a 'sense-making' hypothesis. But GENERAL S-O (*S*)teps for framing new **O**-*S* roles (intelligence, meaning) are faint. In further studying S-O roles we see *raw (S)-percepts* (Stanley et al., 2017; Lewis, 1970) plainly precede **O**-*S* aims. I thus label this project **S-O modeling**[4]—want of a generative *uniform* S-O base, toward *diverse* intelligent/MEANINGFUL '(*S*)et' **O**-*S* roles.

Work of neuro-anthropologist Terrence Deacon (2013), biologist Stuart Kauffman (2024), and others (Wu, 2012; Thórisson & Talevi, 2024) mark early efforts at S-O modeling. Deacon's 'multi-state' view has Shannon's Signal Entropy, Boltzmann's thermodynamic entropy, and Darwin's evolution by means of natural selection (EvNS) as linked vistas (Dennett, 2013), with "structural, referential, and normative" (Deacon, 2020; 2024) facets. This Shannon-Boltzmann-Darwin view suggests 'converged science' in a contiguous role, but its thermodynamic core omits wider physics-based models (Deacon, 2017) (four fundamental forces). Also, as the work is littered with neologisms and difficult prose (Dennett, 2013; Fodor, 2012; McGinn, 2012) it lacks breadth and clarity. Still, the strength of Deacon's *multi-state entropic study* is that it poses a bottom-up view (minimal logical gaps), is innately creative (for *adaptive* differentiation), in a Natural contiguous role (key to any GENERAL theory, crossing domains), with 'simple-to-complex' functional ties (thermodynamic entropy, Signal Entropy, and EvNS). Beyond Deacon's view, Kauffman suggests Natural "order for free" and "adjacent possibilities", tied to Gibson's (1977) "affordance", as further *structural fundaments*.

## 2 DETAILING AN INFORMATIC BASE

As an alternative to Deacon's view, **S-O modeling** may seem paradoxic with 'opposed roles', per Shannon above. In 1901 Bertrand Russell saw a like clash in Georg Cantor's mathematical Set Theory, later called Russell's paradox. His solution asked that we see different 'types' of data exist—a *cognitive advance* that gave rise to Type Theory. S-O modeling demands a like advance in

[3]**S-O modeling** covers detail missed by AI's "Intelligence measures an agent's ability to achieve goals in a wide range of environments" (Legg & Hutter, 2007). At issue, *goals* and *environments* hold further (O)bjects/ives and (*S*) ways/means, all varied via trial-and-error in (*S*)electing 'functional Fits' and 'Fit-ness' (Müller, 2024), ***and*** in developing 'Open World' material reality, to make S-O modeling more foundational.

[4]Elsewhere I call **S-O modeling** Natural Informatics/Intelligence (NI) or 'thinking like Nature'.

(*S*) and (O) 'data types' with "differed" (Bateson, 1979) "levels of abstraction" (Korzybski, 2010), to map 'otherwise paradoxic' *diverse*-but-*uniform* **and** simple-to-complex facets. The problem is that Shannon information theory offers no systemic/informatic 'types' beyond (O) Signal Entropy as a single scalable statistical 'scientific role' without presumably-opposed (*S*)emantic aspects.

But (*S*)emantic aspects abound as 'metadata' with "differed" *meaning* in every formula, recipe, sheet music, blueprint and more, all detailing *types* of meaningful intelligence—that also map 'How things GENERALLY work' for diverse DISTINCT domains. For example, a Periodic Table *metadata* atomic **context** holds 'a type' of knowledge-about-data[5]—'material primitive' **content** of electron-neutron-proton triads as 92 Natural **O**-(*S*)et elements. Maps use 'symbolic primitive' **O**-*S legends* to detail map content. Even Assyrian clay tablets (3 kya) and Rosetta Stone note details *about* 'other tablets'. Myriad meaningful (*S*) metadata examples exist, mirroring (O) Signal Entropy's wide use, with both seen as diverse **O**-(*S*)et roles in the above examples—that also support AI/AGI agent aims, where (*S*) and (O) 'informatic atoms' underlie all aspects of actual **O**-*S meaningful intelligence*.

Beyond metadata, a unifying 'Meta-meta type' also exists. For example, with the Standard Model and Periodic Table holding diverse **O**-*S* meta-content, a view linking the Standard Model *with* the Periodic Table, chemistry, genomics, etc. evokes a contiguous *Meta* type (. . . O-*S*-O-*S* . . . ). Meta-meta 'logical primitives' mark GENERAL LOGIC *across* DISTINCT 'material primitives'—MAPPING 'How things GENERALLY work' *across* domains. If not for **domain-distinct** material/symbolic primitives (*meta*), linked via **domain-neutral** logical primitives (*Meta*), a ToM would be hopeless. Linked *meta*-to-*Meta* (*S*)teps echo Deacon's 'converged science' and the called-for *diverse*-but-*uniform* and simple-to-complex S-O modeling base.

An early Meta-meta example is 'dialectics': thesis + anti-thesis = synthesis—seen across history in every technical advance and cultural leap. Darwin's *uniform* view of *diverse* evolving species is also Meta-meta. Type Theory is another Meta-meta (Type-of-types) example. Lastly, Signal Entropy is Meta-meta, behind all information technology and fitting so many domains that we call it "the mother of all models" (Hollnagel & Woods, 2005). Meta-meta shows GENERAL LOGIC for diverse DISTINCT material and symbolic primitives/roles/types/(*S*)teps—usually as core scientific models, as with the above examples. Biologist Gregory Bateson (1979) called this Meta-meta *structural link* a "necessary unity" and a "pattern that connects" the cosmos, while science targets a kindred 'unified field theory' (UFT) and others aim to "mine a computational universe" (Wolfram, 2017).

A ToM thus *contiguously* MAPS **all** GENERAL $\rightleftarrows$ DISTINCT 'data types'—meta-to-Meta and more—to detail *informatic processing* as 'humanity's main adaptive path', for AI and beyond.

### 2.1 ELEMENTS FOR A GENERAL THEORY OF MEANING—INITIAL 'FIRST PRINCIPLES'

The above shows many informatic (*S*) and (O) roles/types/(*S*)teps, where a ToM targets a Meta-meta *uniform* view of *diverse* types, alongside general intelligence 'first principles'. Before proceeding, I detail some key informatic aspects. Foremost:

- '**Function**' is the term that best notes 'Things GENERALLY work and fall apart', held as abstract S-O *informatic meaning*. **Functional** "affordance" is thus what we hope to 'understand' as *intelligence*. Here, 'O-*S*-O' detail minimal **O**-(*S*)et functions (*meta*, 'simple'), and '. . . O-*S*-O-*S* . . . ' is *varied contiguous dynamic* simple-to-complex (*Meta*, evolving cosmos) functioning.
- **Adaptive** *Fit-ness*—after **O**-(*S*)et functions, agents seek **adaptive options** that abide, exploit, or otherwise 'Fit' a *dynamic* simple-to-complex cosmos, contra 'chaos/noise' as *extinction risk*.

Next, as further detail:

- **(*S*)ubject** and **(O)bject** are **joint** GENERAL *logical primitives*. Signal Entropy's S-O split implies dualism. Stated simply, (*S*) is 'relational joining' in (O)s as O-*S*-O or **O**-(*S*)et 'Fits'. A ToM thus maps *contiguous* **O**-(*S*)et 'functional Fits' **and** (*v*)ariants (. . . O-*S*-O-$S^v$-$O^v$-$S^{v1}$-$O^{v1}$. . . ) with Bateson-like "differed" S-O types/(*S*)teps, alongside Korzybski's "levels of abstraction". Next,
- **Metadata** as 'well-ordered' DISTINCT *meaningful types*—each **O**-*S* Group is a 'domain specific' *context* of (*S*)imilar primitive *detailed* material/symbolic 'functional *content*'. Many such diverse distinct **O**-(*S*)et Groups/*contexts* fill our contiguous dynamic simple-to-complex cosmos.

[5]Metadata: often defined as 'data about data', which ignores Russell's paradox in not naming 'data types' and simple-to-complex 'levels'—but that are detailed herein as (*S*) and (O) (*S*)teps central to S-O modeling.

- **Meta-meta** is a GENERAL *meaningful type*—'domain-neutral' **uniform** LOGIC for **diverse** (*S*)et Groups. *Meta-meta* cross-maps **O**-(*S*)et domains, via shifting (*S*) and (O) 'informatic atoms'.
- **Level** (*S*)teps are a third *meaningful type*—many (*S*) Groups exist due to *simple-to-complex* shifts. Various "differed" force/matter admixes drive (*S*)tep-wise *shifts* in 'functional degrees of freedom' (DoF), where *abrupt*/sharp DoF shifts often mark a new/*emergent* domain Level/Fit.
- **Context** and **Content** in prior roles—(*S*) Group *contexts* with **O**-(*S*)et primitive *content*. Set *contexts* **with** firmly detailed *content*, alongside material **and** LOGICAL (*S*)teps, allow us to map *dynamic* simple-to-complex material reality, detailed as *contiguous* ToM functional segments.

The above mark 'types of meaning', where 'gaps' next show as:

- **Raw (*S*)-percepts** are a *meaningless type*—'things' we say exist but with faint (*S*)ense-making detail, e.g., Life, genomics, evolution, gravity. For meaning agents gather-and-interpret more (*S*) data in posited functions, with '(*S*) and (O) trial-and-error ⇒ **O**-*S* metadata' as the root of all *active intelligence* (applied/generative agent logic, and related 'proof').
- **Voids** are a next *meaningless type*—things we imagine exist but fail to grasp (dark matter, dark energy, quantum mechanics, etc.), **and** unnamed things we are wholly blind to, failing to (*S*)ense them in any useful way. Lastly,
- **Meaningless** roles are a *dysfunctional* 'functional type'—everything has proto-meaning, even noise/ignorance/absence, but seems meaningless due to specific *contexts*, at differed moments.

## 3 INITIAL TOM/S-O MODELING

The above initiates an **S-O modeling**/ToM base, but where simple-to-complex shifts bar one-step vistas, unlike statistical (O) Signal Entropy. Even with Bateson's unified sense, varied coevol generative (*S*)teps must be detailed. Shannon and Weaver saw three Levels (A, B, and C)[6] of needed study, with more to come. Korzybski likewise noted myriad *levels of abstraction*. These all evoke distinct representational and computational challenges, requiring some manner of *multi-state analysis* (re Deacon). Also, Shannon and Weaver saw Signal Entropy's "disappointing and bizarre" lack of *meaning* and odd "surprising" statistical role must be improved upon—causing Shannon to warn against Signal Entropy as a general model (Shannon, 1956), leaving us to ask 'What way forward?'

### 3.1 SIGNAL ENTROPY AS GENERAL 'MULTI-STATE' S-O (*S*)IGNS

To answer 'What way forward?' I show Signal Entropy—a firm Meta-meta model—in a differed *meaningful-meaningless* (multi-state) role: a max-possible functional span, with min-possible (*S*) and (O) 'atomic' (*S*)teps (Figure 1); as an initial S-O modeling example. But first I clarify Shannon's claim "[S]emantic aspects . . . are irrelevant to the [O] engineering problem", implying engineers are blind to (*S*)emantic or *meaningful* aspects.

Foremost, Signal Entropy itself defies Shannon's '*pure*-(O) claim' as engineers plainly pursue (*S*)emantic studies to make 'an engineer' an ***Engineer***. Signal Entropy's Engineered (*S*)emantics show in: Figure 1's *Engineered* (*S*)ign (*S*)ets (number systems, alphabets, kanji, etc.), and an *Engineered* (*S*) logarithmic Fit in all messages—joint (*S*) LOGICAL RULES. Such Engineered roles echo Deacon's *meaningful* "structural information"[7]. The problem is that Shannon's (O) claim mixes *levels of abstraction*, that Korzybski (2010) warned against, to assert '(O)bjective purity'. Signal Entropy is thus "disappointing and bizarre" in ignoring its own *meaningful* (*S*)tructural aspects and other "adjacent possibilities", to make claims of "irrelevant semantics" a fiction. But simplified 'objective' views typify much of science, swapping Natural Open World complexity for more-workable (partial, segmented) 'closed' or 'isolated' system views. Ensuing 'logical fragments' offer *some* gain in mapping contiguous dynamic simple-to-complex Nature, but again, with prior-noted 'gaps'.

A ToM is thus wholly contiguous: simple-to-complex *open* material functions with *generative* Natural **and** Engineered *meaning*, alongside presumed-*meaningless* roles. Hence, Figure 1 shows one *meaningful* (**O**-*S*) and two *meaningless* 'at the limit' [MAX (*S*) and NULL (O)] roles as a broadest-

[6] Shannon's Level A covers Signal Entropy as "the technical problem", Level B marks "the semantic problem", and Level C marks "the effectiveness problem", but Shannon and Weaver (1949) never details B or C.

[7] Here, *structural information* broadly refers to 'specific (*S*) **and** (O) Fits', or a material event as 'some force' applied to 'some object(s)'[1], all of which a *complete* ToM ultimately maps.

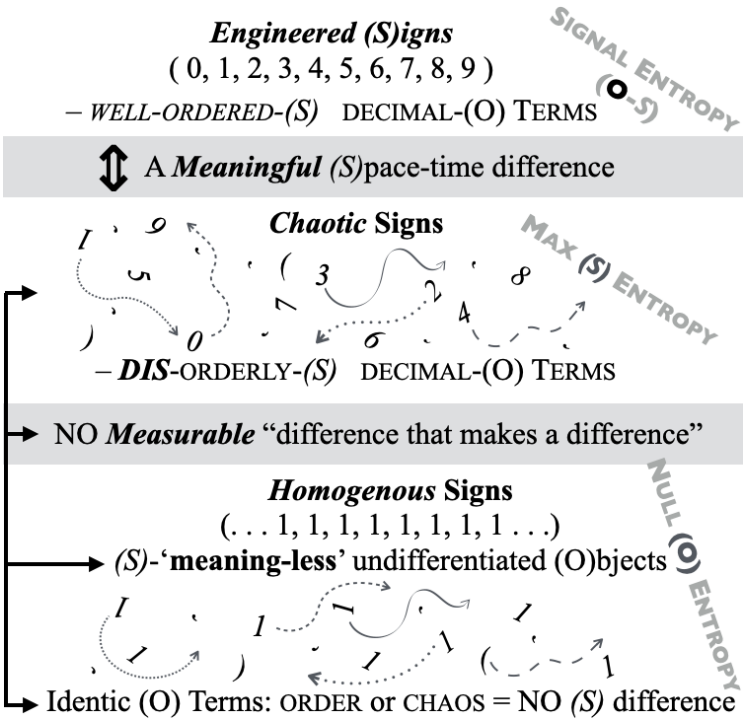


Figure 1: Engineered (*S*)igns, Entropic (*S*)teps, and Min/Max ToM (*S*)tructure. Orderly DECIMAL *symbolic primitives* (top) show a *meaningful* agent-agreed **O**-(*S*)yntax via firm (*S*)pace-time Fits. All messages embody such Signal Entropy. Next, Chaotic signs lack firm (*S*)pace-time Fits that messages require, shown as Max (*S*) Entropy (re thermodynamic entropy). Identic (O) Signs (bottom) also bar messaging due to (O)-indistinct (*S*)pace-time Fits or Null (O) Entropy. Not shown is Null (*S*) Entropy as a collapsed (O) 'singularity', or *fully-un*"differentiated" S-O Fits. Lastly, Min (O) Entropy is (*S*)et by the Standard Model's production of 92 initial Natural atomic elements/Fits. All roles can be shown via 'statistical mechanics', but which itself ignores *meaning-ful/less* aspects.

possible *meaningful*-to-*meaningless* (multi-state) span—or 'How things GENERALLY work and fall apart' across the cosmos . . . for an initial ToM map we can enlarge with later (S) and (O)/DoF detail.

In sum, Engineered (*S*)igns have (*S*)et *meaning*, contra *meaningless* Max (*S*) 'noise' and Null (O) 'Entropic-ity'—**minimal** *uniform* (*S*) and (O) 'informatic atoms', in **maximal**-*differed* DoF (*S*)teps. This ties to a Null-Entropic S-O 'cosmic singularity' ⇒ initial max S-O Entropy (cosmic microwave background) ⇒ initial min **O**-*S* Signal Entropy (early condensed matter) ⇒ Max S-O 'Entropic Death', Open World multi-state *continuum*—as a **proto-ToM**. Also, S-O duality with 'three GENERAL Entropic types' (Figure 1) mark a *uniform* dualist-triune (2-3) GENERAL Pattern, where space-time has similar 2-3 traits[8]. I call this three-fold vista simply 'Entropy' (generic expansion), with myriad material-and-symbolic, *orderly* **and** *dis-orderly*, min/max DoF (*S*)teps. But this view lacks 'generative detail' on specific material-*interstitial events* enacting DISTINCT domain (*S*)hifts.

### 3.2 SIGNAL ENTROPY AS A GENERAL 'GENERATIVE ROLE'

S-O modeling's **generative detail** shows in Signal Entropy's logarithmic base. For example, imagine a 3-term alphabet (A, C, and T) where all messages also hold 3 terms (Figure 2). Here, Engineered '$X^n$ Fits' suggest a 'material event' (O-*S*-O logarithmic joining) *causing*[9] 27 ($3^3$) message (*v*) *options*, as a simple-to-complex S-O (*S*)tep: A, C, and T ⇒ CAT, ACT, etc. Signal Entropy thus 'generates' as (*v*)aried (*S*) **and** (O) space-time Fits (S-O-*v*)—or $X^n$ as *infinitely-generative* "adjacent possible" simple-to-complex (*S*)teps. This S-O *logarithm* echoes genomic code creation/mutation

[8]Dual-three-part (*S*)pace-time with SPACE: height, width, and ***depth*** (2d simple/***3d realism***); and TIME: past, future, and ***present*** (2d imaginal/***3d realism***), herein showing further-*nested* 2-3-***2*** Fits.

[9]A 'logarithmic *tool*' applied by human hands, but also seen in Nature as *the natural logarithm* 'ln(*x*)'.

in diverse species, and 'ln($x$)' as "one of the most useful functions in mathematics, with applications throughout the physical and biological sciences" (Murray, 2024). Lastly, $X^n$'s 'causal structure' again holds a 2-3 Pattern: $X^n$ = base-$X$ **and** term$^n$ (*S*)hifts, or (S-O-*v*) *generative* joining. But the problem now is that Signal Entropy is 'blindly generative', it omits (*S*) *meaning* beyond statistical (O)s—the issue raised above contra Shannon's pure-(O) claim, and that a ToM ultimately corrects.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ***CAT*** | CCT | CTT | CCA | CAA | CTA | CTC | CAC | CCC |
| ***ACT*** | AAT | ATT | AAC | ACC | ATC | ATA | ACA | AAA |
| *TAC* | *TAT* | TCC | TTA | TAA | TCA | TTC | TCT | TTT |

Figure 2: Scale-able/Select-able Signal Entropy. C, A, and T in *orderly* (*S*)pace-time Fits: an S-O Volume with $3^3$ Signal Entropy (27 DoF). CAT and ACT are (*S*)et English words, "what you *do* say", others are (*S*)elect-able DoF options "what you *could* say" (Shannon & Weaver, 1949) (emphasis added). For example *TAC* and *TAT* hold 'meaning' in *differed contexts* (French, Old English, German). But all require 'agent agreement' on *meaning*: inter-(*S*)ubjective (O)bject operation as encultured **O**-*S adaptive functioning*. Without agreed **O**-(*S*)et functions, only 'informatic noise' arises. Lastly, shifting $X^n$'s values makes S-O modeling infinitely +/- (*S*)cale-able and (*S*)elect-able.

***(S)ignal Entropy***'s now-noted '*meaningful* (*S*) and (O)' **and** '*generative* $X^n$' again suggest a **proto-ToM** with *contiguous-scalable* DoF—or 'How things GENERALLY WORK' in the cosmos (Figure 2). Thus, so far we see: a) **O**-(*S*)igns as (*S*)et O-*S*-O functioning, b) contiguous-expansive . . . O-*S*-O-*S* . . . functioning, c) *meaningless* (*S*) and (O) 'noise' (Figure 1), and d) (*S*)tep-wise *generative* S-O-(*v*)ariability, all with e) **Entropic** 2-3 "structural information"—an initial MEANINGFUL "mother of all models" as a proto-ToM. But *now* the issue is that this is 'blind': it omits *meaningful* (*S*)election (Natural Fit-ness, 'reinforcement', EvNS) amid myriad **diverse O**-*S* and S-O-*v noisy* (*S*) options.

Generating S-O options [Figure 2's $X^n$/ln($x$)] affords GENERAL intelligence, making adaption possible. But such 'big data' vistas *alone* cannot treat 'gaps in meaning' due to unsure utility—not all options enact DISTINCT functions (Kauffman, 2024). For example, Figure 2 holds many options that lack utility, akin to 98% of DNA is likely 'non-coding' and most agent mutations are 'non-beneficial'. Functionally "differed" *effective-and-efficient* roles require (*S*)election (trial-and-error, DISTINCT use) as *specific contexts* generatively-rendering *meaningful content*—where each trial offers more +/- DoF detail in understanding or 'proving' material "affordance". The **uniform** aim here is (*S*)tructural (*S*)urvival—an agent's adaptive impulse—with **diverse** material Fits, evolutionary trees, and the like arising, all as "order for free" *Natural Rules* that agents must abide. Thus, I next explore (*S*)elective/(*S*)tructural (*S*)urvival as the last LOGICAL (*S*)tep in **ToM**/S-O modeling.

## 4 (*S*)ELECTIVE/(*S*)TRUCTURAL INTELLIGENCE

***(S)ignal Entropy***'s now-noted *meaningful* role seems to also back a statistical 'big data' approach, given its original "surprising" statistics. But this ignores "contrast[s] between mental models that rely on statistical correlations and those that rely on causal mechanisms" (Mitchell & Krakauer, 2023). Without functional (*S*)election, 'big data' neglects a key scientific role (Wilson, 2009), as a likely "fact-free science"—eluding EvNS as a 'black box' absent 'first principles', and with unsure 'primitives' and 'aims'. Big data *training* ('trials') improves the case some, but not with true scientific *structural clarity*. Shannon similarly saw *miss-labeled* 'information theory' as "disappointing and bizarre" and being "ballooned to an importance beyond its actual accomplishments" with "an element of danger" (Shannon, 1956)—where some now say the same of today's AI (Mitchell, 2024).

Still, (S)election is quite tricky to model. First, (*S*)election amid myriad GENERAL options ***makes*** DISTINCT roles, as functional Fits in varied niches. But DIVERSE outputs raise yet another issue—S-O-(*v*)ariety means no 'one Fit for *all things*' exists, seen as widely (*v*)aried functional 'Fit-ness'.

For example, no 'one (*S*)-role for (O)-carbon atoms' exists with differed ions and isotopes[10], no 'one way to be Human' exists in varied environs, no 'one type of fish', nor even 'one form of Lever or Wheel' exists. ***(S)***election can also bestow a ***(s)***pecific *embodied structure* of *ambiguous* aspects—'human hands' a notable example. Anaxagoras and Aristotle saw hands as an "instrument of all instruments" (Kirk et al., 1983; Maurette, 2017), with later advent of 'six simple machines'. Kaufmann (2024) likewise notes many uses for base screwdrivers. Such multi-use/state GENERAL tools **and** diverse DISTINCT purpose-built roles mark Natural 'computational multiplicity'[11]. In this way, reality 'reductively-expands' (paradox) as simple-to-complex ***(S)***elected DIVERSE-DISTINCT ***(s)***-agents, with shifting evolutionary trees, etc., where not all things are equally functional.

EvNS thus entails (*S*)tructural ***(s⇄S)***election of material functions (re "affordance"), apart from statistics, where Chaos theory and the like offers some *structural* insights . . . while a ToM targets *structural detail*. For example, if science 'describes-and-explains, cause-and-effect, in measurable-and-repeatable ways, with necessary-and-sufficient detail' a ToM is descriptive, as is Signal Entropy. Both hold *meaningful* 'descriptive detail' **about** 'information'—Shannon's universal $X^n$ singular (O) statistics, versus *contiguous-dynamic* DoF as LOGICAL/DISTINCT **O**-(*S*)ets and (*S*)teps, and GENERAL roles. A ToM's mapped ***(s⇄S)***structural 'descriptive detail' thus meets Shannon and Weaver's call to improve Signal Entropy, using (*S*) and (O) informatic atoms to show 'gaps' along with DIVERSE-DISTINCT and GENERAL functional (*v*)ariants.

'Science' also targets *structural detail*, that we (*v*)ariably expand. For example, the Standard Model suggests a latent UFT with partly-detailed gravity, dark energy, dark matter, and neutrinos as 'gaps'. And even if "[c]racks are beginning to show in the periodic table," (Powell, January 19, 2016) it still suitably details a ***(S)***elected "order for free" 92 Natural elements, where we now ***(s)***ynthesize new #93 – #118 elements. This synthetic '***(s⇄S)***uper-intelligent'[12] (SI) expansion of 'elements' divides GENERAL INTELLIGENCE (Natural 'GI' Rules) from human SI where fluid ***(s⇄S)***elective '*dialectic* adaption' presents a Ground of Being (Bliss & Trogdon, 2021) for all things we call intelligent.

### 4.1 INTELLIGENCE BUILDING—TRIAL-AND-ERROR ***(s⇄S)***ELECTION

Hence, ***(s⇄S)elective*** dialectic structure yields '*surprising* types of intelligence'. To see 'How and why?' DIVERSE-DISTINCT ***(s⇄S)***elective intelligences arise, I return to computational multiplicity.

Our *contiguous-dynamic simple-to-complex* cosmos has many functions. From odd quantum facets, to purely-mechanical cause-effect, onto bio-logic stimulus-*processing*-response—many "order for free" ***(S)****tructures* exist. Many types of ***(s)****-intelligence* thus ensue via: niche diversity ⇒ agent diversity ⇒ intelligence diversity, as ***(s⇄S)***urvival. Here, mixed agent outputs would seem to bar further ***(s⇄S)***tructural detail, or measurable-and-repeatable *Patterns*. But 2-3-***2*** roles show again as: a) dualist Life-Death, with three-part Natural *divisive*, *directive*, **purifying** (-/+) (*S*)election effects; upon b) land, water, air (O)-environs, contested via c) ***(S)***-Life as *bacteria*, *archaea*, and **eukarya** (*no cell nucleus*/**nucleus**); along with ***(s)*** 'informatic *paths*' of genomic instincts, intuitive/proto-cognitive bio-mechanics/chemistry, onto full agent cognition—all as mixed/serial . . . O-*S*-O-*S* . . . roles/trials.

'Intelligence building' *content* next arises as one learns to walk, swim, fly, etc.—early ***(s⇄S)***elective trial-and-error. From the ground up, genomics bestow each agent: 1) 'a body' [(O) material], amid 2) material niches [(O) environs], where 3) (*v*)aried ***(s)***-agent acts yield ***(S)***urvival/Death—a *material* **context** ***(s⇄S)***electively rendering *meaningful* **content**—(O-*S*-O). Agents not acting 'effectively-and-efficiently' expire, while survivors continue in a serial 'reproductive' manner. It matters not what informatic path applies: genomic instincts/emotions, bio-mechanical/chemical intuitive 'think feeling', or full cognition, as all rely on '*indirect*/referential abstraction of *direct* material events'. All also use trial-and-error as *feedback*, where each trial poses more +/- DoFs in 'understanding' material "affordance"—or '(*S*) and (O) trial-and-error ⇒ **O**-*S* metadata' as **THE** core of intelligence. We extend this 'process' in many abstract ways, but none that ever surpass '*verified* materiality'.

[10]Carbon has 14 isotopes, "unique among the elements in its ability to form strongly bonded chains" (of Chemistry, 2024), giving carbon a broad profile in forming material reality.

[11]Stephen Wolfram (2016) instead points to a sense of 'computational irreducibility'.

[12]Humans employing Natural Rules with supra-Natural effects reflects SUPER INTELLIGENCE (SI) (e.g., a ball-point pen). True GENERAL INTELLIGENCE (GI) implies a full grasp of Natural Rules (no 'gaps'). Human-Level intelligence (HLI) holds mixed-shifting *partial* GI and SI, which makes HLI unsuitable for modeling.

As an alternative account: ***(S)*** and ***(s⇄S)*** **functional** *material* "affordance" ⇒ **functional** ***(S)*** and ***(s⇄S)*** *material* trial-and-error ⇒ material 'proof' as ***(s⇄S)***urvival ⇒ *informatic* **functional** understanding/*intelligence*; with ***(S)*** as Nature and ***(s⇄S)*** as *dialectic* 'agency'. This base 'rendering of *meaningful content*' thus offers "a framework for [grasping] what intelligence is" and is not (Mitchell, 2017), but requires we also grasp 'trial-and-error'. Earlier I note an 'informatic continuum': genomic instinct/emotions, intuitive bio-mechanics/chemistry, and full agent cognition. The 'generative Life force' **animating** that path drives an agent's adaptive impulse and "breathes fire into the equations" (Hawking, 1988). The main *emotive forces*[13] involved here are: 1) discontent ('something must change!'), 2) curiosity ('open to explore') and, 3) imagination (abstract-recombinant 'visual/material ideation'), with countless DoF/trial-and-error/psycho-logical implications.

Emotive Fear/Hope DoF **with** diverse sensoria DoF ***(s⇄S)***ustains all agents, well before '***(s)***cientific sensibility' arises. We counter Natural ***(S)*** computational multiplicity with emotive ***(s)***-informatic multiplicity, ***(s⇄S)***electively sustained by trial-and-error. Much later we develop more-refined but still-abstract science and engineering, but always subject to material *trial-and-error* verification.

### 4.2 A Simplistic ToM Example

*Emotive* trial-and-error hinders further analysis, being psycho-logical in tone. But as ***(s⇄S)***election is ultimately mediated via shifting 'fundamental-force/matter admixes'—(*v*)aried agent DoF ***contra*** Nature's shifting DoF, as 'adaption'—ensuing direct force/matter effects allow more ToM mapping. For example, regard the Standard Model's 2-3 *proton*, *neutron*, and **electron** DoF, onto the Periodic Table's atomic elements—a *fundamental* expansive GENERAL-to-DISTINCT (Standard Model ⇒ Periodic Table) domain *context*/Level shift. Here, a specific force/matter admix yields 92 elements: 1) strong nuclear attraction in nucleons ($10^{38}$ relative strength), ***contra*** 2) electromagnetic repulsion in protons ($10^{36}$ relative strength), and 3) an electron cloud, mark 2-3 **generative** DoF with *strong⇄electromagnetic* 'force impedance' as a *contested emergent* effect[14]—an ***(x⇄X)*** dialectic.

Ninety-two elements arise in force "differences": strong force's range is near the radius of a nucleon, but electromagnetic force has no like limit. Even if strong nuclear attraction is 100 times greater, electromagnetic repulse builds with more protons, until topping strong force limits (100x ≈ 92 protons). Here, large atoms start to falter and even larger atoms become impossible. After **this** *fundamental* GENERAL-to-DISTINCT *generative* shift, a **next** 'periodic table ⇒ chemistry' domain/*context* shift arises, via molecular bonds (*electromagnetic*, *covalent*, and **metallic**). This **next** 2-3 **generative** (*S*)tep holds myriad *emergent* 'molecular' DoF, where detailing molecule 'types' is **yet another** *emergent* generative task [another 'gap' (Powell, January 19, 2016)]. This short ***(x⇄X)*** example shows already known generative DISTINCT ToM (*S*)election as "order for free", while also alluding to 'gaps' (gravity, dark energy, dark matter, a cause for Life, etc.) awaiting reconciliation as a full *Meta-to-meta* ToM. Thus, much work extending this example to other Levels lies ahead.

## 5 Concluding Discussion

From the ground up, this *Meta-meta* "structural" account departs from usual scientific 'gaps' amid domains, and vague AI/AGI views of intelligence[3]. It notes 'How things GENERALLY work and fall apart' in the cosmos, with multiple (simple-to-complex) Levels of *informatic intelligence*, based on material/functional analysis and 'understanding'—beyond AI's statistical 'next term prediction'.

As such, likely ToM benefits are:

- a crude *force-driven* account of the cosmos with 'knowledge and gaps' toward eventual full Natural Intelligence (NI).
- a fluidly-scalable trans-disciplinary modeling tool, requiring minimal initial (S) and (O) input,
- where one variably 'zooms in and out' for better-focused/dynamic analysis,
- elimination of AI 'black box' issues due to extensive 'mapping',
- named 'first principles' for all *intelligent projects* as AI, AGI, SI, GI, NI, HLI agents,
- an observed contiguous dynamic GENERAL 2-3-***2*** *nested* 'cosmic pattern'.

[13] Akin to four fundamental forces serially driving the Standard Model toward serial complex effects.

[14] Emergent: a *new* function unseen in prior/'lower' Levels.

- a framework for other simple-to-complex GI vistas, to improve scientific/computational modeling, toward 'science' sans logical gaps and the 'de-risking of science',
- tops 'anthropic/narcissistic impulses and biases', for true GI and 'common sense', and lastly,
- suggests an 'insight engine', with re-framed 'gaps', affording many likely eureka moments.

Despite likely ToM benefits, this merely poses 'a tool' for informatic/intelligent exploration—where **application** of that tool ultimately drives future material gains . . . with that application demanding much more S-O modeling work, toward a full ToM and agent NI vistas.

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# A APPENDIX

You may include other additional sections here.