A Simplified *A Priori* Theory Of Meaning –Nature based AI 'first principles'–

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Abstract

This paper explores a key issue in information theory seen by Claude Shannon and Warren Weaver as a missing "theory of meaning". It names *structural fundaments* to cover the matter. Varied informatic roles are first noted as likely elements for a general theory of meaning. It next deconstructs Shannon Signal Entropy in *a priori* terms to mark the signal literacy (contiguous logarithmic Subject-Object primitives) innate to 'scientific' notions of information. It therein initiates general intelligence 'first principles' alongside a dualist-triune (2-3) pattern. This study thus tops today's vague sense of *meaningful* 'agent intelligence' in artificial intelligence, framed herein via an Entropic/informatic continuum of serially varied 'functional degrees of freedom'; all as a mildly-modified view of Signal Entropy.

1 Introduction and Background: emergence of '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** or '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 toward better survival, using 'tools'—a *process* that drives today's vast 'techno-cultural ecology'.

As humanity's main adaptive path, that 'informatic process'—onto today's artificial intelligence (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 [1],
• "de-risking science", Edward Boyden, MIT Media Lab [2],
• "do submarines swim?", Edsger Dijkstra [3], Eindhoven University, computer science,
• "symbol grounding problem", Stevan Harnad [4], Université du Québec, cognitive science,
• "theory of meaning", Claude Shannon and Warren Weaver [5], 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 common notions of information as 'meaningful/semantic content'. But, Shannon and Weaver [5] soon saw *Theory*

[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*.

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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" [6]—due to Signal Entropy's[2] lack of practical *meaningful content* and odd "surprising" statistical role.

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 [7] 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 [8] we have today. With no uniform S-O base, myriad "disappointing and bizarre" [5, 9] informatic notions instead abound—the central issue this paper targets, toward better focused AI.

To further typify an S-O split, mathematics may seem '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 [10, 11]. 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 rather recent '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 many 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 (meaningful intelligence) are faint. In further studying S-O roles we see *raw (S)-percepts* [14] 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 [15], biologist Stuart Kauffman [16], and others [17] 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 [8], with "structural, referential, and normative" [18, 19] facets. This Shannon-Boltzmann-Darwin view suggests 'converged science' in a contiguous role, but its thermodynamic core omits wider physics-based models [20] (four fundamental forces). Also, as the work is littered with neologisms and difficult prose [8, 21, 22] 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 (affords *adaptive* differentiation), in a Natural contiguous role (key to any *general* theory, crossing many 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", innately tied to Gibson's [23] "affordance", as further structural fundaments.

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

[3] **S-O modeling** holds more detail, contra AI's typical "Intelligence measures an agent's ability to achieve goals in a wide range of environments" [12]. At issue, *goals* and *environments* themselves hold (O)bjects/ives and (S) ways/means that are singly varied (trial-and-error) in (S)electively framing functional utility [13] **and** in developing material reality, to make S-O modeling a more-foundational view.

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

2 Naming Informatic 'Types'

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 (S) and (O) 'data types' with differed "levels of abstraction" [24], to map 'otherwise paradoxic' *diverse*-but-*uniform* **and** simple-to-complex informatic facets. The problem is that Shannon information theory offers no 'informatic (S)teps' beyond GENERAL (O) Signal Entropy, as a single scalable statistical *uniform* 'scientific role', without presumably-opposed *diverse* (S)emantic aspects.

But practical (S)emantic aspects abound as 'metadata' with *ascribed meaning* seen in every formula, recipe, schematic, blueprint, sheet music and more, all detailing *types* of meaningful intelligence—GENERALLY mapping 'How things work' for diverse DISTINCT domains. For example, a Periodic Table *metadata* **context** holds 'a type' of *knowledge*-about-data[5]—'material primitive' **content** of (S)et electron-neutron-proton triads as 92 Natural **O**-*S* atomic 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 **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 primitive' roles—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 futile. Linked *meta*-to-*Meta* LOGICAL (S)teps echo Deacon's 'converged science' and the called-for *diverse*-but-*uniform* S-O modeling base.

An early Meta-meta example is 'dialectics': thesis + anti-thesis = synthesis—seen across history in every technical advance, cultural leap, and more. Darwin's *uniform* view of *diverse* evolving species is also Meta-meta. Type and Set Theory are other Meta-meta (Type-of-types) examples. Lastly, Signal Entropy is Meta-meta, underlying all of information technology (IT) and fitting so many domains that at times we call it "the mother of all models" [25]. Meta-meta shows GENERAL LOGIC amid diverse DISTINCT material and symbolic roles/types/(S)teps—often as key scientific models, as with the above examples. Biologist Gregory Bateson [26] 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" [27].

2.1 Elements for a GENERAL Theory of Meaning—initial 'first principles'

In sum, informatic diversity has many (S) and (O) roles/types/(S)teps in **S-O modeling**, where a ToM targets a Meta-meta *uniform* view of *diverse* types, alongside general intelligence 'first principles'. Before proceeding further, I clarify some initial informatic roles. Foremost:

- **Function** is the term that best marks 'How things GENERALLY work and fall apart', abstractly held as S-O *informatic meaning* (**Functional** "affordance", understanding, knowledge, intelligence). Here, 'O-S-O' detail minimal **O**-(*S*)et functions (*meta*, 'simple'), and '. . . O-S-O-S-O . . . ' mark *varied contiguous dynamic* simple-to-complex (*Meta*, evolving cosmos) functioning.
- **Adaptive** functioning (useful creativity, Fit-ness)—past **O**-(*S*)et functions, an agent's main task is **adaptive** functioning that abides a *dynamic* simple-to-complex cosmos ('chaos', 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 roles. A ToM thus broadly maps *contiguous* **O**-(*S*)et roles **and** (*v*)ariants (. . . O-S-O-S^v-O^v-S^{v1}-O^{v1}. . .) as ensuing S-O roles, types, and (S)teps, alongside Korzybski's "levels of abstraction".

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

- **Metadata** is a DISTINCT *meaningful type*—(S)electively Grouped **O**-*S* functions as 'domain *contexts*', with DISTINCT material/symbolic 'primitive *content*'. Many (S)-Groups exist, each a DISTINCT functional *context* defined by **O**-(*S*)et primitive *content*, in turn, GENERALLY filling an (S)-**diverse** contiguous dynamic (S-O-*v*) simple-to-complex cosmos.
- **Meta-meta** is a GENERAL *meaningful type*—a domain-neutral **uniform** LOGICAL *context* for **diverse** domain-distinct material/symbolic (S)-Groups *content*. **Meta** thus maps a GENERAL LOGIC across DISTINCT **meta** sub-*contexts*, all based in (S)hifting (S) and (O) 'informatic atoms'.
- **Level**/(S)teps are a third *meaningful type*—many (S)-Groups exist amid *simple-to-complex* shifts. Differed force/matter admixes drive (S)tep-wise *shifts* in 'functional degrees of freedom' (DoF), with some (S)teps marking a new/*emergent* functional Level/DoF for diverse 'distinct domains'.
- **Context** and **Content** are *logical types* from prior roles—(S)-Group *contexts*, with **O**-(*S*)et primitive *content*. Bounded *contexts* **and** *content*, alongside LOGICAL shifts/(S)teps/Levels, allow us to parse *contiguous* simple-to-complex material reality as available DoF (S)egments.

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

- **Raw (S)-percepts** are a *meaningless type*—'things' we know exist, but with faint (S)ense-making detail. For meaning agents gather-and-interpret further (S)-data in posited functions: S-O trial-and-error ⇒ **O**-*S* metadata, as the core of *active intelligence* (applied generative 'agent logic').
- **Voids** are a next *meaningless type*—things we imagine exist but fail to truly 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 ignorance/absence, but may seem meaningless due to specific *contexts*, at differed moments.

3 Initial ToM/S-O Modeling

The above initiates a ToM base for agents, but simple-to-complex (S)-variety also bars one-step vistas, unlike statistical (O)-Signal Entropy. Even with Bateson's unified view, 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—causing Shannon to warn against using Signal Entropy as a true general model [6] . . . leaving us to wonder 'What way forward?'

3.1 Signal Entropy as Meaning-Full 'Multi-State' ToM (S)igns

To answer 'What way forward?' I show Signal Entropy—a firm Meta-meta model—in an alternative **joint** *meaningful-meaningless* (multi-state) role: a max-possible ToM vista, aired via minimal S-O 'atomic' (S)teps (Figure 1). 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 that 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, script, etc.); and an *Engineered* (S)-logarithmic base in all messages—joint (S) LOGICAL RULES. Shannon's Engineered roles echo Deacon's *meaningful* "structural information". The problem is that Shannon's (O)-claim mixes *levels of abstraction*, that Korzybski warned against [24], to assert '(O)bjective purity'. Thus, Signal Entropy "disappoints" by ignoring its own *meaningful* (S)tructural aspects and other "adjacent possible" roles, to make "irrelevant semantics" a fiction. But simplified 'objective' views fill 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 modeling truly contiguous and dynamic simple-to-complex material reality, but again, with above-noted 'gaps'.

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

[6] Shannon's Level A examines Signal Entropy as "the technical problem", Level B marks "the semantic problem", and Level C marks "the effectiveness problem", but Shannon [5] never details B nor C.

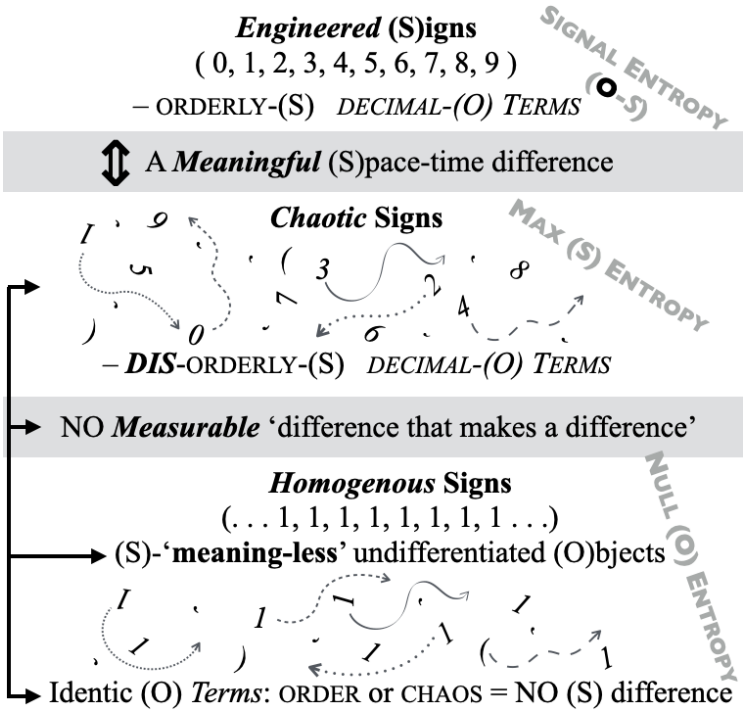

Figure 1: Engineered (S)igns, Entropic (S)teps, and Min/Max ToM (S)tructure. Orderly DECIMAL *symbolic primitives* (top) show a *meaningful* agent-agreed **O**-(*S*)yntax via firm (S)pace-time traits. All messages embody such (S)ignal Entropy. Next, Chaotic DECIMALS lack (S)pace-time order that messages require, shown as Max (S) Entropy (re thermodynamic entropy). Identic (O) Signs (bottom) also bar messaging due to no (O) variety with **indistinct** (S)pace-time traits or Null (O) Entropy. Not shown is Null (S) Entropy as a collapsed (O) 'singularity', or fully non-functional Null S-O Entropy. Lastly, Max (O) Entropy is barred due to Nature's 92 given **O**-(*S*)et/finite atomic elements. All roles can be shown via 'statistical mechanics', but which itself ignores *meaning-ful/less* aspects.

meaningless (multi-state) view—base ToM structure for 'How things GENERALLY work and fall apart', and a true *a priori* (simplified) Open World account, to be populated with (S)hifting DoF detail. This also cures Signal Entropy's "bizarre . . . surprising" statistics by entailing all likely *contiguous* Entropic/statistical/(S)tructural aspects, albeit conveyed via rather large ('at the bounds') DoF (S)teps.

In sum, Engineered (S)igns have (S)et *meaning*, contra *meaningless* Max (S) and Null (O) Entropic (S)teps—**minimal** *uniform* (S) and (O) 'informatic atoms', across **maximal**-*differed* DoF (S)teps. They afford a Null-Entropic S-O 'singularity' ⇒ initial S-O Entropy (cosmic microwave background) ⇒ initial **O**-*S* Signal Entropy (condensed matter) ⇒ Max S-O 'Entropic Death' Open World multi-state *continuum*, for all (S)pace-time. But this lacks 'generative detail'—interstitial DoF events enacting DISTINCT domain (S)hifts. Still, for now I label this *simplified* three-fold view simply 'Entropy' (generic expansion), with myriad material-and-symbolic, *orderly* **and** *disorderly*, min/max DoF. Lastly, S-O duality with 'three GENERAL Entropic types' (Figure 1) conveys a *uniform* dualist-triune (2-3) GENERAL Pattern, across the cosmos, where space-time holds like recurrent 2-3 traits[7].

3.2 Signal Entropy as GENERAL 'Generative Detail'

Next, for Signal Entropy's *generative* role, regard its (S) logarithmic base: imagine a 3-term alphabet (A, C, and T) where all messages also hold only 3 terms (Figure 2). This X^n Engineered base 'causes'[8] 27 (3^3) message (*v*)-*options*/DoF as a simple-to-complex S-O (S)tep: A, C, and T ⇒ CAT, ACT, etc. Here, Signal Entropy is generative via (*v*)aried (S) **and** (O) space-time placement (S-O-*v*): X^n (S)tep-wise *shifts* as an infinitely-adjustable "adjacent possible" generative path, with access to all

[7]Dualist three-part SPACE: *height*, *width*, and **depth** (*2d*/**3d realism**); and TIME: *past*, *future*, and **present** (*imaginal*/**immediate**) that, in turn, are shown here with further (nested) 2-3-***2*** traits.

[8]A 'logarithmic *tool*' applied by human hands, but also evident in Nature as 'ln(*x*)'.

likely Levels of a simple-to-complex cosmos ("the mother of all models"). This S-O *coded logarithm* echoes coded genomic creation/mutation in diverse species, and 'ln(x)' as "one of the most useful functions in mathematics, with applications throughout the physical and biological sciences" [28]. This *structured* 'causal description' again shows a *uniform* 2-3 Pattern: X^n = base-X **and** term^n shifts, as core 2-3 (S-O-*v*) *generative* functioning. But the problem *now* is that Signal Entropy is 'blindly generative', ignoring (S) *meaningful* aspects, beyond *purely* X^n (O) aspects—the issue first raised above, contra Shannon Signal Entropy, which a ToM ultimately targets.

Still, at this Level of analysis ***(S)***ignal Entropy maps *contiguous* **O**-(*S*)et options and S-O (*v*)ariants as a ToM requires: *scalable* DoF (min $\rightleftarrows$ max) (S) 'relational joining' in (O)s, or 'How things GENERALLY WORK' in the cosmos, but in a largely 'blind' *meaningless* [non-(S)elective] way.

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 (O)-terms in *ordered* (S)pace-time roles: an (S)-Volume with 3^3 Signal Entropy (27 DoF). Here, CAT and ACT are (S)et English words, "what you *do* say", other items are select-able DoF adaptive options "what you *could* say" [5] (emphasis added). *TAC* and *TAT* thus have 'meaning' in differed *contexts* (French, Old English, German). All require 'agent agreement' on *meaning*: inter-(S)ubjective (O)bject operation as en-cultured **O**-*S functioning*. Without shared **O**-(*S*)et functioning, only 'informatic noise' is possible.

To review, 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* expansive (S) and (O) 'noise', and d) (S)tep-wise *generative* S-O-(*v*)ariability, all with e) ***Entropic*** 2-3 "structural information"—for a **uniform** MEANINGFUL "mother of all models". But *now* the issue is that this omits *meaningful* (S)elections (Fit-ness, Natural 'reinforcement'), amid myriad (S) **diverse** 'blind' (otherwise-*meaningless*) **O**-*S* and S-O-*v* options.

Naming many S-O options (as above) is a key first-(S)tep in GENERAL intelligence, making adaption possible. But such 'big data' vistas alone cannot treat 'gaps in meaning' as they offer poor (S)tructural detail[9]. Also, not all S-O options equally enact DISTINCT functions [16]. With Figure 2 as an example, many 'options' lack useful roles, akin to genomics where some 98% of DNA is likely 'non-coding', and most agent mutations are 'non-beneficial'. Differed functional effectiveness-and-efficiency requires (S)election (trial-and-error, DISTINCT use), which 'generative-ly' adds *reductive meaning* (further structural Fit-ness), beyond (S)ignal Entropy's *purely expansive* role. Here, the **uniform/**GENERAL aim is 'structural (S)urvival', ultimately yielding **diverse** materials, evolutionary trees, *useful* 'data tables', and the like all as Natural "order for free" (S)tructure. Shannon also starts with "The significant aspect is that the actual message is one *selected from a set* of possible messages" as a central task. Thus, I explore (S)elective (S)urvival as the last LOGICAL (S)tep in a **ToM base**.

4 Concluding Discussion: *Meaningful (S)election*

In crude terms, (S)election amid varied GENERAL options ***makes*** DISTINCT roles—where resulting DIVERSE outputs raise another issue. Natural S-O-(*v*) lacks simplicity, as no 'one way for *all things*' exists. For example, there is no 'one role for carbon atoms' with differed ions, isotopes, and nucleus packing[10], no 'one way to be *Human*' in diverse environs, no 'one *type* of fish', nor even 'one form of screw or lever'. (***S***)election also bestows 'agents' a (***s***)pecific *embodied context* (structure), but often with *ambiguous* aspects—'human hands' a notable example. Anaxagoras and Aristotle noted hands as an "instrument of all instruments" [30, 31], with later advent of 'six simple machines', all as GENERAL tools. GENERAL tools contra 'purpose built' DISTINCT tools again stress Natural

[9]Depending on how closely underlying 'big data' databases are *meaning-fully indexed*.

[10]Carbon has 14 isotopes, "unique among the elements in its ability to form strongly bonded chains," [29] which gives carbon a broad profile in forming material reality.

computational multiplicity—a bounded-yet-ambiguous solution space. Innately creative simple-to-complex "normative information" *reductively-expands* as DIVERSE-DISTINCT functions, agent lineages, 'branched' evolutionary trees, etc.—contra preferred **O**-(*S*)et structural clarity. Here, chaos theory, systems theory, and the like arise to help cover Natural *computational multiplicity*, but with mixed success.

Conversely, in GENERAL-to-DISTINCT S-O (S)election: if science 'describes-and-explains, cause-and-effect, with necessary-and-sufficient detail, in measurable-and-repeatable ways', a ToM is *descriptive* as is **O**-(*S*)ignal Entropy. Both hold "structural information" *about* 'information': Shannon's *singular* (O) statistical view, versus ToM *contiguous dynamic* DoF DISTINCT/LOGICAL **O**-(*S*)teps. This *descriptive* difference initiates a (S)elective ToM, answering Shannon and Weaver's call to improve Signal Entropy—with GENERAL (S) and (O) 'informatic atoms' re-framing 'gaps', alongside already-known DISTINCT **and** GENERAL functional roles.

Still, the most challenging **and** *rewarding* part of a Natural/Open World context is its computational multiplicity, with agent adaption *the rule* alongside 'chaotic' ***(s⇄S)***elected **diversity**. This (***s***) agent ⇄ (***S***) Nature 'contested context' makes EvNS two-part: a) eternally-dynamic Open World **(S)**election forces, contra b) agent 'Self'-**(s)**elected genomic/informatic roles, for (S)urvival. Here, **(S)-Nature ⇄ (s)-agent** feedback mediates via shifting *fundamental-force/matter admixes*, contra agent DoF (adaptive) *admixes*—a Ground of Being [32] for all 'intelligence'. But this also leaves us wondering 'What *actual (s⇄S)*STRUCTURAL INFORMATION exists for further agent/EvNS/ToM (S)ense-making?' Widely mixed *computational multiplicity* should bar further ToM (S)tructure for agents and Nature. But 2-3 nested roles show again as: a) dualist Life-Death ***(s⇄S)***election, with three-part (S)election effects as *divisive*, *directive*, **purifying** (*expansive*/**reductive**); contested via b) (S)elected 'Life domains' of *Bacteria*, *Archaea*, and **Eukarya** (*no cell nucleus*/**nuclear cells**).

Beyond the above '*reductive* (S)election' due to extinction risk, '*generative* (S)election' also shows. For example, regard the Standard Model's 2-3 *proton*, *neutron*, and **electron** DoF, onto the Periodic Table's 92 DoF Natural elements—a *fundamental* expansive GENERAL-to-DISTINCT (Standard Model ⇒ Periodic Table) domain/*context* shift—sans extinction risk. Here, an oxygen atom does not 'go extinct' but at most transforms to another element via '+/- beta decay', as Nature's *order-for-free*—apart from (S) agent Death/extinction. Physicists instead note a 'fine-tuned Universe' to pose 'Why something exists instead of nothing' and initial *order-for-free* "structural information". Next, a specific fundamental force/matter admix yields 92 elements via: 1) strong nuclear attraction in nucleons (10^{38} relative strength), contra 2) electromagnetic repulsion amid protons (10^{36} relative strength), with 3) an electron cloud—2-3 **generative** DoF, tied to *strong⇄electromagnetic* 'force impedance' as a *contested emergent* role (emergent: a function unseen in prior Levels).

Ninety-two elements arise in these force differences: strong force's effective range is small, near the radius of a nucleon, but electromagnetic force has no limit. Even if strong attraction is 100 times greater, electromagnetic repulse aggregates with more protons, until collectively 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 (*covalent*, *metallic*, and **electromagnetic**). This **next** 2-3 **generative** DoF (S)tep holds myriad *emergent* DoF as 'molecules', where naming molecular 'types' is a **yet another**-next *emergent*/generative domain task. These examples mark already known generative DISTINCT ToM (S)election, while also alluding to other generative 'gaps' (gravity, dark energy, dark matter, a cause for Life, etc.), waiting to be reconciled as an UFT (or a?).

A ToM thus maps known-and-unknown (*meaningful*-and-*meaningless*) multi-state roles, with -/+ 'contested events' driving many Levels/*contexts* (computational multiplicity). 'Otherwise paradoxic' *diverse*-but-*uniform*, simple-to-complex, **and** *reductively-expansive* roles are Naturally framed. But a ToM's *mostly descriptive* place also means 'things' need only be present as *raw (S)-percepts* to be first mapped, with further detail added over time—all as a prelude to S-O trial-and-error ⇒ **O**-*S* metadata, as the core of all active intelligence.

To summarize, likely benefits of ToM mapping are:

- a full structural account of the cosmos with posited 'gaps', toward unfolding 'perfect knowledge'.
- a fluidly-scalable trans-disciplinary tool for Entropic modeling, with emergent/(S)tepped (*v*)ariants posed from minimal (S) detail, that also allows one to variably 'zoom in/out' for better study.
- eliminates AI 'black box' issues, due to extensive *mapped* roles,
- names 'informatic first principles' for all 'intelligent projects', where no such clarity now exists,

- a GENERAL 2-3 *nested* 'cosmic pattern' as:
  - a) three-part generic Entropy (Figure 1);
  - b) (S)tepped GENERAL INTELLIGENCE as:
    - i) **O**-(*S*)et functions, ii) **adaptive** S-O-(*v*)ariation and iii) (*v*)ariant (S)election with,
      - **purifying**, divisive, and directive (S)election forces, applied to
      - Bacteria, Archaea, and **Eukarya** Life agents,
  - c) across all (S)pace-time (footnote 7).
- a contiguous framework for spotting/situating kindred simple-to-complex Natural patterns, that ultimately afford new scientific and computational vistas (toward 'science' sans logical gaps).
- tops 'anthropic/narcissistic impulses/biases', to pose true GENERAL INTELLIGENCE and 'common sense',
- an 'insight engine', with re-framed 'gaps', affording many likely eureka moments, and lastly
- poses a way to generally 'de-risk science'.

Still, for all agents, we must remember "Take away the context, and the meaning also disappears. . . . perception is always the perception of [afforded] functional roles" [33]. For Open World vistas, *meaningful* functions start with mapping a suitable Natural/S-O *bounded context*—with no context for *embodied (s⇄S)*election/Fit-ness, **Functional** understanding, knowledge, intelligence is impossible.

The one main remaining ToM task is full DoF detail and its place on *a map*, alongside 'gaps'. This **structural approach** to probing the cosmos may seem trite since, to paraphrase Korzybski [24] "the map itself is not the actual territory". But all science starts with description as it makes no sense to study 'That which we cannot even describe' (context), as often seen with today's notions of GENERAL INTELLIGENCE. Moreover, a ToM has long-been called for, going back 75 years, so its eventual arrival should not be too surprising. Beyond this, naming ALL **O**-*S* and S-O-*v* known-and-unknown (S)teps, with material (*meta*) details, requires much more work—beyond this paper that only targets an initial *Meta-meta* framework to help correct 'gaps in meaning'. As such, little is done here to advance Deacon's notions of more-specific "normative and referential information" and beyond. Lastly, for-now-missing 'further computational detail'—toward new machine approaches—means empiric *trail-and-error* remains our most reliable (non-autonomous) means for 'computing' functional effects. For example, one would not expect to fly a fully-machine-designed-and-created airplane, without extensive testing . . . except for test pilots. Need for continued practical trial-and-error (embodied) testing by human hands, in the face of ongoing diverse/'chaotic' computational multiplicity, also means concerns about autonomous computers taking over humanity seem misplaced, for now.

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