A PRIORI *MODELING OF INFORMATION*

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This session covers the *a priori* modeling of information. It targets a "meaningful void" named by Shannon and Weaver (1949). As such, it seeks to frame a "theory of meaning" and a "unified theory of information" (UTI), two thorny issues. *A priori* models can help as they often focus on organizing principles. Also, a winning view should offer benefits that equal or surpass gains seen from Shannon's (1948) earlier work. For example, firm notions of meaning and universality are key to founding a *meaningful* AI, and to addressing hurdles in quantum mechanics/computing and in material science (Aspuru-Guzik, 2015).

An *a priori* effort starts with "what comes *before* information," using analytic philosophy to frame core concepts, but it ends in a phenomenology of *useful* information – two often opposed views. The session thus entails divergent levels of analysis that may stir confusion. For example, *disorder* at one level implies a *type of order* at a different level (type theory, Bateson's "differences themselves must be differentiated"), but framed by one system of thought. Thus, to help guide this session and to initiate group dialogue, a cursory model is offered. With the foregoing cautionary notes in mind, I invite you to join this FIS session: together we will see what unfolds (4 pages; 1,600 words).

MODEL DEVELOPMENT

In brief, the model synthesizes Shannon entropy, Bateson's different differences, and Darwinian selection, to derive a meaningful informational view. The model is shown in the video link below: First, core questions and issues are framed (2:30 minutes). Second, known meaningful *metadata* models are detailed (2:30 minutes). Third, that metadata role is deconstructed over the remaining time to name universal *a priori* information aspects. Lastly, the model is re-constituted "from the ground up" to present a fully synthesized *a priori* view (23 minutes total).

The model's central narrative is as follows:

1) Universal meaning is named as: <u>a thing exists</u> (e.g., order), <u>a thing *does not* exist</u> (e.g., disorder), and the "<u>becoming-ness</u>" (diverse entropic events) that joins those two states. This triune **universal role** is labeled Generic Entropy (Δz in the video). Two things are achieved here: a) *Core meaning* is named for this all-inclusive cosmos; and b) An *open system* framing is given for that cosmic All. If either *a* or *b* is false, a UTI is unlikely due to no chance of true universality. But if *a* and *b* are both likely, a discoverable UTI is possible. This necessarily simplistic view of **universal meaning** thus supports further UTI study.

2) Universal meaning has a **dualist-triune form**. Each element (existence, non-existence, and becomingness) helps define the other two, in a Bateson-like (1979) necessary unity. *Meaning* thus has three minimal facets (triune), with two key traits (dualist: existential and dynamic). This **organizing principle**, in turn, also supports more UTI study. This does not mean that all information has a dualist-triune form, but that information arises from this minimal organizing principle, as a structural fundament (more detail is given in the supplemental material).

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3) But **one** *dualist logic* offers diverse superficial roles such as order & disorder, life & death, signal & noise, good & evil, coherence & decoherence, etc. Dualism thus supports many operative levels (respectively) as: logic, biology, information theory, morality, quantum mechanics, etc. Lastly, naive dualism also affords a deeper Hegelian dialect: thesis + antithesis = synthesis, as an essentially dualist-triune role that produces diverse "ordered *types*."

4) **One** *dualist logic* has many sub-ordinate orders: Empiric Entropy is thus named to mark those generic-but-diverse logical sub-orders. This "entropic type" marks an initial *analytic parsing* of Generic Entropy into something more intelligible or useful than *The All*. In mythic terms, that analytic divide implies a Sacred Wound (original sin, psycho-logical separation), better known as an archetypal Adam and Eve cast out from the Garden of Eden for eating from the tree of knowledge.

5) Still, *further* empiric questions linger on the actual meaning (functional significance) of that Empiric diversity – Nagel's (1974) "What is it like to be a bat?" *versus* what is it like to be a cat, a car, a rock, etc. Sub-sub-ordinate Aesthetic Entropy is thus named to mark *targeted meaning(s)* for each "entropically legible" trait. This implies more analytic parsing, toward minimally useful roles. Darwinism then infers a significance for those roles via natural selection. Similarly, Penrose (1994) infers minimal Platonic values, and quantum physicists speak of quantum tiles (Gottesman, 2013), as useful Planck scale informational units (i.e., Aesthetic Entropy). In AI, Aesthetic Entropy would name the resource base used in finite calculations that ultimately define an agent's "bounded rationale" (Hutter, 2012).

6) Reducing Aesthetic Entropy to a **most** *effective* & *efficient* (optimized) role marks a specific Aesthetic Order – or *meaningful* material resilience. Working that Aesthetic Order produces Shannon's Signal Entropy; departing from that Order conveys noise. In the video, two views of **opportunistic reducing** Entropy as Generic > Empiric > Aesthetic > Aesthetic Order > Signal Entropy (informational continuum) are given. Also, a mechanical framing of Entropy, using "a lever and simple machines," is given in the supplemental material.

7) Next, additive and subtractive roles (re bifurcation theory) are named to mark the emergence of novel aspects. Those additions and subtractions also convey entropic roles. Ensuing logical or entropic disruptions are further detailed in the supplemental material.

8) Lastly, some readers may notice no mention here of thermodynamic laws, which often typify informational views. The reason for this absence is that those laws imply a closed system and the model targets an open system. Thermodynamics thus have a minor role. For example, Penrose notes that study of cosmic background radiation reveals an entropic maximum (thermodynamic) early in the history of the cosmos. But condensed matter roles later arise, contrary to thermodynamic laws. Also, several of those condensed roles will likely persist as the cosmos now proceeds toward a new entropic maximum (dark energy). Hence, many energetic roles underlie cosmic evolution, and each role must be included for a truly universal theory of meaningful information to arise.

As shown above, the model ties Bateson-like different (entropic) differences with Shannon signal entropy and Darwinian (order) selection for a meaningful informational vista. More detail is given in the listed resources.

RESOURCES
Four resources support this FIS session:
• **Main Material**

1) A 23-minute video of concepts from the International Society for Information Studies (IS4IS Vienna 2015) conference presents the basic model. Watching this video is all that is needed to join the session. The video, which can be downloaded, paused, and replayed for closer study, is available at:
https://vimeo.com/140744119
Text for the video voiceover can be read or downloaded at:
http://issuu.com/mabundis/docs/oneprob.fin

• Supplemental Material
As advanced material, three other items may help:
2) A paper on material aspects of information showing that at least three types of meaningful information occur. This paper: *a)* presents a physical account of meaningful information, and *b)* prepares the ground for a behavioral (adaptive) account of meaningful information. The paper (12 pages; 5,200 words) can be read or downloaded at:
http://issuu.com/mabundis/docs/coreinformatics
3) A paper on adaptive aspects of meaningful information. Together, the two papers (2 and 3) offer a bio-physical account of information. This paper (9 pages; 3,900 words) can be read or downloaded at:
http://issuu.com/mabundis/docs/lgcn.fin.4.15
4) A paper framing mechanical aspects and emergent notions of information, as "a lever and simple machines." It attempts to move beyond a conceptual framing to an initial computational view. This paper (11 pages; 4,000 words) can be read or downloaded at:
https://issuu.com/mabundis/docs/multistate

Lastly, I recognize the influence exerted by FIS members. In particular, I found the thinking of Terry Deacon and John Collier inspirational in facing the challenge of conceptualizing entropy. Also, the work of Steven Ericsson-Zenith inspired my thinking on information locality and bio-physical systems. Lastly, Searle's biological naturalism also incited much of my thinking. While I disagree with parts of their work, I easily acknowledge, and am grateful for, their intellectual prompts. Other FIS, IS4IS, and PIIP (Philosophy of Information and Information Processing, Oxford, 2015) members have likewise inspired me – and for that I give my sincere thanks.

REFERENCES
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(6) Penrose, R. (1994). *Shadows of the mind: A search for the missing science of consciousness*. Oxford, UK: Oxford University Press.

(7) Shannon, C. (1948). *A mathematical theory of communication*, Bell System Technical Journal. July & October 1948, 27, pp. 379-423 & 623-656.

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