SEMIOTIC UNIVERSALS: BEYOND THE RADICAL TRANSLATION PROBLEM. T. W. Deacon[1]

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Overall Goal(s) and Objective(s):

To determine which organizational features of symbolic communication can be expected to be universal due to necessary semiotic constraints, despite radical differences in embodiment, communication medium, evolutionary history, planetary features, etc., and thus provide tools to aid the recognition and interpretation of even radically different forms of symbolic communications received from intelligent extraterrestrial sources.

Main Body of Text:

The *Astrobiology* paper, "Alien Mindscapes," which sets the agenda for the next generation of SETI investigations, concludes with "Question 2: How does intelligent life communicate?" Among the many subquestions raised are: What medium is used naturally and what medium might be used to craft an interstellar message? What constraints of planetary constitution, evolutionary history, and physical embodiment might be important factors shaping a given evolved form of communication? And finally, could the divergence of form be so great that we wouldn't recognize it as communication, or could it be so radically unlike human communication that it would be untranslatable? Thus a "message in a bottle" cast (or broadcast) into space by humans for others to discover or recovered by us containing information from an alien civilization might go unrecognized or remain permanently uninterpretable.

The widespread assumption among many linguists and semiologists is that the referential function of words, phrases, sentences, and symbolic communication in general can be analogized to a code. This framing of the topic dates to Ferdinand de Saussure's description of linguistic reference as a mapping between signifier and signified. But a code is a convention-mediated mapping between two sets of marks. This has long been recognized as far too simple to explain word meaning and reference. But the assumption that this mapping is conventional and arbitrary—even if complex in structure—persists. From this assumption of arbitrarity it follows that the complex and systematic combinatorial structure of language must derive from an independent source. Moreover, since the World's languages exhibit many remarkable commonalities, often described as Universal Grammar (UG), there has been a generation of debates over the relative contributions of nature and nurture to these universals.

Irrespective of which sides one takes in this anthropocentric debate the implications are problematic for communications between intelligent beings that evolved independently in some distant star system. This is the specter of radically untranslatable forms of communication. If the only sources of the structural organization of symbolic communication are nature (e.g. inherited knowledge) or nurture (cultural convention), then messages exchanged between extraterrestrial civilizations could be so radically untranslatable as to go unrecognized as communications. As a result, our own initial attempts to provide messages for extraterrestrial communication are almost exclusively iconic (e.g. pictorial) in form.

In contrast to these standard assumptions, I argue that there are a number of universal features of natural language grammar that derive from semiotic constraints—and thus neither from nature nor nurture; i.e. a truly *universal* UG. In other words, there are semiotic principles that should be shared irrespective of terrestrial or extraterrestrial origin. This is analogous to the presumption that whenever mathematic-like analysis is developed by another intelligent species certain universals will inevitably be discovered, such as prime numbers.

It is my contention that these symbolic Universals can be identified and enumerated. The generality and extent of this universality will determine how well we could expect to interpret radically non-human forms of symbolic communication that we might encounter, and how we might better structure the messages we broadcast into the unknown with hopes that they might be noticed.

One source of insight into what I would call semiotic universals is the study of the diversity of forms of communication and information acquisition found in other terrestrial species. The diversity of media through which animal and plant signals are conveyed—solid, liquid, gas, plasma (?)—and the carriers of these signals—configurations, chemicals, vibrations, electric and magnetic fluctuations, etc., provides an enormous variety that is likely diverse enough to encompass the substrate options likely to be found elsewhere. But this may not provide a sufficient comparison of semiotic diversity to be sure we know the possible range the communicative systems could take, irrespective of medium.

The problem is that with respect to species with a naturally evolved symbolic communication system, such as language, there is an ***n*** of one: *Homo sapiens*.

This poses the question: does the diversity of spoken, signed, written, and formal human languages provide an adequate sample of the possible diversity of symbolic forms of communication?

Moreover, few animal species even interpret drawings, photos, and video images as representing what they represent to us. So we can't even rely on our intuitions about what is and isn't interpretable. Using analogical comparisons to known forms of communication is a useful place to start. Without understanding some of the basic principles of semiosis, however, and how they apply to both symbolic and non-symbolic communication, overcoming this radical translation problem will remain a process of uninformed trials and inevitable errors. It's time to seriously consider the need to develop a rigorous general semiotic theory, for the same reason that we need to develop what Stuart Kauffman has called a "general biology." Without an effort to escape our terrestrio-centrism, we will inevitably be unprepared to create or understand extraterrestrial communications.

This challenge is paralleled by a recent effort to come up with a way to communicate the dangers posed by a nuclear waste disposal site to humans living ten thousand years into the future. Being unable to assume any continuity of language that far into the future, and needing to convey information about an imminent danger that cannot be directly perceived by the senses, it becomes necessary to try to find semiotic universals to help bridge this gap. At least in this case we assume that humans will be the interpreters.

In both efforts to create artifacts to communicate to extraterrestrials—like the famous Pioneer plaque and Voyager golden record—and the effort to communicate the danger of radiation to an unknown future populace, the designers decided to use depiction; iconism. But lacking a more rigorous semiotic analysis, the simple dichotomy between depiction and linguistic description is of little help. The intuition that icons are the most basic means for communicating reflects a basic tent of semiotic theory articulated by the philosopher C. S. Peirce over a century ago. But although Peirce endeavored to develop a systematic taxonomy of sign forms, the creation of a rigorous natural science of semiotic processes remains and unfinished project.

In past and current work [e.g. 1, 2, 4, 6] I have developed a hierarchic semiotic analysis of the relationships between the three canonical modes of representing—iconic, indexical, and symbolic—that shows how they asymmetrically depend on one another and how symbolic language emerges from an iconic and indexical base.

This is the basis for two predictions relevant to the SETI enterprise. First, we should expect that symbolic communication is likely to develop on a life-friendly planet in the course of evolution if given sufficient time and the conditions enabling the evolution of brains (or their equivalent). This is because symbolic communication emerges from more basic iconic and indexical forms of communication, adaptations that are the very basis of all cognitive processes. Second, we should expect that the form of the symbolic communication that emerges will not be radically unlike symbolic forms used for human communication because this hierarchic dependency of symbolization on iconic and indexical communication is highly constrained.

With respect to the first prediction, I would argue that the semiotic constraints required for sensory and motor adaption are entirely generic, and so however brain-like adaptations are implemented they will inevitably converge to exemplify common semiotic properties [5]. I also would argue that for any intelligent species to be able to develop a form of interstellar communication or even just to conceive of its possibility and devise means to possibly "listen" for it, sophisticated symbolic communication would have been necessary.

With respect to the second prediction, I have recently identified five key semiotic constraints that account for the major features of what has been called universal grammar [3, 6]. Because these are semiotic constraints, intrinsic to the hierarchic dependence of symbolic reference on iconic and indexical reference, and not derived either from cultural convention nor from biological inheritance, they should be reflected in any symbolic communication system, on earth or elsewhere in the universe. They can be itemized as follows:

1. Recursive affordance (only symbols can provide non-destructive [opaque] recursion across logical types because their combinatorial relationships are not constrained by intrinsic referential cues)
2. Predication structure (symbols must be bound to indices in order to refer outside of the relational network that they constitute)
3. Transitivity and embedding constraints (indexicality depends on immediate correlation and contiguity—e.g. adjacency— and is transitive)
4. Quantification (symbolized indices need respecification because indexicality is intrinsically particular).
5. Indirect indexicality enabled by iconism (long-distance dependencies afforded by feature agreement; relaxed adjacency criterion).

These semiotic constraints are ineluctable and although they can be implemented in a vast number of ways, they collectively shrink the phase space of possible symbolic communication system in a way that

makes the discovery of their specific implementation a much more tractable task. In this respect analysis of a non-human symbolic communication system is far less complex than any decryption process. More importantly, an understanding of the construction of higher-order semiotic forms from lower-order ones (i.e symbolic from indexical and indexical from iconic) provides both a recipe for systematic analysis and for providing the essential clues for developing the necessary interpretive competence. So just as this could assist in our construction of a self-explaining form of communication that we can cast into the cosmos, we can probably assume that any sophisticated extraterrestrial message-in-a-bottle will include such a primer as well.

References:

1. Deacon, T. W. (1997) *The Symbolic Species: The Co-evolution of Language and the Brain.* W. W. Norton & Co., New York.

2. Deacon, T. (2011) The symbol concept. In M. Tallerman and K. Gibson (eds.) *The Oxford Handbook of Language Evolution.* Oxford University Press, pp. 393-405.

3. Deacon, T. (2012) Beyond The Symbolic Species. In T. Schilhab, F. Stjernfeldt, and T. Deacon (eds.) *The Symbolic Species Evolved*, Springer, pp. 9-38.

4. Deacon, T. W. (2014) Semiosis: from taxonomy to process. In: Thellefsen, T. and Sørensen, B. (eds.), *Charles Sanders Peirce in his own Words.*

5. Deacon, T. (2017) The emergent process of thinking as reflected in language processing. In: Schoeller, D. and Saller, V. (eds.), *Thinking: First person in Interaction. Pragmatism, Phenomenology and Psychotherapy.*

6. Deacon, T. W. (2018) Beneath symbols: Convention as a semiotic phenomenon. In *Evolution & Contextual Behavioral Science: A Reunification.* Steven C. Hayes & David Sloan Wilson (eds.), New Harbinger Publications.