Communications

The intentional nature of communications places it as a branch growing in the

<div>
NEW METAPHORS
  Conduit
  Coupling
  Reflectivity
  Silence

PLATFORM
  Evaluative
</div>

Exchange paradigm. The earliest communications included

individuals signaling to each others on occasions of danger

and opportunity, desire and rejection. Most living organisms

can exchanges such messages—this ability is definitive of

living organisms. Signaling conveys messages that the

recipients learn to respond to as stimulus and response. This mode is based on

the *conduit* metaphor where messages containing intentionally relevant data are

exchanged between a sender and receiver.

Humans also use a second form of communication with quite different from

conduit processes. This form is *coupling*. Coupling is sensed in group expressions,

rhythmic entrainments, chants, dancing, and in the ritual retelling of cultural

epics and myths of creation. It communicates the state of relations rather than

choices. With the development of spoken language, such exchanges became the

semantic domain in which the cultural interpersonal relations were maintained.

This form of communications uses harmonic structuring of intersystem relations

through which to attain meaningful information about our environments.[i] These

two modes are a dual: the conduit model is linear; the other, the systemic

coupling or entrainment mode is non-linear. I expand upon the conduit processes

that has already been introduced as Information theory, then I provide a more fully articulated discussion of system coupling.

Exchanging Messages through a Conduit

Our most common way of thinking about communications is as an exchange of signs and symbols through conduits of discrete signals between persons, as messages carried by our enunciations or actions or through some media that packages our thoughts for remote delivery. This conventionally understood mode of human communication became dominant with the development of symbolic language. It was reinforced with the evolution of written languages and all forms of authored information: music, art, technologies …. An author creates messages that are packaged in books, paintings, cinema films, junk mail, or simply in words. The current common sense of communication is characterized as exchanges of items chosen out of a set of icons, signs, or symbols that conduct the sender's intentionality.[ii] The formed messages are sent along to known or unknown destinations. Messages gain the power to communicate the sender's intent by using standardized grammars, which delimit everything we might say. Dictionaries and grammar texts support the precision of the transmissions, however, it is within context that they are interpreted to enable understanding. Our daily conversations depend on a vast context in which the messages are embedded. For all their specificity, they do not contain information. As Heinz

von Foerster insists, "The environment contains no information: the environment is as it is."[iii] Communication is not in the transmitted message, but the drawing of attention to an element of content in the vocabulary and mind of the recipient. So, while messages are conveyed, communication occurs only to the degree that the sender and receiver operate from the same contexts. This has been the assumption of linguistic studies over past centuries. It fits the physiological premise that we are stimulated by a message and respond to that message.

As noted in the discussion of information theory earlier in this chapter, a message impacts the recipient only to the degree that it is formed in the context of an encompassing silence of what is not said. The conduit image of communication presumes that the sender imbues his message with a meaning that will be conveyed to the recipient, that is, the author creates and defines the meaning. This presumption is rejected by Shannon's work (page 83 §), which places the creation of information and meaning with the recipient. His work asserts that an author does not create information, rather information is defined by the recipient's expectations. The fact of it being *conveyed* to the recipient assures that the message cannot fully take into account the context in which it will be received. For example, a political editorial gives one meaning to a supporter and another to an opponent. Meaning is created in the context in which it is received.

As formally persuasive as Shannon's theory is, it was the work of literary critics that brought general awareness that meaning could not be transmitted from an authoring source to a receiving person. Awareness of this alternative view of communication was generated by the interpretive and hermeneutic thinking of the German phenomenologists, writing early in the twentieth century. Its impact was greatly increased by the writings of a generation of literary critics. In particular, in the 1970s this message was sent by Jacques Derrida, in a more accessible form by Paul de Man, and, with greatest relevance to the communication world, by Paul Ricoeur.[iv] Ricoeur wrote: "to understand [a transmitted message] is to generate a new event from the text in which the initial event has been objectified." The meaning is created by reaction to the text on its reception. Understanding a communication becomes a process of extracting a meaning from the entire situation of the reception: a hermeneutic cycle reflecting the mindset of the reader, the medium, the cultural moment, and incidental knowledge of the conditions under which the author created the message. The recipient's interpretation is independent of the author's intent. Even the meaning ascribed by the receiver is transient, taking on new meanings with each reading.

The view that meaning is in context proved useful in clearing the ground so we could see that "the emperor wore no clothes." The conveyed message is but a

glyph instigating the recipient's mental processes. The deconstruction of the authored meaning did not provide a way to reconstruct meaning that related to the authoring source. The conduit model of communication has to be complemented with one that asserts the recipients' interpretive role while enabling the choices presented in the incoming messages to make a difference to the recipients.[v]

Inter-system relations become Intra-system

In some mythic cosmogony, there was a time when human beings lived in harmony. In this blissful condition, the people had no need for language, because everything was commonly known and commonly held among those with a shared identity. To assure this unity they performed ritual dances, told epic tales of their origins, and, like the apes, mutually groomed. Thus they sustained their fragile harmony. They were living 'at one.' Of course, there was never such a blissful time. There were always differences that threatened the harmony. The ancients invented language to mend rents that were opened at the rough fringes of their societal synchrony. The need to entrain and manage the rents led to communicative exchanges. They formed between the silence of understanding and the noise of novelty and develop conventions for what needed to be uttered and what could be left unsaid. The domain in between harmonic silence and uncorrelated cacophony became the *semantic domain*, merging *noise* and *order*. [vi]

In the arenas of disharmony, the post-Edenites constructed the conventions that matched their rhythms and contained their social norms. In this domain they formed platforms of discourse (Chapter 4), attributed qualities and choose actions that facilitated increasingly complex relationships. They built the tools of speech to reestablish unity in the face of noise. The semantic domain is the arena for maintaining those commonalities and recognizing events that separated and displayed differences.

There never was an Eden, but the myth reminds us that our languages arose out of a silence before there was noise; there were no constraints until there was the need to exchange momentary intelligence. From this view, communication is the noticing of a difference among members when the presumption is similarity. The differences are noted on an occasion when there is non-coordinated movement, a disharmony. The disharmony is experienced when the receiving member notices that an action sequence it generates does not match its environment. It responds to the mismatch, not to the stimulus. We areacting continuously with the environment by generating engaging acts that we expect are in harmony with the energy received. When the responses are surprising and disjoining we propose a new sequence of actions in an attempt to reestablish harmony.

Inter-system communicating is efferent behavior for all the participants. All the parties to a communication propose or confirm hypotheses, about what is presented. If the proffered constructions are responded to, inter-system coupling is increased; the response indicates the involved systems share a common constraint in resonant neuro-muscular or data processing sequences. The shared sequences become templates for noticing and understanding future messages as reenactments. Communication augments inter-system relations establishing shared structures; in humans through generating parallel neuro-motor sequences; in social systems, though confirming vocabulary and grammars; and in cultures, by perpetuating myths and values. The coupling creates an expanding meta-system that operates between the silence and noise, increasing the internal unity and the meta-system's access to the environment. Inter-communication becomes intra-relations. The highly coupled meta-system that emerges grows in the richness of its constraints, thus of knowledge regarding its environment.

Spectral Coupling: Great bells ring their own chimes

All communications arrive as invitations to dance, whether it is via a tap on the shoulder, a question from a spouse, or a humming bird flitting into our view. And, they are never simple. They come with over-tones and under-tones. So as a massive church bell is struck, the surrounding bells receive the impetus to ring.

Every generated sign is accompanied by a spectrum of related signs, some clearly harmonic, others that are so complex that we would hear them as noise. So a fine violin produces sounds unlike the electric keyboard. Whereas the richness of violin entrances, the electric monotone simply informs. It is useful to think of any message as a broadcast with its spectral components being picked up by various members of an organization or sensory receptors of an organism. Systems that are in tune communicate over the range of the spectrum. Those that are harmonically distant may only pick up the dominant tone or a few of the harmonics. The systems are coupled in either case, with many reverberations or with but a linkage or two.

Reviewing the mechanics of coupling systems provides an evocative base for understanding what happens to communication as a function of the differences among systems. The classic example is of two pendulum clocks hanging together on a wall.[vii] The wall provides a medium through which the two clocks influence each other. The clocks are designed to mark the same passage of time, but there will be small differences in the period and the position of swinging pendulums. Over time, the clocks will entrain each other, coming to mark time with identical swings of their pendulums. If the clocks are of the same design and manufacture, their tempo and swing will split the difference between the marking of time they displayed before coupling. If they are quite different design, the rhythms of one

will dominate the other, causing the other to swing to a tempo far from its natural rhythm. The difference that matters in the mechanical setting is the power (or resistance to change) that each system displays in the coupling, the dominance being directly related to the power available. Big systems tend to drag smaller systems toward them in proportion to the ratio of their power in the arena in which they are entraining.

The dominance in a coupling relation can be so complete as to eliminate most of the spectrum of exchange. The pendulum I used to illustrate co-coupling perfectly exemplifies how the massiveness of the whole suppresses the nature of the parts. The physical massiveness of the pendulums overwhelm the rhythms of the molecules of which it is made. The thermal motion of the metal particles and the gas molecules of the air, the friction the clockworks, and the vibrations coming from the building through the wall subtly affect the swing all are so dominated by the unified swing of the whole pendulum that we as observers ignore them. So, we think of a pendulum sending a simple message through the wall to another. However, we must make a deeper consideration of what is happening.

The prototype of coupling between two systems displaying a single rhythmic swing with no harmonics and noise has dominated the discussion on coupling. Appropriately so, as the science of simple harmonic motion has been an

important contributor to the design of mechanical and communication technologies. However in natural systems, say of interacting molecules, the earth's atmosphere, living cells, or a whole community of individuals, there is a multiplicity of significant couplings among the elements. Ring a massive church bell and it chimes the neighboring bells. Read a poem and the audience generates a dozen metaphors. Purse your lips and your feet turn slightly inward. In any living system, a vast range of related harmonic systems come into play when any part of the system is entrained to a stimulus. In most natural systems, engagements produce complex tuning among many frequencies generated by the entrained bodies. Multiple entrainments form a *spectral coupling.*

A spectrum of energy in any waveform that produces light, heat, sound, and even earthquakes distributes energy at various frequencies (or wavelengths). The distribution may be continuous as in white light or consist of energies at discrete frequencies as we see emanating from the intense yellow sodium vapor lamps on the highways. A spectrum can also be defined over the pace of people walking on the avenue or over the verbal rhythms in conversations. Spectral coupling follows from the entrainment of two or more systems across such spectra of energy or messages. The coupling initiates a new meta-system or reinforces an existing pairing.[viii] The two-clock coupling described above is the simplest case, showing coupling at one frequency. In living systems, coupling will occur across

a spectrum. Messages are received at many levels, at different power levels and at different times. Some signals will resonate and exchange, some will be too weak to induce a coupling. Those that resonate pull on other parts of the organism's system according to the their power and the nearness of the natural periodicity operating in the coupling sub-systems. As the merging sub-systems come close to harmonizing, harmonic sub-tones and super-tones and non-linear tones cooperate to yield new couplings. In living systems, inputs from outside and from diverse internal sub-systems find and reinforce many co-resonant feedback and autopoietic loops. Noise induces serendipital couplings.

The richness of the coupling induces more harmonics and thus creates networks of related neuromuscular loops (or data circuits) that enhance the system's abilities to respond to the environment. Systems with similar power that coupled have a greater range of sensitivities to the environment, are more open to intelligence from the environment, and more diversely responsive than are the sum of the systems of which they are composed. A closely working team can get more information from its environment than a set of individuals. It is through spectral coupling that systems attain properties beyond those available to a conglomeration of atomic parts. That the whole is greater than the sum of the parts is due to mutual coupling. The members of spectrally coupled system are in overlapping relations that are one-and-not-one with the whole. The notion of

overlapping parts as in a Venn diagram is not a valid representation of the coupled system. The participants gain both freedoms for individuation and stability through synchronization. Mutual spectral coupling creates the ability to respond to variety, enabling humans to create enduring cultures invigorated by the coupling of distinct individuals.

Entrainment of living systems engenders capacity to handle complexity. It produces systemic resonance that leads to an accelerating growth of complex coupling. The coordinated behavior that ranges across a spectrum of responses allows a system to recognize more of what had once been 'noise' as meaningfully structured. The structure is realized in new vocabularies of molecules, muscular sequences, phonemes, words, literatures, and in grammars that evolve into new system paradigms. Entraining diverse harmonies adds to the repertoire of potential responses, so long as elements of the system have open capacity and free energy is available to convert noise into structure. Every exchange produces sub/supra-harmonies in upwardly reinforcing spirals of organized capacity to handle variety. *A living environment of systems with open vocabularies and grammars spontaneously self organizes.* The self-organizing system grows exponentially into an encompassing meta-system that we recognize as a culture.[ix]

The human condition in this era supports such exponential growth in our capacity to handle information. The growth occurs through the creation of new

vocabulary, networks, and grammars on a path that began with the evolution of speech tens of thousand years ago. We are experiencing an accelerating exponential growth in recent centuries following on the availability of printed books and now with spread of audio and video telecasting that transcends cultural boundaries. We have created a capacity for handling complexity within a technological environment that can support orders of magnitude more complexity than we are currently handling. However, there are no guarantees that we will not destroy the blooming of civilization by negligence of the requisite balances or in our exuberance to let acts of terrorism collapses our extended harmony into a heap of noise.[x]

SUMMARY

This chapter presents a way of thinking about processes that lead to various forms of system thinking, and shows how those processes have greatly expanded the domains of understanding. The focus is on methods, not content or outcomes. The chapter scans the stages of system thinking, from initiating insights to the grammars with which the businesses of science, law, markets, and any discourse are conducted and concludes with considering systemic images that transcend the part/whole axioms that have been the historical basis of system thinking

The first vehicle of system thinking is the metaphor. It is through metaphor that we notice differences and make connections among domains of knowledge. Metaphoric leaps disclose underlying and unseen unities of thinking. The early stages of system thinking were formulated in metaphoric associations; the later stages replace the metaphoric with the high structure of grammars. In displaying the forms of system thinking, I began with the different metaphors from which the current theories grew, then showed how each produced distinct logics for expressing our understanding of the phenomena we wish to model. I also looked at the major constructs shared across the different approaches to system thinking. I proposed that the many distinctions used by its practitioners could be reduced to the dual pair of boundaries and relations requiring that every boundary establishes a relation and every relation necessitates a boundary. It is from this pair that we develop the secondary properties of qualities, parts/wholes, systems and their environments, and the sets of rules (the grammars which are described in the next chapter) by which we engage with the phenomena of our environment and of our minds.

The investigation that led to the description of paradigms of system thinking was in part a typological study, looking for correlations among bodies of knowledge. I started with the heuristic rule that there would be a distinct system paradigm built on each platforms of discourse, as described in Chapter 4. This

proved a useful assumption. The apparent pairings are the Classic paradigm with the Assertive platform, the Dynamic with the Analytic, and the Exchange with the Evaluative. Parallel schemes for the other three platforms have not so apparent. Two of the remaining three platforms contain vast bodies of knowledge that with some ingenuity may be organized into system paradigms. On the Normative platform, a Political paradigm may emerge—even ancient political theories display systemic qualities. On the Generative platform, there are elements of a Narrative Paradigm. However, formalizing storying processes is a more difficult task; perhaps it would be even counter-productive to attempt to form a science of the arts. We have grammars for translating ideas into linguistic forms, but it is not evident that formalizing a narrative system will be any more fecund than have been the attempts to create a science of aesthetics.[xi]

The description of the Classic, Dynamic and Exchange paradigms began with distinct root systems that grew in their respective platforms. On each, I have identified the present branches of exploration. The branches that have developed since the metafluctuation now form an overarching canopy that transcends the part/whole premise on which system thinking has been based. Coupled systems do not subscribe to the relations/boundary duality, yet in their realization they precipitate into parts and wholes. We need both approaches.

As dramatic and innovative as are the products of system thinking, this metafluctuation in the ontological and epistemological foundations of our culture is not an historical first. There have been metafluctuations in the past. The emergence around and following 500 BC of the great spiritual traditions and the hundred years following Galileo were both such times. The new thinking that rises in these revolutionary times has massive impact on the cultures yet is adopted by minute portions of the population. For all the fresh and ingenious ideas that flowed from these hyper-generative eras, most of the world's population goes on about their business with little concern for the new systems of thought. Each new set of metaphors builds new paradigms that add to the human spirit and knowledge, but they do not directly replace the dominant paradigms of its thinking. The animism that arose 30,000 years ago is still a force. We still use the tools of Aristotle. We still speak of sunrises and sunsets. There are, as Jean Gebser so richly documented, traces of every paradigm in its successors.[xii] I believe part/whole thinking as expressed in the three paradigms discussed here will continue to dominate our daily activities, have broad practical uses, and underlie theoretical work for decades to come. We are rooted in the metaphors from which have emerged the new transcendent canopy. New system thinking expands but does not replace prior mindsets in daily engagements with human problems or grand social issues. There is still much to

be learned and enjoyed in the inter-space. David Gates in reviewing the work of

novelist Edith Wharton said her writing

> isn't simply about characters interacting but about the rococo social
> structures they've built and inhabit, about their minutely elaborate
> codes of behavior and the unannounced consequences of an
> infraction, about the wordless agreements and transactions that
> seem to happen in some sort of communal psychic space.
>
> <div align="right">David Gates, NY Times, 24 Dec 2000.</div>

Such a description could have been written for any time and in any culture. No

system of thinking will wholly dominate the human diversity to such an extent

that the distant harmonies are silenced. It is a society spectrally coupled.

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[i] . Barnett Pearce, a communication specialist, identifies the same two, labeling the first the transmission model and the second the social constructionist model. [Pearce, 1999 #173] Pearce uses a communication vocabulary while I stay with a system theoretic frame that presents the two modes as duals of each other.

[ii] . Charles S. S. Peirce used these three terms in his writings that founded the science of semiotics in the late 1800's. A vast number of variations of these have been introduced in attempts to clearly identify the language forms that we use to communicate among ourselves. As the exploration continues, we are likely to find the variety of expressions is an unlimited as is the number of sentences we can create with any natural grammar.

[iii] . [von Foerster, 1981 #44], page 263.

[iv] . Of course, they should not have expected us to get meaning from their messages. However, they wrote profusely: E.g. (Derrida, 1977), (de Man, 1978,) and (Ricoeur, 1975)

v . The two forms of communication are fundamentally different. The conduit model assumes a stimulus that evokes a response. The coupling model begins with an efferent probing action that detects a difference. In mammals and humans, the two forms use different neural paths. In the stimulus-response mode, a message impacts the sensory receptors immediately evoking a primitive muscular reflex or following a slightly longer path through the sensory cortex to the reflexive action. In the coupling mode, action sequences cause the sensory apparatus to encounter the environment and notice differences from what is expected. It then uses the difference to direct the next action. (Cotterill 2001).

vi . I think the dual proposition is necessary. Neither noise nor simplicity alone moves us anywhere. It is the continuing increasing ability of harmonizing systems to engage with noise that makes for complexity. This pairing parallels von Foerster' order from noise and order from order.

vii . See [Abraham, 199? (Year not given) #171].

viii . The coupling model is wholistic, thus all couplings are reinforcements of the grand meta-system of All. However, in a communication discussion I presume the elements to be atomic.

ix . Prigogine refers to these phenomena in discussion of Manfred Eugene's work. [Prigogine, 1980 #113], p. 108-109).

x . I detail that a vision of that process in [McWhinney, 1990 #193]

xi . See the discussion on art and science in the *Journal of Consciousness Studies* Vol. 7, No. 8/9 (2000)

xii . [Gebser, 1985 #7]