

The Role of Love Trust and Intimacy in Learning

Part 1: Intimacy and Learning

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Introduction

This paper presents a path of reflections about love, intimacy, trust and learning along a path of teaching, learning about teaching, and observing learning both in myself and in my students; all of this with an awareness of the work of Dr. Maturana. Thus the paper concerns an application of the network of ideas that I consider his opus. However, as is always the case, the understanding of these ideas is my own, and my understanding may well differ from his in ways that I cannot detect. Because Maturana's writing is precise and condensed (one of my students aptly called it "chewy") and what I have understood resonates deeply with me, I have pursued this work over a decade and a half, and have developed expansions of my own understanding in the context of what I have understood from his work. In many cases I thus independently developed an idea, and later found it (usually more precisely expressed) in some of his extensive writings. This gives me comfort in thinking I have properly understood and operated within what I call the "landscape¹" of this work; which I claim comprises both an epistemological and an ontological shift (Bunnell, 2005).

Consequently in this paper I specify many notions that I explicitly attribute to Maturana, and speak others through my understanding and extension of these notions in my life praxis. However well I manage to handle the substance, and whether or not there are any new insights in what I contribute, I gratefully acknowledge that the landscape itself, what Maturana and his colleague Dávila now call the "Biological and Cultural Matrix of Human Understanding" (ref) is something that I have learned from Maturana. In doing so I believe I am adhering to what most people would consider a constructivist perspective, though I myself have not considered myself to be "a constructivist" in my pursuit of the domain of praxis and reflection that I now refer to as "The Ecology of Humanness".

¹ *When I try to draw this "landscape", positioning ideas and connecting them according to which ones are necessary or useful for fully understanding other ideas, I end up with a complex web of that resembles a tangle dropped onto a flat surface. I need at least a viewer-manipulable 3-D rendering program to make the concept dependencies and idea relations comprehensible. Interestingly, such webs of understanding underlie any culturally coherent world, and we navigate them effortlessly even though we do not see them. Drawing such a landscape in retrospect is a bit like creating a 3-D map of a landscape that has evolved through dynamics that have nothing to do with the mapping process. It is also a bit like analyzing the grammar of a language after the language has evolved. We do not normally learn a language by studying the grammar; the grammar in an analytic abstraction and thus the result of a different process than that which gives rise to the natural learning or the evolution of the language.*

Thus briefly, this paper is about learning about learning, and reflecting on learning about learning, where both the learning and the reflecting comprise an application of the work of Dr. Humberto Maturana Romesin.

Intimacy

For many years I've been thinking about what grounds the experience of intimacy. The cultural bias that intimacy has to do with a special personal relationship, often with a sexual component creates entailment that I realized I would have to release in order to consider the generative grounding for "intimacy".

A quick search reveals that most of the published papers that refer to intimacy do so as a psychological concept that is concerned with the nature of interpersonal relationships. Much of the psychological discussion on intimacy revolves around the premise of a "need" to belong and be cared for (Miller and Perlman, 2008). Though daily life experience ratifies that we do like to belong, and most people do not feel or do well if they are socially isolated, naming something a "need" avoids a deeper explanation.² Rather than consider what happens to people when the dynamics of intimacy are missing, I am interested in what is the basis, the root, or the seed of intimacy (3 different metaphors with 3 different implicit domains of acceptable answers.) Perhaps the best way to phrase my approach to the question is "What is intimacy as a biological phenomenon" -- remaining aware even so that regardless of any story based in biology, the notion of intimacy is a distinction in language.

Any dictionary, however, clarifies that intimacy is not confined to interpersonal relationships. It also refers to a close association with or deep understanding of a place or a subject area; that is one can have intimate knowledge of a place or an idea. Further, the dictionary refers to intimacy as a quality of comfort or familiarity, as the intimacy of a room or other space. The etymology of the word is also revealing, it comes from the Latin "intimus" meaning inmost, which when applied to a relationship reveals a close inner connection.

Beginnings

I had an intimation that intimacy must have a simple basis; that the experience of intimacy must have its roots in a long lineage of relational behaviour. By "long" I mean not only centuries, but millennia; that is our evolutionary past. I am looking for the modest origin for what we experience in the present.

² *In my experience a specified "need" is usually stated as a foregone conclusion, that is it is rarely clearly defined in terms of what would happen should the conditions not be fulfilled; nor is it often clear as to what cultural context the need pertains to. In my view a need is always conditional; that is, it should be expressed as a statement that without a, in the context of x y and z, b cannot take place.*

Since I cannot in fact go back in time, what I have been attempting to do is to abstract³ the generative processes that are consistent among all experiences of intimacy. Though my reflections are not “truths”, I find satisfaction in being able to regard the notion from this perspective; for me the result has been a way of seeing coherence among situations that would otherwise appear unrelated and confusing.

Every experience that we now distinguish, describe, and live in a manner that is modulated by our descriptions and our cultural entailments is of course different from whatever the seed for this experience must have been. We add variation and nuance and thus develop a relational and experiential richness through the ongoing orchestration between how we act, how we feel, and how we coordinate our actions, that is through languaging and emotioning. Mostly we enjoy this richness, though sometimes we also despair in the dissonances and confusions that arise. We humans are languaging beings, and hence we live our experiences as languaging beings.

A touchstone figure

I will approach my account of what I consider the fundamental dynamics of intimacy from the ontology and epistemology (“ontepistany” Bunnell 2005) that I have developed through engaging in the work of Humberto Maturana. As I wrote in the aforementioned paper, I consider the little diagram shown in Figure 1 to be at least as potent in its evocative reference to a worldview, or world understanding, as is Einstein’s $E=MC^2$. Indeed, I have referred to it as a touchstone, as shown in the second panel of Figure 1. Given that Maturana and his colleagues have recently (date?) made this figure the logo for their School “Escuela de Matríztica de Santiago”, they must also consider this iconic figure relevant.



Figure 1. A fundamental diagram from Maturana (see text). The first panel is as presented in Bunnell, 2005, the second an evocative image of the notion of the figure as a “touchstone”, and the third panel is the logo of Escuela de Matríztica.

The diagram in Figure 1 leads to and connects with several important notions. With the circular arrow it shows the continuous recursive autopoietic dynamic that constitutes a living system, and with the double arrows it shows the reciprocal relation of continuous

³ When I say “abstract” as a verb, I am referring to the root meaning of that word: *ab trahere L.* “to draw away from”. That is, I try to detect a regularity that pertains to all instances of a process or dynamic, which is not the same as isolating an essence that is separate from the process.

adaptation between an organism and its medium through the process of structural coupling.

When students balk at the notion of the medium responding to the living system, I point out that most of the relevant medium of any living being is other living beings. This is clearly the case with animals who may coordinate with conspecifics (at least during parts of their life cycle), who may depend on consuming other living beings to remain alive, or avoid being consumed by others. It is also the case with plants as even they are dependent on various other organism, including some bacteria and fungi that require larger living beings to exist. There are very few, if any, multicellular living systems in our modern biosphere that do not depend on other living systems for their existence, directly or indirectly. In any case, recognizing that most of the relevant medium of living systems consists of other living systems that are equally plastic in their responsiveness, helps students understand structural coupling. Most of the response of the medium to what a living system does is far more dynamic than the response of the abiotic environment.

The relevance of those two little arrows in Figure 1 is often omitted from discussions of autopoiesis as the organization of the living (e.g. Froese & Stuart, 2010). Living cannot persist through organization alone, it is always instantiated as a structure in context; a system in a medium that provides for a flow of energy and material. Living as an organization, and the realization of an actual living system are thus not the same look. As Maturana (2002) says, living systems exist as such in two domains, the domain of their constitution (autopoiesis) and the domain of their relations (behavior).

This leads to another reason why I consider this figure so relevant. The figure offers an opening to the notion of domains and how any system, and for that matter any notion that is conceived, arises in a generative domain and operates as a whole in a new domain of relations. As I've just indicated, the notion of autopoiesis exists in the domain of the organization of how a living system constitutes itself. The notion of behavior exists in a different domain in which the inner organization does not have presence. The totality of an actual operating living system requires a double look, an acceptance that two domains are relevant; even though in this reflective stance one cannot fully articulate either of the two domains. Yet one remembers, one is altered by having had the reflective perspective as one re-engages in the view appropriate to either domain.

If one adds to this the understanding that “Every distinction reveals some regularity in our living and obscure others” (Maturana, seminar notes⁴) it becomes clear that some aspects of understanding a living system arise from regarding it as a self generating process (the domain of its constitution), while other aspects of understanding are only

⁴ *Between the years 1995 and 2000 I attended several seminars, lectures and workshops delivered by Maturana, mostly to the American Society for Cybernetics, but also others including ones hosted by the Society for Organizational Learning, and Wondertree Educational Foundation (now renamed SelfDesign Educational Foundation). When I refer to what Maturana has said in seminars, I am referring to my own notes from these occasions; and of course take sole responsibility for the accuracy of my listening.*

available from regarding the living system in its relations with its medium, or more precisely, its niche. Both looks, both distinctions, are required in order to understand a living system or any other system we may distinguish. Thus I consider the diagram a powerful reminder of the value of retaining multiple, often logically incommensurable looks, or awareness of different domains, in order to fluidly⁵ engage in any discourse or activity.

Evolution

There is yet more implicit in the touchstone diagram (Figure 1) that I value. Since the diagram evokes structural coupling, it also implicates evolution. As long as autopoiesis is conserved, and the behavior is adequate for the living, changes can and do happen over time. As Maturana has stated (2005 p. 62) “Whenever in a collection of elements a configuration of relationships begins to be conserved, a space is opened for all to change around the configuration of relations being conserved” This means that alternative possibilities arise in this space; and according to how the behavior of the organism shifts, this can lead to a cascade of changes in the physiology, morphology and behavior of the organism, and of course, also its niche. Thus the touchstone figure implies that as a living system and its medium operate in reciprocal interactions over time, a lineage of changes may result.

As living systems change their behavior as they grow and develop, and as they have more than one way of behaving, both bodyhood and niche develop as a dynamically changing relationship over time, over a variety of alternative disjunctive configurations of the medium over both space and time. Since many living systems are participating in this process simultaneously, the result is a spatiotemporal architecture with adequate cohesion to persist – namely the biosphere as a whole. The evolution of this unevenly yet deeply and intricately networked immense system can be better understood through considering yet another substantive synthetic statement from Maturana (seminar notes), namely “the course of the history of interacting systems is determined by the configuration of relations between them that is conserved while the interacting systems change around the configuration of relations that define them.”

The biosphere, then, is the result of a many interacting discontinuous and partially connected, yet adequately coherent, processes. I like to summarize this by saying that “the biosphere is a systemic matrix of relational existence.” This also means that relationship is fundamental to living. Intimacy refers to a quality of relationship. Is this quality fundamental to living? What qualities are relevant in the relationship between organism and medium?

Intimacy

I can now state my basic premise about intimacy. I think “intimacy” is a comment by an observer on the nature of the relationship between a living system and its medium. It refers to the appropriateness and adequacy of the two reciprocal arrows in the touchstone

⁵ I would add to this that ethicality also depends on the ability to maintain multiple looks; but developing this notion is outside the scope of the current paper.

figure I have been discussing. I think it is that basic, and being that basic, it is that compelling. Living systems cannot exist without retaining an adequately intimate connection with their medium. When we use the word intimacy we refer to an experience of comfort and pleasure in the quality of our connection, however that manifests; according to the domain that it manifests in. Thus we can have an intimate relation with another human, or we can have intimate knowledge of any domain of knowledge, such as Renaissance History, Bayesian Statistics, or the computer world of Second Life. We can also comment on the intimate relation between a bee and the species of orchid that is dependent on it for pollination. Whatever situation we distinguish intimacy in, we do so with a sense of a close and appropriate relation between a living system and some aspect of its medium.

Having said this, I can now make further distinctions regarding what some of the qualities of relationship are that are relevant to the generic distinction of “intimacy”. I will do so with a visual metaphor, looking closely at the interface between two living systems in reciprocal relationship; based on the “two bean figure” (an appellation created by my students) that Maturana often uses in his lectures. In Figure 2 I am simply adding a pull-out or magnification, in order discuss aspects of the connection.

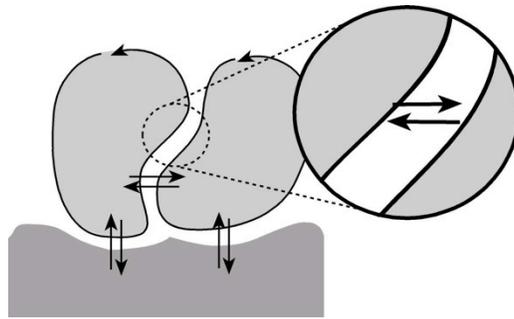


Figure 2. Two living systems in reciprocal relationship with each other while also maintaining a relationship with their medium which may be partly the same for the two. The arrows between the two beings refer to a temporal dynamic as s beings trigger changes in each other according to the structure each has in any given moment.

I will make distinctions concerning aspects of this relationship, well aware of what I mentioned above, namely that any distinction reveals some regularities in our living, and obscures others. Thus all I do, all I can do, is offer ways of looking that can be handled responsibly, ie. accepting that these are but ways of looking with consequences in the domain of reflection and action, and that other ways of looking would have different consequences. I intend my distinctions to offer ethically desirable action; but have no way of ensuring that. This is particularly so in the form of a written document where I cannot adapt my flow of ideas to the listening and speaking of another, as I engage intimately in conversation.

Aspects of Intimacy

I propose five distinctions concerning the intimacy of the direct connection between any living system and its medium: namely fit, intensity, intricacy, fluidity and coherence. Further to these, for languaging beings, I will also consider dimensionality, reciprocity,

reflection and care⁶. This second group entails the ability to reflect; the others can all be lived without language. !

Fit is the most obvious aspect of intimacy. My notion of “fit” refers to how closely the changes in the medium correspond to the changes in the living system (and vice versa). Without fit there is no structural coupling, so fit is fundamental. The organism must engage in at least some domains of relations that are adequately connected with its medium in order to survive. However, not all domains of relationship are necessary for survival, so there can be different degrees of fit in those relations. Without fit there is no relation so speak of, only proximity. Two beings may well maintain proximity as a relationship, but I would not consider that an “intimate” relationship.

This of course brings up the notion of degree of fit. Conceptually and metaphorically, “fit” is shown in the first column of Figure 3 , the top half shows poor fit, the bottom shows a good fit. As in the situation where knowledge is an attribution made by an observer (Maturana, 1988) fit, or any of the other aspects of intimacy, are also attributions made by an observer, who is fundamentally responsible for determining in what domain he or she is distinguishing knowledge, intimacy or any other attribute. Certainly an observer could also invent a metric to describe the degree of fit, intensity, intricacy or fluidity, or one to describe the degree of intimacy, but that is not my interest here. Any such metric is basically arbitrary and only useful in a relative sense (eg. comparisons between several circumstances within a given domain of responsible observations).

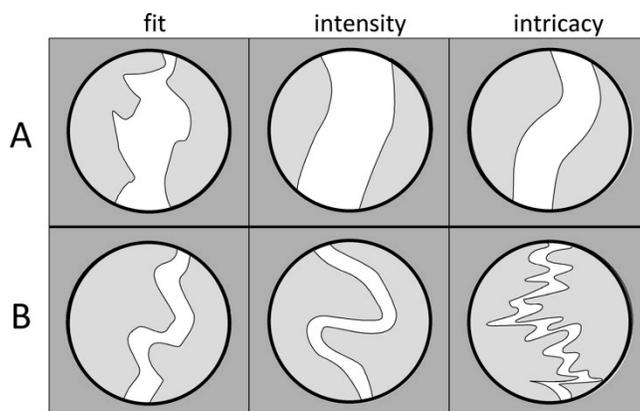


Figure 3 A diagrammatic metaphor alluding to three qualities of intimacy; fit, intensity and intricacy, in each case with a contrast (A and B) appropriate to that quality. Thus fit may be good or poor, whereas intensity may be gentle or fierce, and intricacy may be broad or highly detailed.

The second aspect I wish to distinguish, namely intensity, does not come with an assessment that determines degree of intimacy; the desirable degree of intensity is context specific. For example intensity is likely to be high in an aggressive encounter, and low in a sleepy ball of kittens. However, there are situations where living beings appear to seek

⁶ Care, in this context, is not the same as the emotion of love, though it often does take place in love. I mean “care” as the reflection on what may be appropriate for another.

intense encounters, and people, appear to value intensity as an aspect of intimacy, hence I include it here. For example, intensity is often valued in sports, or conversations, or in a love affair; there is a sense of importance or relevance attached to the sensation. On the other hand, low intensity intimate encounters are also valued; as for example in “quiet companionship”.

The third aspect, intricacy, may also be valued according to circumstance. I have no way of determining how non-languaging animals value a subtle compared to an intricate relationship; as I can claim to observe both happening (just as I can claim to observe both low intensity and high intensity relationships that appear to be sought out, and hence I assume enjoyed). However, in humans, it appears to me that people do enjoy an intricacy or relationship in whatever domain this takes place. Namely if the response of the other, or the medium, is commensurate with the detail, specificity, and dimensionality that one is aware of in one’s own life, then people appear to delight in the intricate intimacy of the relationship. This could be a conversation about mathematics, or it could be dancing a tango. It could be in making love, or it could be researching antigen reactions. As I will discuss in the next section, this delight has to do at least in part with being seen, and accepted as legitimate; that is with the experience of being loved. This experience of being seen also pertains to the fluidity of the relationship.

A fourth aspect of intimacy, fluidity, would have to be illustrated with an animation, which I will not include in this paper. Instead I will invite the reader to imagine it. Namely fluidity has to do with the temporal flow of responsiveness between a living system and its medium. This flow may be either fluid in time, responding incrementally to changes (one could say “tracking” each other) or it may be discontinuous; we would see it as abrupt. For example one side of the surface would change, and the other would not respond for a time; then suddenly it would refit itself to the new configuration. Thus the response would appear “jerky” or temporally disjoint, even in situations where the eventual response fits intricately, either subtly or intensely.

The final aspect that I think is always relevant is coherence. As the distinctions are not alternatives, but rather dimensions that may all pertain, they also need to be coherent with each other as well as adequately coherent with those activities that enable the living of the living being. Though I include it here, I think the notion of coherence is one of those ideas that sounds obvious until one begins to think about what is it really. I will need some time, and I hope to benefit from some conversations to better see, speak and write about what “coherence” entails.

A few examples may help clarify the interplay among these aspects. Kicking a rock has intensity, but very little fit. Expert snowboarding down a difficult hill not only has intensity and fit, but also fluidity. A sheepdog working with both the signals from a human and the responses of its charges is acting in a complex set of intimate relations; and appears to enjoy this with enthusiasm. A child concentrating on an insect crawling on a leaf, or an adult learning fractal geometry enjoy a sense of intimacy with their chosen domain of relations. A conversation may flow easily with low intensity and adequate fit; it may become intense as ideas are challenged, or it may be intricate as both parties are aficionados of some particular network of ideas, such as for example constructivism, or the work of Dr. Humberto Maturana.

The overall claim I am making is that intimacy is a pervasive quality in all the relationships that a living being seeks; and is thus not anything “special” – even though there are contexts where we find it a more or less compelling aspect of our lives. Even in the moment of writing this paper, I am feeling a form of intimacy with the ideas, with the sense of creating something with adequate fit, flow and intricacy; and including the wistful sense that there will be readers that will see this and hence will see me. I think I am being honest in saying that I, like many writers, appreciate being loved, which is not the same as being liked!

Intimacy and computer games

I mentioned a few more aspects of intimacy that pertain specifically and only to languaging beings, but before I describe these, I want to speak about the intimacy that people can experience in the relations they have with their computers. This pertains to any computer based activity, but I will focus on computer games as they most clearly embody the aspects of intimacy I have already presented.

In a conversation with Kalev Tait (pers com. 2009) a computer game programmer and designer, I presented the above aspects and he quickly identified a corresponding vocabulary that game designers use to ensure the games are “fun to play”, and that they take care to incorporate in their projects:

- fit = interface
- intensity = speed
- intricacy = complexity
- fluidity = responsiveness
- coherence = predictability

This, for me explains indeed why computer games are found to be so compelling. They are specially designed to offer a superior experience of intimacy; one with good fit, periods of high intensity, with intricacy commensurate with the developing skill of the player in that game and a fluidity that doesn’t disrupt the sense of immersion. Further this all takes place in a game world that is designed to be coherent among all these aspects. I cannot help but remember my studies in ethology almost a half century ago; namely the early work by Niko Tinbergen (Tinbergen, 1953) where he developed the notion of a “supernormal releaser”, that is a trigger that would elicit a much stronger response from an animal than what would appear to be appropriate to the normal living of that animal. In other words, the supernormal releaser was a caricature of the normal trigger, and it resulted in an exaggerated response that, if continued, would not be conducive to the life of that organism.

The implications of computer games as supernormal releasers that elicit a sense of exaggerated intimacy worry me. Many people worry about addiction to computer games; and I wonder also whether the degree of intimacy to be found in normal relations, especially in the slow development of intricacy in any domain of ideas, will feel inadequate in comparison to these exaggeratedly compelling experiences. The games are designed to offer a rapid rate of increase in intimacy that is not normally available in daily life. A game is abiotic; how does a child who grows with this as his or her norm,

also learn to value the nuances and slow growth of biologically based reciprocal relations?

Dimensions of Intimacy available to languaging beings

The aspects of dimensionality, reciprocity, reflection and care in relationship pertain specifically to humans, living in language. This is so as all of them require the ability to reflect on the relationship. What I have to say in this section is based on personal observation, not experimental evidence or cited authority.

First, people appreciate as sense of reciprocity in the initiation of changes in an encounter. Thus, although a relationship may appear intimate in the various aspects I distinguished above, a person who perceives him or herself as simply continuously adapting to the other may not experience that relationship as intimate. If someone is not able to initiate any of the changes in an interaction, they may feel more like a machine that must respond than an autonomous entity in an intimate relationship. Second, humans enjoy dimensionality, that is intimate relationships that can fluidly move from domain to domain. For example a friendship that includes intricate conversation in some domain of knowledge, as well as simple companionship in food or music, as well as ease in coordinating some daily life tasks is experienced as overall more intimate than a relationship that cannot track from domain to domain, even when the depth of intimacy is valued in a given domain. Thus, as humans can reflect on the dimensionality of a relationship, dimensionality becomes relevant to the sense of intimacy; and this can happen in a delightful recursion as awareness of dimensionality itself becomes a domain of relationship.

This recursion is but one example of the ability to reflect and include those reflections in the dimensionality of the relationship. Indeed, the joy and intimacy of circumstantial humor (which I believe consists of sudden collapses of different domains into a new domain in which an apparent dissonance or paradox is resolved) depends on the ability to follow the path of reflections that another is experiencing, and is thus felt as a particularly intimate moment. Care, and awareness of care is yet another appreciated dimension in human relationships. Animals will of course act appropriately as in care, and respond to care, but without reflecting on the existence of that care it acts as a refinement of fit, fluidity and intricacy.

In summary, intimacy is a comment on the nature of structural coupling between an organism and its medium. Thus “intimacy” is an attribution made by an observer. Like other attributions, making this has implications to the path of further relationships that said observer may participate in. Intimacy as it applies to us pertains to human relationships with other humans, with animals and plants, as well as with inanimate aspects of the medium. Humans may also attribute intimacy to the relationship of non-human organisms with their medium as they perceive the qualities that they consider relevant. As structural coupling is continuous, and usually adequate, the attribution of intimacy is only made on occasion, but then on reflection such intimacy will be seen as implicit and pervasive, invisible and relevant.

That we observers make such attributions does not mean that the qualities referred to are imaginary – we are after all commenting on various looks at what is generally a viable relationship between ourselves and our world.

Learning

Learning Implies Cognition

Learning implies cognition; cognition taken as the ability to respond to changes in the environment in a manner that enables living. This is implicit in the touchstone figure (Fig. 1) and indeed in the notion of structural coupling between a living system and its medium. In one of his earlier papers on cognition Maturana wrote “To cognate is to live, and to live is to cognate” (Maturana, 1978 p. 46) and a decade later “living systems are cognitive systems, and to live is to know” (Maturana 1988 p. 33) Perhaps based on the recent expansion of computing power, some authors claim that the first part of Maturana’s original statement “to cognate is to live” is not necessarily the case, namely cognitive systems could conceivably be designed that are not autopoietic systems, ie. are not living (Riegler 2002.). However, it remains the case that living systems are cognitive systems, and living as a process entails a process of cognition.

In teaching, I like to explain the development and expansion of cognition by describing the history of evolution of living systems. I begin with the origin of life something like 3,900 million years ago (Margulis & Sagan, 1995). Margulis and Sagan claim that the major metabolic modes that all living systems rely on took the first 1,000 million years to develop, and more than another 1,000 million years passed before eucaryotes (living systems with a cell nucleus) arose through ingestion and symbiosis, and multicellular colonies and eventually multicellular discrete organisms followed that. Diversification of gross morphology could take place relatively rapidly after the development of the elements that could eventually be recombined as metabolic and structural “building blocks.”

Based on this history the point I like to make is not the recent arrival of mammals, or the short tenure of humans on this planet, but rather the extent of our biological endowment, our heritage. This heritage is not only metabolic, but also the concurrent ability to engage various aspects of the metabolism in response to circumstances and behave appropriately; ie. cognition. Thus cognition is ancient, it is embodied in the details of all living systems in ways we do not fully see or understand. Further, cognitive systems have evolved as a network, or matrix or relations, so that living systems together comprise a biosphere that on the whole is adequately coherent to have persisted. Thus cognition, as it serves the connections in systemic matrix of relations, has also been adequately coherent to have persisted. In that sense a complex cognitive system embodies a requisite variety, a variety commensurate with the complexity of the medium in which it lives.

I claim, based on these reflections, that we humans retain a complex of cognition that is other than the form cognition that we are explicitly aware of, that is our rationality as languaging beings. I refer to the older form of cognition as “systemic rationality” to distinguish it from the logico-rational organization of ideas in language.

This does not conflict with what Maturana (2005: p. 83) says:

“I call the operational coherences of the structure of an organism the “rationality” of its bodyhood. And I do this at the same time that I claim that that which we usually call rational in our behaviour as languaging self-conscious beings, is a feature of the operational coherences of our changing structure as it arises moment after moment in our operation as languaging self-conscious beings in the conservation of our living in languaging.”

As Maturana says in the above quote our human rationality, whether systemic or explicitly in language, nevertheless takes place in a systemic nervous system that has become complexified along the evolution of language. Whether this enables a more subtle and complex form of systemic rationality, or whether the complexification of our nervous system along language has distorted our evolutionary endowment of systemic rationality; I cannot say. However, I think the frequent incidence of useful insights, hunches, gut feelings, and “instincts” is based in systemic rationality. There is a quote, popularly attributed to Einstein (n.d.) which also speaks to this: “The intuitive mind is a sacred gift and the rational mind a faithful servant. We have created a society that honors the servant and has forgotten the gift.”

Cognition as a Circular Relation

I would now like to refer again to the “touchstone” figure; and add to it two arrows that are implicitly already there and which serve to emphasize that there is a circularity in the relation between organism and medium. Figure 4. Thus as the organism senses some aspect of its medium, its internal structure changes, and its behavior may change in a manner noted by an observer. The physiological changes are necessarily minor in relation to the whole, as the system conserves its autopoietic operation. Thus small modifications in the internal operation lead to discretely different behaviours. As the changes are small, they can also occur in rapid succession, and the organism can quickly respond with a wide repertoire of changes. Maturana refers to this internal dynamic as sensory motor or sensory effector correlations (Maturana 1970 and 1996)

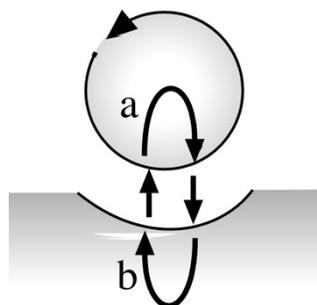


Figure 4 The circularity implicit in structural coupling. The sensory motor coordination that takes place within the living system is shown in a, and the response of the medium in b. Neither of these are normally visible to the observer, who is likely to see only the behavior noted by the reciprocal arrows, and sometimes only those actions that are signified by the downward pointing arrow.

As previously noted, the medium also changes according to the behavior of the organism. Of course some of the apparent change in the medium, from the organism's perspective, may simply be the result of its own movement through the medium; which from an observer's point of view leaves the medium unchanged. Other changes in the medium take place as the behavioral responses of other organisms. Though most of the changes in the medium triggered by the behavior of any individual are small and do not alter the organization of the medium, a few changes, such as being consumed, are of course dramatic. It would indeed be both absurd and horrible if every butterfly that flapped its wings created a hurricane⁷. Ecosystems are well buffered.

Circularity in learning motor coordination was demonstrated half a century ago by Held and Hein (1963). They used multiple pairs of kittens that were placed in an apparatus for various durations at various ages (Figure 5). The perambulations of one kitten operated the levers of the apparatus so that the other kitten, which remained free to move its limbs within a small cage, experienced the same visual stimulation as the first. When tested later for paw placement, blinking, and avoidance of a visual cliff, the caged kitten had not developed the appropriate sensory motor coordinations. The circularity specified in Figure 4 was interrupted; the movements of the caged kitten did not alter its visual perceptions.

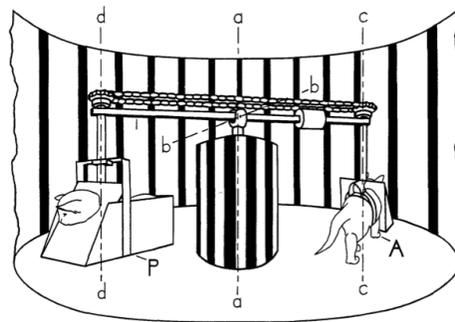


Figure 5 Apparatus for enabling one kitten to develop sensory motor coordination while other receives same visual stimulus unrelated to its motor movements inside the carriage. (Held and Hein, 1963 p.873)

I myself recently had an experience that further exemplified the necessity of this circularity in determining sensory acuity. In the normal course of living, it is not necessary to identify which particular tooth is engaged in chewing, or is being cleaned by a toothbrush; operating with a given area of the mouth is adequate. On a visit to a dental hygienist I was offered an rubber tipped instrument suitable for cleaning between the

⁷ The so called "butterfly effect" is intended as a metaphor to convey the sensitivity of systems to initial conditions. This effect is most readily seen in simple systems where a set of initial conditions can be specified (once a system has evolved to become complex the notion of a "initial" condition becomes moot). Only rarely are circumstances such that a large effect in a complex system can be traced back to some small event that propagated in an escalating fashion.

teeth. It wasn't until my next visit to the hygienist that I realized that I was now able to discern exactly which tooth he was cleaning. Using the smaller instrument had enabled me to close the circularity of sensory motor coordination at a much finer scale than previously.

This difference between how an organism responds to some aspect of the environment at one time and at a later time that is basically what we call "learning". Something happened between the two views that has changed the organism such that it now responds in a manner that is seen as evidence of more knowledge. There is an assessment inherent in this comparison.

Knowledge is Attributed by an Observer

One of Maturana's (1988: p. 31) better known quotes "...knowledge is behavior accepted as adequate by an observer in a particular domain that he or she specifies" has been fundamental to my recurrent reflections concerning my responsibility in evaluating myself or any other, particularly my students where my evaluation has a substantive effect on the course of their lives.

There are several subtleties inherent in Maturana's quote. First, the observer either implicitly or explicitly uses one or more criteria of adequacy. Riegler (2002, p. 340) states that "The complexity of cognition—defined in terms of behavioral repertoire that enables adequate compensation of perturbations from the environment—is different for different individuals..." In writing this he alludes to the domain in which he evaluates adequacy (response to perturbations), and he refers to the implicit lack of any singular standard for 'adequate compensation' by noting individual differences. The specification of adequacy remains elusive even when one deals with an explicit field of studies; there are always more dimensions or perspectives in any field than any one individual can claim an understanding of. We are always in the position of evaluating another's competence with respect to what we ourselves understand; whether or not we consider the other to be more or less competent than ourselves. Furthermore, we are rarely aware of the domains that we generate as we fluidly move from one to another domain in the normal progress of daily life and conversation. Thus our assessments remain at best generalized, and the more specific and "fair" we attempt to make them, the more narrow and less robust they become.

A second subtlety implicit in Maturana's quote is that one must assume that one is competently distinguishing the behavior that is taking place. Very often criteria for adequate conduct are established that obscure the breadth of conduct; and thus an observer may fail to see relevant conduct.

Assessing knowledge

Both these points are particularly relevant to formal assessments. Formal criteria not only blind the evaluator to the breadth of potentially relevant learning, but more perniciously, there is a circularity between established criteria and the content that is taught. As teachers are themselves evaluated based on their students responses to questions based on specified criteria, they focus more and more on these criteria, which unfortunately remain isolated "facts" and do not adequately represent the rich landscape

of any given topic or domain (Figure 6). “Knowing” a landscape, ie. adequately navigating through parts of the domain that may not have been explicitly presented, is an entirely different skill than being able to describe selected “locales” in that landscape as determined by assessment criteria. Setting up activities or exercises that lead to an exploration of the landscape, and subsequently asking a few sample questions that reveal whether or not the exploration has resulted in understanding is a different sort of teaching.

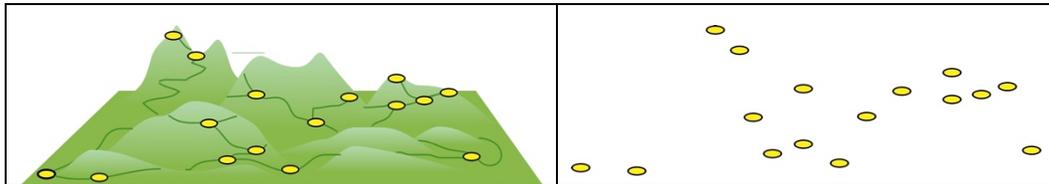


Figure 6 A domain of knowledge that may be learned through open exploration or a landscape, or based on points in that landscape as represented by formal assessment criteria. Even if the logical “paths” are represented as formal links, much of the topology remains unknowable if learning is based on the criteria.

Questions intended to determine knowledge are of course always only samples, they cannot reveal a full knowledge of any domain. The competence for adequate conduct is always only partially revealed in whatever circumstances arise, including those circumstances that are intended to reveal this; ie. tests and questions. In order that a student may reveal how well they know a complex landscape, assessment questions should be made as invitations, be open ended, and be responsive to what the student says. This of course requires that the assessor has mastered the relevant domain.

Assessing learning

As an observer attributes knowledge based on an assessment, so also an observer attributes learning as an expansion in the domain of adequacy of conduct. Whenever we claim that some animal or person, including ourselves has learned something we are of necessity making a comparison between behavior at different moments. We are claiming that the being now acts in a manner that indicates that its behavior in some domain is “better” than before. This was also the case in the experiment with the kittens; the kitten able to experience that its visual sensations related to its movements learned appropriate motor responses to new “test” situations that the other kitten was not able to do; it did not “know how”. Given the cultural context for these experiments, no notice was given that the experimenter was making an assessment that learning was taking place, and that the learned behavior was better for the organism. Such notice was not relevant to their work, nor was it particularly relevant to my earlier comments on circularity.

Learning is an attribution made by an observer. Attributions are operations in language in a matrix of relations. Many of these relations are not be distinguished in language, even when acted properly. Indeed it may be that relations that flow easily do not readily result in a distinction. Perhaps it is when some dissonance or lack of coherence is sensed that a reflection on this discomfort leads the creation of a distinction concerning adequacy or inadequacy.

I think it is reasonable to claim, as per Ashby's law of requisite variety, that the complexity of the learner is always greater than the domain of knowledge that the learner generates. This brings me back to the issue of assessment; namely an assessor is looking at the domain of behavior, not at the domain of the constitution of the learner. Thus the assessment is about a relation between learner and context, not about the learner. Consequently the assessor should take care to determine in what domain the observed behavior is relevant, ie. in what domain does one observe that learning is taking place. In various seminars Maturana has spoken of "listening for the domain in which what the other says is valid" – I think this has particular relevance in a situation that demands evaluation of learning.

Observing for Learning

These kinds of reflections led my friend and colleague, Kathleen Forsythe to develop an assessment procedure for elementary and middle school teachers. In this approach, called "Observing for Learning" (Forsythe K. 1990, 2003) teachers and parents, and at an appropriate age the students themselves, are asked to reflect on what has been learned. In contrast to asking whether particular "facts" have been learned, this approach keeps the assessment open and relational. Observing for Learning does not preclude a wider perspective by the teacher or parent as to what remains to be learned in any particular domain; and this wider perspective can be used to encourage or direct the student in his or her further engagement with the material. Similarly, a more mature student, one who has attained some skill in reflection, will both implicitly and explicitly compare his or her own understanding to that of others; whether in conversation or as presented in various resources. Observing for Learning is now used explicitly by the B.C. Ministry of Education supported SelfDesign Learning Foundation⁸ program with over 1,500 elementary to high school students enrolled. I myself have been using a variant of Observing for Learning in teaching at a Master's level at a University; though I have termed my open-ended essay question "Insights and Ponderables."

One may question whether such an open-ended approach is "fair" and whether it does not take more time and energy for the teacher. I contend that the notion of "fair" in the sense of treating everyone equally is not ethical; people are not equal. Treating all students in an emotion of love, with a teacher's commitment to each one's learning, does not imply identical actions. And yes, it does take more time and energy; and perhaps we should recognize that the teaching aspect of an education program is a larger social commitment than some of our schooling systems acknowledge. An assessor, including a teacher giving grades, must also recognize the role they play in a cultural context; for example future employers of graduates should be able to rely on the assessments made. For this function I contend that a broad, open assessment can offer far better guidance than one based on

⁸ "All parents will remember what it felt like when they realized that they had to interpret their baby's action in order to understand what the baby wanted. Parents have been observing for learning ever since. What the SelfDesign Learning Community intends to do is to help children and parents become aware of observing for learning and, through reflection, to deepen in understanding of the natural way of learning." (SelfDesign Learning Community website, 2011) <http://www.selfdesign.org/> Retrieved January 22, 2011

formal criteria. (There are of course concerns about ensuring, and therefore assessing the competence of the assessors, too, but I wish to get back to the main impetus of this paper)

Learning and Intimacy

In all the situations I have observed, or can imagine, the assessment of adequate conduct with respect to a domain of knowledge implicitly always rests on the observer's view of the fit, intricacy and coherence of the relations between the learner and the domain being assessed. The other aspects of intimacy I named above (fluidity, intensity, reciprocity, dimensionality, reflection and care) are relevant according to circumstance. Thus the observer is assessing knowledge based on an evaluation of the intimacy of the relationship between the learner and the domain.

Learning happens with continued engagement under changing circumstances, with the result that the domain of knowledge expands. The quality of that engagement, thus the intimacy of the engagement, determines how the domain of knowledge grows. At the same time, as the domain of knowledge expands, the experience of intimacy also expands. As the experience of intimacy expands, the relevant domain of knowledge becomes more attractive, or comfortable, or liked, and if nothing countermands this, the living being will seek out that domain. Since conditions in any evolved domain are always somewhat different, or in my earlier metaphor, the landscape is inherently unlimited, continued engagement with the domain leads to a greater domain of knowledge.

Perhaps as a result of a schooling system that demands particular conduct in a particular order at a particular time, many people have associated discomfort with learning. This obscures that most people (and most likely other mammals) feel well with, or enjoy, an autonomous experience of expansion in what they do and how well this fits their circumstances. Learning is a pleasure, and the pleasure becomes increasingly compelling as the domain of knowledge that is generated expands. Anyone can attest to this in daily life terms; people enjoy being competent, and they enjoy the pursuit of further competence; whether that involves a domain such as history, fashion, opera music, actors and their movies, or nuclear physics, or whether the competence is a skill such as playing the violin, repairing engines, programming computers, or snowboarding. When someone becomes deeply engaged in such expansion, we see this as "following their passion." This is a circular relationship; where increased pleasure through expansion leads to greater engagement which leads to more expansion and more pleasure. Learning naturally follows on learning.

For humans learning any domain can be an extended process, given that it takes something like 10,000 hours to develop expertise in a domain. The science journalist Malcolm Gladwell (2008) cites a number of studies ranging from hockey to music and programming skills where the top experts turn out to be those people who have managed to acquire their 10,000 or so hours of practice by an appropriate time in their careers (and at an appropriate moment in history). Without such passion, expertise is not achieved. Although that number is a simplification (Ericsson, 1996) – it still indicates that people do become so passionate about their learning that they will devote the equivalent of 3 hours a day of intensive learning for a decade in order to master a domain. Since expertise is the result of a deep and durable engagement, we cannot each one of us be

experts in many fields. Fortunately people happen to become interested in different domains, which results in a bio-cultural diversity as relevant as any ecological diversity. Further, bio-cultural diversity is also lived by individuals; as most individuals do develop some competence in many fields in which they do not claim expertise. This too is socially relevant; as cultural diversity would not be possible without adequate connectivity. I think adequate coherence among domains of doings is achieved by individuals who effectively intersect domains by engaging in adequate conduct in several domains.

In summary I can from one perspective say that learning is a path of increasing intimacy, and from another that the greater the intimacy of a relation, the greater the opportunity for learning. Evidently this is a circular relation, as is the case for any relation abstracted from a systemic matrix of relations – though sometimes the circularities may include more intermediate steps and each step may be influenced by many relationships.

Teaching

Teaching “about how someone thinks” is never as effective or compelling as teaching what I know. As the student learns the teacher, a pedagogy that treats a domain of knowledge as an object to study rather than a landscape to live in is distant, there is little opportunity for intimacy with the substance. To the student such a teaching feels second hand, which in fact it is. Thus while I always give credit as to the source of the ideas; and provide references, what I teach is what I know, using illustrations, examples and explanations that are meaningful to me.

To be effective, a teacher must know the landscape of the domain being taught in both an explicit and implicit fashion. There will always be memorable guideposts that can be communicated in succinct phrases (or “chewy” statements that yield intellectual nourishment as they are actively engaged with) – but one can never directly represent the entire richness and topology of a topic area, a multidimensional landscape. The student must construct this for him or herself. This can of course happen alone, but if the teacher is to engage in teaching, he or she must know the landscape thoroughly enough that s/he can see where exactly the student is, what the student has found, what the student is looking for, or how it has come to happen that the student feels lost. This kind of inarticulate familiarity, or deep knowledge of a landscape is always grown through exploration. It cannot be conveyed simply through analyzing or describing the ideas of others. The teacher has to be present in the domain that he or she knows in order that the student can learn the teacher.

Constituting Worlds

Finally, a note about whether all of what I have written is “so.” From the perspective of the ontology that I write within, that question is not relevant as stated, namely in accepting the explanation of the biology of cognition as valid, I am also included in that explanation. I am in reciprocal structural coupling with my medium and accept that I can only speak from what I have constituted as a world, even as that world is the explanation of itself. There is an inherent tautology in this, but tautologies are only impermissible in the domain of a logical argument, indeed they only arise as an artifact of logical rationality.

The relation between myself as an observer reflecting on myself as an observer is represented in Figure 7. In the first instance one observes the world through the perspective of some explanation or understanding. In the second level one becomes aware that this understanding also constitutes an ontological and epistemological perspective; and with an imaginative leap, one realizes that one can also reflect on at one's reflection. In this leap an apparent infinity arises, and one comes to an abrupt understanding that there is no "out", one can never step out of one's generated world. However, at the same time, one can both remain grounded in the praxis of living and treat that grounding lightly, without the attachment that pertains to an un-reflected view of how world are constituted.

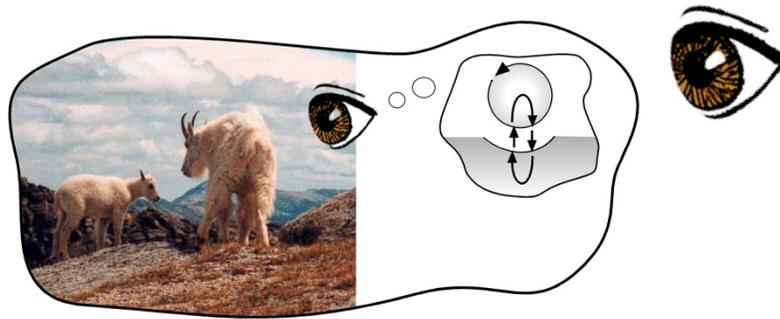


Figure 7 An observer reflecting on themselves as an observer with a particular conceptual understanding of what that observer experiences as seeing.

Hence in common with constructivist manners of thinking, I accept that we can make no claim to an external truth, only to our coherence with our medium. As our medium is physical, biological and social, this coherence must be adequate in all these dimension for our living. Yet the adequacy of the world we socially and individually constitute, always grounded in the possibilities of our biological constitution, is generally measured in terms of the generation that lives it. Sustainability of our species is not necessarily inherent within all the worlds that we constitute. However, some of these worlds are more livable, more conducive to a socially and ecologically responsible behavior. Further, not all of our constituted equally comfortable to live, as each offers different degrees of wellbeing.

I like very much the simple and evocative way that Wade Davis talks about how our worldviews affect our world, and I will end with a quote from his book, *The Wayfinders*.

“A child raised to believe that a mountain is the abode of a protective spirit will be a profoundly different human being from a youth brought up to believe that a mountain is an inert mass of rock ready to be mined” (Davis 2009 p.123)

