Science Into Technique

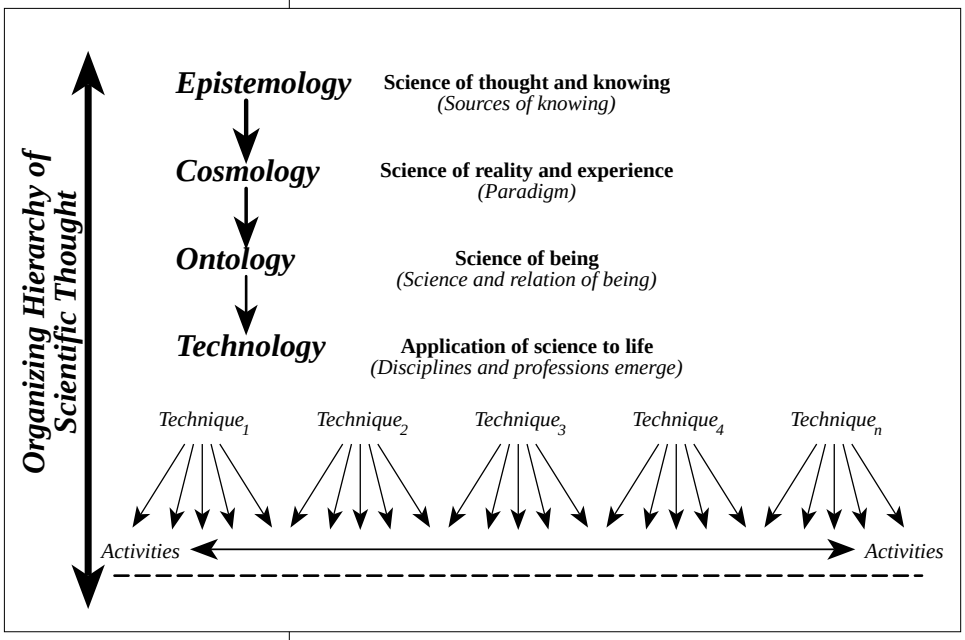
A Systems Research and Development Process for Organizational Science

by Carol Sanford

The work in organizational effectiveness in American industry today is primarily developed at the level of technique or program. As a result it has no real linkage to its science and cannot therefore be creative and evolve its approaches. To work with techniques means that the primary design work is asking, "what is the manner in which something is to be done". The evolution of the discipline of organizational effectiveness is proceeding in this manner and as a result organizational practitioners seek to improve through borrowed/copied techniques or at times the development of techniques. Work to improve the effectiveness of organizations needs to be drawn from a hierarchical scientific approach that makes it possible to actually produce continuous development and regeneration in the processes of organizational effectiveness. This is, after all, the business of organizational effectiveness, that of evolving organizations to new planes of effectiveness. The source, the creation of innovation in organizational effectiveness itself, must operate utilizing the same standards. Organizational effectiveness practitioners need research and development processes from which to continuous evolve techniques. In the following diagram is a suggested model for such an endeavor. What follows is an explanation of the working of the model and an example from a developmental approach to organizational effectiveness.

Up the Down Hierarchy

Most people only experience a hierarchy of science at the level of *technique* or *activity*. With little effort, we can usually describe the technique that is embedded in the activity. Usually the question "how" gets us to this thought. For example, when we see a mother correcting a child, her technique may be one of *questioning* to help the child see an error in behavior or it may be by scolding or spanking. In business the number of courses available to improve our techniques are innumerable e.g.. time management, problem solving, listening skills, photography, and metal welding to mention only a few. We spend most of our improvement efforts (which are a relatively small part of our overall effort) trying to improve our techniques (our functioning). It is actually quite difficult to gain anything really new or innovative from this approach. Without a *technology* to draw on, we are confined to trial and error in our application of techniques.



Technology

What a *technology* adds to technique is a set of interrelated concepts that evoke consciousness of the scientific foundation from which it is drawn. Here we now have available a "whole" source of rich ideas. For example, the fields of manufacturing, dentistry, medicine, management, mountain climbing, or parenting employ one or more technologies—each of which is whole in and of itself but may also have bridges or connections to other technologies in the same field or other fields.

From a technology we can look at how the technique we are using, fits with other elements and how it may have been generated and or may be evolved. This makes it possible to not only extend one's improvement possibilities but to work from a technology and formulate a completely new technique. This can happen only when a whole perspective is the window through which we look, and seek to understand what does exist, also enabling our seeing what does not yet exist. We are then enabled to ask the question, "where else has science not yet been made applicable?" This question is the source of new products as well as new ways of thinking.

Ontology

However, even a *technology* is limiting regarding the ability to improve and create a new approach without a whole perspective from which *it* can be viewed. Providing an appropriate whole which we use to understand a technology is an *Ontology*, or the science of understanding the beings and their nature—what they *are* (individually and collectively), their purpose, or their role, place and meaning in life. In most cultures, this emerges in the philosophy and religious teachings and writings. Ontology is also the science or study of the interactive nature of entities and the relationship of beings to one another. It actually attempt to understand the kinds of entities that may exist (abstract and concrete) and to make choices about which entities we should admit into thinking systems and language systems and which to exclude. Ontology also attempts to examine the role of such entities and role relationships on a planetary scale. For example, one ontology is referred to as "teleological" or the study of purposeful behavior, an idea developed by Teilhard deChardin in Western Philosophy. An ontology is often overtly integrated or related to daily existence, but not in all cultures. For example where ontology is discussed in the culture and explicitly acknowledged, as in Tibet, (as in Yoga philosophy and Buddhist spiritual practice) the ontology tend to be used directly to develop application to technology. Medicine is practiced by spirituals leaders. In Western culture ministers are usually engaged in other work only as a means of livelihood with the real work, their ministry. Of course, we can see examples of this type of integration by some individuals even in Western Culture.

What an ontology provides us is a way to answer the question "Why do we exist" and "what should be the nature of our life efforts?" This is representative of a teleological view, of having and pursuing purpose. If we believe our purpose is to "be happy and prosper" this leads us to pursue our discipline or profession with a particular cause or approach. If we believe we are here to "serve the role of relieving the suffering of humankind" we will pursue our profession and its technological application in another manner. We might possibly even choose a different profession to pursue. Examples of differing ontologies might include; the existentialists of 19th Century Western Europe, the Fundamentalists of the "Bible Belt" in the Southern United States, the Greens Party in Germany, or the Republican or Democratic Party of the United States. Without seeking to condemn or approve of any of these groups, it is possible to see that values are embedded in their ontology and this leads them to pursue life in a particular way—and frequently to ask or force others—to comply, because their ontology gives life a particular meaning for them. In fact, much research indicates a true loss of life-force and productivity for those who have no connection to an ontology—philosophical or religious.

Now how does all this relate to technology? When we are seeking to apply our technology, we are usually unconscious of the ontology out of which it and our approach were formed—or that it was even formed based on an ontology.

Let's take the example using Western Medicine and contrast it to Eastern Medicine to see how, in fact, an ontology influences the development of a technology. The technology of Western medicine is primarily hardware and machinery, basically used

in a diagnostic way, followed by intervention therapy. Western medical technology is highly developed and converges almost exclusively on treating the disease or symptoms of the body with the introduction of externally administered and external derived sources of therapy. This is based on the ontology of humankind as being at the mercy of his/her external environment and on a separation between humans and their environment and seeing humans as primarily physical beings. Almost no attention is paid to the "inner" self, the mental or emotional components of the whole being; that is left to other disciplines and technologies. In most Eastern medicine, the person is treated with consideration for the spiritual, mental, emotional and physical elements and their balance. The diagnostics are done with very little invasion of the body and treatment is often extended over time and is not as invasive as Western medicine. Eastern cultures are based on an ontology that is essentially rooted in a value for evolving the inner self and the consciousness of the inner state as the primary source of physical health as well as a spiritual purpose of life. Believing as they do, in life as existing in different physical forms which reincarnate repeatedly and carrying with the soul the results of deeds in previous lives, means their technology must include a way of transforming these energies from previous lives and that it is not imperative that life preserving measures be taken to sustain the form of an existing body structure. In most Eastern societies development of healing technologies is primarily focused on the development of mind and spirit rather than on treatment of the body. With these different perspectives emanating from differing ontologies and meaning given for human life, medical technologies have evolved quite differently.

We must be able to be conscious of and understand the ontology from which our technologies are derived; it is then and only then that we can find it possible to improve and regenerate our technology. It is further possible to extend that evolution if we can explore and seek to understand the ontologies of others and seek to understand their possible application. We can gain some of this by genuine exploration of other whole technologies, though the tendency is to explore only techniques as we see them being applied. If we do not, however, add the context of an ontology we are at risk of sinking into application of technique and being captured in a mechanical practice of that technique.

Cosmology

To actually be bound to the true foundations of science in our technology however, we must further seek to explore the *cosmology* from which our own ontology has grown. A personal *cosmology* usually does not come from one's own discovery or study but rather through a lineage of teachers and family members who have passed these ideas down to us. Cosmology is the study of universes, and models of the working of the Universe. It tends to be undertaken by science, philosophy, religion and the arts as they seek to gain understanding of what unifies all life and what is fundamental to life. Cosmology is the science and spiritual work of seeking to understand reality and to explain the events and situations we experience in the process of living. As a science it is the study of large scale structure of the Universe, drawing on knowledge of other sciences, disciplines and branches of learning to assemble a world picture. In modern times, cosmology has become, in most fields of science, the pulling apart of the Universe into detailed bits and pieces through specialties and sub-specialties. A cosmologist endeavors to put the pieces together in order to see the picture on the face of the completed jigsaw puzzle. A similar search needs to be a part of the work of organizational scientists who are actively pursuing innovation in organizational design and evolution, although staying abreast of such learnings is no small task.

Cosmology, at a process level is one of making masks, maps or models. We can't see the Universe or experience it directly, therefore we must represent it in some way to be able to study it against the happenings we experience. The cosmology we each have seems so real, we have no idea that we have mistaken the mask for the face or the map for the territory. (Korzybski: 1933). Actually a cosmology tends to first be invented, then modified in the course of time as knowledge advances, and is finally discarded as being an incomplete explanation of the Universe.

The purpose of life in Eastern cultures is linked to an ontology that tends toward being essentially rooted in evolving the inner self and the conscious-

ness of the inner state as the primary source of physical health, we should be able to find a basis for this in the cosmology. The cosmology must have a similar working. And the more material search of the West to produce happiness should also be found in its cosmology.

A cosmology can be studied and understood, usually, through a body of laws or doctrines on the "Natural Order'. Each cosmology has a way of describing or depicting the relationships between space and time and other phenomena such as potential and actual and the place of abstract concepts like life and death.

To get a flavor for how cosmology does evolve, we can look at different periods of history. Major revolution or eras seem to have been marked by changes in Cosmology. Examples of this are fairly easy to find since cosmology seems to be the oldest of intellectual enterprises.

Among primitive humans, the presence of cosmology was expressed as Magic taking the form of spirits with motives and powers over the World. These spirits were fashioned in the image of humans—human emotions and thoughts were projected into nonhuman phenomena, as the guiding force behind activity in the physical and biological world. We still have cosmologies available in children's stories, and in some "primitive" parts of modern cultures (e.g.. Voodoo in the Caribbean).

In the next era, the storehouse of cosmology is found in mythology. The power of supernatural beings grew and became awesome. This was just prior to the creation of science as a discipline. Myths can be found in every culture—Sumerian, Greek, Judaic to the Norse, Celtic and Mayan cultures for example. They each portrayed a version of humankind's early views of the Universe. Joseph Campbell (1968) describes this period of our history as having an anthropocentric cosmology—predicated on humans being of central importance in the Universe; the Earth was viewed as the center of the Universe. This reference to myth continued into the period of Aristotle ($4^{th.}$ Century B. C.) and the Middle Ages ($5^{th.}$ to $15^{th.}$ Centuries) with an integrated cosmology in the Christian, Jewish and Moslem cultures. The cosmologies were integrated in the sense that it could be found simultaneously in the religion, the philosophy and the science.

This Earth-centered cosmology was to be shattered later in the $15^{th.}$ Century. The Copernican Revolution fulfilled the earlier Greek projections of the Universe actually being a Sun-Centered Universe around which the Earth and other planets revolved. This discovery changed the physical scientific view of the Universe, but the biological and religious view continued to hold humans as being descendants from a hierarchy of Angels and other divine forms who ultimately move into lower forms of life on earth. Humans were regarded as a link between Angels and the inanimate worlds—having dominion over (i.e. control of) the lower worlds, as higher worlds had dominion over humans. This allowed human beings to retain some form of central importance in a Sun-centered Universe of cosmology.

With the Darwinian Revolution, even humans were dethroned. This period was the era of the rise of Science ($17^{th.}$ and $18^{th.}$ Centuries) as a discipline separate from philosophy or religion.

In recent times, we have acknowledged that we have minds into which information pours and out of which we construct cosmologies—masks or maps that we devise by theorizing about things observed and experienced. The danger we face of course is that any cosmology is devised and invented by human beings which stand at the "center of the Universe" metaphorically speaking as they invent these cosmologies. We must leave this dilemma to the next level, epistemology, to help humans confront this problem.

Even as we speak and read, cosmologies are in motion and evolving. The results of work leading to Nobel Prizes is frequently based on the development of new "proven" theories on how things actually happen or work on a cosmic scale. For example Einstein's work shifted our cosmology about how light travels and about the laws of gravity as has the recent work of Nobel Prize winner Prigogene and deceased University of California Professor Jantsch on the second law of thermodynamics. In spite of their discoveries, however, physics textbooks in basic courses still describe the Universe as "running down" and as becoming more and more chaotic, even though Prigogene's and Jantsch's work says this is true in a more limited sense for some phenomena. It is sometimes many decades or even centuries before the changes in cosmological theories and phi-

losophies by scientists can impact the average person in a meaningful way. Another example is the work of Rupert Sheldrake, a British biochemist whose recent work has caused a substantial challenge to the work of Charles Darwin and B. F. Skinner on the subject of evolution and motivation. Even though the some scientific community gives awards and credibility to this new work in *field theory* which refute the linear or sequential assumptions of Darwinists, and provide a more geometric and non-spatial view of evolution, these theories are again not a part of the teaching in universities on understanding change or species evolution. Unless we study the learnings on our own and explore other cosmologies, we will be unable to bring them into our own ontology, probably in our lifetime, nor will we be able to make them meaningful to us. In that case, these ideas can not reach our technologies and professional disciplines.

If on the other hand we place a standard on ourselves to keep current in our cosmological thinking, to keep testing it by engaging with the thinking developed in these realms, we can continuously and more rapidly break the veils of "outdatedness" and "restrictedness" with which we pursue life and work. Even more importantly, we can enable others as clients, colleagues, students, or subordinates to bring this rich world of thinking into a brilliant world of reality. Without this, our purposing is bounded by what we can conceive of now. In fact on days we feel like all the creative ideas have been discovered by now, it is helpful to pick up a book or article written from a cosmology perspective. Without this continually opening of cosmology into the elements of our ontologies, our use of ideas becomes dogmatic and we lose our own source of growth. Without technology uniting with cosmology, we are restricted to copying others as they innovate within their technology. This is the role a Research and Development organization often plays in chemicals, electronics or physics based industries. But this must be extended to organizational disciplines of management and joining people with their work.

Epistemology

It would seem, surely, that three levels of hierarchical abstraction above technique would be sufficient to provide thinking space for continuous regeneration, without epistemology or the science of thought and knowing. And it is sufficient for the consumers and users of technique or technologies. But for those who claim to be on the leading edge of technological evolution especially in organizational "science", it is imperative to be familiar with and make some use of the thinkers in the science of epistemology.

Epistemology explains to us the process by which we know what we know, and the processes by which we allow ourselves to know or change what we know. In Western culture for example, the majority of people believe we know (1) through our senses, (2) through our teachers (words—through our senses) and (3) through our experience —which is acquired through our senses. This has provided us in Western Culture with a "so-called" Scientific Method. This method of seeking knowledge requires that knowledge be derived from observing the world in such a way that the observer is no longer completely engaged with it and can, in a detached way and from outside the observed phenomenon, determine what is fact. The attempt is to remove personal bias and to be systematic. The observer admits into knowledge thereby only that which can be picked by the senses or by instruments. No internal impressions about the subjects are accepted since they can not be screened for bias.

If we explore other epistemologies we find that some cultures believe we "know" through many more means than our senses and can expand the way we can learn from our experience and can even affect how our senses take in learning. For example, some cultures believe that there are "records" in a nonmaterial form that hold all the knowledge that exists from the past and even for the future (time is nonlinear) and can be known to us directly, where other epistemologies say it must be passed through ordained teachers (e.g.. The Pope, Swamis, University Professors). Some believe you can perceive the future, others only the present. We don't tend to think of these as other epistemologies that differ from ours but instead as just fallacious ideas.

Some ideas that may be more plausible or acceptable in the Western world (in the sense of being closer to our epistemologies) come from the works of Gregory Bateson, anthropologist of some renown. His research suggests that our *habits* actually build

and promote our personal epistemology and because whole cultures share many habits, they tend to form a cultural epistemology (1987). Therefore to allow in anything new we must disrupt our habit patterns—or even a whole cultures habit patterns. A new capability is needed here. It might be called "learning how to learn." Our cosmology tends not to include this category of capabilities. Without looking at epistemology, we have trouble challenging the way we know the World and learn about the World.

At the level of epistemology it becomes difficult indeed to separate the sciences from one another and to separate science from other disciplines. Our language affects our view of the physical world (e.g. we have a subject acting on an object, without a language for simultaneous reactions); our view of the physical world (physics) affects our philosophy as well as our view of how life can form and evolve (biology) and vice versa.

Knowing or thinking is "prior to" all science, philosophy or religion. Without consciousness of our process of knowing we cannot "be" scientists or philosophers, or linguists or religious scholars, but instead we have a science, a philosophy, a language and a religion. We cannot improve it or our connection with its cosmology.

Working of the model. Let us take a couple of epistemologies and see how they influence cosmology and our ladder of hierarchy. The major form of acceptable knowing in science in the Western World is the "Scientific Method" (and disciplines which extrapolate from science; e.g. economics, psychology). It is a method that is based on an Aristotelian logic, the same logic that provided us with syllogistic reasoning (e.g. All animals are mortal, man is an animal, therefore man is mortal) which was extended into most human sciences by the logical positivist. The "positivist" says that nothing can be accepted as truth or as having meaning unless it can be verified with the senses by an "objective" observer. We can explore how this contrasts and works with other epistemologies which do not have the same premises. For example, western conventional science states that only if a hypothesis can be verified by a third-person form of inquiry can it be considered science. This form of inquiry excludes, of course, the first person forms of inquiry that look at our own consciousness which comes from a different epistemology. As Searle (1992) points out, we are always working within certain traditions that make certain questions seem the right ones to ask and certain answers seem the only possible answers. The era of quantum mechanics has brought consciousness back into the accepted set of questions and an understanding that the researcher influences the results no matter how well controlled the experiment may be. This evolution in epistemology is creating a new relationship between cosmology and epistemology and causing fundamental assumptions to be called into question in science. As we come to believe new realties or truths are possible and as new "truths" are uncovered, we evolve the possible ways we can know about things—and on and on.

Let us imagine for a moment two different cultures on two different continents who believe in different ways of knowing. One culture knows the world through the impressions the senses can observe when taking an object to its most elemental components e.g. dissection. The other culture knows the world through becoming one with something and trying to experience the "isness" of the whole of something. This is the setting when a young Peace Corp. volunteer entered a small village to teach biology to the native children in Tanzania. After dissecting a frog one day and describing all the muscles and organs to the class so that they could "understand" a frog, he was confronted by a local elder who offered his way to understand the working of frog. He set loose a second frog destined for dissection and crouched down in a frog-like position and began to move his head and body in synchronicity with the frog. The native elder paused and looked around as the frog paused, and hopped as the frog hopped. The elder increasingly joined into the experience of "frog" with the frog until the frog finally hopped off into the bush. After many minutes had passed in the becoming one with the frog, the elder described what he had felt happening in his body and "mind" as if he "were" a frog. He reflected to the young volunteer that the young man understood the components of frog—its muscles and organs—while the elder understood the working of frog—its froggy moves and idiosyncrasies as a unique frog in its species surveyed in a given environment. He also added that in the native way of knowing about "frog", the frog lived to produce more frogs. Neither is a more "right way" to know;

each leads to different knowings. The way of knowing about the working of frog could be enhanced further by using a CAT scan machine. The CAT scanner works to "X-ray" a living entity while it is alive and see the muscles and organs as they relate to one another and to their environment. This knowing gives another way of understanding how something is working and what the relationships are among various systems and structures.

The cosmologies that can result in these different ways of knowing lead into different ways of explaining how the worlds works. In the "dissection" model, the view of the world is more static and fixed in time. The world that is sorted into components and parts tends to be interpreted in isolation from other elements. The elementalizing model allows us to gain knowledge about the function of elements of something. The "being" model sees the world as moving and changing. The world is more related and interactive. Each cosmology is able to provide a perspective that is valid for the development of particular techniques that are unique to particular settings and uses.

In the epistemology of scientific method, the acceptable forms of knowing are prescribed by the senses. The separation of the mind and physical world has been created by observations with the senses which has in turn, by its very nature of using only the senses, has provided a fairly clear and explicated knowledge-base on the physical world. So in the modern scientific world, the cosmology is of a physical or functional one. We have a rich storehouse of knowledge about our physical domain. Our ontology has also been primarily a functional view of the human's role, which is the development of skills in a discipline to accomplish work in the material world. Our technologies have been primarily sensory-based and focused on the material/physical world. It is rare to find reference to a spiritual-world technology or intellectual technology—a means of understanding and creating outcomes in the nonmaterial world— that is accepted as valid in the scientific community. This is primarily due to the lack of third-person observable data that can be replicated by another researcher. Technology development has not included nonmaterial forms of development because they have been excluded from our cosmology by our epistemology. Our techniques, not surprisingly, are action-oriented with emphasis on function and doing. We have very few techniques for intellectual accomplishment and we must go to a church or therapist for techniques for the development of spirit or the spiritual.

In the indigenous African culture visited by our young volunteer and in many Eastern cultures, epistemology includes non-sensory ways of knowing and has led to a cosmology that is material, mental, *and* spiritual. Humans have been seen as having an integrated ontology regarding their spiritual, mental, and material world roles—in a systemic relationship to one another. Therefore these cultures have developed many mental technologies for managing the physical body and many spiritual technologies that are highly developed for managing both mental and physical phenomena. Meditation is one example of a technology being borrowing by the West. In the old Soviet Union there was extensive research, based on a non-exclusive material view, that led to work on mental telepathy that is now widely validated by Western Scientists and for which technologies exist that are considered quite reliable. Technologies of the West are now being widely adopted in the East where the epistemology and cosmology did not guide the searchers to such finding. In each case the cultural epistemology and then cosmology and ontologies, reciprocally, have focused the work that has been done in technology development.

Organizational Science

What does all this mean for organizations? In organizational science we have adopted our science from the physical sciences even though we work primarily with nonmaterial phenomena—the mind, attitudes, and values. We need to begin a dialogue within the discipline particularly regarding the cosmologies and epistemologies we use for developing processes. We need to develop a more intentional science of organization, particularly among organizational practitioners.

An Example: Developmental Organization Science

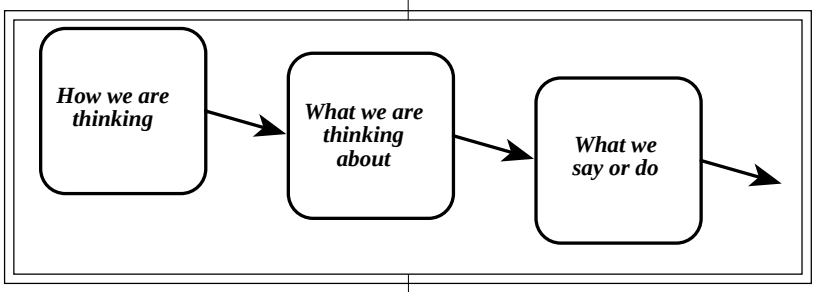
Epistemology of Developmental Approaches

Developmental inquiry, or the process of seeking to "know something" might be understood as the ability to and process of seeing beyond the phenomenal world and into other levels or planes of reality. (Krone: 1977-1994). A different level of understanding of the working of the world is gained by moving from what Edwin Abbott (1984) calls a "Flatland" or two-dimensional view of the world to a perspective that sees the dynamics of the world from escalating levels of complexity and significance.

A simple example is understanding that our actions can be understood and even influenced or improved more readily if we explore "what" we are thinking about that causes us to take particularly actions. The thinking behind our actions or words might be described as a different plane of understanding. Exploring our thinking processes further we can increase our self-managing ability or improve the predictability of our achievements if we can see "how" we are thinking as well as "what" we are thinking. For example, many athletes have found they were blocked at improving performance by self defeating thoughts. In order to change these thoughts they had to have a process for changing how they were thinking. "Visioning" is one such example that has been used to successfully change "how" one thinks different thoughts, and ultimately has different behaviors. Educating ourselves regarding mental processes is foundational to development and improvement—and to a Developmental Philosophy of work design.

There are many different schools which offer ways to view the world from different levels of reality. Peter Senge (1990) points to the idea that *structure* generates *pattern* which leads to particular *events*. For example, the way we structure highways generates particular traffic patterns which result in particular events for individuals and groups. In human systems the structure comes from corporate cultures and operating procedures. Nobel Laureate and physicist David Bohm offers a deeper three-level system which moves from what we can detect with our senses to that which cannot be sensed. He proposes a first level that he calls an *explicate order*. This order is the perceived world, based on physical phenomena which are "explicated" or made explicit through our life experience. Behind or beyond this world, however, is an *implicate order* which is the formative source of power regarding what can and does emerge in the explicate order. Joseph Chilton Pearce, in Evolution's End, (1992) uses a metaphor of a hidden projector to clarify this relationship between implicate and explicate order. The hidden projector displays lights on a screen. If we want to see the light show, we look at the screen (explicate-order) and its display, and not at the projector (implicate order). To change the images on the screen we must change what is within the projector itself, not what is on the screen. The analogy does not hold exactly in our world since the implicate order cannot be found by walking backstage. It is a "non-localized" order. Bohm then carries the worldview to a third level, by pointing to a vastly more powerful ordering which produces the implicate order —"a supra-implicate order." Bohm describes this as that which represents the information that guides and organizes the movement of fields or patterns of reality.

Pearce further describes the relationships among these three levels of reality. An explicate order gives rise to our lived experience—that which is in front of us every day. The implicate order gives rise to our personal consciousness or our inner world experience. The supra-implicate order gives rise to and guides the implicate order. In our projector metaphor, the supra-implicate order is the very source of the projector—creator, power source, and operator.



Each higher level of worldview reduces the restraints we experience in being able to understand or come to terms with very complex phenomena and the workings of complex systems. The technologies

that emerge from a Developmental Philosophy contribute to a capability to understand all the levels of reality that are creating physical world dynamics. This capability provides the base from which we can create more whole solutions to problems and more creative product offerings to the stakeholders of our businesses.

Behavioral epistemologies have incorporated the tenet that *reality* is something that is universal for all persons. All reality is seen as observable by the senses and can be experienced directly. This view of reality tends to exclude the inner workings of the mind and emotions and, therefore excludes work human beings can do in regard to management and development of self beyond functional aspects. The sense-based form of reality, as seen by some, also tends to make it difficult for us to see the "reality forming" processes that go on in our minds—unobservable by others and ourselves without the development of the skill to do so. Recent research has demonstrated a "reality" that is highly interpretative—one which is at least partially constructed by the filters and mental models through which we view the world.

Another Nobel Laureate, Ilya Prigogene, described the experience of reality this way: "Whatever we call reality, it is revealed to us only through the active construction in which we participate." Without understanding this we are at the mercy of forces we cannot see.

We get so accustomed to looking at everything with the same set of eyes that we don't see anything different; we are only looking at the objective world, and all "realities" look pretty similar. When we have an insight, we say to ourselves, "I never looked at it that way before", which can be the same as "I was able to take a new perspective and, therefore, see something from a different level." To continually awaken development of ourselves as persons, we need to continue to shift our perspective or worldview. We have the mental capacity to do that. In a developmental model the inner *and* outer world views are nurtured and seen as giving the individuals and the organization the ableness to see more possibilities.

Cosmology of Developmental Approaches

Most human and organizational science approaches are drawn from the sciences of the physical world that explains and deals with the things that run *down* in the universe. They're tended to be numerous techniques available to work with human processes but no cohesive, whole science and technology. (Polkinghorne: 1983, Reason: 1981) The science that has been used to develop the popular techniques for organizational theory and practice has developed from the only science that was unified, the physical sciences in the form of behavioral psychology. (Sanford: 1993, Pearce: 1992) Even the so-called systems sciences have been drawn primarily from artificial intelligence theory which is still highly tied to machines and those sciences which subscribe to those processes which reflect entropy as the natural process of the Universe. (Bateson" 1979,1987). In fact as a society we have come to know a lot about "run down" and entropic processes in the physical world as a result of that focus and study. But there has been no cohesive science and technology that related to non-entropic phenomena, we have been a great deal less knowledgeable about these processes. Many things do run down. But this is only true in the physical world, but it is not true of human behavior and thinking. Energy disperses and goes toward disorder in the physical world, but value-adding processes can coalesce energies and bring order to them. (Prigogene: 1984, Jantsch: 1975, 1980).

Most human and organizational science approaches are able to offer a variety of *techniques* that are packaged together but without a cogent background of value-adding science—the study and development of systems that are negentropic and can run-up instead of run down—to know what is appropriate to human systems and what has been inaccurately (and, perhaps, inappropriately) transferred from the physical sciences based on classically entropic processes. This also means that the ability to work from a cohesive whole science is not possible and therefore an eclectic technology is not behind a set of techniques. Pioneers of Human and Organizational Systems Science and Technologies working as a network of practitioners have developed and now work from a cohesive whole science and from a technology based on universal principles that relate to value-adding processes in the same way that funda-

mental mechanical principles apply to the physical world.

The process to create a developmental technology was founded on the need for a non-entropic process—a value-adding process. Rather than run down over time or proceed from an assumption of entropy in the intellectual domains, these are processes that possess the capability to bring about increasingly higher order to things. Human science and technology, as do all technologies really, start with energies (human energies here) and with thinking in regard to the behavior of energies in a value-adding process. The development of Human Sciences technology has been based on developing the same type of Primary principles of value-adding processes that can be understood as a unified and cohesive whole, as exist in the physical sciences. By understanding these we can understand what drives human action. A developmental approach works from the belief that it is important to learn to manage energies in a value-adding process with the same level of cohesive science that we have been applying to physical energies.

There are three primary fields of inquiry in which developmental practitioners stay current on the research being performed by others as well as do their own research. In some cases they have worked closely with some of the most creative people in these fields. The three sciences are what might be termed integrative sciences since they incorporate several fields that were traditionally regarded as separate disciplines. Living systems science is now examining organisms as whole, living entities—insects, birds, soil and soil organisms, vegetation, human systems, etc.—from a process standpoint rather than a physical/material view. An example is when scientists rather than seeking to understand the parts of a living thing, are trying to understand the *relationships between the parts* as well as the *whole that is created from the dynamics of the relationships* rather than the sum of the physical pieces. This work emerges from a desire to seek to understand the process of "frogness" rather that the chemical and physical components of frog. The second integrative field of science in which developmental practitioners work is neurological and cognitive sciences—which have only come to be a cohesive field in the last 10-15 years although there have been several scientists working to bring it together for nearly 30 years. (Gardner: 1985). This field is unifying the study of the brain, the neural processes, the mental and cognitive processes, and the effect of our various languages on how we view the world. The third field is integrates the sciences of complexity—quantum mechanics, relativity and chaos theory, and the working of dissipative structures. This field may seem far removed from human sciences but its importance stems from challenging many of the assumptions of physical sciences principles that have been borrowed somewhat inappropriately by the human sciences. It provides foundational principles that let us understand why many of the principles we borrowed from Newtonian and Cartesian mechanics do not work well when applied to human sciences. They are particularly helpful since human systems are very complex and need a science that deals with this complexity.

Although is not the intent here to create a science lesson, a few examples from each discipline may serve to see how these fundamental principles of science encourage us to shift how we have viewed working with human systems.

Living Systems Sciences: The systems studied here are "Open Systems", those that exchange energy in a symbiotic relationship with the environment in which they exist. They possess the ability to establish homeostasis. They are found, in particular, when engaging in the study of the biological or environmental sciences. These living systems seek to *create and maintain a reciprocal maintenance relationship with other stakeholders or whole systems in the context in which they do and must exist.* (Bertalanffy: 1962, 1968, Miller: 1972, 1978). This nature of relationship is necessary in order to ensure the viability (i.e. homeostasis) and health of these systems. Since they are exchanging energies, *they effect one another even without being intentionality involved.* (Laszlo: 1972) This leaves both *systems working to ensure homeostasis on the part of each in order to ensure viability of the system as a whole.* (Bertalanffy: 1962). At the global business level this can be seen in businesses working to build relationships with local governments and to adapt to regional and local preferences. Sensitive energy is expended based on the need to monitor the exchanges that oc-

cur between themselves and other systems and therefore enable the appropriate relationship. A heterostatic process evolves when the system determines that laws or principles it considers to be fundamental or inviolable are being challenged. The natural environment suggests a fundamental change in relationships when building takes place where floods or landslides are recurrent. These conditions invite heterostatic processes. Living systems are continually called upon to engage heterostatic processes as in the case where customer and community relationships, forces and dynamics governing the system are undergoing natural, evolutionary phenomena.

Living systems also *improve the viability of themselves and of their species by building diversity or differentiation within the class of which they are a part and flexibility and integration among and with other classes through confronting new and unknown situations* with which they must engage and create a higher order differentiation and integration. (Bertalanffy: 1968, Csikszentmihalyi: 1993).

There is a nested relationship between different levels of living systems where the higher ordered systems include the capacities of the less ordered types. For example the human body is composed of muscles which are composed of cells which are composed of molecules which are composed of atoms; each provides order and purpose for the next. It is helpful to visualize these relating to each other in the form of concentric circles. There exists a *hierarchy of ordering processing which is based on levels of value-adding processes and increasing degrees of complexity*. (Bennett: 1966).

One of the most fundamental principles in the viability and vitality of living systems is that *complexity is selected-out over time. When two organisms compete for energy, the one with the more complex physiology or behavioral repertoire tends to have the advantage.* (Csikszentmihalyi: 1993). Complexity in living systems science is the ability to increase both differentiation and integration. Differentiation is the degree to which a system is composed of elements that differ in structure, being, and function from one another and from those with which they compete. Integration is the extent to which different parts interact synergetically and can work to enhance greater goals than just their own but including their own. For example, if you are buying a camera it is likely that you will prefer a model that, compared to others available, has more unusual features (differentiation) that work together well (integration) and this is more effective for you. It is possible to see that this is preferred by most buyers as simpler devices are eliminated and more complex devices are created, not only in the field of photography. Many paradigms in our Western education and business culture discourage this capability emanating from complexity from being built into organizations.

Sciences of Complexity: These are fields of science that have grown out of the physical sciences as the available principles did not adequately describe the behavior that was being observed in larger and more complex systems. We have worked closely with Erich Jantsch (1975, 1980) at U C Berkeley and David Bohm (1980) of Birkbeck College in London until their deaths in the last 10 years, and Ilya Prigogene (1984) at the University of Texas and Brussels University. Each of these persons won a Nobel Prize for Science for the advances they provided in understanding the principles guiding the working of value-adding sciences. We have also studied the work of Werner Heisenberg (1963) and the many theorists working with chaos theory. (Gleck: 1987, Waldrop: 1992).

Principles that emerge from these sciences and their implications to Human Science:

Newtonian sciences tell us that the world is made up of objects that interact with one another and cause reactions among one another, but are independently existing parts. The work of Heisenberg and Bohm have demonstrated that the application of these ideas to the human sciences and even many physical realms has created considerable confusion and incorrect assumptions about how human systems work. *We have created a way of viewing and interacting with the world that assumes a fragmentation that does not exists.* (Bohm: 1980) This creates an endless series of problems and an inability to solve existing problems because we are working out of a 'fragmented and divided' view of reality. In business settings this has led us to a division of functions, of activities, and of responsibilities, as well as of areas for thinking where reality and nature have no place in recognizing overlap or demarcations. These divi-

sions become as though they were real in our minds and are constantly being reinforced by separate disciplines and divided accountabilities such that we have lost touch with the fact that the divisions are only figments of our creation. For example, in human interactions we can no longer see that what we consider a failing or weakness in an individual is part of a system dynamic of which we are also a part. We see ourselves as separated from one another and as a result have created an elaborate system of accountabilities, responsibilities and disciplinary procedures that are based on a fragmented view of the world. The elaborate system can not work since it is not reality-based. When it does not work, we actually try to tighten accountabilities so "something will not happen again" rather than work from a systems view—undivided and unfragmented—of the *processes* involved and create a different set of dynamics from which a more enlightened behavior can emerge.

Recent research in Biochemistry (Prigogene: 1984, Jantsch: 1980) has indicated that there is a process whereby *systems shift or restructure their existence to a higher order in response to a declining level of order surrounding them*. The systems that are reordering themselves are referred to as Dissipative Structures. Prigogene found that when things seem most disparate, they are on the verge of transforming to a higher order and that in fact a dissipating process is necessary for reordering to emerge.

What is needed? We need to retrain our way of seeing the world to be able to see processes in motion that are undivided in their flow and that are systemic in their design. When we are able to see the working of the world differently, we can then design different work systems and organizational forms. We need to enable ourselves to apply higher-ordering energies to our organizing processes in order to effectively engage with escalating complexity in our environment.

Neurological and Cognitive Sciences: Our current models of education and development of cognitive processing focus almost exclusively on elemental processing, or the processes of parts reduced for study from the whole. (Krone: 1977-1995) The knowledge we have about information-processing comes primarily from studies that are based on physical science—entropic research practices. (Anderson: 1990) This linear and elemental processing mode tends to move our thinking away from seeing the complexity and wholeness that exists in reality because we separate the elements and thereby limit our access to the relationships that exist.

Recent work in the neurological sciences has led to a new understanding regarding the information-processing part of our mind. *We now know that we have the ability to see and understand the systemic elements in a neural network.* The base for this can be found in the work of Stanford University neuropsychologist, Karl Pribram (Pietsch: 1981), on holographic processing. His work explains how the mind can see the elements from the perspective of the whole. This seeing is accomplished through the educating of people to observe their own mental processing and to see and utilize the holographic processing that naturally occurs in the mind. Research at the Institute for the Comparative Study of History, Philosophy, and the Sciences has demonstrated the *existence of a Structural Intelligence that consists of holographic structural representations that are ubiquitous in all process and are a more accurate representation of the workings of the cognitive processes*. (Bennett: 1980) Intelligence from a value-adding science perspective is based on the discovery that *intelligence is something that is constantly in evolution and represents a capability to see relationship among elements, between elements, and holographically in a moving dynamic reality.* This reality is captured through the intellectual capability to see the underlying structures that are inherent in all reality. (Bohm: 1980) *Intelligence requires the working of higher mental energies that cannot produce predictable responses. Intelligence seems to work from a three centered nature of mind — will, being and function minds— each with its own intelligence working interactively with the others and being affected by the workings of the others.* (Bennett: 1966)

What has been called intelligence from the perspective of the entropic sciences when applied to human sciences, is really a set of formatory patterns which will, like a phonograph record, play when triggered by familiar environmental stimuli. (Watson: 1924). Intelligence from an entropic model is defined as the interaction of accumulated knowledge

using special capabilities for processing information. (Anderson: 1990) Intelligence has been used as an absolute measure that can be ranked on a scale, with some people being ranked higher then others. Organizations have carried the idea forward with the notion of high and low performance among members of the workforce.

The elemental mode of information processing, which is our legacy from Aristotle (Berman: 1984, Tarnas: 1991) also tends to condition the mind to interpret reality as being static while the world is actually dynamic. Value-adding science discoveries emphasizes the possibility of creating new networks of neural pathways and working to create what he calls "cortical committees" that can reorganize themselves. (Calvin: 1989) *Our neural network strengthens itself with any repetition including pathways that are more systemic.* With conscious expansion of the variety and differentiation we introduce into our thinking, we can produce a positive impact on the comprehensiveness with which we can view the World. Understanding the nature of our thinking enables us to literally see a bigger, more dynamic world, to process the input from our senses in a different way, and to expand the use of modes other than that of the sensory input. Calvin's work shows that it is not only a matter of the release of neurotransmitter and increased sensitivity of dendritic receptors, which in the entropic science say we are running down in our thinking, but also a matter of new synapses being formed which occurs when certain mental practices are engaged.

Creativity and perseverance in the face of challenge and confrontation seems related to the number of connectivities that can be made among different neural nodes and even more so when the nodes include more complex data and relationships in increasing rings of distance from the physical day to day world. (Krone: 19770-1995) The further out the connections between our actions and their effect can be made in time and space—the more we can include in our thinking, the greater the creative source of potential and the greater the tenacity that seems to emerge to work through touch situations.

Language: In the last 15-20 years linguistic scientist as well as some scientists in quantum mechanics have discovered a very profound fact. Language causes us to view reality in a particular way and also limits significantly what we can see as reality. (Lakoff: 1980, Logan: 1986, Stauch: 1989) Our language offers us no way to express many ideas that are a part of reality and we have a great deal of language that is not representative of reality but we come to see the world this way because we can only speak of it this way. (Bohm: 1980, Needham: 1956, Ogden: 1989)

If our language mirrored reality, it would have no sharp division between *bush* and *tree* —only a continuum of vegetable forms, some larger or smaller, some more or less branching. Likewise, in nature there is no clear break in the geography of "here" and "there", but we speak of these as separate places—divided by some invisible line. We create the classifications. There is no base in reality to account for the prototypes we create in language, but once they exist, they define how we see that reality and provide a basis for communication and even argument over what something is and is not. (Bickerson: 1990)

The association we have come to automatically make with 'subject-predicate' has been transferred to a reality where "an actor taking an action and producing an effect" invites us to see that subjects are always the source of the effect. "She made me mad" is a typical psychological statement that assumes a separation between an action and an effect without consideration of the physical impossibility of one person entering the other and stimulating the triggers and chemistry that results in "mad" in the other person. The entropic sciences hold this to be true however and we have drawn on the laws of thermodynamics, formulated by scientists such as Newton and Bacon. (Berman: 1984) In experiments scientists theorized that an object must be moved by something and to stay in motion requires continuous action on it. We now know through other scientific "discoveries" that this is not the whole truth, and in fact may be inaccurate for many phenomena to which these findings were applied. For example, Newton saw it as necessary to have an external force as a source of motion before movement could occur and could only be kept in motion by a continued external source of force, something outside ourselves. (Sanford: 1994) The idea that an external force is needed has been transferred to many human dynamics where is it not appropriate. For example it has

been transferred to even nonphysical phenomena like motivation. We most often describe motivation as needing or resulting from an external source. Language, even in science, is a paradigm-former and provides a limit on what can be discovered.

This can happen because our language allows us to represent a very small amount of what exists in reality. For example, we have no tenses in our language that differentiate between past events that happened within our lifetime and past events that happened before we were born. We use the same tense for seconds ago or billions of years in the past. The options are very limited. In the Turkish and Hopi languages, verbal inflections allow them to indicate whether a statement is based on personal experience or on information obtained second hand. (Logan: 1986) What is remarkable here is that the number of possible qualities and relations in the world is immense and perhaps infinite. Our language grammaticizes a few of these relations quite consistently, but never grammaticizes the vast majority of them. Language forces us to express automatically a very restricted subset of all the possible qualities and relations in the world. We cannot build other relationships or qualities of expression into the structure of our discourse without creating very long sentences and unusual sentence structures which require the listener or reader to move out of the automatic mode of interpreting. We can only communicate to each other easily what we already know and already understand and only as separate pieces of information and ideas.

It is easily possible to think of examples where the restrictions of language limit what we can discuss and to, therefore, our ability to represent the world differently. In an open systems science or technology, it would be very highly advantageous to have a grammatical item that does not now exist, but if it did would express the relation between wholes and parts. For example when we say a "tree has leaves", this seems perfectly reasonable. It also has branches, bark and a trunk. But if we take all of these away we do not have a tree. It can not exist independently of these things it *has*. But we ascribe the characteristics of separateness to them in the same way we say "Mary has a cold" because we have no language for doing otherwise—no systems language. We have to use an unsuitable item like *has.* We need a grammatical item like *inc*, which means "including as a part of itself" or *onc*, "forming a part of". However we cannot add to the store of grammatical items. We are stuck with the one we've got. As a result we stretch concepts that are purely grammatical , like "possessive" through the use of *ofs* and *haves*, in order to express something that does exist in nature—a part-whole relationship, but for which we have no grammar. The fact that our way of expressing the relationship between a thing and its parts are quite automatic and can not be altered, replaced, or even added to, leaves us with a world view that can only be expressed and—as a result of an expression—only be conceived of in a limited number of ways.

The fact that we can endlessly create new lexicon words—names for things and ideas and not for grammatical items—those which allow us to bring relationships to ideas and concepts, can be seen in our proliferation of ideas and disciplines without a similar drive to bring relatedness to these separated ideas.

Ontology of Developmental Approaches

Most approaches to organizational change are based on modern psychology and its theory of human beings. It is interesting to note, as part of trying to understanding the developmental approach, that psychology has changed quite radically in the last few decades, particularly regarding the view of humans and what they are about. The current modes of studying humans beings can be divided into two chief categories. The first category is the one that studies and works with humans as they currently are or as they imagine they should be. Modern "scientific" psychology mostly belongs in this category. This is more easily understood when compared to the second major category. The second category of study of humans is not from the point of view of what humans are, or what humans seems to be, but from the point of view of what a person may become with personal effort; that is from the point of view of every individual's possible evolution. This approach is more developmental in it's nature in that it is seeking to unveil the potential that is not yet revealed and to develop the uniqueness of each individual to its fullest.

When one is working developmentally, one ask the questions; what does evolution mean, and are

they any special conditions necessary for it? The term evolution refers to the idea of a higher type of humanity, one whose value and contribution serves as a means of their own unfolding. This is different than the physical evolution of the species as spoken about by scientist in classical biology. We are speaking instead of a conscious, intentional, and managed evolution of the intellectual and emotional nature of humankind. The basic belief here is that humans can develop further than the nature with which they are born by investing their own effort. The development is of *inner* qualities and features which are largely undeveloped in modern cultures and which cannot be developed alone.

This nature of development does call for particular conditions, particularly that of working with others who have some understanding of an ontology of potential rather than an ontology of arresting the disorder in the human psyche; with someone who has a knowledge of methods and processes for such work. This knowledge is very important since the ability to discriminate between the processes of the two schools of ontologies is critical and not sufficiently understood by newcomers to the process.

Within this ontology, one of the major conditions for development is to accept that certain capabilities are needed which we ascribe to ourselves but do not in reality have. We deceive ourselves so easily. These new capabilities include the ability of each person to know themselves—both their limitations and their possibilities, which is different than knowing the strengths and weakness suggested by other schools of psychology.

The ontology for a developmental approach sees humans and human organizations as having three brains, each of which do different work. The reptilian brain of fight or flight, the mammalian brain of nurturing and association, and the human brain that has capacity to use judgment and exercise conscious and intentional management of one's self.

Technology of Developmental Approaches

The technology of any approach emanates from a coalescence of our cosmology or world view and our ontology or human view and our view of what entities are real. Since the primary characteristic of a developmental cosmology is systems in nature—it works with wholes and relationship among and between wholes—the technology is based primarily on systems applications. In fact a developmental technology might be called a Regenerative Systems Technology. It is a systems technology because it works with bringing interrelatedness, connectedness and a context to work in a business environment. It is called "regenerative" because the systems that are being studied and developed are not static, but rather are dynamic (changing, evolving) and are able to recreate themselves as is the environment in which those systems exist. The evolution of systems influences the evolution of the technology as we learn and discover.

From the Living Systems Sciences : Technology Elements The Developmental approach has integrated these ideas into a value-adding technology working with businesses to bring more living systems models to human systems. The technology provides processes for working interactively with individuals and teams in a way that seeks to build increasing character to withstand increasingly more difficult and challenging restraints and opportunities as well as introducing increasingly higher order problems with greater complexity with which people are expected to grapple. Our experience is that living in a culture that is primarily working from physical science models has encouraged and even taught people to work in a reductionist way, to simplify by breaking down non-reducible wholes, and to live in less and less integrated society. There is an ancient saying that "the measure of our being is what it can bear". We work on capability to improve the conceptualization of complexity through the differentiation of individual essences, product essence and therefore product offering, and to see and eliminate or redesign processes and designs that work to simplify and homogenize thus inappropriately reduce complexity. As we work to build differentiating capability, we simultaneously work to create the capability to *integrate* across all elements of a systems in thought and action. By the nature of our process and through the content we offer, we work to develop these capabilities leading to increasingly effective complexity management and therefore to viability, vitality, and value generation capability of all systems. This is also the basis of the professional disciplines that are introduced as a way of nourishing

team-based development processes. When people are working to focus on effects and essence qualities desired by stakeholders, the differentiation and integration have a way to come together in the right form of complexity. Without this the organization will migrate over time, toward production of commodity products, homogenization of skilling and behavior, extraction of natural resources at a non-replenishable rate, and simplification of thinking and thinking processes—and then out of business.

We also work to enable people to see naturally occurring, nested relationships that make sorting out different priorities more possible and to work on many levels of a system at the same time. We work to have people see reciprocal processes that occur even without their intention or awareness so that initiatives undertaken become more intentional.

Because our culture has largely lost sight of the need for these capabilities and no longer introduces them universally as part of our education processes and family building processes, it is initially frustrating and confusing for participants, but becomes energizing and enlivening as these processes become familiar, understood, and valued as people evolve.

From the Science of Complexity: Technology elements The developmental technology has processes designed to develop capability to see whole systems, a non-fragmented view of reality, and to see all entities as opening ended in their potential for development; to see everything in process terms rather than as static or as a series of snapshots. There are also processes designed to develop capability to see where entropy is inappropriately assumed to exist and how a level of reorder will occur and how we can enable it to occur in a way that is more wholistic—e.g. when we experience a marketplace where the competitive dynamics are shifting, or when we see an industry restructuring, or when we read that the relationships between unions and management are deteriorating. Any of these may be a dissipative structure in motion, and therefore can be consciously developed or evolved.

The value-adding process technology makes extensive use of relanguaging processes and the structural representation processes to evoke a more whole view of existence. It also includes processes to develop systems thinking capability through the development of structural, associative, and analytical intelligence and to put "in context" the elemental thinking that tends to invite us to see a fragmented reality. (Krone: 1977-1994) The design processes include holographic team structures that reflect a process more isomorphic with reality—unfragmented reflections of the whole.

From Neurological and Cognitive Sciences: Technology elements The developmental technology has processes designed to enable people to see the mental frameworks through which they are viewing the world and to become more conscious of their effect on thinking which can help bring wholeness to a currently fragmented world view. Providing frameworks in a value-adding process is similar to the role played by calculus for entropic process—they cause relationships to be understandable under almost all conditions. Frameworks also require us to use the part of our brain that can see relationships (Krone: 1977-1994) Putting stress on the neural pathways to go in different routings through questions that require a different perspective be taken to conceive of an answer. We do not seek particular answers of our choosing or we would be programming the thinking toward a particular pattern. We offer our own ideas in a way that requires people to have to look at a familiar topic from a new perspective. We are not seeking to gain adoption of our ideas but rather to enable others to learn the process by which are able to continuously seek new ideas.

We use a language form that is called semantic language; a language that speaks to the levels of experience which we can recognize but for which we have never had a language. The processes tend to be of an inner-world nature and relate to values and meaning. It gives us a way to talk about elements of reality for which we do not have words and do not have a grammar. We put sentences together in a way that people have to exercise and build the mental horsepower to hold related ideas together in the mind, since there is no acceptable way in our existing language to speak of such things. We are attempting to evoke more appropriate mental structuring and visual representations of the wholeness of reality.

Summary of Technology:

The search in all modalities is to create a more isomorphic view of reality so we match our actions and activities appropriately to the needs of the real world. The map becomes increasingly more representative of the territory. There is also a need for a way to talk to one another about the part of the experience of life that is driving us—unconsciously—as people and is driving complex market dynamics but cannot be talked about now and so cannot be understood and joined with. There is finally a desire to increase the intelligence of any organization and the creativity and will in regard to an increasingly complex competitive environment.

Technique

Techniques in Organizational Effectiveness practice tend to fall into three categories, each with a different purpose (though this is rarely acknowledged) and a different result. The first type is that of the *Presenter*. The intention here is to guide the listener toward achieving a particular outcome in regard to particular material and ideas on the material. There is a set of techniques that are used and can be found in motivational speeches, and in large or small meetings to share information or influence decision making.

The second set of techniques are part of the repertoire of the Teacher. The intention here is still specific in regard to some particular subject matter, but the teacher is attempting to relate to current capability of students in regard to an ableness to understand subject matter. So the techniques tend to be based on ensuring the transference of ideas and processes and will be designed to meet a group where it is.

With the third set of techniques, those found being used by the *Educator*, the processes change quite significantly. The educator works to stay true to the science with which they are engaged and the universal nature of laws within the science as carried into a technology. Educators demand that people come up to the level of capacity it takes to grasp the science. The educator demands the mental capacity be exercised and developed to grasp the science, to put in the effort to reach for what is not understood. This tends to raise the level of capability of the student overall as applied to all subjects and as regards thinking capability.

Each one produces a different level of capability and is aimed toward a different purpose. With the *presenter*, the aim is to produce a person who can carry out the presenters ideas and is aimed at effecting a particular *performance*. The presenter is after your vote, your money, or your agreement.

With the *teacher*, the aim is to produce a person(s) who understands the view presented by the teacher of the subject matter with the hope that the student can generate their own applications limited only by their own capability. People have *improved knowledge* with the possibility of application to a variety of arenas. This set of techniques is used primarily in schools, training, and skill development.

With the educator, the aim is to produce a person(s) who understands the knowledge and technology from which they are and will be working (e.g. value-adding or entropic) and from which they can extrapolate to different subject matter in order to generate a variety of different outcomes. The greater intention is to produce increased intellectual capacities from the processes, which can be used to continuously extend the science and technologies on one's own, rather than be limited to the knowledge provided by the teacher. This develops understanding and capability, including capability to learn and develop.

One of the most striking differences that can be seen in a developmental organization is the technique by which the organization is engaged in learning and developing. There must be an essential shift however, because the training and development processes of other technologies dictates a particular path; the developmental technology possesses a direction but follows no specified path, a live decision is made at each juncture encountered.

The developmental techniques are more *Socratic* in form:. Developmental techniques are based on the forming of and exploring of increasingly more complex and higher quality questions. There are no trainers/consultants who provide answers but *Resources* who increase the organization's capability to develop and explore questions that can lead into new arenas unexplored by anyone.

There is a pursuit of *Equality in Discovery and Development*:. Managers and workers at all levels of the organization are brought together to be challenged by and engaged with unfamiliar frameworks

and approaches to thinking. Everyone becomes open, no matter their level, to developing their thinking and their being together versus the cascading method of training from other technologies. It creates an atmosphere that connotes that everyone is continuously learning and developing no matter how educated or promoted they have been in the past. People may be in different places with different capabilities but they are all still developing their potential. It also helps debunk the notion that we may look ignorant if we don't know all the answers, which is tantamount to the plague if you want continuous development to flourish.

The use of *Reflective Processes* is key. People are organized in team processes and group structures that encourage and enable increased self reflection versus gaining feedback from others on the team or outside the team, a technique popular in other technologies based on different ontologies regarding people. People become increasingly able to self correct, self direct, and self manage toward business purposes.

In a way that is highly *Exploratory in it's Processes*, people are on a recurring basis asked to move into processes and interactions that take them into unknown territory in terms of thinking arenas and interactive capability and they are simultaneously given the frameworks and capabilities to master the move into the new territory. This process works in alternating short cycles with producing action plans which become increasingly overlapping rather than sequential. Moving into new unfamiliar territory while gaining new capabilities needed for that mission as well as the next—simultaneously, builds one's confidence and practical learning skills that are the "meat and potatoes" of continuous development. Few significant improvements ever come from existing knowledge or existing capabilities.

The techniques are never the same but are created as part of the *Evolution in the Design*:. This is the most difficult part for many to grasp. There can never be a *package design* but there is always a well conceptualized design relevant to the systems in process of developing. The designs of today will be literally outdated tomorrow. We become able to "design live" with a high degree of precision and complexity but always relevant to the group present and their issues of their tomorrow.

The core techniques are based on an attempt to engage in the *Development of Thinking Capability*: Business arenas are becoming increasingly complex and dynamic and the winners are those who can "read these" and respond with a complex understanding. The ability to develop better and more thoughts on complex issues tends to be in contrast to the models of learning provided in our schools and valued in our business arenas. We have traditionally been provided answers and then tested for reproducing of those answers. A developmental process instead provides structures that improving answering, as well as questioning, and the creation of contextual thinking. These developmental processes build the capability to think isomorphic with the reality with which we are seeking to engage.

When people see a developmental approach being worked, they are first and foremost aware of "technique" and in fact new practitioners seem to attempt first to copy the techniques. Examples or this include asking questions more than providing answers, even in return to a question sometimes; using words and a discussion of particular words in an interaction, or sending people to breakout groups. After a period of time, people notice that the techniques include having people draw pictures and use picture or frameworks a great deal. Even later in the process, people notice that similar principles or ideas reappear but in a new context or related to another concept. After a period of several years, people may notice the developmental approach involves never doing anything twice in the same way or with the same frameworks in the same way.

It would be possible with some extended observation, to prepare a list or booklet of techniques and to notice some that are unique to the development process and some that are used by other processes but it is not likely possible to extract a technology from the observation of technique; in fact even with an in-depth research project over many years, it is probably not possible to conceptualize the technology underlying techniques, of *any* approach. But it is probably possible to determine if there is a technology by looking for patterns. It would also be possible to determine if a practitioner is operating only with a parcel of techniques if the research included investigating the results the techniques seems to produce in an environment or series of environments.

Producing particular results is the nature of "technology" because it is after all, the application by technicians of science to a specific field.

Summary:

Since the epistemology of the developmental approach is based on a belief in multi-levels of reality, it is not surprising to see multiple layers of processes designed to get at these levels or planes of reality. The cosmology also reflects this way of understanding the working of the world, by involvement with systems sciences and particularly the sciences that seek to gain in-depth understanding of particular processes and relationships. Human beings, as the foundation of the developmental ontology is also systemic and multi-leveled in its theory. This carries through the technology into techniques that are focused on enabling persons in an organization to uncover for themselves that they possess many levels of reality and layering processes that they have created by themselves, through socialization and acculturation, that obfuscate different levels of understanding.

The epistemology also includes a belief in the vital role that thinking plays in our working as human beings. This can be seen to follow throughout the other stages of the scientific exploration and can be seen in the techniques as ways of challenging and developing thinking capability. Also since it includes a belief in the uniqueness of each individual and their potential, it moves away from ontologies, technological elements, and techniques that tend to generalize characteristics of humans and ones that tend to ascribe stylized behaviors. Developmental techniques are all aimed at the apprehension of personal experience and the development of individual uniqueness.

It is possible to trace any set of organization effectiveness processes in this way and it fact this paper is arguing that without such a demand of every practitioner of themselves, their work has a tendency to be less than alive and meaningful, and at the worst to be outdated, irrelevant, and degenerative regarding the intentions of the organizations to which they seek to contribute.

References:

Anderson, John R. (1990). Cognitive Psychology And Its Implications. New York: W. H. Freeman and Company.

Bateson, Gregory. (1979). Mind And Nature. New York: E.P. Dutton

Bateson, Gregory and Mary Catherine. (1987). Where Angels Fear. New York: Macmillan Publishing Company.

Bennett, John G. (1989). Energies: Material, Vital, Cosmic. Charles Town, VA: Claymont Communications.

Bennett, John G. (1966). The Dramatic Universe, Vol. Three: Man And His Nature. Gloucestershire, England: Coombe Springs Press.

Berman, Morris (1984). The Reenchantment Of The World. New York, New York: Bantam Books, Inc.

Bertalanffy, Ludwig von. (1962). "General Systems theory—A Critical Review," General Systems, VII, pp. 1-20.

Bertalanffy, Ludwig von. (1968). General Systems Theory. New York: Braziller.

Bickerton, Derek. (1990). Language And Species. Chicago: University of Chicago Press.

Bohm, David. (1980). Wholeness And The Implicate Order. London: Routledge and Kegan Paul.

Calvin, William H. (1989). The Cerebral Symphony: Seashore Reflections On The Structure Of Consciousness. New York: Bantam Books.

Csikszentmihalyi, Mihaly (1993) The Evolving Self: A Psychology For The Third Millennium. New York: Harper Collins Publishers.

Gardner, Howard. (1985). The Mind's New Science: A History Of The Cognitive Revolution. New York: Basic Books, Inc.

Gleck, James (1987) Chaos: Making A New Science. New York: Viking Press.

Heisenberg, W. (1963). Physics And Philosophy. New York: Harper & Row.

Jantsch, Erich. (1975). Design For Evolution. New York: George Braziller.

Jantsch, Erich. (1980). The Self-Organizing Universe. New York: Pergamon Press.

Krone, Charles, (1977-1995) "Unpublished Papers On Systems Thinking And Systems Methodology." Carmel, CA.

Lakoff G. and Johnson, M (1980). Metaphors We Live By. University of Chicago Press: Chicago.

Laszlo, Erwin. (1972). The Systems View Of The World. New York, New York: Braziller.

Logan, Robert K. Ph.D.. (1986) The Alphabet Effect: The Impact Of The Phonetic Alphabet On The Development Of Western Civilization. William Morrow & Co.: New York.

Miller, J. G. (1972). "Living systems: The organization." Behavioral Science, Vol. 17, pp. 1-182.

Needham, Jacob. (1956). Science And Civilization In Society. Vol. 2. Cambridge Press: Cambridge, England.

Miller, James G. (1978). Living Systems. New York: McGraw Hill Books.

Ogden, C. K. and I. A. Richards. (1989) The Meaning Of Meaning. Harcourt Brace: New York.

Pearce, Joseph Chilton. (1992). Evolution's End: Claiming The Potential Of Our Intelligence. Harper: San Francisco.

Pietsch, Paul. (1981). Shuffle-Brain: The Quest For The Hologramic Mind. Boston: Houghton Mifflin Company.

Polkinghorne, Donald. (1983). Methodology For The Human Sciences. Albany, New York: State University of New York Press.

Pribram, K. (1971). Languages Of The Brain. Englewood Cliffs, NJ: Prentice-Hall.

Prigogene, Ilya, and Stengers, Isabelle. (1984). Order Out Of Chaos: Man's Dialogue With Nature. New York: Bantam Books.

Reason, Peter, and John Rowan. (1981). Human Inquiry: A Sourcebook Of New Paradigm Research. New York, New York: John Wiley and Son.

Sanford, Carol (1993) "The Technology Of Change." SpringHill Publications Occasional Paper: Battle Ground, WA.

Sanford, Carol (1994) "Leadership of motivation: the ethics and practicality of incentives", in Renesch, J. (ed.) Leadership In A New Era. New Leader Press: San Francisco, CA.

Strauch, Ralph. (1989) The Reality Illusion: How You Make The World You Experience. Station Hill Press: Barrytown, NY 12507.

Tarnas, Richard (1991) The Passion Of The Western Mind: Understanding The Ideas That Have Shaped Our World View. New York: Harmony Books.

Waldrop, M. Mitchell. 1992) Complexity: The Emerging Science At The Edge Of Order And Chaos. New York: Simon & Schuster.

Watson, John B. (1958) Behaviorism. New York: W. W. Norton & Company.