PatteRNs

ASCD Systems Thinking/Chaos Theory Network January 1998

From the Editor:

The sign of a society in entropy is statistics that show we are increasing the money spent on housing criminals and less on educating children. Roughly, the term 'entropy' means a kind of running down. A situation where we are spending more and getting less. We can look around us and see many examples.

In this issue of PATTERNS three biologists, Elisabet Sahtouris, Pille Bunnell, and Humberto Maturana offer us a look at the wisdom of nature and suggest that our western cultural values prevent us from living wisely. As an introduction to an essay on wisdom, Chilean biologist, Dr. Humberto Maturana and Canadian biologist, Dr. Pille Bunnell write; ***"In many cultures which we call "primitive," people who transgress the norms of custom or manner are not punished as in our patriarchal western culture, rather they are reincorporated through various practices. Restitution and reincorporation are forms of being, of living, beyond the transgression. In this way the natural order of existence is recovered and everything returns to its proper place in the cosmic order. When we see this happening, we recognize the wisdom of it, and at the same time we realize that lack of wisdom in human relations with the natural world leads to suffering. But what is wisdom? Is it something to be studied and learned? Or is it a talent?"***

The authors state that ***"in the present time of our patriarchal culture we humans have lost wisdom as a natural aspect of our daily lives."*** They explore how the natural order came to be and how we humans evolved as part of this natural order. They discuss different ways of thinking and in what circumstances we recognize wisdom. Finally, they talk about how we may recover what we have lost.

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Ecology and Economics:

A conversation with Elisabet Sahtouris

Elisabet Sahtouris is a woman of many talents.Growing up in the Hudson Valley, she studied art "because my parents thought that science was a boy's subject". She had a degree in fine arts before she went into science. She is a geobiologist, ecologist, futurist, and author of Gaia, The Human Journey: From Chaos to Cosmos (1989), a book which has been translated into many languages. (It is now available in a newly expanded edition with the title, EarthDance, which will be reviewed in a later issue of PATTERNS.) She is also a consultant expert on indigenous peoples for the United Nations, a Findhorn fellow, and serves on the advisory board of the Institute for Sustainable Development and Alternative Futures.

Canadian STCT Coordinator, Janet Eaton and I met with Elisabet in San Francisco last November between her presentations at the Bioneers Conference and the State of the World Forum. She is a scientist,who is totally involved with the current shift in our world view, a shift which has profound implications for our social, political and economic realities - realities we educators deal with everyday.

JE: Elisabet, I found an interview with you done by Scott London on the WWW and I was impressed by the down-to-earth view you have about science. Especially your experience during your post-doctoral fellowship at the Museum of Natural History in New York.

ES: Yes, that was around 1969 when they had spent a lot of money on a pollution exhibit and I was noticing that the museum was belching black smoke so that women couldn't hang their laundry out in the neighborhood. I pointed out the contradiction and made myself very unpopular. There were many such lessons that helped me see how science has difficulty relating to the larger society. I sometimes learned more from black inmates in prison who seemed to have a better sense of the structure and function of our society than from the scientists I was meeting with at MIT. What was a new theory for the scientists was often common understanding to people growing up on the streets.

BV: The big questions like globalization and ecology and the effect of technology on human beings and how we relate to each other....quality questions get shoved under the carpet it seems. People are worried but don't know what to do. Certainly these are the kinds of questions that concern educators.

ES: I was in Berkeley during the Viet Nam war demonstrations when people were trying to do something. I started out in Berkeley politically because I was there in '61 and '62 and that's where I got my political education on KPFA. I was pregnant at the time and I was listening to a lot of radio, and I read all the books that were recommended: I read Paul Baram's, ***The Political Economy of Growth*** and another titled, ***Capitalism and Underdevelopment in Latin America***...a whole bunch of books I can still identify as having been my first real introduction to world economics.

BV: And then when did you finally leave academia and go to Greece to write your book?

ES: I began to wonder how science could

Inside

Elisabet Sahtouris demonstrates a down-to-earth feminine kind of wisdom in our conversation with her. As a biologist, ecophilosopher, and futurist, a mother and grandmother, she is able to get to the roots, defining living systems as self-organizing and self-maintaining, and existing at many levels of complexity from the simplest possible "protolife" form of whirlpools to our planet and ourselves. **James Lovelock,** originator of the **Gaia Hypothesis**, writes in a forward to her book, *EarthDance*, that;

"Elisabet's analysis of science reflects a trend that may well make science in the near future as unrecognizable as today's science would be to the ancients. She does well to remind us that science is a human activity that evolves, a living system in which conservatism should be balanced by healthy controversy. After all, as she so well describes, all Gaian systems are forever busy working out their cooperation through conflicting interests, their unities through diversity."

As a consultant to the United Nations on indigenous people and co-founder of the Worldwide Indigenous Science Network, Dr. Sahtouris is very much involved in the social, political, and economic issues of today.

We need only look around us to see evidence that we are still conditioned by the cultural belief in the social Darwinian theory of the survival of the fittest. What is happening in the business world as we struggle to position ourselves in the new global economy is an example.The views of evolution presented here are so very different that I found it difficult to shake myself out of old patterns of thought. For me, it took some time and effort to absorb this new "language." The implications for educators whose work is with human beings, not the bottom line, are far-reaching so I hope you can take some time to 'chew' on this issue of PATTERNS.

Tom Mandel,
<Thommandel@AOL.COM>
moderator for the ***International Systems Science Society*** listserve sends this note on science literacy.

Science literacy is not new. ASSS

answer the big questions while I was in New York in the late 60's. Later, in Boston for I started out doing a research project at Massachusetts General Hospital and then I worked in the housing field involved with stages of child development in relation to subsidized housing. I ended up as a criminal justice planner for the state of Massachusetts. I was very disillusioned with science by that time. I decided Scientists weren't interested in the real problems of the world. So I went out to do my own research.

JE: And you were at Dalhousie University in Halifax at the same time I was there getting my doctorate in Biology. It's a strange world! Speaking of that, that's what we are here for.

ES: To talk about patterns

JE: Patterns that you see in the course of your work. It is very much about that. I was very intrigued in reading your book that there must be a kind of metaphor or a meta-pattern in everything you are working at and doing.

ES: One of my favorite metaphors, inspired by my friend, Norie Huddle's children's book, ***Butterfly***, is the metaphor of the metamorphosis of the butterfly. The caterpillar keeps eating until it is so overweight it goes to sleep, literally, and eventually, the body of the caterpillar turns to sludge and imaginal cells build the butterfly. I connect this with Paul Ray's polling studies in which he found that 25% of the U.S. population are Cultural Creative, with twice as many women as men in this core group. This says to me that the culturally creative energy is strongly feminine energy, the butterfly energy - whether it is exhibited by men or by women . The energy lies in a cooperative, systemic way of doing things. It is also holistic thinking. That biological metaphor is a very nice one - especially in answer to people who say, well how long have we got to turn things around? We are already doing it. Imaginal cells form before the old caterpillar system dies.

BV: It seems also to relate to the whole metaphor of the Internet: the world wide web.. Are you familiar with Ralph Abraham's work? (PATTERNS Vol.1 no.1). He is very interested in the web as a progenesis because of the dynamic. As people get on the web, on the Internet and begin to communicate in this way, it just seems to me that its like what you are talking about... it is a self-organizing system.

It takes a living system to know a living system.

ES: Quite so. And, of course, the only clear definition we have of living systems is ***autopoiesis*** which means self-creation....self-organization.

JE: There are some questions I have about autopoiesis in terms of your reaction to Lovelock's Gaia hypothesis. You prefer to call it a conceptualization, a perspective.

ES: Yes, that's right. When you call it a hypothesis, people always say 'prove it', and then you get into a lot of trouble. It's not easy to prove that something is alive. When we say something is alive we all have some common understanding of what life is and we recognize it. One of my favorite quotes is from Walter Pankow,*"It takes a living system to know a living system."* That raises the question of the difference between mechanical and living systems. I think the only reason that we developed a science based on a mechanical world view was that men, having invented machinery, were so enamored of the machinery that they began to see it everywhere, even in nature.

BV: We certainly see it in schools. The terms, "being on track" and "motivating students" are hints of the mechanical world view. Our language reveals our world view.

ES: That's not unusual. For example, when Evans uncovered the Minoan Culture in Greece he described everything in terms of Parisian bathrooms and Parisian women and fashion and all that kind of thing. So whatever is the theme of the day we tend to project onto everything. In this case of machines, onto the whole universe!

The Greeks really started it by talking about spheres within spheres....the geometry, the mathematization of the cosmos. Actually, machinery was a natural evolution and soon man developed real mechanisms, which Greece had a prohibition against. Whenever mechanisms were invented in ancient Greece - as for warfare - the plans were never written down because it was sacreligious. Geometry was sacred to God, and

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there was sacred geometry behind the messy appearance of the world in Plato's world-view. Because geometry was sacred, mechanical languages, such as mathematics and logic, were part of that sacredness in their world view. Through the centuries it eventually translated into mundane machinery and ***that*** became sacred. In a sense, I suspect that the reason they didn't develop wheeled vehicles in the Andes was similar. The wheel may well have been a sacred symbol okay to put on children's toys, through which we know they knew how to make them, but they never put them onto the vehicles of burden... the mundane.

BV That's interesting. It was okay to do a llama with wheels! That's fascinating. I resonated so much when I was reading your book. It reminded me of the anthropologist, Claude Levi-Strauss who showed that the early people had their own science and the structure of myth was their way of answering the questions about the paradox of nature/culture. That was their science. So the popular way of looking at indigenous people - that they were primitive and we were advanced because we have science - that kind of perception now is hopefully beginning, to break down more or less.

ES: Have you read the book, ***Amazon Beaming***? It is about Loren McIntyre, a well-known National Geographic photographer, and his encounter with the Mayoruna, a group called the "Cat people," who were thought to be extinct at the time. In the course of his stay with them he learned that they do telepathy and participated in that "amazon beaming." He also learned that they had two concepts of time, a very sophisticated concept of simultaneous time as well as historical time. They understood that in the non-material world of consciousness there is no time. Some call it simultaneous time (simultaneous is a 'time' word) but the absence of time is better called" *an eternal now*," which is actually the only time that anyone ever experiences. The rest we make up, right?

Life is too intelligent to proceed by accident

BV: The rest is culturally defined.

ES: We call it memory and future projections. But we never actually experience the future or the past.

BV: Have you been writing of this? People who meditate experience this shift.

ES: I have not yet talked much about simultaneous time. I am just beginning to throw it out into discussion with scientists. In my book, ***EarthDance,*** I used the Western scientific framework of material evolution with consciousness as a product of that. But in "***Biology Revisioned***," (Spring 1998 publication) which is a dialogue between myself and Willis Harman, we make the fundamental statement that consciousness preceeds biological evolution. I stuck my neck out by saying things like, "life is too intelligent to proceed by accident." There is increasing evidence even at the microbiological level that there are intelligent processes going on, and not necessarily those based on accident. Accidents are not the driving force of evolution. Life, basically, stores genes over time. It doesn't change when it doesn't have to change. When mistakes are made - genetic mutations or copy errors - I venture to say, like Arthur Koestler, (***Janus: A Summing Up.*** 1978. Vintage Books) that they're probably repaired rather than becoming the basis for evolution. Now biologists actually talk about "repair genes" and "editor genes." Now, excuse me, 'editor' implies intelligence!

We also find microbiologists saying things like "the nucleus is like a parallel processor with the programmer and the mechanics present." And if I say, "*once you admit that the intelligent life forms are there you don't need the mechanisms,*" they respond, "*what's the difference?*" And I say, "*well, mechanical metaphors and organic metaphors give you very different pictures.*" And they say, "*Naah, you just use which ever metaphor works.*" In my opinion, they really muddle things by not understanding the distinctions between organics and mechanics.

BV: So you're really making a big point about the importance of metaphor.

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(American Society for Systems Science) started their Project 2061 in 1985, the initial stages involved nearly a thousand writers, educators, philosophers, scientists. They pubished their first book, ***Science Literacy for All Americans,*** *four years later. Four years after that they published their* ***Benchmarks for Science Literacy.*** *which was adopted, interestingly, by the up- till -now competitive governmental unit.*

The Project 2061 motto is simple, ***"Teach less, understand more."***

But has anyone heard of them? Project 2061? Four years ago, they planned to introduce systems in grade six. Well, I got this in the mail from my daughter, and pass it on to you.

Science Matters-Achieving Scientific Literacy. Robert M. Hazen & James Trefil (xvii).

This book is dedicated to illustrating a statement that is one of academe's best-kept secrets: The basic ideas underlying all science are simple. In what follows, we present only the constellations of basic facts and concepts that you need to understand the scientific issues of the day, while providing a reading list for those whose interest has been piqued and who wish to pursue some of the points in more detail.

Science is organized around certain central concepts, certain pillars that support the entire structure. There are a limited number of such concepts (or"laws"), but they account for everything we see in the world around us. Since there are an infinite number of phenomena and only a few laws, the logical structure of science is analogous to a spider's web. Start anywhere on the web and work inward, and eventually you come to the same core. Understanding this core of knowledge, then, is what science is all about."

Thank you, Tom.

ASCD Annual Conference
San Antonio, Texas
STCT Network Meeting
Monday, March 24.
12:45 - 2:45 P.M.
Marriott Rivercenter/ 3rd floor
Room 8

ES: Yes.
BV: That's interesting because I remember Gregory Bateson (***Mind and Nature.*** 1979. Dutton NY) once made the statement that humans should not be called "*Homo Faber*", but we should be called "*Homo Metaphoricus.*"
ES: Yes, the only way to understand something new is through metaphor. For example, we used to understand the brain as a plumbing system, then a telephone and later, a computer. Now we understand it as a hologram or a parallel processor.. Our latest technology becomes the new metaphor.
JE: Metaphors bridge the unknown.
ES: There actually is nothing else and the most recent recognition of that I recall is in the book, ***Complexity***, written about the **Santa Fe Institute**. One of the scientists quoted said, basically, that the task of science is choosing the right metaphor.
BV: Wow! That's an insight!
ES: Now, when I read that I said, they must be doing something right at the **Santa Fe Institute.** I got up. I went to my typewriter, I wrote them a letter and I got an invitation to speak there.
BV: I'd like to hear about what that was like because the **Santa Fe Institute** has a mystique of its own.
ES: Well it's very interesting because it was a very contoversial subject that I was introducing there. I was talking about the Living Earth, Gaia. I pointed out that I wasn't presenting a hypothesis or a theory to replace that hypothesis. We finally had a definition of life, and the Earth fits that definition. So I call ***"Gaia"*** a metaphor. It's not a hypothesis. The Earth is alive by definition!
BV: Do you equate concept and metaphor?
ES: Well, a metaphor is usually a concept. It's a picture of the concept of metamorphosis for instance. They are very closely interwoven.
JE: What about a mental map or a cognitive map?
ES: A cognitive map? Well a metaphor is a simpler term. A cognitive map could be a complex metaphor - or you would use a metaphor to construct your cognitive map.
JE: Okay. And then how do you relate using memes?
ES: I use memes in the sense that the word was coined for - which is ideas that form the social body as genes form the physical body. Science is in the business of choosing the right metaphors. That is an incredible insight because that's totally different from saying science is an investigation of what's really true.
BV: Yeah - the "reality." Myth myths itself in man's mind. Claude Levi-Strauss said that.
ES: This view acknowledges that we are in the map-making business, in science,

The task of science is choosing the right metaphor

and that's, of course, what Korzybski (***Science and Sanity.*** 2nd ed. Institute of General Semantics, Lakeview, Conn. 1950) and Bateson were saying as they warned us not to mistake the map for the territory.
JE: We do it all the time.
ES - Yes, we need metaphors and concepts of the known to understand the unknown. It is the only way that you can discuss the unknown, or start investigating something.
JE: There's an analogy that you make in one of your writings about the body and the world economic system.
ES: Yes, I talk about how living systems have to be healthy at all levels to be healthy at all. We don't make the connections between immediate living systems and world systems. We behave very differently at the world level of economics than we do in our bodies and our families. Yet, these are all systems embedded within each other and within the planet as a living system.
JE: If our bodies worked the way the world economic system works we wouldn't live long.
ES: Exactly. We've proved that we can be cooperative at the world level with our postal system and our air travel and our communication systems and things like that. But the economics, which are fundamental to the globalized human system, are dangerously dictatorial. For example, now we have the World Trade Organization which is the most powerful institution on Earth. It overrides national law, state and local laws.
BV: You're speaking of NAFTA?
ES: NAFTA was the first step, and then the GATT discussions. And out of these came the Office of Economic Cooperation and Development in Paris. The OECD then formed the World Trade Organization which passed the legislatures of more than a hundred member countries who all voted to join it....even though the WTO can override their own laws. And the next step is the MAI (Multilateral Agreement on Investment) which is coming down the pipe now.
BV: On the internet, just recently, I saw an alert system so that when they do anything to override any government regulations immediately everyone will know about it.
ES: Yes. The WTO has just stated that the US has to import non-dolphin-safe tuna. I was in Thailand last December when the Thais wanted to stop importing American cigarettes for health reasons and the WTO said, "sorry, you have to import them."
JE: How do you feel about this? Do you ever get discouraged?
ES: Oh I'm up in arms about this whole thing. It is reminiscent of World War II when nobody discussed the fact that American and Nazi business men were business partners. To this day it is not discussed even though it was public knowledge after the war at the Nurenberg trials. We have what can only be considered a fascist organization overpowering national sovereignity.

No one in Latin America south of Mexico; no one in Africa belongs to this organization. What kind of a global organization is that? This is what I wrote about in my article, ***The Biology of Globalization,*** (Perspective on Business and Global Change. September 1997)
JE: There has to be feedback to the powers that be. In Canada we have the ***Network for Creative Change*** which is a new kind of teledemocracy.
BV: Now the internet can serve a role in getting this information out.
ES: Absolutely, and it can wake everyone up to the fact that the universe and planet are alive and that we are part of that vast life system. Another metaphor I use is a keyboard on which the low keys represent the world of matter, and the middle range is the world of electromagnetic energy, and the upper keys are the realm of consciousness. The formula for transposing music from mid-range to the lower range is known from Einstein. Consciousness

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The Wisdom of Nature

by Humberto Maturana and Pille Bunnell.

Dr. Maturana is a well known Chilean biologists. His most accessible writing in English is The Tree of Knowledge, (1987. Shambala) and the more technical book, Autopoiesis of Cognition, (1980. Reidel. Boston). Dr. Bunnell lives in British Columbia and can be reached for further information via email pille@unixg.ubc.ca

Introduction

All life, all living beings, whatever their manner of living, live coherently in the sphere of interactions which makes their living possible. If this coherence is lost, the being disintegrates. Most of the time this does not surprise us, we hardly notice it - except in moments of wonder - which lead us to comment on the wisdom of nature. But what would surprise most of us, if we were to notice it in the course of our daily living, is that what we call wisdom in humans is like what we see as the wisdom of nature. Human wisdom is lived as a coherence between thought, feeling, and awareness of human action in the cosmos; it is innocent and effortless. Human wisdom happens in our animal living, in our participation in the wisdom of nature, and is not a human construct.

But how does the "wisdom of nature" come about, how does it arise? And how is it that human wisdom is not a result of our civilization? We, the authors, think that what we humans call wisdom is possible as a simple result of the systemic dynamics of existence. The existence of any system begins whenever a collection of elements relates in such a manner that this particular constellation of relations begins to be conserved. This is so when a particular constellation of relations between electrons, protons and neutrons is conserved to form an atom that we recognize as an element, or when a constellation of relations between atoms is conserved as a molecule. It is also so when a complex network of relations is conserved between molecules to form a living system, e.g. a protozoan. Living systems are those constellations of molecular relations which not only conserve themselves but also produce themselves, in a process called autopoiesis.

Furthermore, in the moment a system begins to be conserved, it appears as an entity separate from a medium which arises with it. The medium is what the system both exists in and interacts with in a manner which makes it possible for the system to exist. Yes, this is circular, but much more of existence is indeed circular than linear logic can account for.

Human wisdom happens in our animal living.

Thus, the medium appears as a relational domain which arises out of nothing along with the system which it henceforth contains. In the experience of the observer who makes the distinction, system and medium appear from nowhere, out of what simply did not exist before the distinction was made.

Another way of putting this is that in each act of distinction the system and its medium arise out of chaos - that is from a background of structural coherences that can only be imagined or perceived by an observer through an intent to explain the operation of the system after it has already been distinguished.

It is difficult for us to now imagine the first distinctions we have made in our evolution as humans, or our individual development as infants as each distinction becomes the condition for another, and the conditions are accepted as "obviously so". Let us give an example that takes a little poetic liberty, but points to an experience we may have noticed as adults. Let's say that you are out for a walk in the forest and in some

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Statement of Purpose

The **Systems Thinking / Chaos Theory Network** is dedicated to exploring the changes required by the paradigm shift brought about by the new sciences. (General Systems Theory, Cybernetics, Evolutionary Biology, Quantum Mechanics, Field Theory, and the Science of Dynamical Systems/Chaos Theory)

We recognize that the change to systemic thinking is comprehensive and therefore involves the total re-orientation of ourselves as participators in the universe at all levels of our being.

Because our educational institutions are based on causal linear rationality and systemic thinking is not easily represented within that paradigm, we support each other in moving into an expanded understanding of our evolutionary period.

Although sponsored by **The Association for Supervision and Curriculum Development (ASCD),** the STCT network newsletter reflects the thinking of our own members.

Membership in the network offers;

- The bi-monthly newsletter, PATTERNS, publishes interviews with Systems Scientists in a variety of disciplines, articles of interest to educators, commentary and reflections, book reviews, news and announcements.
- An annual annotated bibliography.
- An annual directory of members.
- Discounts on all Forums, Conversations, Workshops, and Seminars sponsored by the Network.

Barbara Vogl, Facilitator/Editor

Nature is more suggestive of a mother juggling resources to ensure each family member's welfare as she works out differences of interest to make the whole family a cooperative venture, than of a rational engineer designing perfect machinery that obeys unchangeable laws.

Elisabet Sahtouris

Wisdom of Nature (continued)

moment happen to glance more closely at a patch of ground. There you see a small plant with red berries! And now, having made that distinction, you look around and see strawberries everywhere, growing in their medium, a field. Neither the strawberries nor the field pre-existed in your relational domain until you, as the observer, made the distinction.

All entities or systems arise in the conservation of relationships which define them, always simultaneously with the medium that makes this possible. As a result, system and medium necessarily arise in structural coherence as they arise together. Furthermore system and medium remain coherent as they change together in the spontaneous flow of their interactions, or they disappear. This coherent structural change which occurs in the course of evolution of a system, in conservation of its existence, and in adaptation with its medium is called ***structural coupling.***

(The authors show that all living systems are interlaced through the circumstances of living as an immense, continuous and coherent structural dynamic in the configuration of our biosphere. This applies equally to us human beings as cultural beings.)

In general terms, living beings always maintain coherence with all the changing circumstances that touch their living as a result of the ***dynamics of conserving structural coupling.*** Something very wonderful happens as a result of this. Because the biosphere is constituted as a coherent systemic dynamic, any local perspective integrates the whole. It is not that every point contains information about every other point but simply that the look from any perspective is necessarily one that is in harmony with all the rest, whether or not we are able to see the details. Usually we do not, but so called "intuitive"people grasp the implications of this coherent dynamic.

So, is this what we call wisdom? No, there is more to wisdom than the comprehension of the coherent connections of our culture, the biosphere, and cosmos.

Human Origins

The differences between humans and other animals that we usually cite are our expanded brain, our opposable thumb, and our use of tools. But how did these differences arise? ***The flat hand and opposable thumb appeared well before tools. Did they evolve with pre-sentience of the possibilities of technology? Did they evolve "on purpose?"***

Nothing in nature happens because it will be needed for something else, or to fulfill a purpose. It was no more necessary for photosynthesis to evolve (and in the process pollute the earth with the dangerous chemical, oxygen), than it was for computers to be invented. Both happened along a drift of changes that happened coherently with everything else, so now they fit, and thus appear necessary.

> ***We have evolved as a loving animal.***

As Maturana has described in a book co-athored with G. Verden Zoller (to be reviewed in a future edition of PATTERNS), humans originated in the emotion of trust and a desire for nearness. About five or six million years ago, the lineage of primates that gave origin to us began in an evolutionary trend of continuous expansion of childhood. The mammalian relationship proper to childhood is one of total mutual trust, body acceptance, and tenderness. This is what our ancestors lived, and preferred to live, so it expanded and expanded to become the basis of humanness. The result was the constitution of a system of lineages whose evolutionary history was centered on love as the basic emotion in community relations as opposed to aggression or competition as has happened with other primates like chimpanzees.

We have evolved as a loving animal, this is what characterizes us. And the 5 to 6 million years of this evolution has brought with it all our other attributes, in particular our bodies, our expanded intelligence, our languaging, and eventually our technologies. Since our concern in this essay is wisdom, we will look at how the expansion of human intelligence is related to wisdom.

One of the aspects of the expansion of childhood relations was the expansion of human sexuality from a yearly estrus cycle to a continuous desire for the pleasure in the intimate body proximity of the other. One consequence of this was the separation of sexual intercourse from reproduction to a fundamental manner of relation between the members of a group. In this shift, sexuality became a source of stability and joy of living together in body intimacy, tenderness, and sensuality. ***It is in this drift towards bodily intimacy that our hands became caressing hands, and it is in this milieu that language arose as an expansion of consensuality.***

Language arose as a manner of living together that expanded the consensual coordination of behaviours - simply as that is what our ancestors wanted to do, or rather what they did because they liked doing it. We say that language is a manner of living together in the flow of consensual coordination of consensual coordinations of behaviour. The recursion that is made explicit in this statement is critical as the constitutive dynamic of language, but for the moment it suffices to notice that language arose in the emotion of love in the pleasure of conserving relationship. As language became part of the medium of growing children, it acquired its own dynamic of being conserved from generation to generation, and in this became part of the human manner of living. Thus humans began to live in networks of conversations, interlacing emotions and language in a process of endlessly proliferating richness. And it is this richness that our large brain evolved to support, bit by bit, over the millennia.

Another way of saying this is that our evolutionary history is a history of expansion of the capacity for consensuality, and hence, the expansion of intelligence. Intelligence is not primarily the capacity to solve problems, rather it is the capacity to participate in the generation and expansion of, and operation in, consensual domains - as domains of coordinations of behaviors and emotions through living together.

The so called "instruments" for measuring intelligence in our current culture do exactly what all instruments do, they measure an abstraction that we make of something that occurs in a systemic dynamic.. Due to the nature of intelligence as a relational biological aspect of our living, dif-

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ferent emotions affect it differently. Thus, ambition, competitiveness, anger, envy, aggression, fear, all reduce intelligence because they restrict the domain of openness for consensuality. Only love expands intelligence because love is the domain of those behaviors through which the other arises as a legitimate other in coexistence with oneself. The other may be another human, or another living being, or all living beings, or all existence. To live fully in love, in the acceptance of the conditions of existence that one lives as a source and not as an opposition, restriction, or limitation, has been the fundament for the evolutionary trend of conservation of the continuous expansion of intelligence in our lineage. In this sense human intelligence has arisen as a grasping of all the richness of existence and all the coherences of the medium, that is the biosphere and cosmos in which we find ourselves existing.

Is this then wisdom? Does human wisdom consist of the intelligent grasping of cosmic coherences in an emotional look of acceptance of the other and all existence? ***No, as this does not yet lead to adequate behaviour in the local circumstance, in the present moment.*** Cosmic "grokking" as it may have been called a few decades ago, is not seen as wisdom if it does not lead to action.

Western Culture

We live immersed in a culture which endows rationality with such supremacy that it devalues emotions. As they are devalued, emotions are presented as if they only happen occasionally, as a disturbance in our rational existence. Indeed, most of the time we only recognize those emotions which are extremes, which do not fit in the day to day operation of our culture. This is evident in the way we refer to someone when we say they are "being emotional."

But we do not see the fundamental emotion that pervades this culture. It is so pervasive that we are blind to it. We are stuck in an emotion of distrust. Distrust leads to a search for certainty and control, which in turn leads to a desire to appropriate everything. But we are not happy in this. Now and then we catch a glimmer that this manner of living leads to the destruction of not only the spiritual and ethical aspects of our lives, but also the natural world which has given origin to us and which makes possible our very existence as human beings.

What we have done is to continually try to improve our situation by developing new approaches and new technologies. This seems entirely reasonable since we have noticed that whatever we conceive or imagine can be realized, as long as we don't confuse domains in our designs. We live in the assumption that our problems can be solved through rational analysis and the development of appropriate technologies. But, in doing this we make a mistake. The designs we invent are not in the same domain as our problems. Our problems do not arise in the inadequacies of technologies, or the lack of information! They arise through the ambitions that we acquire.

Only love expands intelligence

And in our culture success is recognized as competitive advantage, as control of resources, or institutions - or even the manipulation of beliefs and ideas. And all this happens in the devaluation of emotion as a contrast to rational, civilized living. ***If you look at any situation, you will see that human problems arise in the domain of relations.*** They arise as emotional conflicts in the inter crossing of contradictory desires, intentions, aspirations and fears. Because of this their resolution is not possible through rational argument or a technological solutions. Indeed, a rational argument is always an argument for compliance with someone else's desires or ideas. And even in the short history of modern technology we have noticed that each technological "solution" leads to a new set of problems. Solutions in this culture are always based in a linear causal logic which supports the notion of control. But, as you shall see, this is not the only logic of the biosphere, and thus is in itself inadequate.

When a problem does disappear, or is resolved, it is not through a logical solution, but rather through an insight or an expansion which provides a new perspective in which the contradictions cease to exist. Such an insight has nothing to do with a logical solution, and it is based in an emotional shift.

Later in this paper you will see that the fundamental emotional shift which allows problems to be resolved is from distrust to trust, from aggression and control to love. But before that statement will make sense to you we, the authors, will have to explain why trust is so fundamental, and what love is, as we do not mean it as a sentiment.

There are many examples of problems disappearing as the domain is expanded and the emotioning is changed. The following story comes from **Heinz von Foerster, the esteemed father of second order cybernetics.** (PATTERNS, March, 1996)

Concentration camps were the setting for many horrific stories. Imagine then the incredulous delight of a couple who returned to Vienna from two different camps to find each other alive.They were together for about six months, and then the wife died of an illness contracted in the camp. At this her husband lost heart completely and fell into the deepest despair from which no one could rouse him. Finally he was convinced to seek the help of Viktor Frankl, known for his ability to help victims of catastrophe. They conversed for several hours, and eventually Frankl said;

"Lets assume God granted me the power to create a woman just like your wife. She would remember all your conversations, she would remember the jokes, every detail so that you could not distinguish this woman from the wife you lost. Would you like me to do it?"The man kept silent for a while, then said, "No thank you!" They shook hands, the man left and started a new life.

When asked about this astonishing and simple change, Frankl explained, "You see, Heinz, we see ourselves through the eyes of the other. When she died, he became blind. But when he saw that he was blind, he could see!"

Systemic and Causal Rationality

Living systems have not only evolved in conserving the coherences of the biosphere as a whole, but also in conserving the proper coordinations of each living being within this - in the present moment - in whatever domain is relevant to its living. Living happens in the local circumstances

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in a manner that is coherent with the whole. It is through the moment by moment local integration through its actions that each being maintains its continuous participation and inclusion in the biosphere.

Through living in language we humans distinguish two different ways of thinking as we grasp the cosmic coherences and choose our local behaviour. Although both ways of thinking are rational, that is, they have to do with exercising one's reason in a proper manner, only one of them is emphasized in our current culture. Our culture values causal linear rationality and only grudgingly acknowledges the existence of the other, namely systemic rationality.

Systemic thinking pertains to the history of the evolution of our nervous system, not only over the 5 or 6 million year evolution of humans as distinct beings, but over the whole multibillion year evolution of living beings. Systemic thinking happens in the fundamental reciprocal coherence of the nervous system and the medium, and results in the total adequacy of each living being to grasp what is relevant to its manner of living.

Systemic thinking is comprehensive, it is not based in language and is thus not easily represented by language. Let us give you an example. Good sailors, sailors who can confidently sail across oceans and amongst unknown archipelagos without recourse to an engine, are very aware of waves. From the configuration of the waves in the little locus that surrounds their boat they can sense coming storms, shoals, currents, islands.. yet they cannot explain what it is they are looking at in words. They just "know." If they are pushed, as we sometimes push experts in trying to design so called "expert systems," they will generate descriptions - but such descriptions are inevitable like flat projections of a multidimensional and fluid phenomenon. Not many people would feel confident in setting out across an ocean with only expert descriptions to navigate and live by.

What happens with the sailor is something that happens with all living beings. Their nervous systems "just know" things that are relevant to their living even when these things are not directly present. Though the island over the horizon is not directly present, it reveals its presence through the patterning of the local circumstances. ***It is not a matter of learning those particular patterns, one could not do that as each circumstance is new, but a matter of being able to map these patterns onto others that have been experienced by grasping the same relational configurations in them. The ensuing actions are effective because both sets of patterns belong to the same history of transformations in the biosphere and cosmos.***

Part of the difficulty of describing such patterns has to do with their rich dimensionality. But perhaps even more significant is that the experience that had the same configurations as the patterns that are now seen may have happened in a different context, or in a different domain. The mapping happens in an analogic manner. Without such mapping, each domain would be isolated from others in strict adherence to its own internal logic. ***Systemic thinking makes connections between domains and integrates understanding.*** It is this that enables one to have an inspiration from apparently unrelated events, to wake up to an "AHA!" from a vision or dream that brought to conscious awareness some of

Systemic thinking is the poetic look

the relational coherences among the dimensions of a coherent existence.

In this culture we do not give systemic thinking much consideration, or value, but we do have some awareness of it. On reflection we would, however, notice the presence of our own systemic thinking whenever we find that a metaphor serves our desire to speak that which we grasp better than a description or an explanation. We also allude to it as insight, inspiration, or intuition, and often attribute it to the female members of our culture. Mostly it remains mysterious, as it is not readily explained in the linear logical rationality, that is the mode of rationality which we most value and teach in modern western cultures.

In causal linear thinking one sees the regularities in closely connected processes. In focusing on a local look, one notices how the flow of changes necessarily results from the structural properties of the elements, and thus the notion of causality emerges. If a certain perturbation touches a particular structure, that structure becomes modified in a particular manner - thus A causes B. It is this kind of thinking that has enabled us to obtain many of the effects we desire, and it is in this kind of thinking that we have invented procedures, tools, and technologies. Linear logical thinking with the notion of causality en-

Logical linear thinking is the engineering look

ables us to engage in effective local action.

In our culture we are trained to focus on causality. Causality can always be found in a local situation, and irregularities can always be externalized - as random effects, or outside influences, or changed conditions. In effect we cannot prevent our own grasping of systemic connections, but we can rationalize them. An observer who lives immersed in the local linear rationality will treat those analogic systemic relationships that he or she grasps in an unconscious poetic look as if they too corresponded to linear logic. That is, if one believes all thinking is causal, then all that one has grasped must be given a causal rationale. In linear causal logic we are trained to look for "the reason" for any circumstance we do not like, for any unhappiness or conflict, so that we may change that. Thus in this logic anything irregular or undesired is a "problem" implying a "solution."

We, the authors, like to refer to systemic thinking as the poetic look and logical linear thinking as the engineering look. The poetic look is one which grasps the coherences in one domain and expresses these in another, whether in poetry, art, or science. The engineering look is one which is firmly grounded in the local coherences and is entirely consistent within, as well as limited to, the domain it pertains to. The engineering look enables constructs, artifacts, that can endure for a time. These two looks are not fundamentally in opposition, rather they fundamentally complement

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each other. Together they comprise the basis for local action in a systemically coherent manner. Together they comprise the basis for realizing natural wisdom in any living being, us humans included.

Human Wisdom

We recognize what we call wisdom in humans when we encounter it, and what surprises us is the spontaneity and fluidity of the behaviour which reveals it. Yes, it happens effortlessly when it happens, and the conditions for it to happen are ones that are lived as well-being. Wisdom when experienced in oneself or another is always delicious. But what is it indeed? We, the authors, have taken some time to develop the background for explaining wisdom, now we can say what, according to our view, wisdom consists of:

- ***In daily life wisdom happens when one lives in the emotion of love that enables both knowledge and comprehension so that all actions and reflections arise in harmony with the coherences of the systemic medium in which one lives.***
- ***Comprehension happens in open reflection as one sees the local situation as participant of the systemic relations that constitute the world (cosmos, biosphere, culture) to which it pertains. This is a look which grasps multidimensional configurations in multiple domains in an analogical manner.***
- ***Knowledge, or at least that which we refer to as knowledge in this culture, is different. Knowledge happens through a look which grasps the local linear coherences of any particular domain without implicating any systemic connections with other domains. Thus knowledge is always proper to the domain in which it happens, and it pertains to recognizing causal relations.***
- ***Comprehension and knowledge are thus both looks that grasp configurations of relationships; comprehension in a systemic view and knowledge in a local linear view. Both can only happen in a wayof looking which accepts the legitimacy of what is seen, that is in a look of love. Any other emotion obscures vision, restricts intelligence, and one is unwit tingly restricted to ones own prejudices. In these circumstances, wisdom happens in the domain of human living when people live their daily lives, with or without problems, following a course in which their conduct arises from an interlacing of comprehension and knowledge.***
- ***Further, this happens when people live together as a community founded in the conservation of social living.***
- ***Since the emotion which founds and conserves social living is love, wisdom only happens in love.***

We recognize a wise man or a wise woman because their actions reveal both comprehension and knowledge. And with such people human social living participates in the systemic dynamics of all existence in a manner which conserves well-being in a harmony among cultural, biological and cosmic domains - without ideologies, without religious truths, and without sentimentalities.

The wise woman and man always look in the biology of love, and always think and act based on what he or she sees in the conservation of human well-being without doubts concerning its legitimacy. This is what enables the proper participation of his or her culture in the biosphere and cosmos.

Learning Wisdom

The implications of what we have said are of fundamental significance to everyone who is concerned with the learning of our children. The notions we have discussed are of particular significance to those teachers who wish to see their students come to a tranquillity of self awareness and self trust, to assume a responsibility for their participation within their cultures as well as a responsibility for the participation of their culture within the biosphere, and to do all this in a mood of joy. We, the authors, invite teachers, and all other readers of this article, to reflect for themselves on the implications of what we have presented, and to consider how it might reveal openings in their own path of living.

As you reflect you will undoubtedly see how spontaneous natural wisdom is denied in our culture. You will see how we humans are stuck in rational linear logic suitable for the proliferation of technology, but inadequate for sensing our participation in the biosphere. You will perhaps see, too, how the yearning for spirituality and meaning arise in the denial of our own biological heritage as beings who like to live in the open look of love, and who have the capability for aware participation with the cosmos.

Indeed, we humans deeply desire the ecstasy of aware participation with another or with allness, whatever we name it, in which we sense the validity of our singularity within a vastness. You may see too how many attempts to reach what we often call "enlightenment" become ritualized and deadened as they are cooped into the emotional context of a desire for certainty and control, and in this are interpreted in a causal linear logic.

However, you will also see that teaching of wisdom is not something that can be done as a manipulation of students in any form. There is no information, no data, no proceedure which will result in wise students. But this does not at all mean that a teacher cannot create a context for wisdom to arise. Teachers can open a path for their students such that their own living, for the rest of their lives, will become a self enhancing expansion of awareness in all the dimensions that manifest as wisdom. You no more need to teach children this than parents need to "teach" their babies to talk. But you do need to do something analogous to what parents do that enables their children to discover their existence as humans, and to begin the recursive consensual coordinations which manifest as language.

You need to live with them that which you wish them to learn. In this sense the most important thing you can do as a teacher is to expand your own living to expand your own awareness, and to accept your own adequacy and legitimacy, and follow your own desire to live in love and participation as an integral singularity in the society, biosphere and cosmos. Out of this all the rest will flow, without effort or strain, no matter how much energy you devote. You need only play with your students in joy, play in the fullness of the knowledge and comprehension that pertain to the domains that you are teaching. You have always known this, we have but offered you some of the biological explanation of how this happens.

We are all equally intelligent and loving. In our competitive culture we learn to think that we are only good if we are bet-

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ter, but this is a big trap. We do not need to pat ourselves on the back for our intelligence and care, or our wisdom, but we can take pleasure in this, and recognize that it is no little thing to rise as legitimate loving and wise beings out of a culture which denies this.

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International Encyclopedia of Systems and Cybernetics

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would have to slow down to the speed of light to become electromagnetic energy but we have no formula yet for that transition.

JE: This sounds a bit like Buddhism.

ES: Yes, the Eastern religions have certainly been coming in since the '60's. We desperately needed it because we had overexercised our intellectual capacity and had lost connection with our inner senses. I see the whole western culture and science as a temporary experiment that has looped way out and is coming back to reconnect now.

JE: There have been a series of interviews with the Dalai Lama and western scientists. This is a very significant trend that the Buddhist perspective somehow fits into the evolutionary perspective.

ES: Yes. The Dalai Lama has done a lot of PR work in Hollywood and there are several stars who have become Tibetan Buddhists.

BV: He's doing so much in terms of bringing west and east together. In relation to Gaia as a living body, we need both right and left brains.

ES: One of my Native American friends said, "You know, the East does the inner senses and the West does the outer senses. Our native people are like the third leg of the stool that makes it stand because we've never separated the two." And that's what I see very strongly in the indigenous cultures - that mind and body are not separated.

BV: A lot of native teaching stories are becoming popular now among educators. How is that helping?

ES: Most native cultures don't have words for real and not real. They do have words for truth and lying. In our culture we confuse those two dimensions and we call non-truth "not real" as if lying and non-reality are connected. I was punished as a child for saying things happened which weren't part of my mother's version of reality. I was telling my truth. With a native person, if a child said there is something in my room, they'd say "well, what kind of a something is it?" I will believe your experience if you tell it to me with integrity, as reality. My reality does not have to be your reality. We may all agree on the shape of a table, but I'm not going to expect your stories to be the same as my stories.

Paula Underwood is wonderful on this subject. She is an Educatior who works in the Corporate world and has written a book called ***The Walking People*** which is an odyssey of her indigenous ancestors over thousands of years.

JE: You were involved in the Earth Summit in Rio...all those nations coming together to pledge to clean up the planet.

ES: Yes, and since then I'm being invited back to speak at conferences in Brazil. I met a young man on the Internet who got me an invitation and a ticket to come to speak to his high school in Curitiba. It's a city designed about 25 years ago to be ecological (Scientific American cover story. April 1996).

In Brazil I got to speak at the best business school. It's amazing how they listen.

BV: You speak of ecology and the world economy to business men and equate it with our human body?

ES: Yes. No part of a healthy body gains its health at the expense of other parts. Sustainability is talked about now but we still have, what Hazel Henderson has called, a worldwide "win/lose economy," while we need a win/win economy. The parts of a healthy living system do things for each other. In your body, all the organs contribute to each other's wellfare.

There are no such things as rich and poor organs in our body

JE: So if we did world economics in our bodies we wouldn't live very long, eh?

ES: That's right.

BV: I want to quote from your book, ***EarthDance.,*** to finish up.

> ***In this light it is interesting to consider historian Arnold Toynbee's observation, after studying twenty-one collapsed civilizations, that what they had in common was inflexibility under stress and the concentration of wealth into few hands. We cannot deny the current stress. Will we remain inflexible in maintaining a system that concentrates wealth to the increasing detriment of most humans?***

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Reflections

From The State of America's Children Yearbook 1997

Among idustrialized nations, the United States ranks:

1st in military technology and military exports
1st in Gross Domestic Product and number of millionaires and billionaires
1st in health technology
1st in defense expenditures
18th in the gap between rich and poor children
16th in living standards among our poorest one-fifth children
17th in efforts to lift children out of poverty
18th in infant mortality
17th in low birthweigt rates

According to the Center for Disease Control and Prevention, US firearm death rates of children under 15 are far higher than the combined rates of 25 other industrialized nations.

- **Three of every four children murdered in these nations combined were American children.**
- **Five of the nations had no firearm deaths of children.**
- **Five had no firearm suicides or murders.**

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