HOW TO USE CONSCIOUS PURPOSE WITHOUT WRECKING EVERYTHING

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SECTION ONE: INTRODUCTION

I would like to set the tone for my talk by quoting a line from the American poet e e cummings, who wrote:

always the more beautiful answer who asks the more difficult question

—wonderfully concentrated language inviting us to see the deeper truth in our everyday world, to keep us from mistaking the everyday world for the truth.

My alternative title for this talk was: *When is it possible to use conscious purpose without wrecking everything?* Or even: *How is it possible to use conscious purpose without wrecking everything?* That may sound like a silly question, but I take it very seriously; and I hope that by the time I finish, you will too.

1. POWERPOINT SLIDES

Now I won't be using slides for this talk and there is a reason for that. You will be making mental images for yourself as I speak. I am pretty sure you will. That's how the brain works for the vast majority of engineers. In fact, I estimate that each of you will make several hundred such images in the course of this talk. I would rather have you remember those images that you create for yourselves rather than something flashed on a screen. If you are a strongly auditory person you will remember my words. That's fine with me. For presentations that involve numerical data, slides are almost a necessity. My talk will spare you that. So you can just sit back and enjoy the flow of words and the images they call up, and forget about numbers.

2. GOETHE'S *FAUST*

I feel greatly honored to be here, but I am not quite sure why I have been chosen. When Tom Gilb asked me to come and speak to you, I asked myself: What can a very old retired physician say that will be of any value to you? Did Tom think I was some kind of expert on systems? So I am only going to talk about what I can report on from personal experience. That doesn't mean I am reporting provable facts. If I slip and say something that sounds like a pronouncement, please keep in mind that it's only my impression. I respect facts, but impressions are what I live with. I suspect that some of you, too, as you get older, will decide to settle for probable impressions.

I didn't write *Systemantics* as an expert. I wrote it as a confused student, trying out axioms—that is, my own personal brand of fuzzy logic—to try to get some clarity in my own head. I am still a humble student, hoping for moments of insight. I wrote the book from the standpoint of a perplexed citizen trying to reconcile what I saw happening all around me with basic common sense. What I saw all around me were things that utterly defied common sense. I was thinking about writing a fourth edition of *Systemantics*, but I am afraid that if I wrote what I was thinking, I would probably be arrested by the thought police.

Then I woke up one morning a few days ago thinking about Germany's great poet, Johann Wolfgang von Goethe, and his great play, *Faust*, the story of Dr. Faustus, the man who sold his soul to the Devil.

When Act I begins, Faust is sitting in his study, remembering and regretting the years he has spent in taking four consecutive Ph.D's in philosophy, law, medicine, and theology. He is in his late thirties and is still a student and has never tasted life. He says:

Here I sit, with all my lore,
Poor fool, no wiser than before.

Those of you who have read Part One know that Faust makes a pact with the Devil—he trades off his immortal soul for power on earth, in this world. The Devil gives him power to make his wishes come true. What he wishes for is Gretchen, a fifteen year old girl he sees walking with her friends to church at Easter time. He gets the girl he wants—but in the process he kills her brother and her mother. Gretchen delivers their baby and, with her family wiped out, her good name ruined, and abandoned by everyone, including Faust, she goes mad, drowns her baby, and is thrown in jail. She dies, and Part One ends with Gretchen going to Heaven despite being condemned to Hell by the Church and the civil authorities. Gounoud's opera ends there, and Goethe did not bother to spell out the moral to his audience—namely, that Faust, in getting his own way, has wrecked everything.

Part Two—the part nobody reads—is the really interesting part. Faust has become an Administrator, a Bureaucrat, a Project Leader, an Entrepreneur, running a huge private enterprise program to reclaim land from the ocean. He is obsessed with this project. He looks at the ocean and he says, "It nearly drives me mad to see the elements so uncontrolled."

To carry out his project, he has to evict an old couple who are living happily in their little cabin and who refuse to sell out to Faust. The eviction doesn't go well, the old couple are killed by the agents sent to evict them, their cottage catches fire and burns to the ground, and Faust again wrecks everything.

Faust never takes any responsibility for the disasters he has caused. He doesn't see it that way at all. He thinks of himself as a tragic hero, a victim of circumstance, cruelly tricked by the Devil. He goes blind, and when he hears the sounds of digging, he thinks that his engineers are working on his land-reclamation project, but in fact it is the Devil and his helpers, digging Faust's grave. He dies and is buried in the dirt of his own unfinished enterprise. I'm not going to spoil the ending for you by telling you what happens when the Devil shows up to claim his due.

What is Goethe trying to tell us? I think that in this one play Goethe has posed a core problem for modern man—namely: being in possession of the powerful tool of conscious thought, how to use it without wrecking everything.

SECTION TWO: SYSTEMANTICS SINCE 1976

1. BLACK SWANS AND OTHER *BETES NOIRES*

Now, *Systemantics* came out in 1976. My emphasis then was on what you would probably call the Black Swan effect—that is, on some unimaginably rare event happening and surprising everyone. Who would ever have dreamed that the White House could simply lose the Red Telephone—the nuclear hot line between Kennedy and Krushchev? It turns out that the Oval Office was being redecorated, and the interior decorators had dumped it into a box and misplaced it. Apparently it didn't match the color scheme they had in mind.

It was Nassim Taleb who pointed out that these rare events—individually so rare—cumulatively become common because there are so many *circumstances* in which they can occur. It turns out that Black Swans are like Black Holes in Astronomy. They are everywhere, and so it only makes sense to devise some strategy for taking this fact into account..

(By the way, I highly recommend that you read everything Taleb has written. He writes about things like the risks of driving in traffic around Kennedy airport at various times of

day, the pros and cons of going to dinner parties in London, and many other wonderful things. His latest book, entitled *Antifragility*, is due out this September).

Since 1976 I have learned of the Red Queen effect, the Court Jester effect, the Frankenstein effect, Self-organized Criticality, the Boundary Problem, and the Information Silo Effect. If you have not yet encountered these terrifying beasts, you most certainly will at some point in the future. But these are only footnotes to the main story.

2. SYSTEMS IDEAS SINCE 1976

Back in the 1970's and 1980's, a lot of new ideas were getting talked about, ideas that I felt I needed to understand in order to incorporate them into *Systemantics*:

People were applying the concepts of Cybernetics to human interactions.

Ross Ashby was building a machine called the Homeostat, with 256,000 distinct states, in his search for something called "autonomy."

Gregory Bateson was pointing out that the very notion of unilateral power is a delusion. It violates Newton's Law that for every action there is an equal and opposite reaction. Evolution always means Co-evolution. The horse eats the grass, the grass grows stronger roots, the horse grows stronger jaws.

Korzybski was explaining that our very language allows us to commit the logical error of using the names of *classes* of things as if they were the actual names of individual things—for example, the word "apple" for that hard red sphere that you bought last month when you went to the supermarket, that looks better than the real thing but definitely does not taste better than the real thing. Temple Grandin, that wonderful high-functioning autistic lady whose animal-friendly cattle chutes dominate the world's cattle markets, calls it "abstractification," a typically human mistake. I think I understand abstractification now, but in 1976 I didn't. I didn't understand the word, "feedback." I struggled with words like "epistemology" and "schismogenesis."

I had even heard of Margaret Mead's wonderful phrase, the cybernetics of cybernetics, but I surely didn't understand the fact that, at that level, everything changes. It's one thing to interact with a system designed to do just one thing, to provide material output. Even if you get surprises, you still don't feel totally bewildered. But when the system you are dealing with is truly autonomous, that is, when the system itself evaluates your requests and decides which response out of an infinite number of possible responses it is going to give you—well, that's just another situation entirely. There is no longer a relation of master and servant between you and your pet creation. You are now equals, and you must learn to exhibit the behavior appropriate to equals. And what on earth is that, and how do you do it?

SECTION THREE: FEEDBACK

I was interviewed a few years ago by a representative of a business journal who asked me how to get systems to work better. He wanted it all boiled down to a couple of phrases. I had just been reading C. Northcote Parkinson's wonderful little book, and what popped into my head was, "Do anything you want, just don't mess with the coffee shop." But I bit my tongue.

If I had known then what I know now, I would have pointed out that he was asking the wrong question, that maximizing efficiency is the error of having a single goal, what William Blake once called "Newton's sleep." I could have told him that Bateson felt so strongly about the attempt to maximize that he applied the phrase "original sin" to it. For

Bateson, *optimization* is the goal, not maximization. But I didn't know all that then. I didn't know what that word, "optimization," really means.

Getting back to the journalist's question, I thought and thought and finally hit on the three words: Feedback, Flexibility, and Creativity.

1. FEEDBACK

Stafford Beer and Feedback in Living Organisms

In my opinion feedback still gets far too little attention. Stafford Beer—the pioneering special operations theorist—way back in the 1970's recommended looking at biological systems for inspiration. Now we know how truly visionary he was. We should have listened to him.

The amount of feedback that is built into living organisms differs by many orders of magnitude from the amount that we build into manmade systems. Living organisms such as human beings have feedback from almost every cell of the body all of the time. Every event that occurs either to or within a living creature has a feedback component—that is, every part of the rest of the organism knows of it in some way, usually within a fraction of a second.

There is not one living creature that lacks that integrated, total unification through feedback. Compared to a frog or a salamander, some of our biggest manmade systems seem like simple wind-up toys. On a supertanker, an alarm bell rings if the engines aren't working, but doesn't indicate where the malfunction is or what kind it is. It could be a loose wire—or it could be that an eighty-foot wave has just crushed in the bow of the ship, flooding the engine room. Either way you get that same little bell tinkling. Then there is that little idiot light on the dashboard of your car that blinks on and says, "Check engine." A living creature organized like that wouldn't last very long.

I have read estimates of the number of brain cells in the human brain of the order of thirty trillion, that is, 3 times ten to the 13th power. Each neuron has an estimated 75,000 connections to other neurons, so we're talking 2 times ten to the 19^{th} connections. Each neuron can fire 1000 times per second, so we're now up to 2 times 10 to the 22d power. Let's assume the person lives 80 years. Our final figure for the number of firings in 80 years is 1.7 times ten to the 31^{st} power. That is a number that is a hundred million times greater than the number of stars in all the galaxies in our universe. The human brain has probably the greatest complexity in the smallest space in the entire universe. And all our research so far confirms that it is meaningful complexity. It's all there for specific purposes.

Mirror Neurons

We have such a flood of feedback that we can construct, inside our own brain, a working model of ourself as a feeling, sensing, responsive entity, updated in real time, like a 3-D hologram, and also models of the persons with whom we are interacting at the moment.

The people who do brain imaging have even been able to locate the neurons that make that internal model of ourselves and others. They are called mirror neurons. I'm quoting now:

"In monkeys, mirror neurons fire when the monkey reaches for a banana. The same neurons activate when the monkey sees another monkey (or human) likewise reaching for a banana . . .some mirror neurons fire if the monkey reaches for a hidden banana, but don't fire if it reaches behind a screen where it knows there is no banana. Other neurons fire if the context suggests the banana is going to be eaten, versus put in a box. In other words, mirror

neurons encode abstract ideas (such as the idea of a banana, even if it can't be seen) and complex ideas like intentions or goals."

". . . consider what happens when you look at someone's facial expression. If you have normally functioning mirror neurons, you immediately feel the emotion expressed in the other person's face. The mirror neuron fires and sends its impulse to the emotional (limbic) circuit, just as if you had made the expression yourself. This capacity is the basis for empathy and the awareness that other people have feelings and points of view." (End quote.)

What would a management system be like that had that kind of feedback?

Long term memory

Now let's add in the capacity of the human brain to *remember*, to make a permanent record of every event that has occurred to it in the course of eighty-some years. People make a big deal of the fact that short-term memory tends to go—somewhere around the age of eighty, or seventy, or even earlier in some persons—and memory for names. But seldom do you hear anyone talking about the fact that *long-term memory* gets better and better. Many people can remember vividly their first day of school, or their first day of kindergarten, or their fourth birthday, or even that moment when they learned to tie their own shoes. Those memories do not fade as you get older, they become stronger. One reason for that is because they are no longer stored in one little cluster of neurons. Each memory is now distributed over the entire surface of the brain and can only be wiped out by removing the entire cerebral cortex.

Integration of Life Experience

But something even bigger happens. As the years go by, the brain begins to put the dots together, to make conscious links between one experience and another, between one historical fact and another. A person begins to experience one's entire life history as an integrated narrative, complete with all the correlations between that life history and events in the greater world, all the way back to the beginning of recorded history and even beyond that. There's the famous case of the successful business man who woke up one morning and announced, "Oh, so that's what I've been doing all my life!" and promptly gave up his business interests and embarked on a different existence. That's actually what happened to Stafford Beer, as those of you who are familiar with his life story already know, and to Ludwig Wittgenstein, and to Benjamin Whorf, and many others.

This integrating capacity of the human brain is perhaps its most marvelous achievement. And you have to be old—usually fifty or sixty years old—to reach that point where it dawns on your conscious mind that that's what's going on. Unless you are already in your coffin, your mind is always a work in progress, an ongoing process of continual growth and greater differentiation, richer and more far-reaching correlations.

A corporate database is not a corporate memory, and corporate entities do not self-integrate. Is this a deficiency, and if so, what can be done?

2. FLEXIBILITY

The second item was Flexibility. Flexibility means the willingness to act in response to the feedback message *by actually changing* how the system works.

The sad fact is, people in human systems are often ambivalent about feedback or just plain hostile. They are afraid of being overwhelmed by it. They may even fear feedback. When Catherine the Great of Russia made her famous tour of the country to see with her

own eyes how her people were getting along, her minister Potemkin was terrified at the thought that she might not like what she saw. So, in order to hide the miserable shacks and cabins of the Russian villages, he ordered the construction of false fronts down each Main Street along her route of travel.

Now that particular story is probably a piece of propaganda aimed at discrediting Catherine the Great—but in fact there are many Potemkin Villages in operation today, hiding and distracting us from awareness of what's really going on. Just think of the so-called Mainstream Media.

Many systems don't want feedback because typically their system is not designed to respond effectively to it. They may even regard the bearer of feedback as an enemy of the system. But ignoring feedback merely means that the system will eventually experience a *massive* unpleasant surprise rather than a *small* unpleasant surprise. So my advice is: Make a friend of feedback. Plan for it, welcome it, and be sure to make the necessary indicated changes in your system promptly, before the feedback gets really threatening.

3. CREATIVITY

The third item, creativity, is probably the most important of all. I think of it as the ability to respond to feedback by generating multiple models of systemic change in your imagination and choosing which of those is most likely to be an improvement on the original.

There is something really mysterious about creativity. Some people have it, to varying degrees, others apparently don't. Sigmund Freud himself at the end of his life admitted that he had no explanation for it. No psychologist today that I know of has anything convincing to offer. We do have some tantalizing clues, but before I can talk about that I need to bring up the topic of problem-solving as a problem in itself.

SECTION FOUR: PROBLEM-SOLVING AS A PROBLEM TO SOLVE

1. MOTHER NATURE

Dinosaurs into Birds

Not long ago I happened to look through a recent issue of National Geographic Magazine, and the lead article was again about dinosaurs, just as it used to be when I was a kid. And here were a couple of new ideas: that dinosaurs were actually warm-blooded and agile, and that they laid eggs in a nest and protected their offspring. And even more intriguing: that the slimmest, fastest, most agile of them did not perish by extinction like all the rest, but went on to evolve into birds. What a transformation! Talk about solving problems by changing your system! To go from fifty-ton giant lizards to delicate creatures weighing less than half a pound in order to escape extinction.

Over the years I have become increasingly aware of the immense number of incredibly ingenious solutions to problems that Mother Nature has placed before our very eyes in the structure and behavior of living creatures. Living systems have had millions, even billions of years to perfect themselves.

Technical marvels like sonar and distributed memory storage, infrasonic communication and long-distance navigation, are everyday occurrences for biological systems. A blind person can still tell day from night because his blind eyes still sense infrared radiation. Arctic wolves and Siberian husky dogs walk around in the snow at 40 degrees below zero and don't get frostbite. Did you ever wonder how that can happen? They have built-in countercurrent heat exchangers in each foot. The common housecat not only uses its tail as a

gyroscope, it also has an accelerometer in each paw that tells it how fast the ground is sliding past its feet, and how fast its prey is moving out of its grasp.

If I were an engineer and just starting out today, I would make a hobby of biology and study all branches of it for clues.

2. PROBLEM SOLVING AT THE FIRST LEVEL: VARIETY

Now getting back to creativity:

During the Battle of Britain, in World War II, RAF pilots became aware of an unexpected problem. Diving to escape a Nazi fighter plane, going faster and faster, the wings of the Spitfire would begin to shake, and on trying to pull the nose up, the plane would dip into an even steeper dive. Pilots were dying because their plane would go out of control.

One pilot realized his controls had reversed, and when he went against his training and pushed forward on the stick, his plane responded and pulled out of the dive. He survived to tell others what he had done, and the age of supersonic flight had begun.

3. PROBLEM-SOLVING AT THE SECOND LEVEL: NOVELTY

That Spitfire pilot was clearly exhibiting what Ashby called Variety, the ability to vary responses in order to provide different feedback to the system. But there are higher levels of creativity, that not only elicit different behavior from the system, they change the basic terms of relationship between the system and the person relating to it.

Gregory Bateson was working with colleagues who were very interested in dolphins. They had found that dolphins are extremely intelligent and enjoy interacting with humans. A dolphin can learn very quickly to do certain tricks if it is rewarded with a fish, and an individual dolphin can learn ten or fifteen different tricks. What Bateson found was that sometimes a hungry dolphin would not wait for his trainer to signal him for the next trick in sequence but would run through his whole repertoire at top speed and then pop out of the water as if to say: “There you are, now let’s have that whole bucket of fish all at once.”

The dolphin was in fact using one of the most powerful methods of communication known, which is that of transmitting a new kind of message, a *metamessage*, constructed out of units of behavior that had previously been regarded as complete in themselves. In the terminology of cybernetics, the dolphin went up to the second level of cybernetic recursion and proposed a *novelty*, a change of frame that necessarily changed the meaning of the action at the first level. Novelty: something really new, not just a different selection out of the same old bag of tricks.

4. PROBLEM-SOLVING AT THE THIRD LEVEL: HIGHER-LEVEL CREATIVITY

Then it was that Bateson had his inspiration. He decided to test the dolphin to find out if the dolphin could grasp the idea of doing something *completely* new, something that the dolphin had never been taught before, not even once.

The procedure was to reward the dolphin with a fish for doing one of his repertoire of tricks. Then, if the dolphin repeated that trick—no fish. The dolphin would swim around, try a different trick and get a fish, repeat that same trick and get no fish. This went on for some time. The dolphin stopped performing tricks and swam slowly around the pool. Then suddenly, she—it was a female dolphin, naturally!—she seemed to explode with excitement, rapidly swam the length of the pool, and proceeded to perform eight pieces of behavior she had never before exhibited, including four that had never been observed before in that species of dolphin!

The dolphin had understood the command to *be creative* and was able to telegraph her understanding by promptly providing a beautiful behavioral example of creativity. She had gone to the third level of cybernetic recursion, which, by the way, is just about the limit for most human beings. This seems to be a wired-in limitation of the human brain. Apparently we can only deal with three to possibly four levels of abstraction. Try it yourself! Convince yourself! And then ask yourself: How many of us have had the privilege of recognizing such an invitation and responding as creatively as a dolphin?

5. THE SCHOOL SYSTEM

Left brain/right brain

One of the problems with the school system is that it mainly is aimed at developing analytic left-brain functions. But these are precisely and exactly the functions that do not *solve* problems, they carry out previously discovered *solutions* in the form of programs. Our children are *programmed* to carry out *programs*. That is useful for learning basic skills, but the one-sidedness of it has hidden side-effects.

The Deadly Command to "Pay Attention"

The School System teaches us to pay attention to what the teacher is saying. We are taught not to trust the spontaneous turnings of our own attention to other matters. That, we are taught, is self-indulgence, absent-mindedness, day-dreaming, a weakness that will prevent us from learning to study. Forget the fact that as toddlers we learned to speak our own native language and to master the subtleties of its grammar and syntax without any conscious effort. That was then. Now we are officially pupils and we are taught to discount and downplay and not to trust the most vital, central, and creative part of ourselves, the part that worked so well before. We *pay attention* when we are told to do so, and our unconscious mind, the strongest part of ourselves, drifts out the window.

Day-dreaming and Creativity

If anyone doubts that it is the unconscious mind that solves real problems, just take a look at the actual places where new insights have come into existence.

Archimedes recognized the principle of buoyancy while soaking in the bathtub.

Martin Luther did his best thinking in the bathroom, on the toilet.

Albert Einstein as a child was obsessed with the idea of a beam of light passing through a falling elevator. He worked out the details while sailboating during summer vacation, and the result was $e = mc^2$.

Kekule, the discoverer of the benzene ring, which is the basis of organic chemistry, got the idea by dreaming of a fiery snake that formed a circle to bite its own tail.

Otto Loewi, who performed the crucial experiment that proved the chemical transmission of nervous impulses from one neuron to the next, dreamed the whole experiment, woke up, diagrammed it and carried it out, and it worked as he had dreamed.

Robert Goddard, the father of modern rocketry, got the idea while daydreaming up in a tree in his father's orchard.

What is amazing is not that people find creative solutions in this way, but rather that so many people remain unaware or unconvinced in the face of the facts. It is amazing that teachers tell our children not to do the very thing that the great innovators tell us they did to achieve their insights.

Command-and-Control

Another problem with the school system is that by its very structure it embodies the age-old authoritarian approach to human interactions with other humans and with Mother Nature and the world in general. An ancient Egyptian papyrus tells us, “The ear of the boy is on his back. He listens when he is beaten.” Sadly, that authoritarian structure is just as firmly in place and unquestioned today as it was three thousand five hundred years ago.

That approach, which I call Command-and-Control or One-up, One-down, works if you are building a physical machine to perform a mechanical task, but it does not work at all well with people or with organizations of people—that is to say, with self-correcting, autonomous entities.

Command-and-Control applies to systems at the level of solid objects and physical forces, and even there you have to have at least two levels of cybernetic recursion to maintain stability because the system will still “hunt” around the calibration point. Those of you who can remember the early days of power-steering on automobiles know what I am talking about. You drifted too close to the side of the road, you tried to correct, and suddenly you were in the oncoming lane. As Bradford Keeney pointed out, stability is not homeostasis, it’s homeodynamics.

There is an alternative to Command-and-Control. It is simply the understanding that autonomous entities like human beings or pets or committees or parliaments must interact with other autonomous systems as equals to equals, not as master and servant. Each has the power of choice. Each choice changes future potentials. The future of both depends upon the choices of each, which are made in real time. That mutual process is stochastic, not deterministic. By definition, that means you can’t even predict it, much less control it in advance. It is a dance. Anyone who has ever danced knows that you must accommodate your own moves to your partner's moves or the result will be bumps, jerks, and trampled feet. Dancing is done one step at a time. It is a stochastic process. But we humans, being what we are, we can interact so as to steer away from known disaster, we can build our systems to resist at least the more measurable kinds of catastrophes. And with long practice in dancing, we can learn the esthetics of the dance itself, something that we can share as a common goal with our partner, and then we both can enjoy dancing together, each participant gaining satisfaction and delight from the skill of one’s partner.

SECTION FIVE: LOGICAL LEVELS AND LEVELS OF RECURSION

1. WHEN IS AN APPLE NOT AN APPLE?

Question: When is an apple not an apple? Answer: When it is an abstraction—a class of objects rather than an individual apple.

Once you get above that first level, the level of material things and forces, you are dealing with abstractions. In place of physical forces, you have communication—messages, signals. And in place of material things, you have relationships—which are abstractions. At the first level, the engine drives the ship by using physical force to turn its propellers. In days gone by the captain used to steer the ship by physically turning the wheel to move the rudder. But the owners of the ship are at the second level. They steer the captain by sending him messages. And the stockholders steer the owners by sending them messages. And a federal agency controls the stockholders by issuing regulations—which are messages.

Once we get above the level of physical objects and forces, we are dealing with *patterns of interaction*, that is, with abstractions. The message is in the pattern—in fact, the pattern is the message. And right here is a major problem: pattern recognition. Our senses are designed

to register physical events—sound energy, light energy, physical touch. But patterns are in our own head. We see them with our mind, not with our senses.

The confusion of levels of recursion leads to futile attempts to physically eliminate abstract nouns such as crime, addiction, terrorism, war, poverty, obesity—you name it. These are patterns of behavior, that is, abstractions. They have no physical existence, and the attempt to use the concepts of physical objects and physical forces to deal with them is an error of logical category, resulting quite logically in failure. Abstractions—that is, ideas—don't die. They can't be killed. They can't be exterminated. They just keep coming back, over and over and over. This problem can never be solved if one continues to believe that the so-called "real" world of physical objects and forces is all there is. The Chinese have a word for this. They call it "being stuck in the ten thousand things."

2. POSIWID

Stafford Beer is famous for (among other things) the acronym POSIWID: *the purpose of a system is what it does*. I've always been confused by those two words, function and purpose. In my book *Systemantics*, I essentially gave up trying and said that the purpose of a system is simply whatever it can be used for. Since then I have come to wonder if perhaps for autonomous systems, the purpose might be two or three levels of recursion above physical function. In that model, purpose could be viewed as self-actualization, self-realization, the repeated remodeling of self into ever-higher fulfillment and expression. Under some circumstances it might even mean self-sacrifice in the achievement of that goal. After all, in order to become birds, dinosaurs had to give up being dinosaurs. Every lowly caterpillar has to give up being a worm in order to become a butterfly or a moth.

SECTION SIX: AFTER SYSTEMANTICS, WHAT?

1. THE BOUNDARY PROBLEM

The astronomer Harlow Shapley once calculated that each and every human being now alive on earth carries in his lungs on average six molecules of oxygen that were in Julius Caesar's lungs at the time of his death. Are those molecules in our lungs part of our own body or part of Caesar's body or part of the outside world—or are they all three things at the same time? Are they inside or outside our body? What are our true boundaries? And what are the implications of all this for our own particular system? Does this mean that our systems are so interrelated that they cannot be extricated from each other? And if that is the case, how should we act?

2. CONNECTEDNESS

Now, I live in a log home near a big lake just south of the great North Woods of Minnesota. The driveway to my log home is about a hundred feet long, and at the far end, just off the county road, at the edge of the driveway, sits a huge boulder, dropped there by a glacier many thousands of years ago. It's just a rock, right? But everyone who drives in or out of our driveway has to take note of that rock and not drive into it, or even worse, back into it when leaving. People use the rock to recognize the entrance to our home. In summer, the lawn mower has to steer around it. The contours of our garden have to take account of its presence. The trees near the rock—the fir trees, the oaks, the aspens—must send their roots around it. Squirrels perch on the rock to eat acorns. Earthworms and other tiny creatures thrive in the soil under that rock. Moss and lichen grow like a living skin over its surface. When it rains, the rainwater cascades around the rock in rivulets that differentially water different parts of our lawn and the garden. In winter storms, snowdrifts build around it. And when I walk down the driveway to get the mail, I look at that rock and experience feelings of

solidity, security and permanence. I feel my relatedness to that rock, and I feel its relatedness to the other things that I also feel related to. If it were not there, there would still be an infinity of signals—of clues, of reminders—that it had been there. The absent rock still leaves its ghostly presence behind.

What does all this have to do with systems? Just this, that if I design a system with no regard for the universe that surrounds it, I will have scanty knowledge of what can impact it. That is not a formula for success. To fit my system in to the larger system of systems around it, I must go to the next higher level of recursion, which is a frame of reference that encompasses my system *and* its environment—that is, the systems around it. What is involved is not simply survival of the fittest, but survival of the fitting-in-est, of that which fits in best.

Here we see also the insanity of demanding to be free of regulation. Any real-world system you can imagine is embedded in a vast network of other systems, to which it must adapt and respond—which means regulation. Seen in this light, the term "free enterprise" appears to be a brave mask for a delusional belief that there is no need to consider anything beyond one's own single goal—the very thing that got Dr. Faustus into trouble.

3. WHOLENESS

Two and a half centuries ago, William Blake said:

> "May God us keep
> From single vision, and from Newton's sleep."

In school we are taught to pay attention, to concentrate our mind on one thing. And that is good self-discipline for simple tasks. But single-mindedness, the concentration on one thing to the exclusion of all others, is just the wrong thing for wholeness, for being a complete human being. Having only one goal puts us at risk of becoming a robot, a wind-up toy. We risk becoming less than human, of becoming the angry upright ape with the spear, hell-bent to achieve one purpose at the expense of everyone and everything around us. We risk becoming Doctor Faustus, destroying the very things that we most desire even as we reach out blindly to grasp them.

Life demands multiple higher level goals, all balanced in the interest of being a human being. Conscious purpose then takes its place as just one element in a balanced ensemble of resources that also includes intuition, hunches, empathy, unconscious mental process, social awareness, esthetic and ethical impulses, and that mysterious thing that comes upon us when we are at one and the same time most alone and most related to others and the world—namely, creativity. The project becomes transformed—spontaneous yet inevitable, radical yet commonsense, matter-of-fact yet marvelous, innovative yet within the Tao. The people say, "We did it ourselves." No child cries unattended, no widow grieves uncomforted, no worker sits excluded, no crafty miser steals the new entity, because it is too deeply woven into its matrix of mutual relatedness to be torn away.

And now this is the point where we can just get a glimpse of a possible fourth level of recursion, where life and work themselves acquire an esthetic dimension. One's life and work themselves become a work of art, a unique expression of a pattern that has beauty, completeness, and wholeness in itself.

As Immanuel Kant said: "Always recognize that human individuals are ends, and do not use them as means to your end." A person is not to be used as a means to an end. A person is an end in itself. That is what is implied in the very definition of autonomy—self-regulation.

And our systems must demand and embody the same. If the systems we create are to be viable (and I'm using Stafford Beer's own word here), if they are not to destroy us humans and the world we live in, then they too must incorporate this understanding. We must strive to make them things of beauty, beautiful in the adaptation of their parts, beautiful in their adaptation to the needs of the humans within them and around them, thriving amongst other beautiful systems and contributing to the beauty of that greater unity in which we all must live and move and have our being.

Thank you for listening.