Change Is Not Doom

Donella H. Meadows

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Recently I heard a talk by David Brower—part of a seminar for our business community about the James Bay Electric Project. I thought as I drove home from the seminar of a passage I often read to my students about Brower. It is from John McPhee's great book *Encounters with the Archdruid*.[1] The David Brower he describes is exactly the one I saw—he's now seventy-nine years old and hasn't changed a bit.

> David Brower, who talks to groups all over the country about conservation, refers to what he says as "The Sermon." He travels so light he never seems far from home—one tie, one suit. He calls it his preacher suit. He's given The Sermon in universities, in clubs, in meeting halls, and once in a cathedral. He has otherwise not been in a church for thirty years. And while he talks, he leans up to the lectern with his feet together and his knees slightly bent like a skier. He seems to feel comfortable in this stance, perhaps because he was once a ski mountaineer.
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> Sooner or later in every talk, Brower describes the creation of the world. He invites his listeners to consider the six days of Genesis as a figure of speech for what has in fact been four billion years. On this scale, a day equals something like six hundred sixty-six million years and thus—now we're quoting David: "All day Monday and until Tuesday noon creation was busy getting the earth going. Life began Tuesday noon and the beautiful, whole, organic nature of it developed over the next four days. At 4:00 P.M. Saturday the big reptiles came on. Five hours later when the redwoods appeared, there were no more big reptiles. At three minutes before midnight, man appeared. At one-fourth of a second before midnight, Christ arrived. At one-fortieth of a second before midnight the industrial revolution began. We are surrounded with people who think that what we have been doing for that one-fortieth of a second can go on indefinitely. They are considered normal, but they are stark, raving mad."

I hope that the psychological community may be able to diagnose and do something about the "stark raving mad" part.

All I can bring to the effort—all any of us can ever bring—is my own story. My story might be a useful one, because I have come from middle-class, middle America, where jello was the staple food and driving around in a big car was the thing to do. I never knew there was any other way to live. Also, as a kid of Sputnik age, I grew up with a great trust in science, I loved science, and I was good at it. I ended up with a biophysics degree from Harvard.

My journey since then has been from middle America to the globe and from the mind to the heart to the soul. I've had to discover all those parts of the world and of myself. My culture and my education trained me only to value and use my mind. The problem we are here to discuss —the problem of unsustainability—forced me beyond that training. I tried to solve it with my mind alone and ran up against a lot of walls. My mind took me only so far.

At another meeting recently, the question came up: How do people come to *care*? And then beyond caring, what gets them to *act*? What got me to care and to act was a trip to Asia at the age of twenty-nine, right after getting my Ph.D. degree.

I went to climb mountains and kayak rivers with Dennis, my then-husband. We spent a year driving from England to India and back. We lived with the people, very simply. We were sobered by the problems we saw—the poverty, sickness, soil erosion, desertification—but we weren't disheartened because we were lifted by the dignity and spirit of the people. It was clear to us that they knew things that we didn't know, about survival and endurance and community and identity. We had a great time, learned more than we realized we were learning, and came home.

The first shock on coming home was to see how much *stuff* everybody had. The second shock was to see how unhappy everybody was, how driven, how fearful, how insecure—these Americans with all their richness, people who had solved all the problems of poverty that we had seen in Asia, truly were no happier than the people in Asia.

After that trip, I stopped aiming for the Nobel Prize in Physiology, stopped thinking that the world would be saved by technology, and went to work for the Club of Rome. The Club came to the Massachusetts Institute of Technology about a week after we got home from Asia and asked, "How can we understand the connections among the problems of the world? How

do population growth and poverty and environmental degradation all influence each other?" We were young and brash and had just been experiencing the problems of the world directly, and Dennis had just gotten his Ph.D. in system dynamics from Jay Forrester. So we said, essentially, "We'll put everything together in a big systems model and tell you the answer." That's how we got involved in the project that resulted in *The Limits to Growth*.[2] We spent the next two years trying to model poverty, population growth, pollution, and erosion on the computer.

We had to wallow in the data, the economic growth rates, the resource reserves, the birth and death rates. We saw in the numbers that which we had just seen on the ground in Asia. It was lucky that we had both those experiences back to back, because the numbers alone would not have wrenched my heart. As it was, I can remember plotting gross national product per capita versus birth rates and bursting into tears. I found myself putting so many dots way up in the corner of the graph with high birth rates and less than $400 per person per year: all the big dots—China, India, Indonesia—and all the little dots—nearly every country in Africa—all falling into that corner of poverty and population growth. I stuck two billion people into that statistical corner, and I remembered some of their faces, and my heart was with them.

There's a lot to systems analysis; it remains one of my major tools to help understand the world. It helps me keep track of connections and feel the dynamics. Take exponential growth, for example. Fooling around on a computer gives you a sense of how exponential growth takes you to whatever wall is ahead surprisingly quickly. People don't have an intuitive sense of how exponential growth of populations and rates of clearing forests and increases in soil erosion add up, one doubling and then the next and the next, and then, wham! something that was nearly invisible becomes monstrous and unstoppable. Watching that happen on the computer often enough gave me a gut feeling for it—which I never got from studying exponential equations in college.

We learned about a lot of dynamic traps from that model. The primary trap, other than exponential growth, is the delay of information feedback to decisionmaking processes. Signals of trouble come distorted and late to decision makers, and often the decision makers attempt to deny them. People don't want to hear bad news. They ask for proof that when the rain pours acid on a forest that it won't be good for the trees. Given the rate at which trees express their being and produce a measurable reaction to what happens to them, by the time the tree can be proved dying, and the cause of the acid traced, and the decision maker convinced, and the regulations written, the soils of the forest are contaminated, and it's much too late to prevent catastrophe.

Delayed feedback causes much of the trouble in the model that we made. There's a delay in the signal itself, a delay in the willingness to accept the signal, a delay in the action. That makes the system ungovernable. Imagine driving a car with ten-minute delay between what you see out the window and what you do in the car, and you can see what will happen. Unless you go very, very slowly, your car will be unmanageable—as is our current world.

Systems analysis also tells you how to restructure systems to make them manageable. It tells you, for instance, that a culture simply cannot be based on continuous exponential growth. If you base society on the idea of enough, instead of the idea of more and more, then you can escape one system trap. If you build in forecasting facilities and a willingness to be watching for danger signals and a flexibility that allows for changes and redesign, then you can go a long way toward shortening those delays that make it so hard to steer. If you shore up the ability of resources to renew themselves, if you avoid dependence on nonrenewable resources, if you watch for pollution and erosion and stop them sooner rather than later, then you can build a sustainable world.

The last chapter of *The Limits to Growth* was about a sustainable world—which, by the way, has to be a just world too, or it won't be sustainable. Nobody seemed to read that far. Everybody considered the book a message of doom. It wasn't that. It was a call for change and a guideline for the kinds of changes that are necessary. Change is not doom. I considered *Limits* an optimistic book. I still do.

I suppose most of you know something of the world's reaction to that little book. It actually didn't need to have anything printed inside, just the title *The Limits to Growth* would have been enough to create worldwide outrage. Watching that outrage unfold was painful and amazing. The book was called pretentious nonsense. *Science* magazine said something like, "these naive people are trying to save the world!"[3] The right wing, the left

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wing, and the down-the-middle economists outdid each other in their attacks. Mobil Oil ran ads in the *The New York Times* saying that growth is not a four-letter word. President Nixon put our publisher on his enemies list.

After I got over the hurt of all this, I learned from it a lesson about the power of paradigms. Somebody put into my hand at that time Thomas Kuhn's book *The Structure of Scientific Revolutions*.[4] I read it and thought, "This explains what's happening. We have kicked the industrial world in its paradigm by asserting that economic growth can't go on forever. We have confronted the world's most powerful religion with a great heresy." After I understood that, I could lean back and watch the show with a kind of enjoyment.

Having been trained as a scientist, rather than as a growth economist, I thought that the ideas in *Limits* were obvious. I thought it was almost too simple to be worth saying that you can't have an ever-growing number of people or factories on earth. You can't go on cutting the forests, eroding the soils, catching the fish, burning the oil at an exponential pace. My friends who were ecologists, anthropologists, various kinds of physical scientists, read the book and said, "So what else is new?" But the economists didn't get it—still don't get it—and the politicians would rather not know.

I was much more careful after that. I learned that one must challenge paradigms very carefully. I ducked out of the conversation for awhile—Dennis and I decided to go farm and teach in New Hampshire, drop out of sight, and create a little prototype of a sustainable world. Twenty years later, I still live on that farm, not fully sustainably, but having moved a long way in that direction, having made a lot of compromises and mistakes, and having had a wonderful time.

I don't see any sacrifice in a sustainable world. The present industrial world doesn't work well at all for most people—and it is becoming more and more unworkable, more unpleasant, filthy, exhausted, unjust, unreliable, impoverished, and violent. I believe—this belief comes out of the *Limits to Growth* analysis as well as my personal experience—that a sustainable world is possible. It could supply all basic material needs, and it could supply our important non-material needs—for love, for self-confidence, for belonging, for purpose, for challenge, for transcendence—in a non-material way, instead of offering cheap material substitutes that satisfy only temporarily and therefore set up the need for more and more of themselves.

Lots of people are working to bring a sustainable world about in little pockets all over the world. My great joy has been to get to know them and learn from them. They have created the New Alchemy Institute, the Rocky Mountain Institute, Meadowcreek, the Land Institute, Findhorn, Auroville, Mondragon, Sarvodaya Shramadana, Commonweal—and many other such places, which are the stars on the world map for me. None of these places is perfect, all have their failures and successes, none is totally sustainable, but each is a valuable experiment—and a fun one too. I wonder if we could get across to the public that sustainability can be fun!

One of the great revelations of systems theory is that the behavior of the system comes from the system. Most people prefer to look for causes of problems somewhere else, outside, over there. It's OPEC that's doing it to us, or the Russians, or Iraq, or our competitors, or the politicians, or the liberals, or the right-wingers, or whatever. Systems theory almost always reveals that a stress may be coming from outside, but the unproductive reaction of the system to that stress comes from the way the system is structured. The most effective change you can make is usually inside the system, not "out there." OPEC couldn't do it to us if we weren't addicted to its oil. The Russians wouldn't have been a threat if we hadn't threatened them—and so forth.

Systems people have spent years trying to explain to industry this principle of systems causing their own behavior. Some companies have been open to that idea and have made internal changes that served them very well; others would never acknowledge that they had anything to do with their own problems. (Individual people are like that too! And nations, of course!) Systems analysis, for example, tells us that market economies create their own business cycles—not presidents, who always get blamed for them. Economies

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can be restructured to reduce or smooth out those cycles, but no one wants to hear this. The necessary changes would be against the market system! They would violate an important paradigm. We'd rather blame the president and go right on being pitched around by the cycles.

Restructuring a system doesn't mean shoving people or things around, bulldozing, rebuilding, hiring, firing—that's not what changes system behavior. Almost always, the most effective restructuring means putting information into a place where it doesn't now reach, or changing goals, rewards, incentives, and disincentives, so that the same people, in the same positions, make decisions a different way. Restructuring a system means changing what's in people's heads. If you want to really restructure a system—the kind of major restructuring that's necessary if we're ever to have a peaceful, just, or sustainable world—that means changing the paradigms that are in our heads.

Paradigms are the sources of systems. I mean hard, physical systems—they flow out of the deep, socially shared assumptions in our heads, in the culture, in the reigning paradigm. One kind of paradigm produces papyrus, pharoahs, and pyramids; another produces feudal lords and Gothic churches; another produces F-15 fighters and oil tankers. Changing the physical system is as easy—or as hard—as changing the paradigm. That only takes a second to do within one single person, who suddenly sees things a wholly different way. It's painless. It's even thrilling. But there's nothing we resist more as individuals and as a society. Our paradigms are deeply embedded in our psyches. When someone questions my paradigm, they're attacking *me*. The emotional reaction against *The Limits to Growth* came from people who thought their very being was threatened.

Once Dennis and I gave a seminar on growth and sustainability at an important institute. The person who invited us was a nuclear engineer, a big, famous, brilliant man, who had designed some of the major nuclear power systems of Europe. We talked about sustainability and the technical, psychological, social, and political challenges of designing a society that could fit sustainably on the planet. The engineer sat in the front row, listened hard, and at the end he said, "I don't see any role in your sustainable society for a person like me." We tried to tell him about all the engineering challenges of solar energy, but he likes nuclear power plants—he thinks he *is* nuclear power plants. The sustainable society does need him, but it's a larger "him" than he can see in himself. I think one of the major obstacles to a workable world is the puny, limiting self-definitions we tend to form for ourselves.

About five years ago, I resigned from Dartmouth because I decided that I had to reach more than one hundred Dartmouth students a year, bright and wonderful though they are. I am watching those exponentials with grave concern. I have an increasing sense of urgency. It was 1985 when I resigned. Reagan was president, George Will's columns were in the paper three times a week, and I kept muttering, "somebody's got to be saying something else, loudly, publicly. If no one else will do it, I have to. Someone has to make some unpalatable anti-paradigmatic truths understandable. They have to be repeated again and again."

A society upholds its reigning paradigm by repeating it over and over. Little everyday conversations affirm the beliefs that hold the society together. Growth is good. A little more of it will end poverty. The environment is a luxury. Technology will save us. You're a better person if you own a bigger car.

So I stuck myself with an obligation to repeat—a weekly newspaper column. I started with my local paper, which was the only one that would have me. I try to present a global view, a connected view, a long-term view, an environmental and compassionate view. I haven't missed a week in six years. It has become a practice, like Zen meditation, something I just do. I've also worked with television a little bit. I find it tough to work in the media, in terms of what I can actually get through that filter and what I can't but I think there's some hope in the fact that about twenty papers actually do print what I write, though it's totally subversive to the reigning growth paradigm.

So that's what I do, and that's all I know. I know that I won't speak out regularly, clear-

ly, and forcefully unless I stick myself with a commitment to do so. I know that I don't like society's reaction when I poke it in the paradigm, but I have to keep doing it. I try to do it respectfully. I try to present the possibilities for a better world and to show the impossibilities of the world that we have. I wish there were more people doing it. I feel lonely sometimes, especially in the media. But how else, but by speaking out, in multiples, in mass communications, can we reach the culture, work at the level of paradigm, and restructure the system?

NOTES

1. John McPhee, *Encounters with the Archdruid* (New York: Farrar, Straus and Giroux, 1971) 79–80.
2. Donella H. Meadows et al., *The Limits to Growth* (New York: Universe Books, 1972).
3. Robert Gillette, *Science*, (10 March 1972): 1089.
4. Thomas S. Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1962).