The New World Coming: Climatic Disruption and the Clash of World Views[1]

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The particular group of scientists that I represent works on how the world works as a biophysical system. We recognize that the world of the front pages of the newspapers works on a basis of politics and economics, and that it takes politics that works, an economic system that works, and an environmental system that works to support civilization. The environmental system at the moment is conspicuously not working, and the gap between what the scientific community that I represent and the political and economic communities can do about it is increasing day by day. The problem is that the compromises that work and lubricate the political and economic systems do not apply to the biotic systems where basic rules of nature dominate and are simply not open to easy modification. Another fact is that the connections between those three lines, all of which are absolutely necessary if we are going to have a civilization into the future, are breaking down. And we have feedback from the failures in the biophysical world into the economic and political world in Pakistan at the moment, and Guatemala, Haiti, Somalia and other nations around the world, all of which are suffering from the extreme degradation of their environment to the point where it is not possible to have a viable economic system or viable political system.

I want to share a little bit of experience by way of establishing the credentials that the scientists bring to this topic. Years ago in the '70s I was a young scientist at Brookhaven National Laboratory working on the ecological effects of ionizing radiation. And the Senate Committee on Public Works under Mr. Muskie was revising the Water Pollution Control Act to producing the amendments of 1972. A copy of that document, a draft, came to me for some reason or other at Brookhaven with a request that I review it. It was a giant document, impossible to review from my standpoint. I looked at it to find what criteria they were using in establishing all these various rules for handling water in the nation. What was the capstone to test these rules against? There wasn't any. There was no expression as to just how we want to change the world of water, but there were all kinds of rules to change the world of water. So I wrote back and said, well, it would be very good if we had a policy for the nation. This document might start off with words such as, "It is the policy of the nation to restore and protect the physical, chemical, and biotic integrity of the nation's waters – the lakes and streams and coastal waters…" and so on. Mr. Muskie and colleagues thought that was a good idea. I thought that it might just be the beginning of what they wanted to say about objectives, but they took those words as the objective of the Water Pollution Control Act amendments of 1972. I'm told that it has followed all the reincarnations of those amendments over the years and is the law of the land today. It was a very good thing that they didn't pursue me as to just what I meant, for I'm sure I could not have expressed what the integrity of the nation's waters consisted of in an open, straightforward and simple way.

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What those words meant, however, was shown, not in a positive sense, but in terms of what they do not mean over the course of years. This began with the very research my colleagues and I were doing at Brookhaven at that time on ecological effects of ionizing radiation. We showed, making a complicated story brief, that ionizing radiation produced a gradient of change in the structure of the forests of central Long Island, from substantially intact right on down through a series of stages that involved the elimination of trees, then tall shrubs, then short shrubs, then herbaceous plants, then the elimination of mosses and lichens, which survived up to very high concentrations, and beyond that no plants at all – barren ground. That transition turned out not to be an anomaly; it was very common in nature. We had all wondered what changes ionizing radiation would produce, and we were startled to discover that the changes produced were the same changes that we could observe downwind of smelters in Sudbury, Ontario, downwind of a smelter in Pennsylvania producing lead and toxic substances, including lead and oxides of sulphur spread out over the landscape – the same gradient of change in the vegetation around a whole series of smelters in Russia and around the world. And the cause of those changes wasn't ionizing radiation or specifically oxides of sulphur or other toxins. It was chronic disturbance. Chronic disturbance produces a pattern of changes in the vegetation, changes in the structure – the integrity of nature – that is predictable. It's a pattern of biotic impoverishment, a curve of biotic impoverishment. And that's a general rule of nature: changing the environment out from under natural systems – whether they are forests or prairie or ponds or oceans, the gulf of Mexico – changes the structure of nature in a totally predictable way. And it's a series of steps which we would call systematic biotic impoverishment.

Armed with that perspective and the idea that this is a general principle of nature, one can then look around the world and explore the extent to which chronic disturbances produced by an expanding human enterprise are producing increments of biotic impoverishment globally. And once we start looking, we discover that they are everywhere. That no matter where in the world there is an accumulation of some type of human-produced chronic disturbance, continuous change in the general environment that's changing the structure of nature that is the product of millions of years of evolutionary development. So we have that insight as a general principle now, and if we look around the world, we can find what happens at the extremes, the point to which scientists always seek to push things; they want to know where any course leads in the end. Well, we can find that, too. We find that answer in those nations that I just mentioned: Pakistan, Mexico, Guatemala, and so on around the world. In Haiti there are no natural forests. In fact agriculture has been pushed to slopes that will not sustain agriculture; the slopes themselves erode in successive rains filling the valleys with silt so that the water does not run off in the same place. Coastal waters are silted up to the point where fisheries are destroyed. All of this was in place before the earthquake that confirmed the incapacity of Haiti to pull itself out of the abyss – I refer to the Haitian abyss. That nation is so deeply mired in an impoverished landscape with overpopulation that there are not resources intrinsically available to repair it. As with New Orleans, it will take massive outside help to the tune of tens of billions of dollars to repair that nation. It could be done. If we, the U.S., were interested in doing that as a nation, it would be a much better investment than wars in the Middle East. It requires establishing a functional landscape, restoring the integrity of function of the landscape of Haiti, a major challenge. But that is necessary around the world. The model we have at the moment of open-

ended exploitation of environmental resources, the model that allows us to give to a single corporation the potential of contaminating the entire Gulf of Mexico with residues of a spill from one well is outrageous. It marks the absolute end of that sort of permissiveness. We can't have that again. We can't allow ourselves to even think about it. So we need a new model.

I'm going to talk about the climatic disruption, not because it's the only chronic disturbance at the moment, but it is the dominant chronic disturbance and it is one that we can correct. But the chronic disturbance is enormous. In terms of biotic impoverishment, it is the ultimate step that we would take if we were planning to undermine all of the biotic systems of the Earth. And, make no mistake; it is the biotic systems that run the world. We think that it is economics and politics, but economics and politics exist only by dint of environments that work. We have to have a reliable water supply in order to have a government in Haiti to have an economic system. We have to have land to stand on, an economic system based first on agricultural productivity before we can have an economy. They say we can make shoes in Haiti. Well, the people who make shoes have to have clean water, too, and food and a place to live and resources to live by. And that is the purpose of government.

So we have a global climatic system at the moment that is changing in ways that are totally predictable. The changes are predictable in the context that 40 years ago we laid out exactly what would happen globally if we were to warm the Earth systematically. We pointed out then that the effect of warming the Earth would be to warm the continental centers differentially and to warm the high latitudes differentially. There would be small changes in the low latitudes where most of the energy is absorbed, because there is a lot of water in those low latitudes. The evaporation of water absorbs energy into water vapor as the energy of vaporization. That water vapor enters the atmospheric circulation in the tropics and is carried pole-ward toward both poles, north and south. As the water vapor is cooled at higher altitudes and elevations, it condenses, releasing the energy and adding heat to those latitudes. So one of the greatest spots for warming in North America is in the Mackenzie district in northwestern Canada, where the warming is two to three times the average change in the temperature of the Earth as a whole. That's in the boreal forest. That means that the northern forest in that region, and in fact the northern forest around the world, is warming greatly. It is having its environment changed out from under itself more rapidly than any other ecosystem.

And what's happening there? If you've noticed from reading the newspaper, the forests of Asia are burning. They have been burning over the past 20 years, with increased frequency year by year; as they warm up, they dry out and become more vulnerable to fire. So the frequency of fires in our own coniferous forests and in the forests across Russia has been rising systematically. This year, in fact, is the hottest year of the century; in Moscow and across Russia it is an outstandingly hot year. You may recall that in 2003 there were 14,000 excess deaths in France as a result of one hot summer. A study showed that the death rate soared at that time; it also soared in Germany and Spain. When the tabulations are made, this year will be far worse and will reach far into Russia and Poland and elsewhere. So the transitions are underway. They do feed back and have political implications.

What can we do about it? I can go through a litany about changes in the world that are in the newspapers, but you don't hear about the real simplicity of pursuing a solution. You hear about objectives such as adaptation. We can accept, they say, a two-degree change in the average temperature of the Earth. I don't know where that came from; it's an absolute dream, one of these political and economic compromises applied to biophysics that has no relationship to biophysics at all. I've just pointed out that a change of two degrees in the average temperature of the Earth will be two to four times that in the boreal forest. We already have problems in the boreal forest that are totally unacceptable; Moscow is burning up. I haven't talked about the diseases in forests that become prevalent when we change the environment out from under it, making trees vulnerable to insects and other pests. As those forests are destroyed, they dump carbon into the atmosphere, too, and there is three times as much carbon stored in forests and plants and their soils. So there is a large pool of carbon there waiting to be fed into the atmosphere making the problem worse. This is not a problem that we can adapt to; there is no adaptation. There is only mitigation. Adaptation is suicide, and it is suicide in a short time. So we have to figure out ways of controlling it.

The scale of the problem is this: the accumulation of heat-trapping gases in the atmosphere to the extent of about 5 billion tons of carbon a year. It is hard to conceive of a billion tons, but they are just units. A billion tons of carbon is a lot of carbon. It is the net accumulation in the atmosphere of that much carbon that is the product of the total release of carbon into the atmosphere of human activity, by burning fossil fuels and by deforestation especially in the tropics, of about 10 billion tons total annually. The remainder, about 5 billion tons, is absorbed into the ocean and probably into plants on land, especially forests in the middle and higher latitudes. That leaves the residue of 5 billion tons that I mentioned. About 1.5 billion tons of carbon, out of the 10 billion tons annually released, is released by deforestation, changing forest into non-forest – forest into agricultural land, forest into harvested land that's impoverished because the forests won't reproduce there at the moment. We could simply stop deforestation – further harvesting of primary forest. The primary forests of the world – tropical forests and boreal forests – are one of the wonders of the Earth. They are reservoirs of biodiversity; they are systems that work. They are there, and they potentially serve a magnificent purpose. It would be to the advantage of everyone in the world to preserve the remaining primary forests. The only reason for not doing so is greed, simple avarice. People can make money at it. We could indeed stop that. I've suggested that the United States might take leadership. The largest forested areas in the United States are in federal control. It would be a simple thing for this administration to announce to the world that we are taking that step: we will no longer cut any primary forest; we are going to conserve all of them. The public's interest rests in that direction, not only for the carbon budget, but also in land use.

Saving the world's remaining primary forests would remove a total of 1.5 billion tons on a global basis. If we were to proceed and decide that we have to manage forests on a global basis, we could also restore forests to deforested land. One to two million square kilometers would store roughly a billion tons of carbon a year depending on where the forests are. That is an additional billion tons of carbon of the 5 billion tons we have to take out of current annual releases. That leaves 2.5 to 3 billion tons to be removed by reducing the use of fossil fuels on a global basis.

That's 25-30 percent of the total use of fossil fuels immediately. It is entirely reachable in a short time. It would take heavy handed US leadership on a global basis, but it could be done through conservation, shifting to renewable energy sources. It would be a different perspective and a different world. It would be a magnificent step forward, because the changes brought by the total enterprise of mining and using fossil fuels are prodigious. They make a major step in the biotic impoverishment of the Earth, undermining the living systems that in fact run the world. That can be done. Those two steps can be taken, and they can be taken now.

There isn't really anything else that can be done. Small steps shifting to alcohol and to alternative fuels are useful, but none of them operates at the billion ton level. If we were to do that, we would not have finished the job. We have to sustain it. We have agreed, by the way, to stabilizing the composition of the atmosphere with respect to heat-trapping gases at levels that will protect human interests and nature. We agreed to that formally; it is the law of the land. We ratified the Framework Convention on Climate Change of 1992, signed in Rio and ultimately ratified by all the nations in the world. As far as agreement is concerned, we've agreed to go as far as I have just outlined to stabilize the composition of the atmosphere. We've already clearly exceeded those levels. So we have every reason to proceed on the basis of uniform agreement around the world. Arguing against it is arguing for suicide as we change climate out from under civilization itself. If you want to get rid of rats, you change the environment so they can't survive there. Well, that principle applies to the world as a whole.

What do we do? Where do we go from here with that? What sort of a perspective does that give us on the world? Well, it says that we have to turn our view of the world away from the exploitive view, in which every resource is open-ended exploitation by whoever wishes to do it. It's an astonishing series of assumptions. We can dump anything, any waste of industry into the atmosphere and assume that it will be accommodated. That assumption is clearly not sustainable. It cannot be made to work in this world or any other. So, turning this matter upside down, we have to take a view of the life of the Earth as the central resource that has to be preserved to make and keep political and economic systems that can work. The new view says that the life of the Earth is the whole objective of government.

We have to ask ourselves, what is government for? The answer comes back that government exists to protect human interests, to set up the rules by which we live with one another, the rules under which we exploit commonly held resources. As the human activity increases in the world, as the human footprint grows, as the scale of the human undertaking expands, as we honor growth and allow it to happen, the need for rules rises, not in proportion to numbers of people, but as a square of the numbers of people. It rises much more rapidly than the numbers themselves rise. So it's a frightening prospect.

We have one political party in the United States that's committed to smaller government and to growth at the same time. They are absolutely mutually exclusive. That is silliness; it makes no sense at all. We have to have more government if we're going to have more growth, and more rules, more thoroughly pervasive rules that establish the stability of the biophysical system that we all depend on. Building that change is going to take a major effort on the part of the scientific

community first in defining it, and second in executing it – persuading the conservation community that it has to have clear objectives that will work.

I came on a paragraph in a small book that has been produced recently by Dianne Dumanoski, a good friend. She wrote, “For some, including the distinguished physician and science essayist Lewis Thomas, the picture taken of Earth from the moon left little doubt that it was a living whole that inspired reverence and wonder. Viewed from the distance of the moon, the astonishing thing about the Earth,” she wrote, “catching the breath, is that it is alive. The photographs show the dry, pounded surface of the moon in the foreground dead as an old bone. Aloft floating free beneath the membrane of bright blue sky is the rising Earth, the only exuberant thing in this part of the cosmos. It has the organized, self-contained look of a live creature, full of information, marvelously skilled in handling the sun. It is absurd to insist upon the sanctity of humans while denying the sanctity of this larger life that enfolds us. Of the overarching process that gives the Earth its green vitality and has done so for a longer time than the human mind can conceive,” she wrote, “is there not sacredness as well in the living Earth?”

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