Rachel's Environment & Health News
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Is it merely by coincidence that the NEW YORK TIMES chose the birthday of the United States -- July 4th -- to discuss the metaphors that scientists are now using to describe the destruction of the global ecosystem?[1]

What is the best metaphor to help us understand the accelerating disappearance of animal and plant life and indigenous people world-wide, including the U.S. where one-third of all animals and all plants are now at risk of extinction and where the destruction of indigenous people exceeded 90% some time ago?

** Is the best metaphor the airplane losing rivets? Many rivets can pop out without having any effect on the airworthiness of the plane, but eventually the loss of one-too-many rivets will cause a crash.

** Or is it more appropriate to compare the global ecosystem to a rich, diverse tapestry, a metaphor used by Carlos Davidson, a conservation biologist at the University of California (Davis) in an interview with TIMES staff writer William K. Stevens. "The function and beauty of the tapestry is slightly diminished with the removal of each thread. If too many threads are pulled -- especially if they are pulled from the same area -- the tapestry will begin to look worn and may tear locally." In this metaphor, there is no "crash," but rather a "continuum of degradation" from "a world rich in biodiversity to a threadbare remnant with fewer species, fewer natural places, less beauty, and reduced ecosystem services." According to this metaphor, any crashes that may occur (such as the collaps e of a fishery) are relatively rare and local.

** But, says Stevens, even the tapestry metaphor seems "incomplete" because "if the human impact on the rest of nature is as pervasive and encompassing as many scientists say," then humans are not just fraying the tapestry they are re-weaving it in entirely new patterns which are "markedly simpler, duller, and less functional than the original."

The main impact of humans is to simplify the Earth and simplification itself leads to the danger of collapse, according to G. David Tilman and Kevin S. McCann, both of whom recently published articles on biodiversity in the British journal NATURE.[2,3] Only during the past 10 years have scientists been able to show that diversity is important to the stability of ecosystems. David Tilman told William K. Stevens, "We're simplifying the world on a mass scale, an unprecedented scale."

Tilman points out that we now know for sure that simplified ecosystems are subject to collapse, and we see the tapestry metaphor beginning to converge with the rivet metaphor. It is diversity that allows an ecosystem to survive during times of stress, such as drought. Because of diversity, drought will not kill every part of an ecosystem, so there is something remaining from which to rebuild. A grossly simplified ecosystem may not be able to rebuild, and desert conditions (for example) may become the norm. (An estimated 35% of the world's land is now threatened by the advance of deserts.[4]) From a human viewpoint, simple ecosystems can be very productive (farmer's fields of corn, for example), but they are fragile and subject to collapse (for example, the Irish potato famine of 1845-1851 killed a million people). Thus even "local" collapse can be exceedingly painful for those involved.

Humans are altering the face of the earth in three major ways, according to Jane Lubchenco, former president of the American Association for the Advancement of Science: (a) transforming the land and the sea, through land clearing, forestry, grazing, urbanization, mining, trawling, dredging, and so on -- all the activities we call mis-label "development;" (b) adding or removing species and genetically distinct populations via habitat alteration or loss, hunting, fishing, and introductions and invasions of species; and (c) altering the major biogeochemical cycles, of carbon, nitrogen, water, and synthetic chemicals....[5]

Probably the easiest of all these problems to solve is the industrial contamination of the globe with exotic, dangerous chemicals. Jane Lubchenco describes the problem this way: "Novel chemical compounds -- ranging from chlorofluorocarbons to persistent organic compounds such as DDT and PCBs -- are being synthesized and released. Only a few of the thousand or so new chemicals released each year are monitored; the biological effects of most are unknown, especially synergistic interactions of different compounds, and interference with developmental and hormonal systems." Note that all of Lubchenco's examples are chlorinated compounds -- ozone-destroying chlorofluorocarbons (CFCs), DDT and PCBs. These are good choices because chlorinated compounds tend to be toxic, long-lived, and incompatible with ecosystems. Phasing out chlorine on a strict schedule -- the way the world is trying to phase out CFCs through the Montreal Protocol -- would be a rational step that humans could take to reduce the destruction of the Earth.

The Chlorine Chemistry Council -- the association of corporations that make and sell chlorinated chemicals -- argues that the world should continue to regulate chlorinated chemicals one-by-one using risk assessments, the regulatory status quo. They have one main reason for advocating this position: they know it can never lead to any significant curtailment of the chlorinated chemical industry.

The only rational, protective policy would be to phase out all chlorinated chemicals as a class. All of them. If any were to be retained, they would be exempted from phase-out on a case-by-case basis. In other words, the burden of proof should be shifted from the public onto the chlorine-using polluters: they should have to show that their wares are not causing, or going to cause, significant harm.

In other words -- as Joe Thornton says in his excellent new book, PANDORA'S POISON [6] -- before a substance can be introduced into commerce, the manufacturer should have to show that the substance and its associated by-products and breakdown products are neither persistent nor bioaccumulative and that they are not carcinogenic, mutagenic, disruptive of intracellular signaling (by hormones, neurotransmitters, growth factors, cytokines, and so on), or toxic at low doses to development, reproduction, immunity, or neurological function. Very few organochlorines could pass such a test. Thus, this would be entirely too great a burden for the chlorinated chemical industry to bear, and they know it. So they favor a continuation of the entirely ineffective present regulatory system based on risk assessments chemical by chemical, one at a time.

As Joe Thornton points out, there are seven reasons why chemical-by-chemical regulation of chlorinated chemicals has failed:

1) There are 11,000 chlorinated compounds created intentionally and thousands more created unintentionally. Furthermore, new chemicals are brought on the market much faster than toxicologists can evaluate their hazards. As of the early 1990s, EPA [U.S. Environmental Protection Agency] had established effluent guidelines for 128 chemicals, had prepared health assessments on fewer than 100 chemicals, and had issued air emission standards for fewer than 10 chemicals. This is the result of 30 years of intense effort. EPA's scientific reassessment of the hazards of just one organochlorine chemical -- dioxin -- has been underway since 1991 and is still in draft form. Even if EPA were to assign vast new resources to the task of evaluating the hazards of chlorinated chemicals, it would take many, many centuries to complete the task.

2) Organochlorines are formed as complex mixtures of thousands of compounds, and the great majority of chlorinated by-products remain unidentified and unknown. I t is not possible to assess and control on a chemical-by-chemical basis compounds that have not been identified.

3) Even if our goal were to eliminate only the most persistent, bioaccumulative and toxic organochlorines, the only practical way to accomplish this would be to phase out all of them because chlorine chemistry cannot be practiced without creating large quantities of persistent, bioaccumulative and toxic by-products. As Thornton points out, the continuing production of thousands of tons of PCBs each year -- decades after the intentional manufacture of PCBs was outlawed -- shows the failure of chemical-by-chemical regulation. Dioxin is in the same class -- almost all chlorinated products and processes create dioxin somewhere along the way -- so to avoid the production of this most toxic of all chlorinated compounds, all chlorine chemistry must be phased out.

4) The limits of toxicology and epidemiology make the chemical-by-chemical approach unsuitable for protecting health and ecosystems. Organochlorines occur in complex mixtures, so toxicologists and epidemiologists will never be able to sort out which chemical is causing which health effects because, as Thornton says, "the fact is that groups of these compounds are always responsible." "In contrast, a focus on the technologies that cause organochlorine pollution eliminates the formation of these mixtures, immediately dispensing with the problems of unidentified compounds and synergistic effects," Thornton points out. [pg. 351]

5) The fifth reason is economic: as society phases out one organochlorine (for example, DDT), the chlorine industry creates a market for another chlorinated product and thus maintains -- or accelerates -- its program of global destruction. What the world needs is a reduction in the total burden of chlorinated chemicals, not just a reduction in one or two or 10 specific compounds. Chemical-by-chemical regulation can never give the planet respite from the chlorine scourge.

6) It makes no sense to presume that the thousands of untested organochlorines are benign, given that virtually every chlorinated compound ever tested causes one or more toxic effects. Chlorination almost always increases the toxicity and the bioaccumulation of organic chemicals. It is therefore logical and consistent with existing knowledge to presume that all chlorinated compounds are hazardous unless specific information suggests otherwise.

7) The last reason for treating organochlorines as a class is ethical. Chemical-by-chemical regulation assumes each chemical is innocent until proven guilty. This places the burden of proof on the public to prove that each chemical is harmful. As Thornton says (pg. 353), the result is a vast, poorly documented program of chemical experimentation on the public, "in which the ecosystem and our bodies are contaminated by novel chemicals, the effects of which are not well known, but are likely to be harmful." People have a right not to be experimented on without informed consent; no one has ever had the opportunity to grant or deny their consent before being exposed to the organochlorine burden that now contaminates us all." Joe Thornton is too generous to say so, but the chlorophiles -- the lovers of chlorine chemistry -- are imperceptibly different from the Nazis of the Third Reich in their willingness to allow monstrous experiments upon hapless, captive victims, world-wide.

--Peter Montague (National Writers Union, UAW Local 1981/AFL-CIO)

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[1] William K. Stevens, "Lost Rivets and Threads, and Ecosystems Pulled Apart," NEW YORK TIMES July 4, 2000, pg. 4.

[2] David Tilman, "Causes, consequences and ethics of biodiversity," NATURE Vol. 405 (May 11, 2000), pgs. 208-211.

[3] Kevin Shear McCann, "The diversity-stability debate," NATURE Vol. 405 (May 11, 2000), pgs. 228-233.

[4] http://www.funkandwagnalls.com/encyclopedia/

[5] Jane Lubchenco, "Entering the Century of the Environment: A New Social Contract for Science," SCIENCE Vol. 279 (January 23, 1998), pgs. 491-497.

[6] Joe Thornton, PANDORA'S POISON; CHLORINE, HEALTH, AND A NEW ENVIRONMENTAL STRATEGY (Cambridge, Mass.: MIT Press, 2000). ISBN: 0262201240.

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