

# Man and environment: Fighting the backlash

No one can blame the public for being confused about phosphates, lead and mercury.  
But a recent report of the Institute of Ecology warns against complacency and  
calls for changes in attitudes toward other problems as well.

by Richard H. Gilluly

There is evidence that an environmental backlash is in the making. It is compounded of, first, a fear of the costs of pollution abatement, and, second, of new scientific findings that indicate some environmental problems are more complex than earlier imagined. Some of these findings are interpreted in ways that suggest the problems are far less severe than thought; they ultimately produce arguments against abatement that on the surface appear credible.

Phosphates in detergents is a case in point. Seizing on scientific evidence that phosphate substitutes in detergents are not safe, plus growing evidence that eutrophication is more complex than earlier thought, detergent companies have managed to stimulate articles that say detergent phosphates have a "relatively clean bill of health." The growing complexity of the scientific evidence makes laymen particularly susceptible to such arguments.

Lead additives in gasoline are another example. Removing lead from gasoline will be costly. Engines burning low-octane, lead-free fuels are less efficient than the higher-compression engines that burn leaded fuel. Substitutes for lead, such as aromatic hydrocarbons, may create their own environmental problems. Linking these facts with the scanty evidence for low-level chronic toxicity of lead, the lead industry and its scientific allies have been able to make a convincing case for not removing lead additives.

Likewise with mercury. Evidence that mercury contamination of the environment has been with mankind a number of years and, in fact, may be diminishing is held out as evidence that there is no cause for concern.

That the controversies definitely are not settled is made clear by a recent publication, "Man in the Living Environment" (SN: 10/9/71, p. 244), issued by the Institute of Ecology.

The Institute of Ecology is a new organization whose work in compiling the report was funded by the National Science Foundation. The NSF grant was made to four principal investigators who represent large groups of ecologists: Robert F. Inger of the Field Museum of Natural History, chairman of the board of the new Institute of Ecology itself; Arthur D. Hasler, president of the International Association for Ecology; F. Herbert Bormann, president of the Ecological Society of America; and W. Frank Blair, director of the U.S. International Biological Program.

The compilers of the report used as a starting point the ecology section of last year's Massachusetts Institute of Technology-based Study of Critical Environmental Problems (SCEP). Then, using the SCEP format of intensive workshop sessions to compile and integrate earlier research findings, the report was produced. The study makes clear that mankind faces severe environmental problems. As for phosphates, lead and mercury, it shows that there is a large body of scientific opinion that still gives no basis for optimism. On those three contaminants, here is what the report has to say:

**Phosphates.** There are really two problems. The first and best-known is the eutrophication of waterways. The other, lesser-known, is a decline in world phosphate reserves; without recycling, phosphates ultimately enter ocean sediments from which they cannot feasibly be extracted for re-use. With growing demands for phosphate fertilizers for crops, says the report, "Phosphate is in short supply and may run out in the next century." About 15 percent of the phosphates used in the United States go into detergents.

Recommended steps to stretch the phosphate supply include more efficient extraction from minerals; basing the use of fertilizer on real requirements rather

than simply on current availability and cost; curtailment of such nonfertilizer uses as detergent additives; and recycling, perhaps in tertiary sewage treatment plants.

Regarding eutrophication, the report emphasizes the role of phosphates: "The management of phosphates is the key to management of eutrophication in most bodies of water. . . . The ratio of phosphate to nitrate influences the kind of algae that flourish in lakes. Green algae, which are more edible and rapidly enter the food chain, require nitrate or ammonia in the water; whereas many blue-green algae, which are often inedible and, so, tend to accumulate, are able to fix their own nitrogen. Thus pollution with sewage effluents [which are high in phosphorus, low in nitrogen] favors the growth of undesirable algae and large aquatic plants." Frederick Smith of Harvard was chairman of the workshop that considered cycles of elements, including phosphorus.

**Lead.** The report admits that evidence of low-level toxicity of current environmental levels of lead is still virtually nonexistent but insists this is no reason to suggest that ignorance somehow gives lead a clean bill of health. "The major concern over the long-term human health effects due to lead are: its ubiquity in nature, increases from lead additives in gasoline and evidence of increasing lead accumulations in human populations. . . ."

(The report's claim that there have been increases of lead in the environment is contradicted by a recent National Research Council report on lead; however, the NRC report has been challenged by some scientists as not having included the latest findings.)

"Lead pollution has now reached global proportions," the report continues. "Between 1904 and 1964 lead concentrations in Greenland have increased 16-fold."

The report describes the human disorders caused by lead at toxic levels, admitting that current environmental levels are not yet high enough to cause symptoms. But it adds: "We do know that lead has considerable reactivity in biochemical processes. It will affect cell membrane permeability which can in turn cause very subtle changes in intercellular metabolism. Lead passes the placenta and may be secreted in mother's milk. Additionally, alkyl leads are 10 times more toxic to animals than is inorganic lead; and there may be conversion in nature from inorganic to organic forms thereby increasing the danger to man." The critical question, the report says, is whether the body burden of lead from ingestion and inhalation is sufficient to cause sub-acute effects. The general opinion, says the report, is that with increasing levels of lead, this will be the case, and the report recommends removal of lead additives from gasoline.

**Mercury.** Whether environmental levels of mercury have declined or increased in recent years, says the report, there is no excuse for permissive policies regarding further additions. The evidence is clear that organic mercury compounds are highly toxic. They have their source in widely used fungicides, and they may be formed in nature from other mercury compounds. Thus, says the report, release of the less toxic compounds into the environment may be no proof against poisoning by the organic compounds. But the report does add a reassuring note regarding mercury: The chlorine-alkali plants that once were a major source of environmental mercury have largely corrected the problem in recent years. The lead and mercury problems were considered in the "Ecosystems for Human Benefit" portion of the report, which was compiled under the chairmanship of Conrad

Istock of the University of Rochester.

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In addition to specifics such as lead, phosphates and mercury, the report discusses human practices that lead to environmental destruction.

Agriculture is one such practice: "When the practice of industrial agriculture is interpreted in the light of current knowledge of ecosystems, a picture emerges which suggests that the future dependability of such agriculture is in grave doubt."

One of the gravest problems is the mining of agricultural land—"the one-way coupling of nutrient flow from agricultural land to urban areas and [then via pollution] to fresh and salt waters." The problem needs to be solved "by returning nutrients to croplands or by diverting these nutrients to other productive uses such as aquaculture."

Beyond this, however, the report says it is important that the world begin to end its reliance on the over-simple, one-crop systems of modern agriculture. An axiom of ecology is that the more diverse the life forms in an ecosystem, the more stable the system and vice versa. Reliance on single-crop agriculture has created a myriad of problems. Pesticides are among them.

"Dependence on chemical pest control endangers the long-term dependability of our agricultural ecosystems, causes serious environmental degradation and sometimes poses a health hazard. Every effort should be made to replace chemical pest control with other methods and in particular with an integrated approach that will develop and use ecological diversity."

The report urges that agricultural research agencies in all countries start experimenting with systems that increase diversity. Innovation is necessary in many areas. "Management techniques

required to control such complex systems must also be developed. Trade-offs between technical feasibility, economic viability, social acceptability and ecological stability will require decision processes other than those we now use." These comments were also in the "Ecosystems For Human Benefit" section.

Two sections of the report not discussed here relate to the ecological aspects of land management and the management of aquatic resources.

With regard to aquatic resources, the report says conventional fisheries techniques might increase ocean production of proteins as much as 50 percent. But it warns that ocean ecosystems—particularly of intertidal marshes and seaweed zones—must be protected from contamination or destruction if the potential is to be realized. As in most of the other sections of the report, creation of an international authority is recommended.

The recommendations of the study are to be presented to the 1972 United Nations Conference on the Human Environment. They can only be described as radical. The emphasis on the need for international control of prerogatives now jealously guarded by nation states is one radical aspect, as is a recommendation for a new kind of relationship between industrial and underdeveloped nations. (When industrialized nations receive produce from underdeveloped nations, the report notes, they often fail to pay the real costs—in terms of the ecologically destructive single-crop economies and the mining of the soil of the underdeveloped nations.)

In essence, the report calls for unprecedented human cooperation and insists such cooperation is necessary for human survival. The outlook may be dim—especially in view of the difficulties of solving merely the lead and phosphate problems. □

