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EPA JOURNAL

Education and the Environment

Understanding the Environment

In this issue EPA Journal takes a look at the myriad efforts being made to educate people about the natural water, air, and land systems upon which all life is utterly dependent.

The magazine includes reports on approaches to environmental education and ecology —the study of the relationship of living things to each other and their environment—at some universities and institutions.

The issue also includes articles on the activities of various environmental organizations since so much of our information and understanding of the world's troubles and needs are learned outside the school system.

Some of the most eloquent and blunt writing about the principles of ecology was produced by Shakespeare in Hamlet when he wrote lines like the following:

"A man may fish with the worm that hath eat of a king, and eat of the fish that hath fed of that worm."

"We fat all creatures else to fat us, and we fat ourselves for maggots."

"Imperious Caesar, dead and turned to clay, might stop a hole to keep the wind away."

Failure to have a firm grasp of the basic principles of ecology has led to the destruction of some civilizations and the impoverishment of others.

One of the problems today in this era of highly trained biologists is that there has been a tendency to focus, almost myopically, on too narrow segments of the environment.

An unfortunate result is that we risk losing our sense of the natural world as a whole with all its combat and blood, disease and death, and beauty and glory.

A distinguished ecologist, Eugene P. Odum, in an article in this issue, warns that environmental education has become too fragmented. Noting that energy and environmental problems appear hopelessly complicated when viewed piecemeal, Odum emphasizes the need for taking an overview so that humans and nature can be recoupled in a more harmonious whole.

One of the more provocative articles is by Lord Eric Ashby, a noted British scientist who observes that it is sometimes necessary to use "shock tactics" to get corrective action for environmental ills.

Commenting on the failure of some authoritative and meticulously accurate scientific reports to arouse public action, Ashby notes that the philosopher Alfred North Whitehead stated that "it is more important that a proposition be interesting than that it be true."

While we recognize the enormous value of being interesting, we pursue the elusive goal of being both readable and accurate. □

Youngsters examining marine life at Outreach Program in Baltimore public school as part of environmental studies.

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EPA is charged by Congress to protect the Nation's land, air and water systems. Under a mandate of national environmental laws focused on air and water quality, solid waste management and the control of toxic substances, pesticides, noise and radiation, the Agency strives to formulate and implement actions which lead to a compatible balance between human activities and the ability of natural systems to support and nurture life.

Articles

Departments

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Environment,

Ten years ago, I doubt that one American in 500 knew what "ecology" meant. If pressed to define it, I suspect many Americans would have guessed it had something do with where you go after graduating from high school.

Today, by contrast, probably one in three of us knows what "ecology" means.

Or, at least, we *think* we do. The word "ecology" has a precise meaning. It refers to an intellectual discipline that is one branch of the physical sciences, in exactly the same sense as are physics and chemistry. But most Americans use "ecology" as a synonym for "environment." We must, they believe, "clean up our ecology." This is roughly equivalent to arguing that, before expanding the use of nuclear power, we must protect our physics . . . or, in another sphere, that precinct captains are vital to our political science.

Whether they use the word properly or not, most Americans are aware, in a general way, of the relationship between themselves and their habitat . . . and they want their home cleaned up. Congress and various Administrations have translated that desire into laws, and these laws retain broad public support.

Expanded Definitions

But there is harm in the imprecise use of the term "ecology" by both the most militant advocates of environmental protection, and its most militant opponents. In a paradoxical way, bitter as these two groups can be toward each other, *their* definitions of "ecology" go full circle and meet in common agreement.

To some executives in industry, for example, "ecology" means environmental impact statements, protesters being hauled away from nuclear plants, and endless litigation against industrial projects by the Friends of the Raccoon. And to some environmentalists "ecology" seems to mean a passionate desire to make America a place

Scientists examine sorghum grown with aid of irradiated sludge at Department of Energy's Sandia Laboratories, Albuquerque, N.M.

Education And Technology

By Douglas M. Costle,
EPA Administrator

where the deer and the antelope roam, and no factory ever rears its ugly smokestack. They agree on only one thing: that ecology and technology are opposed to each other.

The result, on one side, is that a considerable amount of corporate ingenuity is devoted to circumventing environmental regulation, rather than seeking better, more efficient ways to comply with it; and on the other, that a considerable amount of environmental rhetoric is directed at the managers, engineers, and producers who are our best hope for resolving our environmental problems. What is needed is a better educated society—in the broadest sense of the word—in environmental management.

Let me emphasize that this is not a hymn of praise for American industry. Left to its own devices—left only to regulation by the market system, with no intervention by our political system—industry would have pursued its damaging ways, and presented us with a Nation vastly more polluted than it is now. And our political system would not have been moved to act without pressure from those early environmentalists who were invariably regarded as kooks and radicals. That first Earth Day was labeled "subversive" by the Daughters of the American Revolution, and its dangerous goings-on were closely monitored by the FBI.

Some people are caught in the middle of this dispute. They deal in technology—but apply it to ecology. They symbolize what we need: a marriage between these two "ologies." Part of our environmental education must be an awareness that we cannot solve some of our most pressing ecological problems *without* technology.

Using Energy Wisely

Energy, for example, is probably our greatest single environmental *and* economic problem. Its production and combustion present hazards to our waters, our fishery resources, our air quality, and—in the form of acid rain—to the productivity of forests and soil. The increase in atmospheric carbon dioxide, many scientists believe, could result in a disastrous elevation of temperatures around the globe.

There is no question in my mind that energy conservation in this and other developed countries is our best, cheapest, and most quickly available "source" of energy. But there is also no question that—though conservation must become a way of life in a crowded, resource-limited world—we must also develop new sources to replace our dwindling stock of petroleum. Developing those sources will require the most skillful applications of technology. For example:

• The photovoltaic cell, which transforms sunlight into electrical current, is not yet economically competitive with traditional methods of generating electricity. However, it is rapidly becoming more so. When these cells were first employed, mainly on space satellites, they produced electricity at the rate of $1 million per peak kilowatt. Today the cost is down to about $6,000. It will be competitive when we further reduce that cost to $1,000. In order to do that, we need breakthroughs in the technology of producing and processing silicon. Further, to make these cells as versatile an energy source as possible—to make sure the electricity doesn't stop flowing when the sun goes down—we need major improvements in the technologies for energy storage.

• The municipal refuse that we now dump in landfills and burn in incinerators contains a tremendous amount of energy—enough to meet the lighting needs of every residential and commercial building in the country. Yet today, we make use of but one percent of that energy. To better that record substantially, we will need to improve current technologies, in addition to overcoming political and institutional barriers to resource recovery.

• The energy potential of crop and forest wastes is more massive yet: by one recent estimate, forest wastes alone could supply seven to eight percent of the Nation's energy needs. Yet to harness more than a fraction of that potential will require a series of technological breakthroughs. Identifying new enzymes to speed the breakdown of cellulose, for example, could substantially cut the costs of producing methanol from these wastes; and inventing better methods for distilling the fuel would likewise add to its economic attractiveness.

Needed: Managerial Innovation

There are other ways in which we must rely on technology to help us resolve ecological problems. Among the specific tasks that might be cited are these:

• The problem of disposing of sludge from wastewater treatment would be vastly simplified if we could apply more of the material to farmland—and thereby reclaim its value as a plant nutrient. However, this requires removing some of the water, as well as the small quantities of toxic substances often found in the sludge. With current technology, it can be done, but it's a cumbersome and expensive process. Here again, simpler and cheaper technologies are needed.

• Small communities today cannot afford the systems that would safeguard their water supplies from a variety of contaminants—especially the toxic substances that pose a long-term risk of cancer, genetic mutation, and a range of other health impacts. Thus, there is an urgent need for inexpensive technologies that fit the budgets of our smaller cities and towns.

• This country generates roughly 50 million tons of hazardous waste each year. Much of that will have to be disposed of in landfills or impoundments. But certain common constituents of hazardous waste—such as PCB's—retain their toxicity for literally centuries. Thus we need technologies that will make disposal sites secure for at least several human generations.

This would be a tough agenda to handle even in economically easy times. It is vastly more so in a period of high inflation and

Continued to inside back cover

Looking At The Whole

By Eugene P. Odum

Environmental education has become excessively fragmented into bits and pieces as has the education profession in general. There are literally dozens of well-meaning special interest groups such as foresters, soil conservationists, hunters and fishermen, recreationists, nature preservationists, industrial engineers, government bureaus and so on, each bombarding the public and the schools with their carefully slanted or stratified facts and figures regarding the environment. It would seem that there is too much attention being given to the trees and not enough emphasis on the forest, to cite an all-too-common complaint.

The new science of ecosystem ecology that has emerged during the past decade provides a basis for a more holistic approach to environmental education. Surprisingly, application of basic principles of the ecosystem is easy to teach because they correspond to common-sense wisdom embodied in our traditional culture as is so admirably reflected in its proverbs. A couple of examples will suffice to illustrate.

Haste Makes Waste

This familiar admonition makes a good heading for a chapter on energy in ecosystems, since it expresses an important aspect of the entropy law, also known as the second law of thermodynamics, one of the most important natural laws. The success of any system, whether man-made or natural, depends not only on the quantity and quality of its energy source but also on how efficiently the source is converted into useful work capable of maintaining the system as a whole. As energy is converted from one form to another to accomplish a useful function or transformation, the quantity is reduced by an inevitable heat loss, but the quality of that which is passed on may be increased. Thus, in the well-known food chain conversions it takes about 500-1,000 units (calories, for example) of low quality sun energy to make 10 units of higher quality plant material which in turn can be converted into 1-2 units of still higher quality meat.

When easily convertible energy is plentiful, then both man and nature tend to haste and make waste, which in turn requires additional energy to cope with the disorder created by the growth in size and by the waste products produced. In theory, negative feedback then acts to slow down the haste and increase efficiency. We do observe that in natural ecosystems growth slows down, energy is used more efficiently and stores of high quality energy are established in the biomass as the ecosystem develops from a pioneer stage to maturity. The same things happen if the inflow of energy or its quality is reduced for whatever reason. The common sense notion of saving for a rainy day becomes appropriate when saturation levels of use are approached since energy and resources are always subject to periodic fluctuations in the real world.

Both common sense and the entropy law dictate that man should respond to an energy crisis in the same general way as does nature, but energy conservation as a public policy does not have the appeal that the search for glamorous new sources provides. Unfortunately, finding new sources does not necessarily resolve an energy crisis if a lot of the new-found energy has to be used to develop and maintain the new flow and to deal with new and perhaps more toxic waste products. For example, fusion atomic energy might not prove to be the bonanza we expect since much energy will be needed to cool

down the reaction from millions of degrees to a usable level. So far in fusion research the break-even point, where as much energy is produced as is required to produce it, has not yet been achieved even on a small scale.

Quantity vs. Quality

Not only do natural laws rule against having speed and efficiency at the same time but they also make it difficult to have high quality and large quantity simultaneously. Increasing the quantity of resources increases the potential for rapid growth, but such growth may come at the expense of the quality of the individual and/or the quality of life for the individual. In the extreme, fast growth can become disorderly like cancer and threaten survival of life itself. The eutrophication or enrichment by pollutants of natural lakes provides an illustration of the quantity-quality dilemma. When nutrients from sewage are put into the lake, the number of organisms and the rate of organic production increases but weed-type organisms such as small, scummy algae and trash fish replace the diatoms, attractive water plants, and game fish. If enrichment is intensified more and more kinds of organisms are eliminated, even as those which remain multiply like the out-of-control cells in a cancerous organ. One cannot be certain that the discovery of a new unlimited and cheap energy source, granting it's possible, would really be a boon for humankind. It might just be too much of a good thing that would convert the world into one big, overpopulated cesspool, an undesirable "whole earth" if ever there was one!

All in all, then, the judicious solution to the energy, food, water or other similar crises is to cut down on haste in order to reduce waste, increase efficiency and buy time to improve the quality of human life; at the same time, without undue haste, we can look into our options for adjusting supply and demand. To act on such common sense judgment requires not only science and technology dedicated to such goals, but reordered political and economic objectives, which are more difficult to achieve and today are much too strongly geared to promote growth and waste. Here is where environmental education needs to focus: on the benefits of promoting quality over quantity.

The Need For Diversity

Two common sayings, "Don't put all your eggs in one basket," and "Variety is the spice of life," would make a good base for future design that can couple man and nature more harmoniously. Few of us would disagree that it is unwise, and usually downright foolhardy, to put all one's money, or whatever, into only one venture. Naturalists for centuries have marveled at the diversity of life in natural systems, and modern ecologists have generally agreed that there is efficiency and safety in diversity, although they are not sure just why and how diversification evolves. The idea is that a diverse ecosystem is better able to use the energy and resources available and better able to resist adversity. However, it is also clear that diversity has an energy cost of its own so that one can have too much as well as too little variety. Right now our concern in human society is with too little. Industrial societies have often thrived on the short-term basis by putting all the eggs in one basket. Thus, in the U.S.A. we put most of our transportation eggs in the auto basket, a lot of the energy eggs in the oil basket, too much of our hair spray in aerosol cans, and so on. Also, more and more we concentrate on one or a very few kinds of grain, or species of trees, for the food and forest baskets. All the while we seem fully aware that this sort of strategy invites the overshoot, the boom and the bust, as it were. One reason we do it is that high profits and rapid growth come when we concentrate on promoting single products. We assume that when the diminishing returns set in we can quickly and easily shift to another basket. But what if we do not have another basket ready when the one we have been using breaks, or what if the eggs we lost have not been paid for? Then there will be serious transition losses including perhaps economic depressions and social disorders as we struggle to recoup losses and organize another basket as is so evident in the financial losses suffered by the American automobile industry as it belatedly retools for production of fuel-efficient cars. If we can only heed the common sense warning in these matters and recognize and act on the premise that variety is not only the spice of life (quality factor) but also a valuable stabilizing factor, then we should be able to devise the means to promote diversification. As already noted there would be a cost to such a strategy, and we would have to be convinced that this cost is less than the transition losses inherent in the boom and bust model. The evolutionary success of diversification in nature would seem to indicate that this is indeed the case.

The Bottom Line

My theme has been that common sense notions representing human wisdom of the ages provide a basis for seeking holistic solutions of problems of energy and environment which appear hopelessly complicated when viewed piecemeal. Accordingly, environmental education should focus on holism. I cited several examples to show how the principles of ecosystem ecology can be expressed and easily taught in terms of this common sense wisdom. When we do take an overview of problems related directly or indirectly to environment it becomes clear that the time has come to recouple the two "houses" of man, the man-made urban-industrial system and the natural environment life support system. During the industrial age these two vital parts of our total existence have become too far separated in our minds and actions, leading to dangerous inequities of value and performance. To recouple man and nature into a more harmonious whole requires that science and technology be integrated with reordered social, economic and political goals—a most difficult task. Particularly difficult is getting value of goods and services of nature into the economic system which now deals almost exclusively with man-made values. It is tempting to wish for a benevolent dictator who could act for the good of the whole so as to prevent, or at least blunt, the overshoot that comes with going too fast, too far. But we are immediately reminded of another wise saying that power corrupts! Benevolent dictators do not remain benevolent for very long; being human they are likely to abuse their power to the detriment of basic human rights. The best we can hope for is a massive educational effort at all levels of the media so that an informed public can select leaders who see the whole as well as the parts; and who, we might add, can be recalled if they abuse their political power. In the meantime, there is much to be learned from study of how natural ecosystems survive the same kind of growth problems now facing civilization. □

Eugene P. Odum has been Director of the Institute of Ecology, University of Georgia since 1960. He is author of several books on ecology and wildlife.

Algae caused by eutrophication in Lake Tahoe, Calif.

By Thomas M. Kimball

An Earth Ethic

As citizens we know that the quality of our life in the future will be determined in large measure by how environmentally aware the world's population can become. As educators we know that two things are necessary to develop that awareness: caring and knowledge. Together, care and knowledge can be translated into the understanding we need to solve our environmental problems.

We need people in the environmental movement who care about the condition of the Earth, because as the American poet e. e. cummings would say, "feeling is first." If people care about streams and rivers, about oceans, and air, soil, and water, about people and, of course, about wildlife, they are ready to learn how they can help. Only after they have been awakened to the beauties of the natural world can they be enlisted in the struggle to protect it. And protect it we must. That is a matter of survival, and environmental education is survival education.

We also need people with knowledge. We can't expect everyone to become a pollution expert, but we can expect them to know that to preserve our natural resources we must clean up pollution by controlling the sources of pollution. We can't expect everyone to become an expert on estuarine ecology, but we can expect them to know why wetland areas constitute some of our richest and most productive wildlife habitat We know that it took professional researchers to discover the insidious effects of DDT on wildlife, but we know that it took informed citizens and lawmakers with a love for wildlife to call a halt to the depredation by banning the use of DDT. So, we know that when people who care are given the facts they will stand up for a better world environment.

Care and knowledge are, therefore, the two keys to a quality environment.

How do we use those keys? How do organizations like the National Wildlife Federation, the National Audubon Society, and the Wildlife Management Institute fit in?

I see two specific areas where I feel non-governmental groups can have a major impact on the enhancement and protection of environmental quality. First, we can interpret scientific data as it is developed. Second, we can communicate this information to the public. If we are not now fulfilling these functions, if we are not serving as the leading edge of the environmental movement, we should be. We should and we must work toward the development of an informed citizenry that is willing to make its voice heard, and we must do this by shouldering a major share of the responsibility for popularizing information about the environment.

Creating An 'Earth Ethic'

I think we have already made important contributions in these areas. There already has been a tremendous increase in the public's awareness of environmental matters and I believe that non-governmental environmental education groups can take a great deal of credit for this widespread awakening to the needs of our world. Before the late 1960's, the media made little mention of environmental problems. Then, in the period leading up to the first Earth Day, April 22, 1970, we began to see more and more features dealing with the environment. Today, we find accounts of environmental issues appearing regularly in most major newspapers and magazines. We also notice that those who write these articles have a more comprehensive understanding of the ramifications of an oil spill, or the construction of a new dam or shopping center. I think this new awareness is due in great measure to the efforts of the environmental education community. I think we have already begun to establish an Earth ethic in which all people see themselves as a part *of* the Earth, and not apart *from* it.

We must develop educational materials for the schools—materials that will be used by them. We also must develop materials for the general public that will make the best possible use of available data. And we must improve the distribution of the materials we develop: information that stays on warehouse shelves educates no one.

Helping The Teachers

How can we be sure that the materials we prepare for use in the schools will meet the actual needs of teachers and students? Let me tell you of a recent National Wildlife Federation experience.

For more than four decades, the Federation has sponsored an annual National Wildlife Week. Each year we attempt to improve the materials we provide teachers for the observance of this event. Recently we sent a questionnaire to 200 teachers who had responded to a notice in *Instructor* magazine offering free Wildlife Week Education Kits for classroom use. We asked for ideas for improving the packet and replies poured in from teachers of young students telling us they would like more materials that could be used to awaken environmental awareness in the early grades. So we visited teachers in nearby Fairfax County, Va., to determine how we could meet this need. The answer amazed us; these teachers all said they wanted pictures of wildlife. We were nonplussed to realize that although we publish pictures of wildlife in our magazines all the time, we had not been using them to best advantage in our Wildlife Week Kits. We had been too close to the trees to see the forest.

So, we subsequently included a special poster composed of 16 small pictures of animals with information about each of them on the reverse of the poster, and added two and one-half pages of ideas for using the pictures.

My point is that we went to the teachers themselves for ideas about their needs and then developed our materials to fill that need. By doing that we have helped them to help their students discover new aspects of the world around them.

Still, that is not enough. It would be, if every teacher had a background in ecology and the interrelationships in the

A volunteer youth group collecting litter at Fort [illegible]

natural world. Unfortunately, that is not the case. So we must also provide the schools with information that will train teachers in using the data we prepare for the classroom.

I believe that education of our children is the major, long-term answer to a healthy environment for the future, but it is obvious that most of the current population is no longer in school. If we are to win today's battle for the environment, we must also reach the adults who are voting now, making decisions that will have a significant effect on our world for the next few years. If we do not meet that educational challenge, we are all in very serious trouble.

How do we meet the challenge? First, we must increase our efforts to spread the word through printed materials, news releases, films, radio and television announcements, seminars, and continuing education programs. We must develop the public's awareness that there are acceptable solutions to nearly every problem, whether it involves the diversion of a road around an important wildlife habitat area, the consideration of alternate forms of energy, or the control of pests by methods that will not poison the environment.

Having thus engaged the public's attention and proposed solutions to the problems facing them, we have a further responsibility to expand the general understanding of the issues involved. To do that, we must provide for widespread distribution of materials that define the immediate and long-term costs and benefits of actions that affect the environment. To assure broad dissemination of the facts, we must keep our materials simple and inexpensive. National Wildlife Federation, for instance, limits most of its educational publications to a single topic and offers them free to the public on a single copy basis. The growing demand for these publications has convinced us that more impressive, highly technical materials which the average person could neither understand nor afford would be a waste of our limited time and money.

Finally, we must encourage the public's participation in the environmental debate by helping them to understand the methods that are available to them for making their opinions known. It is, as we have all had occasion to learn, sad to lose a battle because we did not have sufficient information; it is tragic to lose because our voices were not heard.

To avoid that tragedy, our organizations must be effective in guiding the population along the path from a first consciousness of the value of nature because of the beauty it adds to their lives, toward a search for knowledge that will reveal the power humankind has to manipulate nature. It is up to us, as environmental educators, to see that all citizens then come to understand their proper role as stewards of the Earth and exercise their power responsibly.

Then we shall see how care and knowledge can be used to unlock a healthy future for the environment. □

Thomas Kimball is Executive Vice President of the National Wildlife Federation.

By William B. Stapp

UNESCO's Efforts In Environmental Education

Environmental problems exist in all countries of the world and at every stage of economic development and political ideology. Developing countries frequently experience problems associated with underdevelopment or poorly planned development. These include poor farming techniques leading to soil erosion and depletion, improper management of forest resources, inadequate health and nutrition practices, and the lack of educational programs to help resolve these problems. Other developing countries have adopted inappropriate measures based upon short-term gains not suited to existing situations. These strategies have led to the rapid depletion of resources, increased pollution, and in some instances, the spread of disease.

Many developed countries also face severe environmental problems. Some of their more critical problems are industrial pollution, overexploitation of resources, and a variety of social and physical problems confronting metropolitan areas.

When development programs are not planned adequately, they may result in resource deterioration, such as the reduction in quantity and quality of minerals, land, forests, or aquatic sites; biological pollution by organisms that cause disease in humans; chemical contamination resulting from effluents, pesticides, or other materials; and physical pollution, such as noise, silting, thermal wastes, or visual blight.

Such environmental problems cannot be resolved only through technological means. Consideration must also be given to their social and economic roots. We will be facing the same environmental problems in the future and breeding new ones, until we identify their causes and develop programs to help resolve them.

It is evident that there can be no hope of finding workable solutions to environmental problems unless we modify education so that people from all walks of life can comprehend the fundamental interaction between humans and their environment.

Within the attitudes of our population lie the behavioral roots of such problems as pollution, wasted energy, and the destruction of the environment. There is a general lack of a global ethic encompassing the world environment, an ethic that helps individuals and societies think and act in a way that recognizes humanity's place and critical role in the biosphere.

The Stockholm Resolution

The United Nations Educational, Scientific, and Cultural Organization (UNESCO) became involved in environmental education as a direct result of a recommendation at the United Nations Conference on the Human Environment in Stockholm in 1972. The recommendation stated that "organizations of the United Nations system, especially UNESCO, should establish an international program in environmental education, interdisciplinary in approach, in-school and out-of-school, encompassing all levels of education and directed toward the general public, in particular the ordinary citizen living in rural and urban areas, youth and adult alike, with a view to educating people as to simple steps one might take to manage and control one's environment." Furthermore, the Conference called for UNESCO to work with all appropriate United Nations agencies, international non-governmental organizations, and the 148 member nations to develop a framework for furthering environmental education internationally. A direct result was the intergovernmental conference on environmental education held in Tbilisi, U.S.S.R., in October 1977, to formulate and adopt international, regional, and national policies on environmental education.

In September of 1974, I accepted the position as the first director of UNESCO's international environmental education program. I served in this category for two years and have since continued to work with the program on a consulting basis.

In October of 1974, UNESCO convened a consultation meeting with representatives from many United Nations Agencies, international government environmental education organizations, and experts in environmental education from each region of the world.

An outcome of this meeting was a UNESCO proposal, later approved, to the United Nations Environment Program (UNEP) for a $2 million grant for a period of three years. The resulting UNESCO-UNEP effort would help develop an international program in environmental education; promote the international exchange of information on this subject; coordinate research in teaching and learning; and formulate and assess new methods, materials, and programs.

Four-Year Plan

The strategy consisted of four phases, each requiring about one year of preparation and execution. The first phase was to develop a comprehensive bibliography and working documents for an international workshop held in Belgrade, Yugoslavia; to assess needs and priorities of UNESCO member nations; and to establish a network system for environmental education. The second consisted of a series of regional workshops that revised the Belgrade recommendations to meet regional needs better and the funding of twenty-five pilot environmental education projects. The third phase was the convening of the conference in Tbilisi. The fourth was to help carry out recommendations adopted at the intergovernmental conference, assign environmental education experts to each of the UNESCO regional offices, encourage development of national environmental education plans, and build a stronger financial commitment for environmental education with UNESCO.

As a result of the UNEP grant, UNESCO was able to increase its staff and consultants in the environmental education program.

The first year of the program (1975) laid out a four-year strategy: to prepare a funding proposal for UNEP; to survey the world literature in environmental educa-

Malaria control in Chandigarh, State of Punjab, India, is part of environmental health measures there.

tion; to prepare a series of "State of the Art" papers in environmental education; to undertake a world-wide assessment of requirements in environmental education; to arrange for consultant missions to every developing country; to start a network system in environmental education; and to prepare for an international meeting in Belgrade that October.

Dr. David Lockard of the University of Maryland reviewed and abstracted world environmental education literature for the "State of the Art" papers. He covered such areas as philosophy, early childhood, elementary and secondary level education, tertiary level education, training of specialists and teachers, youth and adult programs, methodologies, learning environments, instructional materials, evaluations, and national, regional, and international programs. Environmental education experts from around the world were contracted to prepare papers on these topics.

We drew up and sent to every UNESCO member nation a questionnaire to identify national needs and priorities within seven areas of environmental education: programs, instructional materials, training of personnel, physical facilities, funding, organizations, and legislation.

Resulting papers identified programs, materials, individuals, organizations, and institutions active in the field of environmental education around the world. This material proved invaluable in developing environmental education documentation centers at UNESCO Headquarters in Paris and in the various UNESCO Regional Offices. The information also contributed to the establishment of a computerized world-wide directory of individuals, organizations, and institutions active in environmental education. This network presently has over 10,000 names and is available in print through UNESCO.

The above material provided a series of valuable working documents for the Belgrade Workshop, as well as an important base on which to continue to build the UNESCO-UNEP program.

The 1975 Belgrade Workshop brought together twenty environmental education experts from various regions of the world to refine the "State of the Art" papers, which were subsequently published as a UNESCO book in five languages. These experts identified additional resources for the international bibliography on environmental education, which was later published in three languages by the International Bureau of Education. The workshop provided a framework for environmental education, including its objectives and made recommendations for the promotion of world-wide environmental education. Each region promised to convene a local environmental education meeting to revise the recommendations of the Belgrade Workshop to meet their own needs.

About one year after the Belgrade workshop, regional environmental education meetings were held in each of five UNESCO regions: Bogota, Colombia; Brazzaville, the Federal Republic of the Congo; Kuwait; Bangkok, Thailand; and Helsinki, Finland. A subregional meeting was also held in St. Louis, Mo.

Following Belgrade, we published the first issue of *Connect*, a quarterly international newsletter distributed to over 10,000 individuals and organizations that form the international environmental education network. Printed in five languages, the newsletter has linked people and programs in this subject throughout the world. The Tbilisi conference in October 1977, attracted delegations from approximately 70 countries, eight organizations, and 20 international non-governmental organizations. There were over 265 delegates and an additional 65 representatives and observers in all.

Carefully prepared working documents were developed by UNESCO and distributed to each delegation three months in advance of the conference. In addition, most delegations arrived at the conference with documents regarding environmental education activities in their nations. As a result of ten full days of presentations and dialogue, we discussed resolutions to promote environmental education at the global, regional, or national levels. Eventu-

ally the conference adopted 41 recommendations.

One of the most important recommendations endorsed world-wide goals, objectives, guiding principles, and targets for environmental education.

Some other major recommendations of the conference addressed the following themes: the role and general scheme of environmental education; consumption behavior and the wasteful use of consumer goods; pre-service teacher education; in-service training of teachers; initial education of professionals; vocational training; teaching aids and materials. They also included: research and evaluation; dissemination of information; environmental education at colleges and universities; improving the existing methods for information exchange; social, economic, cultural, and psychological factors relevant for environmental education, and cooperation with non-governmental organizations, as well as specific regional concerns.

There was a strong commitment by both UNESCO and UNEP at the conference to integrate environmental education in their middle-range and long-term plans for education and to assist member states in carrying out the 41 major recommendations adopted at the conference. There was a remarkable amount of agreement in the conference at both the conceptual and strategy levels between the developing and developed countries and the Eastern and Western European countries.

The conference ended with the adoption of a strong report and a commitment from each delegation to work with its government in implementing the recommendations.

UNESCO is currently working with United Nations agencies, international, intergovernmental and non-governmental organizations, regional groups, and national governments to assist in the implementation of each recommendation.

Each region has either held or is in the process of holding regional meetings dedicated to the implementation of the Tbilisi recommendations. In addition, many nations have convened meetings for a similar purpose. Some of these nations are: Czechoslovakia, the Federal Republic of Germany, Great Britain, Poland, Venezuela, and the United States.

In the United States, a National Leadership Conference organized by the Alliance for Environmental Education met in Washington, D.C. in 1978. Conferees reviewed recommendations of past national and international conferences, assessed the present national situation in this field in light of recommendations approved at Tbilisi, and developed a set of recommendations to further environmental education in the U.S.

Another major event since the Tbilisi conference was a move to decentralize UNESCO leadership in environmental education. Recently an Environmental Education Specialist has been added to each of the UNESCO Regional Offices in Latin America, Africa, the Middle East, and Asia. The responsibilities of these specialists vary, but in general they serve to promote environmental education within the region by integrating it with all appropriate activities sponsored by the regional office. They also assist nations in developing environmental education plans and fostering such programs in other ways.

Future Plans

In addition, UNESCO has integrated environmental education into its middle-range plan (covering the period 1977-1982), increased the Paris Headquarters staff, and increased the UNESCO budget for environmental education by over 100 percent in the past four years during an austerity period.

The United Nations Environment Program also has established an Environmental Education post to help coordinate environmental education and to provide greater leadership. UNEP continues to contribute around $800,000 a year to its environmental education program.

At the 20th General Conference of UNESCO held in October and November of 1978, the delegates approved a plan aimed at helping member nations to incorporate environmental education into formal and non-formal public education with a view to providing a better understanding of environmental problems and teaching people how to foster the preservation and improvement of the environment. Priorities during 1979-1980 were given to the development of environmental education, training of personnel, and research on interdisciplinary approaches to environmental education. We also gave support to innovative activities for the development of teaching and learning methods and materials, including the use of mass media and establishment of national and regional mechanisms for concerted action for the development of environmental education.

Although steady progress is being made in environmental education internationally, some major challenges still lie ahead. Greater effort is needed to help agencies in the United Nations system and other international organizations identify ways to further such education. We must remember that very little action may occur in environmental education unless nations plan to help establish and operate environmental education programs and activities.

A great deal has happened since the 1972 Stockholm conference, but much more still needs to occur. Plans are already under way to convene a second Intergovernmental Conference on Environmental Education in 1982 to review the progress since Tbilisi and to recommend adjustments as necessary.

Environmental education can lay a foundation for an environmentally literate citizenry. This foundation, and continued environmental education programs, should make it possible to develop new knowledge and skills, values and attitudes, in a drive toward a better quality of environment and, indeed, toward a higher quality of life for present and future generations. □

Dr. Stapp served as UNESCO's first Director of Environmental Education and is currently Program Chairperson, Behavior and Environmental Program, School of Natural Resources, University of Michigan.

By Joan M. Nicholson

Considering The Connections

Since the fundamental components of the environment—land, air, and water—are the basis of all life and of human activity, protection of the environment bears heavily on virtually all the other human activities, which traditionally we have considered separately. For the greater part of human history, populations have been small and the scope of our technology limited. Hence, the failure to relate quality of the environment to such matters as economics, energy, transportation, and urban growth did not necessarily lead to disastrous consequences. Today, this is no longer true. The pressures of human populations and the helter-skelter application of technology are quite capable of severely altering the life-supporting capacities of ecological systems. This means, quite simply, that the people of this planet must consider the connections, or perish.

Natural systems are bound together in complex ways. Waters flow from one body to another and the air knows no boundaries. Chemical compounds, both those developed in natural systems and those created in recent decades outside the time-tested boundaries of nature, move up and down through food chains permeating ecosystems and affecting plants and animals, including human beings, in unanticipated ways. Through the recently recognized phenomenon of acid rain, air pollution adversely affects water and aquatic life hundreds of miles from the sources. Pollutants applied to the land wash into surface waters and sink into groundwaters. Hazardous wastes dumped on the land contaminate groundwater supplies with substances that do not degrade and will maintain their potential for harm far longer than any human civilization has endured.

A clear view of the connections between environmental protection and other social endeavors would help us avoid or diminish the unanticipated by-product problems which have accompanied the application of science and technology in the past. It would help us learn to satisfy our basic needs for food, clothing, sanitation, and shelter through the optimum use of resources without paying an unforeseen cost in pollution and other forms of environmental degradation that may threaten our health and well-being.

In this country we are much farther down the road toward environmental responsibility than we were a decade ago. The environmental legislation created or drastically amended in the last decade indicates that our society realizes that environmental goals cannot be achieved by pollution control alone, but must rely also on foresighted environmental policies. We have already lessened the gross impact of air and water pollution. Even more importantly, on the firm foundation of the National Environmental Policy Act of 1969, we have begun at last to look before we leap. We no longer build bridges, power plants, airports, or dams without first considering the environmental consequences. Our society has begun to consider the connections—a tendency which we must intensify and expand until we habitually take appropriate account of ecological considerations in our pursuit of critical national and international goals.

The Environment and Health

Too often, when we hear the word "environment" we think it's "out there," that we are separate from it. In reality, however, we are associated with the environment in numerous complex ways. The human body is about 60 percent water, adults breathe a minimum of 12,000 quarts of air every 24 hours, and in many less obvious ways we are clearly creatures of this planet. As our physical and social environment changes, the physical and chemical make-up of our bodies is altered. As we consume air, water and food, our bodies absorb and react to their contents. Noise and radiation also affect us. The breakdown of ecological systems mirrors our own destiny: as land, air, water and living creatures are affected by environmental mismanagement, our lives are diminished.

The most important objective of environmental protection is the prevention of disease and death. When we overload natural systems with pollutants and cause illness and death through acute air pollution episodes or cause massive fish kills and threaten drinking water supplies, the relationship between cause and effect is easy to see and understand. But in the last decade we have become acutely aware of the fact that environmentally-caused death and disease can occur under much less dramatic and obvious circumstances. Moreover, since World War II our technological skill has introduced into the world new substances which are utterly alien to the natural processes of the Earth. We no longer derive the chemicals we use from naturally-occurring materials only—plants, animals, and minerals that evolved in the same environment in which people have always lived. Through three million years of trial and error we have learned which of these substances were edible, which were useful, and which were dangerous.

Through the chemical revolution we have created about five million synthetic compounds—three million since 1971 alone. About 65,000 are in commercial distribution. Most serve us well, but some pose a serious threat when used improperly, or particularly when they enter the environment in ways that were not intended or anticipated. Some are dangerous in quantities so small that they can be detected only with sophisticated instruments capable of detecting chemicals present in parts-per-billion or even parts-per-trillion. Some cause health problems many years after exposure. They provide the coup de grace to the obsolete view that land, air, and water have an almost unlimited capacity to absorb pollution. Neither our bodies nor the natural environment can safely process the quantities and varieties of pollutants produced today.

Health effects related to the environment are not limited to such well-known and serious ailments as cancer, neurological damage, or heart and lung diseases. Environmental pollution also diminishes well-being, lowers human vitality, contributes to lost work time, and aggravates chronic illness.

The economic benefits of environmental protection are many and varied. The higher the degree of protection, the greater the opportunity for individuals and their families to lead full and productive lives. Society benefits from greater productivity among workers and from lowered public health costs. The prevention of environmentally-related diseases is not cheap. But compared to the costs of the illness and deaths that protection efforts allow us to diminish or avoid, the price is surely small.

The Environment and The Economy

Intense interactions between environmental and economic goals—each vital to a healthy society—characterize the current era of transition, with its changing values and new views of "costs" and "benefits." The practice of democracy has stimulated widespread public involvement in the day-to-day actions of business. This involvement occurs both directly and indirectly, through group pressures and formal regulations. Environmental quality is one of the most universal aspects of increased public involvement.

The link between environment and economic activity is obvious. The availability of natural resources has always been a basic ingredient of production. Environmental regulation—while rooted in public health concerns—also helps protect the economic value of clean air, water, and land. Contamination of these resources can result in both physical and economic disasters. Unfortunately, the sometimes acrimonious debate over how and how much to regulate sometimes obscures this longstanding interdependence.

Are unpolluted water resources adequate for primary industry? Is acid rain damaging trees and other crops? Are fishing grounds being despoiled by oil spills? Concerns such as these illustrate the fact that traditional economic activity has an immense stake in the health of the environment.

Once, it was considered sound business to maximize the production of goods no matter what the cost to the environment. The Gross National Product (GNP) reflects this view by including the market value of products regardless of any adverse effects upon health or the environment. Ironically, while protection of the environment receives little or no value in this calculation, the costs of illness imposed by pollution are assigned positive values in the GNP. Such reasoning would suggest that it is economically beneficial to produce more carcinogenic substances.

A better understanding of our total economic welfare would recognize that environmental quality can mean fewer illnesses, greater worker productivity, more purchasing power available for non-medical goods and services, and greater efficiency in industrial operations.

The recreational values of clean air, land, and water are also economic values. Millions of Americans provide services to those seeking outdoor recreation—fishing and sightseeing, swimming and hiking—which is enhanced by a clean environment. As opportunities increase, the benefits of these activities will increase as well, often in some of the Nation's most depressed areas. The recreational needs of congested metropolitan centers can be partially met by reclaimed waterfronts and urban lakes, landfills recycled as parks and playgrounds, and effective transportation planning.

Clearly, environmental protection not only maintains today's economy but also permits future growth. Billions of dollars spent for air pollution control and for sewage treatment plants provide thousands of jobs not only in construction but in the manufacture, installation, and operation of this complex equipment. Pollution control regulations have led directly to increased overall employment in America. The resurgence of the Nation's huge coal industry also may be anticipated, thanks to advanced technology which can make coal use environmentally acceptable.

Throughout the past decade, environmental concerns have shifted the outlook of many business and industrial leaders. They have continued to seek opportunities for expansion and innovation while at the same time showing more care for the long-term costs of their products and waste streams. They have adopted a conserving attitude, which recognizes the direct relationship between energy costs, use of waste products for industrial energy, markets for innovative technology, and the broad environmental imperative.

Gully erosion in Santa Fe Vineyards, Riverside County, Calif. caused by mountain runoff.

This attitude, if widely adopted, will help ensure environmental conditions that can sustain future economic activity. The goal of industries drawing on America's resource abundance in a responsible manner is one that is shared by environmentalists, businessmen, government officials, and the public as a whole.

The Environment and Agriculture

America's productive farmland is one of our most valuable natural resources, and a critical element in our foreign balance of payments. An effective environmental protection program helps ensure the continued value of this resource because well-managed land, clean water, and clean air all contribute to the quality and quantity of agricultural products.

Numerous vital connections exist between water quality and agriculture. Farmers need suitable water for the irrigation of crops and for livestock. Farm families commonly rely upon wells for safe drinking water. Rural ponds and lakes provide reereational opportunities such as swimming and fishing. Maintenance of water supplies suitable for many uses, including those of agriculture, is a major objective of State and Federal water pollution control legislation.

Pollution control measures are essential because agricultural runoff seriously affects water quality in two-thirds of our river basins. Important water supplies—the Lower Colorado, for example—have been polluted by salts washed out of the soil through irrigation.

Runoff also accounts for over half of the Nation's man-made sediment load. An estimated 1.8 billion tons of topsoil from agricultural croplands erode into America's streams, lakes, and waterways each year. Attached to the soil particles reaching the water are insecticides, weed killers, fungicides, nitrates and phosphates from fertilizers, and the bacteria of animal wastes from barnyards and animal feedlots. Excessive sediment in water harms fish populations. The United States pays one half billion dollars annually to remove sediment (both natural and man-made) from waterways. We pay still more to clean up drinking water supplies for both people and animals.

Protecting rivers and streams from sediment also contributes to maintaining topsoil on the land. Farmers are losing precious soil at a rate faster than that of the "dustbowl" days of the Depression. Since 1935, agricultural practices have so severely damaged farmland that one hundred million acres of land can no longer be cultivated and over half the topsoil on yet another hundred million acres has been lost. Natural processes replenish some of this topsoil, but not nearly fast enough and not on a uniform basis.

Farmers must also be concerned about air pollution. Current research indicates that air pollution may adversely affect plant growth and reduce production, particularly near large urban centers. A potentially more serious problem is posed by acid rain, which is formed when nitrous oxides and sulfur oxides, produced by burning fossil fuels, increase the acidity of precipitation. Because air pollution is carried hundreds of miles, acid rain may be a threat to crops far distant from pollution sources.

Pesticides can pose a problem not only to water quality, but to crops and even to farmers themselves. Long-term use of pesticides often leads to the development of resistant strains of pests for which alternative chemical controls are not always available. Natural predators of pests often are unwittingly destroyed by the use of pesticides and once-secondary pests then become primary, moving unchecked through crops. Improperly applied, pesticides have poisoned farmers during the process of spraying, and have seriously affected the health of some farmworkers and their families, as well as nearby residents. Pesticides can affect drinking water supplies if sprayed near waterways or kill fish and other wildlife. New management practices to control pests, together with greater care in the use of pesticides by trained applicators, will help protect against some of these problems.

Residential, industrial, and shopping center developments near urban areas gobbled up nearly 17 million acres of farmland between 1967 and 1977. Loss of farmland means a smaller base for food and fiber production as well as the loss of needed environmental benefits. One acre of agricultural woodland can trap the smog produced by eight automobiles—or the carbon monoxide from fifty. Additionally, urban sprawl increases energy cost. Food must be transported greater distances, and food production may be forced on to less suitable and more easily eroded land. The new drive for massive energy development and expanded mining of fossil fuels threatens increased diversions from the agricultural use of land and water.

The multiple factors that affect food and fiber agricultural production, so vital to public welfare and the national economy, illustrate in a compelling way the complex connections that link agriculture and environmental issues.

The Environment; The Global Connection

Environmental pollution occurs as a result of the actions and choices of individuals. These individual decisions affecting the environment—whether they are made carefully or carelessly, whether they pertain to a single household or extend throughout a giant corporation—ultimately become part of the conglomerate of similar actions and choices by millions of other individuals around the globe. The environmental effects of these many decisions, naturally enough, are felt worldwide as well.

It is local governments, however, that are usually the first to learn about a pollution problem, and the first to try to solve it. But pollution knows no boundaries. One community's environmental problems may orginate in an area quite apart, upstream or upwind, and beyond the regulatory reach of the jurisidiction that bears the burden of pollution.

Because of such jurisdictional limitations, local governments in our country of necessity sought State action to control the sources of pollution. But State boundaries do not inhibit the movement of pollutants any more than city or county lines. Many of the more serious environmental problems that arose the United States were regional in nature; States could not act alone to deal with them. Moreover, conflicting State environmental demands posed special difficulties for many industries and underscored the need for national environmental laws. Recognition of the national implications of pollution control led to the major environmental legislation of the past two decades.

As we begin the decade of the 80's, we are confronted almost daily with evidence that even nation-wide pollution control programs cannot contain some environmental problems.

International measures are increasingly necessary so that we may cope with problems such as acid rain and the release of chlorofluorcarbons which deplete the atmosphere's ozone layer which protects us from excessive radiation from the sun.

To solve environmental problems it is necessary to "think globally, but act locally." If we do so we may better comprehend the global implications of local actions affecting such matters as the long-term storage or disposal of nuclear and other hazardous wastes and the types and degree of control placed on local sources of air or water pollution.

The better we see environmental problems in their global context, the more we appreciate the importance of remedial action in our own communities. The global commons are shared by the world's people and the universal need for clean air, potable water and fertile land connects us all. □

This article by Joan Nicholson, Director of EPA's Office of Public Awareness, is an excerpt from a new EPA brochure with the same title which will be published shortly.

By Don Cook

Training And Manpower In Environmental Quality

The talents of approximately a million people are needed to manage environmental quality in the United States. It is a rapidly-expanding field; the workforce covers more than 120 occupations, many of which did not even exist five years ago. That fact underscores the need for environmental education to prepare a skilled workforce.

Only about one percent of the current workforce is employed directly by EPA which by itself cannot carry the burden of maintaining environmental quality in the Nation. The training and education of the other 99 percent is carried out by organizations such as labor unions, community colleges and universities, as well as by on-the-job training. Thus the purpose of environmental education is not only to inform the general public in environmental concerns, but also to prepare a skilled workforce to deal with problems in this field.

Some of the groups that make up the environmental workforce are:

Wastewater treatment plant operators	90,000
Solid waste workers (public & private)	275,000
Professional engineers in wastewater treatment	6,000
State and local air pollution control workers	7,300
Federal EPA employees	11,000
Drinking water plant operators	60,000
Scientists & engineers who describe their jobs as pollution control related	130,000
Toxicologists, doctorate level	1,200
State environmental employment, all programs	25,000*

*Source: "Manpower for Environmental Pollution Control," National Academy of Sciences, 1977.

The environmental workforce uses the talents of many different occupations. The skills of the scientist are used to detect trends and limits in ecosystems. The talents of the engineer are used to design environmentally sound technology. The tools of the social scientist are used to study and recommend choices. The talents of the lawyer are used to obtain compliance with environmental laws.

The Environmental Protection Careers Guidebook, a joint publication of the U.S. Department of Labor and EPA, describes occupations in the environmental field. It is estimated that 40 or more of the 120 occupations were not in existence as recently as 5 years ago.

Some emerging occupations which are expected to be difficult to fill in the first half of the 1980's are:

Integrated Pest Management Specialists—workers who can recommend a variety of chemical and non-chemical options for pest control.

Toxicologists—those who have knowledge and ability in defining the toxic properties of chemicals and their movement through ecosystems.

Veterinary pathologists—veterinarians who are certified by a State board to evaluate diseases in test animals and other organisms.

Ground water protection specialists—those who can predict the movement of chemicals through the ground and recommend safe disposal sites and methods.

Land reclamation specialists—those who can devise and carry out plans to restore damaged landscapes (e.g. strip mine spoil) to stable ecosystems.

Hazardous waste workers—professionals and technicians who handle, store, incinerate and manage waste materials which are toxic, corrosive, explosive and persistent in the environment.

EPA's role in promoting the development of the environmental workforce consists of several major activities:

- *Direct training through short courses:* EPA sponsors over 14,000 training days each year and reaches more than 4,000 individuals with its technical short courses.
- *Academic training support and training grants:* More than 200 individuals receive fellowships or traineeships annually to pursue graduate degrees. Training grants are intended to develop skills for effecting pollution abatement.
- *Interagency agreements with Departments of Labor and Education:* EPA uses agreements with agencies having a primary mission in education and training to obtain commitments to carry a share of training and education development.
- *Promoting regional linkages:* EPA has worked through regional offices to get environmental education and training established in professional associations, State education plans, certification standards and at universities.

The content of environmental learning tends to fall into three broad categories: the impact of human culture on ecosystems; fundamentals of ecology, and corrective steps for human activities.

Learning the corrective steps almost always requires a *multi*-disciplinary approach. Devising and implementing a single corrective step often involves political science, law, economics, engineering, statistics, and life sciences. Actions to protect the whole system tend to involve various parts of the whole of human knowledge, requiring environmental education to be interdisciplinary. □

Don Cook is Senior Technical Advisor, EPA Office of Research and Development.

A sanitary engineer checks controls at a modern wastewater treatment plant.

For further information on EPA courses, here are additional sources:

Water Training
Registrar
National Training and Operational Technology Center
U.S. Environmental Protection Agency
Cincinnati, Ohio 45268

Telephone: 513/684-7501

Air Pollution Training
Manpower and Technical Information Branch
Air Pollution Training Institute, MD 17
Environmental Research Center
U.S. Environmental Protection Agency
Research Triangle Park, North Carolina 27711

Telephone: 919/541-2401

The 205-page "Environmental Protection Careers Guidebook" mentioned in this article may be obtained for $6.50 per copy (Stock number 029-014-00205-4) from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

By Suzanne Miller Pogell

Learning On The Chesapeake

Chesapeake Bay boaters in Maryland who have sailed past "No Trespassing—Smithsonian Institution" signs on Rhode River and the Bay around the Poplar Islands, may wonder what is really behind the signs and why unlimited public access is prohibited.

Behind the signs is a 2,600 acre laboratory for research and education—a site of critical environmental studies that have meaning for all of us and for the ultimate health of the Bay. The "No Trespassing" signs have a serious purpose: they are there to protect study sites, delicate instrumentation, and animal populations, which are the subjects of Center staff investigations.

While the facility as a whole is off limits to public access, it carries on a very active education and public outreach program. Emphasizing "learning while doing," the study of various environmental concepts begins with sessions for pre-schoolers and their parents and includes teacher-led activities for children in school, after school, and summer programs, and regularly scheduled trail walks. Two years ago, group boat tours were added.

The Chesapeake Bay Center for Environmental Studies was established in 1965. Java Dairy Farm, the original 368 acre tract, was left to the Smithsonian in 1962, by Robert Lee Forrest, who operated the farm from 1915 to 1946.

The Center is located seven miles south of Annapolis, Md., on the Rhode River, a tidal arm of the Chesapeake Bay. Within its boundaries are forests, abandoned fields, marshlands and active farms—a full range of southern Maryland habitats and animal populations for study. Research also is conducted on the Smithsonian-owned and Center-administrated Poplar Islands near Talbot County on the Eastern Shore of the Bay.

The research program focuses on the dynamics of an estuarine-watershed ecosystem, land use effects, and man's interactions with his environment. The program includes a broad range of long term, integrated studies on the Center's uplands, watershed, the two-square mile Rhode River estuary, and the effects of environment on people's attitudes and behavior.

Fragmented Habitats

Two Center researchers, Dennis Whigham and James Lynch, have been exploring the effects of fragmentation of habitat on plant and bird species. Earlier studies by Lynch in Washington's Rock Creek Park revealed sharp declines in certain bird populations with the increase in isolation and fragmentation of their natural habitat. The two ecologists are also studying the impact of deer on one of the small Poplar Islands and the factors of competition and compatability in different plant and animal communities.

Dr. David Correll's group has mapped small basins of the watershed according to their land use, such as cropland, pasture, and forest. They are monitoring and analyzing samples of the stormwater runoff from each basin through a series of instrumented sampling stations and gauges. Nutrients, pathogens, sediments, pesticides, and herbicides are among the components of runoff being analyzed in Center Laboratories.

The Rhode River estuary receives fresh water from small creeks, runoff from the land, and materials entering from the atmosphere through drainage and rainwater. Microbiologists and chemists at the Chesapeake Bay Center are studying how materials from land runoff are distributed in the estuary and the effects of these materials on the estuarine environment. In another current estuarine study, white and yellow perch are being studied for spawning success, growth, and abundance.

Many of the Center's public programs are made possible by the dedicated and able assistance of a corps of volunteer guides. The group boat tours, for example, have been under the direction of two volunteer Coast Guard Auxiliary captains.

The Center publishes a quarterly newsletter, the Rhode River Review, which features articles on current staff research, curriculum development, and public programs. A meeting facility, completed in 1975, is the site of frequent presentations by guides and Center staff to visiting groups.

In keeping with the Smithsonian tradition, the Center is committed to the increase and diffusion of knowledge and careful preservation. Its focus is data base for wise management of its valuable natural resources.

People and Landscapes

One unusual research program at the Center is concerned with environmental influences on human behavior and ways in which human preferences for various landscapes are formed. John Balling and John Falk have been exploring the effects that man's evolutionary history may have on these preferences. Underlying much of their work is the hypothesis that human evolution, in large part, took place along or near river courses in the East African savanna. Preferences for natural settings with scattered trees, short grass, and some type of water body may, therefore, reflect an innate preference for the environment in which much of our biological (and psychological) apparatus evolved.

A two-part theory of the development of environmental preferences was tested in a series of studies in which participants "rated" photographic slides of different natural environments—tropical rain forest, temperate deciduous forest, coniferous forest, savanna, and desert. First, it was proposed that there is innate predisposition towards savanna-like settings that expresses itself most clearly in childhood. Recently completed research by Balling and Falk has shown that children as young as three to five years of age show a strong preference for savanna environments. Earlier data revealed that the preference for savanna persists throughout the elementary school years. Second, with increasing age and experience, familiarity

with environment comes into play. Preference for savanna can be seen to decline while preference for those environments with which people are most familiar rises. Participants in studies completed to date have been most familiar with deciduous and coniferous forests. Thus, the ratings of those from the ages of mid-adolescence through adulthood indicate an equal preference for these forested settings and savanna.

Last year, research on landscape preference was extended through use of an experimental overlay procedure, developed by Falk and Balling. This device allows an individual to "construct" the landscape which he or she most prefers by selecting, in turn, a preferred background and a preferred foreground. The results of studies using this apparatus tend to confirm earlier investigations. Overall, participants selected foreground scenes containing low, even ground cover and a few scattered trees. Preferred backgrounds tended to be hilly, with tree density somewhat higher than that of the foreground. Almost all subjects who added additional elements drew in water of some type (streams, lakes, etc.). In general, the highly preferred scenes could be described as "parkland" adjacent to or surrounding some body of water. The natural environment that most closely approximates such scenes is the savanna. Thus, results from studies using techniques with very different types of experimental biases—judgments of slides and the overlay—have tended to support the hypothesis that there is some innate component to landscape preference.

The Center is also concerned with the development of educational materials for out-of-school, or informal audiences. In 1979, a series of estuarine ecology materials entitled SEA (Smithsonian Estuarine Activities) was produced, which was targeted for early adolescents in informal settings such as nature centers. Starting last year, the Center began work on two other materials development projects aimed at different audiences—families and parents with preschoolers.

Parents As Teachers

A goal of the Center is to develop ways to help today's parents function effectively in their role as educators of their children. While a child may spend some twenty-five hours per week involved in classroom learning, the majority of the child's waking hours are spent away from the school grounds. Parents, then, have a substantial opportunity to explore with their children the world around them, to teach them how to make decisions, and to help them make the connections between what they learn in the classroom and what happens in their everyday world. However, the rapid scientific and technological change of today's world often severely limits this opportunity, leaving an ever-widening gap between what most parents can impart to their children and the science in actual use around them.

The Smithsonian Family Learning Project is an effort to strengthen the family as a significant teaching-learning unit. Under the direction of John Falk, staff members Jamie Harms, Sharon Maves, and Laurie Greenberg are developing a series of learning activities for families to do together at home, which focus on the home environment as a functioning ecosystem. To date, packets have been developed and tested in three areas: home energy use, houseplants, and lawns. Included in each packet are games, experiments, and exploratory projects that provide the tools for families to discover the dynamics of these systems in their home environment. In one of the activities, families learn about solar energy by constructing a solar greenhouse. In another, families explore the critical variables of heat, light, water, and other environmental requirements in the growth and productivity of individual houseplants.

A complementary project is the Parent and Preschooler Ecology Series. In a preliminary stage of development, the series is being designed by Ann Coren to help families and their young children work in partnership to learn basic ecological principles. Materials are being developed which will enable parents to capitalize on the preschool child's natural curiosity. An essential element of the process of testing the materials is a pilot workshop format where small groups of parents and children work as a family team using "hands on" exploratory activities as a framework for discovery. Two outcomes have been identified in sessions conducted to date: children learn ecological concepts through exploration and manipulation of the environment; and the experience of shared discovery reinforces the teaching/learning process for both parents and children. These results suggest that family-based activities such as these can initiate a lifelong pattern of family learning. □

Suzanne Pogell is a public information officer with the Chesapeake Bay Center.

By Edward W. Weidner
Chancellor,
University of Wisconsin-Green Bay

A New Approach To Environmental Education

The search for an effective means of providing a broad education has gone on for hundreds—even thousands—of years. This was, of course, a concern of Aristotle and Plato. This was also a concern of scholars at the time of the Renaissance, when the "well-rounded man" was an objective. The last hundred years have been no exception. Western countries have shown great interest in trying to define liberal education over this period. And increasingly during the last 30 years, the search for an appropriate approach to the subject and an appropriate role for liberal education has spread throughout the world.

In recent years, the effort has encountered at least four major problems. There has been a difficulty in defining liberal education, in appropriately relating it to the disciplines, in relating it to professional areas or to professional schools and colleges, and finally, liberal education has been under attack recently from the proponents of technical-vocational education and, especially in the United States, of what is called career education. In brief, some consider liberal education as impractical and theoretical.

Marcia Nylund, student at the University of Wisconsin—Green Bay, extracting PCB's from liver tissue of rats.

Environmental Focus

It is against this background that applied liberal education at the University of Wisconsin-Green Bay may find its significance. Ours is one of the few universities in the United States that has adopted a rather specific educational philosophy for all its activities, using a particular theme or focus. Its approach is one of problem-oriented higher education, focused on the problems associated with people and the environment. We define the environment very broadly as the context in which life takes place—including the socio-cultural as well as the bio-physical environment. While we place emphasis upon such problems, the same educational principles we use could apply equally to the study of any other set of problems.

This approach immediately gives some clues as to how to avoid the four difficulties that face liberal education. First of all, a university following this course has fewer problems with the definition of liberal education. Such a university is not just concerned abstractly with the whole person or with broadening or liberalizing a person through higher education, or with developing the capacity to think, to reason, or to make decisions. A problem-oriented approach emphasizes application of all disciplines and professions to the world in which we live now and in the future. More specifically, it relates the whole person and the liberalizing thinking, reasoning, and decision-making process to human affairs in an integrated manner. It is

concerned with problem analysis, and this provides substantial guidelines for liberal education. It therefore makes some of the abstract aspects of liberal education very concrete and tangible.

Furthermore, a problem-oriented approach provides an appropriate educational role for the various disciplines and professions, which can gain their significance from concentrating together on a problem at hand, rather than from autonomous or theoretical systems. By this means one discipline becomes meaningfully related to another, and one profession to another, when applied to a particular problem.

Finally, in regard to making liberal education marketable, a problem-oriented approach provides an education with a variety of job applications. In order to analyze problems, students must acquire both general knowledge and specific skills in those areas, and apply them outside the walls of a university. They must learn to work cooperatively with others. They must learn to anticipate the future. An education such as this produces students who are in high demand on graduation, and who will continue to be so in the years ahead.

Other Advantages

But there is more to the subject than this. There are important advantages for the student. For example, a problem approach provides a very substantial motivation to learn and may enhance his or her ability to learn. Thus, chemistry comes alive in its application to problems, as the student perceives that it is closely related to other disciplines such as sociology, literature, mathematics, and biology. A student who focuses attention on chemistry can actually perform better in this field if he or she follows a problem approach to learning, becomes motivated to apply the discipline, and finds that this specialty cannot stand alone, but must be interwoven with many other disciplines and professions. And it may well be that fewer credits of chemistry, and more of related subjects also will give the student more knowledge of chemistry.

There are important advantages for the faculty member. Professors commonly become more and more specialized over the years. The range of their coursework is restricted. Extensive contacts with other professionals often are limited to those whose fields are similar. The institution groups their offices, classrooms, laboratories, and studios together by discipline. A problem-oriented university can provide a far wider range of stimuli both inside and outside the classroom. Team teaching, interdisciplinary departments, and varying problems encourage faculty members to consider new and broader perspectives. It is an atmosphere conducive to innovative thinking.

There are important advantages for research and community outreach. Most traditional universities have a difficult time organizing for problem-oriented research. Typically, they create many institutes or centers, which are rather odd appendages, separate from the mainstream of the university. The faculty member may or may not be rewarded for his or her work in them. A problem approach places problem-oriented research in the mainstream. Whether the topic is local or worldwide, whether it involves few or many disciplines or professions, whether it is marked by many community complications or not, the problem-oriented university is in an excellent position to make a contribution to knowledge and to help solve community problems at the same time.

At a conventional university a student fundamentally chooses subject matter—such as biology, chemistry, sociology, or psychology—or a profession—engineering, medicine, business administration, social work, and so on. At the University of Wisconsin-Green Bay, these two choices are open to students. They can decide to emphasize any of the traditional disciplines or subjects, and they can decide to emphasize any of the appropriate professions. The difference is that students have a third choice—one which they are required to exercise. They must choose a problem of some social significance on which to concentrate. If they also choose a subject matter and/or a profession, it is their responsibility to apply the subject matter and/or profession to the problem they have selected for understanding and analysis—in cooperation with other disciplines and professions and other students and professors. Thus, they do not study chemistry for chemistry's sake alone, but in regard to its application to the world outside the university. Similarly, they do not study business administration alone, but in regard to the way in which business structures can constructively relate to the problem selected.

A conventional university organizes faculty members either on the basis of disciplines or on the basis of professional areas. At our Green Bay institution, the faculty is organized into multidisciplinary problem-oriented units called concentrations. This encourages faculty members to think in multidisciplinary, problem-oriented ways. We hire and evaluate them on this basis, and determine academic policies on this basis.

Thus, neither from a faculty nor a student point of view are disciplines or professions predominant. Students select their major in one of the concentrations. Of course, they need to have backgrounds in disciplinary and professional subjects as well as interdisciplinary and problem-oriented areas. The great majority of students, therefore, select a co-major or a minor in a discipline or a profession, to go along with the concentration major that focuses on a problem. This permits or encourages a student to consider the discipline or profession as a useful means

to a social end, rather than as a means or an end in and of itself. About one-third of the teaching at the University is in broad interdisciplinary or problem-oriented courses, and about two-thirds in the disciplines or professions. However, in regard to this latter component of courses, much of it is specifically problem oriented as well, although within the confines of a single discipline or profession.

A Moral Imperative

To put the matter in a different way, we base our academic plan upon the idea of social responsibility. Each student must opt *for* the world, not out of the world. Each has a responsibility to help make the world a better place in which to live. We ask each student to consider the social importance and social application of his or her intellectual interest. In this world, those persons who are particularly gifted intellectually have a special responsibility to apply their talents so that they benefit many people. Students should begin this application at the university, to place learning in a social context. In this manner, they will understand more fully that each person obtains much of his or her identity by relating to other human beings, and indeed has a sacred responsibility to do so.

At our institution each student has a wide range of problems from which to select. A number of students focus upon urban areas, and environmental questions associated with them. Others take a larger geographical perspective and focus on the region. Some students are primarily concerned with ecosystems. Others are concerned with more specific matters of natural resource management, or with water, air, and soil quality. Attention to population pressure and hunger is common. And questions associated with modernity or with the cultural and aesthetic environments are among other areas of concern. Whatever the problem selected—and students have a considerable freedom in identifying a particular one of interest to them—the emphasis is on an area or topic that affects many people—one that is a truly social problem.

This approach to higher education requires training in problem analysis. It begins with the identification of what constitutes a problem, and proceeds to an examination of its various ramifications, the development of alternative solutions, and a study of the different ways that these solutions can be reached most effectively. This is not a value-free process, of course. A student needs to understand that different communities, different groups of people, and different individuals will vary widely in terms of their value preferences. Therefore, requiring a student to consider values, be sensitive to them, and understand priorities among values are important parts of such a University of Wisconsin-Green Bay education.

One important element in a problem-oriented approach to higher education is to avoid elitism on the part of individual students, faculty members, or the university itself. Working with people at each step involved in a problem analysis is essential to identifying a workable solution. This includes people of all walks of life, in all geographical areas, in any way related to the problem. We cannot carry out problem analysis completely within an educational or research institution. It must involve collaboration with the people responsible for achieving a solution. And in most cases, problems are not "theirs" but rather "ours." The researcher or analyst is a citizen and also a part of the problem. We hope that at our institution there is not a we/they or a devil/angel situation. Problem analysis requires the talents of many different kinds of specialists, persons from many professions and disciplines and persons who fulfill many roles in the community. It is overall a humbling and collegial experience, not an elitist one.

A university with a program such as this becomes far more interdisciplinary since problems do not confine themselves to the artificial boundaries of particular disciplines. All aspects of the educational enterprise can be related or integrated—both the more general subjects and the more specialized subjects. A special emphasis on future time is appropriate to problem-oriented universities. A comparison among different cultures becomes important in order for students to understand how similar problems are affected by cultural variables. A merger of university and community resources becomes useful in combining teaching, research, and community outreach. Students need to have a substantial amount of learning through experience, and the student/professor relationship must be one that is both close and heavily biased in the direction of the "co-learner's" principle. If students are going to learn to solve problems, they must have considerable freedom in their own education. Student-initiated education and a choice among many different alternatives in securing one's education become requisites.

This is the kind of institution that the University of Wisconsin-Green Bay aspires to be. I say aspires because it is probably impossible for any institution to embrace completely the principles just outlined, much less carry them out faithfully. Rather, these are goals of direction, goals that we can extend and enlarge, as we accumulate experience and new knowledge.

Nonetheless, we have made an encouraging beginning. Our institution illustrates that education and social responsibility can go hand in hand, while academic freedom is preserved. We remain optimistic for the future. □

Igniting The Public Conscience

By Eric Ashby

(The following excerpt is from a book "Reconciling Man with the Environment" by Lord Eric Ashby, one of the world's distinguished scientists. A Fellow of Britain's Royal Society, he has received 21 honorary degrees recognizing his contributions both as a scientist and as a leader in higher education.

In the summer of 1963, on a couple of farms in southeast England, some sheep and cattle and a foxhound died. The postmortem showed that they had been poisoned by fluorocetamide, which was traced to a field next to a factory that produced pesticides. The factory dumped drums and canisters and allowed them to rust away in this field, which drained into some ponds on the farms where the animals were likely to drink.

The incident caused no great stir, but it did lead the Minister of Housing and Local Government to appoint a Technical Committee on the Disposal of Toxic Solid Wastes to advise what changes were desirable in order to ensure safe disposal without risk of polluting water supplies and rivers. The committee set to work in a leisurely manner: it met 20 times over a stretch of six years and produced in the spring of 1970 a lifeless and tedious report that did, however, conclude that existing legislation on toxic wastes was inadequate. The report got scant notice in the media, and nothing was done.

Meanwhile Britain, along with other industrial countries, was becoming environment-conscious. In 1970 a Royal Commission on Environmental Pollution was appointed, with wide powers of enquiry. Its first task was to survey the state of the environment in Britain. It found evidence of "fly-tipping," that is, the illicit dumping of toxic wastes in places not registered to receive them; and it urged the government to tighten the law. Still nothing was done. Throughout 1971 the Royal Commission collected further examples of fly-tipping, and in August it expressed disquiet at the potential danger to water supplies and the government's failure to deal with the matter.

The government's reply was that there was too heavy a program of parliamentary business for the matter to be dealt with in the coming session; moreover, there was to be a reorganization of local government that would affect the administrative arrangements, and a comprehensive bill to control pollution was to be introduced sometime in 1974. In October and November 1971, further pressure was brought on the Minister by the Royal Commission, and on November 30, the chairman of the Royal Commission wrote to the Minister to say that "the risk to the public is such that we must pursue this matter, even though it is at an awkward time." Still no action was taken, and the Commission drafted a report critical of the government that was published on March 7, 1972.

But before that date a new character had appeared in the story. His name was Lonnie Downes. He was a truck driver in a waste-disposal firm in the Midlands and shop steward for his branch of the Transport and General Workers Union. He discovered that some of his mates were being given a bonus of 20 pounds a week for dumping loads of cyanide, chromic acid, caustic soda, phenol, and other noxious substances on delivery tickets that described them as

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SMART
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(First of Two Articles)

RALIEGH — Until now, about all state officials could say about hazardous wastes in North Carolina is that there is,

tion, and North Carolina is at least a step ahead of others on that approach, with the state government and Research Triangle Institute already working cooperatively on a viable way to burn both hazardous

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harmless "suds oil." Mr. Downes complained to the management of the firm, who replied with vague threats of dismissal. A few weeks later Mr. Downes was offered promotion, which he declined. Then, so it was reported, he was offered 300 pounds if he would leave the company; again he declined. Instead, he reported the whole affair to the local branch of the Conservation Society. The Society, helped by specific information from Mr. Downes and his mates, prepared a detailed report and sent it to the Secretary of State for the Environment. Still nothing was done.

At this point the Conservation Society, having given due warning that it would make the matter public, sent its findings to the press. The story broke in the Birmingham *Sunday Mercury* on January 10, 1972. Thereafter press, radio and television descended upon the refuse dumps of Britain like a flock of scavenging birds. Pictures of alleged toxic waste drums appeared in the newspapers. Parliament was forced to hold a special debate on the issue, but the Under Secretary of State still maintained that the parliamentary timetable was too packed for legislation to be introduced before 1974.

Toward the end of February 1972 the government knew that the Royal Commission was about to publish its views on toxic wastes; but on February 24 an incident occurred that eclipsed the sober deliberations of a Royal Commission. Thirty-six one-hundredweight drums were discovered in a derelict piece of ground near the town of Nuneaton, on a site where children played. Attempts had been made to erase the label 'sodium cyanide' from the drums and some of the crystals were sticking to the outside. The Department of the Environment hurriedly drafted a bill to control the deposit of poisonous waste. It was read for the first time on March 8, went through its remaining stages on March 16, and passed into law on March 30.

I tell this story to illustrate the vagaries of the human dimension in the first stage of the chain reaction between the disclosure of an environmental hazard and political action to control it. The moral of the story was aptly summed up in an editorial in *The Times* when the emergency bill was introduced:

"It is instructive to note what did and what did not prompt the Government to squeeze a Bill as a matter of urgency into an already crowded legislative programme. The urgent representations of an official commission composed of distinguished persons who were moved by 'the disturbing cases which have come to our knowledge of local problems and anxieties,' did not. Headlines about drums of cyanide waste on derelict land in the Midlands did."

It is one consequence of the astonishing adaptability of man that he has to be persuaded to be dissatisfied about abuses to his environment. To set the chain reaction going is often the hardest task in social reform. This raises an ethical problem of some importance. Is it morally defensible to use shock tactics, to exaggerate, to distort the facts or color them with emotive words, or to slant the television camera in order to excite the public conscience? My experience leads me reluctantly to believe that *in the present social climate* some dramatization is necessary.

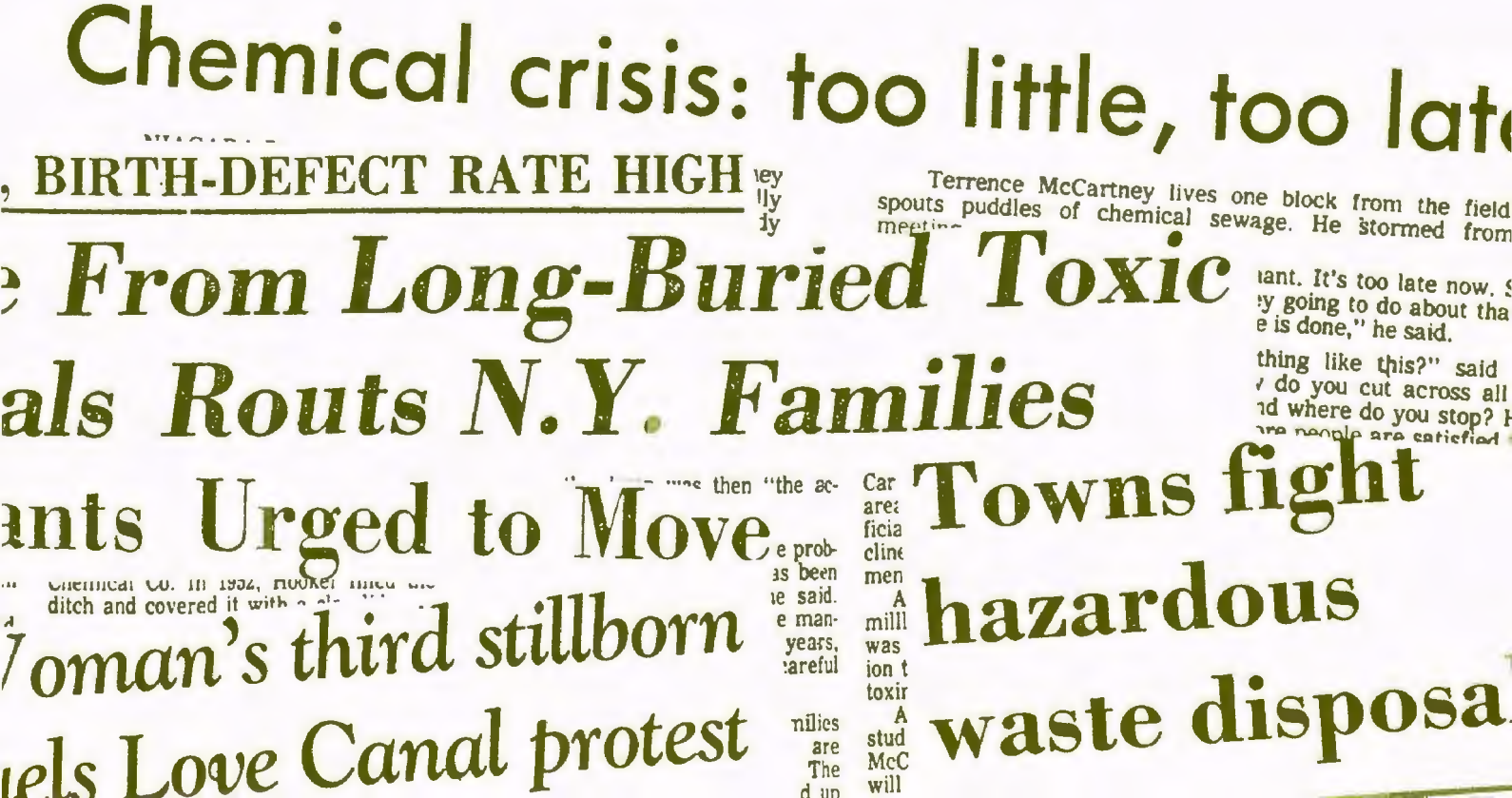
Without Rachel Carson public apathy about the hazards of pesticides might have persisted for a decade longer.

* * *

But notice an important point about these enthusiasts: they are commonly what academics call "unsound," which in academia is a highly pejorative epithet. Rachel Carson's biology can be faulted, and she uses cunningly the technique of a storyteller in her opening chapter.

* * *

And yet, if these writers had been coolly rational, if they had stuck meticulously to uncolored verifiable facts, would they have made any impression on the public conscience? I doubt it, and my doubts are confirmed by the opinions of two very great men, one a philosopher and the other a theologian. It was Alfred North Whitehead who made the surprising assertion, "It is more important that a proposition be interesting than that it be true." Propositions hedged about with reservations, as many scientific statements have to be, are seldom interesting to the public. And Cardinal Newman was even more emphatic: "Deductions," he wrote, "have no power of persuasion. . . . Many a man will live and die upon a dogma; no man will be a martyr for a conclusion." □



Wild In Philadelphia

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Pythons, turtles, and owls are among the stars in the "Eco-shows" produced by the Philadelphia Academy of Natural Sciences to help students learn the fundamentals of ecology.

A typical eco-show, such as the presentation "Wetlands and Waterways," takes the audience on an imaginary journey down Wissahickon Creek to the Schuylkill River and into Tinicum Marsh. Their guides are a great horned owl, a skunk, a mallard duck, a red-tailed hawk, and a snapping turtle. Participants find out how these creatures interact with people and with their surroundings. By learning the ways of swamp denizens, people can understand better the impact of human activities such as draining and filling wetlands.

Certain shows are given daily in the Academy's auditorium for groups of schoolchildren. A variation called "Eco-show on the Road" travels to schools, community organizations, and private groups giving performances days, evenings, and week-ends. Traveling show topics include: Digging for Dinosaurs, Animals and their Young, Animals With Bad Reputations, Survival in a Wild World, and Animal Myths and Legends.


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D

(A) The flapping wings of a Great Horned Owl capture the attention of a class.

(B) This young lad waits for a chance to handle a turtle in the course of a lesson on amphibious creatures.

(C) Some youngsters are equally enthralled by the traditional [illegible] exhibits.

(D) Students pet a python to [illegible] familiarity with this reptile with a bad reputation.

By Mattie Montgomery

EPA's Role In Educating Youth

Three and a half years ago, the Office of Public Awareness began a special effort to reach youth as part of its communications program. The ideal method of making this information available to youth and educators was through environmental education.

Many school systems include environmental studies in existing curricula. However, a review of the existing programs and materials they used showed most of the material focused on nature and wildlife. Only a few items even touched briefly on the subjects of air and water quality or considered solid waste management as more than an anti-litter campaign. (However, in some of the materials used specifically in health classes, areas such as radiation, chemical contamination, and solid waste as a health hazard were highlighted.)

The Office of Public Awareness (OPA) is periodically mailing specific program materials to environmental education coordinators in each of the State Departments

of Education to encourage a broader concept of environmental education. The coordinators then make the materials available to classroom teachers. The EPA Regional Offices provide additional assistance and the person-to-person contact needed to insure that students and teachers gain a greater understanding of the environmental mission. Regional Office Staffs provide assistance to teachers and curriculum specialists, which enables them to create lesson plans that focus on a particular problem in their geographic location.

Safety Tips on Chemicals

Through meetings with State representatives of the National Education Association, we have been asked to provide information and assistance in developing educational materials in highly technical areas—toxic substances and hazardous waste. A product being used in high schools is a complete study unit on toxicology developed by the National Science Teachers Association. The unit covers the use and production of chemicals, the hazards involved in certain chemical compounds, EPA regulations affecting the production of chemicals, and safety tips for use in shopping for everyday products that can become hazardous by misuse.

Efforts in the educational community have increased the number of articles appearing in journals and newsletters focusing on environmental issues. For example, My Weekly Reader has published a series of articles on the environmental impact of energy development.

The amount of mail we receive from students and teachers requesting specific information has more than doubled. Environmental issues are becoming the subject of discussions among high school debating teams. The most popular topic is acid rain.

Because of OPA's work with children, we have been included in several Federal Interagency Committees dealing with children and youth.

International Year of the Child

One of the Interagency Committees we have been involved with was the Federal Interagency Committee on the 1979 International Year of the Child (IYC). This Committee was established in September 1977 to help improve the condition and status of children in the United States.

While the Commitee had been active since October 1977, EPA did not become involved until August of 1978. By this time, many of the projects and programs initiated by other agencies were completed or nearly completed. However, a review of EPA activities showed many of them related to the well-being of children. Among the existing EPA projects that were recognized as vital was the School Asbestos Program. This program not only focused on the hazard to children of asbestos materials in school buildings, but provided a common cause for concern and action by parents, educators, and government.

EPA was also commended for its Farmworker Safety Program, designed to help reduce the danger of exposing children to pesticides not only in the fields but to contamination from clothing of parents who worked in the fields without proper safety measures.

The EPA Noise Control efforts, the President's Environmental Youth Awards Program, the environmental education programs and materials, and the overall research and development activities in the area of health were also considered excellent examples of Federal concern for children.

The Committee worked closely with the U.S. National Commission for IYC, chaired by Jean C. Young, which coordinated work with the United Nations IYC staff. OPA was asked to prepare a statement on enronmental problems affecting children for inclusion in the National Commission's report to the President and later to the United Nations General Assembly. The statement included an abbreviated list of projects and programs that had already been completed and a similar list of recommendations of things that remain to be done in the environmental field.

As a result of this statement and the Commission's report, OPA has received requests from a number of African nations who want to use EPA's programs as models for assistance in developing environmental education programs.

Health and Safety Guides

Another important group involving children is the Intergovernmental Regulatory Liaison Group (IRLG). The IRLG established a work

group to develop health and safety curriculum guides for teachers of middle, junior and senior high school students. The guides will represent the joint efforts of four Federal agencies—the Consumer Product Safety Commission, EPA, the Food and Drug Administration, and the Occupational Safety and Health Administration—and will introduce young people to essential principles of health and safety relevant to the concerns of the agencies. These guides are designed to provide teachers with tools for helping students to assume responsibility for their own health and safety and that of those around them.

More specifically, the guides are constructed so that teachers may lead students through a progression of discoveries toward the recognition that, in various spheres of their lives and in relation to various types of potential hazards, they can, and inevitably will, make the difference between safety and harm.

Each unit of the guides begins with information and activities that teachers may adapt to help students recognize the risks involved in one general class of substances or products. Next, the units offer information and activities that can help students identify the specific hazard associated with them. Then we focus on methods of prevention and control of those hazards, both precautions that individuals may take and regulations that the Federal Government enforces. Exploring these methods will help students to identify the responsibilities that are involved in the different roles that they and others may fulfill.

These guides reflect the conviction that educating young people in basic principles of health and safety can make a difference to all of us. There are many reasons to focus upon their recognition of risks and responsibilities. Young people are as vulnerable as the rest of the public to the hazards associated with our Nation's increasingly sophisticated technology. They are already consumers and are constantly exposed to advertising; they need a foundation for making enlightened decisions about what products to buy and how to use them. Moreover, young people are often idealistic, committed to improving their world. And they are flexible. They can learn patterns of behavior that can promote health and safety for the rest of their lives.

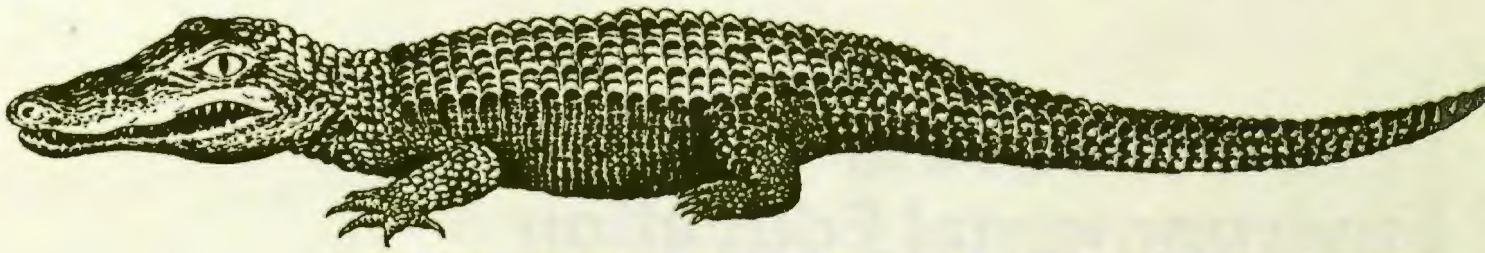
The health and safety material contains study units on toxic substances, food, drugs, cosmetics, air pollution, water pollution, noise pollution, fire, and powered equipment. The guides will be ready for distribution by the spring of 1981, and represent one of the IRLG's efforts to help the public protect itself.

Under an EPA Region 4 purchase order, the Warren Wilson College at Swannanoa, N.C. brought together various environmental education specialists throughout the Southeastern United States in a workshop to recommend materials which EPA could develop for use in its programs for students in kindergarten through grade 12. The result of these sessions was the development of activity cards relating to the eight basic laws which give EPA most of its authority. Activities on these cards would be designed for use at any grade level.

Accompanying the cards will be an EPA booklet, providing more substantive information, and providing additional ideas.

These materials are currently being reviewed by Region 4 staff. After editing and printing, the materials should be ready for distribution by spring, 1981. □

Mattie Montgomery is the Youth Constituency Coordinator in EPA's Office of Public Awareness.



Alligators And The World

The main role in preservation of life during drought periods in the Everglades National Park in Florida is played by a rather surprising protector—the alligator.

A National Park Service publication, Everglades Wildguide, notes that during the dry season it is the alligator that keeps the water holes open, using its feet and snout to clear out vegetation and muck.

As a result, large numbers of turtles, snails, and freshwater animals move right in with the alligators. Birds and small animals then congregate at the alligator holes to feed on the teeming water life.

While the host alligator eats some of his guests from time to time, most survive until they can leave when the rains return.

While this is one of the more unusual ecosystems (the interaction of all the plants and animals with each other and with their particular habitat) it is only one of many that make up the astounding interrelated mosaic of the natural world.

The National Park Service is one of thousands of organizations around the world which are now providing information about the natural environment upon which all civilization and life depend.

University programs, nature centers, ecology camps, and wildlife refuges are all helping to contribute to a vastly improved understanding of our life-giving air and water systems.

The National Audubon Society, for example, supports a network of nature centers, camps, and wildlife sanctuaries, and publishes several publications, including perhaps the most beautiful magazine in the world, Audubon.

National Audubon also has a series of visual aids and educational materials about birds, trees, wildflowers and other features of the natural world. These can be obtained by writing to the Encyclopaedia Britannica Educational Corp., 425 N. Michigan Ave., Chicago, Ill. 60611.

The National Audubon Society has more than 451 chapters across the country, and many of these also have educational programs.

Other major environmental groups with extensive educational programs include: The Sierra Club, Friends of the Earth, Defenders of Wildlife, American Forestry Association, National Parks and Conservation Association, Wilderness Society, Izaak Walton League, and the National Wildlife Federation.

Additional information about national and international organizations dealing with education and the environment may be found in a reference work, Directory of Environmental Education Resources. It is available for $3.95, plus 90 cents for mailing, from the Center for Environmental Education, 1925 K Street, NW, Washington, D.C. 20006.

Several Federal agencies have environmental programs. A listing of agencies and their activities can be found in a publication titled "Environmental Education Activities of Federal Agencies," sponsored by the Educational Resources Information Center of the National Institute of Education and the Ohio State University. Copies are available by writing to the ERIC Clearinghouse, Ohio State University, 1200 Chambers Road, Third Floor, Columbus, Ohio, 43212. The reference number is SE-024-166, and the cost is $4.15 per copy.

By Jane and Don Kellogg

EPA, Guam, And Environmental Education

Palms swaying in the warm tropical breeze, curling aquamarine waves crashing on a white beach, and puffy clouds skidding across a crystalline sky would indicate that the Pacific island of Guam is environmentally sound, unpolluted, and problem-free.

On a closer examination, however, it becomes apparent that, though conditions are a vast improvement over the past, environmental education and action are needed to protect this island.

Prevention of pollution has been the responsibility of the Guam Office of the Environmental Protection Agency since 1973. Legislation relating to environmental protection has been written and is currently being enforced by the Guam EPA. The present day image of a jewel in the Pacific is no accident. Through cooperation by governmental agencies and private enterprise, many of the difficulties of the past have been dealt with and acceptable alternatives developed.

Compared to many American communities, Guam is an environmental utopia. Local action centers on prevention of large-scale environmental degradation through careful planning and, equally important, through education.

Raw sewage is no longer allowed simply to flow into the nearest river, stream, lake, or sea. Air quality has been improved through control of dust created by rock processing and construction companies, and emissions from power plants are being controlled. Groundwater contamination is being monitored and the placement of septic tanks, cesspools, sewage lagoons, and landfills is carefully controlled. Hazardous materials are being identified and, in many cases, are collected, stored, and ultimately receive disposal in approved hazardous waste landfills on the mainland United States.

Legislation and monitoring are only a portion of the role of the Guam EPA in protecting environmental quality. Qualified personnel are presently conducting research in many areas. One of these is the northern Guam freshwater aquifer. As is true in the United States, knowledge of groundwater characteristics is limited due to previous difficulties in the collection of uncontaminated samples. This study will give a more accurate picture of the quantity and quality of this main source of drinking water.

Residents are kept abreast of environmental problems, solutions, regulations, and research being conducted through public participation meetings and educational problems.

"Wet and Wild" Workshop

The most recent venture into an education program resulted in a rather unusual cooperative agreement with four other agencies—the Guam Coastal Zone Planning and Management Bureau, Guam Department of Agriculture, Guam Teacher Center, and the University of Guam—to provide environmental education.

Talents and finances were combined to support a six-day environmental education workshop for fifty teachers in August, 1980. This unique workshop, entitled, "Wet and Wild," immersed teachers in activities designed to heighten their awareness of the environment as a whole. In-depth coverage was given on groundwater.

Teachers came from all over Guam and from the island of Ponape. During the workshop, they attended classroom sessions in which they learned environmental concepts and discussed with representatives of the participating agencies how those concepts related to solving or preventing Guam's environmental problems.

While lectures and classroom work did occur, the main emphasis was on activities. The most enlightening was an overnight camp-out on a remote beach complete with naturally edible foods, spear-fishing, snorkeling, and field studies. Equipment for the field studies as well as literature were purchased with funds generated by the sponsoring agencies. In addition, representatives of the cooperating agencies will be available during the school year to provide advice to the public schools.

Commitment to carrying out an environmental education program in the classrooms was demonstrated by the preparation of a plan of action by each of the teachers. Through programs such as this, teachers can make a significant impact on the environmental ethic of the citizens of Guam.

The same pressures which have already created environmental disasters in parts of the mainland U.S. are present in Guam. Fortunately, the "conquer and move west" ethic which prevailed so long on the mainland has had a barrier on Guam—no west to move on to. There seems to be a strong determination to prevent pollution in the future and to save one of the few remaining tropical paradises.□

Jane Kellogg is a Writer/Editor at EPA's Robert S. Kerr Environmental Research Laboratory in Ada, Oklahoma. Her husband, Don, is Professor of Science Education at East Central Oklahoma State University in Ada. This report is based on their studies last year at Guam, a U.S. territory in the Western Pacific with an approximately 100,000 population and a land area of about 209 square miles.

A native of Guam husking coconuts.

The Greening Of The Gray Panthers

By Harold A. Bair

Maggie Kuhn (center) with young environmental students.

A decade ago, in the same year that the Environmental Protection Agency was created, a dynamic woman, Maggie Kuhn, and four of her friends refused to accept the stereotype that old people are useless. Maggie Kuhn, at 65, had been forced into retirement, and she was neither ready nor willing to stop a lifetime of hard work and social contribution. With her friends she formed the Gray Panthers, an organization devoted to combatting ageism, that is, discrimination based on chronological age.

Gray Panthers believe that ageism saps the strength of American society, just as virulently as racism, sexism, and elitism do. Ageism afflicts not only the job market, but contributes to personal identity crisis, victimization from drug and alcohol abuse, and far-reaching neglect in the decision-making process. Gray Panthers were quick to recognize that all of these injustices are shared by young and old alike. Ageism affects people at both ends of the age spectrum.

Today, the initial group of five Gray Panthers has grown to more than 55,000 people throughout the land. The key to their success, and the heart of their movement, is that they are young and old in action together. Gray Panthers, above all, are inter-generational.

Environmental Awareness Project

One of the problems that Gray Panthers are now addressing is the environment. Older Americans have witnessed the buildup of pollution in this country across the entire span of their adulthood. As young people they lived in a relatively unpolluted world. But since the two world wars they have watched one small piece of environmental erosion occur after another. And recently they have become aware, as have all of us, that each of these small things has added up to create the critical state that our environment is in today.

With this understanding, the Philadelphia Gray Panthers Education Fund, Inc. has initiated a nation-wide Environmental Awareness Project under the direct sponsorship of the Environmental Protection Agency. The originators of the project believe that they can uncover ways that older people can use the experiences which they have lived through to help young people understand environmental problems. In particular, they want to help young people recognize how crucial the time element is if the ravages of pollution are to be abated and controlled.

Maggie Kuhn remembers, for example, from her own childhood a proposal to keep Lake Erie clean. But not enough people at that time recognized or cared about the threat of the impending disaster. So the proposal was never adopted, the life of the lake was imperiled, and now millions of dollars have had to be spent for its restoration.

Many older people, from all walks of life, have stories like this that can be told to the young. One of the greatest gifts that older people have is their past. Their experience, survivorship, and perspective can serve as models for the young. Their personal appeal can add validity to our common goal of a cleaner, healthier environment for all. Rather than sitting by and watching young people float around and recite slogans and then go into the ordinary work-a-day world and add to pollution, older Americans can serve as motivators for the young by helping them become actively involved in the environmental cause.

"What are we doing to the children who grow up today without knowing old people or having any old friends that they can love and be comforted by and look forward to association with?" Maggie Kuhn asks. "The Environmental Awareness Project puts people together, people who have been separated, for a very important cause that affects both. We, as the elders of our society, have an obligation and a responsibility to protect our environment for the young who come after us. The Environmental Awareness Project is the kind of program where we're looking beyond our little, self-centered beings to others. And our goal ought to be to reach out to others, to get connected with a cause that we believe in and that we can work in."

This new program is being developed in six cities that form a geographic cross-section of the United States: Philadelphia, Pa.; Miami, Fla.; Denver, Colo.; Austin, Tex.; Portland, Oreg.; and San Francisco, Calif. Groups in each of these cities are working with a particular social action theme directly related to environmental policy.

Some of the themes from which they are choosing are law, health effects, technology, energy conservation, economic benefits, scientific progress, recreation, transportation, and ethics. The groups will target their programs to fit existing youth service systems such as scout troops, neighborhood associations, service clubs, Y's, community centers, afterschool programs, church groups, and summer camps. When the project is completed, they will publish their program in a total social action-oriented manual so that their model can be duplicated in communities throughout the country.

Maggie Kuhn sees older people being scrap-piled and thrown away by our society like so many old, used cars. The primary efforts of the Gray Panthers over the past ten years have been to counter this scrap-piling by recycling older Americans into public interest work, into monitoring the operations of the courts, banks, nursing homes, insurance companies, and municipal agencies such as planning commissions and zoning boards.

The Gray Panthers were the first group to organize people across the country to reform nursing homes. They have kept a vigilant eye on the media to eliminate negative portrayals of older people. Because many older people do not have large sums of money to invest and cannot wait long periods of time for their investments to accrue, Gray Panthers, in 1978, petitioned the Federal Reserve Board and four other Federal agencies to raise interest rates on small saver accounts, and, supported by numerous allies, the Gray Panthers won. They were also instrumental in raising the mandatory retirement age from 65 to 70, and they continue to lobby for a complete lifting of the age limit. In 1974 Ralph Nader's Retired Professional Action Group merged with the Gray Panthers, and they guided the successful enactment of legislation to regulate the hearing aid industry.

"You handle the stereotypes," Maggie Kuhn says, "by projecting other images that define age in affirming tones." While Gray Panthers make news by fighting the inequities of ageism, they try to instill the idea that aging is a natural process that begins at birth. A positive attitude toward aging views life as a continuum with all parts contributing to a wholeness of living. Life must not be segmented into periods of greater or lesser worth. Each moment can be worthwhile. There is an interconnectedness to all living toward which we can devote our common efforts. □

Harold A. Bair is Co-Convener of the Philadelphia Gray Panthers and the Director of the Environmental Awareness Project. Anyone wishing to get involved in the Gray Panthers-EPA Environmental Awareness Project should contact him at 6344 Greene Street, Philadelphia, Pa. 19144, telephone 215-843-0814.

Winter Skeletons

As dawn arrives, the naked branches of elm and oak trees are silhouetted like intricate black fans against the ruby background light of a slowly rising sun.

So another winter day unfolds over a landscape where plant skeletons—wildflower and weed stalks and trees stripped of their winter leaves—march along roadsides and across fields and woods.

Gone is the perfumed beauty of such annual flowers as violets which disappear completely by the end of summer. Yet plants such as milkweed, Queen Anne's Lace, wild yams, goldenrod, teasel, and virgin's bower remain and are transformed into a new dry form that can survive icy breezes.

Some of these plants still carry seeds and were described by Thoreau as those "unexhausted granaries which entertain the earliest birds—decent weeds . . . which widowed nature wears."

Many birds and other animals also find feed in bare trees or the vines wrapped around them. The orange berries of the bittersweet vine, the dried purple fruit of grape vines, and the white berries of poison ivy all provide nourishment for wildlife.

Even erect dead trees—called snags—are useful to creatures of the forest. Woodpeckers and other insect-eating birds, such as the brown creeper, thrive on carpenter ants, beetles, and termites living in the dead wood. Tree holes drilled by woodpeckers or caused by disease provide shelter needed by raccoons and other mammals.

The most successful hole digger is the pileated woodpecker, a red-headed black and white bird about the size of a crow, with a massive black beak. When drilling, the pileated woodpecker sounds like a jackhammer breaking up concrete and sends wood chips flying with its hammering blows.

The large oval holes it creates while making a nest or digging for carpenter ants in the trunk are later used by many other birds and small animals.

An excellent den tree is the sycamore which is particularly susceptible to the internal diseases and decay that leave large cavities. Hikers caught in rain storms can sometimes walk into the trunk holes in huge sycamores and find shelter.

One of the more ancient trees, the sycamore has a brown exterior bark that splits as the trunk grows instead of expanding as the bark does on more modern trees. When the exterior flakes off, the sycamore's light under-bark gives it a distinctive mottled or whitish appearance.

Other trees which can also be identified in winter despite the absence of leaves include the elm which has a vase-shaped trunk and branches, the pin oak with its ascending upper and drooping lower branches, the honey locust noted for its prominent trunk thorns, and the shagbark hickory with its shaggy bark.

The silhouettes are only one of many clues that can provide a guide to trees and help solve a tiny part of the vast mystery of nature.

Winter often savages forest trees, bending or cracking them with heavy burdens of ice or snow.

Occasionally, branches of a falling tree catch on a neighboring limb, and two forest monarchs are locked in an awkward embrace. When winds blow again, they groan, moan, and squeak as their branches rub against each other.

Once they crash to earth, fallen trees may be cut for lumber or firewood, but the less desirable ones will be left to rot on the forest floor.

Sometimes a seed falling from a standing tree will be blown by wind into a crevice in a log below. When conditions are right, the embryo in the seed gradually begins to grow as the point of its root cracks the seed case and finds mineral and water in the decaying trunk, known by foresters as a nurse log.

Gradually a new tree sprouts and begins its long journey toward the sky as once again life renews itself in death.—C.D.P. □

Douglas MacMillan

Al Smith, Jr.

Deborah Taylor

Tenth Annual Awards Ceremony

Three individuals and four groups were awarded gold medals for exceptional service last month at the 10th EPA annual awards ceremony. The individuals honored were: Douglas MacMillan, Director, Hazardous Waste Enforcement Task Force, Headquarters, for leadership in the hazardous waste enforcement program; Al Smith, Jr., Chief, Environmental Emergency Branch, Region 4, for leadership in environmental emergency programs, and Deborah Taylor, Acting Chief, Air Economics Branch, Headquarters, for leadership in the design and implementation of EPA's Budget Policy.

A gold medal went to the EPA Region 10 Alpetco Project team for exemplary processing of a precedent-setting environmental impact statement and consolidated permit process for a major energy project. The group includes Glenn Akins, Paul Boys, Robert Courson, Michael Johnston, Sylvia Kawabata, Deborah Kirk, William Lamoreaux, Lee Marshall, Alexandra Smith, Daniel Steinborn, Robert Wilson, and John Yearsley.

The Resource Conservation Recovery Act Senior Task Force, Headquarters, received a gold medal for its outstanding achievement in developing and implementing regulations for the management of hazardous waste. Members of the group are: Dorothy Darrah, Gary Dietrich, Lisa Friedman, John Lehman, and John Skinner.

A gold medal went to the Consolidated Permit Regulation and Application Group, Headquarters, for exceptional service in developing regulations and forms for the wastewater discharge, hazardous waste, and underground injection control permit program. The group includes Joel Blumstein, Robert Brook, Alan Eckert, Frank Hall, J. William Jordan, Heather Struck, Dov Weitman, and Robin Conrad.

A gold medal was also awarded to the Inspection and Maintenance Team from EPA's Region 8 and the Office of Mobile Source Air Pollution Control in Ann Arbor, Mich., for their outstanding work in setting a national precedent for vehicle inspection and maintenance in Colorado. The members of the group are: Thomas Cackette, Robert DeSpain, Robert Duprey, John Philbrook, Christine Shaver, and Dale Wells.

The silver medal for superior service went to seven individuals and five groups. Silver medals were awarded to Michael Dellarco, Headquarters; Jerry Kurtzweg, Headquarters; Joellen Lewtas, Research Triangle Park, N.C.; Alvin Morris, Region 3; William Preston, Jr., Headquarters; Terry Thoem, Region 8, and James Vincent, National Enforcement Investigations Center, Denver, Colo.

Silver medals went also to the Alabama Power Task Force from Region 4, Research Triangle Park, and Headquarters: Richard Biondi, Kirt Cox, Alex Cristofaro, Warren Peters, Roger Pfaff, Libby Scopino, Eric Smith, Jimmy Suitt, Michael Trutna, Lydia Wegman, James Weigold, Peter Wyckoff, Jerry Yarn; the Pulp and Paper Mill Litigation Team from Region 10: Danforth Bodien, Lloyd Reed, Thomas Waite; the Uncontrolled Hazardous

Sanford W. Harvey, Jr.

He has been named Deputy Assistant Administrator for Mobile Source, Noise and Radiation Enforcement. He was most recently Regional Enforcement Director for EPA in Atlanta.

In his new role, he will be responsible for designing and implementing programs to insure compliance with noise and motor vehicle emission standards. Harvey replaces Ben Jackson, who resigned last April.

Harvey came to the Agency in 1978 as the Regional Counsel for Region 5. Prior to that, he was an Administrative Judge with the Corps of Engineers. He has also worked in the Office of the General Counsel of the Office of the Chief of Engineers, after serving in the Army Judge Advocate General's Corps from 1971-1975.

He received his bachelor's degree from Norwich University in 1967, and his law degree from Harvard Law School in 1970.

Waste Site Investigation and Safety Interim Guidance Group with the National Enforcement Investigations Center: William Blackman, Jr., Barrett Benson, Kenneth Fischer, James Hatheway, John Lattimer; the Pesticide Effluent Guideline Group at Headquarters: Colburn Cherney, George Jett; and the I-84 Environmental Review Team from Region 1 and Headquarters: Stephen Ells, Elizabeth Higgins, Peter Karalekas, Mary Kelley, Sam Little, Joseph McCabe, Marianne Salerno, and Wallace Stickney.

The Administrator's Award for Excellence went to six individuals and two groups. Winners include Sheila Allen and Margaret Boswell, Headquarters; Forrest Crane, Las Vegas, Nev.; Wayne Goforth, Research Triangle Park, N.C.; Penelope Poeppelman, Atlanta, Ga.; Barbara Spahr, Kansas City, Mo.; the EGD Word One Center group from Headquarters including Pearl Smith, Kaye Storey, Carol Swann, Nancy Zrubek, and the Specialized Procurement Unit also from Headquarters including J. Lawrence Butler, Patricia Caldwell, Nancy Collins, Natika George, Phyllis Parisi, Roberta Roberts, and Edwin Stull.

Winner of the Public Health Service Distinguished Service Medal was Lawrence Gray, Headquarters. Public Health Service Meritorious Service Medals were won by Robert Ajax, Research Triangle Park, N.C., and Charles Porter, Montgomery, Ala.

Five retiring EPA officials received Distinguished Career Awards. They include Allen Cywin, Senior Science Advisor, Headquarters; Paul DeFalco, Jr., Region 9 Administrator; Robert Horton, Senior Research Advisor, Research Triangle Park, N.C.; Albert Metzler, Assistant Director for Planning and Management, National Enforcement Investigation Center, and Thomas Williams, Deputy Director, Office of Public Awareness, Headquarters.

Also recognized were the 12 EPA employees who received 1980 Presidential Rank Awards. Members of that group are: Walter Barber, Deputy Assistant Administrator for Air Quality Planning and Standards, Research Triangle Park; Eckardt Beck, Assistant Administrator for Water and Waste Management, Headquarters; Roy N. Gamse, Deputy Assistant Administrator for Planning and Evaluation, Headquarters; Richard Wilson, Deputy Assistant Administrator for General Enforcement, Headquarters; Henry Beal, Director, Standards and Regulations Division, Headquarters; Marilyn Bracken, Deputy Assistant Administrator for Toxic Program Integration and Information, Headquarters; Richard Dewling, Region 2 Deputy Administrator; Rebecca Hanmer, Region 4 Administrator; Frank Princiotta, Director, Energy Processes Division, Headquarters; Steven Reznek, Deputy Assistant Administrator for Environmental Engineering and Technology, Headquarters; James Rogers, Associate General Counsel for Water and Solid Waste, Headquarters, and Michael Walsh, Deputy Assistant Administrator for Mobile Source Air Pollution Control, Headquarters. □

Update

A review of recent major EPA activities and developments in the pollution control program areas.

AIR

Emission Limits
EPA has approved final air emission limits for two West Virginia power plants that will protect human health in the area and maintain employment stability at various State coal mines. The plants affected are Mitchell Station near Wheeling and the Harrison Station near Morgantown. The Mitchell Station is operated by Ohio Power Company, and the Harrison facility is operated by Monongahela Power Company. Although EPA has approved the emission limits as adequate to protect the atmospheric health standard, the Agency has determined that the State's plan to protect atmospheric welfare standards is inadequate. The Agency has asked the State to submit a new plan within nine months for attaining this standard within a reasonable time.

Options Announced
EPA recently announced major options it is considering for restricting production of ozone-destroying chlorofluorocarbons. The Agency's preferred option involves an innovative new approach that would limit the total amount of chlorofluorocarbons allowed to be used in the United States and give industry the right to "buy" and "sell" permits to produce or use up to that limit. This approach would allow, in essence, continuation of those uses of chlorofluorocarbons society values most highly while less essential uses would be replaced by substitutes. A second approach being considered by EPA involves the use of more traditional types of restrictions such as selective bans, and setting technical standards for emissions during production and usage.

Standards
Air pollution standards recently proposed by the EPA would cut particulate (dust material) emissions from most new sodium carbonate production plants by 55 percent. New Source Performance Standards are issued under authority of the Clean Air Act.

Particulate emissions from sodium carbonate plants can endanger public health and welfare. These tiny particles, when ingested into the lungs, can cause breathing problems and respiratory illness.

If these new sodium carbonate plants were subject to current State standards, particulate emissions would be limited to 768 tons per year in 1985. The proposed standards would lower that figure to 348 tons annually in 1985.

ENFORCEMENT

Accord Reached
EPA has signed an agreement with National Steel Corporation which will bring company plants in three States into compliance with all air and water pollution control requirements by the end of 1982. The agreement affects one plant in Weirton, W.Va., one plant just outside Detroit, and a facility in Granite City, Ill. The settlement incorporates National's plans for modernization and replacement of several basic steelmaking processes. It will also maintain the economic stability of these facilities, which together employ over 30,000 workers, while protecting the health of citizens in surrounding communities. Particulate emissions will be reduced 79 percent and 80 percent respectively at the Detroit and Granite City plants.

Suits Filed
On behalf of EPA, the Department of Justice has taken the following actions:

- Filed suit against Chemical Recovery Systems, Inc., charging that a chemical waste storage and solvent recovery facility operated by the company is contaminating soil and the Black River in Elyria, Ohio.
- Filed suit against the Diamond Shamrock Corporation charging that hazardous chromate wastes deposited at its Painesville, Ohio site have contaminated soil and groundwater underlying the site and have migrated into the Grand River.
- Filed suit against the Gulf Coast Lead Company of Tampa, Fla., charging that the disposal of hazardous wastes at its secondary lead smelting facility has polluted groundwater under the site.
- Filed suit against the Chemcentral-Detroit Corporation of Romulus, Mich., charging the toxic chemicals discharged at the company's facility in Romulus have contaminated soil and groundwater beneath the facility and have polluted a nearby stream which connects with the Detroit River.

Barge loaded with Philadelphia sludge moving down the Delaware River.

Ocean Dumping Ended

Philadelphia recently became the first major U.S. city to stop dumping sewage sludge into the Atlantic Ocean. The cessation, after nearly twenty years, fulfills a commitment made by the city in May 1979 when it signed a consent agreement with the U.S. Environmental Protection Agency, the States of Pennsylvania and Maryland, the Delaware River Basin Commission, and the Sierra Club. That agreement called for a halt to ocean dumping by December 31, 1980.

"We are extremely pleased by the actions of the City of Philadelphia and its new Water Commissioner, William Marrazzo," said EPA Regional Administrator Jack J. Schramm.

Marrazzo said the city's strip-mine reclamation program, one of several alternative programs devised to utilize the sludge, played a major role in ending the dumping. Almost 70 percent of the 60,000 to 70,000 dry tons of sludge produced annually by the city is now trucked to two counties in southwestern Pennsylvania where it is applied over spoiled strip-mine land to foster revegetation.

Congress has mandated an end-date of December 1981 for all other cities which continue to dump sludge material into the Atlantic.

in all of these actions, EPA is asking the court to order the companies to take remedial action to eliminate the contamination, and resolve all other related problems.

Request Denied
The EPA has denied a request from Rolls-Royce Ltd. for a waiver of the carbon monoxide (CO) emission standard for its 6.75 Liter V-8 engine family that it plans to use in all its models for both the 1981 and 1982 model years. The auto manufacturer had requested a two-year delay because initial emission tests results suggested there may be problems with the vehicles meeting the standard. Since then, however, EPA said test vehicles have demonstrated a capability of meeting the standards.

HAZARDOUS WASTE

Hotline Started
EPA's Office of Solid Waste has begun operating an industry assistance telephone "hotline" to help industry comply with the new hazardous waste regulations under the Resource Conservation and Recovery Act. The toll-free hotline operates Monday-Friday from 9 a.m. to 4:30 p.m. The number is 800-424-9346 (in Washington, D.C., 554-1404). Questions concerning the hotline may be directed to: Michael Barclay, Project Officer, RCRA Industry Assistance Project, Office of Solid Waste (WH-565), Environmental Protection Agency, Washington, D.C. 20460. Tel.: (202) 755-9190.

Shortage Predicted
A contract study prepared for EPA estimates that some areas of the country do not appear to have enough hazardous waste disposal facilities to handle industrial wastes over the next year, although nationally, sufficient capacity exists for hazardous waste generators to comply with new regulations that took effect this past November.

EPA Administrator Douglas M. Costle said "the results of the study must be interpreted with extreme caution." Costle pointed to the fact that data on hazardous waste generation are still very rudimentary and will continue to be for several years, that the hazardous waste disposal situation is shifting rapidly, and that the attention in the study was focused on the situation in 1981.

NOISE

Buy Quiet
Municipal officials around the country are beginning to establish programs to reduce noise in their cities by buying, when possible, quiet equipment, vehicles and other machine-driven products.

The program, called Buy Quiet, is being coordinated by the EPA and National Institute of Governmental Purchasing. It is part of a Federal urban noise initiative to achieve noise reductions without Federal regulation, soon to be implemented in such cities as New York, Chicago, Pittsburgh, New Orleans and Minneapolis-St. Paul.

Consolidated Guidelines
New consolidated Federal guidelines on noise-compatible land use were announced recently by the EPA. As a result of this, localities now will have a central point of access to this information. The guidelines are intended to help cities and other local government in guiding noise sensitive developments, such as housing, away from highways, airports and other major noise sources and to encourage noise-compatible growth instead.

PESTICIDES

Investigation Opened
An investigation to determine whether to allow the continued unrestricted use of carbon tetrachloride in fumigants sprayed on harvested wheat and other grains has been opened by the EPA. The reason, said EPA, is that carbon tetrachloride causes cancer, liver damage, and other adverse effects in test animals indicating a potential human hazard.

The Agency said it has preliminary evidence that low level residues of carbon tetrachloride are showing up in flour. Bread baked from this flour probably would still retain a small amount of the residue, according to the Agency.

RESEARCH

Pilot Study
The EPA recently announced a pilot study to see if compact, portable carbon monoxide detectors carried by commuters are of practical use in determining carbon monoxide levels in everyday living and working conditions. EPA's Environmental Monitoring Systems Laboratory in Research Triangle Park, N.C., is responsible for the project.

Program Completed
The EPA has successfully completed its first minority apprenticeship science program. More than 100 students were placed in the Agency's research and development laboratories.

The Minority Apprenticeship Program includes EPA and six other Federal agencies with research and development responsibilities. In order to participate in the program, students had to have completed the 10th grade and have at least one course in the physical or life sciences. They also had to be recommended by their science teacher or school principal.

Cold Weather
The EPA recently released a study which recommends replacement of existing home furnaces and boilers with new high efficiency heating equipment as a means of conserving energy while reducing pollution emissions and heating costs.

The study notes that homeowners who have older, less efficient gas equipment can reduce their heating bills by approximately one-third by purchasing new high efficiency equipment which has seasonal efficiencies greater than 80 percent. Those homeowners with old oil heating equipment can have it upgraded, while those who can heat with oil but have access to a gas main could consider switching to high efficiency gas equipment. These homeowners could cut their fuel consumption by one third and save money, according to the study.

Copies of the study entitled, "An Analysis of the Economics of Replacing Existing Residential Furnaces and Boilers with High Efficiency Units" may be obtained from EPA, Rm 415 West Tower, 401 M Street, SW, Washington, D.C. 20460, Attn: Rosetta Stokes.

TOXICS

Study Results
The Toxic Substances Control Act, passed by Congress in 1976, is just as likely to stimulate innovation in some sectors of the chemical industry as it is to discourage it in others, according to a study just released by the EPA. This finding runs contrary to fears expressed by some members of the chemical industry that the only effect of the Act's requirements will be to slow down the development of needed new chemicals.

New Rule
New regulations issued recently by EPA require companies intending to manufacture or import two controversial fire-retardants, PBB's and TRIS, to give advance notice to the Agency. EPA would then determine whether the production or importing of these two compounds threaten human health or the environment and take any required action.

WATER

Clean Water
More than a million rural residents either already have or soon will have their drinking water cleaned up to meet Federal drinking water standards as a result of a financial aid program run by the U.S. Department of Agriculture's Farmers Home Administration in cooperation with the EPA.

Since the cooperative effort began in 1978, the Farmer's Home Administration has awarded over $850 million in 44 States for roughly 1,500 drinking water projects. □

Around the Nation

REGION 1

Bubble Approved
EPA is proposing formal approval of an individual bubble plan. The bubble plan was submitted to the Agency—after approval by the State of Rhode Island—by Narragansett Electric Company on August 24, 1980, and involves a pollution trade-off between two of the utility's power plants in Providence. This multi-plant bubble strategy would allow Narragansett to burn higher-sulfur oil at one plant, but only when the other plant is not operating or is burning natural gas. Once adopted, this strategy should cut sulfur dioxide emissions 1,389 tons per year, reduce dependence on foreign oil by 6,000,000 barrels per year, and reap an annual fuel cost savings of nearly $3 million.

Agreement Reached
U.S. Attorney Edward F. Harrington and EPA Regional Administrator William R. Adams, Jr. have announced that EPA has entered into a consent decree with W. R. Grace and Co. concerning the disposal of hazardous waste at the W. R. Grace industrial complex in Acton, Mass.

The decree, which has been submitted to the Federal District Court in Boston, requires the company to take a number of actions, all of which must be approved by EPA, to clean up the pollution at the Acton plant, and to restore the groundwater and aquifer to a fully usable condition.

REGION 2

Transportation Grant
A $3 million Federal grant to the Tri-State Regional Planning Commission will finance local planning agency efforts to use transportation innovations around the New York Metropolitan Region to reduce harmful levels of carbon monoxide and ozone from auto traffic.

EPA Regional Administrator Charles S. Warren said the grant "represents a challenge to local planning agencies to look carefully at available alternatives to single-occupant auto use, choose the best methods for their area and plan how to put them into effect. The agencies involved also will be asked to predict how these innovations will affect local communities."

The two-year project will involve transportation and environmental planners in New York City, Nassau, Suffolk, Rockland, and Westchester Counties, Northeast New Jersey, and Southwest Connecticut. They will be studying a mix of transportation alternatives.

REGION 3

Environmental Program
Region 3 and the Free Library of Philadelphia recently sponsored a week-long environmental awareness program for approximately 1,500 children in grades 4 through 8.

Regional staff members showed films and spoke to groups of children at the main library and at 16 branch libraries. Each child also received a packet containing environmental literature, a bookmark listing books on environmental themes, and a balloon imprinted with a Charles Schultz "Peanuts" cartoon.

EPA and library officials are developing plans for a larger and continuing program in the future.

Suit Filed
The Department of Justice, on behalf of EPA, filed suit recently against Fischer and Porter Company, Inc., for contaminating the public drinking water supply in Hatboro and Warminster Heights, Pa. The complaint alleges that the Warminster company improperly disposed of a degreaser used in its manufacturing process, which seeped into the groundwater. The degreaser contains trichloroethylene and perchloroethylene, two known cancer-causing agents.

REGION 4

Technology Surge
Region 4 is witnessing a surge in the use of innovative and alternative technology in wastewater treatment. Sixty-three such projects were funded by the Regional Office in fiscal year '80, while only nine were funded the previous fiscal year. The number of land application systems has also increased in the region from 6 to 45.

Among the more noteworthy projects is one of the largest over-land flow systems in the Nation in Cleveland, Miss. It has a capacity of three million gallons per day. Dalton, Ga., has one of the largest land treatment systems of any type in the country. It is a 50-million gallon per day silviculture project on 8,000 acres. In St. Petersburg, Fla., there is a zero discharge system where tertiary-treated wastewater is used to irrigate public golf courses, highway rights-of-way, and other areas. The facility also includes a deep-well injection system for use as a backup during wet weather.

REGION 5

Dust Clean-Up
One of the first practical applications of EPA's bubble policy has been put into effect at the Armco Inc., steel plant in Middleton, Ohio, opening the door for other steel companies to follow suit. Under the bubble plan, plant managers are allowed to figure out the best way to control air pollution, as long as overall clean-air standards are met. Instead of instituting expensive dust-control measures in the plant itself, Armco chose to control wind-blown dust from outside sources. Armco paved more than 8 miles of road within the 1,700-acre plant complex, installed fixed and mobile sprays for raw material storage areas, paved parking lots at the plant perimeter, and began operating company-owned buses to reduce employee auto traffic. In addition, Armco covered about 18 acres of barren ground with trees, shrubs, and grass.

Armco's dust-control plan under the bubble received tentative EPA approval; final approval is expected within the next several months.

Coal Contract
EPA has subpoenaed documents from Cleveland Electric Illuminating Co., dealing with the company's cancellation of a coal contract that put several hundred Y & O Coal Co. miners out of work. United Mine Workers filed a petition on September 26, seeking an investigation into the layoffs at Y & O's Allison mines as a result of Cleveland Electric's cancellation of the contract. EPA granted the union's request on October 8 and asked voluntary cooperation of all parties. EPA's action stems from Section 321 of the Clean Air Act, which allows an employee, or his representative, to seek a full investigation in cases where layoffs are being attributed to compliance with Clean Air Act requirements.

Y & O Coal Co. contended that Cleveland Electric could continue using coal from its Allison mine and still comply with applicable regulations of the Clean Air Act. While officials of Y & O Coal voluntarily submitted documents to EPA, Cleveland Electric raised objections to the investigation.

REGION 6

Waste Control
Arkansas became one of the first States in the Nation to assume responsibility for management of its hazardous waste control program when Regional Administrator Adlene Harrison approved the program during ceremonies in Governor Bill Clinton's office recently.

Giving her approval, Mrs. Harrison said, "EPA feels strongly that the State level is the appropriate place for such programs, and I feel confident that Arkansas officials will do an outstanding job."

Noise Conference
A national conference of noise pollution officials was held recently in the University of Texas Convention Center in Dallas.

Federal and State officials discussed noise-related issues including State and local noise control programs and the function of regional Noise Technical Assistance Centers. Technical issues such as noise measurements, monitoring and enforcement were also on the agenda.

REGION 7

Proposal Approved
Voters in Kansas City, Mo., recently approved a proposal to add a controlled amount of fluoride to their drinking water. This decision follows more than a year's campaign begun in 1979 with the introduction of an ordinance by City Councilman Emanuel Cleaver. A citizens' committee led by local dentists and pediatricians actively campaigned for approval of the measure.

Federal financial assistance is offered to municipalities that wish to practice controlled fluoridation. EPA supports this program through its Office of Drinking Water.

Drinking Water Study
A Region 7 Task Force, in conjunction with the Robert L. Kerr Environmental Research Laboratory, Ada, Okla., is investigating the problem of nitrates in the groundwater of the region. Preliminary findings show that there are areas in Iowa, Kansas, Missouri, and Nebraska where groundwater is contaminated with high levels (10 mg per liter) of nitrate.

REGION 8

Suit Filed
U.S. Attorney Charles E. Graves, on behalf of EPA, has filed suit in Wyoming against Rainbow Pipeline Company of Afton and the Rio Vista Homesites water system near Green River. Rainbow serves about 40 people in Lincoln County and Rio Vista some 300 people in Sweetwater County.

EPA's complaint alleges that the water suppliers failed to: do basic monitoring of their water quality, report results of their water quality to EPA, notify users that the system was not in compliance with Safe Drinking Water Act, and maintain records of testing.

Closing Studies
The Regional Office in Denver has begun an economic investigation of the closing of Anaconda Company's Anaconda Smelter and Great Falls Refinery. The investigation was requested by Carpenters and Joiners Local #88, Machinist and Aerospace Workers Local #29, and the International Union of Operating Engineers. Section 321 of the Clean Air Act allows workers affected by pollution control-related plant closings or threatened closures to call for an investigation.

EPA Regional Administrator Roger Williams said the effort will be "a full investigation of the claims by the Anaconda Company that the plant closure is a direct result of the administration of provisions of the Clean Air Act." He added, "The company has pledged its full cooperation."

Although not related to the investigation, ways to reopen those facilities and allow operation until 1988 are being explored. Williams said that although he's not optimistic, he and his staff are continuing discussions and communications with Montana's Congressional delegation, State environmental officials and the Company.

REGION 9

Nuclear Waste:
Region 9 will initiate a memorandum of understanding with the National Oceanic and Atmospheric Administration, the Nuclear Regulatory Commission, and the State of California to monitor a low level nuclear disposal site fifty miles off the coast of San Francisco, near the Farallon Islands. Approximately 47,500 steel drums containing laboratory paraphernalia and low level nuclear waste from the Lawrence Livermore nuclear research laboratory were disposed of at the site between 1946 and 1970. EPA surveys conducted in 1974 and 1977 confirmed concentrations of radioactivity within expected levels but concluded they posed no threat to man or the marine environment. Increased public concern resulted in a review of the data on the disposal site by a Congressional subcommittee. The subcommittee concluded that fish in the area were edible, but that a detailed and regular surveillance of the site was warranted.

REGION 10

Urban Pests
Region 10 last month supported a three-day Seattle seminar on urban integrated pest management.

"Integrated pest management is not just for the farm . . . it can be adopted by public and private institutions in the city as well," said the Washington Environmental Foundation, sponsor of the seminar. The seminar was designed to acquaint local governments and community groups with biological techniques and other alternatives that could supplement or replace chemical agents used to control pests and unwanted vegetation.

Eskimo Language
To accommodate Alaskans who speak only Inupiaq—an Eskimo language—Region 10 held a recent public hearing in Barrow in both English and Inupiaq to hear comments on EPA's proposed permit for seven compressor stations that would be used on the planned Alaska gas pipeline. □

States Served by EPA Regions

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Region 10 (Seattle)
Alaska, Idaho, Oregon, Washington
206-442-1220

News Briefs

Superfund Approved

Congress has passed legislation authorizing a "Superfund" to aid the Environmental Protection Agency in the clean-up of toxic waste dumps and chemical spills. The Agency estimates that some 30,000 to 50,000 potentially hazardous waste dumps are scattered across the country. The legislation passed by Congress authorizes over $1.6 billion to be spent over a five-year period. Of that, 87.5 percent will come from a tax on those industries which operate the chemical feed-stocks of hazardous waste. The remaining 12.5 percent of the fund will come from the Treasury. The Agency will take clean-up action, under this legislation, only in cases where a responsible party cannot be identified, where a responsible party refuses or cannot afford to adequately respond, and if the State is unwilling to take corrective steps.

New Use For Bubble Idea

The EPA is making a variation of its "bubble" idea immediately effective to let American can manufacturers save an estimated $107 million in capital expenditures and $28 million annually in operating costs. The Agency's action expressly encourages States to allow can makers to meet applicable emission levels by averaging emissions over a 24-hour period, permitting much greater flexibility with no adverse air quality effects.

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Young students examining insect specimens at the Chesapeake Bay Center for Environmental Studies.

Environment Education
Continued from page 3

budget constraints—a time when we find it difficult enough simply to maintain business as usual, let alone take on new assignments. I say "we" because EPA and the pollution control and energy industries must work together in protecting and enhancing our environment. The task calls for ingenuity, cooperation, and a better understanding by all segments of our society of the underlying causes of environmental problems.

We need managerial and conceptual innovations from the private sector and government that will enable us to meet our environmental mandate without imposing impossible financial demands on our country. We need fresh thinking about the things I've mentioned: better waste technologies, resource recovery, and, above all, making limited funds do more than routine duty.

Such calls for technological innovation are common, and are easily dismissed as being unrealistic. Yet the history of technology is full of achievements that sages predicted would never come to pass.

In 1900, for example, the *Literary Digest* —once the most influential publication in the U.S.—had this to say about the automobile: "Although its price will probably fall in the future, it will never, of course, come into as common use as the bicycle." The day before the Wright Brothers took off at Kitty Hawk, a Harvard professor of physics called a press conference to explain why it was flatly impossible for man to fly. In 1926, electronics pioneer Lee DeForest offered this opinion on the future of commercial television: "While theoretically and technically television may be feasible, commercially and financially I consider it an impossibility, a development of which we need waste little time dreaming."

In short, a striking number of impossible things have somehow gotten done over the years by people who refused to stop trying.

The technology that has given us so many ecological problems must now be applied to prevent them. We must merge two "ologies" that have often been in conflict into a single life-sustaining, resource-conserving science for the environment. □

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