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EPA JOURNAL

Health and the Environment

Protecting Public Health

Major environmental health questions and some of the activities of EPA's research program in protecting people are reviewed in this issue of the EPA Journal.

The controversial question of whether the health danger from chemicals has been exaggerated receives a wide variety of answers from various authorities. Another article discusses EPA's policy in evaluating cancer risks.

Dr. Stephen J. Gage, EPA's Assistant Administrator for Research and Development, explains what the Agency hopes to do to step up its pursuit of solutions to a host of questions about the impact of pollutants on the human body.

One initiative proposed as part of EPA's budget for Fiscal Year 1980 is the creation of a new Office of Health and Environmental Assessment. EPA will be recruiting nationwide to find an outstanding director for this post.

While most of EPA's research effort is devoted to environmental problems such as cancer that afflict so many Americans, the magazine also takes a look at some of the more unusual research projects, including some in the Great Smoky Mountains National Park, India, and Egypt.

Much of the information obtained in Egypt and India is expected to help EPA in evaluating health risks to the U.S. population.

Dr. Philip Handler, president of the National Academy of Sciences, emphasizes in an interiew with the Journal that there should be more studies of the riddle of how cancer varies around the world among different peoples.

Labor's stake in the cleanup of pollution in the steel industry is reviewed by Lloyd McBride, President of the United Steelworkers of America, in another interview with EPA Journal.

The development of pollution monitoring devices, which can be worn as personal jewelry such as bracelets or necklaces, is also the subject of an article. These personal monitors could be especially useful to people with lung or heart problems who need to know promptly about air pollutants.

Researchers using portable monitors have found that pedestrians in some city neigborhoods are often breathing pollutants at levels far higher than reported by the nearest stationary monitor machines.

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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

Front cover: Newborn babies being cared for in a hospital nursery.

Opposite: EPA and National Park Service scientists cross a log bridge in Great Smoky Mountains National Park en route to a monitoring project. Photo by Nick Karanikas.

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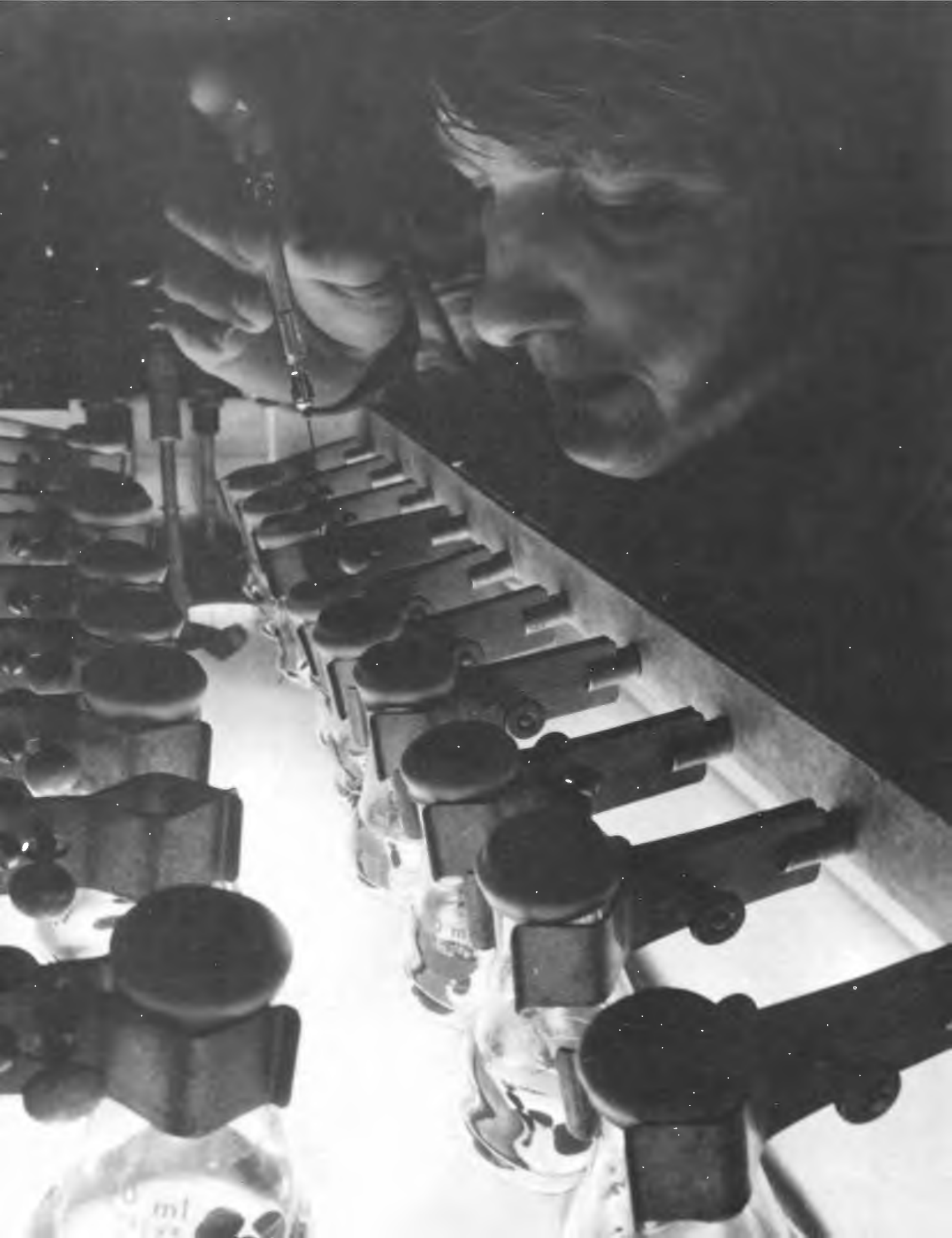

Protecting Public Health

By Douglas M. Costle
EPA Administrator

EPA is pushing with new vigor the goal of protecting public health from thousands of new pollutants, many of them invisible, spawned by modern technology.

The highlight of EPA's research and development budget for Fiscal Year 1980 is a major initiative in preventive public health research. We are devoting $37 million for an integrated research program to provide us with a better data base on which to make our crucial regulatory decisions.

We will focus on three critical research and development activities. They are:

- development of screening tests which will permit rapid, inexpensive detection of chemicals which may pose a serious health threat;
- use of new techniques to predict the concentration of these chemicals as they reach man in various ways; and
- conduct of studies which validate and improve the ability of our animal tests and other techniques to predict health effects.

The proposed new effort would dramatically expand research support for chemical regulation under three Acts administered by EPA—the Toxic Substances Control Act, the Safe Drinking Water Act, and the Clean Air Act. With Congressional support, we will have in FY 1980 the largest health research budget in EPA's history—$113 million—an increase of $34 million over FY 1979.

Now that the Agency is shifting the focus from the so-called conventional pollutants —such as sulfur dioxide and carbon monoxide—to toxic chemicals, we're going through a change that I think will put to a severe test our ability to understand and apply scientific knowledge effectively.

The current state of knowledge about the lasting environmental or health effects of the chemical revolution can be described as something like a block of swiss cheese —there is a fair amount of substance, but there are a lot of holes.

Even as our knowledge expands, it is fragmentary, a phenomenon with which scientists are comfortably familiar, but which can cause public policy makers to have fitful and sleepless nights.

Something that John Gardner said recently describes the problem exactly: "When you get into the world of action, you find that people have to act day in and day out without conclusive proof of the rightness of their actions."

EPA operates in a tension-filled atmosphere—not just political tension, not just tension between environmental and industrial interests—but tension between good science and good regulatory policies as well.

Good science and good regulatory policy—the two are not mutually exclusive, but neither are they necessarily synonymous. The regulators cannot wait until the scientists provide all the answers, for there will almost always be some degree of uncertainty in some part of that data. In the face of threats to public health, we must act, and not duck behind a cloud of uncertainty. Yet acting without an adequate scientific understanding is irresponsible.

Until very recently much of EPA's focus —both scientific and regulatory—has been on the waste products of our industrial society and on the application of science and technology to controlling residuals.

But with the passage of the Toxic Substances Control Act (TSCA), EPA is shifting its attention to the potential adverse effects of otherwise socially beneficial products.

As it was put by one person recently, instead of regulating the inadvertent by-products of the industrial engine, the government is now being asked to regulate the moving parts of the engine itself, and that's quite a different thing.

Congress recognized the difference, and gave us a stiffer legal test to pass before we can act. That test is "unreasonable risk."

Making the "unreasonable risk" determination is, I think, going to intensify the tension between good science and good regulatory policy as never before in EPA's experience.

To make such a determination requires three steps. First, assessment of the risks of a chemical; second, assessment of the benefits of the chemical; and third, the weighing of risks and benefits in a final regulatory judgment.

We are relying heavily on the scientific community to help us in the first step, that is, risk assessment. Yet we will have to make many decisions with less than perfect scientific knowledge.

If I can elaborate a bit—we don't even know yet how many chemical substances are in commerce. For most substances, we know little if anything about how they are used, what health or environmental effects they may cause, who gets exposed to them and how, and what is the result, both short-term and long-term, of such exposure.

Although we will use TSCA's powerful testing and information tools to narrow those gaps, we will never be able to answer every question to everybody's satisfaction.

Even though we must grapple with all too much scientific uncertainty today, I believe that in the longer term, one of TSCA's major contributions will be to extend our body of scientific knowledge on chemicals and their behavior in the human environment. TSCA will push the-state-of-the-art:

- In detection and monitoring. How does the chemical get into the environment, how does it change, where does it go, and who does it affect?
- In testing. How can we predict more accurately, rapidly, and cheaply the chronic effects of chemicals in health and environment?
- In health effects. Which chemicals cause cancer, birth defects, gene mutations, neurological degeneration? What are the biological mechanisms?
- In ecological effects. Which chemicals affect the relationships between living systems, and what is the potential long-term result of subtle changes or damages?

The government response in recent years to the chemical revolution of the last several decades has been relatively comprehensive. The rising cancer rate, and its association with chemicals, is particularly disconcerting and has sparked the Congress to pass a variety of laws regulating chemical exposure in the environment.

The Congress, the Administration, and the public have come to define our mission more broadly as one of protecting public health as well as protecting the environment. □

Chemicals and Health

Are health dangers from chemicals being exaggerated?
EPA Journal has asked observers and participants in the national debate now under way about these crucial concerns.
The same question was asked of each person:

"More and more chemicals are being labelled hazardous to health. Is the danger being exaggerated?"

U.S. Rep. George E. Brown, Jr. (D-Calif.)
Chairman, House Subcommittee on Environment and the Atmosphere

The simple, honest answer to your question is, we don't know. The numerous cases of documented hazards from new and old chemical compounds are cause for genuine concern. The Congress, largely in response to these real hazards, has enacted a variety of laws aimed at identifying existing hazards, and preventing future chemical disasters from occurring.

The danger may very well be exaggerated, especially in the minds of individuals. On the other hand, we may only be seeing the tip of the iceberg of the adverse effects of the chemical revolution. We can't afford to be complacent in any case, and prudence dictates that we approach this subject with the worst case situation in mind.

The Federal Government has a clear responsibility to guarantee the health and safety of the American people with all the authority at its disposal. It further has the responsibility to identify what the nature of those threats to our Nation are. The chemical threat is one area where the Federal Government has generally done too little, too late.

My colleagues in the Congress and I will be watching the implementation of the basic environmental laws very carefully. We all hope that the chemical threat is exaggerated, and future disasters will be nonexistent. Until we know if that state of perfection has arrived, much more information must be gathered and much more work will need to be done.

Michael Halberstam, M.D.
Practicing internist, Associate Clinical Professor of Medicine at George Washington University, and editor of Modern Medicine Magazine.

Of course, *some* people and *some* groups *sometimes* exaggerate the danger of *some* chemicals. Examples of this are the on-again, off-again status of DDT as a carcinogen, as well as the general, unquestioning (but unjustified) acceptance of the notion that 70 to 90 percent of cancer is "environmental" in origin.

Exaggeration occurs and denial occurs. This is because health hazards are less and less either a medical or a personal issue, and more and more a political problem. Political debate is carried out under different ground rules than scientific debate—exaggeration is as normal to the politician as breathing, while in scientific endeavor it is, to say the least, frowned upon. What is confusing is that the same people frequently play under both sets of rules—a scientist may be properly tentative in presenting his findings to colleagues, but become an impassioned advocate when presenting in front of a Congressional hearing or a TV camera.

This is done in the name of "concerned scientists" or "activist science" or whatever. I've never been happy about it, but now I'm sure. It stinks. It stinks because it trades upon the public's basic belief in science as impartial for a temporary political advantage that may be forgotten in five or 10 years. It stinks because lying in the public's interest is still lying, and "the public's interest" is usually defined by the person doing the lying. Read Sissela Bok's "Lying" for a nice approach to this.

In a recent issue of this journal Paul Samuelson, speaking of environmental policy, said "In order to sell, sometimes you have to oversell." I respect Professor Samuelson, but I don't think this is true, because overselling means exaggerating and exaggerating means lying and/or concealing. When you oversell, you burn out the public's faith in your message, and you become the laughingstock of Johnny Carson and Bob Hope ("This is the only country in the world that's about to ban saccharin and legalize marijuana"). EPA has been relatively good in this regard, and I hope it stays so. The way in which data are presented should be as honest as the data itself. The public wants protection by EPA, and it wants concerned scientists, but even more it wants the simple, unexaggerated truth—and it deserves it.

Dr. Barry Commoner
Director, Center for the Biology of Natural Systems, and University Professor of Environmental Science, Washington University

To answer this question it is useful to start with the facts. The evidence in support of claims of health hazards from synthetic chemicals is clear-cut. In recent years research has considerably improved the testing of chemicals for toxicity, and the resulting data have been carefully collected and reviewed. For example, the International Agency for Research on Cancer in Lyon, France, publishes carefully analyzed summaries of the data about the carcinogenicity of chemicals. These data show that the number of synthetic organic chemicals that have been identified as carcinogens is rising rapidly: between 1950 and 1960, 17 new such carcinogens were identified; between 1960 and 1970, 38 new carcinogens were identified. These and similar data establish quite clearly that the widely-held impression that we are learning about increasing numbers of hazardous chemicals is based on solid fact.

Is there any factual evidence to support the idea that claims about such hazards are being exaggerated? Such evidence would be, for example, scientific data which show that substances previously identified as hazardous, on being studied further, have been shown to be not hazardous. To my knowledge a list of such substances which have been downgraded with respect to toxicity has not been compiled, but it must be very small. For example, reexamination of a number of suspected substances which have been the subject of controversy has, in fact, confirmed their carcinogenicity: saccharin, TRIS, vinyl chloride and various hair dyes. There is, therefore, no scientific evidence to support the notion that such claims have been "exaggerated."

In the face of this evidence it is important to ask why the question of exaggeration should arise at all. What has happened to encourage such an unsubstantiated response to the

solid evidence of increasing numbers of toxic chemicals? My own answer is that in the last few years the public knowledge about toxic chemicals has begun to affect certain groups where they really hurt—in their pocketbooks.

For example, in the last few years, as a result of evidence regarding environmental or health hazards, several major chemical products have been forced off the market: fluorocarbons, propellants extensively used in a wide range of products, have been replaced by finger-pumps; plastic soda bottles—developed at a reported cost of $50,000,000—were abandoned because of evidence that acrylonitrile leached out of them; PCB's, once produced at the rate of 40,000 tons per year, have been withdrawn, following evidence that they have become very widespread in all living things. It is therefore not surprising that chemical companies have recently begun a massive public relations campaign against what they call "chemophobia"—irrational fear of chemicals. They are, of course, entitled to their opinion, but the scientific *factual* evidence tells us that increasing numbers of hazardous chemicals are, in fact, being detected, and that the dangers have by no means been exaggerated.

Dr. Elizabeth M. Whelan

Research Associate, Harvard School of Public Health; Executive Director, American Council on Science and Health

In many instances, the health hazards posed by chemicals *are* overstated to the point where many people apparently believe that we are living in a sea of toxic and carcinogenic substances, paying for the benefits of technology with poor health.

Today, even the word "chemical" conjures up a negative image. The average consumer has a poor understanding of chemicals as fundamental units of life, and hears substantially more about the relatively few cases of chemical-related tragedies than he does about the essential and beneficial chemicals occurring in the natural food supply and in the forms of food additives, pesticides, drugs, in the occupational setting and general environment.

The fact that some chemicals in the environment have caused illness and death in unique circumstances should not mean that all chemicals are suspect or that there are no ways of using potentially unsafe materials. Our goal in regulating the chemicals around us and indeed in making judgments about all aspects of our environment, is to minimize the potential for harm and maximize technological and cultural advances and the quality of life for our country.

For example, in assessing the use of a potentially cancer-causing chemical in the production of a useful product, we should be guided by reasonable judgments, setting levels of exposure which pose no known hazards to workers yet still allow efficient production of this product. If the scientific consensus is that workers can be protected from the effects of the chemical in question by means of an efficient ventilation system costing $5,000, there is no purpose in exaggerating the risk to the point that $2,000,000 is spent to totally redesign the workplace in an effort to reach the same end, and it becomes no longer cost-efficient for the plant to operate.

In making judgments of this type, we are *not* saying, "If you want a product you must assume that people will die." (Indeed that is exactly the type of tradeoff we willingly make using automobiles, airplanes and swimming pools.) It is possible to set levels of chemical exposure which according to all scientific evidence do not significantly raise anyone's disease probability.

Recent overstatements on risks posed by environmental chemicals have served only to distract Americans from real environmental health threats like cigarette smoking, have led to bannings of items that make our life easier and more pleasurable, and have contributed to higher prices for those goods and services that do remain.

Eula Bingham

Assistant Secretary of Labor, Occupational Safety and Health

No. Death can never be exaggerated. And death is exactly what the question is all about. No one knows the exact extent of death caused by workplace exposures to the thousands of toxic substances in common industrial use today. But we do know the toll is in the thousands —perhaps more than a hundred thousand per year becoming ill.

Those are people—not just numbers. They are our friends, brothers, uncles, cousins, mothers and fathers. Their loss is too real to too many of us to be concealed behind phony arguments that it costs too much to control the hazards that caused such tragedy.

Paradoxically, it seems that there isn't enough exaggeration. No one really gets concerned until a tower collapses and kills 51 men. Or until a pesticide makes walking zombies of a plant full of healthy workers. Or until a chemical previously thought to be harmless causes rare cancers twenty to forty years after exposure.

Total national concern about all harmful exposures, not just sporadic attention in a few isolated instances, is what will finally provide the impetus—and resources—needed to apply our collective effort to guarantee safe and healthful workplaces for all Americans.

Bruce W. Karrh, M.D.

Corporate Medical Director of the E. I. Du Pont Co.

Yes. Some chemicals—a relatively low percentage of all the natural and synthetic chemicals we use—possess properties which under certain conditions can represent potentially serious health hazards. As new information of this type becomes available, appropriate steps to reduce the risks to human health must be and are being taken. But exaggeration frequently begins where our real scientific knowledge ends. A welcome growth in recent years in our knowledge of chemical hazards has, perhaps predictably, generated some irrational fears.

The new knowledge—much of it developed by the chemical industry—has principally to do with chronic health effects from long-term, low-level exposures to a limited number of chemical compounds. The new findings have aroused widespread public fears that synthetic chemicals as such are responsible for a variety of diseases, notably cancer. This is perhaps understandable, for there is often a tendency to overreact to new scientific knowledge, particularly when it is widely and rapidly disseminated without proper scientific evaluation to a very large audience, most of which lacks the training and experience to differentiate between potential hazards and natural risks.

An assessment of true risk is best arrived at by scientific evaluation. In the case of cancer, for example, the most reliable epidemiological and statistical evidence indicates that perhaps as much as 85 to 90 percent of cases are indeed caused by environmental factors—diet, alcohol, tobacco, sunlight; the totality of our environment and not just exposure to synthetic chemicals. Human exposure to synthetic chemicals may account for 1 to 10 percent of all cancers. The recently discovered carcinogenicity of certain synthetic chemicals is significant and must be considered in enabling us to prevent future cancers. It is not likely to lead to the cause of all cancers.

There is a community of interests in identifying hazards, and controlling the risks. All parties also share the responsibility to avoid unfounded allegations, or inaccurate interpretations that can lead to unnecessary alarm, ill advised programs, and diversion from higher priority, beneficial health programs.

Dr. Samuel S. Epstein

Author, "The Politics of Cancer," and Professor, Occupational and Environmental Medicine, University of Illinois School of Public Health

Exaggeration, no! Belated recognition of the problem, yes!

The recent identification of a

wide range of hazardous chemicals reflects the fact that originally they were improperly or prematurely introduced into commerce. This occurred either without pre-testing or on the basis of test data, much of which has since been shown to be inadequate, manipulated, or suppressed.

Data on the costs of compliance have also been grossly distorted. Meanwhile, the fact has been overlooked that the full price tag for failure to regulate is far higher than the cost of regulation itself. The chemical industry for years blocked the passage of toxic substances legislation, which when it became law in 1976 finally gave the EPA Administrator a discretionary right to require premarket testing. Even in 1979 the industry still refuses to disclose the identity of toxic and carcinogenic chemicals in trade name products to which workers are exposed.

Such policies of the chemical industry have been directly responsible for an ever-growing litany of disasters. Consider the respiratory disease and cancer toll of asbestos workers which is anticipated to claim more than 50,000 annual victims over the next few decades. Industry had much evidence of these hazards as long ago as the 1930's which it suppressed and failed to act on. Or consider the neurological crippling of workers exposed to Leptophos at the Velsicol Plant in Bayport Tex. Information on the neurotoxicity of Leptophos had been withheld from exposed workers and Federal agencies. Or look at the neurological and other diseases induced in Life Sciences Product Corp. workers by Kepone in the early 1970's. Allied Chemical Co., the parent corporation, had information of such effects in the early 1950's.

There are innumerable other such examples. Consider the sterility in Dow Chemical Co. workers exposed to DBCP. Such toxicological effects had been recognized in the early 1950's without parallel protective measures. Or consider the administration of DES to pregnant women in clinical trials in the early 1950's. These women were told by their obstetricans, reflecting advice from the pharmaceutical industry, that there was no evidence that DES was harmful, although its carcinogenicity had been experimentally established by 1940.

Finally, consider the recent epidemic of uterine cancer in post-menopausal women given Premarin or other estrogen replacement therapy, particularly at high doses and for long periods. In spite of this the Pharmaceutical Manufacturers Association and the American College of Obstetricians and Gynecologists have filed an unsuccessful suit against the FDA requirement that women should be warned of such damages by appropriate labelling.

There is little doubt that we will experience a growing and ever wider range of such disasters. In all likelihood, they will impact most heavily on workers in the petrochemical and certain mining and processing industries. They will also impact, though to a lesser extent, on those living in the vicinity of such industries or their hazardous waste disposal sites scattered irresponsibly and randomly across the Nation and on a wide range of other consumer groups who have become unknowing participants in mass human carcinogenicity tests as involuntary tradeoffs for improper marketing of hazardous but profitable chemicals.

Irving J. Selikoff, M.D.
Director of the Environmental Sciences Laboratory, Mount Sinai School of Medicine, City University of New York

It is presently impossible to answer the question with confidence, simply because we have little information about many of these chemicals, even about their acute or subacute effects. It is dismaying to realize that for the large majority, we know virtually nothing of the long term hazards.

What to do? The best we can, actively, vigorously. This speaks against stopping the world because we want to get off or for modern chemical Luddites. Chemicals are a broad class, good and bad. It is not beyond us to sort them out, recognizing that costly misjudgments can occur.

The Toxic Substances Control Act (TSCA) reflects this, even if it doesn't solve it. Information is sought so evaluation can be made. (How can there be valid judgments otherwise?) For the first time, the commandment is stated: "Thou shalt not expose workers, or others, or our world to unstudied chemicals."

TSCA, industry, labor, and government agencies need help since it has been precisely the absence of needed information that led us to the Act, and to the question you've posed. Simply engraving the Commandment on a Congressional Tablet doesn't provide an answer. It merely adds a link in the unbroken circle. Only information —pertinent research—will break this circle.

Finally, what to do until the information comes? Again, the best we can—use the most reliable information available. Regulation and control will not wait. All of which points to the urgency of our responsibilities —and opportunities.

Sidney M. Wolfe, M.D.
Director, Public Citizen's Health Research Group

Industry's past negligence in testing chemicals is the main reason for the large number of hazardous substances being discovered in current tests. Since the most highly suspicious chemicals were the first ones cranked into the testing apparatus, it is not surprising that many are turning out to show toxicity. As testing continues, and chemicals with a much lower index of suspicion are tested, fewer will be shown to cause cancer or other types of toxicity. The list will grow, but not at the frightening rate of today.

There are at least two major reasons why the dangers of these chemicals may, if anything, be underestimated rather than exaggerated.

First is the problem of species differences. A chemical which is not very potent in one kind of animal may be very toxic to humans. Thalidomide is one such unfortunate example where animal tests greatly underestimated the danger of this drug which caused hundreds of deformed babies.

Another reason for perhaps thinking chemicals are less dangerous than they are is because positive animal tests usually involve only one chemical. Humans breathe, smoke, eat, or absorb through the skin many chemicals whose combined effects are considerably greater than that of just one component.

When the age-adjusted rate of cancer deaths in this country starts declining instead of increasing, it will be because the public has taken individual and collective action to reduce exposure to the hazards we are learning about.

Ronald A. Lang
Executive Director American Industrial Health Council

There is no question but that the scientific community today is much more sophisticated than heretofore in its ability to test for and to detect physiological changes in test animals or cell cultures which might indicate a potential hazard to man. Thousands of substances, both natural and synthetic, have been shown to cause such effects in selectively designed experiments and with highly imaginative routes of dosing.

The real problem starts once the tests have been completed in that it takes experienced scientific judgment in all but the most clear-cut cases to accurately extrapolate from such tests to a potential human hazard. At least two Federal agencies have proposed doing away with this careful scientific judgment by adopting simplistic rules for "identifying" potential human carcinogens—with the result that hundreds, if not thousands, of substances could be mislabeled. There is too much at stake for this to be allowed to happen for the sake of expediency.

It is clear that both industry and government are concerned that there still exist some chemicals whose chronic hazards

have not yet been identified. The American Industrial Health Council was organized specifically to work with government and other interested parties in attempting to develop a sound scientific method of identifying any such substances and finding methods of minimizing their hazards. But, another concern is that unsound regulations will result in those few real hazards being mixed in with hundreds of mislabeled ones to where the public attitude becomes 'Since everything causes cancer, why be concerned about anything?' Such public cynicism would be a national calamity—and yet we are edging ever closer to it.

Dr. John Higginson
Director, International Agency for Research on Cancer, Lyon, France

No simple and correct answer can be given to this question, as circumstances vary from country to country. Chemicals shown to be toxic or carcinogenic to animals naturally cause concern as to their potential dangers to man.

The necessity to evaluate and control human exposures to demonstrated or suspected carcinogens is generally accepted, although available cancer data provide no evidence of a new cancer epidemic, apart from tobacco-related tumors. Evaluation, however, of *potential* carcinogenic risks based on *in vitro* (test tube) or *in vivo* (living animal) systems is subjective since no biological method exists permitting either quantitative or qualitative extrapolation to man. Thus potential carcinogens generate greater emotive reactions and concern among the public and scientific community than *real* or *known* risks.

Such concern becomes exaggerated when:
i) it leads to excessive emphasis on minor risks, with neglect of major risks and resultant distortion of public health priorities or cancer control strategies; moreover, over-regulation of trivia may cause a public backlash against desirable control measures; (ii) exaggeration and simplistic misinterpretation of complex problems, sometimes due to premature publication of unevaluated or inconclusive data, politicize approaches to cancer control and cause unnecessary public "cancerphobia" and loss of faith in the objectivity of experts, an essential ingredient of rational decision-making; (iii) it results in attempts to replace biological uncertainties by legal absolutes so that legislation becomes irreversible and increasingly unresponsive to newer scientific developments.

Biological complexities and historical developments make a balanced and objective approach to environmental hazards difficult for regulators, politicans, governmental scientists, industrialists, trade unions, etc., who are exposed to many pressure groups. The role "professional saviours" is easy but in evaluating hazards, exaggerations are not permissible for the scientist who should retain an unbiased approach since neither animal, short-term tests, nor human studies can guarantee complete safety. The physician with his concern for total health has a major role in advising a common sense approach to control of environmental hazards; the good sense of the average layman also should not be underrated.

Dr. Bruce N. Ames
Professor, Department of Biochemistry University of California at Berkeley

The public is unclear how to respond to our current era of daily newspaper stories about newly identified carcinogens and mutagens. The new discoveries have been caused by several developments, including new and simple ways to test for mutagenicity and the information that almost all chemical carcinogens are mutagens. In addition, animal cancer tests have now been completed on a few hundred of the more suspicious or more important chemicals of over 50,000 used in commerce.

If one plots the production of many of the major chemicals since World War II, it becomes apparent that, in terms of cancer, the full impact of the modern chemical world will only start to be felt in the 1980's. This is because most human cancers only appear 20-30 years after exposure to carcinogens, such as cigarette smoke or radiation. It seems likely to me that the future cost of the modern chemical world, in terms of birth defects and cancer, may be appreciable.

One (of many) recent examples is ethylene dichloride, produced at 10 billion pounds per year. It has just been tested for carcinogenicity and found to be a carcinogen in mice and rats. It has hundreds of uses, and there clearly is considerable human exposure which, as with many environmental chemicals, can often be quite appreciable. In the case of ethylene dichloride, the level the workers are allowed to breathe in is comparable (on a milligram per kilogram basis) to the level that is giving half of the animals cancer in the rodent cancer tests.

I am particularly concerned about the 20 billion pounds of chlorine made per year and the many chlorinated and brominated chemicals in widespread use. This is an enormous biological experiment, as organic chemicals containing chlorine and bromine are not used in natural mammalian biochemical processes and do not appear to have been normally present in the human diet until the onset of the modern chemical age. An extremely high percentage of chlorinated and brominated chemicals are carcinogens in animal cancer tests and thus represent an extremely suspect class of chemicals.

A few of the more suspicious members of this chemical class are Kepone, mirex, dieldrin, DDT, chlordane, hexachlorobenzene, heptachlor, strobane, toxaphene, petachlorophenol, PCB's, PBB's, ethylene dichloride, ethylene dibromide, vinyl chloride, vinyl bromide, methylene chloride, vinylidine chloride, methyl chloride, methyl bromide, DBCP, chloroform, carbon tetrachloride, brominated vegetable oils, and TCDD. In addition, there are many nonchlorinated carcinogens, such as aromatic amines in hair dyes, pyrolysis products from burning, and nitrosamines, where there is widespread human exposure.

It seems clear that we will not be able to ban all the man-made carcinogens and mutagens because too many exist and many are extremely useful and of great economic importance. Thus, setting priorities, treating carcinogens and mutagens with respect, and trying to minimize human exposure are essential. The carcinogen and mutagen, vinyl chloride, is still used in the plastics industry to make vinyl floor tiles and PVC pipe, but vinyl chloride is no longer used in millions of cosmetic spray cans, and workers are no longer breathing in a dose that could give a high percentage of them cancer. It is also important to emphasize that most of the cancer today is likely to be due to natural chemicals (and also to cigarette smoking, ultraviolet and other radiation) and that nature isn't benign.

Nevertheless, I feel we have made tremendous progress in the last few years. We have the tools, such as the short-term mutagenicity tests, to help address the problem: to identify the many natural carcinogens (the first step in dealing with them); to help industry weed out mutagens and carcinogens from among their new products under development; and to identify the many mutagens and carcinogens in the complex mixtures surrounding us. Scientists are also now developing the methods for setting priorities among the many mutagens and carcinogens in our environment and for dealing with risk benefit calculations: we all recognize that there are few human activities without risk. I am optimistic that even with the difficult problem of cigarette smoking, as the public is made aware of the extreme health costs the habit will decline. The average 2-pack-a-day smoker has a life expectancy about 8 years less than the nonsmoker, and I expect more and more evidence will accumulate about genetic birth defects in the children of smokers and the cost of this to society.

C t ... age 34

Cancer Risk

An interview with Dr. Elizabeth Anderson

Executive Director, Carcinogen Assessment Group

Is there a cancer risk policy for EPA?

EPA was the first Federal regulatory agency to adopt a policy for performing risk assessments as a part of the regulatory process. This policy statement was published as interim guidelines. Public comment was invited. These interim guidelines provide the Agency's approach for the evaluation of carcinogenesis data. This approach as stated in the preamble, provides for a two-step process. The first step is to decide what, if any, risk is associated with exposure to a pollutant and the impact of this exposure on public health; a scientific risk assessment, to be performed independent of social and economic assessments. In the second step, the regulator uses the health risk assessment in conjunction with other considerations of benefits, to the extent mandated by the particular statute, to determine whether or not regulatory action is necessary and if so what level of regulation is appropriate.

The health risk assessment guidelines provide for two determinations, a qualitative statement regarding the likelihood that an agent is a carcinogen and a quantitative statement of the public health burden if the agent goes unregulated. With regards to the first, since only rarely do we know for sure that an agent is a human carcinogen, it is necessary to describe the strength of the certainty—or weight of the evidence that supports a conclusion that a particular chemical is a carcinogen. Human epidemiology backed up by confirming animal data is the strongest evidence. Most often, this assessment is based on animal bioassay studies alone or supported by short-term tests. The weight of evidence approach acknowledges the differences in data types—that is human-epidemiology versus animal bioassay data versus short term, *in vitro* (test tube) tests—the array of data, and the adequacy of the studies involved. Then, on the assumption that the risk exists, a quantitative risk assessment is made to describe the impact on public health if the agent goes unregulated or is regulated to some prescribed level. Because of uncertainties in the extrapolation from high doses to low doses and in cross-species extrapolation, these are best used as rough indicators of increased risk on an individual basis as estimates of impacts on the exposed population.

Is the second step part of EPA's R&D program? Are we actually doing some quantitative risk assessments now?

The Carcinogen Assessment Group actually has done this for quite a few pollutants for the Agency's regulatory programs, including the Office of Pesticide Programs and the Office of Air Programs. In addition, at least one risk assessment, for chlordane/heptachlor, was submitted in hearings before the administrative law judge, and we have completed a number of risk assessments for Regional Offices. These involve localized problems such as the risk associated with exposure to chemicals coming from the Love Canal in Region 2.

Would it be safe to say that pesticides are a major concern?

Pesticides certainly have received a good deal of Agency attention. This is largely because of the requirement under the law that the Agency review all 30,000 or so pesticides in our files. Under the review process EPA issues a notice of rebuttable presumption against registration for pesticides exhibiting a possible health problem, including of course carcinogens. Therefore, special attention has been focused on pesticides largely because of the process, not because pesticides necessarily contribute to a greater cancer threat than other pollutants, although pesticides are unique in that they are intentionally released into the environment. It is true, however, that we are probably looking at more pesticides right now than other pollutants.

Are we doing the same thing under the Safe Drinking Water, Air, and Toxic Substances Acts?

In a way, yes. However the Congress has not imposed the same prescription because the situation is entirely different. The EPA registers the pesticides used, they are on our books and we know precisely which ones we should go back and review. In the case of air pollution and water pollution, there is no such listing because the EPA has not given a license to release particular pollutants into the environment in the first place. It's a little harder to get a clear idea as to which substances need reviewing. Such a determination is based on exposure patterns and the degree of hazard but it's a little harder to do that kind of homework.

Are we setting any kind of agenda for things to look at or will the Cancer Assessment Group pick toxic substances as they appear?

The Assessment Group does not look at any particular chemical unless asked to do so by one of our program offices. It is the program office that must set priorities. For instance, the Office of Air, Noise, and Radiation is prioritizing chemicals based on exposure and degree of hazard. Each program office has criteria for prioritizing chemicals for review based on its knowledge of the media, sources, levels, and exposure.

The interim guidelines provide for the Assessment Group to function either as an operational group, if necessary, or to act as a health oversight committee to assist or to review risk assessments performed by an individual program office. This function ensures technical competency and consistency of risk assessments throughout the Agency. Thus far, it has largely been doing all the risk assessments for the Agency since no program office has established this capability. The Office of Toxic Substances is the only program office, to date, making plans to do some of their own assessments.

Is it reasonable to think that any of the other programs in EPA could actually do that?

I think we have to recognize a certain handicap in the expert resource category. For example, Dr. Albert's willingness to serve as Chairman of the Assessment Group while holding his post at New York University Medical School is unique in the Federal Government, so far as I know, and it is rare that someone of his caliber is available to regulatory agencies to fill such a role. In addition, it is difficult to assemble even one or two groups of adequately trained individuals to fully assess these data. It would be highly unlikely that the Agency could set up a half dozen independent risk assessment committees. However, to date the Cancer Assessment Group has been completely understaffed to carry the Agency's full workload of cancer risk assessments. Therefore it makes some sense to decentralize some of the routine risk assessment work to the extent possible and free some time for the primary health oversight committee to explore areas requiring more detailed guidance. I believe the Agency is attempting to achieve this by creating an assessment group in the Office of Toxic Substances.

We've seen a number of studies that point to environmental factors as a leading cause of cancer. Would you say the work that's done bears out that conclusion?

I think generally it's recognized that 60 to 90 percent of current cancer rates is attributable to environmental causes. These figures include dietary, smoking, and other habits that are not controlled by EPA's laws. Nevertheless, I think there is substantial evidence that cancer arises from a combination of factors. So it's not possible to slice the pie of environmentally-caused cancer and come out with some prescribed proportion that is caused by air pollution, water pollution, and so forth. I think there is certainly a good reason to think that we can improve the situation by limiting exposure to carcinogenic pollutants.

When was the Carcinogen Assessment Group formed, and what is its purpose?

The Carcinogen Assessment Group was formed in July, 1976, as a consequence of the Agency's publication of interim guidelines for assessing the risk associated with suspect carcinogens. (*Federal Register* 41: 21402 (May 25) 1976.) Dr. Roy Albert, Deputy Director of the Institute of Environmental Medicine at New York University Medical School, has served as Chairman of the Cancer Assessment Group since that time. The members of the group are civil servants but the Group also draws heavily on expert consultants and advisors from various Federal agencies and the private sector. In addition the Assessment Group conducts independent analysis of data, as necessary, to make recommendations to the lead program office or Regional Office concerning the risks associated with exposure to carcinogens. The purpose of the Group, as articulated in the guidelines, is to provide health oversight with regards to the scientific review of carcinogens for the entire agency. Such assessments are independent of economic impact analyses. The Group also reviews the final risk assessment portion of regulatory packages relevant to cancer prevention.

How do we choose participants from outside the Federal Government?

Various people have been asked to participate because of their recognized expertise on particular issues. These individuals have been identified by their publications as well as by our colleagues in other parts of the Federal Government, particularly the National Cancer Institute. For example, epidemiologists from the Dow Chemical Company met with the Assessment Group and epidemiologists from the Institute to present unpublished data on ethylene dibromide. The Assessment Group recently has asked a panel of pathologists from the University of Chicago, recommended by the director of the National Cancer Institute, to participate in the review of the histopathology from an important animal bioassay study. This kind of external participation is routine for much of our work.

How does the work of the Carcinogen Assessment Group mesh with the mission of EPA?

I think EPA has become increasingly committed to the protection of public health as well as to the environment. EPA has been given an enormous responsibility for public health protection by the Congress in an impressive array of legal authorities covering air, water, drinking water, pesticides, radiation, solid waste, and toxic substances. In setting regulatory controls under these statutes, it is extremely useful to know which agents pose a possible cancer risk and the impact these exposures may have on public health. This information is provided by the Cancer Assessment Group in a scientific risk assessment document.

How does the question of exposure assessment fit into EPA's programs and how can you put it to use? Does the Cancer Assessment Group have a policy towards the use of exposure assessment from monitoring or modeling?

That's an interesting question. I think the answer is that the EPA really has not adopted guidelines for exposure assessment. Obviously, this is the underpinning for any quantitative statement in the risk assessment regarding the impact on public health from exposure to a particular pollutant. In recognizing this, the Agency has now moved to set up a group to ensure that consistent guidelines are adopted to improve our exposure assessment capabilities. Certainly the Agency is active in this area. Of necessity, each program office must assess exposure in some way. This is particularly true for all the pesticides and air pollutants which the Assessment Group is now reviewing. Exposure assessment is not a new art. It is, however, an area that requires a lot of homework. Most often we do not have monitoring data to precisely describe human exposure, for example. Models are being used to predict these exposure patterns but no standard process for making these predictions has been established. I think this new committee being established as a counterpart of the Carcinogen Assessment Group will be useful in establishing useful approaches to exposure assessment.

On the question of exposure assessment it seems that there are tools we haven't quite learned how to use. If you look into it the thing that's most obvious is how much we don't know about the routes that various chemicals take to get into the body.

Yes. You're addressing one of the finer points, that is, exactly how people are exposed, to what levels, and what really is the effective dose? Then we have the broader problem of describing populations at risk. Once we can identify sub-population groups at risk, then we can talk about individual exposure patterns. It's a very big problem. I think EPA has a great deal of experience in this area but we must put it all together, and make it accessible to the entire Agency.

Do we need to distinguish between benign and malignant tumors?

The position taken in the interim guidelines is that the Agency will consider both benign and malignant tumors equally as indications that an agent may present a cancer risk to humans. Most often this question comes up with regards to evaluation of animal bioassay data. The guidelines say that even benign tumors, which are generally recognized as not progressing to malignancy and which are not life-shortening, are regarded as suggestive evidence of a carcinogenic effect. We recognize that cancer progresses most often from early lesions through a series of steps to final malignancy. For this

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Monitoring in India

Most of the world's health effects studies have been done primarily in developed countries where people have good nutrition, acceptable living standards, and their health is relatively good.

But how does pollution affect people in developing countries who do not have good nutrition or acceptable living standards, and who may be afflicted with disease and parasites?

The World Health Organization has initiated a study to determine if the effect of environmental pollution on people living under conditions prevalent in developing countries is greater than or different from the effect on people in developed countries.

George B. Morgan, Director of the U.S. Environmental Protection Agency's Environmental Monitoring and Support Laboratory in Las Vegas, Nev., was selected by the World Health Organization as a member of the team to develop the study protocol. The laboratory he directs has been actively involved in the development of the integrated exposure assessment monitoring methodology—the approach to be used in the study.

Experts from six nations are participating in developing the study—Great Britain, The Netherlands, Yugoslavia, Egypt, India, and the United States. At the first planning meeting, held in Geneva, Switzerland, in May, 1978, the study area was selected and a written plan developed to establish the administrative framework and technical specifications to carry out the study.

Bombay, India, was selected as the site of the 5-year "Epidemiological Study of the Environmental Conditions in Developing Areas." Epidemiology is the science dealing with the incidence, distribution, and control of disease in a population. Findings from the study will be compared to findings from health effects studies conducted in Europe and the United States.

Bombay was selected because favorable study conditions are present. The population of Bombay is estimated to be about 8 million, with as many as 800 people per day migrating there from other parts of India in search of work. More than half the people have no permanent shelter. Sixteen sewage treatment plants exist, but only two are operating. Bombay is the import center of India with as much as 75 to 80 percent of all imports to India coming through Bombay. It is industrialized to some extent. There are few environmental regulations and little enforcement of those which do exist.

Another important reason for selecting Bombay was the willingness of the Indian government to cooperate. In fact, the Indian Council of Medical Research is already conducting studies, which can be incorporated in the World Health Organization study.

Bombay is a beautiful old city, but very much in need of environmental improvements. This study, in addition to providing information on health effects of environmental pollution, will identify the problems of Bombay and provide the city and the Indian government data needed to develop control strategies.

This is to be an exposure monitoring study in which not just one pollutant is measured, but the effect of the total environment upon the health of specific people will be studied. It will use an integrated exposure assessment monitoring approach to determine the extent of the effect various sources of pollution have on the health of the participants.

Integrated exposure assessment monitoring is the coordination of environmental monitoring networks to obtain pollutant exposure data for 3,000 Bombay families. In other words, it is the systematic collection and coordination of pollution data in air, water, land, and food. The basic objective of this systems approach is to provide the data required for strategic control of critical sources of pollutants, which cause major problems or threats.

The concept of an integrated exposure assessment monitoring system was developed in order to coordinate a large amount of information about the complex relationships among pollutants, critical sources, and critical receptors such as a particular group of human beings. This approach considers many aspects of the problem simultaneously and it defines, quantifies and compares specific information relative to each pollutant or combination thereof. More specifically it assesses the total exposure to a pollutant or combination of pollutants.

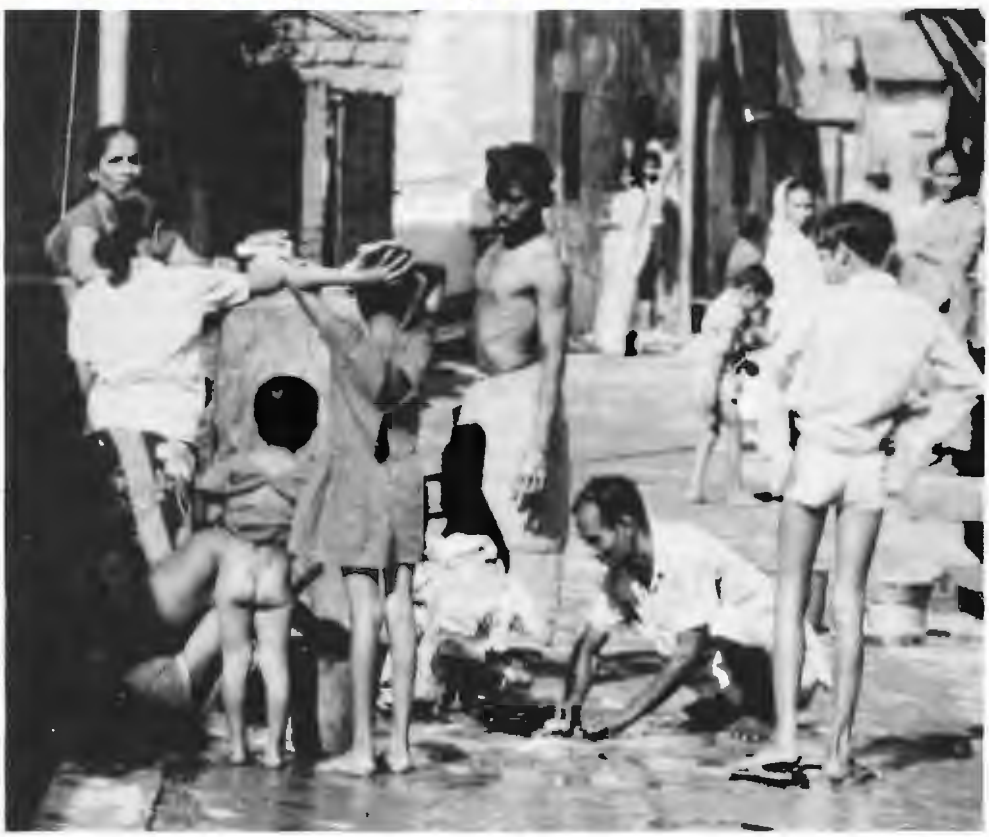
What is being studied is the total exposure to environmental pollutants such as heavy metals, sulfur dioxide, carbon monoxide, ozone, and nitrogen oxides. To use this approach, the air in the area and the water supplies used by the 3,000 Bombay families must be sampled and tested, actual samples of the families' food will be taken, household dust will be measured, and samples of blood, hair, and fingernails will be taken from the participants. Periodically, perhaps as often as monthly, this sampling will be repeated.

Previous studies of pollution-related health effects in urban areas did not encompass all of the factors and environmental conditions this study will.

In October, Morgan met with international representatives in India to determine the scope and methodology of the study and the facilities, manpower and budget needed. The representatives toured Bombay to see some of its environmental problems and visit areas where study groups will be located.

A feasibility study is underway with the complete full-scale study to begin in about 18 months. The field work is being done by natives under the direct supervision of the Indian Council of Medical Research. □

Indians gather to do laundry at a community water source.



New Research Directions

An interview with Stephen A. Gage, *EPA Assistant Administrator for Research and Development*

Will preventive health research be an important part of the Agency's R&D in the future?

Yes, without a doubt. During the FY 1980 budget cycle, the Office of Research and Development developed a major public health research initiative. The President's Budget requests $37 million and 44 positions for expanding our research both in health effects of toxicants and in their environmental transport, fate, and effects.

The Public Health Research Initiative is one of the centerpieces of the Agency's budget requests. Administrator Costle and I are going to be pushing very hard in our Congressional hearings for this program.

I think that this is a very important change in the perception of the role of scientific information in the regulatory process. There is now a very clear recognition, by this Administration, that we must make the necessary investments in good scientific information in order to avoid future inadequate regulatory decisions.

Do you anticipate greater cooperative efforts in the future with the National Institute of Environmental Health Sciences and the National Cancer Institute, particularly in the health-related areas?

Yes, we have quite a number of cooperative efforts going on already. I'm proudest of a joint effort that Donald Kennedy, Commissioner of the Food and Drug Administration, and I have undertaken in establishing a research institute for neurotoxicological effects at Research Triangle Park, N.C. Dr. Kennedy and I have pooled our resources for this institute to be located at EPA's research facility in North Carolina. This will create a critical mass of expertise that neither agency was able to bring together on its own.

We also are working closely with the National Cancer Institute. For the last two years, the National Cancer Institute has committed $4 million of its research funding to support research activities needed by the Environmental Protection Agency. In fiscal year 1980, as part of the Public Health Research Initiative, this institute will be committing an additional $15 million in its budget to support EPA in several areas where it has the specific expertise that we need.

We also have a number of other interagency agreements, through which we work with the National Institute of Environmental Health Sciences, the National Institute of Occupational Health and Safety, and others. We find that these interagency agreements are very useful and very supportive of EPA's work to improve public health protection.

Is EPA cutting back on research in ecological fields in order to provide more funds and manpower for strictly human health research?

While there have been some reductions and redirections in our environmental research, it will, in fact, be expanding during the next fiscal year. We have had to redirect certain research from the historical areas of activity to support toxic chemical control. But this is only natural, given the general shift of EPA's concern from the conventional pollutants to the toxic chemicals.

I'm pleased that we have, in our Public Health Research Initiative for FY 1980, a very substantial increase in research on environmental transport, fate, and effects, as such research relates to reducing the threat of exposure to humans. We felt it was critical for EPA with its unique responsibility to address the environmental routes of exposure through a substantial expansion of our efforts in this area.

Would you describe some of the assessment groups now functioning to support EPA regulatory actions?

The Agency has just approved our proposal to establish an Office of Health and Environmental Assessment, which will be built around two successful groups now in operation, namely, the Carcinogen Assessment Group, and the Environmental Criteria and Assessment Office located at Research Triangle Park.

We will be expanding the efforts of this new office beyond carcinogenic assessment and air quality criteria development, respectively, to include risk assessments for other media, especially water. The new office will ultimately have a responsibility for reproductive effects, for chronic effects, and for exposure assessment.

The new health office also includes a second Environmental Criteria and Assessment Office in Cincinnati. That office will focus primarily on the preparation of water quality criteria documents, a responsibility that has grown greatly in the past year as the Agency has been attempting to comply with the consent decree for toxic pollutants.

Are you recruiting nationwide to find somebody to head this office?

Yes, we will be establishing that office and all of its components just as quickly as the Agency's order is signed, and will be recruiting the best people we can find.

Isn't exposure assessment a new tack for the Agency—a new way of using our resources? In the past we have tended to look at the media such as air or water just one at a time.

Very much so. I think the Agency has suffered from taking a narrow viewpoint. We need to focus on the overall effects of a pollutant as it affects humans in several ways. This comprehensive approach is not only more efficient use of the Agency's scarce resources—people, time, and expertise—but also provides more public health protection by truly assessing the total impact of the environmental toxicants on human beings.

This interview was conducted by Charles D. Pierce, Editor, and Chris Perham, Assistant Editor, EPA Journal.

Would you comment on your efforts in recent months to make R&D more responsive to the program offices? For example, I understand you were recently in Chicago discussing plans to help support our enforcement program.

For the past year we have been working very hard to develop a mechanism to provide for joint planning of the research that we perform in support of regulatory activities. We carried out a pilot study involving the establishment and monitoring of five research committees in substantive research areas—pesticides, inhalable particulates, mobile sources, industrial wastewater control, and drinking water. The success we had with these five pilot committees has encouraged us to expand this method of joint planning. The regulatory control offices are supporting our expansion of the concept to include all of the research activities that we conduct for the Agency.

To support the Agency's enforcement efforts, we have taken a somewhat different approach. We have established a task force of some of our key people, who are working with the Office of Enforcement and the Regional Enforcement Offices, in the four highest priority enforcement areas—power plants, steel, pulp and paper, and chemicals. Although this effort is just getting underway, we have already given Regions 3 and 5 considerable assistance in case preparation for the four key industrial sectors.

How has the Zero Base Budget process affected your programs?

Zero Base Budgeting has provided net benefits for the Office of Research and Development. The largest positive impact so far is the Public Health Research Initiative which I mentioned earlier.

On the other hand, there have been some reductions in certain programs. The air ecology program has been converted from an in-house program to a primarily extramural program. The environmental management research program was terminated through the ZBB process. Smaller cuts in our water ecology program have for the most part been offset by increases in the toxic substances ecology program. So, on balance, over the last two years we have benefited budgetarily and have about held our own in personnel. Given the high priorities of the Agency to develop major efforts in toxic substances and hazardous waste regulation, I think that the ZBB process has dealt fairly with us.

Will the laboratories be reflecting the changes you have just mentioned? Are we going to close some down and open others?

No, we have no plans to close any of the laboratories. We have to keep looking continually at how we can effect economies in the laboratories. It is likely that there will be some redirection in some of the laboratories. The Zero Base Budget process for FY 1979 did necessitate some reductions-in-force at three of our laboratories. Reductions at the Robert S. Kerr Laboratory in Ada, Oklahoma, are essentially complete, and we will soon be initiating the reductions in the Las Vegas and Corvallis laboratories.

But I would say, in all three cases, the laboratories have not been substantially harmed by these reductions. In fact, they probably have an enhanced ability to compete for resources in the future.

With fixed personnel ceilings for the last five years, we have not really had the opportunity to think about establishing new laboratories. Our concentration is more on how best to use the laboratories and the scientists and engineers that we do have more efficiently.

Are you satisifed with the performance of EPA's laboratories?

In general, yes. We do face mixed performance. As in any organization with fifteen quite different components, we expect some variation in performance. We have undertaken serious efforts to improve performance through peer review, at the laboratory level, and programmatic review by the Deputy Assistant Administrators and myself. And I think the combination of these review techniques will upgrade the general performance, and bring some of the less satisfactory performances up to acceptable levels within the coming year.

Could you explain what you mean by peer review, and how this is a change in the way things are done in the R&D program?

Many of our scientists do publish their work. However, many reports that we and our contractors prepare are not published and do not receive the careful scrutiny from scientists outside of the Agency. This is in part because of the fast timetables required for much of the research that we conduct in support of the Program Offices. However, what has developed is a massive body of "grey" literature, which has not been carefully reviewed by the best scientists in those areas.

I'm working with our laboratory directors to develop ways in which we can get a larger fraction of our EPA reports and papers reviewed by scientists outside the Agency before publication. This will be a source of strength for us in the future, rather than just another burden placed upon the researchers.

It's absolutely critical in terms of improving the credibility of the Agency, not only to conduct research, but to take regulatory decisions based on those research results.

Do you have any plans for major reorganization of the Office of Research and Development?

My view of organizations is that they must constantly adapt to the changing environment—both external and internal. There is no more dynamic organization than the Environmental Protection Agency, which is perennially faced with changing priorities and requirements. We have made several evolutionary changes during the past year in establishing the Office of Research Program Management and the Office of Health and Environmental Assessment.

We now have under serious discussion a proposal made by some of our laboratory directors to realign their reporting relationships to the Deputy Assistant Administrators. Such a realignment would represent, in my estimation, only a modest evolution in the organization, and thus have minimal impact on morale and productivity. On the other hand, it should help us immensely in integrating our research planning and implementation in health effects; environmental transport, fate, and effects; and environmental control measures.

Is it possible that our scientific knowledge of health and environmental problems has gotten ahead of our ability to solve them? For example, we have learned to detect chemicals in parts per million, although we're only beginning to learn how to protect ourselves from these dangers.

FDA Commissioner Kennedy has put it very well. He says we have become embarrassingly good at identifying chemicals in the environment and workplace. I agree with that view. I would, however, rather know what is there with the new analytical techniques that we have developed in the past decade than not know. I fully recognize that it takes time to develop the rest of the information and, in some instances, the institutional framework, so that one can map out an intelligent regulatory course.

I do not think that ignorance is bliss. We are probably going to be faced in the future with knowing about a lot of problems before we are able to devise and implement solutions.

Is EPA approaching a risk-benefit formula to use in dealing with environmental carcinogens?

In the area of carcinogen assessment, we are in fact following the Agency's interim guidelines, established in 1976, which stated that we would provide risk and benefit analyses, as part of the regulation of carcinogenic materials. That's complicated somewhat by the fact that we regulate carcinogens under at least seven major

pieces of legislation, with quite a wide range of regulatory requirements. For example, Congress did make it explicit that risk and benefits are to be considered in regulating pesticides and toxic substances, namely, products which supposedly have beneficial uses in commerce.

On the other hand, some provisions of the Clean Water Act are driven solely by technology considerations, and some provisions of the Clean Air Act are driven solely by health protection considerations. We do conduct economic impact analyses of each of our regulatory proposals, but are not always able to calculate the benefits. Thus, it is difficult to do a strict economic balancing of the risk and benefits under all of our regulations.

What research is EPA doing in the genetic repercussions of environmental contaminants?

As I mentioned, we are establishing an assessment group on reproductive effects, as part of the new office of Health Assessment for genetic effects. We already have set up a working group with Dr. Gary Flamm, who is on loan from the Food and Drug Administration, to provide guidelines for mutagenic risk. We'll be looking at other aspects of genetic risk in the future. In addition, we do have under way in our health effects laboratories research on the ways toxic chemicals threaten genetic health and on quick and reliable screening techniques to identify genetic risks.

How much of EPA's R&D work is in the physical, hard sciences, and how much is in the softer sciences, such as economics?

At this point nearly all of our research and development is in the area of the physical, biological, and medical sciences. We do have a very small research component oriented towards attempting to determine the economic benefits of pollution control measures, such as the study we've funded at the University of Wyoming. But the bulk of the work on economic impacts of regulation is done in either the regulatory program offices, or by the Office of Planning and Management.

Is there a promising future at EPA for young scientists just getting out of college?

I would say that a young scientist, who could find a position with the Environmental Protection Agency, would have a very exciting future. We have, however, few openings for research-oriented scientists each year in our research laboratories, because of the personnel limitations that we have faced for five years.

There are, of course, a number of new positions in the toxic substances area, but those will be oriented towards regulation, as opposed to research.

I assume that EPA probably gets quite a substantial number of applications, despite the difficulties of getting a position?

Yes, we get many applications. Each one of the new entry-level positions are very highly contested. We're able to attract a high caliber of young scientists into our laboratories. In many instances, the new people coming in are carrying a substantial portion of the workload and are providing a large fraction of the new and exciting ideas.

I noticed Secretary of Energy Schlesinger is saying now that there should be more emphasis on the use of natural gas, indicating that the country may slow up a little bit in converting to coal as a major source of power. Does that have an impact on our research program?

No, I think that the increased use of natural gas, within the United States, will be a fairly short-lived phenomenon, on the order of a few tens of years. Therefore, we must increasingly turn to other forms of energy and conserve natural gas. I think that the use of coal will continue to expand. This, in turn, will put a great deal of stress on the environment if we don't do everything we can to minimize the environmental impacts associated with coal production and use.

In one of your recent speeches, you seemed to be sympathetic to the soft energy paths, endorsing the uses of windmills, solar energy, and so on, and I wondered if this is your personal view, or official EPA policy?

EPA does not have an official policy in this area. I can point, however, to a number of examples where the Agency's policies are reflecting what I personally feel is a growing awareness that large, complicated technological solutions to society's problems are not the only, or even the best, route that could be followed.

I think that the new policy shifts in water pollution control, emphasizing land application of sewage sludges and partially treated municipal wastewater, are a clear recognition of the fact that the huge commitment that society is making to publicly-owned wastewater treatment plants also entails large future obligations.

These obligations are in the form of maintenance and operating expenses which will, in time, become very burdensome. The softer paths, to use your term, such as land application, can capture the nutrient value that exists in the sludge or wastewater, without requiring large capital and operating costs. That's an excellent example of the softer technology path.

I focused on the energy alternatives in that particular speech because I was trying to highlight, from four years of experience with pilot energy studies conducted by the Committee on Challenges of Modern Society (the civilian arm of the North Atlantic Treaty Organization), some lessons which I thought the representatives of the countries involved should know. The pilot studies taught that alternative energy systems such as solar and geothermal could play a very significant role in the future of not only the developing nations but also of the highly industrialized nations.

We understand that R&D is starting to look fifteen and twenty years into the future, regarding research needs. With this new perspective, what critical environmental problems do you see on the horizon?

In our efforts to develop a solid analytical basis for the Research Outlook—our five-year research plan—we are attempting to identify future development patterns and their possible environmental consequences. We see two types of pressures which could have great influence on environmental quality.

The first of these is driven by both increases in human populations, and in their expectations for affluence. This pressure will mean greater demands for food, housing, energy, minerals, etc. These increased demands, around the world, could hold many implications for the environment. For example, an aggressive food production program might have to rely even more heavily than is now the case on chemical fertilizers and pesticides. And we're quite familiar with the environmental damage they've caused.

Pressure on the biological resources in the sea could increase to a point where major ecological balances could be disturbed. Demand for timber, for housing, could lead to massive deforestation and associated climatic changes, especially in such sensitive areas as the Amazon.

The second type of pressure derives from the development of new technologies, which are just now emerging. It's hard to predict in advance what the nature of all these technologies are, of course, and even more difficult to identify what their environmental impacts might be. And I'm speaking of technologies in a very broad sense —weather control, deep ocean mining, advanced energy systems, or genetic engineering. In fact, in the area of genetic research, we could find very dramatic advances, which could improve human health, change industrial processes quite fundamentally, or endanger human health and the basic ecological

systems upon which life depends.

We're going to have to monitor both of these pressures very carefully, and attempt to anticipate the nature of the environmental problems that we might face in the future, rather than wait until those problems overtake us, and then react to them after possible irreversible damage is done.

When you leave your post as Assistant Administrator for Research and Development, some time in the future, what do you want to be remembered for, and what do you hope to have accomplished?

I'd like to be remembered for two things. First, improving the quality of the science and engineering done by the Agency and, second, building the institutions which facilitate the performance of higher quality work.

I believe fundamentally in the scientific ethic, which is built in part on the idea that only quality science can survive the scrutiny of the scientific peers. We have to make that idea one of the operating principles of the Office of Research and Development and of the Agency. As the research component of a critical Federal regulatory agency, we do not have the option of isolating ourselves from the broader scientific community. Quite to the contrary, we must, in fact, be aggressive in seeking out the best scientific criticism we can find anywhere. We're making progress in building our scientific credibility but we still have much to do.

An important aspect in improving our science is creating a truly professional environment throughout the Office of Research and Development. We have many laboratories and specialized instruments, but we still have much to do in building our human institutions—we need a cadre of highly professional and committed scientific managers, who are excited about their work. We have some outstanding examples of that type of individual now, but I would like to leave behind a stronger heritage of professionalism and performance. □

The Team Leaders and Laboratories

Dr. Gage has four Deputy Assistant Administrators to aid in the direction of the Office of Research and Development. They help manage the Office's 1,752 employees and the $314 million annual budget. The Office of Research and Development has 15 major laboratories and numerous field stations that are devoted to scientific study. Approximately one out of every five EPA employees works in these labs.

Dr. Thomas A. Murphy
Deputy Assistant Administrator for Air, Land, and Water Use

He is responsible for planning and evaluating the research and development program related to the control of pollution from community and agricultural sources; determining the nature, fate, and interaction of pollutants in air and water; providing safe drinking water supplies, and planning and implementing community environmental management systems. He also oversees development of incentives for environmental cleanup, methods for integrated environmental planning and analysis, and plans for the disposal and management of hazardous and other waste material.

Dr. Murphy joined the Federal Water Pollution Control Administration, an EPA predecessor agency, at its Edison, N.J., laboratory in 1967 as a biologist, later becoming Chief of the Oil and Hazardous Materials Research. In 1971 he was appointed Special Assistant to the Assistant Commissioner for Research and Development at the Federal Water Quality Administration. He was Chief of the Program Development Branch of EPA's Office of Research and Monitoring in 1972 and 1973, and Director of the Nonpoint Pollution Control Division in the Office of Research and Development from 1973 to 1975, when he assumed his present post.

Dr. Murphy received a B.A. from Knox College, Galesburg, Ill., in 1959, and M.S. and Ph.D. degrees from Yale University in 1964. He has taken law courses at Seton Hall and George Washington Universities.

There are four laboratories attached to the Office of Air, Land, and Water Use. They are:

Environmental Research Laboratory, Athens, Ga. Director: Dr. David W. Duttweiler

The mission of the lab deals with identifying and tracing the movement of pollutants through soil and water and the subsequent changes that take place. Agricultural and silvicultural sources of pollution, and environmental systems to control them, are studied. The staff develop models to help judge the environmental consequences if a contaminant reaches certain portions of a water-soil system. They develop management techniques that could be applied to an entire river-basin to achieve water quality objectives. The staff also work on methods for assessing environmental exposures to toxic chemicals.

Robert S. Kerr Environmental Research Laboratory, Ada, Okla. Director: William C. Galegar

The staff of the lab conduct research, development, and demonstration activities on groundwater, natural systems for treating wastewater, irrigation, the petrochemical industry, and the treatment of combined industrial or mixed industrial and municipal wastes. This research provides basic data for the establishment of guidelines, standards, and criteria. The lab personnel also develop social, economic, and institutional assessments of technological developments.

Environmental Sciences Research Laboratory, Research Triangle Park, N.C. Director: Dr. A. Paul Altshuller

The mission of the lab is to determine the effects of air pollution on the atmosphere, and any subsequent efforts on air and water quality and land use. The staff develop techniques, methods, and instruments to identify and measure pollutants and toxic substances in the air, in addition to studying pollutant transport and fate, resulting in air quality simulation models. The scientists assess the effects of pollution on weather and climate, and develop mathematical models to relate pollution emissions to air quality and to forecast potential pollution crises.

Municipal Environmental Research Laboratory, Cincinnati, Ohio Director: Francis T. Mayo

The lab's mission is to find ways to prevent, control, and treat pollutants that affect communities. This includes developing cost-effective methods of providing safe drinking water, community environmental management, solid and hazardous waste disposal, and wastewater treatment. The staff work to find new and improved technology for collection, transportation, processing, and disposal of solid and hazardous wastes, with recovery of valuable resources. They also seek alternative solutions for pollutants that affect several media, such as air and land or water.

Dr. William B. Murray,
Acting Deputy Assistant Administrator for Health and Ecological Effects.

He is responsible for the research that documents the health risk to people and the impacts on the ecology of pollutants moving through the environment. The research conducted adds to the necessary scientific foundation for health-protective regulatory decisions. In order to formulate control strategies for pollution the Agency must be informed about subtle changes in human physiology that may develop into or worsen illness, as a result of a contaminant that reached people through air, drinking water, or food.

The ecological effects research and health effects research complement one another; the first investigates the impact of disturbances and contaminants on the whole environment and the second determines how these ecological changes and contaminants affect people. Since the effects of pollution can move up through the food chain to people, the ecological research supports preventive health studies. The results of these studies are used in developing water quality standards, effluent guidelines for toxic and hazardous materials, ocean discharge criteria, secondary air quality standards and dose-response relationships for pesticides and other toxicants.

Dr. Murray was most recently Director of the Technical Services Division in the Office of Pesticide Programs, a post he assumed in 1973. He joined the Agency in 1971 as Staff Director of the Hazardous Materials Advisory Committee, and served as Acting Director of both the Criteria and Evaluation Division and the Tolerance Division while in the pesticide office. Dr. Murray has served in numerous positions throughout the Federal Government since 1952, including the President's Cabinet Committee on the Environment and the Federal Committee on Pest Control. He earned a B.S. degree from Juniata College in 1950, and M.S. and Ph.D. degrees from the University of Maryland.

There are six laboratories attached to the Office of Health and Ecological Effects. They are:

Health Effects Research Laboratory, Research Triangle Park, N.C.
Director: Dr. F. Gordon Hueter

This laboratory performs studies of problems in air pollution, non-ionizing radiation, environmental carcinogenesis, and the toxic effects of pesticides and chemicals. The staff develop and revise air quality criteria documents for pollutants that are governed by existing or proposed ambient air quality standards. The research staff work to identify the health effects of environmental pollutants. They provide data to assist in regulatory decisions on the registration of new pesticides and review of others now in use. They also conduct health-related studies of hazardous and toxic materials, including the biological effects of microwaves.

Health Effects Research Laboratory, Cincinnati, Ohio
Director: Dr. R. John Garner

The staff conduct field and laboratory studies of the effects on human health and welfare of auto emissions, drinking water contaminants, pollution in swimming and shellfish-growing waters, wastewater treatment plant effluents, land treatment and disposal of wastewater and sludge, as well as other pollutants that reach people through more than one media. They develop models and test systems to predict mutation and cancer threats. The research identifies and describes the harmful effects possible from exposure to chemical or biological agents found in the environment.

Environmental Research Laboratory, Corvallis, Ore.
Director: James C. McCarty, Acting

The mission of the laboratory is to determine the effects of pollution on terrestrial, freshwater, and marine ecosystems linking air, land, and water, as a basis for setting criteria and regulations. Studies include: air pollution impact on plants, animals, and ecosystems; the social and economic effect of water pollution on aquatic plants and animals; how best to restore dying lakes; defining wetlands and determining the effects of pollution on them; assessing the effects of water pollution from runoff, and finding ways to improve water sanitation and conservation in remote Alaskan Communities.

Environmental Research Laboratory, Duluth, Minn.
Director: Dr. Donald I. Mount

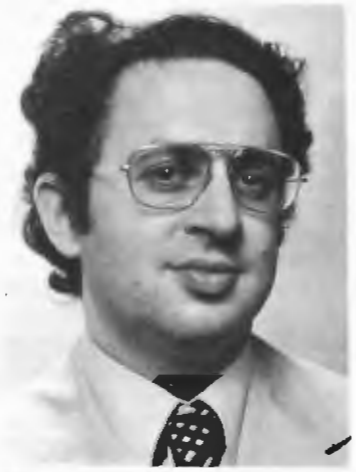
The laboratory staff conduct research on the biological and chemical effects of pollution on freshwater ecosystems, especially the impact on aquatic life. They study the effect of toxic substances on freshwater biological systems. This lab has the primary research responsibility for describing the fate and effects of pollutants that enter the Great Lakes. The staff also study the effects that fuel cycles used to produce energy can have on freshwater ecosystems.

Environmental Research Laboratory, Narragansett, R.I.
Director: Dr. Eric D. Schneider

The laboratory provides a research base for Agency decisions relating to the use of the oceans, by studying the impact of pollution on marine ecosystems. The staff study the chemical and physical behavior of pollutants in ocean life systems, and general and specific responses of marine organisms to environmental stress. They find ways to monitor the build-up and movement of pollutants in ocean systems, and to determine the impact of pollution incidents.

Environmental Research Laboratory, Gulf Breeze, Fla.
Director: Dr. Thomas W. Duke

The staff conduct research on the exposure-effects relationships of hazardous pollutants on marine, coastal, and estuarine ecosystems. This information is used by EPA's pesticide program and by the Agency in setting water quality criteria to protect human and aquatic health in those areas. They especially study the coasts and estuaries of the South Atlantic and Gulf of Mexico, for the impacts of petroleum extraction on the marine populations.



Dr. Steven R. Reznek,
Acting Deputy Assistant Administrator for Energy, Minerals, and Industry

He is responsible for directing research to assess the environmental and socio-economic impacts of energy and mineral resource extraction, processing, conversion, and use. The program develops and demonstrates ways to control the effects of mining, energy production, industrial processing, and manufacturing. He directs research to identify and evaluate alternative systems for producing goods and energy,

as well as ways to conserve the resources that are available. This office coordinates research activities within EPA and among other government agencies relating to the environmental aspects of resource mining, processing, conservation, and use.

Dr. Reznek came to EPA in 1971 as a staff member in the Technical Assistance Branch of the Office of Water Programs, dealing with groundwater hydrology and the transport of chemicals in water. He worked in the Office of Research and Development from 1971 to 1973, planning and managing the air pollution control program and coordinating research work with the Air Program Office. He helped create major EPA regulations on ambient and stationary source monitoring equipment, lead content in gasoline, and non-deterioration of air quality. In 1974 he was a researcher in the Center for Environmental Studies and lectured on formulation of environmental policies in the Civil and Geological Engineering Department at Princeton University. From 1974 to 1976 he was Director of Program Coordination with the National Commission on Water Quality.

Dr. Reznek received a B.S. and Ph.D. in physics from the Massachusetts Institute of Technology, where he was also employed as a research associate in 1968 and 1969. He was a research fellow at the University of Bristol, England in 1969 and 1970.

There are two labs attached to the Office of Energy, Minerals, and Industry. They are:

Industrial Environmental Research Laboratory, Research Triangle Park, N.C.
Director: Dr. John K. Burchard

The staff of this lab work to assess the environmental impact of energy production and industrial processes. They develop timely and cost-effective techniques and process modifications that will conserve energy and help industries to meet environmental quality standards for air, water, solid waste, thermal discharge, and pesticides. The activities of the lab staff also support the Agency's enforcement and regulatory activities.

Industrial Environmental Research Laboratory, Cincinnati, Ohio
Director: Dr. David G. Stephan

The lab staff is concerned with finding ways to prevent, control, or abate the pollution associated with the extraction, processing, conversion, and use of mineral resources, and general industrial activity. They work on closed-loop systems to eliminate waste discharge, and ways to change industrial processes so that less waste is produced. The staff look for cost-effective techniques for removing and disposing of pollutants. The staff seek improved methods for preventing, containing, and cleaning up spills of oil and hazardous materials.

Albert C. Trakowski
Deputy Assistant Administrator for Monitoring and Technical Support

He is responsible for Agency programs in development of environmental monitoring technology and systems, and technical support to the Agency's operating functions. This includes the development of measurement techniques and equipment as well as the application of monitoring systems, including sample analyses, which assess the pollution that people are exposed to. Trakowski is responsible for quality control to assure that Agency data are statistically valid and legally defensible.

Trakowski served as acting Assistant Administrator for Research and Development from May to December, 1974, directing and conducting EPA's research, development, and demonstration programs. He joined the Agency in 1971 as Deputy Assistant Administrator for R&D Program Operations, and managed the resources needed to accomplish environmental research. In 1973, he was appointed Deputy Assistant Administrator for Environmental Engineering, taking over the research into pollution prevention and control technology.

From 1964 to 1971 Trakowski was Vice-President of the Wolf Division of EG&G, Inc., where he was Director of Corporate Development, Project Director for the design and operation of the NASA National Space Science Data Center, and directed EG&G's environmental control program. For 21 years he was with the U.S. Air Force as an engineering and scientific officer in geophysical and environmental technology, pioneering certain developments in atmospheric remote sensing and data analysis systems.

Trakowski obtained a B.S. from the Massachusetts Institute of Technology and Master's level training from the Air Force Meteorology School. He has had extended schooling in engineering, research, and management.

There are three laboratories attached to the Office of Monitoring and Technical Support. They are;

Environmental Monitoring and Support Laboratory, Research Triangle Park, N.C.
Director: Dr. Thomas R. Hauser

This lab provides monitoring and analytical support to EPA air programs and other air pollution control organizations. The staff operates the quality assurance program for ambient air and stationary source measurements and provides analyses, evaluations, and new monitoring developments for air pollution control. It analyzes samples from air quality monitoring networks such as the National Fuel Surveillance Network. The lab supplies rapid response and special techniques of air sampling as needed for emergency situations or enforcement actions, and evaluates commercial air monitoring equipment. The laboratory staff conducts the EPA Fuels and Fuel Additive Registration Program.

Environmental Monitoring and Support Laboratory, Cincinnati, Ohio
Director: Dwight G. Ballinger

This lab develops tests to identify and measure major pollutants and quality characteristics in water. The staff develops monitoring techniques to detect viruses and microorganisms of health significance in drinking water, ambient waters, and municipal wastes, as well as ways to measure the effect of waste discharges on receiving waters. It prepares official test methods and provides materials to evaluate and maintain the quality of water monitoring data from laboratory testing. The lab provides technical support of water and waste monitoring programs at EPA and other pollution control agencies.

Environmental Monitoring and Support Laboratory, Las Vegas, Nev.
Director: George B. Morgan

The staff of this lab develop monitoring methods and systems that assess human exposure to pollution by studying the movement of pollutants through the atmosphere and their final disposition. The lab develops sophisticated monitoring and analytical capabilities for lab and field studies, and conducts quality assurance for radiation and biological research. It provides aerial support for the Agency and develops monitoring systems for contact and remote sensing, especially for environmental emergencies or pollution spills. The lab also conducts radiological surveillance and studies human exposure to radiation from past and present nuclear testing. □

Research, Environment and Health

An interview with Dr. Philip Handler, President, National Academy of Sciences

Dr. Philip Handler has served as President of the National Academy of Sciences since 1969. The author of more than 200 articles in the field of biochemistry, he also is editor of *Biology And The Future of Man* and co-author of *Principles of Biochemistry*. He has served on numerous scientific panels including the Surgeon General's Committee on Environmental Health Problems, the President's Commission on Heart Disease, Cancer and Stroke, and the President's Science Advisory Committee. After receiving his Ph.D. from the University of Illinois, he taught from 1939 to 1969 at Duke University School of Medicine, where he was Chairman of the Department of Biochemistry. He is the recipient of many honors here and abroad for his contributions to science.

Environmental illness seems to be partly due to geography. Stomach cancer, for example is common in Japan but rare among second generation or Nisei Japanese in this country. Do you believe there should be more funding and emphasis on unraveling this puzzle?

My answer is an unqualified "yes." But let me explain. It is the conventional wisdom of our time that perhaps 80 or 90 percent of all cancer is somehow environmentally related. Whether that is true is more than I know.

Ten years ago, it seemed equally true that much cancer was due to a form of virus infection—viruses which we either pick up from the environment or are with us from birth. Indeed, that was so firmly believed that there's a special building out at NIH which was built for the isolation of such viruses.

That belief was just as firmly held then as the current environmental theory is held today. I don't know what it will be 10 years from now. Having stated that caveat, let me note that there is little doubt that the pattern of distribution of various forms of cancer varies greatly around the world, and varies, rather considerably, even inside the United States.

The best single evidence that these are not the genetic heritages of the people who have concentrated in any one region is the phenomenon that you mentioned; namely, that there is a high incidence of gastric carcinoma in Japan. It's smaller in Japanese in Hawaii, and Nisei Japanese are like all the rest of us here in the United States. But I remind you that the incidence of gastric carcinoma in the United States in the 1920's was as high as it is in Japan today.

Do they know why?

No sir. We did something right and we haven't the faintest idea what it is.

There's something about the way we live, the way we eat, or something that is different than it was in the '20s.

What all that says is that the prevalence of gastric carcinoma is determined by something other than our own inherent biology. And it's extremely important to find out what that is.

The incidence of primary carcinoma of the liver is very high in Central Africa—higher than anywhere else in the world, as far as I know. And it seems important to find out why because it is not true of those of their descendants now living in the United States.

I know of no reason to believe that these differences should be ascribed to the influence of man-made materials. The peak incidence of every form of cancer but carcinoma of the lung happens somewhere outside of the United States in relatively primitive societies. There is surely no reason to think that in Central Africa, the primary cause of liver cancer is some man-made chemical. It's due to the environment, using the word in its broadest sense.

The currently fashionable thinking is that however cancer is occasioned, whether there be a virus or an environmental chemical that really does it, once the neoplastic transformation happens, a genetic change has occurred in the cells that are involved. The genetic controls that previously maintained the cell in its differentiated and nondividing form have been lost. The cell de-differentiates and becomes a relatively primitive cell and grows without constraint. That's a genetic effect, if you will, in the life of that cell.

And it perpetuates itself in the absence of whatever that initial insult was. It is important to know, someday, both what the initiating insults are and just what that transformation is. At this moment, no one can describe it in satisfactory terms.

It is of interest, though, that the initial insult needn't be due to manmade activity.

When Jim Neil was looking around the world for the incidence of chromosomal damage, chromosomal breaks, abnormal bizarre chromosomal structures, the population which showed the most striking and most frequent chromosomal damage was in the Central Amazon valley—people still living very close to nature, as close to the savage state as anywhere on earth at this moment. They showed more chromosomal difficulty than any other population he found. He has no idea why. Again, one has reason to think that it is due to something in their environment, using the word "environment" in its broadest sense, but not the man-made environment.

And, again, it is imperative that we learn, one day, what that is about.

There have been recent efforts to impose new Government regulations on science and medicine such as prohibiting some kinds of DNA research. Do you think these regulations are needed?

I have insisted, from the very beginning, that no regulation of research with recombinant DNA and no legislation was needed, for several reasons.

The principal one is that the risks were utterly imaginary. They were all in the realm of science fiction without a scrap of evidence that indicated there was any reason to believe in their reality. The people who called the whole matter into question were the most knowledgeable scientists so engaged.

It was they who said, "Let's stop a moment and consider what we're doing." They did stop. They did think. And when they completed their analyses, they said, "Well, there seems no basis in reality for our concerns. Those concerns were real concerns of the moment. But now that we've thought them through, we can't see that they have any substance."

Hundreds of such experiments have been performed in the United States and elsewhere. There's hasn't been a single untoward incident. It all seems a bizarre and strange episode to me.

The organism with which all this work is done, Escherichia coli, is about the most helpless, innocuous organism known to man. It cannot survive except in a laboratory under carefully cultured conditions. If you put it in water, it dies.

More to the point, we have no regulations with respect to guarding what happens every day in every hospital in the whole world where doctors, nurses and technicians minister to individuals who are, indeed, infected with genuine, infectious, dangerous organisms, real pathogens.

Technicians draw blood and culture it. Nurses and interns, residents and attending physicians are all in contact with people who are infected with genuine, virulent organisms. And yet their infection is extremely rare.

The rationality of all this has been lost on me. And I am delighted that the Congress has avoided passing legislation to protect us against hazards that no one can show to exist.

How do you feel about the occupational safety regulations further applied to university laboratories as compared to industry laboratories? Should they be the same?

I think it's time to study that question rather than to give you an answer. It's a legitimate question. I don't really know what the answer is at this time.

The OSHA regulations, which were intended to protect the workplace, are appropriate, for example, in a factory that's making benzene or using benzene as a solvent day after day after day.

It's rather another thing to try to understand how best to safeguard those who work in a laboratory that never does the same thing twice. The shelves of the stockroom in my biochemistry department must have contained at least 50,000 different chemicals.

We would use some of them in microgram quantities and some in gallon quantities. And we never did the same thing twice. Prescribing how life shall be conducted under those circumstances seems to me to be a reasonable question but for which, as yet, I haven't heard quite acceptable descriptions.

I think what is required first is a careful examination of those, with some retrospective understanding of what hazards there may have been all the while. And then ask, "Well, how can you minimize those hazards without making it impossible to work in those laboratories, or so inordinately expensive as in effect to make it impossible?"

You were very successful when you were in the Duke University School of Medicine Department of Biochemistry in hiring women for research. Can you comment on this latest NAS study of employment trends for women and minorities in science in the 1970's?

Rather briefly, what it says is that, because of the internal dynamics of our own country, the altered aspirations of women and minorities, ever larger numbers of women and minorities are seeking advanced education in science. And it is clear that, as they leave school, they may have an advantage over a young white male in getting the first step on the employment ladder.

As a sociological phenomenon, what is clear is that they get up onto the first rungs of the ladder easily, but they climb the rest of the way with much more difficulty than their white male colleagues. I have a second comment which relates to a perhaps more subtle phenomenon.

The truly important contributions to science are made by a relatively small number of people. Those who have compiled 'scientific family trees' are always struck by the fact that with surprising frequency, the people who do important science were trained in the laboratories of other people who did important science.

The word science means many things. The habit of mind, of taking a broad view, of asking yourself what is the most important unsolved problem which may be amenable to attack at this moment, is a habit that must be inculcated young.

It is awfully easy to find all kinds of other scientific busy work to do. Useful busy work, but not great science. It makes its contribution; it's needful that it be done. But the great science is done by those few people who, when very young, got into this way of life.

That process is not inculcated in graduate school, formally, by going to lectures. It is not what happens even in the laboratories of distinguished scientists. It happens in the camaraderie of the laboratory. It happens at the end of the day, while drinking a glass of beer.

It's what happens during the relaxed off-moments, not in formally structured seminars, but in the informal kind of seminar. From what I have been able to see so far, relatively rarely do the young women in the laboratory as easily participate in that aspect of the life of the laboratory as their male peers do.

But it happens. The young ladies aren't quite as comfortable and they aren't quite as welcome. They are dealing with male mentors, in the main. The male mentors, having been 20 years older, or more than that, have lived a different life. And they are not quite yet wholly comfortable with the young ladies in their shops. In consequence, the easy give and take by which, socially, there is imparted the very best of what makes for good science is not quite as available to young women as to young men even now.

I don't mean that there are no important women scientists. Far from it. As a gross statistic, there is a bridge that only a few have crossed. The process is very subtle. My most cherished experiences as a graduate student were in Farwell's Soda Shop just across the street from the chemistry building at the University of Illinois. In the middle of the morning and the middle of the afternoon, the great and the near-great of the chemistry department could be found there having a Coca Cola or coffee.

The banter around those tables was much more important in making me what I became than what happened in the classrooms. And so there's a barrier; an invisible but functioning barrier, which is still there, because of which the number of women elected to this Academy will still be a small fraction of the total for some years to come.

"We surely do have a handful of horror stories in which certain chemicals have been handled rather cavalierly and done undisputed harm to relatively small groups of people. No one has a license to do that, or should have."

How would you say the United States ranks in scientific research now?

The usual thing that one does in response to such questions is to point to the Nobel Prizes; they are self-evident.

In the aftermath of World War II, only one nation came through whole, and that was ours. With the stimulus of the atomic bomb and later, the stimulus of Sputnik, the American people, through their Government, invested in science in a way no people in the world had ever previously invested.

And with that, we built the most remarkable, the most exciting and the most successful scientific enterprise the world has ever known. We're still riding on that crest. There is no field of science for which I would say, the quality of such-and-such of some other country is decidedly better than the quality here. There is no such country, no such field.

But there surely is developing competition. As there should be. The magnitude, the number of people and the amount of money for science in the totality of western Europe is now approximately equal to that of the United States. And the quality of their work is rising very, very rapidly.

We know that in the Soviet Union, they have made an enormous investment in science.

Their fusion research, for a while, was ahead of ours. I doubt that it is any longer. They are very good at some forms of chemistry and have done well at it. They do great mathematics. They have cultivated mathematics in the Soviet Union. It's an old tradition which was never broken. In the whole of biology and biological science, they are still way behind us and have a long distance to go. But to get there, they're making immense investments, of a kind we never made, in the ability to do biology tomorrow. And I assume it will pay, and that in due time, they will take their place on the world scientific scene. So far, the return on their investment is not as good as the return on ours. We have a tradition that young scientists should go as fast as they can go. They have no such tradition. They still have large institutions, where the nature and pace of research is heavily dominated by their leadership. We don't do that. They are beginning to understand that that's a problem for them.

Japan is rather a different matter. Japan uses its money differently. The Japanese population is one half ours, and they have the same number of scientists and engineers per million that we do. So they have a scientific engineering labor force half the size of ours.

But they do no military R&D. And they don't put nearly as much money into basic science as we do because they've been using our basic science. Therefore, they have concentrated their technical force on applied R&D,—an enterprise which therefore comes out as big as ours.

If you discount our basic science, and you remove military R&D, then the size of the research endeavor in this country isn't much different from that in Japan, excepting theirs is largely employed to drive their domestic economy.

The argument is sometimes made that nature, itself, is a major polluter: dust from volcanic eruptions, hydrocarbons from vegetation, natural radiation, and so forth. And therefore we should keep things in perspective and accept manmade pollution with more equanimity. What is your reaction to that point of view?

It's a half truth. Man has not simply taken the world as it was given to him.

If one drives around Germany, France, Italy, or takes a boat ride up the Thames, one is impressed by the beauty of the landscape and what seems to be the quality of the natural surroundings. You must understand that it isn't. That's a manmade surrounding. The whole of what one sees has been reworked by man's activities. And we like it rather more. Thus, we don't have to take nature as given, in an aesthetic sense, or for food and timber production —but on the other hand we can't control volcanoes.

We can hope to discover what the natural environmental contributions to cancer may be, and minimize those if we can. I don't know of any Americans who would decide not to live in Denver because the radiation background is twice that of what it is in Washington.

I am unaware of anybody who refuses to work in Grand Central Station because the radiation background inside is higher than is permitted on the outside of a reactor.

Natural radiation?

Yes. The radioactive potassium in the granite. We accept those hazards. But if they are responsible for some fraction of carcinogenesis, we may never know. It is intrinsically extraordinarily difficult to find that out. For example, there are no data that say that people who live in high altitudes have more cancer than people at low altitudes, except for suggestive data concerning skin cancer. Nevertheless, we don't have to run down into lead mines to escape, because the risk, however real, seems very small. On the other hand, there is no need to accept unnecessary, unwarranted abuse of nature by man.

We, here and everywhere else in the world, took the natural environment as what, in economic terms, is a 'free good.' And I suppose if we had it to do all over again, we would do it all over again. It made possible the very rapid development of our economy with immense benefit to the quality of life for the most of us.

My mother was one of nine siblings in southern New Jersey, all of whom had typhoid at the same time. That three-holer was probably the culprit. I see no reason to accept that as a state of nature. The natural environment is hostile.

We have learned how to curb natural hazards fairly well, and mold much of the Earth to our own ends. That makes it possible for four and a half billion people to live on the face of the earth, but it doesn't give us a license to pollute.

> **"At the bottom of much current environmental concern is the American phobia against cancer. Not because cancer is an important statistical cause of death, but because of our horror of this way of dying."**

As a scientist, do you think that total elimination of pollution, as proposed by some persons, is a feasible goal?

It's not feasible, necessary or even desirable. What is certainly true is that it would be extraordinarily expensive. There is no way to do that without investing an immense fraction of our total economy in the effort.

And I cannot see that there would be any payoff. In your first question, you spoke of "environmental illness." The magnitude of "environmental illness" is unknown to me. I have yet to see any studies that persuade me that we know what that magnitude is, not even 'ballpark' figures that one can trust. I do not know what the health consequences of air pollution have been. I do not know whether the people of New York who have invested heavily in reducing the level of sulfur oxides in their ambient air have bought any health protection whatever from that action.

Environmental questions deal with conservation, with which no one can quarrel, aesthetic practices to see to it that the world we live in is attractive and pleasing to us, and health protection against noxious materials. Our heightened concern with respect to manmade chemicals arises out of the fact that the rate of introduction of new chemical species into the economy in the U.S. since World War II has been prodigious. Admittedly, for most of them, we have little understanding of what the potential for good or ill may be in the environment.

We surely do have a handful of horror stories in which certain chemicals have been handled rather cavalierly and done undisputed harm to relatively small groups of people. No one has a license to do that, or should have. And so we have been attempting to achieve "protection of the environment," which really means protection of ourselves, to seek wise regulatory practices despite a background of ignorance and lack of raw data for understanding.

Given all the attention we have paid to air pollution and

water pollution in the last decade, the fact remains that if you would like to state with confidence what contamination of water and air has done to the American people, you would be hard put to give numbers in which anyone has any reason for confidence.

We can be sure that none of the pollutants are good for us. Therefore, minimizing them is intrinsically good since there is no excuse for their presence in a positive sense. But the amount of effort that should be directed into reducing that presence, the goals to be established for that reduction must reflect, somehow, the magnitude of risk to which we've been exposed and how far we would like to reduce it.

Unhappily, matters become murky at that point. And we are unable to formulate that problem very well, largely for lack of data. Until recently, we had no motivation for gathering such information and nobody would either pay for or do the necessary research.

Secondly, the scientific problems haven't held great intellectual attraction. This was epitomized by a friend, whom I shall not name, at a meeting of the President's Science Advisory Committee about 10 years ago, who said, "I've been looking at the stars too long to start looking down sewers now."

That more or less characterizes the attitudes of our most talented scientists. Environmental pollution was not a natural lure for the scientific mind and society was unwilling to put money into such research until recently.

But we will have to justify the actions necessary with respect to those pollutants that will require great expenditures, and not on a merely one-time basis. And that can only be done by expanding the data base, which means spending enough money to acquire reliable data that might help.

At the bottom of much current environmental concern is the American phobia against cancer. Not because cancer is an important statistical cause of death, but because of our horror of this way of dying. If cancer were to be abolished tomorrow, the increase in life expectancy of Americans would be rather small—the statistical increased life expectancy.

Why is that?

Because it's a disease of older people even now. The number of young people who die of cancer is very small.

We would like to reduce the incidence of cancer. That's a clear national goal; it's been expressed again and again, not only in expenditures through EPA and OSHA but through the National Institutes of Health, one-half of whose budget goes to the cancer program, deliberately thrust upon the NIH by the Congress and several Presidents.

That's what the American people want. Therefore, we should assist them in getting it. And to do that, it becomes imperative to understand the low dose end of the dose-response curve for carcinogens. The problem is not cancer due to inadvertent accidental large-scale exposure to carcinogens, it is chronic exposure to very low dose levels, the consequence of which is not known.

It is surely time we explored the low level end of that dose response curve with experiments done on a large enough scale to know what to believe.

Usually we test 50 or 100 rats at the maximum dosage that will not kill them acutely, and then we reason from the results. Then, the argument holds that chemicals are rather like radiation. A single ionizing event happens to hit the right cell in the right place and triggers off the neoplastic transformation. And for radiation, that seems true.

If you irradiate enough animals, there will be some for which a single ionizing event will have done it. And maybe that's responsible for part of the background rate of cancer which Americans have always known.

If you examine a list of a half a dozen carcinogens and look at their chemistry, arsenic, butter yellow, methylcholanthrene, vinyl chloride, saccharin if it's true—chemically, they are so different, it is fantastic to think that they operate by doing the same thing.

Butter yellow is a carcinogen?

Yes, sure. Butter yellow isn't used anymore to color butter, but it used to be. It caused liver tumors; that was discovered in the '30s.

But I cannot imagine that these diverse compounds operate by an identical molecular mechanism by which they cause whatever they cause. Cancer is the ultimate expression of what must be many different cellular reaction mechanisms. If that be true, it does not follow that necessarily, for all of them, the dose response curve goes through the origin.

We are surely aware, now, that all cells contain very effective mechanisms for repairing damage to the DNA, such as the enzyme that Arthur Kornberg discovered.

If we have DNA repair mechanisms, and if carcinogenesis is the result of a mutagenetic change in DNA, presumably we can compensate for some amount of mutagenesis. If so, very low doses would have no untoward consequences. I would like to know for at least a few chemicals, once and for all, and stop the argument.

What's your reaction to the argument that if pollution controls become too strict, major industries will move from America to some developing country?

I guess it's a half-truth, again. There are other countries anxious for such development, all too eager to repeat our mistakes. In a country where mean life expectancy is below 45, repeating our mistakes may look charming.

That there are such places, I wouldn't doubt. That American companies will walk away from large investments here and seek that opportunity abroad, remains to be demonstrated. I'm a little skeptical.

This interview was conducted by Truman Temple, Associate Editor of EPA Journal.

That isn't the kind of thing that's drawn Americans to go outside this country. American companies have gone abroad for cheap labor costs time and again.

Environmental costs are costs, and if manufacturers could escape them to be more competitive, they would. But if they have to write off a huge capital investment at home in the doing, they will think twice about it.

The other side of that question is I would think more than twice before forcing any company into making that choice. I certainly wouldn't do it unless I were absolutely convinced that the risks to be mitigated are real and of a magnitude commensurate with what you are about to do.

Are there any laws that you would suggest we still need in the environmental area?

We are having problems enough existing with the ones we have. I don't know whether the battery of them is complete, but, certainly, we have yet to learn to live with the measures concerning water pollution, air quality, surface mining with the Toxic Substances Control Act, and so forth.

That's a good deal for us to digest and learn how to live with and implement wisely. There's an ironic aspect to all of this. As one examines the current scene, you come to the conclusion that every regulation and every act was certainly put on the books with great, good intention, that every one actually may be commendable; it isn't their individual nature which is a problem. But collectively, they may be imposing a burden we don't know how to live with. That's a political judgment; not a scientific judgment. Likewise, here at the Academy, our business is to help the country go down a path in which we expand the knowledge base so that we understand as fully as possible what the risks are and how we might minimize those risks and what the consequences would be if we didn't. The political machinery must take it from there. □

Personal Pollution Monitoring

This silver pendant contains a photocell that senses air pollution and alerts wearer with an electronically triggered sound device. The monitor also contains a small oxygen mask and a 10-minute supply of oxygen to allow the wearer to escape to safety.

EPA scientists are evaluating the usefulness of personal air pollution monitors, some of which can be worn as necklaces or wrist bands.

The Agency recently held a symposium on portable monitors at Chapel Hill, N.C. Purpose of the symposium was to acquaint environmental managers and researchers with the advantages of using personal air monitors as supplements to fixed-station monitors such as those placed along streets or attached to buildings.

Approximately 35 reports dealing with the development and capability of personal physiological and air pollution monitors were presented at the meeting by representatives of the Federal and State Governments, private industry and research firms.

Congressman George E. Brown, Jr., Chairman of the House Subcommittee on Environment and the Atmosphere, told the conference that the demand "for personal monitors is going to skyrocket and the technology is going to have to respond to meet that demand."

He said that while the rate of advance in the technology of monitoring devices has been swift, "this is a technological initiative which has not reached its peak." He called for the development of wrist monitors that measure the amount of any pollutant in the air and then store the information.

The Congressman said there is a need to determine more precisely at what point pollutants affect human health. He added that personal monitors might help solve this problem.

Dr. David Magee, senior scientific advisor at EPA's Environmental Monitoring and Support Laboratory at Research Triangle Park, N.C., said that "numerous studies have called attention to the need for greater use of personal monitors.

"In downtown San Jose, Calif., for example, researchers have found that pedestrians breathe carbon monoxide at levels 60 percent higher than levels shown on the nearest fixed monitors.

"On the other side of the country, in Boston, pedestrians were exposed to levels about 40 percent higher than those recorded at fixed stations."

He noted that in similar studies people in both urban areas and small towns in South Carolina and Connecticut received higher exposures to particulates (mainly because of indoor pollution) than those recorded at fixed locations.

"All of this points out the need for a device capable of accompanying people on their daily rounds and sampling the air in their own immediate breathing zones."

Some of the personal monitors now available were displayed at the symposium. Most of the devices use sensors which respond to environmental conditions.

Among the environmental jewelry displayed at the workshop was a pendant which senses polluted air, warns the wearer with a buzzer and includes a mask and 10-minute supply of oxygen.

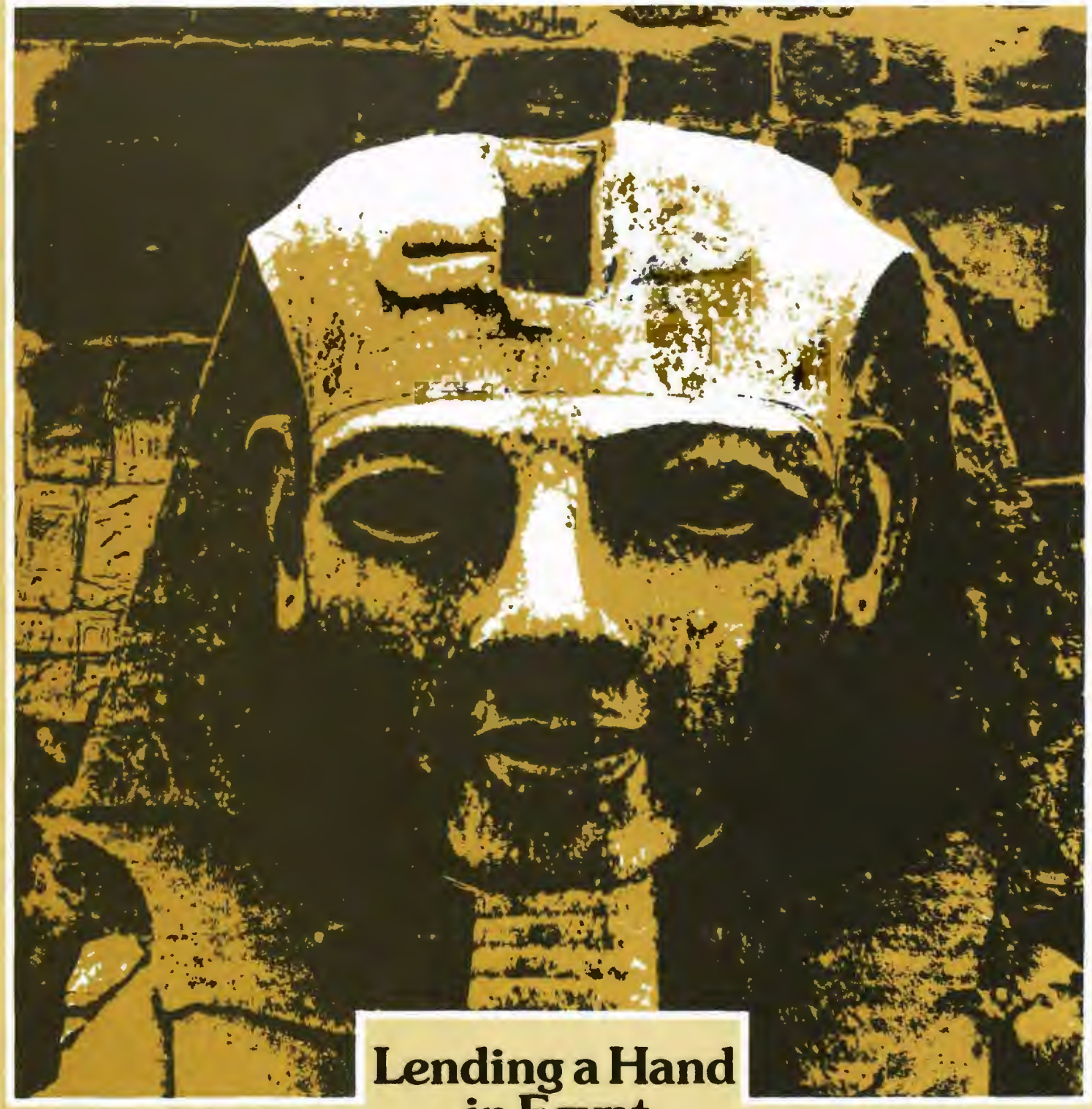
Speakers at the meeting noted that these devices could be especially useful to people with a variety of lung or heart problems who need to know when they are in danger so they can seek prompt medical help.

Cost of these monitors ranges "anywhere from a dollar up," according to Dr. Magee. The cheapest devices are small tubes with chemical absorbents.

Among those making a presentation on the more developed devices were Dr. George S. Malindzak, chairman of the Department of Physiology at Northeastern Ohio Universities' College of Medicine and Mary Ann Scherr, Professor of Art at Kent State University. Mrs. Scherr is a designer of jewelry containing personal monitors.

The symposium was sponsored by two EPA laboratories at Research Triangle Park, N.C., the Health Effects Research Laboratory and the Environmental Monitoring and Support Laboratory.

These laboratories conduct monitoring, human studies and biological research to determine the health effects of exposure to air pollutants, pesticides, toxic substances, and non-ionizing radiation. □



Lending a Hand in Egypt

By Truman Temple

Nearly a dozen major environmental research and development projects in Egypt are being supported by EPA under its Scientific Activities Overseas (SAO) Program. Since 1973, the Agency has obligated more than $7.2 million in helping Egypt deal with its many environmental problems while allowing EPA scientists to learn from unique environmental or pollutant exposure situations.

EPA's projects in Egypt have so interested the International Communication Agency (formerly known as the U.S. Information Agency), that it dispatched a film crew there in January. The team, headed by Robert Butler, producer and director of ICA's TV and Film Service, will be interviewing scientists in environmental projects including those dealing with phosphate mines near Luxor, reuse of process water at a poultry processing plant in Alexandria, the Aswan dam, and studies of wastewater treatment at the Moharrem-Bey Industrial Complex in Alexandria.

The EPA projects in Egypt are funded by credits built up over the years in Egyptian currency, chiefly from United States exports of agricultural products under the Public Law 480 program. At one time EPA was assisting half a dozen countries in environmental research under this type of funding, but the work is now concentrated in Egypt, Pakistan and India. Interestingly, two other nations, Poland and Yugoslavia,

found the programs formerly financed by this type of funding so valuable that they have created special funds of their own to carry on the work.

The program in Egypt is directed by EPA's Office of International Activities, headed by Alice B. Popkin, Associate Administrator. Individual projects are supervised by staff members of the Office of Research and Development, the Office of Air, Noise and Radiation, and several Regions.

"I'm encouraged by the usefulness of this program in Egypt," declared Mrs. Popkin. "Not only are these scientific studies of local conditions of direct concern to the Egyptian people, but they also are broadening our own knowledge of similar environmental problems we encounter in the United States."

If one looks at a map of Egypt, it is immediately obvious that the EPA-sponsored research extends throughout the length of the land. Several projects are under way in the north along the shores of the Mediterranean. One study has been analyzing desert ecosystems since 1975. Its overall purpose is to improve land management in areas now hard-pressed to produce food, fiber, and basic minerals, according to Dr. Norman R. Glass, EPA project officer. Seventeen staff members of five Egyptian universities, aided by 40 research scientists, are involved.

Dr. Victor J. Cabelli, of EPA's Health Effects Research Laboratory in West Kingston, R.I., is project officer for additional studies at Alexandria looking into illnesses associated with swimming at polluted beaches there. Thousands of individuals have been interviewed by public health and social workers to correlate information on their exposure and any subsequent illness. Scientists also have tested water quality, and the collected data are being used by the Egyptian government in the design of a new sewage disposal system for the city. The results of this study, when added to similar ones in the United States, are being used to develop water quality criteria which may have world-wide applications.

Population and industrial growth have made increasing demands on scarce water resources in Egypt. A study of the potential for water recycling and reuse is under way in Alexandria at a modern poultry processing plant. The EPA project officer, Jack L. Witherow of the Ada, Okla. Research Laboratory, explains that the poultry industry in Egypt is encountering a unique problem because new plants and farms will be located in remote areas as part of an overall plan to renew the deserts. The shortage of water and the need for large amounts of it in this industry make the study of pressing importance. Scientists at Alexandria University are evaluating the process water characteristics and will focus on a multiple water reuse system.

Doctors check an Egyptian girl for signs of schistosomiasis, a disease carried by water snails.

August Curley of EPA's Health Effects Research Laboratory at Research Triangle Park, N.C. is project officer for three studies. In one, researchers at Alexandria University are seeking to determine the safe use of insecticides and to study their effects on animals, fish, poultry, insects and plants. Another study by the Regional Radioisotope Center in Cairo is investigating the health hazards of pesticides that are important to both Egypt and EPA. The third, being carried out by the Plant Protection Institute in Cairo, is monitoring levels of various toxicants in the environment such as water, soil, and agricultural products before and after aerial and ground application of pesticides.

Curley, who helped organize an international symposium last November in Egypt on the hazards of pesticides to the environment and human health, said there is an increasing use of chemical pesticides in that country to protect crops. "Coupled with this trend," he added, "are reported instances of indiscriminate use of pesticides, leading to contamination of food crops and the immediate environment. In Egypt, as in our country, there is a growing and continuing concern about the hazards of pesticides to human health, not only to field workers and pesticide applicators, but also to the health of the people generally exposed through contaminated food, water and air."

The rapid growth of industry in Egypt in recent times has made air pollution an important public health concern. Taking advantage of 13 air monitoring stations already in operation in Alexandria, a team of researchers under direction of the Egyptian Department of Occupational Health

Two Egyptian farmers load a pack animal near a modern water pumping station in the Nile Delta.

Truman Temple is Associate Editor of EPA Journal

has been sampling ambient air pollutants and examining persons suffering from chronic respiratory diseases. Dr. Carl G. Hayes of EPA's Health Effects Research Laboratory in Research Triangle Park is project officer. The purpose of the investigation is to help define the relationship between the pollutants and disease. Since Alexandria is the second largest city in Egypt and contains about a third of all industry in that country, the project is of special significance in public health.

During the past decade, fish production in Lake Mariut, which lies just southeast of Alexandria, has declined by about 75 percent, due primarily to the discharge of industrial wastewaters from the adjacent Moharrem Bey Industrial Complex. In addition the lake has ceased to be an important recreation area because of its offensive odors and unsightly algal growth. The lake is economically important as a source of food, and Egyptian scientists and engineers now are investigating a number of alternatives for treating the industrial wastewater pouring into the lake. According to Dr. James D. Gallup of the Effluent Guidelines Division, the EPA project officer, the industries include food oil and fat production, paper reprocessing, textile finishing, yeast and starch production, and other facilities. The alternatives under study include pretreatment of effluent before discharge to the lake; in-plant modifications, and combined treatment of both industrial and municipal wastes in the city's sewage treatment plant. The study thus is laying the foundations for a comprehensive and far-reaching restoration of an essential resource.

The rapid rate of industrialization and agricultural development in Egypt to provide her millions with food, jobs and consumer goods ironically has polluted some of those very sources of food. Inland, changes in Nile River drainage patterns have led to salinization of lakes that formerly produced high yields of freshwater fish. Under this program, Egyptian scientists are now investigating the impact of pollutants on saline waters to determine how marine life is being affected. The project officer, Dr. Gerald E. Walsh of EPA's Environmental Research Laboratory at Gulf Breeze, Fla., describes three geographically distinct study areas in the project, each with its own laboratory for research into specific problems.

The first includes Lake Quarun and Wadi El-Rayan in the Western Desert about 65 miles southwest of Cairo. "Lake Quarun, the world's oldest artificial impoundment, was begun over 5,000 years ago by shunting of Nile River water to a large natural depression," Walsh explains.

"At that time, its impounded water was used to irrigate crops during the dry season. Lush vegetation grew in the newly-watered area, and the site was used as a vacation resort by the pharaohs. Now, the lake is as saline as the ocean and cannot be used for crop irrigation, but marine fish and shrimp, introduced from the Mediterranean, grow in it." The current project is aimed at increasing the yield of fish by application of sound fisheries management practices. It also is investigating the effects of pesticides that enter the water as agricultural runoff.

The second area is a fishing village on the Red Sea named Al-Ghardaga. A laboratory there is studying the effects of pollutants on marine biota and also the ecology of reefs. Data obtained will be used to estimate the impact of pollutants on marine life, and also to set water quality standards. The third area embraces the Mediterranean coast of Egypt, where a branch of the Institute of Oceanography and Fisheries is monitoring and analyzing water conditions and relating them to marine life.

Further to the south, an EPA project is looking into another environmental question involving radiation from phosphate mining and manufacturing. The project officer, Richard J. Guimond of EPA's Office of Radiation Programs, explains the situation this way:

"Historically, the Egyptian phosphate industry was quite small because of the great fertilizing effect of the Nile floods. However, the halt to the annual flood increased the country's need for fertilizer. Further, fertilizer is considered a good export product for the country. As a consequence, the industry is growing in Egypt."

Phosphate mines are located along the Nile near Luxor, known as the Valley of the Kings; along the Red Sea to the east, and in the central desert west of the Nile. Manufacturing facilities are located around Cairo and Alexandria. Egyptian scientists are especially interested in studying operations because phosphate is radioactive, environmental controls now in use are poor, the facilities are near heavily populated areas, many workers are employed in the industry, and phosphate production is expected to increase. Guimond also noted that information acquired on the exposure of thousands of Egyptian workers could help EPA in evaluating health risks to the U.S. population from phosphate.

Near Egypt's southern border where the Nile encounters the famous and controversial Aswan Dam, EPA is sponsoring a broad study of how the dam has affected the region, for ill and for good. The project officer, Dr. Walter M. Sanders of the EPA Environmental Research Laboratory in Athens, Ga., explains that the study is examining the effects of the Aswan project "along the lines of hydrology, water quality, aquatic ecology, public health, agriculture, and social implications."

The Aswan is a major force in Egypt's life. It has created one of the largest reservoirs in the world. It provides about half of the nation's electric power. It causes 100 million metric tons of silt to be deposited annually in Lake Nasser Reservoir. Because the dam is in an arid region, evaporation losses cause the Nile to increase about 10 percent in salinity as it passes through the reservoir. Lake Nasser Reservoir shows a high rate of algal production. At the same time, food fish production has increased there from 750 metric tons in 1966 to 20,600 tons in 1978. The city of Aswan a few miles north of the dam has mushroomed from 30,000 to 620,000 between 1960 and 1976. The impact of industrial and domestic waste discharge and farmland drainage have become evident not only in the main river but in its irrigation canals and drains.

Egyptian scientists in the EPA project are studying how the Nile's ecology is changing. They are determining water quality characteristics above and below the lake and comparing them with earlier data before the dam was built. Researchers also are developing a water resources model, and seeking to predict future trends in water quality and how they will affect the region. Later they will propose a comprehensive river plan on how to manage this vast water resource most effectively.

The public health survey completed by the project staff of over 15,000 rural Egyptians located in 41 villages from Aswan to the Mediterranean showed an average drop of about 50 percent in the overall prevalence of schistosomiasis (snail fever disease) since 1937. The current prevalence in the north central delta is 42.1 percent, in upper middle Egypt 26.7 percent, and in the Aswan region 4.1 percent. The survey showed that infections were significantly lower in populations obtaining their domestic water from protected sources.

The Aswan Dam has regulated the water flow in the river so that there is a continual supply of irrigation water year-round. The agricultural studies have found that this increase in use of water has caused the water table to rise. Where the table once lay about 250 centimeters or more than eight feet below the Earth's surface, it now lies only 40 to 70 centimeters down (about 16 to 28 inches) in large areas where tile drains have not been installed. These undrained soils are increasing both in salinity and alkalinity, causing a decrease in crop productivity.

From Alexandria south to Aswan, from the Western Desert eastward to the shores of the Red Sea, EPA scientists have joined with their colleagues in Egypt to help that nation cope with its many environmental and health-related questions. There is no question that both countries are finding unexpected rewards in the experience, both in environmental knowledge and in international cooperation. □

Hunting Pollution in the Great Smokies

By Charles D. Pierce

"A few steps or a three-mile round trip on an easy-graded surface will take you away from the sights, sounds, and smells of your everyday world, along one of America's loveliest streams. You will be walking into one of the last great wilderness areas remaining in the East. . . ."

So reads a National Park Service sign as one enters the Ramsey Cascade area of the Little Pigeon River in the Great Smoky Mountains National Park.

A small group of scientists from EPA and the National Park Service trod this path last spring on their way to key monitoring tests, one step in a global effort to find the impact of pollution on the relatively isolated areas of the world.

This quest was part of an international effort known as the Man and Biosphere

Amy Cross, an EPA scientist, gathers vegetation samples in the Great Smoky Mountains National Park.

Dr. Bruce Wiersma of EPA's Environmental Monitoring and Support Laboratory at Las Vegas, Nev., sets up monitoring equipment.

Program, established by the U.N. Educational Scientific and Cultural Organization in 1971.

Under this program the Great Smoky Mountains National Park was designated as one of 117 biosphere reserve sites, pristine areas which have been designated at various locations around the world.

An important goal is to use these reserves as a record of the environment in its natural state and to monitor these areas to measure global pollution fallout that might be masked in more heavily polluted areas.

Monitoring and sampling performed by the EPA-National Park Service team last spring and on a preliminary visit in 1977 have discovered evidence of relatively high concentrations of lead in the park.

While the source of this lead has not been determined so far, EPA scientists believe there are two main possibilities:

The lead particles were borne by wind from either the heavy auto traffic in the park or industrial and urban sources outside the Great Smokies.

Pierce, Editor of EPA Journal, accompanied the scientific team on their journey into the Great Smoky Mountains National Park.

Some lead is also found from natural sources. The results of testing for other types of pollutants are still being analyzed and assessed. Additional monitoring in the park will be undertaken this spring.

The scientific team investigating the health of the Great Smoky Mountains National Park carried heavy monitoring equipment by back pack because even horses or burros couldn't climb the heavily forested 60-degree slopes that led to some of the isolated sampling sites.

The team members, led by Dr. G. Bruce Wiersma of EPA's Environmental Monitoring and Support Laboratory at Las Vegas, Nev., were often drenched in sweat as they climbed up root- and rock-studded trails and steep banks.

However, occasional torrents of rain helped cool the climbers. At some points the downpour was so heavy that the group had to huddle under tarpaulins, wait till the storm passed and then slog on along trails which had been transformed by rain run-off into swiftly flowing rivulets.

It is water vapor from the frequent rains and natural emissions from vegetation that give the park the haze responsible for its name, Great Smoky.

The group crossed and re-crossed the roaring and foaming Little Pigeon River on crude log bridges as they scrambled their way to the monitoring sites under a dripping canopy of towering trees.

In addition to giant hemlock and tulip poplars and a rich variety of other trees, the park has a wealth of shrubs and wild flowers. Waves of Wake Robin (red trillium) bloomed in shady areas.

The animal life includes salamanders in many different sizes, shapes, and colors; a dazzling variety of warblers and other song birds, wild boars and black bears.

The air pollution monitoring equipment set up in the park by the team at exposed sites was placed in a tepee-like construction of steel rods specially rigged with barbed wire to discourage intrusion by the inquisitive bears.

Drinking water taken from the park's swift flowing streams had to be treated to kill the bacteria left by the wild boars which wallow in the headwaters. The boars invaded the park after escaping from a nearby hunting preserve.

The team of scientists visited 10 research blocks in the park, each about one square kilometer in area, where they took multiple samples of air, water, vegetation, soil, and forest floor litter. Approximately 1,200 samples were taken.

The soil, forest floor litter, and vegetation samples were placed in plastic bags and carried out in back packs. The researchers used plastic gloves to avoid contaminating the leaves and other plant material collected.

Plants gathered included such varieties as New York fern, witch hazel, asters, moss, mountain laurel, dogwood, and rhododendron. In some cases the moss was gathered from the logs of huge American chestnut trees, which had been killed by a blight many years ago and are still rotting on the forest floor.

In addition to bottling samples of the water from the park streams for later analysis, the team left rain gauges at some of the sampling sites to compare findings with those obtained from air filters.

At most of the air sampling sites, filters were tied around trees and air was drawn through them by battery-operated pumps. Four filters were used at each site.

In order to determine the size, distribution, and composition of metallic air-borne particles in the park, the monitoring plan provided for one filter to be analyzed by scanning electron microscopy at the University of Iowa, one by conventional atomic absorption methods at the "clean" laboratory facilities at Carnegie-Mellon University in Pittsburgh, and one by x-ray fluorescent spectrometry at the Environmental Monitoring and Support Laboratory at Las Vegas. The fourth filter was provided in case of damage or loss to one of the

continued to inside back cover

Dandelion Time

"What is a weed? A plant whose virtues have not yet been discovered."
—Emerson.

In the Washington area now comes the time of the dandelion, a doughty little plant you can eat, drink, curse as a weed, and admire as a wildflower.

It will soon be lifting its golden head on lawns across America. This will prompt many horrified home owners to rush out and buy more herbicides to rid their property of what they consider to be a weed.

Millions of dollars will be spent to slay dandelions because homeowners have been brainwashed into thinking that their outdoor lawn carpets should run from driveway to driveway without any distracting flecks of gold.

In their fierce desire to present a front to the world of monotonous green they will spend hours digging up any dandelions that may survive the herbicide dousing. Even if the lawn owner recognizes the basic beauty and utility of the dandelion he or she is often so intimidated by frowning neighbors that they join the mad dandelion purge.

While they are out buying fresh supplies of herbicide to kill the dandelions, they often stop by the drug store to pick up minerals and vitamins that they could obtain without charge by eating dandelion greens.

Tests have shown that dandelions beat spinach hands down in food energy, proteins and many vitamins, according to the Wise Encyclopedia of Cookery.

The narrow green leaves with jagged edges which can be used in salads gave the plant its French name of "dent-de-lion" or "lion's tooth" and we long ago took over this name in modified form.

Some people grow dandelions as a crop for sale which they have raised from packets of "improved" dandelion seeds sold at garden stores.

Dandelion roots kept in a basket of dirt will provide a supply of pale greens all winter long. Many people prefer leaves produced in such semi-darkness as they are tender and milder.

The young leaves can be boiled as a pot herb. A rather pungent tea can be made by boiling mature leaves. The roots can be used to make a coffee substitute. Wine can be prepared from the fermentation of the blossoms.

Apart from these useful functions, the dandelion, one of the most widespread and best known flowers in the world, also provides beauty.

Children are attracted by their feathery seed spheres and blow on them to find their fortunes. The seeds are often carried on the breeze by small downy parachutes to neighbors' lawns.

The dandelion was brought to America by colonists who were eager for its early greens after a long winter with no fresh vegetables. It was also cultivated for its roots which could be dried and used as a bitter tonic and laxative.

In a world of an increasing number of "don'ts," the dandelion also provides a wildflower that can be picked with impunity.

If it had no other virtues, the dandelion would be recognized as one of the heralds of spring, a reminder of that time of year when in the words of Swinburne:

"Winter's rains and ruins are over
* * * * *
And time remembered is grief forgotten
And frosts are slain and flowers begotten
And in green underwood and cover
Blossom by blossom the spring begins."
—C.D.P.

The New Environmentalists

By Administrator Douglas M. Costle

The fervor of the late sixties and early seventies has evolved into the environmental institutions of the seventies and eighties. Environmentalists today carry calculators instead of picket signs. Demonstrating housewives are now Presidents of the Lung Association or the League of Women Voters. Law students wearing sweatshirts and sneakers now carry legal briefs in fine leather cases—and those briefs have established a truly astounding docket of precedent setting environmental decisions.

Perhaps most significant, the street leaders on Earth Day have become the institutional leaders of today. In fact, many of them are now EPA administrators wondering why the environmentalists are shouting at them.

The reason is simple. We have become a permanent part of the political value system. Environmental courses are taught at every major university. Most companies have environmental departments. And grassroots organizations—of the kind that organize letter writing campaigns, participate in government hearings, and lobby

political officials—abound throughout this country. They have provided strong intellectual leadership on a wide range of issues.

So it's no surprise to me that public opinion polls show that support for environmental programs is broadly based. The differences in support between Republicans and Democrats are negligible. Support among those with a high school education or less has grown until it approaches the level of those with college education. Support among blacks for more government spending on the environment jumped from 33 percent in 1969 to 65 percent today.

A new Resources for the Future poll shows that 53 percent of those polled believe that protecting the environment is so important that requirements and standards cannot be too high, and continuing improvements must be made regardless of cost.

These are attitudes born of experience—of having seen one environmental forecast after another proved to be right, of having seen technical products made better by environmental concern, of having seen cleaner air and water.

Those who scorned Rachel Carson's "Silent Spring" have seen the chemical disasters with names like Kepone, Love Canal, and PCB's. They have also seen the return of birds and wildlife to estuaries no longer threatened by DDT.

Those who castigated environmentalists for holding up the Alaska Pipeline must admit that it's a better, safer line today than it would have been without their protests. And there are plenty of oil men who share that recognition—at least on an off-the-record basis.

Nationally, sulfur oxides are down 27 percent. Dirt and smoke are down 12 percent. Carbon monoxide is going down at a rate of 5 percent a year. And most importantly, there are people in Los Angeles who can see the mountains for the first time—in spite of continuing high levels of smog. Their eyes still may water from the effort, but progress is being made.

However, even these successes do not fully explain the masses of people—two out of three according to a Harris poll last year—who consider themselves concerned about the environment. So what is it that has attracted blue collar workers, inner city residents, sophisticated suburbanites, farmers, and merchants alike to make this claim?

Certainly, the basic principles of ecology provide worthy answers. Whether articulated by Rene Dubos, or Jacques Cousteau, or any other environmentalist, the principle remains valid that all elements of life are connected to each other in a fabric of cause and effect relationships. We all know that if even one strand is cut, a basic strength of the system is diminished. This understanding has nurtured the environmental movement throughout its existence.

James Michener in his new book *Chesapeake*, which fictionally describes the history of the Chesapeake Bay area, chronicles once again ecological destruction that occurs when this principle is ignored.

Certainly this bed-rock environmentalism is one explanation for the polls. But I believe that in the last decade, two other broad groups of like-minded people have formed—those who find stability in lasting environmental values and those who have come to respect the environment for its impact on their health and livelihood. These are the new environmentalists, the people who have discovered a source of strength in nature and a new understanding of the fragility of human life. Perhaps they are drawn to this discovery through the general frustrations of a highly technical and complex society: of products that don't work, governments that don't respond, services that aren't rendered, and promises that aren't kept. In the environment they find a sense of order, a permanence in the life cycle of nature, and genuine hope in the age-old renewal of life that regenerates the world. These are values that transcend the daily onslaught of society's breakdowns.

These new friends spent $5.1 billion dollars last year on campers and vans. They purchased back packs by the millions. They lined up for marathon races by the thousands. They appreciate clean air and clean water.

Some people fear that these environmentalists will destroy the sanctuaries they seek. And preservation is a necessary vigil. But they present a tremendous opportunity for the environmental movement in terms of mass support.

The second group of new environmentalists are those who have felt the adverse impact of degradation on their lives and livelihoods.

The Washington Post ran a story last month with this lead paragraph:

I quote:

"Wearing quilted jackets, string ties and suspenders, the dairy farmers who sat in a Frederick County courtroom last week are not anyone's image of political activitists. But they are part of a new group of environmentalists: those who claim that industrial pollution damages their livelihoods as well as the quality of their lives."

These are people who have been harmed by environmental carelessness, or callousness or disregard. They are fishermen fighting Kepone in the James River. They are oystermen and crabbers concerned about thermal discharges from nuclear plants, or oil spills from petroleum refineries. They are farmers worried about reduced milk production or damaged trees and crops.

They understand that a clean, healthy environment is in their own economic self-interest. And when economic self-interest reinforces a sound environmental ethic, the combination is just about unbeatable.

Certainly we have come to understand in the last few years that there is an economic cost associated with using up clean air, clean water and other natural resources.

When our forefathers strode mightily across this country, land was their most valuable resource. Land determined voting rights, personal profits, individual stature and physical freedom. To a degree, many of those qualities are still associated with the land.

But for the 80 percent of our population which lives on 20 percent of the land—in our urban areas—the values are changing. There is no more land to take. Natural resources are limited. But the land has taken on a new value—its quality. This includes the quality of the air above it and the land's proximity to other human endeavors. The elite today live in environmentally rich areas. Smog is heaviest in poor areas. And real estate values can be measured in the color of the sky and how far you can see. A recent study found that people living in the Four Corners area of the Southwest said that they would pay an average of $850 a year to avoid having visibility reduced from 75 to 25 miles.

People are beginning to realize that their quality of life depends on how others use the water and the land. A smokestack on one side of town influences property values on the other side of town. A chemical plant in the next State may contaminate fish in far away waters. It's a pocketbook issue that will continue to swell the ranks of the environmental movement.

People today also can clearly see the connection between the environment and their health—their ability to work and live with the promise of a full life. The symptoms of many new environmentally related diseases are now becoming visible. Air pollution that destroys the lung and weakens the heart is too often casually described as the source of stinging eyes or a little congestion. But only an ostrich can ignore the miscarriages, nervous conditions, sterility, and death associated with environmental exposure to certain chemical substances—many of them cancer causing. One cannot think of Kepone, PCB's, PBB's, and Love Canal without also thinking: the environmentalists were right.

John B. Oakes wrote on the editorial pages of the *New York Times* a couple of years ago, "The environmental cause is neither amorphous nor elitist; it is a combination of pragmatism and ethics. It is summed up in the practical conviction that man cannot survive as a civilized being unless he reaches an accommodation with his natural surroundings; and in the ethical view that if he fails to do so, his survival in such a world will be worthless." □

(Excerpts from a speech by Costle Dec. 13, 1978, before the National Wildlife Federation, Washington, D.C.)

Labor's Stake in Steel Cleanup

An Interview With Lloyd McBride, President, United Steelworkers of America

One steel company in 1978 published a full-page advertisement saying that less rigid environmental rules can save steelworker jobs. Do you agree with this view?

No. The key to jobs in the steel industry is a healthy economy. There has to be enough business for the companies to generate the cash flow that will enable them to meet their obligations. It's not a question of EPA or Occupational Safety and Health Administration (OSHA) regulations.

Also, projections have been made that between now and 1985 the steel industry will spend $40 billion to expand, modernize, and increase production capability. Only four billion dollars will need to be spent on environmental improvement facilities. That's only about 10 percent of the modernization total.

The industry's future and jobs depend on such spending, not only for cleanup but for expansion and other activities. Steel companies can't remain viable without modernization. They can't remain viable without meeting their obligations in terms of being good citizens, environmentally and occupational safety and healthwise.

There is another factor. EPA is tailoring its programs, in some instances at least, to be coordinated with steel mill expansion. This way environmental measures can be effectively built in during the expansion or improvement of the facility.

In short, I don't think that ad campaign really presented the situation in its true light. There are important reasons why weaker environmental rules wouldn't help steel worker jobs.

This interview was conducted by John Heritage, Assistant Editor of EPA Journal.

Some of the most polluting steel industry jobs pay the highest salaries. Are workers willing to take health risks for more pay?

Money can't compensate for health risks. It's not a viable concept. It's particularly faulty when you consider that some of the health problems may not appear for years. If there is a long delay from exposure to the pollutant to an illness, the idea of paying money for the risk is just ridiculous. No one should be forced to gamble between higher wages now, and the risk of contracting cancer sometime in the future.

Do you believe pollution cleanup requirements could ever cause steel mills to move overseas?

No. Pollution cleanup rules would be a bigger factor regarding where to locate within our country. That problem requires uniform controls so there's no particular advantage to a company, environmentally or occupational safety and healthwise, to locate in one part of the country versus another.

But overseas flight from antipollution regulations is not a realistic possibility for our steel mills. The international trade problems of steel really are more related to over-capacity, unfair competition, and the extensive use of social protection programs in other countries that help them maintain full employment even during economic downturns. As trade unionists we can appreciate and in some cases envy these social programs. But they do impact international trade and we feel that we're making some progress in terms of calling to everyone's attention some of these effects. We see a chance of some improvements in taking the effects into account for shaping our trade policies.

Looking at the full trade situation, I have some very serious doubts about the viability of our steel industry operating in other parts of the world and then trying to ship back here. Our problem will continue to be one of whether we should have a self- sufficiency in our ability to provide our own country with steel.

A 1978 report by the Council on Economic Priorities found that the steel industry still lags in pollution control. Is this inevitable due to the industry's economic problems?

There's no question that the industry's economic problems in the past have had an effect by straining companies' supply of capital. The industry has been forced to compete under unfair conditions to retain the domestic market. That's had the effect of depressing steel's opportunity to earn. I think the basic problem then is one of having the wherewithall to clean up.

Of course, historically, worldwide, the steel industry has been a big offender in terms of pollution. It's the nature of the industry. The raw materials, the technology, all have been ones that contributed to pollution.

But also, there's evidence that the steel industry has been recalcitrant in accepting pollution cleanup regulations. One problem brings on the other. If the industry doesn't have the money to clean up perhaps that forces them to take a defensive attitude with respect to their obligations.

Their defensive attitude has compounded their problems, though. Not one steel mill in the U. S. is now in total compliance and all of the mills are in areas not yet attaining air quality standards. The steel mills are now required to clean up their act and are starting from way behind other industries. Their recalcitrance, then, has led to the need to catch up, and may lead to sizable noncompliance penalties.

But I believe that as the industry can cope with its economic problems, then it will no doubt speed up its cleanup effort. We have seen a very encouraging change in attitude on the part of most of the steel companies in the past year. They finally are sitting down with EPA and seriously working out compliance plans. The speedup has begun, I believe, because they see that their need to modernize fits in with the cleanup requirements.

Is the steel industry overregulated by pollution cleanup requirements?

No. My own reaction is that the steel industry has the same obligation as everyone else to be good citizens. They have no more right to pollute our air and our water than anyone else. And so whatever regulations are applicable have to be applied across the board in an even-handed way.

The fact that the steel industry has a bigger cleanup problem accentuates their need to be in a healthy economic situation so they can comply. But I don't think the steel industry has any more right to pollute or to conduct themselves in any other fashion in terms of responsibilities than any citizen.

Is the steel industry in any other country that you know of doing a better job than the U.S. in pollution control?

I have seen examples of a cleaner coke oven operation in Japan and Russia. With these very few instances, I can say that I'm convinced that there's a better way to do it. I don't think the Japanese and the Russians were operating their coke ovens this way across the board. I believe we were shown the best that they have. But the best that they have, if it were utilized across our steel industry, would result in a much cleaner operation.

To your knowledge, have any American steel mills closed for environmental reasons and what's the danger of this happening?

I don't think that any steel mills have closed for environmental reasons alone. There may have been some reference to environmental requirements as a contributing factor. But the real cause is economic pressures that have built up over time.

At least in two instances I know of, the facilities that were closed were confronted with a loss of their market for certain product lines to foreign imports. A third closing resulted from a kind of planned obsolescence where a company over a long period of time just did not make any expenditures to keep a particular mill modern and competitive. As it became obsolete, then it was closed. Environmental requirements may have been one of the things that caused it not to be profitable. But had the mill been modernized along the line, and money been spent to improve facilities, to change the technology, to update it in the various ways, then I think that mill would still be viable.

So, I can't see that environmental reasons alone would close any mill.

What's the significance of the pollution cleanup agreement between Republic Steel Corp. and the EPA?

There's a distinct advantage and a great significance to the type of agreement and the planning that was worked out in the Republic Steel case. It shows that EPA is coordinating their enforcement timing with company-wide investment plans and capabilities. And it also shows the need for the union to be aware of these types of plans in advance so that we can make plans too. Then we can avoid job disruption. We also can avoid last minute opposition to the control plans as they're implemented.

What is having the biggest economic impact on the American steel industry—pollution control, modernization, or the overall economy?

The key is the economy. I don't think it's the EPA or OSHA regulations. I don't think it's pollution control.

What specific protections do Federal pollution cleanup laws now provide for workers?

There are some very distinct ones, and I'm proud to say that our union was instrumental in developing these protections as part of the environmental laws so that workers can feel free to get involved. For instance, it is now illegal for employers to retaliate against workers who tell EPA about a violation, or who testify at a public hearing. In the past some of our members have felt this type of retaliation, and it has a very chilling effect on other workers who otherwise would like to be more environmentally active.

In a similar vein, there are now provisions to discourage what we call environmental blackmail—cases where employers whip up emotional opposition to environmental regulations by making irresponsible job-loss claims. In these cases now, we can get public hearings and EPA can subpoena company books to find out what the real impact is.

We also have some wage protection for workers in industries where the companies control their pollution by slowing down, or shutting down production every once in a while. This mainly helps workers in the copper, lead, and zinc smelters. What it means is that the smelters can't shift the cost of control to the people who work in the plant.

There is a gap, however. I think we also need a worker assistance arrangement in the few cases where a dislocation does result from the cleanup laws. Especially in a one-company town the effect of a shutdown is devastating. I think the government has a responsibility to help ease the disruption in that kind of situation.

The State Implementation Plans under the Clean Air Act are the key means to achieve air quality standards. Do you see any other objectives that the plans should stress for industry and workers?

First they represent a planning exercise, a planning program, and that's extremely important. The process calls for company expansion plans to be revealed, as well as company departure intentions. Community plans for air, water, and resource allocation all come into focus as a part of the planning exercise.

There's a need for unions to take greater advantage of this planning information and a need to be more involved than perhaps we are.

Environmental planning for the State clean air implementation plans tends to promote job security. It leads to rational economic growth that does not face the uncertainty of possibly having to be undone in the future because of environmental overloading.

We're convinced that in very few instances will a shut-down of a facility have to take place. In any event, by this planning process we would not have to deal with after-the-fact situations. We would have an opportunity to deal with the problem before it really hits us.

Is cost-benefit analysis a good enough yardstick to decide the value of a healthy environment in a steel mill?

I can't accept the idea that you can have cost-benefit analysis as an acceptable tool in health regulation. I think it's impossible to place a value on human life and health. It's probably impossible to evaluate or place a value upon damage to our ecology, damage to vegetation, deterioration of buildings, and such things that result from pollution.

This whole concept of cost-benefit analysis is leading us in the wrong direction. It seems to me we should talk about cost-effectiveness or least-cost with respect to specific control methods. But we should not have to rely upon cost-benefit analysis to justify that healthful levels of control be required. We can't afford to get into trade-offs. If we've got conditions that are unhealthful, we just have to correct them. □

Chemicals and Health

Continued from page 7.

Roy E. Albert, M.D.
Chairman, EPA Carcinogen Assessment Group; Professor and Deputy Director, Institute of Environmental Medicine, New York University Medical Center

My remarks are directed toward carcinogens since my experience from a research and regulatory standpoint is greatest with them. I don't believe it is an exaggeration to say that we need some form of regulatory control on all agents that show substantial evidence of carcinogenic action either by animal bioassay or on the basis of epidemiological studies. However, I do believe it would be an exaggerated response to the danger of carcinogens to require virtually zero exposure for all such agents.

What we need, and do not yet have, is an overall Federal regulating strategy that would seek to maximize the chances of reducing the heavy public health burden of cancer which currently kills one of every five of us. There is evidence that environmental agents play a causal role in a large proportion of cancers and that there are hundreds of carcinogens and carcinogenic cofactors in the environment that may act individually or in concert to produce cancer.

I think the regulatory strategy that would have the best chance of success is one that would seek to control carcinogens wherever they occur but only to a reasonably low level of exposure rather than to virtually zero exposure. Also, particular attention ought to be paid to eliminating pockets of high level exposure whether they occur in the occupational or environmental setting.

In short, I suggest that we ought to think in terms of easing the stringency of controls for individual carcinogens as a trade-off for getting controls in place for as large a number of carcinogens as possible. I think this is the direction that would gain the biggest public health returns for the regulatory investment.

Paul G. Rogers
Former Congressman and former Chairman, House Subcommittee on Health and the Environment

The question is deceptively straightforward. The problem is that we don't really have a simple answer. Our experience with some very specific chemical substances—for example, PCB's, vinyl chloride, and DDT—has awakened our concern about the whole spectrum of chemicals. This concern is heightened when we realize the breadth of possible human exposure—that there are close to four million chemical substances known to man and that some 70,000 of these are now in commercial use. With as many as 400 new substances entering the market each year our past experience means that we do know that what we don't know is legitimate cause for concern.

We do know that we need a system capable of examining the safety of these substances. We do know that we need to expand upon our present knowledge and attempt to answer some of the very difficult scientific questions concerning the possible hazards of long-term, low-level exposures, of latency periods and the complex issue of synergistic effects.

We also know that there are indications that a substantial number of cancers, as well as birth defects and other serious health problems, are related to occupational and environmental exposures to chemical substances. In terms of possible threats to human health and well-being the unanswered questions are not academic ones, but quite personal in their impact on our daily lives.

I believe that with the passage of legislation such as the Toxic Substances Control Act, with new efforts in basic research, and with improved systems of data and information gathering we will be able to strike a balanced, reasoned approach to the problem. Although we do not intend to ignore the possibility of harmful effects from some chemical substances, neither do we intend to go too far in the other direction and indiscriminately paint all chemical substances as suspect. It appears that finding answers to the broad questions that face us lies not in a simplistic, generic approach but rather through an approach which recognizes the specific facts surrounding each substance. I believe that this is precisely the approach which we have chosen.

Arthur C. Upton, M.D.
Director, National Cancer Institute National Cancer Program

Since the recognition of scrotal cancer as an occupational disease of chimney sweeps over 200 years ago, more than 20 chemicals have since been implicated as causing various forms of cancer in other types of workers. Environmental chemicals have also come to be linked with certain forms of cancer in the population at large. These observations, considered in the light of the growing number of new chemicals being introduced into commercial use each year, make it increasingly important to evaluate suspected substances in order to minimize any potential hazards that they may pose.

Although proof that a chemical can cause cancer in humans rests only on the demonstration of such an effect in human beings themselves, the high correlation between carcinogenicity in humans and carcinogenicity in animals makes it possible to utilize animal tests as a means of identifying presumptive carcinogens and thereby instituting prudent safeguards for the protection of human populations. This method for the evaluation of environmental hazards constitutes an essential approach toward the prevention of cancer, which must be reflected in modern public health policy. □

Update

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

AIR

New Rules Proposed For Diesel Autos, Light-duty Trucks

EPA has proposed new standards for the control of particulate exhaust emissions from diesel-fueled cars and light-duty trucks.

The proposed standard would take effect in model year 1981 with a tighter reduction scheduled for 1983 and later model years. The standard for the 1981 and 1982 model years would be 0.6 grams per mile. This would be reduced to 0.2 grams per mile for 1983 and later models.

Douglas M. Costle, EPA Administrator, said, "Diesel cars emit between 30 to 70 times as many particulates as catalyst-equipped gasoline-powered cars. The expected increase in diesel auto production during the next several years would add to the difficulty of cleaning up air pollution in most cities."

Costle also said, "Particulates emitted from diesel cars are small in size and can penetrate deeply into the lungs. We are conducting health effects research to determine if this pollutant can cause cancer. However, the standards being proposed now are not based on any such effect."

EPA Aid For Urban Quality

In a new initiative toward meeting President Carter's goals to revitalize and improve environmental quality in urban America, Administrator Douglas M. Costle has announced changes in the Agency's pollution offset policy to help cities avoid increases in air pollution while attracting business and industry.

Last March President Carter announced proposals for a comprehensive national policy to make America's cities better places in which to live and work, Costle explained. As part of this innovative policy, he said, the President promised that EPA would amend part of its air pollution policy to more easily accommodate new economic development in dirty air areas, while still assuring progress in meeting clean air goals. EPA's recent action addresses that commitment.

The major EPA change would permit localities to "bank" reductions in pollution beyond what is presently required, including reductions which result from firms going out of business, Costle said. These reductions, or clean air credits, could later be transferred to new firms locating in the community. This change would encourage new industry to locate in urban areas.

PESTICIDES

Agency Proposes Use with Limits

EPA has proposed that uses of the pesticide pronamide, marketed as KERB, be allowed to continue as currently used on lettuce, alfalfa, berries, turf, commercial nursery plantings, and sugarbeet seed, but with additional precautions to reduce potential risks to human health.

The risks associated with the use of pronamide were weighed against its benefits in a full-scale review by the Agency before final decisions were proposed. Public review began in May, 1977, based on data showing pronamide caused cancer in mice. This data was confirmed during the review.

To reduce potential risks to the general population from pronamide residues on lettuce, EPA would reduce the amount of residue allowed before it is marketed, said EPA Assistant Administrator Steven D. Jellinek. To reduce potential risk to applicators of pronamide, EPA would require that the use of the pesticide be restricted to trained applicators wearing protective clothing, and that pronamide be marketed only in water soluble packaging to keep down dust emissions when mixing.

Pesticide Proposal

EPA has proposed conditional approval of the new pesticide amitraz for use on pears in the U.S. with certain restrictions to reduce potential risks to human health.

Conditional approval means the use on pears would be allowed for four years pending completion of additional laboratory tests by the manufacturer. Then EPA will consider permanent registration of the pesticide.

EPA's proposal follows a full-scale review of the risks vs. benefits of using amitraz on pears. There is some evidence amitraz may cause tumors in laboratory animals, and, therefore, might present a small risk of cancer to humans. However, the EPA would significantly reduce these risks by imposing certain safeguards.

Specifically, EPA would require application only by trained users wearing protective clothing. To reduce residue levels on the fruit before it is marketed, EPA would require longer periods from the time a crop is sprayed to the time it is harvested.

WATER

Symposium On Estuary Pollution

An international symposium on the effects of nutrient enrichment in estuaries will be held May 29-31 in Williamsburg, Va. The conference is being organized by the Chesapeake Research Consortium and sponsored by EPA. For more information, contact Dr. Bruce J. Neilson, Virginia Institute of Marine Science, Gloucester Point, Va. 23062. Phone: 804-642-2111.

Water Cleanup Seminar

Participants in the Water Pollution Control Federation's 13th annual Government Affairs Seminar will include Thomas C. Jorling, EPA's Assistant Administrator for Water and Waste Management, as well as representatives from other Federal and local government agencies, private industry, and the Federation.

The seminar is set for March 20 at the Mayflower Hotel, Washington, D.C. The topic will be "Actions and Interactions: Toward the Implementation of the Clean Water Act." For further information, contact the Federation at 2626 Pennsylvania Ave., N.W., Washington, D.C. 20037, or call (202) 337-2500.

AGENCY WIDE

EPA Budget Increase

President Carter has proposed for the EPA a fiscal year 1980 budget that increases last year's operating budget by $76.6 million and 247 people.

Under the proposal, the Agency's total budget would be $5.1 billion, $3.8 billion of this for constructing sewage treatment plants, and $1.3 billion for the Agency's operating program. EPA's permanent workforce will grow to 10,945.

"While the total Federal budget for 1980 reflects an overall reduction in Federal employment and a major effort to reduce the annual Federal deficit, the President has increased EPA's operating budget," said EPA Assistant Administrator William Drayton. "The President has once again recognized the growing complexity of environmental and preventive public health problems and demonstrated his commitment to solving them."

The largest increases in the 1980 budget are:

- $44.4 million and 167 people to center on the testing of toxic chemicals and the review of new compounds before they are marketed.
- $37.0 million and 46 people to further research the connection between pollution and human illness.
- $37.3 million in grants to the States for air pollution control, drinking water improvement, hazardous waste control, and consolidating State environmental programs.
- $15 million to extend air pollution controls to new industrial plants, called "new source performance standards," for all major industrial categories by 1982.

Economic Impact Report

The costs of air and pollution cleanup required by Federal legislation will add no more than 0.1 to 0.2 percentage points to the average annual inflation rate over the next eight years, says a new study of the economic effects of pollution controls. It also shows that the unemployment rate will drop an average of 0.2 to 0.3 percentage points during the same period due to the existence of Federal cleanup programs.

These findings are contained in a new study titled "The Macroeconomic Impact of Federal Pollution Control Programs: 1978 Assessment," which was recently released by the EPA and the Council on Environmental Quality. The study does not, however, take into account the many health and other benefits that result to society from cleaning up pollution.

"Over the last year or so government regulation has been subject to withering criticism for its inflationary effects. This study shows that environmental quality programs will add very little to inflation over the next few years, while at the same time reducing the unemployment rate," said Council Chairman Charles Warren.

"This study confirms previous findings that environmental regulations have some positive effects on employment," said EPA Administrator Douglas M. Costle. "Even without taking into account the benefits of regulation, the study shows inflationary impacts that are relatively small. We must continue to be vigilant in reducing the costs of individual regulations, but this study indicates that the total impacts are within reason."

The 51-page report was prepared by Data Resources, Inc., a Cambridge, Mass., firm. It covers the period 1970-1986.

EPA, Agriculture Cooperation Pact

EPA and the U.S. Department of Agriculture recently renewed an agreement to share employees, funds, and facilities to clean up rural waterways, protect important farm and forest land from development, create sound pest control programs, and cooperate in other areas of mutual interest.

Agriculture Secretary Bob Bergland and EPA Administrator Douglas M. Costle have signed a five-year "memorandum of understanding" to pursue "common objectives, interest, and statutory requirements, and to avoid duplication of effort." The new agreement replaces a 1974 cooperative pact. □

Andrew J. Young, Jr., U.S. Ambassador to the United Nations, spoke at the opening ceremony of EPA's Black History Week Celebration. Young told the assembly at the Arena stage that, "Growing up black in the South we had no need for a black history week. We always knew who we were because there was a constant struggle for identity." He noted that in this country, "we have seen progress we never expected possible." Young said that the work of Dr. Martin Luther King, Jr., and the civil rights movement in America gave form and substance to the rising tide of aspirations of people all over the globe. He emphasized that all forms of segregation limit and deprive us, and that the most powerful idea loose in the world is that "all people are somebody." Agency employees heard presentations by numerous speakers throughout the week on the culture, history, and accomplishments of black Americans.

EPA Update News, a taped TV program about Agency activities, is now playing on screens at Headquarters and the Agency's Regional Offices and laboratories. The environmental news format is patterned on employee communication techniques widely used in industry and in Government. The program has been commended by EPA's leadership as an excellent way to inform employees about Agency developments. William F. Gallogly, Chief of the EPA Audiovisual Support Branch and producer of the Update series, has stated that "as long as Update News has the help and support of all employees, it can revolutionize information distribution at the Agency." In the photograph above of the Update News program set are (from left) cameraman Harold Rice, anchorman Scott Berdine, and Gallogly.

William N. Hedeman, Jr.

He is the new Director of EPA's Office of Federal Activities. Hedeman began his career with the U.S. Army Corps of Engineers in 1968 at its Baltimore District following graduation from the University of Maryland School of Law. In 1971, he was nominated by the Corps to participate in its Fellowship Program in Water Resources and Environmental Law, which is sponsored by the Corps in conjunction with the National Law Center, George Washington University. He received a Masters in Environmental Law from George Washington University in 1972 and transferred to the Office of the Chief of Engineers as Counsel for its regulatory programs. In this position, Hedeman served as the principal legal adviser to the Chief of Engineers on the Corps' regulatory programs administered under the River and Harbor Act of 1899 and Section 404 of the Clean Water Act. In 1977, Hedeman became legal adviser to the Chief of Engineers for all of the environmental programs administered by his office.

Hedeman is also a member of the faculty at the National Law Center, George Washington University, where he instructs the course in Water Resources Law. He earned a B.A. degree from Gettysburg College in 1964 and is the author of several articles related to wetlands.

Deputy Administrator Barbara Blum met recently with EPA's Presidential Management interns. They are part of an executive program to attract into Federal service men and women with exceptional potential and training in planning and management of public programs. Panels of Federal, State, and local government officials annually choose 250 interns from over 1,000 graduate students nominated by the Deans of public management or business administration schools across the Nation. Interns receive two-year special appointments to Federal agencies. At the end of the internship they can be converted to permanent employees. As part of the program EPA's interns take supplementary training and project assignments to broaden their knowledge of the functions of the Agency. EPA's interns shown above with Deputy Administrator Blum are (l. to r.) Nancy Ventrone, Kathy Kenworthy, Julie Erickson, Elizabeth LaPointe, Kirk Johnson and Georgia Callahan. Other interns in this program at EPA not in this photo are Doris Sanders, Ed Milch, and Laura Yoshii.

Cancer Report Issued

EPA and three other Federal agencies have joined in issuing a report that describes their scientific approach to deciding whether a compound could cause cancer, and methods for estimating the risk such a substance poses to people. EPA took this step with the Food and Drug Administration, the Consumer Product Safety Commission, and the Occupational Safety and Health Administration to help provide consistent evaluation of carcinogens in foods, consumer goods, workplaces, and the environment. Administrator Costle cautioned that the document, "Scientific Bases for Identifying Potential Carcinogens and Estimating Their Risks," is not a statement of uniform cancer policy. "The regulatory decisions that each agency makes still will be determined by the requirements and flexibility of the agencies' individual statutes," he said. Scientists and the general public will be encouraged to review the report and submit comments. Single copies of the report may be obtained from the Executive Assistant, Interagency Regulatory Liaison Group (IRLG), Room 500, 1111 18th St, NW, Washington, D.C. 20207.

Cleaner Air

EPA Administrator Douglas M. Costle recently released data showing that although America has made significant progress in cleaning up its air from 1972-1977, much remains to be done. Citing figures from a new EPA report, Costle pointed out that from 1972 to 1977:

--Sulfur dioxide levels dropped 17 percent.

--Carbon monoxide levels were cut 20 percent.

--Particulates (smoke and dust) decreased 8 percent, resulting in an estimated 18 million fewer people being exposed to levels violating health standards in 1977 than in 1972.

--Ozone levels showed little change, despite a 30 percent increase in motor vehicle miles traveled. (Ozone is indicative of photochemical oxidants or smog.)

--Nitrogen dioxide levels increased.

While America's air has gotten cleaner, Costle said, "We're still a long way from having healthy air throughout the country. The problem of urban smog is among the most difficult before us." The new report is the National Air Quality, Monitoring and Emissions Trends Report, 1977.

States Served by EPA Regions

Region 1 (Boston)
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
617-223-7210

Region 2 (New York City)
New Jersey, New York, Puerto Rico, Virgin Islands
212-264-2525

Region 3 (Philadelphia)
Delaware, Maryland, Pennsylvania, Virginia, West Virginia, District of Columbia
215-597-9814

Region 4 (Atlanta)
Alabama, Georgia, Florida, Mississippi, North Carolina, South Carolina, Tennessee, Kentucky
404-881-4727

Region 5 (Chicago)
Illinois, Indiana, Ohio, Michigan, Wisconsin, Minnesota
312-353-2000

Region 6 (Dallas)
Arkansas, Louisiana, Oklahoma, Texas, New Mexico
214-767-2600

Region 7 (Kansas City)
Iowa, Kansas, Missouri, Nebraska
816-374-5493

Region 8 (Denver)
Colorado, Utah, Wyoming, Montana, North Dakota, South Dakota
303-837-3895

Region 9 (San Francisco)
Arizona, California, Nevada, Hawaii
415-556-2320

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

REGION 1

Environmental Appointments

Gov. Edward J. King of the Commonwealth of Massachusetts recently made two key environmental appointments.

Named were John A. Bewick, to be Secretary of Environmental Affairs, and Anthony D. Cortese as Commissioner of Environmental Quality Engineering.

In his post Bewick will direct all of Massachusetts' environmental activities such as air, water, and noise pollution control, and solid and hazardous waste management. Prior to his appointment Bewick was with the Cabot Corporation, a land development company, where he was development manager for the firm's energy group. He has served with the U.S. Atomic Energy Commission and the New York City Environmental Protection Administration. He received a B.S. in engineering from Cornell University, and an M.B.A and D.B.A. in managerial economics from the Harvard Graduate School of Business Administration.

Cortese has served since 1976 as Director of the Department's Air and Hazardous Materials Division, where he set policy for and directed air and noise pollution control and solid and hazardous waste programs for the Commonwealth. Before joining the department Cortese was with EPA's Office of Planning and Evaluation in Washington and the Air Branch in Boston. He has also served with the U.S. Public Health Service. Cortese received a B.S. in civil engineering, an M.S. in environmental engineering from Tufts University, and a Ph.D. from the Harvard School of Public Health.

REGION 2

NY Receives Grants

Region 2 has awarded two grants to New York State's Department of Environmental Conservation. Under the Resource Conservation and Recovery Act EPA gave the State $1.7 million to expand and improve the hazardous waste and solid waste management programs in New York. The grant is designed to halt improper disposal of wastes, which could adversely affect groundwater. The second grant was for $9.5 million under the Cleveland-Wright Amendment of the Clean Water Act, which permits the State to have increased responsibility for the construction grants program. Regional Administrator Chris Beck and former NY Dept. of Environmental Conservation Commissioner Peter A. A. Berle had signed a Delegation Agreement, which cleared the last obstacles in the award of funds to finance the State's administration of its own construction grants for a period of two years.

REGION 3

National Steel Penalty Set

The National Steel Corporation has agreed to pay $3.5 million in civil penalties and to take necessary steps to clean up water pollution caused by wastewater discharges at its Weirton, W. Va., facility. The agreement calls for National to install approximately $21.6 million in water pollution control equipment there to improve the water quality of Harmon Creek and the Ohio River. The fine will be held in escrow for one year and some of the money could be returned to the company based on provisions of EPA's Civil Penalty Policy, if National submits additional plans to clean up air and water pollution during that time. Any remaining funds plus interest will go to the U.S. Treasury.

West Penn Agrees to Scrubber

West Penn Power Company agreed to install a scrubber at its Mitchell Generating Station Unit #3 near Monongahela, Pa., to reduce harmful sulfur dioxide emissions from burning coal. The agreement resolves a suit filed by the Justice Department on behalf of EPA in 1977. The scrubber must be installed and operating in compliance by September 21, 1982. The company also agreed to meet more stringent pollution control requirements for 18 months following construction of the scrubber in order to avoid paying civil penalties. During scrubber construction the company will burn lower sulfur coal to minimize sulfur dioxide emissions.

REGION 4

Toxic Cleanup Underway

An Environmental Emergency Response Team from Region 4 recently directed the cleanup of drums of toxic and flammable hazardous waste, which threatened a tributary of the Ohio River near Louisville. During an episode of flooding on the Ohio hundreds of drums containing wastes from chemical and pesticide manufacturing plants were washed from their storage on an open farm field. When flood waters receded the drums were found scattered on the flood plain, caught in trees, and floating in Stump Gap Creek, a tributary of the Ohio. Some drums were oozing chemical wastes onto the ground and into the stream. Kentucky Governor Julian Carroll called on President Carter for Federal assistance, citing the immediate threat to four public water supply wells and a water supply well on the Fort Knox Reservation. EPA responded with $100,000 in emergency clean-up funds. A contract firm removed the drums from the creek and floodplain to higher ground to minimize the threat of contamination to drinking water supplies. The farm where the wastes were stored belongs to the parents of Donald E. Distler, president of Kentucky Liquid Recycling, Inc. Last December Distler was found guilty by a Federal judge of criminally discharging toxics into the Louisville municipal sewer system. During the emergency clean-up workers also discovered at least three other sites where drums containing hazardous wastes were buried just below the surface. One of those sites is owned by Distler. State and EPA officials are working together to determine final remedies for the area. EPA's Response Team continued to monitor drinking water supplies to ensure safety.

REGION 5

Scott Agrees to Fines

Scott Paper Company in Wisconsin agreed recently to pay $1 million in pollution control fines in settlement of numerous civil and criminal violations cited by both Federal and State governments. In addition, Scott has agreed to enter a plea of no contest to 10 criminal violations of the Federal Clean Water Act. In an unusual settlement, the company will place $600,000 of the fine in a trust fund to help restore Wisconsin environmental quality.

Air Pollution Suits Filed

EPA has filed lawsuits against Bethlehem Steel, U.S. Steel, and American Brick, charging them with violations of the particulate regulations of the Clean Air Act. In all the suits the Agency is asking the court to order a clean-up schedule in addition to civil penalties of $25,000 per day. The fines would be retroactive to August, 1977, the effective date of the Clean Air Act. Two coke batteries at Bethlehem's mill in Burn's Harbor, Ind., emit more than 2,200 tons of particulates per year, more than four

times the allowed amount. EPA charges that the level of particles in the area around the U.S. Steel mill in Gary, Ind., has been seriously in excess of national health standards for years. The mill itself is said to emit three times the allowed amount of pollution. American Brick plants in Dolton, Ill., are also in areas that do not meet health standards according to the Agency, and emit more than five times the allowed amount of particles.

I&M Seminar Held

Region 6 sponsored a seminar for Texas State and business leaders in Phoenix, Ariz., on the Inspection and Maintenance program for motor vehicles, which is mandated by the Clean Air Act for areas where the health standard for hydrocarbons cannot be met. The visitors from Texas saw the Arizona program in action and learned how it has gained public support, has been proved cost-effective, and has reduced automobile-related air pollution. The program, which is operated by a private contractor, costs the State nothing and returns part of the fees collected to the State to cover administrative expenses. The inspection fee is $5 and repair costs for vehicles that fail the inspection have averaged $23. Cars 13 years old or older are exempt from the inspection. Regional Administrator Adlene Harrison commented, "Whether the Texas Legislature will pass the necessary I&M legislation is uncertain; but now the officials have the facts on the inspection and maintenance program. They've seen a successful program in action and know that it is an alternative for achieving clean air."

Penalty Proposed

EPA has proposed a civil penalty of $5,000 against the Velsicol Chemical Corporation for alleged violation of the Federal Insecticide, Fungicide, and Rodenticide Act. The Agency alleges that Velsicol added claims and directions for use of the product "Weedmaster Herbicide" that were not covered in the product registration.

Hazardous Spill Creates Ghost Town

Nearly 1,000 residents were evacuated from Sturgeon, Mo., in bitterly cold, early morning hours recently. Shortly before midnight a railroad tank car derailed at the edge of town, ruptured, and spilled 20,000 gallons of chlorophenol, a type of carbolic acid, over a 1,000-yard area before the train came to a stop. Police and firemen went from door to door, advising residents to leave their homes because of a possible health threat. The odor of the chemical is extremely offensive and can cause respiratory problems if there are large concentrations in the atmosphere. It is most dangerous when skin contact is made. The evacuated residents were taken to schools and churches in nearby communities. Employees of a local bus company evacuated a nursing home, carrying the elderly to the buses. The Salvation Army provided hot meals to the evacuated residents and the work crews in Sturgeon. An EPA Emergency Response Team inspected the spill site and determined there was very little danger of the chemical reaching surface or groundwater due to a heavy cover of ice and snow on the ground. The EPA staff set up air sampling equipment to determine if the chemical was concentrated enough in the air to create a hazard. The air samples were returned to the EPA lab in Kansas City, analyzed, and given to a Kansas University Medical Center toxicologist for a medical opinion. Thirty-six hours after Sturgeon residents had left their homes, EPA was able to tell them it was safe to return even though the odor was still objectionable. Emergency response personnel remained on the scene until the clean-up was completed.

Exhibit Emphasizes the Label

An exhibit developed by the Region 8 pesticide program in cooperation with the State Vocational-Agriculture Program told visitors to the National Western Stockshow in Denver recently about the importance of reading the label on pesticide products. The exhibit featured a visual display complemented by a continuous slide-tape presentation. A poster explaining how pesticides affect bees accompanied a demonstration bee hive from the National Bee Research Laboratory in Laramie, Wyo. The exhibit also displayed a teacher's packet complete with puzzles, glossary, and coloring books in Spanish and English on pesticides. Workers at the booth gave away 8,000 balloons reading "Pesticides: Read the Label." Some 60,000 people passed through the building housing the exhibit.

Chemical Misuse Investigated

As a result of recent San Francisco newspaper reports, inspectors from Region 9 have been investigating how the Bay Area Rapid Transit system handles, stores, and disposes of polychlorinated biphenyls (PCB's). The papers said that transit workers were not wearing protective gloves or masks when handling the toxic materials. Reports also alleged that blown-out electrical capacitors from the trains were being shipped uncovered and unlabeled to the Bay Area Rapid Transit yard for cleaning. Wastes containing PCB's were stored in 55-gallon drums, some uncovered and exposed to the elements. One drum had been knocked over and spilled approximately 25 gallons of waste liquid into the soil. The inspectors found additional problems, which they brought to the attention of transit officials. Drums with removable lids and no bung holes were stored outside on a cement slab. The date, nature, or quantity of the contents were not marked on the containers, and no records on their disposition had been developed. Although the soil and water samples taken around the transit yard contained low PCB levels, analysis showed the materials in the drums contained high PCB levels. The Regional Office plans to assess a civil penalty against the Bay Area Rapid Transit system, which is now moving to remedy the situation.

Bunker Hill Shutdown

A lead and zinc smelter complex in Kellogg, Idaho owned by the Bunker Hill Co. shut down during a period of air stagnation in early January, in accordance with its clean air plan. The company chose some time ago to install less stringent emission controls and to cut back operations when air became stagnant, rather than installing more stringent and costly controls that would have allowed it to remain in operation at such times. In this case the stagnant air coincided with a cold spell that froze water pipes and kept the smelter shut down even after winds cleared up the bad air. Congress noted that employees and communities might suffer economic injury because of corporate decisions to choose the supplementary control plan option. As a result, the Clean Air Act Amendments of 1977 required that new State Clean Air plans include a provision that "the owner or operator of such a source may not temporarily reduce the pay of any employee by reason of the use of such supplemental or intermittent or other dispersion-dependent control system." EPA interprets this clause to mean that the new Idaho State Clean Air Plan will include a provision to guarantee that smelter employees will not suffer pay losses if another shutdown becomes necessary after the State plan is approved. □

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Cancer Risk

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reason, we think it is necessary to take all tumor types and lesions into account in evaluating the likelihood that the agent may pose a cancer risk to humans based on the response in animal bioassay tests.

Do you think that the Ames test or certain *in vitro* tests will become more important in relation to animal testing as we get further into risk assessment?

Hopefully. One of the handicaps of long-term animal bioassay tests of course is that the test system is a very complicated one, and the results are sometimes very difficult to interpret. Of course these tests are also very costly to conduct and interpretation requires experts often short in supply. In implementing our various laws, we are necessarily relying on the long-term bioassay testing and there is a concern about the cost as well as the available resources for conducting all the tests necessary to ensure human safety. Obviously there is a good deal of interest in shorter-term tests. To date, I think that the only thing that can be said is that there is increasing knowledge about the correlation between results in the shorter-term tests, for both in vitro and in vivo vs. the longer-term bioassay tests. However, these tests are not regarded as adequate tools for predicting carcinogenicity. These tests best serve, at present, as supportive or suggestive evidence of carcinogenicity and may be very useful in screening and in setting priorities for further testing. However, I think there is hope that over the next five years or so, these tests can become more useful in predicting of carcinogenic effects.

Do we have a problem with animal testing, in that people choose in some cases not to believe that the substances will affect them in the same respect that it will a mouse or hamster?

Yes. This is a very difficult concept and one of the obvious public concerns judging by the correspondence we receive. The basis for using long term bioassay data to predict human carcinogenicity is that, of the 25 or so known human carcinogens, all but one has been shown to respond similarly in rodents. This is obviously a limited body of data; nevertheless, it is extremely difficult to conduct human epidemiology studies. Reliance on animal data is obviously preferable to testing in humans or to regulating only those substances that have been demonstrated to cause cancer in humans. Along these lines, it is important to note that, of those chemicals tested both by the National Cancer Institute as well as those reported in the international literature, only a small percentage have actually caused cancer in animals. Therefore it is clear that not everything causes cancer. I think that somewhere in the neighborhood of 17 to 20 percent of all the chemicals that have been tested have actually shown tumor responses. And this is fairly low considering that the selection of chemicals for this costly testing is biased toward chemicals that might be carcinogens.

Another facet, which is rarely clear, is the matter of degree. Some agents may be weak acting carcinogens, which at low levels may pose a relatively low risk of cancer. But the message that comes across to the public is often in black and white terms, either something causes cancer or it doesn't. That's unfortunate because the probability of any one person getting cancer from exposure to a carcinogen is dependent on a series of factors including individual susceptibility, the levels of exposure, and the carcinogenic strength of the agent. Therefore, the probability of an individual getting cancer from exposure to chemical carcinogens can be reduced by reducing the levels of exposure.

It is hard to get across to the general public that we are dealing with differing levels of probabilities and not absolute certainties when we are talking about an agent being a carcinogen, in the absence of human epidemiology data.

Is there anything that's important about the cancer work we're doing that may need to be called to people's attention?

Yes, the Agency is actually regulating carcinogenic substances under seven major pieces of legislation covering air, water, drinking water, pesticides, solid waste, radiation, and toxic substances.

While the Agency thus far has not articulated an across-the-board policy for the regulation of all carcinogens, largely because our laws are so different, we do have a consistent basis for assessing the risk associated with carcinogens. Also EPA as a whole is concentrating on the evaluation of data for a large number of suspected carcinogens. For example, to date the Carcinogen Assessment Group has reviewed data for 13 air pollutants, 31 pesticides, and 24 water pollutants thought to be carcinogenic. In addition we are completing the review of an additional 43 air pollutants and 30 water pollutants in 1979. Regulatory policy is tending toward the regulation of the greatest health hazards first, to the extent that these can be identified and toward overall reduction in exposure to as many carcinogens as possible. I believe this goal is realistic and is likely to achieve the greatest improvement in public health. The EPA is definitely active in the area of cancer prevention. □

Pollution Hunting in the Great Smokies

Continued from page 28

other three or in case a more extensive analytical examination was required.

Water samples were analyzed at EPA's Environmental Research Laboratory in Athens, Ga.

Of the 10 sampling sites chosen, four were on the north slope (Tennessee side) of the mountain range at various high and low altitudes in mixed hardwood forests. An additional four were on the south slope (North Carolina side) at corresponding elevations and in the same type of vegetation as those on the north exposure.

The final two sites were high elevations, one on a mountain top and one in a naturally cleared area known as a "bald."

All of the sampling areas were at least three miles from the nearest heavily traveled roads.

Although the high altitude air sampling sites were protected with barbed wire, EPA scientists found that a bear cub had gotten through the wire at one location and turned over the batteries and pump. However, even in this overturned position, the equipment continued to function properly for an eight-hour period.

In addition to Dr. Wiersma, members of the science team participating in the Great Smoky Mountains monitoring expeditions were Kenneth Brown and Amy Cross, both of the EPA Environmental Monitoring and Support Laboratory at Las Vegas, Dr. Sue Bratton, a Park Service ecologist stationed at the park, and Don Kilgore, a Park Service seasonal technician.

While the project is being conducted under an interagency agreement with the National Park Service, a number of other organizations are also contributing consultation and analytical support.

Biosphere Reserves such as the Great Smoky Mountains National Park were identified to: provide a permanent record of the natural state of the environment; ensure undisturbed areas from which background data on pollutant levels could be obtained; serve as early warning sites for more dangerous buildups in higher impact areas, and provide repositories for natural sources of genetic pools of animal and plant species.

These reserves will be key units in the Global Environmental Monitoring System now being set up as a result of proposals by the U.N. and several other international groups. □

EPA scientists set up air monitoring device in the Great Smoky Mountains.

Back cover: Early flowering heath, (Erica carnea "Springwood pink"), blooming in the snow at Brookside Gardens in Wheaton, Md.

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