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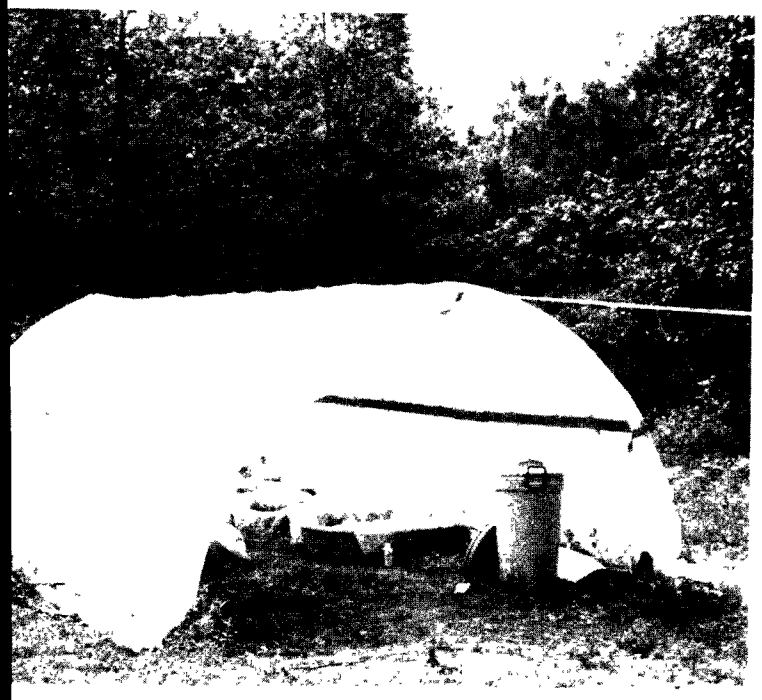
Environmental Research Laboratory - Athens, GA

1993 Highlights



Cover: Biochemical remediation research uses plastic pools at field site to test plant nitroreductase process for cleaning up TNT-contaminated soil.

The U.S. Environmental Protection Agency's Environmental Research Laboratory at Athens, Georgia, conducts and manages basic and applied research to predict, assess, and reduce human and environmental exposures and risks from pollutants in freshwater, marine, and terrestrial ecosystems and the emission of greenhouse gases to the atmosphere.

ERL-Athens researchers identify and characterize the natural biological and chemical processes in soils, surface waters, and sediments that affect the environmental fate of toxic substances, such as solvents, pesticides, or metals. The results are applied in state-of-the-art multimedia models for predicting and assessing exposures and managing environmental pollution problems. A second emphasis involves the development of ecological risk assessment methods to evaluate pollutant stresses on ecosystems such as the Great Lakes, Chesapeake Bay, the Everglades, and large agricultural areas.

Lab-developed fate and process data and assessment techniques provide the scientific basis that supports EPA's environmental management, regulation, and enforcement activities. Major research areas include global climate change, stratospheric ozone depletion, ecological risk assessment, pollution prevention, sediment quality evaluation, computational chemistry, identification of complex organic pollutants, environmental chemistry of metals, nonpoint source pollution management, agroecosystem monitoring and assessment, multimedia nitrogen impacts, bioremediation, biochemical remediation, and wellhead protection. The Center for Exposure Assessment Modeling distributes models and user's guides to environmental managers throughout the world by mail and via electronic bulletin board and Internet.

Rosemarie C. Russo, Ph.D., Director

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The Office of Research and Development (ORD) conducts an integrated program of scientific research and development on the sources, transport and fate processes, monitoring, control, and the assessment of risk and effects of environmental pollutants. These activities are implemented through its headquarters offices, technical support offices, and twelve research laboratories across the country. The research focuses on key scientific and technical issues to generate knowledge supporting sound decisions today, and to anticipate the complex challenges of tomorrow. With a strong and forward-looking research program, less expensive, more effective solutions can be pursued and irreversible damage to the environment can be prevented.

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Program Highlights

Biochemical Remediation Using Plant Enzymes

The transformation of trinitrotoluene (TNT) to environmentally acceptable compounds is achieved through a Lab-developed process that uses common aquatic weeds containing a nitroreductase enzyme. This research breakthrough provides an efficient and inexpensive technology for the cleanup of soils contaminated with munitions waste at military installations and other sites.

Dr. N. Lee Wolfe, research chemist, has a patent pending for the process, which is the first successful use of plant enzymes to remediate sites contaminated with chemicals. The remediation potential of the enzyme system was discovered through basic research at the Athens Lab on the degradation of pollutants in sediments.

Process development, which was partially funded by the Department of Defense's Strategic Environmental Research and Development Program, has occurred over the last 3 years and has involved the contributions of biochemists, analytical chemists, organic chemists, and engineers. The rapid development of the process was made possible by assembling a world class team of scientists and engineers at the Lab as soon as it became evident that the basic research had produced a viable, innovative technology.

Dr. Steven McCutcheon, lead engineer for the team, estimates that their interactive approach has reduced the time from lab bench studies to field demonstration by as much as 5 years. And, in just 3 years, the biochemical remediation process has caught up with other TNT-remediation technologies that have been in development for 10-12 years.

According to Dr. Wolfe, several plants, including stonewort, hornwort, and parrotfeather, possess the nitroreductase enzyme that mediates the cleanup process. In laboratory studies, the plants were successful in remediation of TNT-contaminated soil samples from seven munitions sites. A pilot-scale field study currently underway using parrotfeather shows predicted progress in TNT remediation. Several TNT-contaminated sites in the Southeastern United States are

being considered for an *in situ* remediation study in Spring 1994 to demonstrate the practical application of this remediation technique.

Conventional remediation of munitions waste sites usually involves the incineration of TNT-contaminated soils. Incineration costs about $400 per ton and the resulting ash represents a continuing contamination and disposal problem. The use of composting to degrade these wastes has met with only limited success. Composting involves the use of bacteria to break down the TNT, but these bacteria are difficult to control. Moreover, they do not completely break the TNT down into environmentally benign products.

TNT remediation technique can be applied to solvents and other organics

Biochemical site remediation using the aquatic plant process involves construction of an earthen berm around a TNT-contaminated site to create an artificial, shallow pond. Aquatic weeds would be grown in this pond, allowing the nitroreductase enzymes to attack the nitro group on the TNT molecule, producing triaminotoluene. The weeds also contain a laccase enzyme that rapidly oxidizes the triaminotoluene to harmless compounds.

This remediation process is based on using redox proteins (or the whole plant) to convert contaminants to environmentally acceptable compounds. In general, redox proteins observed to be effective for selected pollutants are isolated from soils or sediments, the proteins are purified and characterized, the monoclonal antibodies are produced, and a field immuno-specific assay is developed to identify the source of the redox protein in the environment. The use of an immunoassy to identify the plants that produce the required enzyme avoids the time-consuming study of potentially thousands of plants to determine which ones work.

In continuing work, the process is being applied to two other munitions, RDX and HMX, and to industrial nitroaromatics, chlorinated solvents, aromatic nitriles, anisoles, and other organic pollutants of soils, sediments, and aquifers. Successful application of the biochemical remediation process to chlorinated solvents would be particularly important. The thousands of sites across the United States that are contaminated with chlorinated solvents are one of the country's most pervasive cleanup problems. Chlorinated solvents are found at almost all problem sites at Department of Defense and Department of Energy installations and at a majority of hazardous waste sites that are being cleaned up under Superfund.

The EPA Lab work is already being extended by collaborating researchers at the University of Idaho, the University of Houston, and

the Georgia Institute of Technology. As articles by Dr. Wolfe and his Lab colleagues appear in the peer- reviewed literature, this exciting science approach to remediation will be quickly applied by other investigators in public and private laboratories, resulting in improved environmental cleanup. *(N.L. Wolfe, 706-546-3429)*

Pesticides in On-Farm Wells

First results are in from the Lab's groundwater quality research project in the Little Coharie Watershed in North Carolina. Relatively high levels of nitrate-N were found in the sampling of 21 research wells and 78 on-farm drinking wells. Only two of the wells had pesticide concentrations (atrazine and metolachlor) that were higher than EPA's Maximum Contaminant Level.

Study compares pesticides data from research wells and on-farm wells

The Little Coharie Watershed is one of the fastest-growing, highest-production agricultural areas in the eastern United States. Agrichemicals applied in these fields can move rapidly into the underlying shallow aquifers.

The continuing study provides data concerning potential exposure to agricultural chemicals and information about the advantages and disadvantages of using existing wells versus new stainless-steel-cased "research" wells designed specifically for monitoring nitrates and pesticides in shallow groundwater. The database developed in the study also will be used to conduct watershed-scale performance testing of exposure assessment and nonpoint source models.

The study is being conducted in cooperation with the North Carolina Cooperative Extension Service, North Carolina State University, the U.S. Department of Agriculture, and the landowners within the Little Coharie Watershed. The monitoring program has received strong cooperation from the landowners. *(C.N. Smith, 706-546-3175)*

Assessing Soil Carbon Policies

The goal of EPA's BIOME Agroecosystems Assessment Project, which is part of the Global Climate Change Research Program, is to evaluate the degree to which agroecosystems can be technically managed, on a sustainable basis, to conserve and sequester carbon, reduce accumulation of atmospheric carbon dioxide, and provide

reference data sets and methodologies for agricultural assessment. Carbon sequestration potential is being estimated through application of integrated methods employing existing soil carbon mass balance models, analysis of agricultural production cycles, and data bases on agroecosystem carbon pools and dynamics.

The Lab's first major BIOME product is a preliminary estimate of carbon sequestration potential for the Central United States. The study area includes the Corn Belt, the Great Lakes, and portions of the Great Plains. About 44% of the land area and 60% of the agricultural cropland of the conterminous United States is represented. The integrated assessment methodology uses the RAMS economic model, the CENTURY soil carbon model, and meteorologic and soils data bases in investigating impacts on soil carbon of current agricultural trends and conditions, alternative tillage practices, use of cover crops, and Conservation Reserve Program policy.

Study results indicate a 26 to 53% increase in soil carbon for the 40-year projection period from 1990 to 2030 under assumptions representing current agricultural trends and alternative policy scenarios. Conservation tillage alternatives and cover crops appear to have significant potential for increased carbon sequestration. Assessment of soil carbon changes on Conservation Reserve land yielded mixed results across the study region with both increases and decreases. The study also identifies refinements needed to improve the assessment methodology and extend it to other regions of the United States. *(L.A. Mulkey, 706-546-3129)*

Conservation tillage alternatives and cover crops appear to have significant potential for increased carbon sequestration

South Florida Ecosystem Restoration

Federal agencies and the state of Florida have launched a massive new effort "to address and solve the myriad issues involved in restoring and maintaining the unique world resources embodied in the South Florida ecosystem." EPA and the Departments of Interior, Commerce, Army, Justice, and Agriculture, along with the Florida Department of Environmental Protection and the South Florida Water Management District are providing expertise to the first coordinated government attempt to promote genuine ecosystem management and restoration.

The ORD lead for the project's Science Working Sub-Group is Dr. Lawrence Burns, a research ecologist at ERL-Athens. The Sub-

Group's initial task is to develop ecological restoration goals for the entire flood control system in South Florida, suggest hydrologic modifications to support those goals, and establish initial criteria for measuring their success.

The thrust of the restoration efforts will be to return the control of the South Florida ecosystem to the natural hydrologic processes that created and maintained the system long before human activities interacted to produce the current crisis. Reliance on natural hydrologic processes is the only sure way to recover the desired ecosystem values. *(L.A. Burns, 706-546-3511)*

Reliance on natural hydrologic processes is the only sure way to recover the desired ecosystem values

Protecting Wells in Agricultural Areas

A new modeling system simulates ground water flow and pesticide-nutrient transport in three-dimensional, variably saturated porous media. The system was developed to implement the assimilative capacity criterion for delineating wellhead protection zones in agricultural regions. The assimilative capacity criterion is considered to be the most accurate basis for delineating wellhead protection zones because it considers the specific nature of potential contaminant sources, the effect of human activities, and the complexity of the groundwater flow system through which contaminants travel. The system's two companion models, 3DFEMWATER and 3DLEWASTE, can be used to establish wellhead protection zones based either on flow criteria alone or on flow and contaminant criteria combined. *(R.F. Carsel, 706-546-3210)*

Improved Pesticide Fate Model

3DFEMWATER and 3DLEWASTE can be used to establish wellhead protection zones

The second version of the Pesticide Root Zone Model (PRZM-2) allows improved assessments of potential risks to groundwater from agricultural chemicals. Other useful applications are to provide guidance for monitoring compliance with conditional pesticide registrations, to develop information for selecting alternative land management practices to reduce leaching, and to evaluate the leaching potential of new chemicals. PRZM-2 simulates the transport and transformation of pesticides through the plant root zone and the unsaturated zone in agricultural areas. Features added to the original 1984 model are soil temperature simulation, volatilization and vapor phase transport in soils, irrigation simulation, microbial transformation, and a method-of-characteristics algorithm to eliminate numeri-

cal dispersion. PRZM-2 is capable of simulating transport and transformation of the parent compound and as many as two daughter products. *(R.F. Carsel, 706-546-3210)*

PATRIOT Assesses Leaching Potential of Pesticides

PRZM-2 simulates the transport and transformation of pesticides

A new model called PATRIOT helps state environmental agencies develop local management plans for pesticides as required by the Federal Insecticide, Fungicide and Rodenticide Act. The Pesticide Assessment Tool for Rating Investigations of Transport permits the rapid analysis of groundwater vulnerability to pesticides on a regional, state, or local basis. To make sound decisions, environmental managers need to understand the potential for pesticides to leach from application sites through the underlying soils' unsaturated zone and into aquifers. Pesticide leaching is highly site-specific, and predicting the expected extent is not a simple task. The tendency of a pesticide to leach to groundwater is determined by the combined factors of climate, pesticide chemodynamics, soil properties, agricultural practices and depth to groundwater. The personal-computer-based PATRIOT software provides all the methods and databases necessary, in a highly user-friendly environment, to analyze pesticide leaching potential anywhere in the conterminous United States. *(R.F. Carsel, 706-546-3210)*

PATRIOT helps develop local management plans for pesticides

Cleanup of Pesticide Contamination

ERL-Athens has launched a research effort to address the problem of soil and water contamination by mixtures of pesticides at sites where agrichemicals are mixed, loaded, and distributed. The Agricultural Retailers Association, as well as others involved in agrichemical manufacture or regulation, are keenly interested in cleaning up these sites. Unfortunately, the needed remediation technologies are not available. Basic research at the laboratory and field levels are needed to support the development of the appropriate technologies.

Through inhouse and extramural research the Laboratory is developing cost-effective technologies. Pesticides of importance are atrazine, alachlor, metolachlor, chlordane, toxaphene, parathion, dicamba,

trifluralin, 2,4-dichlorophenol, dinaseb, simazine, butylate, chlorpyrifos, fonofos, glyphosphate, metribuzine, pendimethlin, and diazinon. The research addresses major information gaps in six important areas: physical and chemical controls, biodegradation process and pathway characterization, contaminant loading rates (based on degradation kinetics), toxic intermediate identification, bioavailability, and extent of degradation. *(J.E. Rogers, 706-546-3592)*

Multimedia Model for Disposal Sites

Through inhouse and extramural research the Lab is developing cost-effective technologies

The MULTIMED model simulates the transport and transformation of contaminants released from a hazardous waste disposal facility into the multimedia environment. Contaminant release to air and soil, including the unsaturated and saturated zones, and possible interception of the subsurface contaminant plume by a surface stream is modeled. The model further simulates contaminant movement in these media to humans and other potentially affected receptors. MULTIMED is intended for general exposure and risk assessments of waste facilities and for analysis of the impacts of engineering and management controls at waste sites. MULTIMED documentation includes an application manual for using the model to characterize Subtitle D landfills. *G.F. Laniak, 706-546-3310)*

Difficult-to-Identify Byproducts in Tapwater

Three ERL-Athens chemists, Dr. Susan Richardson, Dr. Tim Collette, and Mr. Al Thruston, identified more than 40 disinfection byproducts, most of which had not been observed previously, in treated drinking water. The research was conducted in cooperation with the Drinking Water Research Division of EPA's Risk Reduction Engineering Laboratory, which is studying the chlorine dioxide disinfection of drinking water at a pilot plant in Evansville IN. Samples from that plant were analyzed here.

MULTIMED simulates transport and transformation of contaminants released from a hazardous waste disposal facility into the multimedia environment

Chlorine dioxide is being considered as an alternative to chlorine as a disinfectant because it produces lower concentrations of trihalomethanes than chlorine. Our study indicates that other byproducts are also produced at lower concentrations than those produced by chlorine. In the Agency's efforts to reduce the incidence of gastrointestinal infections through improved disinfection, it is essential that the byproducts be identified so their potential health effects can be evaluated. ERL-Athens' unique capabilities in multi-

spectral identification (various mass-spectrometric and molecular spectroscopic techniques) allows the characterization of these difficult-to-identify organic chemicals. *(S.D. Richardson, 706-546-3199)*

ERL-Athens' unique capabilities in multispectral identification allows the characterization of difficult-to-identify organic chemicals

New Method for Monitoring Textile Dyes

Dr. Susan Richardson, Mr. Al Thruston, Dr. John McGuire, and Dr. Eric Weber have developed new structural information about reactive textile dyes and information about how the dyes fragment to produce a characteristic mass spectrum. The latter development may lead to methodology to identify the dyes in complex waste streams. Application of negative ion liquid secondary ion mass spectrometry/tandem mass spectrometry to Reactive Blue 19 and its reactive and hydrolyzed forms revealed ions due to the loss of sulfur dioxide for all three dyes. Fragment ions, therefore, could be useful in screening sulfonated reactive dyes in complex environmental mixtures. Reactive dyes constitute one of the fastest growing groups of commercial dyes in use today. In 1985, 12% of the dyes marketed were reactive dyes. Unfortunately, reactive dyes are resistant to traditional water treatment methods, and because they are electrophilic, there is concern about their possible ecotoxicity and mutagenicity. *(S.D. Richardson, 706-546-3199)*

New structural information may lead to methodology to identify dyes in complex waste streams

Fate Constants for EPA's Hazardous Waste Identification Projects

The most comprehensive and reliable information ever assembled for assessing chemical persistence and the potential of chemicals to migrate in the aquatic and subsurface environment is now available. Approximately 200 organic chemicals are being considered as compounds to be regulated under Section 301 of the Resource Conservation and Recovery Act. The new information base lists each of 202 parent compounds by its common name and most widely used synonyms and Chemical Abstracts Services Number. Sorption values are listed as octanol-water partition coefficients and carbon-adjusted octanol-water partition coefficients; second order chemical hydrolysis rates are provided for acid, base, and neutral hydrolysis.

The potential application of this information (and other data being developed) is likely to extend far beyond the RCRA regulations. As EPA moves toward comprehensive assessment of risks so that it can focus on the most important risks first, it must be able to address rapidly and reliably the literally thousands of chemicals that are not currently regulated but that are present in the environments to which humans and critical ecosystems are exposed every day. This information base will be a major support for the assessment process. Comprehensive risk assessment holds promise of averting thousands of premature deaths annually and of saving hundreds of billions of dollars over the course of a decade by addressing the truly significant risks and enhancing the preservation of important ecosystems.

Comprehensive risk assessment holds promise of averting thousands of premature deaths annually and of saving hundreds of billions of dollars by addressing risks and enhancing the preservation of ecosystems

The information was assembled by the Lab's Pathway Analysis Team--Mr. Heinz Kollig, Dr. Jackson Ellington, Dr. Sam Karickhoff, Ms. Brenda Kitchens, Dr. Mac Long, Dr. Eric Weber, and Dr. Lee Wolfe. The Team's work began with an analysis of theoretical considerations that help to identify likely transformation processes and products on the basis of chemical structure. Next, the transformation rates and equilibrium constants are arrived at by considering measured values from the literature, applying computational chemistry methods, postulating values from chemical structure, and making laboratory measurements of important parameters. *(H.P. Kollig, 706-546-3198)*

Version 10 of HSPF

A new release of HSPF, the widely used model for simulating various water quantity and quality processes, is available for distribution. The Hydrological Simulation Program--FORTRAN is a set of computer codes that can simulate the hydrologic, and associated water quality, processes on pervious and impervious land surfaces and in streams and well-mixed impoundments. Release 10 of HSPF incorporates code modifications and corrections to earlier versions and documents selected algorithm enhancements. *(T.O. Barnwell, 706-546-3180)*

Lab Work Adopted as RCRA Methods

Two techniques for analyzing soil samples for organic chemicals developed by Dr. Jackson Ellington and Dr. Tim Collette have been adopted by EPA's Office of Solid Waste to meet requirements of the Resource Conservation and Recovery Act. The methods are 8145 Qualitative Analysis of Alkyl Phosphates Using Automated Cool On-

column Injection and 8430 Identification of Bis(2-chloroethyl) Ether Hydrolysis Products by Direct Aqueous Injection GC/FT-IR. *(J.J. Ellington, 706-546-3197)*

HSPF simulates various water quantity and quality processes

Water Quality and the Hydrologist

Two Lab Engineers have contributed to a new standard reference for the practicing hydrologist and others interested in the science of the earth's waters. Dr. Steve McCutcheon and Mr. Tom Barnwell addressed the topic of water quality for *Handbook of Hydrology*, published by McGraw-Hill. Their chapter covers the basic concepts of water chemistry, the physical properties of water, and the constituents and impurities of water. To aid in the interpretation of measurements, water quality standards and criteria for various uses are presented. The information should be of interest to those who are planning for and adapting to limitations on the use of water as well as those who are protecting valuable water resources. *(S.C. McCutcheon, 706-546-3301)*

SPARC Manual Developed

A user manual for the prototype version of the chemical properties program of SPARC is now available. SPARC (SPARC Performs Automated Reasoning in Chemistry) is an expert system developed by ERL-Athens for the estimation of chemical and physical reactivity. Its computational algorithms are based on considerations of molecular structure that are arrived at using the reasoning process that a chemist might undertake in evaluating reactivity. This approach allows for a broad range of reactivity parameters--pKa's, equilibrium and rate constants, sunlight absorption spectrum, or any parameter that depends on molecular structure. *(S. W. Karickhoff, 706-546-3349)*

CEAM Activities

The Center for Exposure Assessment Modeling distributed 4852 copies of CEAM-supported models to requesters throughout the world during 1993. Models were distributed by diskette, downloading from the electronic bulletin board, or over Internet. CEAM also assisted EPA Regional Offices and Program Offices, and State environmental agencies. Major assistance efforts involved the Nyanza Superfund Site (Region 1), the Everglades (Region 4), Clear Lake

Superfund Site (Region 9), South San Francisco Bay (Region 9), mercury risk (Office of Air and Radiation), and the States of North Carolina and Florida. *(D.C. Bouchard, 706-546-3130)*

23rd Chemistry Symposium

The 23rd International Symposium on Environmental Analytical Chemistry, held in May 1993 at Jekyll Island GA, focused on recent advances in analytical chemistry applicable to environmental studies. In the 3-day meeting cosponsored by EPA, invited speakers in government, industry, and university laboratories presented 19 papers on the latest developments in the analysis of organic and inorganic pollutants as well as research to define the mechanisms of chemical transformations and to improve measurement of equilibrium and kinetic constants. The plenary theme for the symposium was "Waste Incineration." Plenary lecturers were Professor Dwight R. Lee, Department of Economics, University of Georgia; Dr. Steven P. Bayard, Office of Research and Development, EPA; and Dr. Gio Gori, The Health Policy Center, Bethesda MD. Approximately 150 scientists attended the symposium, which is sponsored by EPA, the University of Georgia, the American Chemical Society, and the International Association of Environmental Analytical Chemistry. A workshop on Metal Speciation and Contamination of Aquatic Sediments was held in conjunction with the symposium. *(W.T. Donaldson, 706-546-3183)*

Center for Exposure Assessment Modeling distributed 4852 copies of CEAM-supported models to requestors throughout the world

Lab Sets Research Teams

Six Research Teams were established in May to address the Lab's Research Issues. The issues are (a) Global Climate, (b) Stratospheric Ozone, (c) Human Exposure, (d) Groundwater, (e) Drinking Water, (f) Ecological Risk Assessment, (g) Contaminated Sediments, (h) Large Lakes and Rivers, (i) Bioremediation, (j) Environmental Review of New Chemicals, (k) Nonpoint Sources, and (l) Pollution Prevention. Teams and their leaders are: Global Climate (a and b), Mr. Lee Mulkey; Bioremediation (i), Dr. John Rogers; Ecological Risk (f, g and h), Dr. Lawrence Burns; Nonpoint Sources (k and l), Mr. Robert Carsel; Human Exposure (c, d and e), Mr. Lee Mulkey; and Environmental Review of New Chemicals (j), Dr. Samuel Karickhoff. *(R.C. Ryans, 706-546-3306)*

LAB, CAU Set Joint Program

Through a Memorandum of Understanding signed in January, ERL-Athens and Clark Atlanta University have established a cooperative program to enhance the education and training of students and to assist EPA in achieving its mission of environmental protection. The Memorandum was signed by Dr. Thomas W. Cole, Jr., President of Clark Atlanta University, and Dr. Rosemarie C. Russo, Lab Director. The collaborative program includes joint research projects, research participation (visits, sabbaticals, etc., by faculty, staff, and students), student internships, mutual access to facilities and instrumentation, technical assistance through consultations and workshops, staff appointments (adjunct faculty and visiting scientists), and guest lectures and instruction.

Significant positive effects are expected in three areas: the quality of science and technical education; the relevance of Clark Atlanta University research to EPA's environmental mission; and the number of African Americans and other minority students electing to pursue graduate study and research careers in science, engineering, environmental policy, and economics. It is anticipated that Clark Atlanta University's capacity to develop contributors to environmental fields will be significantly enhanced while important contributions are made to EPA's overall research and development programs. *(W.C. Steen, 706-546-3103)*

Lifespan Center Opens

Approximately 60 persons attended the Grand Opening and Ribbon Cutting in August for the new Lifespan Center, a child development center provided by EPA to the Athens area Federal agencies and the community. The Lifespan Center, located at the EPA Laboratory, provides quality daycare for families, emphasizing a nurturing environment and featuring an environmentally focused educational curriculum. Classes for infants, toddlers, and pre-school children are managed by the Athens Montessori School, under an EPA license agreement. The facility allows the Athens area Federal community to join the small number of Federal locations across the country that offer quality daycare for their employees' children. *(S.L. Bird, 706-546-3476)*

Lab Doubles CFC Goal

Proving they can "give where it helps," Lab staff contributed $8253 to the 1993 Combined Federal Campaign. This overwhelming response reached 209% of the goal for the Lab. Contributions were received from 60% of the staff (47 of 76). Lab Director Dr. Rosemarie Russo was Chairperson for the Athens area CFC and Mr. Paul Smith served as coordinator. The campaign resulted in donations of $73,387 from 17 Athens agencies to the annual charity drive. *(R.C. Ryans, 706-546-3306)*

The Lifespan Center provides quality daycare, emphasizing a nurturing environment and featuring an environmentally focused educational curriculum

Boy Scout Jamboree

Ms. Kate McDaniel, the Lab's Environmental Education Program Manager, organized and presented environmental displays at the Quadrennial Boy Scout Jamboree in August at Ft. A.P. Hill VA. Other EPA displays were from ERL-Narragansett, ERL-Duluth, Breidenbach Research Center, Office of Water, and Office of Air and Radiation. *(V.K. McDaniel, 706-546-3524)*

Teacher Workshop at Lab

Twenty-four high school teachers representing school districts across Georgia participated in a 7-day workshop in July at ERL-Athens entitled "Environmental Science in the Classroom As It Relates to the Community." The workshop, now in its third year, is sponsored by EPA and the American Chemical Society and is coordinated by Ms. Kate McDaniel, the Lab's Environmental Education Program Manager. High school teachers who are certified by the ACS presented the course. The teachers enhanced their capabilities for teaching science in the high school classroom and for motivating more of their students to pursue careers in science as related to the environment. *(V.K. McDaniel, 706-546-3524)*

STAFF HONORS AND AWARDS

Barnwell Named EPA's Engineer of Year

Mr. Thomas O. Barnwell, Jr., research civil engineer, was named EPA's Engineer of the Year for 1994. The award recognizes Mr. Barnwell's contributions since he joined the Agency in 1971 and, in particular, his recent activities in developing pollutant fate models, providing technical assistance in water quality modeling for EPA and state environmental agencies, and coordinating soil carbon research in global climate change studies.

Mr. Barnwell participates in the activities of several professional engineering groups, including the American Society of Civil Engineers (ASCE) and the International Association for Water Quality (IAWQ). He is secretary of the IAWQ's Specialist Group on Systems Analysis and Computing and a member of the executive committee of ASCE's Technical Council on Computer Practices.

He began his EPA career as a sanitary engineer on the Surveillance and Analysis Division staff of Region 4 after receiving his Masters in Environmental Systems Engineering from Clemson University. He joined ERL-Athens in 1977.

Mr. Barnwell is the third ERL-Athens engineer to be awarded the annual honor from EPA. The other honorees were Mr. Robert Ambrose (1989) and Mr. Steve McCutcheon (1991).

Barnwell, Jackson Win Science Award

EPA's Scientific and Technical Careers Advisory Committee selected Mr. Thomas O. Barnwell, Jr., and Mr. Robert B. Jackson, IV, as winners of the 1993 EPA Science Achievement Award in Earth Sciences. The award was presented "for creative and innovative application of simulation models and use of data bases in developing estimates of the carbon sequestration potential of agricultural land in the Central United States." Each year, as part of the EPA Honors Awards Program, Agency scientists and engineers are recognized for outstanding contributions in several scientific-technical fields.

Lab Articles Win Awards

Three journal articles by Lab staff were recognized in the Office of Research and Development's 1992 Scientific and Technological Achievement Awards competition. Mr. Robert Jackson was honored for "On Estimating Agriculture's Net Contribution to Atmospheric Carbon." Dr. Samuel Karickhoff and Ms. Kate McDaniel were recognized for "Predicting Chemical Reactivity by Computer." Dr. Richard Zepp was honored for "Hydroxyl Radical Formation in Aqueous Reactions (pH 3-8) of Iron(II) with Hydrogen Peroxide: The Photo-Fenton Reaction." Each article was recognized with a Level III award, which consists of a certificate and a monetary award.

The STA Awards are granted by ORD upon the recommendation of the Science Advisory Board. In the 1992 competition, the SAB reviewed 137 submissions and selected 39 for award.

Journal articles by Lab staff were recognized in ORD's 1992 Scientific and Technological Achievement Awards competition

Lewis Wins Sigma Xi Award

Dr. David Lewis, research microbiologist, won the 1993 research award given by the University of Georgia Chapter of Sigma Xi. The winning paper was "Cross-infection Risks Associated with Current Procedures Using High-speed Dental Handpieces" (*J. Clinical Microbiology*). Dr. Lewis' work on contamination of dental handpieces was carried out totally separate from his EPA duties. The work prompted national and state dental associations, as well as the Centers for Disease Control and the Food and Drug Administration, to issue new guidelines for heat sterilizing the dental devices.

Russo Chairs Sci-Tech Careers Committee

Dr. Rosemarie Russo, Laboratory Director, was elected Chair of the Agency's Scientific and Careers Advisory Committee. The Committee was established in 1985 to advise the Administrator, Deputy Administrator, and Office of Human Resources Management on improving the quality of work life of EPA's scientific and technical staff. The Committee also provides advice on incorporating the latest scientific and technical information and methods into the Agency's work.

Sci-Tech provides advice on incorporating the latest scientific and technical information and methods into the Agency's work

Lewis Elected Sigma Xi President

Dr. David Lewis, research microbiologist, was elected president of the University of Georgia Chapter of Sigma Xi. The honor society of Sigma Xi was formed in 1886 for scientists and engineers as a counterpart to Phi Beta Kappa, which was organized for the humanities. Its purpose is to reward excellence in scientific research and to encourage a sense of cooperation and companionship among scientists in all fields. The UGA Chapter has approximately 400 members.

Symposium in China

The Third Biennial International Symposium on Fish Physiology, Toxicology, and Water Quality Management was held on November 3-5, 1993, in Nanjing, People's Republic of China. Along with EPA, the official sponsors of the symposium are the PRC National Environmental Protection Agency, PRC National Science Foundation, EPA of Jiangsu Province, Nanjing University, Nanjing Institute of Environmental Sciences, PRC Research Institute of of Eco-Environmental Sciences, and the University of British Columbia.

NEW PERSONNEL AND ACTIVITIES

Holm Heads Chemistry Branch

Dr. Harvey W. Holm accepted permanent appointment as Chief of the Chemistry Branch. Dr. Holm returned to the Lab in August from EPA's Hatfield Marine Science Center in Newport OR where he served as the new facility's first director. He left ERL-Athens in 1988 to serve as Acting Deputy Director of ERL-Narragansett. He takes over from Dr. Wayne Garrison, who elected to continue research begun during a research detail at the Institute for Ecological Chemistry of the GSF, Munich, Germany.

New ADP Coordinator

Mr. Thomas L. Prather, Computer Systems Analyst, joined the Laboratory staff as the Automatic Data Processing Coordinator. Mr. Prather holds a Masters in Business Data Processing and has extensive experience in VAX, PC, and LAN systems and in database management.

International Visitors

Ms. Kati Mattern, a program manager at the Federal Environmental Agency of Germany in Berlin, spent 3 months at the Lab investigating our geographic-information-system-based ecosystem modeling approach for potential application in Germany. Ms. Pilar Hernandez Hernandez of the University of Alicante spent 3 months at the Lab developing and testing water quality simulation models for reservoirs. The Lab also hosted brief (day-long) visits by scientists-engineers from Spain, Nigeria, Japan, Gabon, Senegal, Chad, Morocco, South Africa, China, Czech Republic, The Netherlands, Canada, and Argentina.

New NRC Associates

Ten scientists began joint research at the Laboratory under the National Research Council Associates Program. Dr. Mary Bergs is modeling the transport of fine sediments and the flux of related benthic contaminants. Dr. Michael Elovitz is examining the covalent binding of aromatic amines to natural organic matter. Dr. Huamin Gan is studying the redox transformation of chromium in soils and sediment. Dr. Rex Kerstatter is investigating pollutant transformation and the role of plant peroxidases in soil carbon cycling. Dr. Valentine Nzengung is researching the use of enzymes to degrade chlorinated hydrocarbons. Dr. Yuri Plis is developing a model of the effects of combined nutrient and toxicant concentrations on natural population dynamics in lakes. Dr. Sergey Schevchenko is examining the structure, morphology, and reactivity of humic substances. Dr. Dayton Wilde is investigating the development of trans-genetic plants for the bioreduction of heavy metals. Dr. Tien-Shuenn Wu is working to

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integrate 3-D hydrodynamic models, water quality models, and sediment models to improve surface water simulation techniques. Dr. Xiaoming Zhang is performing research to characterize microorganisms in enrichment cultures capable of para-dechlorination of chlorophenols.

Bailey Leads Soils Sessions

Dr. George Bailey, research soil scientist, had a leading role at the 85th Annual Meeting in November of the American Society of Agronomy, the Crop Science Society of America, and the Soil Science Society of America. Dr. Bailey, who served as chairman of the Soil Chemistry Division for 1993, organized three symposia and the Division's program of 149 presentations, chaired several sessions, and co-presided over the Surface and Colloid Chemistry Working Group

Zepp, Lassiter at Global Change Workshop

Dr. Richard Zepp, research chemist, and Dr. Ray Lassiter, research microbiologist, participated in the Dahlen Workshop on the Role of Non-living Organic matter in the Earth's Carbon Cycle that was held in September in Berlin, Germany. The workshop participants focused on devising experimental and modeling strategies for assessment of the sensitivity of the global carbon cycle to changes in non-living organic pools.

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