Briefing Book

1998

The Institute of Environmental and Human Health

- Texas Tech University
- Texas Tech University Health Sciences Center

Briefing Book

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THE INSTITUTE OF ENVIRONMENTAL AND HUMAN HEALTH
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Education: training the outstanding environmental and human health specialists of tomorrow

TIEHH provides multidisciplinary graduate and undergraduate education in environmental toxicology to students from all over the United States and around the world. TIEHH is currently offering graduate education to over 30 students in terrestrial toxicology, biochemical toxicology, aquatic toxicology and environmental modeling. Each student actively participates in research conducted both nationally and internationally. This experience for environmental toxicology students becomes extremely important to their future career success as a representative of a corporation or government agency or possibly as a university professor.

TIEHH's previous graduates have gained employment with companies such as:

- American Cyanamid Company
- Dow Agrosciences
- DuPont Agricultural Products
- Procter and Gamble
- Novartis Crop Protection

TIEHH's graduates have also gained employment with government agencies such as:

- Texas Natural Resource Conservation Commission (TNRCC)
- United States Fish and Wildlife Service
- United States Army Corp. of Engineers
- United States Environmental Protection Agency

Finally, TIEHH graduates have attained employment in universities and colleges as professors

Research: increasing the body of knowledge to solve environmental and human health problems

TIEHH's research, tied together with education, stands as a major focus. Currently, the faculty and graduate students are working on projects both nationally and internationally. In Kentucky, TIEHH graduate students are studying the toxic chemical impacts on raccoons from exposure to polychlorinated biphenyls (industrial chemicals that are used as insulation in transformers and other electrical equipment), or PCBs. In Iowa, research has been conducted on the effects of reduced habitat on the Northern Bobwhite Quail due to expansion farming. In addition, TIEHH is currently conducting research in Central America (Belize), related to the consequences endocrine disrupting chemicals, or EDCs, pose for endangered crocodile populations. These research efforts lead to an enhanced body of knowledge that in turn leads to improved environmental policies and an improved quality of life for people.

Joint ventures with industry and government: building "win-win" partnerships

TIEHH aims to develop and enhance education, new technology, monitoring systems and risk assessment approaches through joint ventures with industry and state/federal government agencies. These joint ventures lead to greater knowledge concerning toxic chemical substances and the effects these substances pose for human beings as well as the environment. The outcomes of these joint ventures enable corporate executives, environmental managers, public administrators as well as legislators and national government officials to make better decisions related to environment and human health issues. Over the years, TIEHH faculty have formed partnerships with corporate and governmental entities such as:

- Dow AgroSciences (Indianapolis, Indiana)
- Ecorisk (Ferndale, Washington)
- Monsanto Chemical (St. Louis, Missouri)
- National Institute of Environmental Health Sciences (Washington, DC)
- United States Agency for International Development (Washington, DC)
- United States Air Force-Brooks Air Force Base (San Antonio, Texas), Human Systems Center

These partnerships increase the body of knowledge related to environmental and human health problems so that effective solutions to these problems can be developed and implemented.

The outcome from TIEHH's focus upon education, research and joint ventures results in a "win-win" situation for all parties involved in the process. TIEHH plans to continue its efforts to pursue an aggressive research agenda and to train outstanding environmental and human health specialists. The combination of education, research and joint ventures provides the guiding focus for Texas Tech's The Institute of Environmental and Human Health.

As a research and educational institution, some of TIEHH objectives include:

- To provide multidisciplinary graduate and undergraduate education in environmental science, toxicology and environmental health
- To stimulate collaborative teams of researchers to develop sound technologies and implement high quality science and technology in the interface of the environment, human health, economics, law and policy
- To develop and enhance education, new technology, monitoring Systems and risk assessment approaches through joint ventures with industry, state and federal agencies
- To develop, enhance, and standardize diagnostic procedures, including biomarkers of exposure and effect
- To assess the health effects of environmental contaminants
- To utilize analytical methodologies to quantify chemicals in environmental compartments including water, soil, air, blood, tissue, urine, etc.
- To build upon population-based epidemiology studies in both humans and wildlife to define both exposure and effect in environmental risk assessments
- To identify and evaluate medical interventions designed to prevent, ameliorate or eliminate adverse health effects from environmental exposures
- To develop innovative approaches for the use of wildlife as sentinels and predictor of human health effects
- To enhance cost-effective approaches to quantify "how clean is clean enough" to support toxic remediation and management
- To develop and evaluate personal protective equipment designed for protection against inhalation or dermal exposure to environmental toxins

TIEHH's Divisions/Sections

The multi-disciplinary program implemented through TIEHH studies the impacts of toxic chemicals on the environment and educates outstanding students in the process. TIEHH's environmental toxicology research team interfaces with faculty from Texas Tech University and Texas Tech Health Sciences Center, including biological sciences, medicine, epidemiology, engineering, chemistry, computer sciences, mathematics, law, range/wildlife/fisheries management, pharmacology and physiology to enhance multi-disciplinary faculty participation in environmental toxicology research.

Environmental health and toxicology

is comprised of four sections: Analytical and Biochemical Toxicology, Terrestrial Toxicology, Aquatic Toxicology, and Ecological Modeling and Geographic Information Systems. The division determines the impact of toxic chemicals on terrestrial and aquatic wildlife, as well as on human health. Each of the four subdivisions maintains a separate set of objectives in advancing its research and educational goals.

Analytical and biochemical toxicology

Section Leader, George Cobb, Ph.D.
Assistant Section Leader, Todd Anderson, Ph.D.

- To integrate new methods of chemical and biochemical analysis into ecological risk assessment processes
- To provide chemical and biochemical analysis for ongoing research initiatives
- To develop new methods to evaluate trophic movement and effects of environmental chemicals
- To verify chemical removal accomplished by biological and mechanical remediation
- To develop biomarkers indicative of chemical exposure for use in site assessment

Aquatic toxicology

Section Leader, Thomas La Point, Ph.D.

- To understand contaminant effects on freshwater aquatic communities, specifically linkages among fisheries and benthic invertebrate population dynamics as influenced by anthropogenic perturbations
- To assess how chemical pollutants are distributed throughout, and bioaccumulate in, biological communities and how such chemical perturbations modify community structure and function
- To combine laboratory and field experiments using pollutants as "probes" to shed light on fundamental population dynamics (e.g., mortality, fecundity, survivorship) and population behavior (predation, competition, etc.)

Environmental modeling/geographic information systems

Section Leader, Kenneth Dixon, Ph.D.

- To develop novel methods that integrate simulation models with geographic information systems in order to predict effects of toxic compounds on environmental and human health
- To apply computer simulation and mathematical modeling tools to enhance environmental decisions

Terrestrial Toxicology

Section Leader, Scott McMurry, Ph.D.

- To integrate field-and laboratory-based research methods in environmental toxicology
- To provide state-of-the-art approaches to Ecological Risk Assessments of contaminated sites through integration of analytical chemistry, behavioral and biochemistry toxicology, ecological modeling and quality assurance
- To assess individual, population and community level effects of contaminant exposure on plants and animals living on contaminated sites

- To assess trophic level movement of contaminants in animal communities and ecosystems

Environmental law and policy

Frank Skillern, J.D., L.L.B.;
Todd Anderson, Ph.D.

This division provides Texas Tech University law students, as well as other Texas Tech students, the opportunity to work actively with the legal and public policy issues surrounding the environment and human health. The Environmental Law and Policy section of TIEHH will implement training of law students as a major initiative. This division will work actively with the Texas Tech University School of Law to produce outstanding environmental law and policy specialists. In addition, efforts are currently underway to establish a joint J.D./M.S. degree in law and Environmental Toxicology.

Objective

- To implement good environmental toxicology and health studies in a risk-based context to support sound environmental law and policy implementation

Human health sciences

Ernest Smith, Ph.D.

In collaboration with Texas Tech University Health Sciences Center, the Human Health Sciences division will help train medical students and physicians to identify the symptoms associated with toxic chemical exposures and to remediate exposures in adults and children.

Objectives

- To use of wildlife as sentinels of human exposure to toxic substances
- To study of symptomologies of human exposure to toxic substances as evidence by wildlife and human food chain contaminants
- To train for physicians with unique capabilities to detect and to resolve toxic exposure in adults and children
- To provide M.D./Ph.D. degree programs that train physicians to identify symptomologies and remediate chemical toxicosis in adults and children

Research management and quality assurance

Division Leader, Catherine Bens, M.S.

Research Management and Quality Assurance provides support services designed to assist individuals or organizations in developing a Quality Management Program based on quality assurance/quality control principles and practices, especially with respect to regulatory requirements and standards such as the Good Laboratory Practice Guidelines (40 CFT Part 160), ANSI/ASQC E-4 and U.S. Department of Energy Orders such as 5600-6C.

The Quality Assurance Unit conducts independent inspections of facilities, personnel training systems, equipment calibration and maintenance, study procedures, protocols, and reports. Research Management and Quality Assurance assists in the design and implementing a Quality System including Standard Operating Procedures (SOPs), Quality Assurance Manual, Equipment Maintenance Schedules and other quality management tools.

Quality Assurance also assists in the design and implementation of project-specific Quality Management Plans, which include Protocols, Task Project Plans, Sample Collection Plans, Quality Assurance Plans, Data Quality Objectives, SOPs, Data Collection Forms and Safety Plans.

The section monitors projects by inspecting studies at intervals to ensure the integrity of the study and to determine that there are no deviations to the protocol or SOPs without proper authorization. Furthermore, Quality Assurance suggests correct action and provides written reports as needed, inspects the data, reviews final reports and archives files for completeness and accuracy.

The division also offers significant support in the areas of:

- Proposal development and coordination (pre-award)
- Grant business management, purchasing, payroll and budget management (post award)

Objectives

- To bring sound business and quality skills that ensure process reliability in scientific activities
- To provide training on the principles and practices of quality management, quality control and other specialized topics
- To assist in defining wildlife collection permits and other regulatory compliance needs
- To assist in the identification and preparation of grant application packages
- To provide sound business support services to enhance pre-award and post-award activities including project development, project management, contract review, budget development, purchasing, personnel and accounting services
- To ensure reliability and research quality
- To assist in providing increased funding opportunities and increased student job opportunities

Communications and outreach

John Gooch-Staff Support for Communications and Outreach

This area relates research findings and new knowledge concerning toxic chemicals' effects on both human and environmental health to scientists, physicians, state/federal regulatory authorities, industry and the general public through informative brochures, the *On the Move* newsletter as well as the TIEHH World Wide Web site.

Objective

- To communicate research findings and new knowledge about the effects of toxic chemicals on human and environmental health to scientists, physicians, state/federal regulatory authorities, industry and the public

Faculty/Graduate Student Research

TIEHH faculty and graduate students are engaged in collaborative research projects that focus on environmental and human health problems all over the world. During 1997-98, TIEHH faculty and graduate students conducted research in Iowa, Alabama, and Kentucky as well as the Central American country of Belize.

Raccoon study at the Paducah Gaseous Diffusion Plant

A project to study the effects of industrial waste products on raccoons was awarded by the United States Department of Energy (DOE) and Lockheed Martin to researchers at TIEHH in 1997. Researchers include the Principal Investigator, Dr. Scott T. McMurry (Section Leader-Terrestrial Toxicology), Project Manager, Mr. Phil Smith (Graduate Research Assistant - Terrestrial Toxicology), and Co-Investigator, Dr. Todd Anderson (Assistant Section Leader - Analytical and Biochemical Toxicology). The purpose of the study is to examine the effects of polychlorinated biphenyls, or PCBs (industrial chemicals that are used as insulation in transformers and other electrical equipment), and heavy metals on raccoons at the Paducah Gaseous Diffusion Plant and DOE property, which is surrounded by the West Kentucky Wildlife Management Area west of Paducah, Kentucky near Kevil, Kentucky.

Researchers chose raccoons as the sentinel species based on a number of criteria deemed important by both the researchers and sponsors. The study requires capturing raccoons, sampling tissues for residues and biomarker analysis and monitoring habitat use on the site. Two additional one-year options for continuance were included in the initial contract.

This study stems from previous work completed by Dr. McMurry and Mr. Smith in which elevated concentrations of PCBs and metals were discovered in tissues of rodents inhabiting the area surrounding the Paducah Gaseous Diffusion Plant (PGDP). Kentucky state officials previously had conducted sampling and concluded that red-tailed hawks and bobcats possibly were being exposed to PCBs present on the PGDP property and the surrounding wildlife refuge. DOE and Lockheed Martin officials have become concerned that contaminants may be accumulating up food chains resulting in detrimental effects to organisms. The study is intended to determine if contaminants present at this site are affecting reproduction, population levels and normal physiological functions of raccoons.

The field research continued through July 1998 and laboratory components of the study will proceed throughout the remainder of the year. In addition to Mr. Smith, Dr. Anderson, and Dr. McMurry, other TIEHH collaborators on the project include Dr. George P. Cobb (Section Leader - Analytical and Biochemical Toxicology), Dr. Michael J. Hooper (Member - Analytical and Biochemical Toxicology) and Mr. Kevin Rummel (Graduate Research Assistant - Analytical and Biochemical Toxicology). Also, Dr. Kevin A. Johnson (Assistant Professor, Department of Chemistry - Southern Illinois University at Edwardsville) collaborated with Texas Tech researchers on this project. (Note: Bechtel-Jacobs later replaced Lockheed Martin as the Site Contractor Managing this DOE facility.)

TIEHH faculty and students receive grant to study endocrine disruption in Central American crocodiles

The Institute of Environmental and Human Health (TIEHH) was awarded a three-year grant by the United States Environmental Protection Agency (EPA) to study the effects of endocrine disrupting chemicals (EDCs) on crocodiles in Belize. Founding researchers include the Principal Investigator, Dr. Scott McMurry (Section Leader-Terrestrial Toxicology), Project Manager, Mr. Thomas Rainwater (Graduate Research Assistant - Terrestrial Toxicology), Co-Investigator, Dr. Todd Anderson (Assistant Section Leader - Analytical and Biochemical Toxicology), and collaborator, Dr. Steve Platt (Wildlife Conservation Society). Other collaborators on the project include Drs. Ernest Smith and George Cobb (TIEHH, Texas Tech University/Texas Tech Health Sciences Center), Dr. Lew Densmore (Department of Biological Sciences, Texas Tech University) and Dr. Kevin

Johnson (Department of Chemistry, Southern Illinois University at Edwardsville).

EDCs are chemicals that disrupt the normal function of the endocrine system and impairing reproduction in exposed organisms. It is believed that numerous EDCs, including pesticides and industrial chemicals, have been released into the environment during the last half-century. Of primary concern is the long-term effect that exposure to these compounds can have on the future well-being of wildlife and humans.

Much of the concern regarding EDCs stems from observations by researchers in Florida who documented reproductive impairment and population declines in American alligators from Lake Apopka, Florida where a chemical spill in 1980 contaminated the lake with organochlorine chemicals. Since the spill, low egg viability, reduced hatchling survival, altered hormone levels and gonadal abnormalities have been found in alligators inhabiting the lake.

In 1995, in collaboration with Dr. Platt, McMurry and Rainwater journeyed to Belize to collect Morelet's crocodile eggs for contaminant analysis. Platt had been studying Morelet's crocodile, an endangered species, since 1992 and was himself curious about possible exposure of these animals to environmental contaminants in Belize where regulations governing the use of chemicals are scant or difficult to enforce. Detectable levels of DDT, its metabolites, and mercury were found in eggs from three lagoons, providing the basis for further research. Through continuing support by Mark and Monique Howells of Lamanai Field Research Center - Lamanai Outpost Lodge, fieldwork has continued from 1995 to present. Thus, this project represents a unique collaboration between academia and private tourism in Belize, supporting both education and research of the natural resources of Belize. To date, over 530 crocodiles have been marked and released, and biological samples have been collected from over 100 individuals.

With the acquisition of the EPA grant, TIEHH scientists now hope to more thoroughly examine exposure and effects of EDCs on Morelet's crocodile populations in Belize. They hypothesize that crocodiles inhabiting contaminated areas contain higher EDC concentrations in their tissues than individuals in non-contaminated areas, and that differences in crocodile morphology, blood hormone levels, serum chemistry, reproductive success, population density and juvenile survival exist between contaminated and non-contaminated sites. Blood, fat, non-viable eggs and population data was collected from crocodiles on contaminated and reference sites to examine exposure and effects of EDCs at the individual and population levels.

When completed, this study will provide much needed information on the linkage between EDC exposure at the individual level and resulting effects at the population level. Comparison of these data with data from alligators from Lake Apopka will provide a unique opportunity to examine whether Lake Apopka is a worst-case scenario or if similar reproductive problems and population declines occur in other crocodilian species exposed to EDCs. Moreover, this study will provide valuable insight into the efficacy of reptiles, particularly crocodilians, as sensitive indicators of environmental contamination and ecosystems potentially at risk. This information will be especially useful for ecological risk assessment in tropical countries where reptiles are abundant and regulations governing the use of chemicals, some of them EDCs, are underdeveloped or inadequately enforced.

Field border mitigation and the Northern Bobwhite Quail

Early in 1998, Mr. Damian J. Walter, Research Assistant-Terrestrial Toxicology, conducted a research project at the Edith Angel Environmental Research Center in Chariton, Iowa. His research project estimated the effects of grassy headland implementation on the Northern Bobwhite. He evaluated the effects of field border management alterations brought about by the game birds' importance as both an ecological resource and economic supplement to farmers through the issuance of hunting permits.

A major issue in Midwestern agroecosystems has emerged over balancing the demands of agricultural production with environmental concerns. Many wildlife species in the Midwest have experienced population declines as a result of intensified farming practices, which include the advent of larger field sizes and reduced available habitat edge.

Several previous studies have revealed that edge habitats, which comprise fencerows, hedgerows, and shelterbeds, are important for farmland wildlife. Wildlife populations use edge habitats more frequently than field interiors for feeding, nesting and escape cover. The decline in these habitats has led to the need for grassy border implementation in the Midwestern United States. Grassy border implementation requires that habitats be established in border areas around plots of farmland. Grassy border implementation is expected to increase forb and grass coverage, plant diversity and height and invertebrate abundance along field edges.

Fish reproduction study

Steven Wall, Research Assistant-Aquatic Toxicology, is examining how certain environmental contaminants, capable of disrupting the endocrine system, affect fish reproduction. Specifically, he is examining the production of sex steroids and vitellogenin (a yolk precursor protein) and the role these substances play in parental and larval behavior. He is monitoring these changes in fathead minnows and zebrafish following exposure to endocrine disrupting contaminants.

DDT exposed P. warbler study

Kevin D. Reynolds, Graduate Research Assistant-Terrestrial Ecotoxicology, under the direction of Dr. Scott T. McMurry, Section Leader-Terrestrial Ecotoxicology, completed a study during 1997-1998 which addressed mercury and DDT exposure to prothonotary warblers breeding on a contaminated flood plain in southern Alabama. Research combined residue analysis of the bird's diet, eggs and nestlings with radiotelemetry data and Geographical Information System (GIS) technology in an attempt to quantify site-specific accumulation of these environmentally persistent contaminants. One of the primary goals of this research was to examine the intricate associations between concentrations of contaminants in the soil in areas where the birds were feeding and respective concentrations in the selected tissues. Positive and significant relationships between environmental concentrations and warbler tissue concentrations were observed. Information gained from research such as this could supplement and help economize future site remediation decisions dealing with reducing specific sites to 'acceptable levels' of environmental contaminants.

Interdisciplinary Training in Environmental Toxicology

The Environmental Toxicology Graduate Program — While research is the underlying activity within the Institute, graduate education is the means by which the research progresses. The training of graduate students prepares them for Institute research programs, theses and dissertations projects, and the skills needed as they enter professional careers. Because environmental toxicology is by definition an interdisciplinary science, this graduate program has been developed to draw on the interdiscipliary expertise available at Texas Tech to provide students with these skills.

Encompassing broad fields such as biology, chemistry, ecology, law and medicine, the Environmental Toxicology degree program benefits from the incorporation of faculty from across these disciplines. The proposed Environmental Toxicology master of science and doctoral degree programs will be inter-institutional in nature, encompassing graduate faculty from departments and colleges at Texas Tech University (TTU), Texas Tech University Health Sciences Center (TTUHSC) and the TTU School of Law. The core faculty of the Environmental Toxicology graduate program will initially be from the faculty of TIEHH, faculty on graduate student committees associated with TIEHH, and representative faculty from programs with anticipated participation in the program. Based on a recently documented shortage of toxicology students with risk assessment and quality assurance backgrounds, particular emphasis will be placed on having students trained for applying these critical research techniques.

Proposals for Master of Science and Doctoral degree programs in Environmental Toxicology were presented to the Texas Tech administration on June 5, 1998. Approval of the programs by the Texas Tech Board of Regents and Chancellor John T. Montford occurred on August 14, 1998, and we now await a final approval by the Texas Higher Education Coordinating Board. We hope to have the program in place officially by mid-spring semester, 1999. All students coming into the program are expected to graduate with a degree in Environmental Toxicology.

■ ***Technical Communication***
The program in technical communication, located in the Department of English-Texas Tech University, has provided support to TIEHH's communications initiatives during 1997-98. Technical communication emphasizes written communication that facilitates a person's efforts to complete work related tasks, particularly work related tasks associated with the use of technological innovations and digital, computer based mediums (World Wide Web and e-mail). Technical communication offers two graduate academic programs leading to either a Master of Arts or Ph.D. degree and will eventually offer courses to Environmental Toxicology graduate students that will enhance their written communication proficiency.

■ ***Law*** — The Texas Tech University School of Law offers courses that are relevant to the environmental toxicology graduate program including environmental law, environmental crimes, oil and gas law, oil and gas problems and water law. Eventually, the Texas Tech University School of Law and TIEHH will provide a joint Master of Science/Doctor of Jurisprudence degree that will enable the student to complete a degree in toxicology and a law degree in four years. The Texas Tech University School of Law already provides joint programs in agriculture, business administration, public administration and accounting.

■ ***Research Management and Quality Assurance*** — The Research and Quality Management division is a research support program that assists researchers and students in attaining and monitoring research opportunities from pre-award development through final report presentations. The division takes the lead in designing and implementing an Institute-wide Quality System including Standard Operating Procedures (SOPs), Quality Assurance Manuals, Equipment Maintenance Schedules, and other quality management tools. This division will support efforts to train graduate students in quality research practices and sound scientific procedure.

1997-

■ In August 1997, a "Memorandum of Agreement" was signed between The Human Systems Center-Brooks Air Force Base of the United States Air Force and TIEHH. Chancellor John T. Montford, Vice President of Research Dr. David J. Schmidly and TIEHH Director Dr. Ronald J. Kendall on behalf of Texas Tech University/Texas Tech Health Sciences Center signed this document. Dr. Brendan B. Godfrey, previous Director-The Human Systems Center, and Dr. David Erwin, current Director of the Occupational and Environmental Health Directorate-The Human Systems Center, were also on hand for the signing. This "Memorandum of Agreement" embraced joint ventures in research and development addressing hazardous waste and clean up issues and also educational and training components involving faculty, staff and students of both organizations.

■ On Wednesday, November 19, 1997, The Institute of Environmental and Human Health and the City of Lubbock received a grant totaling $4 million from the Texas Department of Economic Development.

■ On Wednesday, December 17, 1997, the signing of the lease for TIEHH's tenancy at Reese Center between the Air Force Base Conversion Agency and Texas Tech was finalized. This event occurred at 10:15 A.M. in the Texas Tech Board of Regents' conference room on the Texas Tech University campus. Representatives from the City of Lubbock, Lubbock Reese Redevelopment Authority, and Texas Tech were present for the lease agreement signing. TIEHH became Reese Center's first tenant, and this action begins the redevelopment process for converting the former Reese Air Force Base into a business, industrial and research center.

■ Dr. Todd A. Anderson was appointed to serve as the 1998 chairperson for the South Plains Section of the American Chemical Society (ACS).

98 MAJOR EVENTS

■ Dr. Ronald J. Kendall served as chair of a United States Environmental Protection Agency (EPA) Science Advisory Panel Subcommittee Review on genetically enhanced plant pesticide resistance management in agriculture, particularly in cotton, corn and potato crops. The subcommittee review took place on February 9-10, 1998 in Washington, D.C.

■ Dr. Thomas W. La Point was appointed chairman for the 1998 Society for Environmental Toxicology and Chemistry (SETAC) national conference in Charlotte, North Carolina.

■ Dr. Ernest E. Smith presented research at an international conference focusing on "Hazardous Substances and Male Reproductive Health" at the New York Academy of Medicine on May 13-15, 1998.

■ Ms. Cathy M. Bens taught "Good Laboratory Practices (GLPs) for the Analytical Laboratory: Quality Assurance/Quality Control Principles and Practices"—March 2-27, 1998 in Miskolc, Hungary. The International Atmoic Energy Agency and Food and Agriculture Organization of the United Nations sponsored the training course.

■ TIEHH appointed 13 adjunct faculty members in 1997-98: *Dr. Robert Baker*-Texas Tech University, Lubbock, Texas; *Dr. Russell Bowes*-Texas Tech University Health Sciences Center School of Pharmacy-Amarillo, Texas ; *Dr. Joel Coats*-Iowa State University-Ames, Iowa; *Dr. Pernendu (Sandy) Dasgupta*-Texas Tech University, Lubbock, Texas; *Dr. Kevin Johnson*-Southern Illinois University-Edwardsville, Illinois; *Dr. Elizabeth Maull*-Brooks Air Force Base-San Antonio, Texas; *Dr. Kishor Mehta*-Texas Tech University, Lubbock, Texas; *Dr. David Otis*-Clemson University-Clemson, South Carolina; *Dr. Barbara Pence,* Texas Tech University Health Sciences Center, Lubbock, Texas; *Dr. Ronald Porter*-Brooks Air Force Base-San Antonio, Texas; *Dr. David Smith,* Texas Tech University Health Sciences Center, Lubbock, Texas; *Dr. Ron Warner,* Texas Tech University Health Sciences Center, Lubbock, Texas; *Dr. James Woods*-The University of Washington-Seattle, Washington

■ Dr. Michael J. Hooper presented his findings on the Swainson Hawk to the International Conference on Pesticide Use in Developing countries: Impact on Health and Environment in Heredia, Costa Rica.

■ Tim Bargar, Research Assistant under Dr. George Cobb (Section Leader-Analytical and Biochemical Toxicology), is completing his dissertation research with the National Marine Fisheries Service (NMFS) of the National Oceanic and Atmospheric Administration (NOAA) in Charleston, South Carolina. He is assessing exposure of raptors to organochlorine contaminants in the Florida Bay and Everglades region.

■ On April 25, 1998, Kevin Reynolds, Research Assistant-Terrestrial Toxicology, presented research regarding the Alabama Warbler at the Eastern New Mexico University Student Research Conference. He won first place for the best presentation of research in the "Life Sciences" category.

■ Several TIEHH graduate students won awards at the South Central/Ozark Prairie Regional Society for Environmental Toxicology and Chemistry (SETAC) Meeting in April 1998. Kevin Reynolds (Research Assistant-Terrestrial Toxicology) won first place and Emilia Cruz-Li (Research Assistant-Analytical and Biochemical Toxicology) won third place for platform presentations. Mr. Reynolds is currently serving as assistant editor for the South Central/Ozark Prairie SETAC regional newsletter. Jeanne Summers (Research Assistant-Aquatic Toxicology) was elected student representative from this region.

■ On April 27-30, 1998, Dr. Mike Hooper gave a presentation to the 4th Annual National Health Effects Environmental Research Laboratory (NHEERL) Symposium on Research Advances in Risk Assessments: Extrapolation in Human Health and Ecological Risk Assessments in Cary, North Carolina. The title of his presentation was "Temporal Variability in Ecological Susceptibility."

■ On April 13, 1998, construction crews began renovating TIEHH's primary building at Reese Center. The renovation will result in 11 new offices and new laboratory facilities.

■ The 1998 Annual Review Issue of the journal, ENVIRONMENTAL TOXICOLOGY AND CHEMISTRY, was dedicated to "Environmental Endocrine Disruption." Richard Dickerson and Ronald Kendall served as editors for this issue.

■ The book entitled Principles and Processes for Evaluating Endocrine Disruption in Wildlife, edited by R. Kendall and R. Dickerson of TIEHH, J. Giesy of Michigan State University, and W. Suk of the National Institutes of Environmental Health Sciences, was published by the Society of Environmental and Toxicology Chemistry (SETAC) Press in May 1998.

■ Houston Endowment Inc. has awarded a $500,000 grant to enhance environmental and human health programs at TIEHH. This award was received on Friday, August 14, 1998 as part of the Texas Tech Horizon Campaign and was received on behalf of TIEHH by Texas Tech Chancellor John T. Montford, Texas Tech University Vice President of Research David J. Schmidly, and Texas Tech University Health Sciences President David R. Smith.

1997-98 Academic Year Publications and Presentations

JOURNAL ARTICLES

■ ***Anderson, T.A., D.M. Scherubel, R. Tsao, A.W. Schwabacher, and J.R. Coats.*** 1997. Synthesis of 3H-polyethylene and its use for fate studies on degradable plastics. Journal of Environmental Polymer Degradation 5: 119-124.

■ ***Arthur, E. L., J.C. Anhalt, T.A. Anderson, and J.R. Coats.*** 1997. Enhanced degradation of deethylatrazine in an atrazine-history soil of Iowa. Journal of Environmental Science and Health 32: 599-620.

■ ***Bens, C.M.*** 1997. The role of quality in today's research university. Quality Assurance: Good Practice, Regulation and Law 34: 248-253.

■ ***Cobb, G.P. and P.D. Wood.*** 1997. PCB concentrations in eggs and chorioallantoic membranes of Loggerhead Sea Turtles (Caretta caretta) from the Cape Romain National Wildlife Refuge. Chemosphere 34: 539-549.

■ ***Cobb, G.P., P.D. Wood and M. O'Quinn.*** 1997. Determination of PCBs in eggs and chorioallantoic membranes of american alligators (Alligator mississippiensis). Environmental Toxicology and Chemistry 16: 1456-1462.

■ ***Dixon, K.R., M.A. Horner, S.R. Anderson, W.D. Henriques, D. Durham and R.J. Kendall.*** 1997. Northern bobwhite habitat use and survival on a South Carolina plantation during winter. Wildlife Society Bulletin 24: 627-635.

■ ***Dixon, K.R., B.M. Joab, and F.D. Snyder.*** 1997. A model for predicting ventilation rates in mammals. Environmental Toxicology and Pharmacology 3: 25-29.

■ ***Fornstrom, C.B., P.F. Landrum, C.P. Weisskopf and T.W. La Point.*** 1997. The effects of terbufos on juvenile red swamp crayfish, Procambarus clarkii: Differential routes of exposure. Environmental Toxicology and Chemistry 16.

■ ***Henriques, W., R.D. Jeffers, T.E. Lacher, Jr. and Kendall, R.J.*** 1997. Agrochemical use on banana plantations in Latin America: perspectives on ecological risk. Environmental Toxicology and Chemistry 16: 91-99.

■ ***Kruger, E.L., P.J. Rice, J.A. Chaplin, T.A. Anderson, and J.R. Coats.*** 1997. Comparative fates of atrazine and deethylatrazine in sterile and nonsterile soils. Journal of Environmental Quality 26: 95-101.

■ ***Lacher, T.E., Jr., S. Mortensen, K. Johnson, and R.J. Kendall.*** 1997. Environmental aspects of pesticide use in banana plantations. Pesticide Outlook 8: 24-28.

■ ***Mortensen, S.R., S. Brimijoin, M.J. Hooper, and S. Padilla.*** 1998. Comparison of the in vitro sensitivity of tat tissue acetylocholinestrease to chlorpyrifos-oxon: What do IC50 values represent? Toxicology and Applied Pharmacology 148:46-49.

■ ***Mortensen, S.R., M.J. Hooper, and S. Padilla.*** 1997. Age-related sensitivity to cholinesterase-inhibiting insecticides: Is brain acetylcholinesterase from young animals intrinsically more sensitive to inhibition? Toxicology 125 (1):13-19.

■ ***Mortensen, S.R., K.A. Johnson, C.P. Weisskopf, M.J. Hooper, T.E. Lacher, and R.J. Kendall.*** 1997. Avian exposures to pesticides in Costa Rican banana plantations. Bulletin of Environmental Contamination and Toxicology 60: 562-568.

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■ ***Kendall, R.J., R L. Dickerson, J.P. Giesy, and W.A. Suk, editors.*** 1998. Principles and Processes for Evaluating Endocrine Disruption in Wildlife. SETAC Press: Pensacola, FL.

■ ***Kruger, E.L., T.A. Anderson, and J.R. Coats, Editors.*** 1997. Phytoremediation of Soil and Water Contaminants. American Chemical Society: Washington, DC.

BOOK CHAPTERS

■ ***Anderson, T.A., P.J. Rice, J.H. Cink, and J.R. Coats.*** 1997. Fate of methyl bromide in fumigated soils. In Seiber, J.N., J.A. Knuteson, J.E. Woodrow, N.L. Wolfe, M.V. Yates, and S.R. Yates, Eds. Fumigants: Environmental Fate, Exposure, and Analysis. American Chemical Society, Washington, DC, pp. 42-52.

■ ***Anderson, T.A., A. M. Hoylman, N.T. Edwards, and B.T. Walton.*** 1997. Uptake of Polycyclic Aromatic Hydrocarbons by Vegetation: A Review of Experimental Methods. In Wang, W., J.W. Gorsuch, and J.S. Hughes, Eds. Plants for Environmental Studies. Lewis Publishers, Chelsea, MI, pp. 453-482.

■ ***Arthur, E.L., P.J. Rice, T.A. Anderson, and J.R. Coats.*** 1998. Mobility and Degradation of Pesticides and Their Degradates in Intact Soil Columns. In Fuhr, F. Ed. Comparative Tracer Studies on the Environmental Behavior of Pesticides: The Lysimeter Concept. American Chemical Society. Washington, DC.

■ ***Cunningham, S.D., J.R. Shann, D. Crowley, and T.A. Anderson.*** 1997. Phytoremediation of contaminated water and soil. In Kruger, E.L., J.R. Coats, and T.A. Anderson, Editors. Phytoremediation of Soil and Water Contaminants. American Chemical Society, Washington, DC, pp. 2-17.

■ ***Kruger, E.L., J.C. Anhalt, D. Sorenson, B. Nelson, A.L. Chouby, T.A. Anderson, and J.R. Coats.*** 1997. Atrazine degradation in pesticide-contaminated soils: phytoremediation potential. In Kruger, E.L., J.R. Coats, and T.A. Anderson, Editors. Phytoremediation of Soil and Water Contaminants. American Chemical Society, Washington, DC, pp. 54-64.

■ ***Pittinger, C.A., W.J. Adams, J.J. Dulka, R. Fleming, R. Kimerle, P.A. King, T.W. La Point, T. Maciorowski, and G. Schiefer.*** Product Safety Assessment, Chapter 4 in Ingersoll, C.G., T. Dillon and G.R. Biddinger (eds.). 1997. Ecological Risk Assessment of Contaminated Sediments. SETAC Press, Pensacola, FL.

■ ***Rice, P.J., T.A. Anderson, and J.R. Coats.*** 1997. Phytoremediation of herbicide-contaminated surface water with aquatic plants. In Kruger, E.L., J.R. Coats, and T.A. Anderson, Editors. Phytoremediation of Soil and Water Contaminants. American Chemical Society, Washington, DC, pp. 133-151.

■ ***Rice, P.J., T.A. Anderson, and J.R. Coats.*** 1997. Evaluation of the use of vegetation for reducing the environmental impact of deicing agents. In Kruger, E.L., J.R. Coats, and T.A. Anderson, Editors. Phytoremediation of Soil and Water Contaminants. American Chemical

Society. Washington, DC, pp. 162-176.

■ ***Tillitt, D., E. Mihlach, G.P. Cobb, L. Toutant, and K. Solomon.*** 1997. Approaches to exposure assessment. in R.L. Dickerson and R.J. Kendall eds., Principles and Processes for Evaluating Endocrine Disruption in Wildlife. SETAC Special Publication. Lewis Publishers, Chelsea, MI.

PRESENTATIONS

■ ***Chuiko, G.M., Y.Y. Zhelnin, T. Huang, M.J. Hooper, and T.W. La Point.*** In-vitro and in-vivo inhibition of acetylocholinesterase (AchE) and butyrylcholinesterase (BchE) activity by DDVP and prostigmine in freshwater fish tissue. Presented at the 18th Annual SETAC Meeting. November 16-20, 1997. San Francisco, CA.

■ ***Everson, M., and T.W. La Point.*** The impact of non-point source runoff on macroinvertebrate communities. Presented at the 18th Annual SETAC Meeting. November 16-20, 1997. San Francisco, CA.

■ ***Frame, L.T., T.L. Gatlin, S.A. Nowell, J.E.A. Leakey, S.L. MacCleod, and N.P. Lang.*** 1997. "Lowering Oxygen Increases 3-Methylcholanthrene (3-MC)-Mediated Induction of CYP1A Activity in Cultured HEPG2 Cells." Presentation to the International Society for the Study of Xenobiotics (ISSX).

■ ***Karen, D.J., W.R. Brown, B.S. Day, T.W. La Point, D. Ownby, D.P. Shupack.*** Influence of varying water quality parameters on toxicity and bioavailability of AG+ to rainbow trout. Presented at the 18th Annual SETAC Meeting. November 16-20, 1997. San Francisco, CA.

■ ***Karen, D.J., D.R. Ownby, D.P. Shupack, G.P. Cobb, T.W. La Point.*** 1997. Influence of water quality parameters on silver toxicity to rainbow tout, Oncorhynchus mykiss. Presented at the Fifth Argentum Conference. September 1997. Hamilton, Ontario, Canada.

■ ***Montie, E.W., M.P. Gooding, S.M. Richards, T.A. Anderson, and D. St. Aubin.*** 1997. Organochlorine contaminants in marine mammals from the northeastern United States. Abstracts of the 18th Annual Meeting of the Society of Environmental Toxicology and Chemistry. San Francisco, CA.

■ ***Moran, J.H., L.T. Frame, R.F. Minchin, J. Massengill, N.P. Lang, F.F. Kadlubar.*** 1997. "Comparison of N-Aceltyltransferase-1 (NAT1) Activity in Human Lymphocytes, Platelets, and Liver." Presentation to the International Society for the Study of Xenobiotics (ISSX).

■ ***Nowell, S.A., L.T. Frame, T.L. Gatlin, M. Taylor, E.E. Smith, N.P. Lang, and R.L. Dickerson.*** 1997. "Phase I and phase II metabolism in the deer mouse (Peromyscus maniculatis) following acute exposure to p, p'-DDE. Presentation to the International Society for the Study of Xenobiotics (ISSX).

■ ***Nowell, S.A., N.P. Lang, J.E.A. Leakey, and L.T. Frame.*** 1997. "Identification and characterization of bilirubin UDP-glucuronosyltransferase activity in human platelets." Presenation to the International Society for the Study of Xenobiotics (ISSX).

■ ***Ownby, D.R., D.J. Karen, B.S. Day, S.J. Klaine, T.W. La Point, and G.P. Cobb.*** Silver availability to rainbow trout as determined by atomic absorption and stripping voltametry. Presented at the 18th Annual SETAC Meeting. November 16-20, 1997. San Francisco, CA.

■ ***Ownby, D.R., D.J. Karen, D.P. Shupak, B.S. Day, T.W. La Point, S.J. Klaine, and G.P. Cobb.*** 1997. Using spectroscopy and voltammetry to evaluate silver activity in aquatic toxicity evaluations. Presented at the Fifth Argentum Conference. September 1997. Hamilton, Ontario, Canada.

■ ***Patten, C.J., J.A.E. Leakey, L.T. Frame, and C.L. Crespi.*** 1997. "Heterologous Expression of Human UDP Glucuronosyl Transferases." Presentation to the International Society for the Study of Xenobiotics (ISSX).

■ ***Rice, P.J., T.A. Anderson, J.C. Anbalt, and J.R. Coats.*** 1997. Phytoremediation of atrazine-and metolachlor-contaminated water with submerged and floating aquatic plants. Abstracts of the 12th Annual Conference on Hazardous Waste Research. Kansas City, MO.

■ ***Rice, P.J., T.A. Anderson, J.C. Anbalt, and J.R. Coats.*** 1997. Phytoremediation of surface water and soil contaminated with aircraft deicing agents. Abstracts of the 12th Annual Conference on Hazardous Waste Research. Kansas City, MO.

■ ***Richards, S.R., T.A. Anderson, S.T. McMurry, and M.J. Hooper.*** 1997. Avian response to chlorphyrifos exposure in a corn agroecosystem. Abstracts of the 18th Annual Meeting of the Society of Environmental Toxicology and Chemistry. San Francisco, CA.

■ ***Shupack, D.P., T.A. Anderson, and G.P. Cobb.*** 1997. Influence of vegetation on reduction of propylene glycol in runoff water. Abstracts of the 18th Annual Meeting of the Society of Environmental Toxicology and Chemistry. San Francisco, CA.

■ ***Shupack, D.P., T.A. Anderson, and G.P. Cobb.*** 1997. Mineralization of propylene glycol by root zone soils. Abstracts of the Annual Meeting of the Carolinas Chapter of the Society of Environmental Toxicology and Chemistry. Clemson, SC.

■ ***Wall, S., S. Richards, and T.W. La Point.*** Zebrafish (Brachiodanio rerio) as a model to examine multigenerational reproductive effects following contaminant exposure. Presented at the 18th Annual SETAC Meeting. November 16-20, 1997. San Francisco, CA.

TECHNICAL REPORTS

■ ***Anderson, T.A.*** 1997. Development of a phytoremediation handbook: considerations for enhancing microbial degradation in the rhizosphere. Final Report: Environmental Science and Engineering Fellows Program. American Association for the Advancement of Science. Washington, DC.

■ ***Anbalt, J.C., E.L. Arthur, A. Chouby, T.A. Anderson, and J.R. Coats.*** 1997. Pesticide Contaminated Soil Studies: Part I. Effects of Aging Herbicide Mixtures on Herbicide Degradation, Soil Respiration and Plant Survival. Part II. Phytoremediation Study with Native Prairie Grasses. Proceedings of the 12th Annual conference on Hazardous Waste Research. Manhattan, KS. pp. 542-555.

■ ***Horner, M.A. , R.D. Durham, and R.J. Kendall.*** 1998. Ashepoo Plantation Bobwhite Quail Research and Management: Winter Covey Assessment. Final Report.

Partnerships and Joint Ventures

Human Systems Center-Brook Air Force Base (San Antonio, Texas)

The "Memorandum of Agreement" between TIEHH and the Human Systems Center at Brooks Air Force Base in San Antonio, Texas embraces joint ventures between The Institute of Environmental and Human Health and the faculty at the Human Systems Center and Brooks Air Force Base-San Antonio. This "Memorandum of Agreement" provides for research addressing hazardous waste and clean up issues and also educational and training components involving faculty, staff and students of both organizations.

In April-May, 1998, Drs. Elizabeth Maull, and Ronald Porter, Human Systems Center-Brooks Air Force Base, joined TIEHH's efforts to research environmental and human health issues.

Ecorisk, Inc. TIEHH has also built collaborative efforts with industry. TIEHH's partnership with Ecorisk, Inc. in Ferndale, Washington has resulted in a mutually beneficial relationship for both entities. Ecorisk is preparing to move into facilities at the Reese Center so that the company may collaborate with TIEHH members to research and to develop solutions for environmental and human health problems.

Graduate Students Sponsored by The Institute of Environmental and Human Health

Texas Tech University/Texas Tech Health Sciences Center (1997-98)

TIEHH sponsored the following graduate students during the 1997-98 academic year. Currently, most TIEHH graduate students enroll in the Department of Biological Sciences (Texas Tech University) as well as other academic departments at Texas Tech University and Texas Tech Health Sciences Center.

Major Prof	Name	Degree Objective/Research Area
Cobb	Blakely Adair	Ph.D./Metal movement in ecosystems
Anderson	Hiroshi Awata	M.S./Bioavailability of aged contaminants
Cobb	Tim Bargar	Ph.D./Non-lethal monitoring of chlorinated hydrocarbon exposure
La Point	Bryan Brooks	Ph.D./Aquatic Toxicology
Smith	Kevin Burge	Ph.D./Heavy metals, endocrine disruption and developmental biology
Cobb	Emilia Cruz-Li	Ph.D./Pesticide transport and effects in agricultural watersheds
Smith	Burnella Gentles	Ph.D./Heavy metals, endocrine disruption and developmental biology
Dickerson	Celine Godard	Ph.D./Cloning P450 genes in cetaceans at Wood's Hole Oceanographic Institute
Dixon	Lori Gordon	Ph.D./Models that predict the spread of rabies in raccoons
Hooper	Tong-Yuh Huang	Ph.D./Esterase characterization and sensitivity to inhibitors in fish
Hooper	Tobias McBride	M.S./Metal mixture effects in starlings and kestrels on mine waste sites
Hooper	Craig McFarland	Ph.D./Metal mixture biomarkers in rodents inhabiting mine waste sites
Dickerson	Cynthia Sills-McMurry	Ph.D./Endocrine disruption in deer mice, quail and alligators
McMurry	Thomas Rainwater	Ph.D./Endocrine disrupting chemicals and endangered crocodiles
McMurry	Kevin Reynolds	Ph.D./Wildlife biomonitoring at a Montana smelter site
Kendall	Sean Richards	Ph.D./Avian cholinesterase response to chlorpyrifos
Hooper	Kevin Rummel	Ph.D./Porphyrin profiles and chelators in mercury exposure assessment
Kendall	Tillman Sauls	Ph.D./Agrochemicals' effect on avian wildlife in the Midwest
McMurry	Matt Schwarz	M.S./Terrestrial Toxicology
Cobb	Edward Scollon	Ph.D./Chlorinated hydrocarbon exposure in migratory birds
Dickerson	Daam Settachen	Ph.D./Regulation of P450 induction in New World Rodents
McMurry	Phil Smith	Ph.D./Polychlorinated biphenyl and heavy metal exposure and effects in raccoons
Kendall	Jeanne Summers	Ph.D./Phytoremediation of pesticides in wetland systems
La Point	Melody Wainscott	M.S./Movement of chemicals through the aquatic food chain in playa lakes
La Point	Steven Wall	Ph.D./Reproductive toxicology in fish
Kendall	Damian Walter	Ph.D./Direct and indirect effects of herbicides on gamebirds in mesquite management

Job Placement

Master of Science and Ph.D. graduates of TIEHH faculty members place in private and public sector jobs as well as university and college teaching positions.

■ Corporate Job Placement

Name	Degree	Current Employer	Advisor
Jonathan Akins	Ph.D.	Novartis Corporation	Mike Hooper
Max Feken	M.S.	KBN Engineering and Applied Sciences	Scott McMurry
Nicholas Gard	Ph.D.	PTI Environmental Services	Mike Hooper
Tony Hawkes	Ph.D.	DuPont Agricultural Products	Ronald Kendall
Rick Kenman	M.S.	Compliance Service International	Ronald Kendall
Spencer Mortenson	Ph.D.	DOW Agrosciences	Mike Hooper
Jarrett Rice	M.S.	HRP/Spectrum, Inc.	Ronald Kendall
Corie Rockett Sharon	M.S.	Parsons Consulting-Atlanta, Georgia	Richard Dickerson
Rudolph Ohanessian	M.S.	Kleinfelder	George Cobb
Kristin Sands	M.S.	Waste Management-Atlanta, Georgia	George Cobb
Tillman Sauls	Ph.D./99	American Cyanamid Company	Ronald Kendall
Debbie Shupack	M.S.	Bradburne, Briller, and Johnson	Todd Anderson
Rob Troup	M.S.	Genesis	Ronald Kendall

■ Government Job Placement

Jerremy Buck	M.S.	US Fish and Wildlife Service, Oregon	Ronald Kendall
Ted Buerger	Ph.D.	US Fish and Wildlife Service, Oregon	Ronald Kendall
Laura A.Esman	M.S.	US Fish and Wildlife Service, New York	Thomas La Point
Cindy Fornstrom	M.S.	Denver Independent School District	Tom LaPoint
William Henriques	Ph.D.	ATSDR-Toxicology Division	Ken Dixon
Dale Hoff	Ph.D.	EPA Region VIII	Mike Hooper
Jana Hofius	M.S.	US Fish and Wildlife Services,	Ronald Kendall
Julie Hoover	M.S.	US Army Corp. of Engineers	Richard Dickerson
Rusty Jeffers	M.S.	US Fish and Wildlife Service	George Cobb
Vince Leopold	M.S.	Texas Natural Resource Conservation Commission	Mike Hooper
Chuck Nace	M.S.	Maryland Department of the Environment, Environmental Risk Assessment Program	Thomas La Point
Tobin McCoy	M.S.	Texas Natural Resource Conservation Commission	George Cobb
Sherry Skipper	M.S.	US Fish and Wildlife Services, Rocky Mountain Arsenal	Mike Hooper
Kim Trust	M.S.	US Fish and Wildlife Service	Mike Hooper
Jennifer Walters	M.S.	Texas Natural Resource Conservation Commission, Water Quality Standards Team	Thomas La Point
Kay Alonso Wigley	M.S.	South Carolina Department of Health and Environmental Control	Richard Dickerson

Academic Job Placement

Name	Degree	Current Employer	Advisor
Doug Florian	Ph.D.	Clemson University, Research Assistant	Kenneth Dixon
Whitney Mashburn	M.S.	Colorado State University, Laboratory Manager	Richard Dickerson
Melissa Parker	M.S.	Texas A&M University Department of Animal Science	Mike Hooper
Mala Pattanayek	M.S.	Marine Institute, University of Georgia/Research Associate	George Cobb
Thomas Rainwater	M.S.	TIEHH Ph.D. candidate with Dr. Scott McMurry	Ronald Kendall
Daam Settachan	M.S.	TIEHH Ph.D. candidate with Dr. Richard Dickerson	Richard Dickerson
Prakash Silwal	M.S.	International University of Florida	Mike Hooper
Steven Wall	M.S.	TIEHH Ph.D. candidate	Thomas La Point
Travis Warren	M.S.	Oklahoma State University, National Pesticide Telecommunications Network/Ecological Incident Information Systems	Thomas La Point
Pattie Wood	M.S.	Mt. Hood Community College, Lecturer	George Cobb

TIEHH part-time staff

Monty Barnett, Student Assistant-Financial and Administrative Services
Dianne Bruscato, Student Assistant-Research Management/Quality Assurance
Rebecca Dunnan, Student Assistant-Research Management/Quality Assurance
John C. Gooch, Staff Support for Communications/Outreach-Executive Office
Andrew Moore, Student Assistant-Analytical and Biochemical Toxicology
Lynn Sholtis, Graduate Student Assistant-Research Management/Quality Assurance (Ph.D. student, Department of History-Texas Tech University)
Jessica Walters, Student Assistant-Executive Office

TIEHH staff

TIEHH administrative and support staff ensures that the day-to-day operations are completed effectively and efficiently. Staff positions at TIEHH include micro-computing and network support specialist, quality assurance officer, inventory administrator and administrative secretary.

FULL-TIME STAFF

Brad Boring, Analytical Instrumentation Specialist-Analytical and Biochemical Toxicology
Ryan Bounds, Inventory Administrator-Assistant Faculty Supervisor-Research Management/Quality Assurance
Chuck Crabtree, Site Manager-Edith Angel Environmental Research Center, Chariton, Iowa
Jennifer Craddick, Administrative Assistant for Faculty-Research Management/Quality Assurance
Lynn T. Frame, Post-doctoral Research Associate-Analytical and Biochemical Toxicology
Dee Hollis, Manager of Financial and Administrative Services-Executive Office
Scott Johnson, Micro-Computing and Network Support Specialist-Research Management/Qnality Assurance
Alicia O. Knight, Assistant Director-Executive Office
Stephen Poe, Research Projects Administrator-Research Management/Quality Assurance
Kimberly Pruitt, Purchasing Specialist
Abbie Sauls, Temporary Staff, Edith Angel Environmental Research Center, Chariton, Iowa
P.J. Schmidt, Quality Assurance Officer-Research Management/Quality Assurance
Denise Wanner, Administrative Secretary-Executive Office
Matthew Young, Custodial Services

Supercomputing at TIEHH

Dr. Kenneth R. Dixon, Section Leader-Environmental Modeling/Geographical Information Systems, and Dr. Ronald Kendall have been leading an effort to obtain a high performance computer (HPC) for The Institute of Environmental and Human Health as well as other businesses and organizations that will eventually reside at the Reese Center. A supercomputing system at TIEHH will enhance researchers' ability to predict the effects of toxic chemicals upon the environment and human health over a period of time through computer simulation. Computer simulation, in turn, helps researchers at TIEHH better determine the effects of toxic chemicals on both the environment and human health.

Dr. Dixon has also proposed that a HPC laboratory be established at the Reese Center and that TIEHH's facility be the location for this HPC laboratory. TIEHH is leading the effort for the Reese Center to become a highly technological industrial and business complex, and furthermore, other organizations that reside at Reese Center will use the HPC for various tasks in day-to-day operations.

The HPC laboratory will eventually include workstations and a high-speed network that connects the HPC to different workstations. The connection will require a high-speed fiber-optic connection to the Texas Tech University campus.

TIEHH Core Faculty

Todd Anderson, Assistant Section Leader and Assistant Professor Analytical Chemistry
Catherine Bens, Section Leader and Research Faculty Research Management and Quality Assurance
George Cobb, Section Leader and Associate Professor Analytical/Environmental Chemistry
Richard Dickerson, Member and Associate Professor Biochemical Toxicology
Ken Dixon, Section Leader and Associate Professor Environmental Modeling/Geographic Information Systems
Mike Hooper, Graduate Education Coordinator and Associate Professor, Biochemical Toxicology
Ronald Kendall, Director and Professor Ecotoxicology
Thomas La Point, Section Leader and Professor Aquatic Toxicology
Scott McMurry, Section Leader and Assistant Professor Terrestrial Toxicology
Ernest Smith, Undergraduate Education Coordinator and Assistant Professor- Immunology/ Reproductive Toxicology

TIEHH Adjunct Faculty

Robert Baker, Department of Biological Sciences, Texas Tech University
Russell Bowes, Department of Pharmaceutical Sciences, Texas Tech University Health Sciences Center School of Pharmacy-Amarillo, Texas
Joel Coats, Department of Entomology and Toxicology, Iowa Sate University-Ames, Iowa
Pernendu (Sandy) Dasgupta, Department of Chemistry and Biochemistry, Texas Tech University
Kevin Johnson, Department of Chemistry, Southern Illinois University-Edwardsville, Illinois
Elizabeth Maull, Occupational Medicine Division, Human Systems Center-Brooks Air Force Base, Texas
Kishor Mehta, Department of Civil Engineering, Texas Tech University
David Otis, Department of Aquaculture, Fisheries and Wildlife, Clemson University-Clemson, South Carolina
Barbara Pence, Department of Pathology, Texas Tech University Health Sciences Center
Ronald Porter, Occupational and Environmental Health, Human Systems Center, Brooks Air Force Base, Texas
David Smith, President-Texas Tech University Health Sciences Center
Ron Warner, Department of Family and Community Medicine, Division of Preventative and Occupational Medicine, Texas Tech University Health Sciences Center
James Woods, Department of Environmental Health, The University of Washington-Seattle, Washington

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Dr. Ronald J. Kendall

Dr. Todd A. Anderson

Dr. George P. Cobb

Dr. Ronald J. Kendall, Director-The Institute of Environmental and Human Health Dr. Ronald J. Kendall is founding director of The Institute of Environmental and Human Health and professor of biological sciences, Texas Tech University as well as professor of pharmacology, Texas Tech University Health Sciences Center. Dr. Kendall comes to Texas Tech from Clemson University where he was founding director of The Institute of Wildlife and Environmental Toxicology (TIWET).

The Institute of Environmental and Human Health becomes the third institute that Dr. Kendall has founded in 19 years. Not only did he establish The Institute of Wildlife and Environmental Toxicology (TIWET) at Clemson University in 1989, but he also founded the Institute of Wildlife Toxicology at Western Washington University in 1981.

Dr. Kendall received his Ph.D. in Fisheries and Wildlife Science/ Toxicology from Virginia Polytechnic Institute and State University in 1980. He is a member of the Scientific Advisory Panel of the U.S. Environmental Protection Agency. He is a past president of the Society of Environmental Toxicology and Chemistry (SETAC) and member of the Science Advisory Board of the Canadian Network of Toxicology Centers.

Dr. Todd A. Anderson, Assistant Section Leader-Analytical/Biochemical Toxicology Todd A. Anderson serves as assistant section leader of TIEHH's Analytical and Biochemical Toxicology Division and assistant professor of biological sciences. His teaching and research interests are in environmental fate, phytoremediation and analytical toxicology. He received his M.S. and Ph.D. in Environmental Toxicology from the University of Tennessee, Knoxville where he was a Department of Energy Research Fellow at Oak Ridge National Laboratory.

Dr. Anderson was an assistant professor in the Department of Environmental Toxicology and an Assistant Section Leader (Analytical Chemistry) in The Institute of Wildlife and Environmental Toxicology (TIWET) at Clemson University. Formally, Dr. Anderson was a Postdoctoral Research Associate and Research Affiliate Professor at Iowa State University from 1992-1996. He is a member of the Society of Environmental Toxicology and Chemistry (SETAC) and a past member of the editorial board for its journal, *Environmental Toxicology and Chemistry*. He also serves as an Associate Editor for the *Journal of Water, Air, and Soil Pollution*. He is the author of numerous peer-reviewed publications, and in 1996, Dr. Anderson received the SETAC/ Roy F. Weston Environmental Chemistry Award. During the summer of 1997, he was an American Association for the Advancement of Science (AAAS) Environmental Science and Engineering Fellow at the EPA Office of Solid Waste and Emergency Response.

Dr. George P. Cobb, Section Leader-Analytical and Biochemical Toxicology George P. Cobb serves as section leader for the Analytical and Biochemical Toxicology Division of TIEHH and associate professor of biological sciences. He received his Ph.D. in Chemistry from University of South Florida in 1989.

Dr. Cobb's students receive advanced degrees in several disciplines including toxicology, chemistry, engineering and mathematics. His teaching and research interests are in environmental chemistry and analytical toxicology. This emphasis includes analytical technique development and evaluation of chemical movement within organisms (Cobb et al., 1995a) and through ecosystems (Cobb et al. 1994, 1995b; Cobb and Braman, 1995; Osowski et al., 1996). Analytical techniques are being developed with funding from the National Institute of Environmental Health Sciences (NIEHS) and corporations to determine trace quantities of metals and chlorinated organic compounds in exceedingly small tissues. This allows waste tissues or small biopsies or organ tissue to be used to evaluate contaminant uptake by fish and wildlife (Dickerson et al., 1994; Cobb et al., 1995b, 1997; Wood 1994; Adair 1997). Metal Uptake by plants has also been investigated (Sands, 1994) as part of metal uptake through food chains. Development of these analytical techniques has also allowed metabolites of hazardous chemicals to be identified and quantified (Buck et al., 1996; Harper et al. 1998). Improved analytical techniques have been successfully employed to assess impacts of contaminant point sources (Rudolph, 1991; Cobb et al. 1993) and to assess impacts of nonpoint source pollution (Tank et al. 1992; Cobb and Hooper 1993; Cobb et al. 1997; Adair, 1997).

Dr. Cobb formerly served as member of the Society of Environmental Toxicology and

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SETAC Committee and as Board of Director member and secretary for the SETAC Carolinas' chapter. Dr. Cobb also served as Program Chair for the 1997 Carolinas' SETAC Annual Meeting and is currently charged with organizing Special Symposium for the Program Committee for The 1998 SETAC meeting in Charlotte, NC. Dr. Cobb has served on the Editorial Board of Environmental Toxicology and Chemistry from 1994-1996, and he continues to provide peer review for this publication as well as other scientific journals including *Environmental Health Perspectives, Chemosphere, Environmental Pollution, Journal of Wildlife Diseases, Journal of Nematology* and *Soil Biochemistry*.

Ms. Catherine M. Bens, Section Leader-Research Management/Quality Assurance Catherine M. Bens is division and section leader of the Research and Quality Management Division of TIEHH. She was a lecturer and faculty member for the Department of Environmental Toxicology and the Section Leader of the Quality and Research Management Section at The Institute of Wildlife and Environmental Toxicology (TIWET) at Clemson University. Her teaching and research interests include wildlife toxicology, particularly avian toxicology, and the application of quality assurance/quality control principles to environmental research and ecological risk assessment. She received her M.S. in Wildlife Toxicology/Biology from Western Washington University.

Ms. Bens is an active SETAC member who has served on the Membership Committee and Planning Committee for the annual meeting, and acting as Committee Co-Chair for the establishment of the Pacific Northwest Chapter. Ms. Bens is also an active member of the Society of Quality Assurance (serving on the Board of Publications and Liaison Committee, ASTM and American Society of Quality Control. Ms. Bens has published articles in both Environmental Toxicology and Quality Assurance. Most recently, she participated in a month-long seminar in Miskolc, Hungary teaching "Good Laboratory Practices (GLPs) for the Analytical Laboratory: Quality Assurance/ Quality Control Principles and Practices." The seminar was sponsored by the International Atomic Energy Agency and the Food and Agriculture Organization of the United Nations.

Dr. Richard L. Dickerson-Member, Analytical and Biochemical Toxicology Richard L. Dickerson is a member of the Analytical and Biochemical Toxicology Division of TIEHH and associate professor, Department of Pharmacology, Texas Tech University Health Sciences Center. He was Assistant Professor in the Department of Environmental Toxicology and a Section Leader of The Institute of Wildlife and Environmental Toxicology (TIWET) at Clemson University. His teaching and research interests include antiestrogenic and immunotoxic effects of environmental contaminants and biomarkers of effect. He received his M.S. in Environmental Chemical Engineering from the University of Arkansas and his Ph.D. in Toxicology from Texas A&M University.

Dr. Dickerson is the author of over 25 peer-reviewed publications and has been awarded numerous research grants from federal, state, and private source to investigate aspects of biochemistry and ecotoxicology. He is a frequent invited speaker and international workshop participant on subjects of immunotoxicology, health effects of dioxins as well as endocrine disrupting chemicals.

Dr. Kenneth R. Dixon, Section Leader-Environmental Modeling/Geographic Information Systems Dr. Kenneth R. Dixon serves as section leader for the Environmental Modeling and Geographic Information Systems Division of TIEHH and Associate Professor Department of Biological Sciences. He has served as associate professor in the Department of Environmental Toxicology and The Institute of Wildlife and Environmental Toxicology (TIWET) at Clemson University. His research interests include developing and applying computer simulation models to predict the movement and effects of toxic chemicals on wildlife populations and the environment. Dr. Dixon also studies the spatial distribution of toxicants and effects at ecosystem, landscape and regional scales by integrating models with geographic information systems. Current research projects include the development of a terrestrial food chain model to predict the uptake and effects of pesticides, a study of the runoff of pesticides into farm ponds and a real-time model of exposure and effects of atmospheric pollutants. Dr. Dixon has taught courses in modeling, geographic information systems, ecosystems analysis, biometry and wildlife management.

Dr. Dixon received his B.S.

Ms. Catherine M. Bens

Dr. Richard L. Dickerson

Dr. Kenneth R. Dixon

Dr. Michael J. Hooper

Dr. Thomas W. La Point

Dr. Ernest E. Smith

Dr. Scott T. McMurry

degree in Forestry from the University of Florida in 1964. In 1968 he received his M.S. in Forestry, also from the University of Florida, specializing in statistics and systems engineering. In 1974, Dr. Dixon received a Ph.D. in the School of Natural Resources at the University of Michigan. His research primarily involved developing an ecosystem model to predict the effects of sewage wastewater on wetland ecosystems.

Dr. Michael J. Hooper-Member, Analytical and Biochemical Toxicology Mike Hooper serves as member of the Analytical and Biochemical Division of TIEHH and associate professor of biological sciences. He also serves as Graduate Education Coordinator. He is a biochemical toxicologist whose work focuses on transferring laboratory exposure and effect measurement techniques to field applications. He received his Ph.D. in Pharmacology and Toxicology from the University of California at Davis in 1988 and has been working as a wildlife toxicologist in academia since that time.

Before joining TIEHH, he was Associate Professor of Environmental Toxicology at the Institute of Wildlife and Environmental Toxicology (TIWET)Clemson University. His research program emphasized the study of chemical impacts on wildlife inhabiting chemically contaminated environments.

Biochemical techniques are used to assess chemical exposure, effects and potential susceptibility in a wide variety of species. Of particular interest are the maturational patterns of contaminant-sensitive enzymes in developing young and the role they play in age-dependent toxicity. These techniques, when tied to field studies, help evaluate the safety and/or hazard of chemical pesticides, direct the remediation of contaminated ecosystems, and provide an endpoint in the assessment of remediation success. Much of his work has been through the joint EPA/NIEHS Superfund Basic Research Program.

Recently, he has been studying wild birds, particularly Swainson's Hawks, in Latin America, examining native and migrating species, their natural history and their interactions with pesticides. His efforts have focused on bringing regulatory, industrial, non-governmental and academic research interests to bear on pesticide incident issues by developing interactions and consensus for action between these diverse interest groups.

Dr. Thomas W. La Point, Section Leader-Aquatic Toxicology Thomas W. La Point serves as section leader of the Aquatic Toxicology Section of TIEHH and Professor. Formerly, Dr. La Point was associate professor, Department of Environmental Toxicology, The Institute of Wildlife and Environmental Toxicology at Clemson University.

Dr. La Point received his Bachelor of Science degree in Zoology and Physiology from University of Wyoming in May of 1971. He earned his Master of Science degree in Population Biology from University of Houston in August of 1975 and his Ph.D. in Aquatic Biology from Idaho State University in May of 1980.

Dr. La Point is interested in the effects of exposure to single or multiple chemicals on the dynamics of aquatic community structure and function. A strong component of this research links laboratory to field measures of toxicity and determines how chemicals influence benthic invertebrate population dynamics in relation to habitat structure and trophic status. In addition, his students have studied the effects of non-point pollution and chronic low levels of contaminants on the structure of aquatic communities.

Dr. La Point has served as an ecotoxicologist with the U.S. Fish & Wildlife Service in Columbia, MO. He is a member of several scientific societies and have served on the Board of Directors of the Society of Environmental Toxicology and Chemistry (SETAC) and as Editor of SETAC Special Publications.

Dr. Ernest E. Smith, Member-Analytical and Biochemical Toxicology Ernest E. Smith serves as a member of the Analytical and Biochemical Division of TIEHH and assistant professor of biological sciences. In addition, Dr. Smith serves as Undergraduate Education Coordinator. He was assistant professor in the Department of Environmental Toxicology and an Assistant Section Leader of the Biochemical and Behavioral Toxicology Division, in The Institute of Wildlife and Environmental Toxicology (TIWET) at Clemson University. His teaching and research interests include reproductive and developmental effects of environmental contaminants, as well as the development and understanding of biomarkers of the endocrine and immune systems, in developing offsprings and adults. He received his undergraduate degree in Agricultural Sciences, with a major in animal science, from Prairie View A&M University

from Prairie View A&M University in Prairie View, Texas and his Ph.D. in Toxicology from Texas A&M University. He is the author of several peer-reviewed publications and has been awarded several research grants from federal, state and private source to investigate aspects of teratogenesis, biochemistry, ecotoxicology, mycotoxicology and endocrine disruption.

Dr. Scott T. McMurry, Section Leader-Terrestrial Toxicology Scott McMurry serves as section leader of the Terrestrial Toxicology Division of TIEHH and assistant professor of biological sciences. He did serve as Assistant Professor in the Department of Environmental Toxicology and The Institute of Wildlife and Environmental Toxicology at Clemson University in South Carolina.

He received his Ph.D. in Fisheries and Wildlife Ecology from Oklahoma State University in 1993 where he studied the effects of petroleum waste on immune function and population and community dynamics of wild rodents. He has been researching the effects of stressors on wildlife populations for 10 years, focusing on small mammal population and community dynamics in disturbed environments. His recent research activities and interests include contaminant effects on reproduction and migration in birds and immune function and population dynamics of small mammals, food chain transfer of contaminants, contaminant exposure and effects on crocodilians in Central America, and development of resistance to chemicals and associated fitness tradeoffs in small mammals.

Faculty/Graduate Student Professional Memberships

TIEHH faculty and graduate students are members of several professional organizations including:
American Association for the Advancement of Science (AAAS)
American Board of Toxicology (ABT)
American Chemical Society (ACS)
American Society for Microbiology (ASM)
American Society of Quality Assurance
Canadian Network of Toxicology Centers
The Conservation Foundation
National Academy of Science
Sigma Xi (Scientific Honorary Society)
Society of Environmental Toxicology and Chemistry (SETAC)
Society of Toxicology (SOT)

Guest Speakers, 1997-98

During 1997-98, TIEHH attracted specialists in environmental science and toxicology fromindustry, government and academia to speak to the faculty, staff and students at Texas Tech University and Texas Tech Health Sciences Center. The following individuals conducted special seminars in 1997-98:

Dr. Perry Gehring, Vice President of Research and Development, Dow AgroSciences in Indianapolis, Indiana
"Pesticide Research and Development"- January 12, 1998

Dr. James Bus, Technical Director of the Health and Environmental Research Laboratory, The Dow Chemical Company in Midland, Michigan "Use of Mechanism of Action Studies for Insight into Human Cancer Risks Associated with Chemical Exposure: Examples of Methyl Chloride and Ethyl Chloride"- January 22, 1998

Dr. Russell Bowes, Department of Pharmaceutical Sciences-Texas Tech University Health Sciences Center School of Pharmacy in Amarillo, Texas "Chemically-induced tubulointerstitial fibrosis and hepatocyte growth factor induced renal proximal tubule epithelial cell tubulogenesis are modulated by transforming growth factor-b1"- February 6, 1998

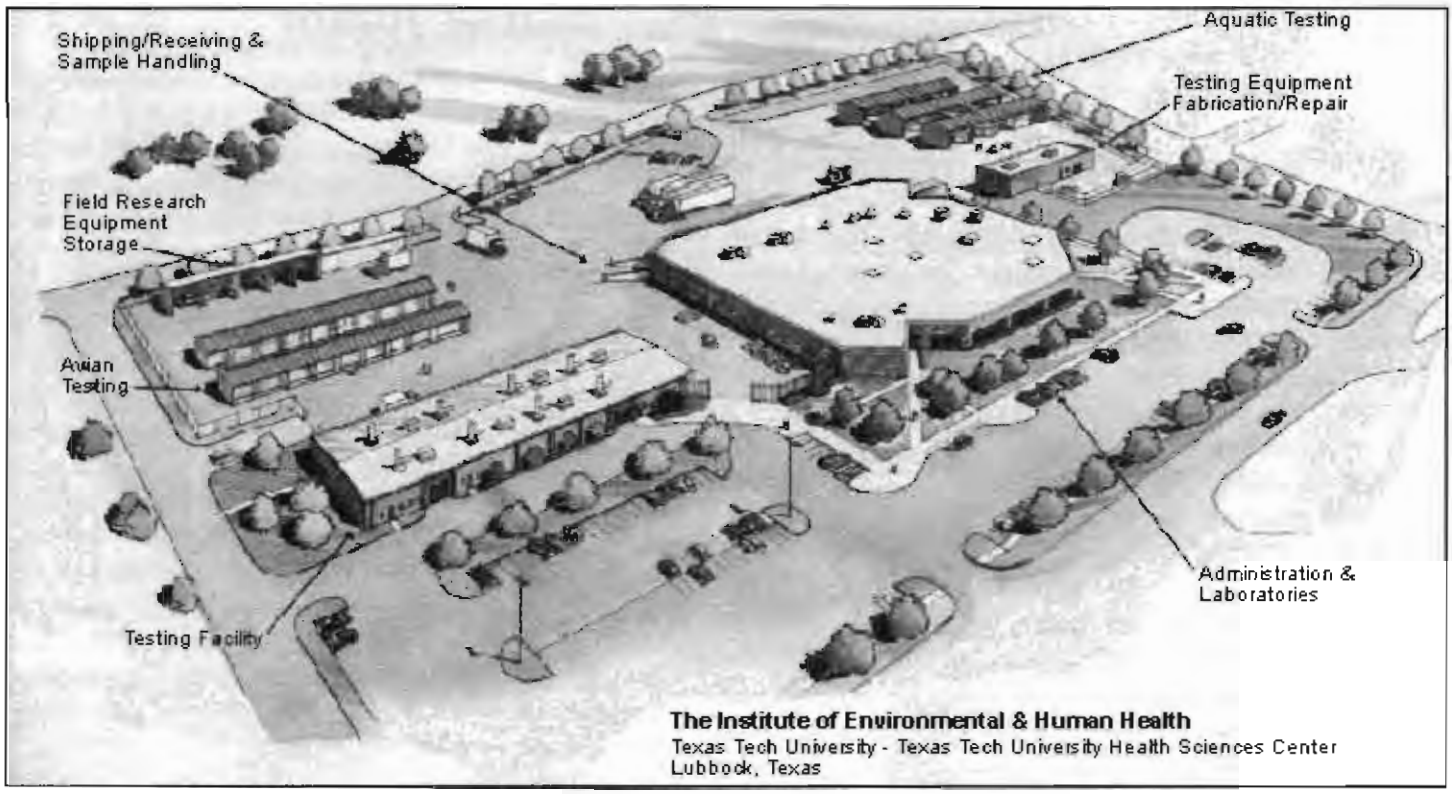
Dr. Ronald Porter, Staff Toxicologist-Human Systems Center, Brooks Air Force Base in San Antonio, Texas
"Approaches to Environmental Risk Assessment in the U.S. Air Force"- February 19, 1998

Dr. Elizabeth Maull, Staff Toxicologist-Human Systems Center, Brooks Air Force Base in San Antonio, Texas "The Evolution of Health Risk Assessments: Trichloroethylene as a Case Study"-February 20, 1998

Dr. Roger Haldenby, Vice President-Operations Plains Cotton Growers, Inc. in Lubbock, Texas "Current Issues in West Texas Agriculture"- March 11, 1998

Dr. Ronald Chesser, Director of Radioecology at the Savannah River Ecology Lab, "The New International Radioecology Program at Chernobyl," August 3, 1998

"There is a pressing need for sound scientifically-based research concerning the serious and growing ecological and environmental health problems affecting the Southwest United States and the nation as a whole. Texas Tech has made a major investment in the creation of TIEHH, which is dedicated to establishing partnerships to improve risk-based toxic chemical research and mediation and to focus on the health effects of chemicals in the environment on humans, especially children. Working hand in hand with our general academic departments, School of Medicine and School of Law, the Institute represents a unique and powerful opportunity to conduct research that will benefit the nation's environment and economy while contributing to the improved health of the American people."



TIEHH Facility and Research Locations

TIEHH Headquarters-Lubbock, Texas
Ecorisk, Inc.-Ferndale, Washington
Edith Angel Research Center-Chariton, Iowa
Ciba/Olin Research Site-McIntosh, Alabama
Lamanai Outpost Lodge-Belize
Paducah Gaseous Diffusion Plant-Paducah, Kentucky
Rocky Mountain Arsenal-Denver, Colorado
Anaconda Smelter- Anaconda, Montana
Crooked Creek Project-Bennettsville, South Carolina

Edith Angel Environmental Research Center

(EAERC) Mr. Chuck Crabtree, Site Manager

The Edith Angel Environmental Research Center (EAERC) is headquartered on a 160-acre farm three miles south of Chariton, Iowa. The Center provides the headquarters for more than 6 farm tracts involving 12 cooperators comprising a total 2,540 acres for the facilitation of current agricultural research. This 4,500 square foot building was erected in 1991 and serves as headquarters for the EAERC. The building houses a 1,090 square foot analytical chemistry laboratory, 940 square foot conference room, two smaller laboratories, a freezer room, reception area, 5 private offices and rest room and shower facilities.

Topography of the south central Iowa region ranges from nearly flat upland areas to gently rolling hills cut by intermittent streams. Most upland areas are grazed by cattle or utilized for hay, corn, or soybean production. There are 100 arable acres of Center property in crop and hay rotations; the remaining acreage includes three small ponds, mixed timber, grassy upland, waterways and creek bottomlands. EAERC provides a research base for studying the effects of farm management practices, including chemical use, on wildlife inhabiting this agricultural region.

EAERC was established in October 1988 and named after the former property owner, Edith Angel. Edith Angel desired that the property be used "to protect the wildlife she loved and provide a safer environment for mankind."

Past studies conducted at the Iowa field site include research addressing:

- Pesticide concentrations and fate in soil, water, vegetation and biological tissues
- Pesticide exposure in Great Horned owls and American kestrels
- Risk management and agricultural ponds

"TIEHH is a unique concept. It brings together environmental, toxicological, medical, and legal expertise into an institute to focus on and resolve issues created by modern society—an ambitious and, to my knowledge, unduplicated effort elsewhere in the academic community. Reese [Center] has created an opportunity to not only house the Institute but to launch other programs such as meetings and workshops that are relevant to the mission of the Institute. The support of the community, business leaders and administration at Texas Tech is both unique and valuable. The foregoing together with the excellence of the new faculty and the enthusiasm of the graduate students indicates a bright future."

Former Vice President for Research and Development Perry Gehring, Dow AgroSciences

Texas Tech University/Texas Tech Health Sciences Center Administration

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"TIEHH is an outstanding example of how Texas Tech's varied academic disciplines can join forces for a common goal. From a health care perspective, TIEHH is able to tap into our resources and we, in turn, have access to an enhanced spectrum of expertise in environmental health. It is a partnership that benefits everyone and an opportunity for Texas Tech to give back something to the community of West Texas."

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Research in environmental and human health must provide solutions for some critical problems in the near future. The establishment of the Institute at Texas Tech provides us an opportunity to play a pivotal role in this research. We are fortunate to have Dr. Ron Kendall directing the Institute. He and the faculty members whom he has recruited for the Institute provide a wealth of expertise in this area."

Notes