



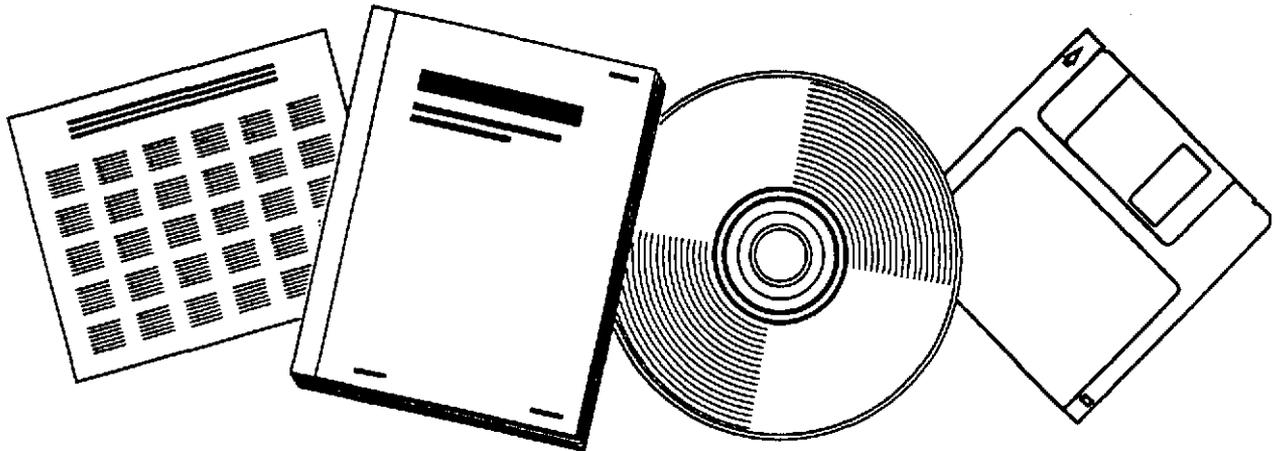
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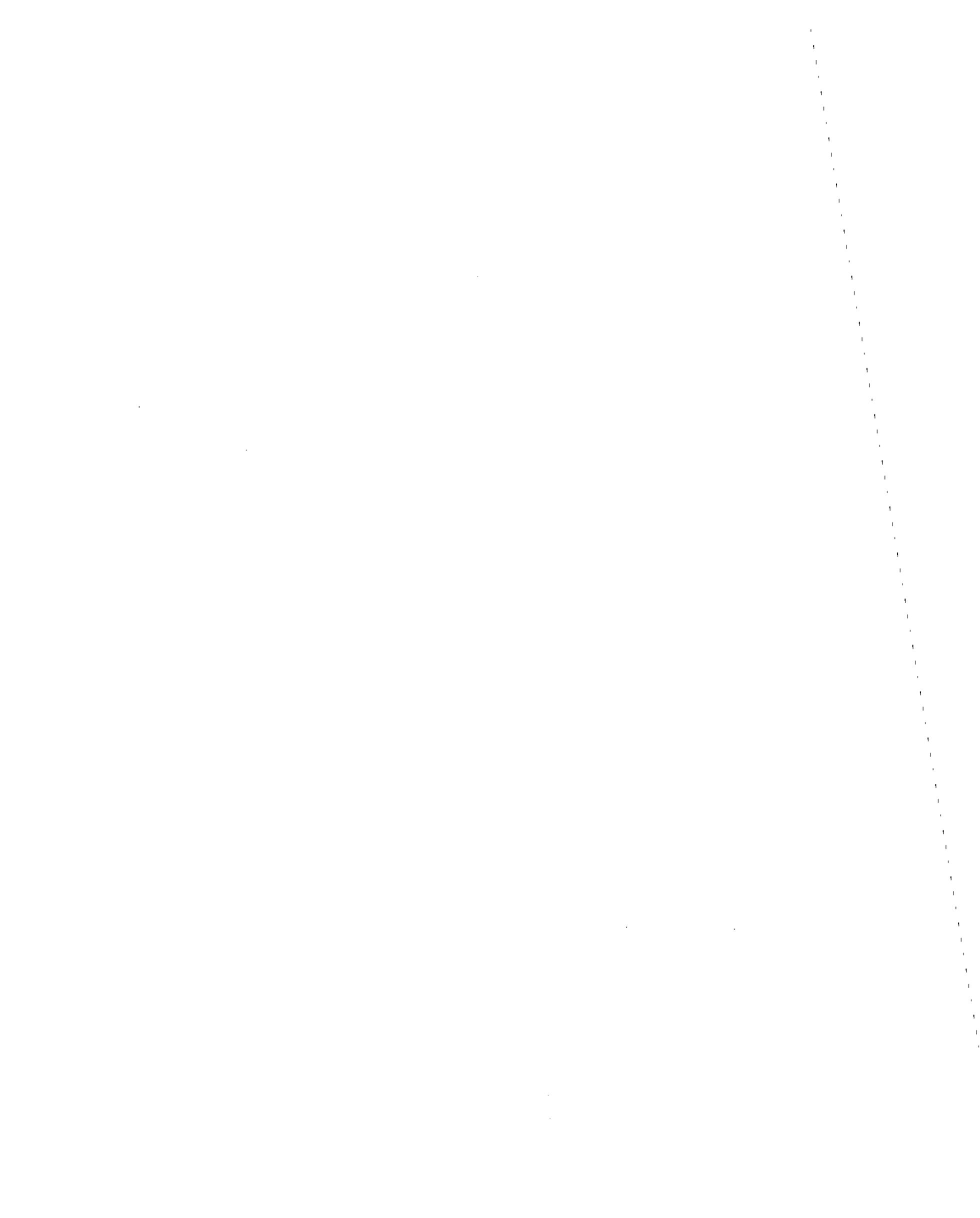
**NORTH CAROLINA OCCUPATIONAL SAFETY AND
HEALTH EDUCATIONAL RESOURCE CENTER FINAL
PERFORMANCE REPORT COVERING THE PERIOD OF
JULY 1, 1992-JUNE 30, 1995**

NORTH CAROLINA UNIV. AT CHAPEL HILL

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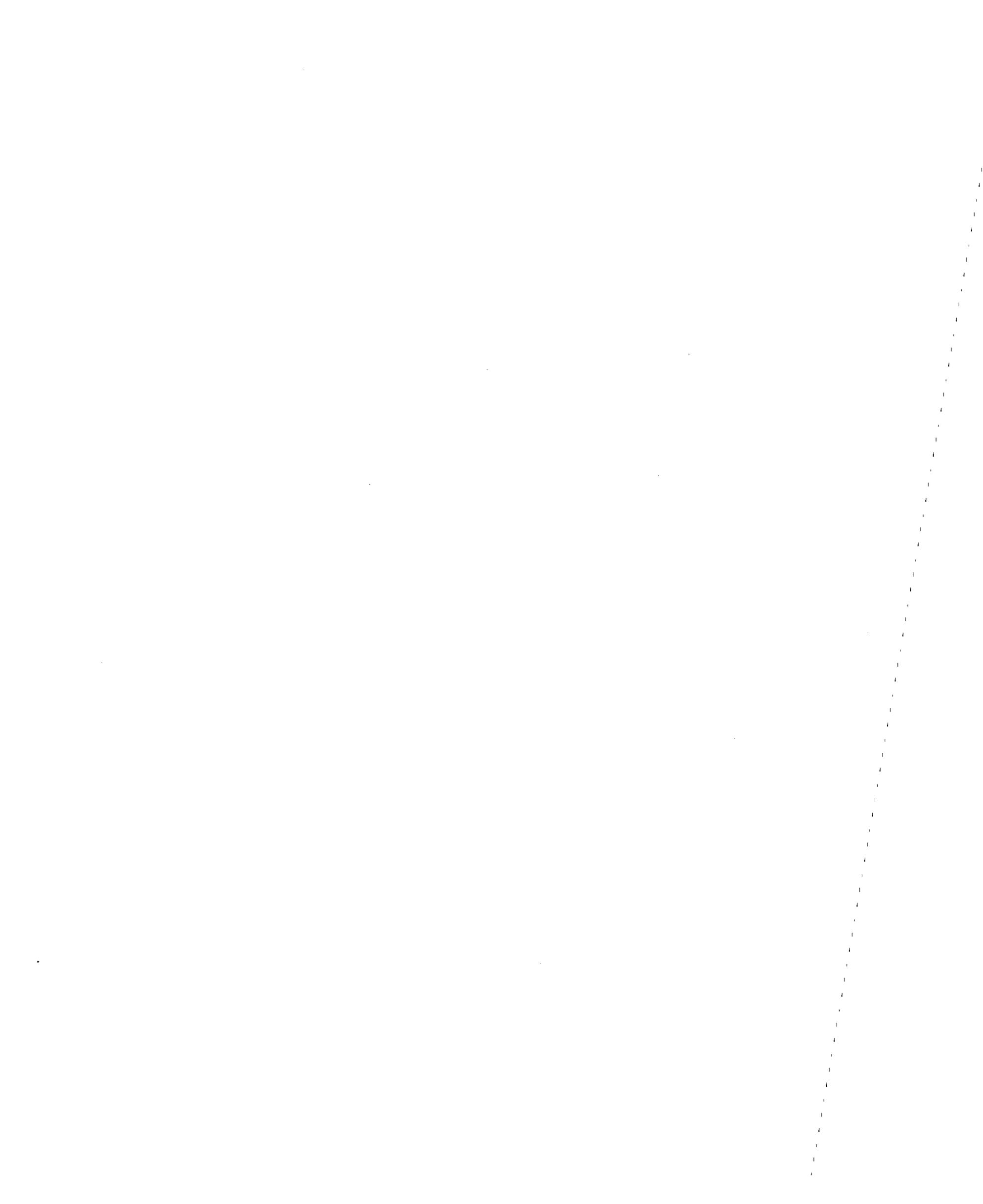
THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF ENVIRONMENTAL SCIENCES AND ENGINEERING
CHAPEL HILL, NC 27599-7400

FINAL PERFORMANCE REPORT
NIOSH TRAINING GRANT NO. T42 OH 07101--19-20, T42 CCT410423-01
THE NORTH CAROLINA OCCUPATIONAL SAFETY AND HEALTH
EDUCATIONAL RESOURCE CENTER
COVERING THE PERIOD JULY 1, 1992 - JUNE 30, 1995

NOVEMBER 1995
MICHAEL R. FLYNN, Sc.D.
PROGRAM DIRECTOR



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FINAL PERFORMANCE REPORT
 Years 1992 - 1995
 North Carolina Occupational Safety and Health
 Educational Resource Center
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DIRECTOR'S OVERVIEW

Administration

The North Carolina ERC is administered by an Executive Committee consisting of the Center Director (Michael R. Flynn, Sc.D.) who also serves as the Industrial Hygiene Program Director, the Director for the Occupational Medicine Program (Woodhall Stopford, M.D.), the Director of the Occupational Health Nursing Program, (Bonnie Rogers, Dr. P.H.), and the Director of Continuing Education (Larry Hyde, M.S.). In addition, Mr. Hyde directs the Hazardous Substance Training Program. All programs are located at the University of North Carolina, Chapel Hill with the exception of Occupational Medicine which is at nearby Duke University. Please see Organizational Chart on following page. The North Carolina ERC utilizes advisory committees for each of the programs listed above. These committees consist of members from industry, government, and academia, and they provide the various programs with input regarding curricula; needs assessment; and regional, national, and global perspectives on occupational health and safety. Each program advisory committee has a chair who serves as a representative to the Center Advisory Board. The Advisory Board contains an additional labor/community representative and it meets semi-annually with the ERC Executive Committee to co-ordinate the advisory process, propose action items, and facilitate changes within the ERC.

Program Status

The past three year period has been one of change at the North Carolina ERC. This change is the result of the ongoing process to achieve an appropriate balance between research and teaching in the education of occupational health professionals. Specifically for each of the program areas within the past three years there have been significant changes: Occupational Health Nursing has established an interdepartmental arrangement whereby Epidemiology students may obtain a PhD degree with specialization in Occupational Health Nursing; Industrial Hygiene has reduced the number of Master's students and increased PhD enrollment, while simultaneously expanding the options available for Masters students; and Occupational Medicine has initiated a post-residency research training program and initiated an interdisciplinary training course where students work on industrial projects.

These changes reflect trends within the field of Occupational Health and Safety which paradoxically point to the need for more technical expertise and specialization while at the same time increasing demand for broad based practioners. The rapid changes which have swept the industrial community including downsizing and outsourcing have had impact on the field and are changing the the job market. To be responsive to the changing climate and shifting priorities the ERC has expanded its Advisory Infrastructure and increased the interdisciplinary interactions, not only within the ERC, but the universities as well.

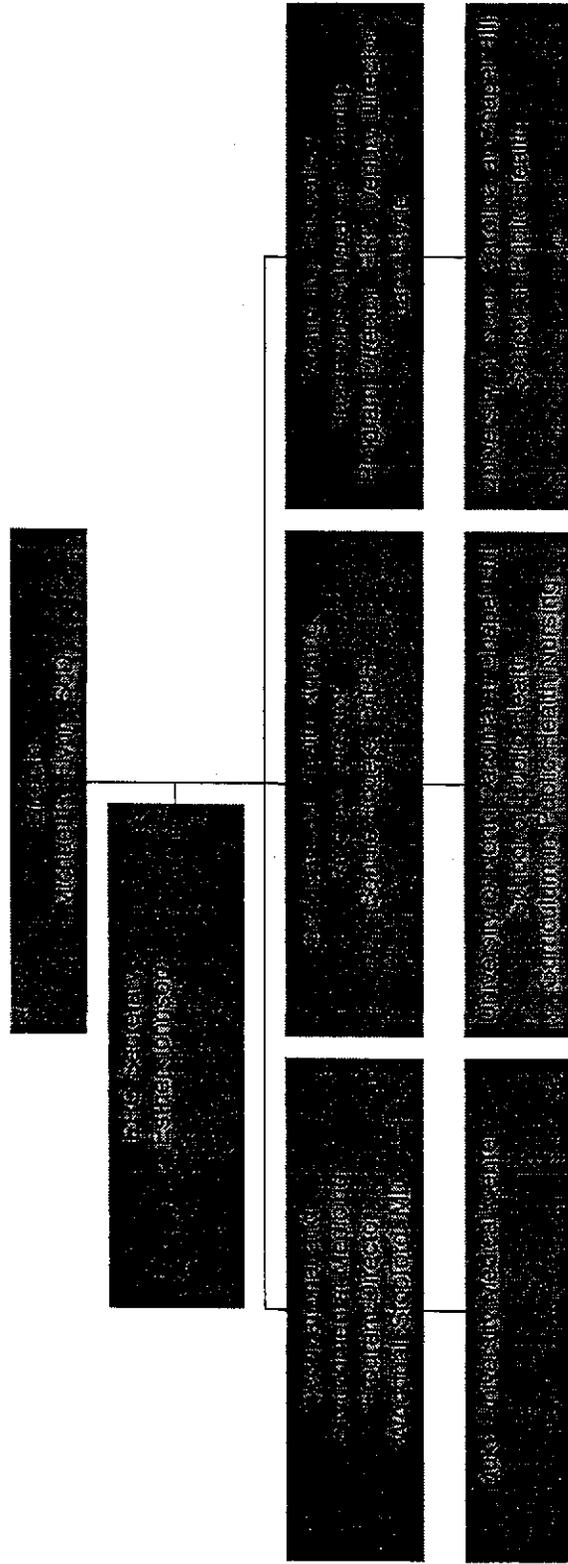
Major changes include: (1) the creation of a formal interdisciplinary course sequence required of all NIOSH trainees which brings together physicians, nurses, and hygienists together in a field-trip based course, with hands-on experience at local industries; (2) the creation of a joint industrial hygiene-radiation health option resulting in a double major for Masters students desiring such cross-training; and (3) the enhancement and formalization of the advisory processes including mission statements. In addition, a plan to integrate the Safety and Ergonomics options available within the ERC into a single course is under study. A search is underway for a faculty member with a joint appointment in Industrial Hygiene and Epidemiology. We anticipate filling this position during the next year.

Research continues to be a strong trademark of the North Carolina ERC. Specific areas include: Engineering control and mathematical modeling of occupational exposures; Exposure assessment, Aerosol Physics, and Measurement methods. The faculty remains committed to the philosophy that in-depth study on a specific research project is one of the most important educational experiences a student can have. However, trends make it desireable for some students to have broad skills in a wide variety of disciplines. There is continuing effort to adjust our research projects to fit both needs. The requirements for a Masters technical report both written and oral remain an important part of our program, and develop the communication and problem solving skills so highly sought after by the private sector.

Faculty

Appendix I presents a listing of faculty who have been involved in a significant way with the ERC during the last three year period.

ORGANIZATIONAL CHART
 NIOSH SPONSORED
 NORTH CAROLINA OCCUPATIONAL SAFETY AND HEALTH
 EDUCATIONAL RESOURCE CENTER



Students

Table 1 shows the summary enrollment data for the ERC programs.

TABLE I
THREE YEAR SUMMARY
Enrollments, Graduates and Continuing Education

	1992 - 1993	1993 - 1994	1994 - 1995	TOTAL
ACADEMIC ENROLLMENTS				
Occupational & Environmental Medicine	2	3	3	8
Occupational Health Nursing	15	11	14	40
Industrial Hygiene	44	33	27	104
TOTAL	61	47	44	152
TRAINEES RECEIVING NIOSH SUPPORT				
Occupational & Environmental Medicine	2	3	2	7
Occupational Health Nursing	11	10	7	28
Industrial Hygiene	6	5	7	18
TOTAL	19	18	16	53
NUMBER OF GRADUATES				
Occupational & Environmental Medicine	2	3	2	7
Occupational Health Nursing	4	3	7	14
Industrial Hygiene	8	9	13	30
TOTAL	14	15	22	51
Continuing Education Enrollment				
TOTAL PARTICIPANTS	2555	2404	2757	7716

Figures 1-3 present graphic displays of Table 1 summary data.

FIGURE I

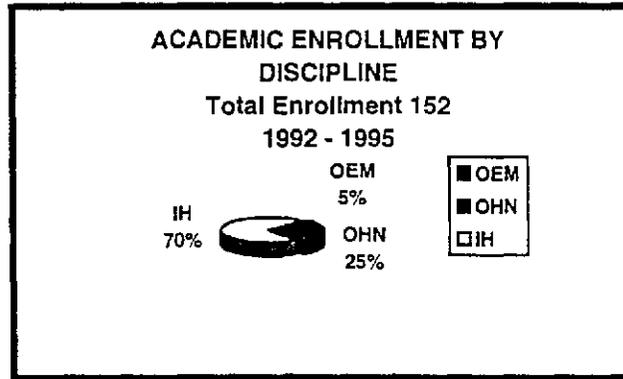


FIGURE II

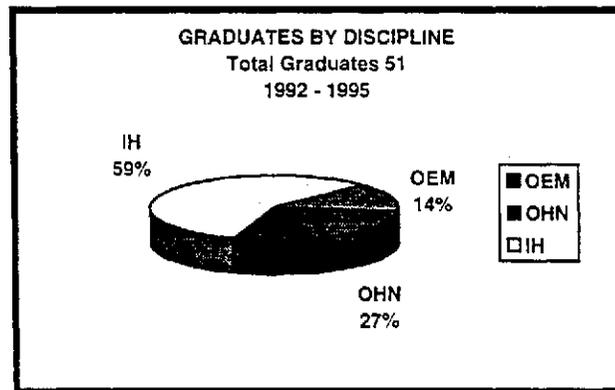
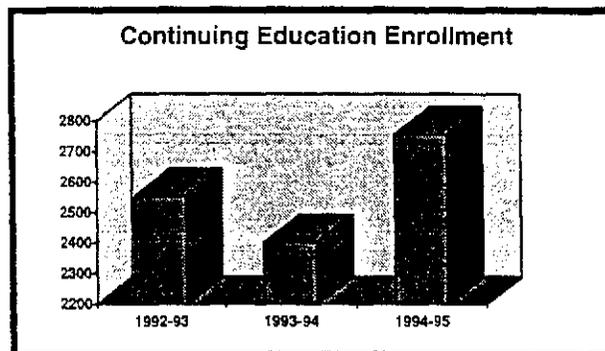


FIGURE III



Appendix II provides a comprehensive list of students who completed the training during this 3 year period.

Funding

The principle sources of funding for faculty and staff in industrial hygiene and occupational health nursing remain state funds and research grants. For the 25 major faculty and staff contributors to the ERC academic programs, NIOSH funding from the training grant accounts for about 9% of the need. This funding is helpful, but there is obvious pressure on faculty to obtain research grants for the remainder of salary support. State funds at UNC account for, on average, about 50% of the remaining need. In the absence of increased training support, survival of these programs is clearly dependent upon the ability of faculty to maintain active, on going research programs.

NIOSH support for students has been extremely important and without stipends and tuition awards it is unlikely many of the students would attend. A recent analysis of the NIOSH Training Line Funding from 1971-1995 indicates that for 1995 approximately the same amount of money, in actual dollars, was budgeted as in 1980, \$12.9 million. However the impact of inflation as reflected in equivalent dollars indicates that this allotment will purchase only about 40% of what it would have in 1980. The continuing erosion of financial support is having a negative impact on occupational health and safety training.

Needs Assessment

Nationwide occupational injuries and illnesses continue to be a major public health problem. The number of work related fatalities from 1980-1989 was 63,589. The National Safety Council estimates 3.3 million Americans disabled each year due to occupational injuries at a cost to the economy of about 200 billion dollars. Although occupational illnesses are more difficult to identify from current recordkeeping requirements, asbestosis alone accounted for 8,125 deaths from 1968 to 1990 with a dramatic increase from 77 in 1968 to 948 in 1990, and further increases anticipated.

The North Carolina ERC serves the southeastern area (Region 4) of the US including: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina and Tennessee. Data from the *Statistical Abstract of the United States - 1994* indicates that the civilian workforce in these states comprised approximately 18% of the total US workforce in 1993. Based on data from an 1994 AIHA survey of its membership this same region accounts for only 12% of the total number of US hygienists. Assuming comparability despite the slightly different time periods for which the data were collected, region 4 is about 32% below the national average of hygienists per worker: 67 hygienists per million workers employed locally in Region 4 vs. 97 hygienists per million workers nationwide.

An analysis of work-related lung disease (Work-Related Lung Disease Surveillance Report Aug 1994 CDC) indicates that for the period from 1968-1978 deaths in region 4 from malignant neoplasms of the lung, and from asbestosis accounted for 13% and 10% respectively for these causes of death nationwide. For the period of 1979-1990 these numbers jumped to 27% and 14% respectively. In addition 65% of the deaths in the US due to byssinosis occurred in region 4 during this latter period (1979-1990). It is clear that increased attention to occupational health and safety remains a priority in region 4 and increased numbers of hygienists, physicians, and nurses are needed.

Future Trends

As this report is written, funding for continuation of the ERC programs is in jeopardy, as is NIOSH itself. Legislation under consideration in Congress, as well as market forces in a changing global economy, raise significant concerns about how occupational safety and health education and practice will continue in the years to come. Several trends appear to be at work which are of special significance for the ERC's. - (1) The growing environmental movement is of major significance, the days of focusing strictly on what occurs inside the plant are gone. The growing realization of the interdependence of environmental and occupational health issues and achieving successful solutions has become a major revolution in the way hygiene is practiced. (2) The globalization of the economy and increased competition is putting pressure on industry to obtain economic solutions for occupational health and safety problems. (3) The growth of risk assessment as a science, and the realization that all jobs have risks and that any control decision implemented will exchange one set of risks for another (hopefully more protective).

These trends, an expanding world population, and the technology revolution will continue to reshape not only occupational safety and health but our world in general. Education will have to remain broad and interdisciplinary; and paradoxically, at the same time more focused on research. These competing trends will have profound implications for how NIOSH ERC's evolve. At the North Carolina ERC continued efforts are

underway to identify co-operative interactions with other disciplines to provide hygienists, nurses and physicians with the opportunity to expand their knowledge-base for the jobs of the next decade. Interactions between biostatistics, epidemiology, environmental engineering, environmental health sciences, mathematics, computer sciences, the business school and other programs on and off campus are ongoing at the North Carolina ERC.

OCCUPATIONAL AND ENVIRONMENTAL MEDICINE TRAINING AT DUKE MEDICAL CENTER

Purpose and Program Characteristics

Occupational and Environmental Medicine training programs within the Division of Occupational and Environmental Medicine at Duke have been developed to meet a regional need for physicians and health professionals with training and expertise in the areas of Occupational and Environmental Medicine. Duke's Occupational and Environmental Medicine Residency Program is fully accredited and has graduated 25 residents since the initial accreditation in 1981. Duke offers a two year residency program which integrates the academic and practical years of training. Academic training, leading to an MPH or MSPH degree, is received at the UNC School of Public Health with emphasis in Environmental Sciences, Industrial Epidemiology, Industrial Hygiene or Health Care Administration Planning. Further didactic training is received through ongoing seminars in Occupational and Environmental Medicine, Toxicology and Occupational Mental Health within our Division. Each year, Duke residents take short courses at the North Carolina ERC Winter or Summer Institute. The Duke University Employee Occupational Health Service, and Glaxo-Wellcome, Inc. support on-site practicum training for our residency program. Residents receive further clinical training in our consulting service. Continuing Educational in Occupational and Environmental Medicine is offered to health care professionals in our region through day-long short courses in Worker's Compensation law as well as a seminar in Occupational and Environmental health held at Duke each week.

Program Leadership and New Faculty

The residency training program in Occupational and Environmental Medicine lies within the Division of Occupational and Environmental Medicine. Residents are supervised by the Division's faculty members. Each resident's academic emphasis area at the UNC School of Public Health provides an academic advisor. The resident must meet with this academic advisor quarterly. Residents provide the Duke OME Program Director with evaluations of each academic course at the end of each term. These evaluations are used for counseling future residents. The UNC academic advisors consult with the Duke OME Program Director on any deficiencies in academic training. The Duke OME Program Director is responsible to assure that the academic portion of the training program meets requirements for graduation at the UNC School of Public Health, special requirements of the program (including Occupational Mental Health and Industrial Toxicology) as well as requirements for board certification in Occupational Medicine.

The physician manager at each practicum site acts as the resident's advisor for his practicum training. This advisor meets with the resident every 1-2 weeks and is responsible for assuring that the experience at the practicum site meets both the program's expectations as well as that of the practicum training site. Both the residents and the practicum site advisors meet with the program director quarterly concerning this training experience.

New Faculty

Edward Thalmann MD: Dr. Thalmann has joined our faculty after completing his occupational medicine residency at Duke. Prior to joining our residency, he was Director of Diving Biomedical Technology and the Decompression Research Programs at the Naval Medical Research Institute. Dr. Thalmann has assumed the directorship of the Divers Alert Network, a teaching and research program in recreational diving at Duke. Dr. Thalmann will offer our residents a course in hyper/hypobaric physiology and act as a preceptor in a longitudinal experience in clinical hyperbaric medicine. He acts as a resident advisor for residents in the Underseas Medicine/Occupational and Environmental Medicine residency tract.

David Siebens, MD: Dr. Siebens joins our faculty after completing his MPH at the University of North Carolina's School of Public Health. Prior to accepting an academic position, he worked as a consulting physician to IBM and the Duke Occupational Health Service. He acts as a clinical preceptor and advisor to our residents and as an instructor in the Duke School of the Environment.

John Dement, Ph.D: Dr. Dement joined our faculty from his position as director of the Office of Occupational Health and Technical Services of the National Institute of Environmental Health Sciences. He provided expert technical assistance to special Institute initiatives and projects related to occupational and environmental health. He also provided exposure assessment expertise to Institute epidemiologic research activities. Dr. Dement directs an extensive interdisciplinary research training experience in epidemiology involving occupational medicine fellows and occupational safety trainees.

Ricky Langley, MD: Dr. Langley joined our faculty from an academic position within the Department of Preventive Medicine and Public Health Policy at East Carolina University. Dr. Langley's research focus is on work-related injuries and illness associated with farming. Dr. Langley acts as a preceptor for our occupational medicine residents and as an advisor where research projects involve rural occupational and environmental health issues.

Changes in Interdisciplinary Training

Residents are required to take a combined 6 hour interdisciplinary course built on the following two courses:
ENVR 144, Industrial Toxicology and Occupational Medicine
ENVR 149, Health hazards of Industrial Operations

ENVR 144 is an applied industrial hygiene course where students learn of potential hazards in various industries through a series of field trips. Both courses will be required for core students in industrial hygiene, occupational medicine and occupational nursing. A team made up of representative learners from each core discipline will evaluate a work site for potential occupational hazards. The problem-oriented approach to the prevention of a specific hazard will then be addressed, also as a group, as a project within ENVR 144.

Our faculty has assumed complete responsibility for all occupational medicine training for general internal medicine residents at Duke and for the Duke Family Medicine Residency program. The format is a series of grand rounds, case studies and seminars. In addition our faculty offers the Family Medicine Residency program monthly lectures in practice management and preceptors for clinical experiences. Our program continues to offer one-month rotations in occupational medicine for general internal medicine and family medicine residents.

Research

Since 1993, we have offered a more extensive interdisciplinary research training experience in epidemiology involving occupational medicine fellows and occupational safety trainees. This interdisciplinary research training program involves the Environmental Epidemiology Section of the NC Department of Environment, Health and Natural Resources, the Department of Epidemiology at the UNC School of Public Health and the Division of Occupational and Environmental Medicine at Duke. The research training fellow in this program spends one year entirely within the Environmental Epidemiology Section and is responsible for one or more major research project of the Section.

Duke has recruited a director of research training for this program, Dr. John Dement. His expertise in the areas of exposure assessment, industrial hygiene and epidemiology are particularly appropriate for our program's emphasis in research training. It is expected that graduate students and post-doctoral fellows of the UNC-SPH Department of Epidemiology will become directly involved in the study of some of the environmental health problems investigated by the Environmental Epidemiology Section. These will be

addressed in classroom seminars, directed research, on-site summer research projects and other forms of learning experiences for graduate students. Students will be involved in cooperative investigations with an environmental epidemiology fellow.

Changes in Academic Requirements and Practicum Experiences

In order to address concerns about adequate resident time to allow a greater breadth of practicum experiences, we have negotiated an alternate academic path for occupational medicine residents.. The Department of Epidemiology of the UNC School of Public Health will reserve 3 slots each year for qualified occupational medicine applicants. Residents must apply for early acceptance and must have alternate programmatic preferences (in health care administration policy, industrial hygiene or environmental health) to allow a competitive acceptance process. The first resident who was accepted via this process, completed academic requirements for our program in two semesters while maintaining a weekly longitudinal practicum experience.

Our program continues to have two primary longitudinal practicum sites (Glaxo-Wellcome, Inc. And Duke University Medical Center). The practicum requirements for these rotations are now met with a combination of longitudinal management and clinical experience block rotations in the summer for program introduction and intensive project activities. This allows residents to take a variety of alternate longitudinal and block practicum experiences during their second year. A new longitudinal experience focusing in repetitive stress disorders has been developed at Blue Cross/Blue Shield. During the coming year we will be developing a new block rotation at the Navy Underseas Environmental Research Center in Norfolk, Virginia.

Multi-Specialty Training

Training Tract in Occupational Medicine for the Primary Care Specialist

Our program is offering a joint training experience in occupational and family medicine in cooperation with the Duke Family Medicine Residency Program. When Duke initiated the occupational medicine residency program, it was designed to combine training in both family medicine and occupational medicine. These programs have continued to cooperate closely. Both programs are within the Department of Community and Family Medicine. Family medicine residents have the opportunity for elective experiences in occupational medicine. Two published papers (one on monitoring for VDT effects and the other on worker's compensation issues) have resulted from such cooperative opportunities. The Duke OEM faculty is responsible for providing periodic occupational medicine seminars to all family medicine residents to fulfill their occupational medicine training requirement.

Underseas Medicine/Occupational Medicine Graduate Training Program

An Undersea Medicine Graduate Training Program has been developed at Duke University. This program represents a collaboration between the F.G. Hall Hypo/Hyperbaric Center, the Divers Alert Network and the Duke Division of Occupational and Environmental Medicine. Trainees complete a program similar to occupational medicine residents while at Duke University. The substantial flexibility in occupational medicine training will be exploited to allow specific training opportunities in advanced undersea medicine while completing requirements for board certification in occupational medicine.

Residents

Six residents have completed the program between 1992 and 1995 (see ~~attached information on resident~~
We currently have four residents in the program.

OCCUPATIONAL HEALTH NURSING

I. BACKGROUND

A. The Curriculum in Public Health Nursing and Commitment

The Curriculum in Public Health Nursing offers the Master of Public Health (MPH) and the Master of Science (MS) degrees of public health nursing with specialization in occupational health nursing. The MPH program in Occupational Health Nursing prepares nurses for positions in program planning and evaluation, administration and management of occupational health programs. The program leading to the MS degree prepares graduates in a similar functional capacity; however, more emphasis is placed on the development of research skills, as beginning researchers. In October 1995, the Curriculum in Public Health Nursing was reaccredited by the National League for Nursing for a full 8 years.

B. National Need

The OHN program continues to attract students who, upon graduation, are in high demand for positions in occupational health settings. A 1995 survey of program graduates indicated that of the 48 who responded 42 were employed in occupational health related work; three were unemployed for family responsibilities; and three were employed in other fields. Students are usually recruited prior to graduation.

II. PROGRAM LEADERSHIP AND FACULTY

The Occupational Health Nursing Program is under the direction of Dr. Bonnie Rogers who provides 100 percent effort to the OHN program. The Occupational Health Nursing Program is housed within the Curriculum in Public Health Nursing, School of Public Health under the direction of Chairperson, Dr. Rachel Stevens. The Occupational Health Nursing Program has added two additional faculty. Dr. Wendie Robbins has a doctorate in Epidemiology and would be responsible for assisting with the Doctoral Program (later described) and development of the Occupational Health Nursing Practitioner Program. She also has a joint appointment in the Epidemiology Department. Ms. Judy Ostendorf is responsible for the practicum management and assisting with continuing education. She will also help develop and teach an expanded Safety-Ergonomics course.

There currently are some structural changes in the School of Public Health and the Curriculum in Public Health Nursing will be housed in a new unit, the Interdisciplinary Curriculum in Public Health Leadership. A chairperson of the new Curriculum has yet to be named. The impact of this move cannot be fully assessed at this time.

An Advisory Committee to the Occupational Health Nursing Program has been established for several years and is comprised of occupational health professionals from industry/occupational settings. This group provides advice and input as to curricular direction for the Occupational Health Nursing Program, new initiatives, and continuing education needs. This will help keep the Occupational Health Nursing Program abreast of the most current needs for occupational health nursing training and research, and industry needs for qualified individuals.

A. Program Curriculum

The MPH student usually completes the degree in 1 1/2 years. Two full years of study is required for the MS student. The academic content of the Curriculum in Public Health Nursing and occupational health nursing contains three curricular components: the public health sciences, the public health nursing core studies, and the OHN functional role courses and practicum. Specialization in public health nursing requires a sound foundation in courses from the public health sciences, specifically epidemiology, biostatistics and the environmental sciences.

The Curriculum in Public Health Nursing core courses, have been revised with the intent to increase student's knowledge of content and issues related to advanced public health nursing practice, program planning, health policy and management. The goal is to enhance student's skills in leadership roles in public health/occupational health nursing. The research methods course has been revised and developed into two. The first course is specific to the research process, methods, proposal development, and the latter specific to data management.

These courses help to prepare the student to demonstrate the conduct and utilization of research as a public health nursing leader who must assess and diagnose aggregates (i.e., worker) needs, and plan, implement, and evaluate programs directed at those needs. This course also helps prepare students for scholarly communication required for leadership in the health professions.

The OHN courses include content in role emphasis on management, program planning and administration in occupational settings. The occupational health nursing courses and practica are sequenced so that students begin by learning theories, concepts and processes in occupational health nursing and then apply these at the worksite i.e., assess and diagnose occupation-related problems, and plan, implement, and evaluate occupational health programs. Students have a variety of applied learning experiences e.g. walk-throughs, health promotion projects, seminar leadership and teaching, and simulated job interviews. The field practica, required of all students, enable students to develop and implement advanced occupational health nursing practice projects and synthesize the practice within their functional roles. A survey has been developed and pilot tested and will be mailed to approximately 1950 occupational health nurses in the Southeast region to have them identify and rate their practice areas with respect to curricular revision. We anticipate revising the curriculum content in the Spring of 1996 for the next academic year.

Selected coursework in safety, toxicology, industrial hygiene, occupational epidemiology, and ergonomics, and health policy provides the student with the skills necessary for the further development of the role of the occupational health nursing specialist within an interdisciplinary framework. Students learn about multidiscipline roles and interdisciplinary collaboration necessary to improve the health and safety of the worker and work environment.

Students are given a broad introduction to health management theory and concepts in organizational theory are explored in term of managing health care delivery systems. Health care financing, cost containment, and the economic impact of health care within an ethical framework is emphasized throughout the program.

1. Allocation of Program Credits and Program Examples

The requirements of the Curriculum in Public Health Nursing for the MPH/OHN degree is 37 credit hours. The use of practicing professionals as role models is built into many of the courses, particularly those in the nursing core. Students have participated in several worksite tours such as Cone Mills Textiles, American Airlines, SAS Institute, Goodmark Foods, and Coty Cosmetics, Revlon, City of Durham, and Glaxo. A special tour of the Kennedy Space Center in Orlando, FL was arranged which involved a 2-day walk-through of the facility. This was quite exciting and presented many challenging ideas for the students. In addition, we were invited guests to witness the launch of Endeavor.

Students are also required to arrange for and conduct independent walk-throughs and complete a worksite survey and System's Analysis. In addition, as a teaching/learning technique, students, working in pairs, arrange and conduct a worksite tour for classmates and faculty, in the second semester. Students prepare seminars for class presentations and discussion; plan, implement and evaluate a health promotion programs at an industry site; and participate in simulated job interviews and analyses arranged for at an industry site. Examples of health promotion programs are attached in Table 1.

2. Unique Contribution

Two particular foci are unique to this program. First is the opportunity for many diverse field experiences and practica. Students are involved in the planning and development of specific applied experiences which not only enhance their learning experiences but also enable them to actually apply what they are learning. Secondly, students conduct needs assessments in a occupational setting and then develop health promotion programs for a targeted group of workers and implement and evaluate the results of the experience.

Field practica or training is a planned and supervised experiential component of the academic program which provides learning opportunities not usually available in the classroom. This is perhaps one of the best learning opportunities students experience and has evolved to provide students opportunities for experiences not only in traditional industry settings but in agricultural and hospital employee health settings. Students have both a concurrent (academic year), usually one day per week, and an intensive summer practicum, five to eight weeks.

Each experience is uniquely tailored to the student's needs, interests, and future career goals and is planned jointly by the student, his/her faculty advisor or field course faculty. The purpose and potential benefits of the field practicum are to relate theoretical classroom learning to practice situations; gain experience, skills and confidence in dealing with administrative, educational, and/or service problems; explore and increase understanding of the structure and dynamics (e.g., agency objectives, goals, values, resources, constraints, etc.) of the setting in which he/she is working; and identify problems which may produce researchable questions.

Health promotion projects are designed, implemented and evaluated by the student. Each intervention is based on assessed needs of the target group and fully developed in collaboration with the site OHN and other appropriate personnel. This includes developing measurable objectives, content, teaching methods, handouts, budget, and evaluation tools. Project summaries and outcomes, after completion, are then presented in class for discussion. Examples are listed in Table 1.

During the intensive summer practicum, students have the opportunity to fully synthesize and apply their knowledge. This culminates in the completion of a comprehensive administrative project and in student presentations at the Annual Practicum Workshop. The practicum workshop is held for all preceptors, current students, and program faculty. Students present each of their projects that were completed during their field practicum experience (see Table 1). This has been a very successful endeavor and gives both the student and preceptor an opportunity to share this teaching-learning endeavor.

B. Interdisciplinary Interaction

In the Occupational Health Nursing Program, students in addition to the required public health science courses, public health nursing courses and occupational health nursing courses, are required to take coursework in the occupational health cognates in toxicology, industrial hygiene, and safety. These courses are taken with industrial hygienists, safety specialists and physicians in order to increase interdisciplinary communication. Students participate in the Occupational Medicine/ERC Seminars as able, and the practicum experience affords

the OHN student the opportunity to interact with other occupational health professionals. In addition, Occupational Health Nursing faculty have met with David Coble, who teaches the Safety course to expand that course to include content (and additional credit) in ergonomics. Judy Ostendorf will help teach this content to begin Fall, 1996.

C. Research

Dr. Rogers has been exploring options and possibilities for offering doctoral level training for Occupational Health Nursing Program students. We have developed a collaborative arrangement with the Department of Epidemiology to offer admission to occupational health nurses to receive a doctoral degree in epidemiology with a minor in occupational health nursing. Applicants will be required to meet admission/graduation requirements for both the Department of Epidemiology and Curriculum in Public Health Nursing Program. Both Dr. Rogers and Dr. Robbins will generally serve as advisors. The Occupational Health Nursing Advisory Committee supports this option and has also suggested we pursue a similar arrangement with the Department of Environmental Sciences and Engineering. We currently have two applications in process.

In the absence of doctoral training, master's level students have completed research projects. Students electing the MPH degree may complete a small research project or engage in faculty sponsored research. Students electing the MS degree are required to complete a thesis. The Program faculty act as advisors for all students and direct and guide the students through the research process. Each student is expected to develop a written proposal for approval by the faculty advisor and ultimately the thesis committee (if an MS degree student) prior to conducting the research. Once the proposal is approved the student is guided by the research advisor (and committee members) throughout the conduct of the research. Student projects for all graduates are attached in Table II in chronological order.

In order to expand the research program it is necessary to attract funding for research proposals. The Program Director has been able to obtain funding for several research projects, and students have participated as research assistants with these projects. Examples include:

- Nursing, Safety, and Health: A pilot study was completed to assess perceived hazards of nurses in hospital environments and to develop a valid and reliable tool to measure these perceptions. A larger study proposal has now been developed, using an interdisciplinary framework, to examine hazards in five health care environments.

- Migraine Headache Assessment in Occupational Health Settings: A pilot study was completed in North Carolina and a current survey has been mailed to a random sample of occupational health nurses nationwide to assess both practice and knowledge of migraine headaches.

- Ethical Dilemmas in Occupational Health Nursing - This project has been completed. Dilemmas have been identified and an instrument developed to measure nursing actions specific to the dilemmas.

Interdisciplinary Interaction

Interdisciplinary collaborative research is encouraged. The three year project on Nursing, Safety and Health, which has been submitted to NINR, is designed as interdisciplinary research and involves risk assessment by an interdisciplinary team including the OHN, occupational medicine physician, industrial hygienist, and ergonomic specialist. Using instruments, walk-throughs will be conducted to observe/validate perceived hazards. In addition to core disciplines involved, investigators in biostatistics and epidemiology are collaborators. Students will have the opportunity to be involved in the project as research assistants with specific involvement in data collection, observations and data analysis.

III. CURRENT AND PAST TRAINING RECORD

The OHN Program continues to prepare nurses for leadership positions in administration, program planning, and management in occupational health settings and as beginning researchers. During the period 1992 to 1995, 15 students (trainees) enrolled in the OHN program have graduated.

A. Summary

The Occupational Health Nursing Program has added 74 Master's prepared occupational health nurses to the workforce. Graduates are readily employed in occupational health nursing in leadership positions in occupational health settings as managers, educators, practitioners, consultants, and researchers.

Currently, the Occupational Health Nursing Program of study is under revision for 1996 based on needs identified in the practicum field. Students are placed in practicum experiences throughout the nation with well qualified preceptors. The practicum experience is a unique part of our program and students and preceptors alike believe it represents a significant learning opportunity for both parties. These experiences enable students to learn more about and apply management/administrative skills. The practicum experience culminates in a workshop where the students present their "products" to faculty, other students and preceptors. It's a remarkable event! Our preceptors are excellent role models and teachers.

Graduates of the program have been prolific in their writing and have authored approximately thirty (30) articles on topics ranging from epidemiologic investigations, to occupational health nursing roles, record keeping, administration and policy studies. A listing of the publications of graduates, obtained from those OHNs locatable is attached in Table III.

B. Outreach, Service and Continuing Education

These activities have been extensive and are described in the overall Continuing Education Program Section. However, the Occupational Health Nursing Program offers several courses per year for continuing education and outreach including: Certification Review for occupational health nurses; Basic Theory and Principles in Occupational Health Nursing; Advances Forum in Occupational Health Nursing; Clemson University Annual Occupational Health Nursing Institute (outreach); consultation to the University of Puerto Rico to develop an occupational health nursing academic and CE program; and new this year, Physical Assessment in Occupational Health.

The primary changes which have occurred in the curriculum and program enhancement achieved as a result of this training program are numerous:

1. The continued development of a comprehensive practicum experience for students, with highly qualified preceptors across the nation; this has enabled students to apply classroom theory in the real world and develop meaningful projects which have benefited workers.

2. The development and implementation of the Epidemiology/Occupational Health Nursing doctoral program which affords interested occupational health nurses an opportunity for doctoral level training.

3. Increased research emphasis in the program resulting in increased research opportunities for students through faculty sponsored research; this has enabled several students to learn more about conducting original research and three students have published articles even prior to graduation.

4. Increased emphasis on continuing education and outreach which has extended learning opportunities and networking for occupational health nurses and occupational health nursing students who attend these workshops.

5. The enhanced utilization of an OHN Advisory Committee which provides valuable input to the OHN program in terms of expansion and curricular modeling (e.g. proposed nurse executive and doctoral program).

Table I
 Examples of
HEALTH PROMOTION/ADMINISTRATIVE PROJECTS (94-95)

<u>Student</u>	<u>Occupational Setting</u>	<u>Project</u>
Teresa Morton	Town of Chapel Hill	Bloodborne Pathogen Compliance
Amy Pearson	Alamance Schools	Cardiovascular Screening
Ingrid Bilan	Metrosport	Cholesterol Reduction and Fitness Program
Tina Hess	Hillhaven Nursing Home	Back Injuries
Kathleen Buckheit *	OSHA	Ergonomics Standard
Lisa Pompeii *	Time Life Books	Medical Directives Project
Naoko Sato *	Duke University Hospital	Tracking System for Occupational Injuries
Tina Hambien *	International Paper	Cardiovascular Risk Reduction Program

*Presented at Annual Practicum Workshop

Table II

Theses and Major Papers Completed by Occupational
Health Nursing Graduates

	<u>Year</u>	<u>Name</u>	<u>Degree</u>	<u>Title of Paper</u>
1.	1972	Oleta E. Burkeen	MPH	A Descriptive Study of Occupational Health Nurses' Role in Health Examinations
2.	1973	Margaret L. Hornyack	MPH	A Description of Participants' Responses to the Independent Study Program/Fundamentals of Occupational Health Nursing Practice
3.	1973	Kay Fust and Francis Martin	MPH MPH	A Descriptive Study of Functions of Occupational Health Nurses
4.	1974	Judy Hayes Brande	MS	Review and Recommendations Concerning Selected Health Records Use in One Large Company
5.	1974	Mary E. Rahjes	MPH	Occupational Health Nursing Services for Workers in Small Establishments
6.	1974	Joyce Collins Ball	MPH	A Pilot Study to Develop a Questionnaire to Identify the Health Needs of Office Workers
7.	1974	Gleenis Ann Nielsen	MPH	Survey of Occupational Health Nursing Orientation Programs in Industry
8.	1974	Mildred Lirtman	MS	A Descriptive Study of the Type and Amount of Health Education in Selected Industries
9.	1975	Mildred Bartko	MPH	A Descriptive Study of the Occupational Health Nurse's Participation in the Prevention of Occupational Disease
10.	1975	Cynthia Coulter-Houston	MPH	A Descriptive Study of Pre-retirement Programs in Four North Carolina Industries
11.	1975	Joyce A. Spencer	MPH	Selected Occupational Health Nursing Functions as a Role Model for School Health Nurses in Schools with Industrial Arts Curricula

12.	1975	Gary Bargstadt	MS	A Study to Develop Guidelines for Orientation and Inservice Education for Nurses Working with Migrant Laborers
13.	1975	Edna Brown	MS	A Descriptive Study of the Occupational Health Nursing Content in the Baccalaureate Curricula of Selected Schools of Nursing
14.	1975	Bonnie Fulcher	MS	Beliefs and Attitudes Among Coal Miners About Pneumonconiosis
15.	1975	Ann Hardinger	MS	A Descriptive Study of Selected Characteristics of Continuity of Migrant Health Care
16.	1975	Bernadine Kuchinski	MS	Survey of Occupational Health Nurses' and Supervisors' Perceptions of Orientation in Occupational Health Settings
17.	1975	Arleen Hayes	MPH	The Occupational Health Nurse's Participation in Preventing Occupational Diseases
18.	1979	Cecilia A. Byrd	MPH	Planning, Implementing, and Evaluating an Occupational Health Service for Small Employee Groups by a Selected Health Department in North Carolina
19.	1979	Shelia M. Doherty	MPH	Quality Assurance in Occupational Health Nursing
20.	1979	Virginia L. Stiles	MPH	A Descriptive Study of North Carolina Occupational Health Nurses' Perceived Needs for Baccalaureate Education
21.	1980	Catherine R. Barrett	MPH	Occupational Health Nursing: What are the Future Roles?
22.	1980	Connie E. Harrison	MPH	Secondary Occupational Inorganic Lead Exposure to Child of Lead Workers
23.	1981	Joyce M. Fester	MPH	Medical Surveillance for Fire-Fighters: A Literature Review
24.	1981	Margaret Rae Wharton	MPH	The Occupational Health Nurse's Role in the Abatement of Low Back Pain: A Systems Approach

25.	1981	Andrea A. LaCroix	MS	Women's Work and Health: The Effects of Working Conditions on Perceived Control and Well-Being
26.	1982	Marian B. Caldwell	MPH	Development of a Survey Questionnaire for Occupational Health Nurses in the State of North Carolina
27.	1982	Cynthia B. Johnston	MPH	Discrepancies Between Work Performance and Standards: An Analysis of Department of the Army Civilian (DAC) Occupational Health Nurses
28.	1983	Barbara J. Mullie	MPH	Developing and Implementing a Survey Tool for Assessing Small Industry's Need for Occupational Health and Safety Services
29.	1983	Barbara S. Staten	MPH	1983 North Carolina Occupational Health Nurse Survey-Questionnaire, Design and Plan for Data Analysis
30.	1983	Ann Snead Allen	MPH	The Process of Consultation and Its Application in Occupational Health Nursing Consultation
31.	1983	Karen Ann Croyle	MPH	A Model for Development of Health Care Directives for the Occupational Health Nurse
32.	1983	Christine Wilmot	MPH	Jet Lag and Occupational Health: Before You Break Ground, There is Something You Should Know
33.	1984	Carolyn H. Robinson	MPH	Dual Career Couples: Implications for Occupational Health Nurses
34.	1984	Ann Marie Johnson	MPH	A Reproductive Risk Management Tool for Use in Industry
35.	1984	Sandra L. Hellman	MPH	The Health Promotion Survey and its Application in Wellness Program in Business Industry
36.	1984	Laurette Wright	MPH	Decision Making by Management About Health Promotion Programs at the Worksite
37.	1985	Patricia G. Albright	MPH	Stretching into Fitness
38.	1985	Esther B. Haithcock	MPH	A Breast Self-Examination Program in Industry

39.	1987	Dolores Brookshire	MS	A Description Study of Policies for Handling Antineoplastic Agents in North Carolina Hospitals
40.	1987	Jenifer Freeman	MPH	An Analysis of Hypertension Prevalence in a Semiconductor Manufacturing Plant
41.	1987	Michael Jarrett	MPH	A Questionnaire to Identify Quality Assurance Activities in Occupational Health Nursing
42.	1987	Stephen Miller	MPH	Xylene Exposure of Art Workers
43.	1987	Betty McMullen	MPH	Pregnancy Outcomes of Women Exposed to Ethylene Oxide
44.	1988	Lee Landreth	MPH	The Occupational Health Nurse Consultant
45.	1988	Karen Mastroianni	MPH	The Effects of Child Care Arrangements on Mothers' Perceptions of Their Health Status, Stress and Anxiety Levels, and Job Performance
46.	1988	Deborah Roy	MPH	A Descriptive Study of Occupational Health Nurse Consultants
47.	1988	Melodie Miller	MPH	A Cholesterol Education Program in an Industrial Setting
48.	1988	Virginia Davis-Smith	MPH	A Questionnaire to Examine Nurses' Perceptions of Their Workplace Hazards
49.	1989	Paula Thrash	MPH	Occupational Hazards for Commercial Airline Flight Crew Members
50.	1990	Susan Johnson	MPH	Compliance with Universal Precautions: A Survey of Nurses
51.	1990	Susan Brooks	MPH	Fatal Occupational Injuries, North Carolina, 1984-1988
52.	1990	Elaine Carafagna	MPH	Development of a Questionnaire to Examine Jail Detention Officer's Perceptions of Their Workplace Hazards
53.	1990	Mary Nack	MPH	Construction Workers' Health and Safety Perceptions and Behaviors
54.	1991	Lisa Goldstein	MPH	Occupational Hazards of Flight Nurses

55.	1991	Caroline Haynes	MPH	Hospital Employee Health Programs: Policy Directives
56.	1991	Margaret Goodrich	MPH	Cholesterol Education Intervention
57.	1991	Cara Winstead	MPH	Pesticide Handling Practices Among Farmworkers
58.	1991	Rosyln Padgett	MPH	Occupational Hazards of Poultry Workers
59.	1991	Charles Richard	MPH	Occupational Hazards for Long Distance Truck Drivers
60.	1992	Shelia Higgins	MPH	The Role of the Spouse in Assisting With Cholesterol Reduction
61.	1992	Ruth Barlow	MS	Tension and CTDs
62.	1992	Euzelia Hunter	MPH	The Impact of Continuing Education Course on the OSHA Recordkeeping Practices: An Investigation Project
63.	1993	Judith Ostendorf	MPH	OSHA Ergonomic Tool Development
64.	1993	Cherir Bennett	MPH	Occupational Hazards Associated With Emergency Nursing
65.	1993	Catherine Henderson	MPH	Substance Abuse in Nursing: Perceptions of Nursing Directors
66.	1993	Alice Lind	MPH	Agricultural Workers' Perceptions of Risk and Awareness of Occupational Injury and Illness
67.	1994	Patti Terrill	MPH	North Carolina Hospitals Health Promotions Efforts for Health Care Workers
68.	1994	Susan Finch	MPH	Basic and Advanced Practice in Occupational Health Nursing
69.	1994	Katherine Jenifer	MPH	A Quality Assurance Plan for an Employee Health Service
70.	1994	David Machles	MPH	The Small Business Perspective Towards Occupational Safety and Health
71.	1994	Kathleen Buckheit	MPH	Development of an Ergonomic Risk Factor Checklist
72.	1995	Tina Hamblen	MS	Knowledge-Based Management of Migraine Headache at the Worksite
73.	1995	Lisa Pompeii	MS	Violence in the Workplace and the Practice of Occupational Health Nursing

74.	1995	Naoko Sato	MS	Occupational Health Nursing Role Perceptions and Role Expectations by Nurses, Employers, and Employees in North Carolina
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Table III

NAME	AUTHOR(S) PUBLICATIONS	LEADERSHIP
Mastroianni, Karen President, Consultant Dimensions in Occupational Health and Safety, Inc. Research Triangle Park, NC	Rogers, B., Mastroianni, K. and Randolph, S. Occupational Health Nursing Guidelines for Primary Clinical Conditions Mastroianni, K. (1992) Child day care arrangements and employee health care. AAOIN Journal 40(2): 78-83.	AAOIN, Book Reviewer AAOIN, Peer Review Committee NCAOIN, Education Committee, member NCAOIN, Chair, Professional Affairs Sub-committee, 1990-91 NCTAOIN, Chair, Planning Committee, 1991-1992 NCTAOIN, Member, Planning Committee, 1989-1994 NCTAOIN, Governmental Affairs, Member, 1993 - present NCTAOIN, Research Committee, Member, 1993 - present Health Promoters Network, Planning Committee, 1993 - present Health Promoters Network, Chair, Planning Committee, 1994 PHNU Alumni Board of Directors, 1994 - present
Ryan, Sheila M. Doherty Unemployed		AOHC Conference, Chairman of Nursing Section, 1983 Local OIIN Association, numerous offices, 1979 - 1987
Machles, David Consultant Dimensions in Occupational Health and Safety, Inc. Research Triangle Park, NC		
Nack, Mary Senior Health Program Specialist University of Missouri-Columbia, School of Medicine, Columbia, MO		NCTAOIN, Chair, Professional Affairs Committee, 1993-94
Higgins, Sheila Medical Services Supervisor United Parcel Service Raleigh, NC		NCTAOIN, Vice President, NCTAOIN, Chair, Public Affairs Committee NCAOIN, Chair, Ad Hoc Comm "Constituency of Year Award Application NCAOIN, Governmental Affairs Committee Member NCAOIN, 1993 NC Occupational Health Nurse of the Year Award
Stendorf, Judith Clinical Instructor University of North Carolina at Chapel Hill, NC	B. Rogers and C. Haynes, A Study of Hospital Employee Health Programs, AAOIN Journal 39(4):157-166	Great 100, Inc., Great 100 Registered Nurses in NC for 1994 UNC SPH OIIN Program Advisory Committee member, 1991 - present AAOIN, Peer Review Committee Member - for AAOIN Continuing education approval, 1993-present AAOIN Credentialing Committee
Haynes, Caroline Health Services Manager Luckeye Florida, L.P. Terry, FL		

NAME

AUTHOR(S) PUBLICATIONS

Brookshire, Dolores S.
 Director, QM
 TSRJIC
 Dallas, TX

Brookshire, Dolores S., Urine drug screening in the workplace,
 AAOHN Update Series, 3(5), May 1989

Brookshire, Dolores S., Health Column, City - Co. Magazine,
 1987-1989

Brookshire, Dolores S., Editor of "Alert": Occupational
 Health & Safety Publication, Alamance Health Services,
 Burlington, NC 1987-1991

Brookshire, D., Rogers, B., A descriptive study of hospital policies
 in N.C. regarding handling of antineoplastic agents, Seminars in
 Occupational Medicine, 1987.

LEADERSHIP

NCAOHN, Education & Professional Stds Committee 1987-89

NCAOHN, Co-chair Education & Professional
 Stds Committee, 1989-91

Habitat for Humanity, Selection Committee, 1991 - 1993

United Way, Alamance Coalition Against Drug Abuse 1990

United Way, Division Captain, Annual Campaign
 of Alamance Co, 1989

United Way, AIDS Workplace Taskforce &
 Speakers Bureau, 1987 - 1990

American Cancer Society, Worksite
 Subcommittee, NC, 1989 - 1990

American Heart Association, Worksite
 Subcommittee, NC, 1987 - 1989

City of Rockwall, TX, Comprehensive City Planning
 Task Force, 1995

City of Rockwall, TX, Community Facilities Planning
 Subcommittee, 1995

City of Rockwall, TX, Parks & Open Space Planning
 Subcommittee 1995

City of Rockwall, TX, Residential Planning Subcommittee, 1995

South Carolina State Association of OHHN,
 Parliamentarian, 1986 - 1988

Central PA Association of OHHN, Chairperson,
 Nomination Committee, 1989

Central PA Association of OHHN, Preventive Education
 Committee Member, 1989 - 1990

Central Pennsylvania Association of OHHN,
 1st Vice President, 1990 - 1992

Toastmaster (Quaker Oats Chapter), Recording
 Secretary, 1990

South Central AIDS Association Network,
 Preventive Education Committee Member, 1990-91

South Central AIDS Association Network,
 Chairperson Preventive Education, 1991 - 1992

Dallas Texas Association of OHHN, Board of Director
 (Telephone/Benevolence), 1995 - 1997

Wright, Laurette Renee
 Occupational Health Consultant
 Wausat Insurance Companies
 Irving, TX

AUTHOR(S) PUBLICATIONS

LEADERSHIP

Goodrich, Margaret Unemployed		Certification in Occupational Health Nursing (COHN) April 1994 April 1994
Roy, Deborah R. President/Safety Consultant Safe Tech Consultants, Inc. South Portland, ME		Maine Safety Council, Treasurer Maine Safety Council, Vice-President, presently Maine Safety and Health Conference, Committee member
Lind, Alice Quality Improvement/Risk Manager Good Samaritan In Home Services Puyallup, WA		Thurston County Public Health Department, Family Planning Clinic Advisory Board member
Nielsen, Glenn A. School Nurse Seattle Public School District		
Winstead, Cara B. Clinical Occupational Health Nurse Glaxo, Inc. Zebulon, NC	Winstead, Cara How Pesticides are Handled in a Rural North Carolina County: A Survey of Farms, AAOHN, 41(1):24-32, 1993	Healthy Mothers Healthy Babies of Wake County Board Member, 1993 - present NCTAOSH, Board member 1994 - present NCTAOSH, Chair, Communications Subcommittee, 1994-present NCTAOSH, Chair, communications Subcommittee 1994-present
Finch, Susan Sr. Occupational Health Nurse Duke University Medical Center Division of Occupational & Environmental Medicine Durham, NC		
McMullen, Betty C. Occupational Health Nurse Practitioner Perry Point Veterans Medical Center Perry Point, MD		
Brooks, Susan Nance Homemaker		
Harrison, Connie Elizabeth Retired Lt. Col USAF Nurse Corps		

NAME

AUTHOR(S) PUBLICATIONS

LEADERSHIP

Allen, Ann Sneed
 Instructor/Clinical Professor
 UNC-Wilmington, School of Nursing
 Wilmington, NC

UNC-Wilmington, Faculty Senate
 Foundation for Home Care, Board Member
 Sigma Theta Tau

Johnson, Susan
 Director, Infection Control

Goldstein, L., and Johnson, S.

The Moses H. Cone Memorial Hospital
 Greensboro, NC

OSHA Bloodborne Pathogens Standard:
 Implications for the Occupational Health Nurse,
 AAOHN, 39(4):182-188.

Padgett, Roslyn
 FNP
 Kaiser Permanente
 Chapel Hill, NC

Padgett, R. Nurse's perceptions of their communication with
 Spanish speaking migrant farmworkers, PIIN Journal, (accepted
 pending revisions).

Carson, Jennifer Haas
 Occupational Health Nurse Consultant

Whorton, M.D., Haas, J.L., Trent, L.S., and Wong, O.

M. Donald Whorton, M.D., Inc.
 Alameda, CA

Reproductive effects of sodium borates on male employees:
 birth rate assessment, Occ. Environ. Med., 51:761-767.

Hellman, Sandra L.
 Nurse Practitioner
 College of the Redwoods
 Eureka, CA

Hellman, Sandra L., The Resurgence of Tuberculosis -
 Risk in Health Care Settings, AAOHN Journal, Feb. 1993
 Hellman, Sandra L., Counseling Employees at Risk for HIV,
 AAOHN Journal, October 1989.

Hellman, Sandra L., The AIDS Epidemic, AAOHN Journal,
 June 1986

Hellman, Sandra L., Individual HIV/AIDS Counseling and
 Partner Notification, Self-study course, Extended MPH Degree
 Program, SPHICM, University of Washington, Fall 1990.

California Coalition of Nurse Practitioners, 1985 - present
 Washington State Public Health Association, Vice President
 for Region Five

Henderson, Catherine A.

Nurse Consultant
 Options & Choices, Inc.,
 Servicing Contract with FedEx,
 King of Prussia, PA

Miller, J. Stephen
 Occupational Health Nurse Specialist
 AT&T

Breinigsville, PA

Goldstein, Lisa Phillips

Unemployed

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Bernhardt, Judy H.
Acting Associate Dean
East Carolina University
Greenville, NC

AUTHOR(S), PUBLICATIONS

Bernhardt, J. and Langley, R., Agricultural Hazards in North Carolina, *NC Medical Journal*, 54:512-515, 1993.
Bernhardt, J. and Langley, R., Hazards of Farm Life, *Pulse*, 3:6-7, 1993.
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Bernhardt, J.H., and Langley, R., Accidental Occupational Farm Fatalities in NC: 1984-88, *Journal of Rural Health*, 8:60-69, 1992.
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JOGNN, 19:53-62.
Bernhardt, J.H., Theory and Practice of Occupational Health Nursing, Number 18 in *AAOHN Third Update Series*, 1989.
Lawler, T.G., Bernhardt, J.H., Reasoning on the Margin and the use of Nurse Practitioners and HMOs in *Occup. Health, AAOHN Journal*, 34:333-336, 1986.
Bernhardt, J.H., Factors Affecting Nursing Practice and Occupational Health Nursing Education, *AAOHN Journal*, 4:210-215, 1986.
Bernhardt, J.H., Survey of Interest in CE for OHNs in Wisconsin, *Occupational Health Nursing*, 28:35-38, 1980.
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Bernhardt, J.H., The Role of the OHN in Employee Rehabilitation, *Occupational Health Nursing*, 23:9-14, 1975.

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American Lung Association, Member, Advisory Committee for development of OHN CE programs, 1987
Chicago Lung Association, Member, Advisory Committee, Programs for OHNs, 1975-1979
Chicago Lung Association, Member,
Occupational Health Committee, 1977-1978
OIH, Inc, Board of Directors, 1977-86
AAOHN, CE Review Committee, 1977-80
External Review Committee for Research Training in Educational Resource Centers, Member, April 22-24, 1987
NIOSH Safety and Occupational Health Study Section, Member, Site Visit Team, 1983-1991
National Association for Safety and Health in the Arts, Consultant, 1979-1984
AAOHN, Practice Standards Committee, 1980-83
Office of Prevention, Educ. and Control, NIH, DHEW, Member, Health Education Branch Working Group, 1979
NIOSH, Member, Safety and Occupational Health Study Section, 1982-1985
NC Public Health Nursing, Member, Continuing Educ. Advisory Committee, 1984-1990
Sigma Theta Tau-Beta Nu Chapter, Member, Research Committee, 1985-1989, 1993-1995
Safety and Occup. Health Study Section, Member, Surveillance Cooperative Agreement Sub-group, Dec 16-17, 1982
NIOSH, Safety and Occupational Health Study Section, Member, Small Business Innovative Research Ad hoc Committee, 1983
Office of Technology Assessment, US Congress, Member, advisory panel on Genetic Testing in the Workplace, 1988-90
UNC-CH, School of Public Health, Committee to Implement the Curriculum in Public Health Nursing, 1984-1985
North Carolina Assoc. of Public Health Nursing Administrators, Committee on Practice and Education, 1984-present
NIOSH, Ad hoc member, Safety and Occupational Health Study Section, June 10-12, 1987
NIOSH, Board of scientific counselors, 1988-90
NIOSH, *Budcommittee on research strategies* and priorities, 1988-1990

NAME

AUTHOR(S), PUBLICATIONS

LEADERSHIP

Jennifer, Kathryn
Physician Liason with Marketing and
Public Relations Department
Cape Fear Valley Med Center, NC

NCNA, President Elect

Fulcher, Bonnie McClure
retired

Fulcher, Bonnie McClure, Beliefs and Attitudes Among Miners
about Pneumoconiosis, Nursing Research in the South, 344,
(abstract), 1976.
Fulcher, Bonnie McClure, Bob Kay-A Mountain Man: Biography of
a Rural W. Virginian, West Virginia Magazine, submitted.

Kanawha County Local Health Dept, Home Health Care
State Task Force, 1988 - present

Newhouser, Catherine R.

(maiden: Goss/name at UNC:Barrett)

Contract OIHIN

Med Temps, Metropolitan Nurses

Marietta/Stone Mtn., GA

Carfagno, Elaine

Donor Counselor

Central Blood Bank, PA

Hemophilia Center of W. PA, President
of Activity Board

Albright, Patricia Gordon
Faculty, School of Nursing,
University of South Florida,

Miller, RJ, Albright, PG, What is the role of nutritional support
and hydration in terminal cancer patients? American Journal of
Hospice Care, November/December: 33-38, 1989.

Florida Hospices, Nurse Liason
for Hospice Nurses 1991

Burkeen, Oleta

Burkeen, OE, Experiences students will never forget in a rural
homeless shelter, Journal of Nursing Education, 1993

Sigma Theta Tau, Nominating Committee

Assoc. Professor

Murray State University, KY

Burkeen, O.E., Cooper, G., Preplacement health assessment,
American Association Occupational Health Update Series (5),
Continuing Professional Education Center, Inc.,
Princeton, NJ, 1993

ABOIHIN, member 2 yrs.

State Personnel Council, KY

Member of the Purchase District Board of Health

Sigma Theta Tau, Faculty Advisor

KY Nurses Assn., President-District 13

NIOSH, Evaluation Team Member and Site Visitor
to Harvard.

Haithcock, Esther B

retired

President, NC Federation of Nursing Organizations, 1994-95
NCAOIHIN, member - Research Committee
Triad NCTA OIHIN, Board Member

Buckheit, Kathleen Krajci

Ergonomics Health Specialist

NC Ergonomics Center

Raleigh, NC

Wilnot, Christine Rhena

President

Eastview Development Co.

NAME

AUTHOR(S) PUBLICATIONS

Nickolaus, Mary (Rahjies)
retired

Garcia, M.K., Nickolaus, M.E., Education for OIINs Shows Improvement but Schools Must Respond to Growth, *Occupational Health & Safety*, 60:18-19, 1991
 Rahjies, M., Ethical Issues for Occupational Health Nursing in Legal and Ethical Dilemmas in Occupational Health, Lee, J. and Rom, W. (eds), Ann Arbor Science Publishers, Ann Arbor, 1982
 Rahjies, M. Assessing toxic agents: Maximizing proficiency, *Occupational Health & Safety*, 50 (11), 1981.

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Texas Department of Health, Public Health Nursing Section, Consultant, August 1990
 NIOSH, US Dept of Health and Human Services, Consultant, 1982 - 1988
 NIOSH, Member, External Review Committee for Univ. NIOSH Educational Resource Center grant applications, March 1982
 Rocky Mountain Center for Occupational & Environmental Health, College of Nursing, Univ Utah, Member, Planning Committee for Occupational Health Nursing Summer Institute, June 1986
 Department of Nursing, University of Southern Colorado, Chair, Curriculum Committee 1991 - 1993
 School of Public Health, Univ of Texas Health Science Center, Member, Programs of Instruction Committee, 1990 - 1991
 School of Public Health, University Texas Health Science Center, Member, Admissions Committee, 1990 - 1991
 School of Public Health, University Texas Health Science Center, Member, Financial Aid Committee, 1990 - 1991
 Southwest Center for Occupational and Environmental Health, Univ of Texas Health Science Center, Member, Continuing Education Committee, 1990 - 1991
 University of Texas, M.D. Anderson Cancer Center, Member, Advisory Committee, *Worksite Cancer Prevention*, 1988-91
 Southwest Center for Occupational and Environmental Health, Univ of Texas Health Science Center, Member, Steering Committee, 1988 - 1991
 Rocky Mountain Center for Occupational & Environmental Health, School of Medicine, Univ of Utah, Member, Advisory Board, 1986 - present
 APHA, Chair, Nursing Sub-Committee
 Occupational Health Section, 1990 - present
 Occupational Health Specialist Grad Program, School of Nursing, Univ of Utah, Member, Advisory Committee, 1985 - present
 American Conference of Governmental Industrial Hygienists, Membership committee, 1985 - 1992
 National Cancer Institute, Washington DC, Member, Consensus Committee for Occupational Cancer Education, February 1987
 College of Health Sciences, Univ of Northern Colorado, Member, Curriculum Committee, 1982 - 1983

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AUTHOR(S), PUBLICATIONS

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School of Nursing, Univ of Northern Colorado, Member,
Curriculum Committee, 1981 - 1983
School of Nursing, Univ of Northern Colorado, Chair,
Curriculum Committee, 1982 - 1983
DIHS and NIOSH, Member, Federal Mine Health Research
Advisory Committee, 1979 - 1983
DIHS and the NIOSH, Member, Sub-Committee,
Mine Health Surveillance, 1980 - 1981
Services & Educational Activities for Rural CO's Health,
Univ of CO Health Sciences Center, Member,
Chancellor's Statewide Advisory Committee, 1977 - 1978
Western Colorado Health Systems Agency, Grand Junction, CO,
Member, Task Force for Public Health Services, 1977 - 1978
Second Annual Rural Health Conference, Colorado Medical Society,
Member, Planning Committee, 1976
Colorado Region Eleven and Mesa County Comprehensive
Health Planning Committees, Member, 1975 - 1976
Colorado Public Health Nursing Directors, Member, 1975 - 1977
Colorado Public Health Nursing Directors, Chair, 1976 - 1977

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Division of Risk Management Jarrett, M. Writing business proposals, AAOHN Update Series,
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NCNA, Bylaws Committee/Community Health Council

Oceanside NCAOHN Chair-Education Program,
and Professional Standards Committee 1991-93
Oceanside NCAOHN Newsletter Coordinator 1991-93
American Health Association, NC Affiliate, Inc.,
Education & Community Programs Committee Member
March of Dimes, Eastern Carolina Chapter, SE Division,
Advisory Council Member

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Hardinger, Ann N.
Staff Educator
Martha Jefferson Hospital Home Care
NC

Contributor to How to Achieve Quality and Accreditation in Hospital Infection Control Programs, (eds) Kennedy, M, 1990.
Editor of newsletter, Orgelwerke des Tales g., 1977-82.
Contributor to Women's Health Nursing Examination (Maternity Nursing) (eds) Yurchuck R., Fields, S., Medical Examination Publishing Company, 1984.
Editor of newsletter, Virginia Society of Professional Nurses, 1985-86.

NCMAOHN, Secretary
Greater Carolinas Nat'l MS Society, Board Member
Greater Carolinas Nat'l MS Society,
Chairman Chapter Services Committee

Mental Health Association, Board Member
Home Call, Inc., Member Professional Advisory Group & Utilization Review Committee
Shenandoah Valley Chapter March of Dimes,
Member of Board of Directors
Student Nurses Organization, faculty advisor

Terrill, Patti

Senior OHN Consultant
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Kuchinski, B., SCOHN Chairman's report, in Newsletter, International Commission on Occupational Health-ICOH Nursing Committee, in press.
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International Commission on Occ Health,
Chairman, 1993-present
NIOSH secondary Research Review Committee, Member, 1993
PHS Nurse Officer Promotion Board, Chairman, 1993
NIOSH/Finnish Symposium Planning Committee,
Member, 1993-present
NIOSH Working Group on Partnership Local Health Departments, Member, 1993-present
American Delegation ICOH, Secretary, 1990-1994
Nursing Committee Exec ICOH, Vice-Chairman, 1990-93
NIOSH Surveillance Coordinating Group, Member, 1990-93
NIOSH Development Occ Health Disease Definitions,
Sub-committee member, 1989-90
NIOSH Review Panel Occ Health and Safety Surveillance,
Panel member, 1989
NIOSH Working Group on AIDS in the Workplace,
Member, 1987-present
International Association on OHN, Secretary, 1984-90
NIOSH Health Motivation/Promotion, Working Group
Member, 1982-85

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- PHS CE Review Committee for Nursing, Chairperson, 1982-83
NIOSH Approval Committee for Pulmonary Function Testing Courses, Chairman, 1981-present
American Board for Occ Health Nurses, Inc., Chairman on Education, 1978-1979
American Board for Occ Health Nurses, Inc., Chairman, Standards, 1977-1978
Long Island Association of Occ Health Nurses, Inc., Director, 1970-1971

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- LaCroix, A.Z.
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Consultant, NC State Health Dept. Preplacement examinations, *OHN Journal*, 1973

Pompeti, Lisa Multiple Myeloma Study Research Project, funded by NIOSH Research Assistant, NIEHS, 6/95-8/95

Research Assistant Migraine Study Research Project Research Assistant, funded by Glaxo, Inc. Research Assistant, UNC-Chapel Hill, PINU Dept., 8/95-present
Research Assistant, UNC-Chapel Hill, EPI Dept., 8/95 - present

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INDUSTRIAL HYGIENE PROGRAM

I. RATIONALE FOR TRAINING PROGRAM

Following passage of the Occupational Safety and Health Act of 1970, NIOSH developed a core of training programs in industrial hygiene to increase the number of practicing industrial hygienists in this country. Under the direction of Professor David A. Fraser such a program was developed at the University of North Carolina at Chapel Hill and eventually became the cornerstone of the North Carolina Educational Resource Center (ERC) in 1975. During the past three years, the North Carolina ERC has trained 30 industrial hygienists, 28 master's degree level and 2 at the doctoral level.

1. Program Leadership and Faculty

a) Faculty - The graduate program in industrial hygiene at the University of North Carolina is in the Air, Radiation and Industrial Hygiene (ARIH) Program Area within the Department of Environmental Sciences and Engineering. The ARIH program includes tracks in industrial hygiene, air pollution control, and radiological hygiene. In all, there are 10 full-time and 7 joint and adjunct faculty members in the ARIH program. Of these, 7 full-time faculty and all of the adjuncts are affiliated with the industrial hygiene track; these faculty and their areas of interest are listed below. In addition, we are continuing our search for a new faculty member with interests in exposure assessment for epidemiological investigations. This position, which will be joint with the Department of Epidemiology, will be filled during the 1995/96 academic year.

Faculty of the Industrial Hygiene Track of the ARIH Program

Name	Interest
<u>Regular Faculty</u>	
Michael Flynn	Ventilation, Mathematical Modeling of Exposure
Richard Kamens	Indoor Air, Exposures to PAH's
David Leith	Engineering Controls, Aerosol Physics
Stephen Rappaport	Exposure Assessment, Biological Monitoring
Parker Reist	Aerosol Science
Lori Todd	Air Monitoring
James Watson	Radiological Hygiene
To Be Appointed	Exposure Assessment for Epidemiological Investigations
<u>Joint and Adjunct Faculty</u>	
Merril Eisenbud	Radiological and Industrial Hygiene
David Ensor	Aerosol Physics
John Hickey	Ventilation and Exposure Assessment
Carl Shy	Occupational Epidemiology
Woodhall Stopford	Occupational Medicine
Russel Wiener	Aerosol Physics
John Dement	Exposure Assessment, Hazardous Materials

b) Administrative Structure - Prof. Flynn is currently Director of the industrial hygiene program, however Dr. Todd will assume this responsibility during the next year, contingent upon her receipt of tenure. Prof. Flynn is also director of the ARIH program area within the Dept. of Environmental Sciences and Engineering of the School of Public Health, which is Chaired by Prof. William Glaze. The ARIH faculty meet monthly throughout the academic year; ERC activities are a regular item of discussion. Prof. Flynn, Interim ERC director, meets with all ERC Program Directors at intervals of 6-8 weeks to discuss ERC policies and activities.

c) Teaching and Research Interests - We adhere to the principle that teaching at the graduate level is most effective when linked to an active research program. Research interests of the faculty in industrial hygiene

c) Teaching and Research Interests - We adhere to the principle that teaching at the graduate level is most effective when linked to an active research program. Research interests of the faculty in industrial hygiene cover many of the important aspects of this field. We recognize that expertise in all aspects of industrial hygiene cannot possibly be represented in any faculty. Rather than attempt to cover all aspects of research in industrial hygiene through our program, we have identified two areas that we believe are of prime importance, involving the assessment and control of workplace exposures to chemical substances, and are developing our expertise in these areas to the fullest. We have strengths in aerosol science, in engineering controls, in exposure assessment, and in methods of air and biological monitoring. Areas of importance to our teaching program that we cannot cover through our own faculty are dealt with through links to other faculty in our program and department, through specific appointments of lecturers, and through the ERC.

Most faculty in the industrial hygiene program teach two academic courses per year, one each semester. This allows time for the faculty to be active in the research that is important if we are to bring the latest information to the classroom. Over the last four years (1990 - 1994), faculty in the industrial hygiene track have published 105 peer-reviewed articles in technical journals. This research visibility has, in turn, helped to attract students to our program.

The following brief descriptions of the full-time faculty summarize their research interests, teaching and professional activities.

i) M. Flynn: Prof. Flynn's primary research interests lie in the control aspects of industrial hygiene and particularly in ventilation. He is currently involved with applications of computational fluid mechanics to the control of airborne contaminants. He is a member of the ACGIH Industrial Ventilation Committee and has served as a reviewer for the NIH Safety and Occupational Health Study Section and has conducted internal reviews for NIOSH. Dr. Flynn teaches ENVR 241, Industrial Ventilation Design (with laboratory) and ENVR 149, Health Hazards of Industrial Operations, which focuses on field surveys and makes several visits to local industries. He also teaches ENVR 247, Microenvironmental Air Flow Modeling, a course designed to introduce engineers to computational fluid dynamics and applications in the industrial hygiene arena. He is certified by the ABIH in comprehensive practice of Industrial Hygiene. Prof. Flynn serves as Interim-Director of the ERC.

ii) R. Kamens: Prof. Kamens' research interests lie in the areas of indoor air pollution and in gas-particle interactions. He is particularly interested in exposures to polynuclear aromatic hydrocarbons (PAH) associated with combustion of fuels. Current work addresses heterogeneous gas and particle phase reactions and kinetic simulation modeling of atmospheric nitroPAH and other PAH derivatives in indoor and outdoor environments. He teaches ENVR 366 Measurement of Gas Particle Interactions.

iii) D. Leith: Prof. Leith is interested in aerosol science, particularly those aspects that concern the generation and control of small particles. He has authored or co-authored over 70 publications concerned with (1) engineering controls for particle collection that include cyclones, filters and scrubbers, (2) methods to measure contaminant concentrations, and (3) fundamental aspects of aerosol physics. He teaches two academic courses, ENVR 145L, Aerosol Science Laboratory, and ENVR 245, Air Pollution Control. Presently Prof. Leith is involved with research related to improving the efficiency of filters used to remove metal-machining fluid mists from recirculated air.

iv) S. M. Rappaport: Prof. Rappaport has interests in all aspects of the assessment of exposure to chemical hazards in the workplace. With over 70 peer-reviewed publications in the literature he has pursued methods of air and biological monitoring, development of statistical sampling strategies, evaluation of occupational exposure limits, development of assessment practices for epidemiological studies, and recently, in the development and application of protein biomarkers of exposure to genotoxic chemicals. He has been a member of numerous professional committees including the Safety and Occupational Health Study Section (NIH, DIRG) and the Environmental Health Committee of the Science Advisory Board for the U.S. Environmental Protection Agency. He has organized national and international workshops and symposia in the area of exposure assessment. He teaches ENVR 246, Advanced Methods of Exposure Assessment. He is board certified in comprehensive practice by the American Board of Industrial Hygiene. He is co-director with Prof. David Savitz (Epidemiology) of the Occupational and Environmental Health Program, an interdisciplinary research program in the School of Public Health which provides doctoral and post-doctoral training in Environmental Epidemiology and Exposure Assessment, with funding from NIEHS.

v) P. Reist: Prof. Reist's interests lie in the general area of aerosol science. This includes research on aerosol generation, aerosol sampling and air cleaning devices, as well as research dealing with the fundamental properties of aerosol behavior. He has over 80 publications on various topics dealing with aerosol science and industrial hygiene including a textbook on aerosol science. He is a registered professional engineer (PA, inactive) and has been certified by the American Board of Industrial Hygiene. Dr. Reist teaches two courses, ENVR 145, Introduction to Aerosol Science, and ENVR 244, Industrial Hygiene Instrumentation.

vi) L. Todd: Prof. Todd has interests in the evaluation of exposure to chemical and biological agents, development of innovative methods to measure chemicals, historical reconstruction of past exposures to chemicals and physical agents, and use of expert systems to aid in making decisions in the workplace. She is a member of numerous professional societies and is a member of the Gas and Vapor Detection Committee of the American Industrial Hygiene Association. She teaches two courses, ENVR 141, Air and Industrial Hygiene (with D. Fox), and ENVR 242, Theory and Practice of Exposure Evaluation and is a certified industrial hygienist.

vii) J. Watson: Prof. Watson's research interests lie in the areas of low-level radioactive waste management and radon indoors and in water. His research focuses on characterizing radon concentrations indoors and in groundwater in North Carolina and improving the methods for measuring them. He also conducts research on the implications of use of granular activated carbon for removal of radon from drinking water. Dr. Watson serves as Chairman of the U. S. Environmental Protection Agency Radiation Advisory Committee.

d) Professional Advisory Committee: To ensure the overall professional competence of the Industrial Hygiene program, an external committee was established to advise the program director. The professional advisory committee meets twice each year to discuss the training program with particular attention to the curriculum and the level of instruction. The professional advisory committee is currently comprised of the following individuals, representing professionals in industrial hygiene as well as the OHN and OM program directors:

Susan Buchanan, CIH
Radian Corporation
3508 Travis Court
Chapel Hill, N.C. 27516

Nelson Couch, Ph.D., CIH
Glaxo, Inc.
5 Moore Drive
Research Triangle Park, N.C. 27709

Jerry Grindstaff, CIH
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P. O. Box 1006 EC102M
Charlotte, N.C. 28201-1006

Michael Flynn, Sc.D., CIH
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Dept. of Environmental Sciences & Engineering
Rosenau Hall, CB# 7400
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Bonnie Rogers, Dr.PH., COHN
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Durham, N.C. 27710

2. Program Plan

a) Degree Programs - The industrial-hygiene track of the ARIH Program Area offers the following degrees: Master of Science (MS), Master of Science in Public Health (MSPH), Master of Science in Environmental Engineering (MSEE) and the Doctor of Philosophy (Ph.D.). The Industrial Hygiene Program received ABET accreditation in 1990 and a six year re-accreditation in 1993; the MSEE program also holds ABET accreditation.

All three MS-degree programs require 2 years of coursework and submission of a masters' technical report or thesis which describes a relevant research project. Appropriate projects involve bench research, development of theory, or field work. Typically, the research project takes about half the student's time during the second year of graduate study. Successful projects result in presentations at annual meetings, and publication in a relevant technical journal. The masters project teaches the student to develop independent thoughts and to write these thoughts in a concise, straightforward manner. Abilities in these areas will serve the student well whatever his or her duties may ultimately be. A list of the titles of the technical reports of MS students in the industrial-hygiene track from the last five years is given in Appendix II.

Each student project is under direct supervision of a faculty member in the industrial-hygiene track. In addition, two other faculty members serve on the student's research committee and help with evaluation of the academic progress. Students receiving the Masters degree generally work as practicing industrial hygienists in industry or government.

Although there are few formal course guidelines for the Ph.D. degree, students in this program typically spend between one and two years in coursework prior to taking their qualifying examinations. These examinations include both written and oral components and cover basic knowledge of the principles of industrial hygiene as well as a proposal for a research project. The student is then responsible for conducting an independent research project which contains sufficient new information for several peer-reviewed publications. Dissertation titles of students who have graduated in the last five years are listed in Appendix II. Ph.D. students typically receive their degrees in 3-5 years after the masters degree. Ph.D. graduates have the option of working in either research institutions or academia.

Course Requirements and Electives for Industrial-Hygiene Students

SPH and ARIH Core Requirements

- BIOS 110* - Principles of Statistical Inference
- BIOS 145* - Principles of Experimental Analysis
- EPID 160 - Principles of Epidemiology
- EPID 160L - Principles of Epidemiology Laboratory
- ENVR 141 - Air and Industrial Hygiene
- ENVR 145 - Introduction to Aerosol Science
- ENVR 191 - Health and Ecological Effects of Environmental Agents
or ENVR 144 - Industrial Toxicology (required for all NIOSH Trainees)
- ENVR 392 - Master's technical report

*BIOS 135 (Probability and Statistics) may be substituted for both BIOS 110 and BIOS 145.

Requirements for the Industrial Hygiene Track

- ENVR 241 - Industrial Ventilation Design & Laboratory
- ENVR 242 - Theory and Practice of Exposure Evaluation
- ENVR 244 - Industrial Hygiene Laboratory
- ENVR 263 - Radiation Hazards Evaluation I

Additional Requirement for MSEE Candidates

- ENVR 245 - Air Pollution Control
- ENVR 241D - Industrial Ventilation Design Project

Elective Courses Commonly Selected

- ENVR 145L - Aerosol Science Laboratory
- ENVR 147 - Industrial Safety*
- ENVR 149 - Health Hazards of Industrial Operations*
- ENVR 162 - Modern Physics for Environmental Science
- ENVR 211 - Methods in Environmental Management
- ENVR 243 - Instrumentation and Data Acquisition
- ENVR 246 - Advanced Methods of Exposure Assessment
- ENVR 247 - Microenvironmental Airflow Modeling
- ENVR 248 - Industrial Medicine
- ENVR 283 - Natural Resource Law and Policy
- ENVR 200-3 - Ergonomics

* Required for all NIOSH Trainees

b) Curriculum - The course requirements of MS students in the industrial-hygiene track are given above. These students take the required core courses for the School of Public Health and the ARIH program as well as those for the industrial-hygiene track. In addition, students take enough additional course work to bring the total number of credits earned to a minimum of thirty semester hours. In all, the faculty of the ARIH program offer about 20 graduate courses; the Department of Environmental Sciences and Engineering offers over 100 graduate courses.

As it currently stands the curriculum provides adequate coverage of the important topics facing practicing industrial hygienists. The course in Ergonomics (ENVR 200-3) was added to our curriculum during the 1993/94 academic year to fill a deficiency which came about when the safety and ergonomics program at North Carolina State University was disapproved for further support through the ERC. (That program was disapproved during the 1990/91 academic year and phased out during the following year.) The new ergonomics course is taught by Dr. James Burnette, a practicing ergonomist who resides in central North Carolina. Dr. Burnette is compensated for his effort by the ERC.

All NIOSH supported Industrial Hygiene Trainees are required to take the ENVR 147 Safety Course and also the multidisciplinary series of ENVR149, Health Hazards of Industrial Operations, and ENVR 144 Industrial Toxicology. These two courses are offered in the Spring Semester and are co-ordinated to provide an interdisciplinary learning opportunity for physicians, nurses, and hygienists to see actual industrial processes and discuss the occupational health and toxicological aspects of potential exposures observed during the site visits. This sequence is now a joint requirement for all NIOSH trainees including physicians, nurses, and hygienists.

A joint Radiation Health Physics and Industrial Hygiene degree is now also a possible option for students in the ARIH program. We also encourage our students to enroll in continuing education courses offered through the ERC that cover materials related to professional practice which are not presented through our regular academic courses. In order to take better advantage of the excellent collection of CE courses in industrial hygiene which are offered by our ERC, the ARIH faculty recently made it possible for students to receive academic credit (a maximum of 3 SU) for attending CE courses. A formula of one SU per 15 contact hours was agreed upon in keeping with university guidelines.

Students in the industrial-hygiene track can also take courses at Duke University (e.g., occupational diseases, biohazards) or at North Carolina State University (e.g., noise, ergonomics and safety) through a reciprocity agreement we have with those schools.

c) Summer Internship - Many of the first-year students in the industrial-hygiene track, particularly those who are not involved in laboratory research, accept internships for the summer with major companies. Although not a formal requirement, this internship program has long been popular with the students since it offers direct paid experience, and also by the employers, many of which use the program as a tool for recruiting full time employees. Although the internship has worked well on an ad hoc basis, we plan to institute a formal program for placing trainees in internships, for monitoring their progress during the summer, and for obtaining feedback from trainees and mentors in the fall. This task will be developed for the TBN associate professor, with expertise in exposure assessment, since one of the principle functions of that position is to develop field studies of occupational exposures.

d) Areas of Emphasis in Research Training

i) Engineering Controls - The research involving engineering controls is multifaceted due to the fact that three of the regular faculty have interests in this area. Prof. **Flynn** is utilizing modern techniques of numerical analysis to model gas flows around workers and into ventilation systems. These models, developed using the UNC supercomputer, allow concentrations of pollutants to be predicted in workers' breathing zones. Results of numerical simulations are validated through large-scale experiments in a wind tunnel in our laboratory. Prof. **Leith** is identifying factors that affect the generation of pollutants in the workplace. Through this understanding, he hopes to be able to identify ways to reduce the generation of pollutants and to determine how pollutants can be controlled most effectively. For example, he is now investigating fundamental factors that affect dust generation in industry. In a related study, Dr. Leith is modeling and optimizing the design of particle collection equipment. Prof. **Reist** has studied filtration media with a full-scale pulse jet cartridge filtration system. This project, holds the possibility of identifying industrial filter media for use in air cleaning systems where the cleaned air could be recirculated back into the workplace.

ii) Exposure Assessment - The other area of prime research interest of our faculty is in the area of exposure assessment. This research includes laboratory components, field aspects and work in the areas of modeling and data analysis. Prof. **Rappaport** has performed experimental studies involving measurement of exposure and dose indices through air and biological monitoring. He is also interested in aspects of exposure assessment which do not involve laboratory research, including sampling strategies, analysis of data, occupational exposure limits, and kinetic modeling. Prof. **Todd** is developing alternative methods to measure and evaluate workplace exposures to gases and vapors in real time using remote sensing and computed tomography techniques. One objective of the research is to set up a room-sized exposure chamber with an open-path infrared optical remote sensing system which can fully characterize the flow of contaminants and can subsequently be used to evaluate workers' exposures. Prof. **Kamens** has interests in characterizing exposures to polynuclear aromatic hydrocarbons associated with both indoor and outdoor combustion sources with particular emphasis upon the semivolatile components. Another full-time faculty member (**To Be Named**) will be added during the 1995/96 academic year with interests in exposure assessment for epidemiological assessments. This position, which is joint with the Department of Epidemiology, is intended to bring the two departments together through collaborative investigations involving the health effects of toxic chemicals.

e) Unique Contribution

Development of the areas of exposure assessment and hazard control has established UNC's industrial hygiene program as the premiere program in the US with the theme 'Exposure Assessment and Control of Workplace Hazards'. We believe, therefore, that this program provides a unique contribution to the field of industrial hygiene which deserves support through the ERC. In particular, we propose to provide trainees with research experience in conducting field studies to develop and calibrate models for the optimal control of exposure and to investigate exposure-response relationships. We believe that by blending experimental studies in our laboratories, which develop the theory and appropriate models, with empirical studies in the field, which provide the data to validate the models, trainees will obtain truly rewarding experiences.

f) Training Support Requested for 1996-97

i) Predoctoral Training - Funds are requested for 11 predoctoral students, 7 at the masters level and 4 at the Ph.D. level. The support will be divided between first and second-year students with the hope of supporting at least 6 new students (4 MS and 2 Ph.D.) next year. We further request tuition and fees for 6 students from out of state and 5 from in state in keeping with our projection that most of the new students will not be residents of North Carolina during their first year of support but will become residents by the second year. The description above of areas of emphasis in research training as well as individual faculty biographical sketches, provide information concerning the types of research projects to be pursued by these students.

ii) Postdoctoral Research Training - Given the resources available for research in the areas of engineering controls and exposure assessment at UNC we believe that some portion of our budget should be allocated to post-doctoral training so that we can begin to develop a pool of new researchers who are fully qualified to begin academic careers at research institutions. Thus, we request funds for support of one post-graduate fellow each year. We expect to recruit these post-doctoral fellows from recent Ph.D. graduates, in engineering, industrial hygiene, or a related discipline, who wish to obtain advanced research training in exposure assessment and control. Our expectation is that support will be provided by the ERC to the recipient for no more than two years. This will ensure that the NIOSH funds will essentially "seed" research projects and will thereby enhance the overall research program.

3. Training Candidates

a) Admission Requirements - Requirements for admission into the industrial hygiene track of the ARIH program include a bachelor's degree in one of the sciences or engineering and an undergraduate GPA of at least 3.0 out of 4. Applicants are required to have had at least one year of college physics and mathematics through calculus. Scores from the graduate record examination (GRE) are also required; the mean GRE score (combined quantitative and verbal) for applicants who have accepted places for the forthcoming 1995-96 academic year is 1250. Each application is reviewed by at least 2 faculty members. In addition to academic performance, each applicant's professional experience is also weighed as well as the letters of recommendation and the personal statement of interest in the program.

b) Recruitment of Trainees

i) Graduate Students - Relatively little formal recruitment of students to our program has been performed. The program has long maintained a booth at the American Industrial Hygiene Conference each year which does heighten the visibility of the program to the professional community and provides for recruitment of those who are already members of the profession. Another informal avenue for recruitment involves our outreach and continuing- education activities where the academic program is often discussed and where faculty from the program sometimes participate.

The table below lists the number of applications, admissions, and acceptances for the Air and Industrial-Hygiene (AIH) component of the ARIH program over the last three years.

Student Recruitment: 1991-1996

<u>Year</u>	<u>Applicants</u>	<u>Admitted</u>	<u>Enrolled</u>
1993	76	31	11
1994	65	20	7
1995	75	22	12

The table shows that the number of applications to our program has remained more or less constant at about 68 for each of the last five years to give an applicant/admission ratio of about 2 to 3. We consider this ratio acceptable for maintaining a reasonable quality of graduates. We have enjoyed a diverse population of students with prior training in chemistry, biological sciences and engineering. Some of our students have been members of the industrial-hygiene profession for several years.

4. Training Facilities and Resources

a) General Facilities Provided by the University

i) Faculty Offices - The School of Public Health provides office space for the seven core faculty of the industrial hygiene program. Profs. Leith, Flynn, and Kamens each has 150 sq.ft. of office space in Rosenau Hall while Profs. Rappaport, Reist, Todd, and the new faculty member have offices of 120 sq.ft. in McGavran-Greenberg Hall which is contiguous to Rosenau Hall and connected with a 2nd-floor walkway. All faculty have personal computers and printers in their offices.

ii) Teaching Facilities - The new McGavran-Greenberg Hall houses state-of-the-art classrooms of several sizes appropriate for the classes taught in industrial hygiene. These classrooms contain a full range of audio visual equipment to suit the requirements of modern courses.

iii) Computing Services - The McGavran-Greenberg Hall also houses a microcomputer laboratory available for students to use in class assignments and research projects. The lab contains 32 IBM

486 PCs, each with 16 megabytes of RAM, a 40 megabyte hard disk, a math coprocessor, a mouse and a color VGA screen. There are also 8 Macintosh LC machines, each with 16 megaytes of RAM, a floppy drive, a 40 megabyte hard disk, and color screen. All machines are Novell-networked which allows access to several software applications, university library databases and electronic mail within the university's network and internationally. Training may be obtained from faculty during courses or from the campus training center. Facsimile service is also available.

iv) Shop Facilities - The School of Public Health maintains a complete machine and instrument shop with two full time employees. Located in the basement of Rosenau Hall, this in-house capability provides a unique opportunity for students pursuing graduate studies and research involving design and construction of specialized equipment. The close working relationship between the shop and students ensures that the work is done expeditiously and that it is customized to the requirements of the particular problem. A CAD Package is available for student use on a PC in the machine shop.

v) Library Resources - The Library system of the University of North Carolina contains in its sixteen locations on the Chapel Hill campus over 6,900,000 volumes and microforms. An online interactive catalog, the Triangle Research Libraries Network, links the library system at UNC-Chapel Hill with the campus libraries at Duke University and North Carolina State University to provide scholars with access to the collections of the three university library systems. The Health Sciences Library is the primary library for the University's Schools of Dentistry, Medicine, Nursing, Pharmacy, and Public Health. This library's collections contain 252,000 volumes, including recent and historical materials, and over 5,000 audiovisual and microcomputer software programs. Over 4,100 serial titles are currently received.

b) Special Training Facilities for the Industrial Hygiene Track

i) Ventilation Laboratory - The Ventilation Laboratory is located in the new Baity Laboratory directly behind McGavran Greenberg Hall. This laboratory is equipped with a wind tunnel and a full range of equipment for measuring velocities and flow rates in both open and closed systems. This laboratory is used to train students in the standard methods for designing and testing ventilation systems.

ii) Industrial Hygiene Teaching Laboratory - Laboratory facilities are maintained for teaching of the industrial hygiene instrumentation course. At the present time part of the Aerosol Laboratory is used for this course. Besides the usual flow calibration devices, such as, spirometers, bubble meters, wet and dry gas test meters, and pressure measurement devices, there is also specialized industrial hygiene equipment for use in teaching. Examples of the latter are microscopes, a mercury vapor monitor, respirable dust samplers, and expendable supplies, such as, midget impingers, bubblers, detector tubes, passive monitors, and charcoal tubes.

c) Special Facilities for Research

i) Engineering Controls - Research in the area of engineering controls includes design of both ventilation systems and systems to remove pollutants from contaminated air. Faculty with primary research interests in this field include Profs. Flynn, Leith, and Reist. With the addition our new Baity Laboratory for engineering research we have added about 3000 sq.ft. of new laboratory space designated for research in ventilation and control technology. A high-bay laboratory is included for work with large quantities of dusty or contaminated air, and three adjacent laboratories allow bench-scale research to be performed. Adjoining these laboratories are student offices and a computer room where data can be reduced and analyzed. Buffalo Forge Fans are available as well as a large 5 ft square wind tunnel for flow visualization studies. Equipment which has been recently added to the laboratory includes TSI hot film anemometers, SAI neutrally buoyant bubble generator and flow visualization system, video camera and recorder, as well as new manometers, pitot tubes, duct work and fans. We believe these facilities are unsurpassed in this country for engineering research in the field of industrial hygiene.

ii) Air and Biological Monitoring - Prof. Rappaport has 1600 sq.ft. of laboratory space in the McGavran-Greenburg which has recently been added to the complex of the School of Public Health and an additional 1000 sq. ft. of laboratory/office space to support laboratory and field studies. Work in these facilities is devoted to the measurements of chemical exposures and of selected biomarkers in humans exposed to toxic substances, and to supporting field investigations of occupational exposures to toxic chemicals in general. Equipment includes two laboratory gas-chromatograph-mass spectrometers (one with CI as well as EI sources), 2 gas chromatographs, one portable gas chromatograph, one HPLC, spectrophotometers, -80°C freezer, centrifuge, freeze dryer, air sampling pumps, and the usual assortment of balances, pH meters, refrigerators, and associated supplies. A system is also available for generating controlled test atmospheres of gases and vapors and for testing both active and passive air monitoring devices.

The Kamens' research lab is dedicated to the study of semi-volatile organics in both the outdoor and indoor environments. There are 900 ft³ of laboratory space in Rosenau hall used for sample work up and chemical analysis. The facility contains two capillary gas chromatographs one of which is equipped with a Hewlett Packard (HP) 5971 mass selective detector. For general student use there is another HP 5890 GC and 5971 MSD with an associated HP IRD, FTIR detector. There are three programmable HPLC systems and one super critical extraction system. Associated with this laboratory is the ESE outdoor chamber facility which is located 20 miles south of the University. It has three large outdoor chambers (two 25m³ and one 190 m³) which are primarily used for aerosol research. Different types of aerosol generators (inorganic and combustion related)

are used to add particles to the chambers and size distributions and concentrations are monitored with a nuclei counter, an Electrical Aerosol Analyzer (Model 3030 TSI), and an LAS-X optical Aerosol counter (PMS). The lab is also equipped with trace gas analytical equipment which include volatile hydrocarbon GCs, and NO_x and O₃ analyzers. Newly developed semi-volatile denuder-filter samplers are used to collect semi-volatile compounds which partition between the gas and particle phases. Equipment in Rosenau and at the chamber laboratories are used both for research and in ARIH courses.

Excellent analytical support is available for research in this area from the Dept. of Environmental Sciences and Engineering which operates, jointly with the Chemistry Dept., the Gas Chromatography/Mass spectrometry Facility which offers state-of-the-art instrumentation for identification of trace organic compounds. The facility operates three instruments, i.e., a VG- Analytical 7070F double focusing mass spectrometer, a VG- Analytical 250KSEQ ultra high resolution instrument capable of FAB and MS/MS analysis, and a Hewlett Packard 5989 GC/MS that is dedicated to ultratrace analysis of DNA and protein adducts.

iii) Aerosol Laboratory - An 800 sq.ft. aerosol laboratory has also recently been completed in McGavran-Greenberg Hall. This laboratory is used for faculty and student research on both fundamental and applied studies pertaining to aerosol science. The laboratory has two aerosol chambers, one of 1 m³ volume and the other (room sized) with a 20 m³ volume. Aerosol generation equipment includes a Mage Condensation Aerosol Generator, a May Spinning Disk Generator, a Berglund-Liu Vibrating Orifice generator, an exploding wire generator as well as various nebulizers and turntable dust feeders. In addition, the aerosol laboratory has such specialized research equipment as an aerosol centrifuge, Climet optical particle counter, Gardner Condensation Nuclei Counter, TSI point-to-plane and MSA electrostatic precipitators, microscopes, May biological samplers, a centripeter and numerous cascade impactors.

iv) High-Level Computational Resources - In addition to the microcomputer facilities noted above, the North Carolina Supercomputer Center is available to researchers from UNC. All of the supercomputers, and workstations are conveniently accessed from campus, including, a new CRAY-YMP 8/464, with a complete scientific visualization laboratory. Efforts are currently underway to expand an Environmental Sciences and Engineering Simulation Laboratory within the department which houses the Industrial Hygiene Program. This would provide improved intermediate scale (high-end work station) simulation of environmental phenomena and visualization of complex data and simulation results.

III. CURRENT AND PAST TRAINING RECORD

During the 1994-95 academic year, 27 students were enrolled in the industrial-hygiene track. Of these, 15 were studying for the master's degree, and 12 were pursuing the PhD degree. A roster is given in Table I on the following page.

ii) Post-doctoral Fellows - As described earlier we propose to train one post-doctoral fellow each year in some pertinent aspect of exposure assessment and control. Recruitment for these positions will involve advertisements in appropriate journals which target particular specialties and personal inquiries to departments which train these individuals.

A. Current Roster

The names of the students enrolled during the 1994/1995 year in our industrial-hygiene track are given below.

Roster of Students in the Industrial-Hygiene Track (1994/95)

<u>Name</u>	<u>Degree Sought</u>
Boucher, Michael	PhD
Carlton, Gary	PhD
Cato, Sonya	MSEE
Chase, Shana	MSPH
Cone, Anna	MSPH
Dunn, Kevin	MSEE
Farhat, Sahla	PhD
Gatano, Betty	MSEE
Jin, Wei	MSPH
Kotecki, Michelle	PhD
Kovitz, Jordan	PhD
McCann, Eric	MSEE
McKernan, John	MSPH
Mihlan, Gary	PhD
Moser, Allison	MSPH
Owen, Kathleen	MSEE
Petrick, Michelle	MSPH
Samanta, Arindam	PhD
Schulz, Mark	MSPH
Smith, Courtney	MSEE
Symanski, Elaine	PhD
Taylor, Lauralynn	MSPH
Thomburg, Jonathan	PhD
Tornero, Rogelio	PhD
Voelker, Joseph	MSEE
Wu, Kuen-Yuh	PhD
Yu, Rong Chun	PhD

B. Publication Status of Students During the Last Three Years

(Graduates of reporting period names are underlined).

Kromhout, H., Symanski, E. and Rappaport, S.M. (1993) A comprehensive evaluation of within- and between-worker components of occupational exposure to chemical agents, *Annals of Occupational Hygiene* 7:253-270.

Rappaport, S.M., Kromhout, H. and Symanski, E. (1993) Variation of exposure between workers in homogeneous exposure groups, *Am. Ind. Hyg. Assoc. J.* 54:654-662.

Symanski, E. and Rappaport, S.M. (1994) An investigation of the dependence of exposure variability on the interval between measurements, *Annals of Occupational Hygiene* 38:361-372.

Boyle, K.M., Kim, T., Flynn, M.R., and Wiener, R. (1993) Numerical Calculation of Inertial Aspiration Efficiency of Aerosols into Thin-Walled Sampling Inlets. *Aerosol Sci. Tech.* 19:227-242.

Smith, T.J., Flynn, M.R., and Dement, J.M. (1994) A Design and Performance Analysis of Laboratory Fume Hoods. *Appl. Occup. Env. Hyg.* 9(2): 117-124.

Flynn, M.R., Chen, M., Kim, T., and Muthedath, P. (1995) Computational Simulation of Worker Exposure using a Particle Trajectory Method. *Am. Ind. Hyg. Assoc. J.* 39(3):277-289.

Reist, P.C. and Creed, D. (1994) Use of a Sedimentation Method for Determining the Respirable Mass Fraction of a Bulk Sample. *AIHAJ.* 55:619-25.

Reist, P.C. and Brantley, C. D. (1994) Abrasive Blasting with Quartz Sand Factors Affecting the Potential for Incidental Exposure to Respirable Silica. *AIHAJ.* 55: 946-952.

Mukoda, T.K., Todd, L.A. and Sobsey, M. (1994) PCR and Gene Probes for Detecting Bioaerosols. *J. Aerosol Sci.*, 25(8):1523-1532.

Collins, J.D. and Todd, L.A. (1992) Evaluation of Infrared Optical Remote Sensing Equipment in an Exposure Chamber. Proceedings Optical Remote Sensing Applications to Environmental and Industrial Safety Problems. *AWMA.* SP81: 351-355.

Kamens, Richard, Chung-te, Lee, Russell Wiener and David Leith (1991) A Preliminary Study to Characterize Indoor Particles in Three Homes, *Environ. Sci. Technol.* 25A: 939-948.

Kessler, Marc and David Leith (1991) Flow Measurement and Efficiency Modeling of Cyclones for Particle Collection, *Aerosol Science and Technology*, 15:8-18.

Flynn, M.R., K. Ahn and C.T. Miller (1995) "Three-Dimensional Finite Element Simulation of a Turbulent Push-Pull Ventilation System, *Ann. Occup. Hyg.* 59(5):573-589.

Articles Submitted or Accepted for Publication:

McAneny, John J., David Leith and Maryanne G. Boundy (1994) Volatilization of Mineral Oil Mist Collected on Sampling Filters, submitted to *Applied Occupational and Environmental Hygiene*, (1994).

Lanning, Jeffrey S., Maryanne G. Boundy and David Leith, Validating a Model for the Prediction of Dust Generation, submitted to *Particulate Science and Technology*, (1994).

Hsu, C.F. and Reist, P.C., Factors Influencing the Effectiveness of In-room Filtration Units (Portable Air Cleaning Devices) for Controlling Certain Viable Aerosols, submitted to *American Industrial Hygiene Association Journal* (1995).

George, D.K., Flynn, M.R. and Harris, R.H. "Autocorrelation of Interday Exposures at an Automobile Assembly Plant, in press, *American Industrial Hygiene Association Journal* (1995).

C. List of Trainees

Below are listed all the graduates of the industrial hygiene program including their current employment, year of graduation, and degree awarded. (Asterisk indicates that the individual was a NIOSH trainee).

Ahn, Kwangseog	University of North Carolina Health & Safety Office Chapel Hill, NC 27599	1994	MSEE
<i>Three-Dimensional Finite Element Simulations of a Turbulent Push-Pull Ventilation System</i>			
Ajemian, Robert C.	40 Congers Street, Apt.1501-B Bloomfield, NJ 07003	1995	MSPH
<i>Analysis of Stray Radiation Produced by the Advanced Light Source (1.9GeV Synchrotron Radiation Source) at Lawrence Berkeley Laboratory</i>			
Altmore, Brent A.	Industrial Hygiene Engineer Environmental Health & Engineering 255 Washington St. Newton, MA 02158	1995	MSEE *
<i>An Investigation of Factors Affecting the Performance of Laboratory Fume Hoods</i>			
Austin, Meredith L.	Marine Safety School Reserve Training Center Yorktown, NY	1994	MSPH
<i>Intra-and Inter-Subject Variability of Fit for Full-Face Respirators Using A Quantitative Fit Testing Method</i>			
Baldauf, Richard	7575 West 106th St., Apt. 376 Overland Park, KS 66212-5914	1993	MSEE
<i>Guidance for Conducting Air Quality Monitoring Studies in Local Airsheds</i>			
Bhattacharyya, Runa	38 Dr. K. D. Mukherje Road Behala, Calcutta 7000606, INDIA	1995	MSPH
<i>Two-Dimensional Mapping of Air Contaminants Using an FTIR/Computer Tomography System: Simulation Studies</i>			
Bodurow, Catherine C.	Georgia Technical Research Institute Atlanta, Georgia 30338	1992	MSPH
<i>A Modified Method for Determination of Free Styrene Glycol in Human Blood</i>			
Brantley, Charles D.	U.S.C.G. 8th Coast Guard Dist. 501 Magazine Street New Orleans, LA 70130-3396	1992	MSPH
<i>Field Study of Abrasive Blasting with Quartz Sand: Factors Affecting the Potential for Incidental Exposure to Respirable Silica</i>			
Collins II, John D.	NC Department of Labor Health Compliance Division 319 Chapanoke Road Raleigh, NC 27603 Dallas, TX 75221	1992	MSEE
<i>Evaluation of an Optical Remote Sensing Device for Laboratory Validation of Optical Remote Sensing/Computed Tomography Theory</i>			
Cooper, Steven J.	2935 Foster Grand Rapids, MI 49505	1995	MSEE
<i>Evaporation of Mineral Oil In A Mist Collector</i>			

Danielczyk, Steven	US Coast Guard COMMATDEA (MOH) Coast Guard Building 408 Atlantic Avenue Boston, MA 02210-2209	1993	MSPH	
	<i>Meeting the Coast Guard's Needs for Radiation Protection While Conducting Inspections of Freight Containers Containing Radioactive Materials Through Survey Instrumentation and Safework Practices</i>			
Frankel, Russel	Oregon Occupational Safety & Health Division, 9500 SW Barbour Blvd. Suite 200, Portland, OR 97219	1995	MSPH	*
	<i>Fugitive Dust Emissions: Accuracy of Gas Tracer Determinations</i>			
George, Dennis	Assistant Professor Western Kentucky University Dept. of Engineering Technology Bowling Green, KY 42101	1994	PhD	
	<i>An Examination of Applied Issues in Occupational Exposure Assessment</i>			
Happy, Susan E.	N. C. Department of Labor Compliance Bureau Consultative Services 319 Chapanoke Road Raleigh, N.C. 27603	1992	MSEE	
	<i>Validation of Light Extinction Technique to Determine Monodisperse Aerosol Properties</i>			
Hodson, Laura	Research Industrial Hygienist Research Triangle Institute P. O. Box 12194 Research Triangle Park, NC 27709	1993	MSPH	
	<i>Evaluation of a Passive Sampling Device for Ozone</i>			
Hsu, Chang Fu	P. O. Box 3803 Chapel Hill, NC 27515	1994	MSPH	
	<i>Factors Influencing the Effectiveness of In-Room Filtration Units (Portable Air Cleaning Devices) for Controlling Certain Viable Aerosols</i>			
Johnson, Jeffrey	Merck Manufacturing Division 3517 Radium Springs Road Albany, GA 31707	1995	MSPH	*
	<i>Determination of Respirable Mass Concentration Using a High Volume Air Sampler and a Sedimentation Method for Fractionation</i>			
Kesler, Marc D.	University of North Carolina School of Public Health CB# 7400, Rosneau Hall Chapel Hill, NC 27599	1995 1990	PhD MS	
King, Jeffrey L.	Occidental Chemical Corporation Occidental Tower P. O. Box 809050 Dallas, TX 75380-9050	1992	MSPH	
	<i>Application of an Anova Model to Evaluate Occupational Exposure to Formaldehyde</i>			
Lackey, Bradley D.	217 Green Street. #5 Chapel Hill, NC 27516	1993	MSPH	
	<i>A Study of Worker Exposure From a Hand Held Contaminant Source in a Simulated Spray Booth Operation</i>			

Lanning, Jeffrey	Southern Research Institute Research Triangle Park, NC 27707	1994	MSEE
<i>Validating a Model from the Prediction of Dust Generation</i>			
Lloyd, Eileen M.	State of California Div. of Occupational Safety & Health 1390 Market Street, Suite 718 San Francisco, CA 94102	1993	MSPH *
<i>A Comparison of Two Analytical Techniques for Quantifying Endotoxins in Dutch Animal Feed Mills</i>			
McAneny, John	404 Jones Ferry Rd. F-19 Carrboro, NC 27510	1994	MSPH *
<i>Volatilization of Mineral Oil Mist Collected on Sampling Filters</i>			
Mukoda, Timothy J.	23 Birdsell Drive Bridgeton, NJ 08302	1993	MSPH
<i>A Feasibility Study for the Detection of Airborne Legionella Pneumophila Using the Polymerase Chain Reaction</i>			
Muthedath, Premkumar	226 McCauley Street Chapel Hill, NC 27514	1994	MSEE
<i>A Numerical Model to Predict Worker Exposure from a Hand-Held Source</i>			
Nelson, Roger W.	2572 58th Avebye Sityg St. Petersburg, FL 33712-4927	1993	MSEE
<i>An Analysis of Changes in Threshold Limit Values Over Time</i>			
Ramstack, Bryan, E.	U.S. Air Force General Delivery, APO New York, NY 09097	1990	MSEE
<i>Analysis of Respirator Cartridges and Filters as a Determination of Occupational Exposure</i>			
Symanski, Elaine	Doctoral Program University of North Carolina School of Public Health Dept. of Environ. Sci. & Eng. CB# 7400, Rosenau Hall Chapel Hill, NC 27599-7400	1992	MSPH
<i>Time Series Behavior of Occupational Exposure Data</i>			
Thomas, Gary W.	Naval Hospital Industrial Hygiene Division (Code 0305) Patuxent River, MD 20670-5370	1992	MSEE
<i>Evaluation of a First Order Autoregressive Model for the Determination of Physiological Damping Under Field Conditions</i>			
Thomas, Johnathan	U. S. Air Force Bioenvironmental Engineering 96 AMS Esln AFB, FL 32542	1995	MSEE
<i>The Application of Audiometric Data Base Analysis to Selected Air Force Bases</i>			
Tomasko, Marie S.	107 Friar Lane Carrboro, NC 27510	1995	MSEE *
<i>Evaluating Open-Path FTIR Spectrometer Data Using Differential Quantification Methods, Libraries and Background Spectra Obtained Under Varying Environmental Conditions</i>			

Tornero-Velez, Rogelio	Doctoral Program University of North Carolina School of Public Health CB# 7400, Rosenau Hall Chapel Hill, NC 27599-7400	1994	MSPH *
<i>A Comparison of Compliance with Occupational Exposure Limits and the Risk of Disease</i>			
Wu, Kuen-Yuh	Doctoral Program School of Public Health University of North Carolina Chapel Hill, NC 27599-7400	1993	MSEE
<i>Spatial and Temporal Variations of Sampling Bioaerosols</i>			
Zontek, Tracy	1550 Thousand Oaks Apartment 1510 San Antonio, TX 78232	1994	MSPH
<i>A Method to Determine the Homogeneity of Noise Exposure Groups and Criteria for Enrollment into a Hearing Conservation Program</i>			

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Altmore, Brent A.	Industrial Hygiene Engineer Environmental Health & Engineering 255 Washington St. Newton, MA 02158	1995	MSEE *
	<i>An Investigation of Factors Affecting the Performance of Laboratory Fume Hoods</i>		
Austin, Meredith L.	Marine Safety School Reserve Training Center Yorktown, NY	1994	MSPH
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	<i>Guidance for Conducting Air Quality Monitoring Studies in Local Airsheds</i>		
Bhattacharyya, Runa	38 Dr. K. D. Mukherje Road. Behala, Calcutta 7000606, INDIA	1995	MSPH
	<i>Two-Dimensional Mapping of Air Contaminants Using an FTIR/Computer Tomography System: Simulation Studies</i>		
Bodurow, Catherine C.	Georgia Technical Research Institute Atlanta, Georgia 30338	1992	MSPH
	<i>A Modified Method for Determination of Free Styrene Glycol in Human Blood</i>		
Brantley, Charles D.	U.S.C.G. 8th Coast Guard Dist. 501 Magazine Street New Orleans, LA 70130-3396	1992	MSPH
	<i>Field Study of Abrasive Blasting with Quartz Sand: Factors Affecting the Potential for Incidental Exposure to Respirable Silica</i>		
Collins II, John D.	NC Department of Labor Health Compliance Division 319 Chapanoke Road Raleigh, NC 27603 Dallas, TX 75221	1992	MSEE
	<i>Evaluation of an Optical Remote Sensing Device for Laboratory Validation of Optical Remote Sensing/Computed Tomography Theory</i>		
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<i>Meeting the Coast Guard's Needs for Radiation Protection While Conducting Inspections of Freight Containers Containing Radioactive Materials Through Survey Instrumentation and Safework Practices</i>			
Frankel, Russel	Oregon Occupational Safety & Health Division, 9500 SW Barbour Blvd. Suite 200, Portland, OR 97219	1995	MSPH *
<i>Fugitive Dust Emissions: Accuracy of Gas Tracer Determinations</i>			
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<i>An Examination of Applied Issues in Occupational Exposure Assessment</i>			
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<i>Validation of Light Extinction Technique to Determine Monodisperse Aerosol Properties</i>			
Hodson, Laura	Research Industrial Hygienist Research Triangle Institute P. O. Box 12194 Research Triangle Park, NC 27709	1993	MSPH
<i>Evaluation of a Passive Sampling Device for Ozone</i>			
Hsu, Chang Fu	P. O. Box 3803 Chapel Hill, NC 27515	1994	MSPH
<i>Factors Influencing the Effectiveness of In-Room Filtration Units (Portable Air Cleaning Devices) for Controlling Certain Viable Aerosols</i>			
Johnson, Jeffrey	Merck Manufacturing Division 3517 Radium Springs Road Albany, GA 31707	1995	MSPH *
<i>Determination of Respirable Mass Concentration Using a High Volume Air Sampler and a Sedimentation Method for Fractionation</i>			
Kesler, Marc D.	University of North Carolina School of Public Health CB# 7400, Rosneau Hall Chapel Hill, NC 27599	1995 1990	PhD MS
King, Jeffrey L.	Occidental Chemical Corporation Occidental Tower P. O. Box 809050 Dallas, TX 75380-9050	1992	MSPH
<i>Application of an Anova Model to Evaluate Occupational Exposure to Formaldehyde</i>			
Lackey, Bradley D.	217 Green Street, #5 Chapel Hill, NC 27516	1993	MSPH
<i>A Study of Worker Exposure From a Hand Held Contaminant Source in a Simulated Spray Booth Operation</i>			

Lanning, Jeffrey	Southern Research Institute Research Triangle Park, NC 27707	1994	MSEE
<i>Validating a Model from the Prediction of Dust Generation</i>			
Lloyd, Eileen M.	State of California Div. of Occupational Safety & Health 1390 Market Street, Suite 718 San Francisco, CA 94102	1993	MSPH *
<i>A Comparison of Two Analytical Techniques for Quantifying Endotoxins in Dutch Animal Feed Mills</i>			
McAneny, John	404 Jones Ferry Rd. F-19 Carrboro, NC 27510	1994	MSPH *
<i>Volatilization of Mineral Oil Mist Collected on Sampling Filters</i>			
Mukoda, Timothy J.	23 Birdsall Drive Bridgeton, NJ 08302	1993	MSPH
<i>A Feasibility Study for the Detection of Airborne Legionella Pneumophila Using the Polymerase Chain Reaction</i>			
Muthedath, Premkumar	226 McCauley Street Chapel Hill, NC 27514	1994	MSEE
<i>A Numerical Model to Predict Worker Exposure from a Hand-Held Source</i>			
Nelson, Roger W.	2572 58th Avebye Svytg St. Petersburg, FL 33712-4927	1993	MSEE
<i>An Analysis of Changes in Threshold Limit Values Over Time</i>			
Ramstack, Bryan, E.	U.S. Air Force General Delivery, APO New York, NY 09097	1990	MSEE
<i>Analysis of Respirator Cartridges and Filters as a Determination of Occupational Exposure</i>			
Symanski, Elaine	Doctoral Program University of North Carolina School of Public Health Dept. of Environ. Sci. & Eng. CB# 7400, Rosenau Hall Chapel Hill, NC 27599-7400	1992	MSPH
<i>Time Series Behavior of Occupational Exposure Data</i>			
Thomas, Gary W.	Naval Hospital Industrial Hygiene Division (Code 0305) Patuxent River, MD 20670-5370	1992	MSEE
<i>Evaluation of a First Order Autoregressive Model for the Determination of Physiological Damping Under Field Conditions</i>			
Thomas, Johnathan	U. S. Air Force Bioenvironmental Engineering 96 AMS Eslin AFB, FL 32542	1995	MSEE
<i>The Application of Audiometric Data Base Analysis to Selected Air Force Bases</i>			
Tomasko, Marie S.	107 Friar Lane Carrboro, NC 27510	1995	MSEE *
<i>Evaluating Open-Path FTIR Spectrometer Data Using Differential Quantification Methods, Libraries and Background Spectra Obtained Under Varying Environmental Conditions</i>			

Tornero-Velez, Rogelio	Doctoral Program University of North Carolina School of Public Health CB# 7400, Rosenau Hall Chapel Hill, NC 27599-7400	1994	MSPH *
<i>A Comparison of Compliance with Occupational Exposure Limits and the Risk of Disease</i>			
Wu, Kuen-Yuh	Doctoral Program School of Public Health University of North Carolina Chapel Hill, NC 27599-7400	1993	MSEE
<i>Spatial and Temporal Variations of Sampling Bioaerosols</i>			
Zontek, Tracy	1550 Thousand Oaks Apartment 1510 San Antonio, TX 78232	1994	MSPH
<i>A Method to Determine the Homogeneity of Noise Exposure Groups and Criteria for Enrollment into a Hearing Conservation Program</i>			

CONTINUING EDUCATION / OUTREACH

A. BACKGROUND

Since initial funding in 1976, the North Carolina Educational Resource Center has been committed to the concept of presenting quality continuing education programs for occupational safety and health professionals. Over the past nineteen years, continuing education has proven to be an effective mechanism for providing current information to those just entering the field as well as to those in need of updating their skills. It has also proven to be successful in promoting academic programs.

During this time period, the center has enjoyed much success in the presentation of continuing education programs. Over 28,000 students have attended the 1300 programs offered and the center has developed an extensive client base from which to continue operations.

Despite the great number of those trained within the network established as NIOSH educational resource centers, there continues to be a great need for more training to be offered. This is due in part to the ever-changing needs of practitioners in occupational safety and health. Over the years, understanding and controlling occupational hazards has become increasingly complex and requires highly skilled and broadly trained individuals to evaluate existing conditions in the workplace. New regulations are increasingly requiring training in specific areas. Because of these two events, the present level of need for occupational safety and health training continues to expand.

B. TRAINING COMPLETED

During the last completed year of the grant, 7-1-94 to 6-30-95, a total of 113 courses were presented to 2757 individuals. A listing of courses and breakdown by discipline, students and employer is included in the annual statistical report (attached).

C. PROPOSED TRAINING FOR YEAR 20

(July 1, 1996 to June 30, 1997)

1. Administration

Larry Hyde will continue to serve as Director of the Continuing Education Program at the NC-OSHERC. He has a total of over 17 years experience in this role at the American Industrial Hygiene Association, the University of California at Berkeley and the University of North Carolina at Chapel Hill. He will also serve as Deputy Director of the Center as outlined in the Administration Section of this proposal.

Vicki Smith will serve as Assistant Director of Continuing Education. Ms. Smith has 15 years experience in all aspects of continuing education and has specific responsibility for staff supervision, course promotion, faculty and facilities coordination and other administrative duties.

JoAnne Wright is an administrative assistant and will serve as financial manager for continuing education. In this role Ms. Wright has responsibility for financial management of the continuing education program, including grant moneys and a generated income of approximately \$1,200,000 annually.

2. Proposed plan

The past year has proven to be successful in the presentation of continuing education courses at the North Carolina ERC. Based upon this success, only minor modifications will be made to fine tune the program. These changes will occur in the following areas:

a) Balance of courses - A recommendation during the last site visit was that a better balance be maintained in the courses offered for the four disciplines. The center has traditionally been very strong in industrial hygiene, less active in safety and only marginally active in nursing and medicine. In the future, the center will continue as in the previous years, to financially subsidize those introductory nursing programs that would otherwise not be presented and to work with Duke University in the presentation of course segments dealing with occupational medicine. Attempt

have been made to offer more courses in both Occupational Health Nursing and Occupational Medicine but the needs are being met by other training providers in our region. Our plan is to continue to place emphasis on our strengths in the area of Industrial Hygiene and to offer those programs that are financially feasible in occupational health nursing and occupational medicine. Efforts will also continue to improve the balance between the number of open registration courses and contract courses being offered. Although this ratio has improved, it will require additional effort to achieve the 3 to 1 ratio set as a goal in previous years.

b) Needs Assessment - Needs assessment during this period of the grant will continue with input from the following sources.

- i) Survey of students attending current continuing education programs.
- ii) Mailed questionnaire that will be sent to 37,000 people on the mailing list semi-annually.
- iii) Information gathered at NC-OSHERC exhibit booth.
- iv) Information gathered by NIOSH/ERC booth at national conferences.
- v) Information from the established Advisory Committee.

c) Targeted areas of improvement - Three areas have been identified as targeted areas for improvement during the next grant period.

- i) Efforts will be continued in gaining more participation by faculty in the presentation of continuing education courses. Commitments have been obtained by additional faculty at both Duke and UNC and their participation is expected to greatly improve the courses offered as well as the faculty knowledge of the needs in their specialty area.
- ii) Administration at the center will take a more active role in the development of materials for courses. Although the quality of programs offered has been good, it is felt this is an area that can be improved.
- iii) The balance between the type of course (open vs. contract) and the balance between program area courses will be continually monitored and efforts will be made to bring that more in line with the goals listed in the five year plan.

d) Proposed Level of Activities - Because of a highly successful past years, the center has been able to exceed the growth projection contained in the five year plan. The goal is to maintain the current level in year 20. It is anticipated approximately 120 courses will be offered with an attendance of 2500 individuals. Efforts will be placed in offering a better distribution of courses as previously described. Efforts during the next grant period will be devoted to the refinement of existing programs and systems that will result in the improvement of program quality.

e) Program Evaluation - During previous years, evaluation of continuing education programs has been conducted with a student evaluation upon completion of the course. In addition, the evaluation process will also include:

- i) evaluation by course director;
- ii) post course tracking and evaluation by students;
- iii) development of testing for courses;
- iv) evaluation by advisory committee member attending courses;
- v) continuation of external evaluation process.

The evaluation of programs offered is directly tied to the quality of the end product and other methods will be considered in maintaining and improving upon this quality.

3. Training Facilities and Resources

The courses presented by the continuing education group are offered at a variety of locations throughout the United States. The following policies apply to the selection of training facilities for the various courses:

- a. If courses are being offered at locations other than the southeastern United States, the center responsible for that region will be notified in advance of the program regarding date of presentation and location.
- b. For most courses offered in Chapel Hill, the Friday Center for Continuing Education will be utilized. This 20,000 sq. ft. facility has 25 break-out rooms, computer facilities, distance learning capabilities and the latest technology available in meeting space facilities.
- c. For small groups, the training facility at the center will be utilized. This 800 sq. ft. meeting room will accommodate 18 classrooms and is located adjacent to the center offices.
- d. The center has an additional 2400 sq. ft. facility located at the edge of campus known as Chadryu. This facility will be utilized for storage and the practical, hands-on sessions of many courses. It can be set for a ventilation laboratory, asbestos removal, respirator fit testing, hazardous waste clean-up or other segments required in courses.
- e. For certain courses which require that housing be at the same location as the meeting site, local hotels are utilized. Approximately 15 hotels with suitable meeting space are located within a 10-mile radius of the ERC.

Over the past eighteen (19) years of operation the center has acquired much of the equipment necessary to conduct courses. Most courses are structured to utilize equipment for demonstration as well as hands-on use. A small amount of equipment has been purchased using grant moneys, a larger amount from income from training courses, and an even larger amount has been donated by companies. The center will maintain its contacts with equipment suppliers to receive the latest equipment available for students to use in the classroom. Donated equipment also carries with it the advantage that the providing company will maintain complete service of the equipment so it will be functioning properly when demonstrated to potential customers.

The greatest resource of the continuing education program is the instructional staff of 70 individuals developed over the years to teach the courses. We believe strongly that the quality of courses is the best insurance for the future of the center. Much effort has been expended by the faculty to maintain a high quality product, and the administration of the center continuing education program is continually working with faculty in the development of objectives for program modules and the feedback of input gained through course evaluations. Instructors bring into the classroom a great amount of pride in their teaching skills and expertise in their field which are reflected in their performance.

4. Advisory Committee

The use of an external advisory committee for the continuing education program will be continued during the next grant period. The advisory committee includes all four program areas of occupational safety and health and represents academia, industry and government agencies. The committee will meet at least once annually and will be asked to provide input on the overall direction of the program, evaluation of programs attended, emerging issues within the area of specialty and guidance in the development of a certificate program in industrial hygiene. The chairperson of this committee will also serve as the continuing education representative on the advisory committee for the North Carolina OSHERC.

A listing of the membership of the advisory committee is included as attachment C.

5. Response to Site-visit Recommendations

There were seven suggestions for improvement made in the report following the last site visit to the center. These were not conditions that had to be met to continue funding, but rather suggestions offered that the site visitors felt might improve on the continuing education program. The following is our response to these suggestions:

- a. Add University faculty and labor representation to the advisory board - This has been discussed by the current advisory committee, which contains University faculty members. It was decided that since such a small percentage of the work force in the southeast is organized, it would be more appropriate to add the labor representative to the Center advisory board as opposed to one at the program level.
- b. Better geographic tracking of students - We have the capability within the current computer system used to register students, to geographically track students. Had we known in advance of this interest during the site visit, we could have presented that information.
More courses for occupational physicians - During the past year we offered three courses specifically for physicians. A total of 72 attendees participated but only 6 were physicians. In addition to the offerings, 15 other physicians attended other courses offered. In the upcoming year, we will explore the possibility of co-sponsorship of activities with the Carolinas Occupational Medicine Association to enhance these numbers.
- c. Re-instate ceu's - The apparent value of ceu's to attendees is quite low since in the 2,500 students last year only 2 requested ceu's. We have checked with the University and the only way we can offer ceu's is through the existing system, which at our current level of training would cost approximately \$20,000 annually. We have decided not to re-instate ceu's for all courses, but would consider it when requested.
- d. Complete a needs assessment targeting the specific cores - We are currently corresponding with professional societies in our region to determine if they have information on training needs. If it is available, we will utilize that data, if not we will conduct our own assessments.
- e. Use continuing education programs for academic credit only when necessary - We feel that in many cases, the continuing education courses can be used to enhance to total program academic students are exposed to. As a result, at the discretion of the faculty advisor, continuing education courses will continue to be offered for academic credit.
- f. Demonstrate more faculty involvement in CE program - It has been decided that faculty members from either UNC or Duke will serve in an advisory role in the review of training materials for any new courses offered by the center. They will also be invited to attend an initial training session and provide input on improvements.

6. Summary

The next year will be a time to further refine the existing programs offered by the center, to develop and present new courses based upon needs analysis of the region, and to consolidate the selected industrial hygiene courses into an industrial hygiene technician certificate program. Although some expansion is expected, it is felt that through a concentrated effort in balancing courses, improving the needs assessment process, and expansion of program evaluation techniques, much improvement can be obtained in the quality of programs offered.

The advisory committee for continuing education is an essential portion of this refinement, and the end product will be a more solid future for continuing education at the North Carolina ERC.

OUTREACH

A. BACKGROUND

Since the inception of the North Carolina Occupational Safety and Health Educational Resource Center, outreach has been an important part of the activities conducted by the center. In the past, outreach activities have been reported in two categories; support of educational activities and support for a wide variety of other activities.

A library of resource materials was developed and made available on a free loan basis to anyone requesting information. This collection of printed material and audio-visuals was maintained by a librarian and was a great asset to those in our service region. Support of other educational activities has been provided in the form of serving on advisory committees to other academic institutions and providing educational materials and equipment for the program development or presentation. Students from other institutions were allowed to attend continuing education courses on a fee waived basis.

Throughout the first 15 years of the Center, financial support of outreach activities was supplied by the continuing education program. Cost of operation for this aspect of center activities was approximately \$100,000 per year. At the time of a previous proposal, the decision was made to submit the outreach activity as a separate entity, with a budget for those activities. Since the program was not funded beyond the usual \$2500 allotment within the continuing education budget, it was necessary to terminate the services of the librarian, to eliminate the free loan of printed materials to industry and other academic groups and to eliminate the plans to have one individual responsible for the planning, coordination and reporting of all outreach activities.

Since that time, outreach continues to be recognized as an important portion of the activities conducted by the center, but it is conducted on a basis more consistent with financial support.

B. ACTIVITIES DURING THE PAST YEAR

Outreach activities are conducted by each academic program within the center and as such are reported within that section of this proposal. In addition the continuing education program has done the following outreach activities:

1. Provided free tuition to attend continuing education classes to 146 students of academic programs at the following schools:
 - UNC-CH
 - North Carolina State University
 - Western Carolina University
 - St. Augustine College
 - Central Piedmont Community College
 - Hahnemann University
 - Duke University
 - North Carolina A & T
2. Provided audio-visual materials on a free loan basis to 260 companies.
3. Provided approximately 400 course manuals on various topics to interested students.
4. Assisted with planning of continuing education courses at Western Kentucky University.
5. Provided mailing labels for course promotion at Western Kentucky University.
6. Provided mailing labels for course promotion at Hahneman University.

7. Provide equipment for use to NCOSH.
8. Provide equipment for use to State of North Carolina.

C. PLANS FOR THE FUTURE

Emphasis will continue to be placed upon the importance of outreach activities at the center. We anticipate that the faculty of the various programs and the staff of the continuing education activity will continue their level of involvement in all areas of outreach.

Plans are currently underway to develop a uniform mechanism for the reporting of outreach activities. A form is being developed for all program areas to report outreach activities on a quarterly basis. This should simplify the reporting mechanism and provide a more accurate reflection of outreach activities within the center.

HAZARDOUS SUBSTANCE TRAINING

A. BACKGROUND

Since initial funding in 1976, the North Carolina Educational Resource Center has been committed to the concept of presenting quality continuing education programs for occupational safety and health professionals. Over the past nineteen years, hazardous substance training has proven to be an effective mechanism for providing current information to those just entering the field as well as to those in need of updating their skills. It has also proven to be successful in promoting academic programs.

During this time period, the center has experienced much success in the presentation of continuing education programs. Over 28,000 students have attended the 1300 programs offered and the center has developed an extensive client base from which to continue operations.

The hazardous substance training is viewed as an integral part of the total continuing education activities of the center. During the past years, funding was received to conduct needs assessments of the state and the center worked closely with the State of North Carolina to this end. Based upon this study, awareness level training was presented at 6 locations throughout the region. The most recent activities have been the offering of a variety of courses on an open registration basis.

Despite the great number of those trained within the network established as NIOSH educational resource centers, there continues to be a substantial need for more training to be offered. This is due in part to the ever-changing needs of practitioners in the area of hazardous substances. Over the years, understanding and controlling occupational hazards has become increasingly complex and requires highly skilled and broadly trained individuals to effectively deal with hazardous substances. Regulations require training in specific areas. Because of these two events, the present level of need for hazardous substance training continues to expand.

B. TRAINING COMPLETED

During the last completed year of the grant, July 1, 1994 to 6-30-95, a total of 11 courses were offered with an attendance of 211 individuals. A listing of courses is included in the annual statistical report of this proposal. An additional 7 courses were scheduled but were canceled due to low enrollment. In conjunction with the CHMM review course the CHMM exam was also presented on five different dates.

C. PROPOSED TRAINING FOR YEAR 20

(July 1, 1996 to June 30, 1997)

1. Administration

Larry Hyde will continue to serve as Director of the Continuing Education Program at the NC-OSHERC. He has a total of over 17 years experience in this role at the American Industrial Hygiene Association, the University of California at Berkeley and the University of North Carolina at Chapel Hill. He will also serve as Deputy Director of the Center as outlined in the Administration Section of this proposal.

Vicki Smith will serve as Assistant Director of Continuing Education. Ms. Smith has 15 years experience in all aspects of continuing education and has specific responsibility for staff supervision, course promotion, faculty and facilities coordination and other administrative duties.

JoAnne Wright is an administrative assistant and will serve as financial manager for continuing education. In this role Ms. Wright has responsibility for financial management of the continuing education program, including grant moneys and a generated income of approximately \$1,200,000 annually.

Ron Conrad will serve as hazardous waste specialist for the hazardous substance training activities. He will serve in this capacity on a consulting basis as previously approved by NIOSH/CDC.

2. Proposed plan

- a) Needs Assessment - Needs assessment during this period of the grant will continue with input from the following sources:
- i) survey of students attending current continuing education programs
 - ii) mailed questionnaire that will be sent to 37,000 people on the mailing list semi- annually
 - iii) information gathered at NC-OSHERC exhibit booth
 - iv) information gathered by NIOSH/ERC booth at national conferences
 - v) information from the established Advisory Committee
- b) Targeted areas of improvement - Four areas have been identified as targeted areas for improvement during the next grant period.
- i) The administration at the center will take a more active role in the development of materials for courses. Although the quality of programs offered has been good, it is felt this is an area that can be improved.
 - ii) The instructors used in courses will be expanded to accommodate a program that is expected to grow during this time period. This will also accommodate the busy schedules of existing instructors and will give the program the opportunity to evaluate the teaching skills of new individuals.
 - iii) The current needs assessment will be refined to address the specific area of hazardous substance training. The large number of courses canceled this past year due to low registrations is an indicator that improvement is necessary in this area.
 - iv) Efforts will be made to solicit more contract courses as opposed to the high number of open registration activities. This will provide a better financial base from which to operate this program.
- c) Proposed Level of Activities - We anticipate a continued expansion in the number of activities offered and number of students attending. The past year showed an increase of 20% in courses offered and 70% increase in attendance. Although not at this rate, we would anticipate increases to continue through this grant period.
- d) Program Evaluation - During previous years, evaluation of continuing education programs has been conducted as a student evaluation upon completion of the course. This evaluation process will continue to include:
- i) evaluation by course director
 - ii) post course tracking and evaluation by students
 - iii) development of testing for courses
 - iv) evaluation by advisory committee member attending courses
 - v) continuation of external evaluation process
- The evaluation of programs offered is directly tied to the quality of the end product and other methods will be considered in maintaining and improving upon this quality.

3. Training Facilities and Resources

The courses presented by the continuing education group are offered at a variety of locations throughout the United States. The following policies apply to the selection of training facilities for the various courses:

- a. If courses are being offered at locations other than the southeastern United States, the center responsible for that region will be notified in advance of the program regarding date of presentation and location.
- b. For most courses offered in Chapel Hill, the Friday Center for Continuing Education will be utilized. This 20,000 sq. ft. facility has 25 break-out rooms, computer facilities, distance learning capabilities and the latest technology available in meeting space facilities.

- c. For small groups, the training facility at the center will be utilized. This 800 sq. ft. meeting room will accommodate 18 classroom style and is located adjacent to the center offices.
- d. The center has an additional 2400 sq. ft. facility located at the edge of campus known as Chadryu. This facility will be utilized for storage and the practical, hands-on sessions of many courses. It can be set for a ventilation laboratory, asbestos removal, respirator fit testing, hazardous waste clean-up or other segments required in courses.
- e. For courses requiring housing be at the same location of the meeting site, local hotels are utilized. Approximately 15 hotels with suitable meeting space are located within a 10-mile radius of the ERC.

Over the past years of operation the center has acquired much of the equipment necessary to conduct courses. Most courses are structured to utilize equipment for demonstration as well as hands-on use in live areas. A small amount of equipment has been purchased using grant moneys, a larger amount from income from training courses and an even larger amount has been donated by companies. The center will maintain its contacts with equipment suppliers to receive the latest equipment available for students to use in the classroom. Donated equipment also carries with it the advantage that the providing company will maintain complete service of the equipment so it will be functioning properly when demonstrated to potential customers.

The greatest resource of the continuing education program is the instructional staff developed over the years. We believe strongly that the quality of courses is the best insurance for the future of the center. Much effort has been extended by the faculty to maintain a high quality product and the administration of the center continuing education program is continually working with faculty in the development of objectives for program modules and the feedback of input gained through course evaluations. Instructors bring into the classroom a great amount of pride in their teaching skills and expertise in their field which are reflected in their performance.

4. Advisory Committee

The use of an external Advisory Committee for the continuing education program will be continued during the next grant period. The Advisory Committee represents academia, industry and government agencies. The committee will meet at least once annually and will be asked to provide input on the overall direction of the program, evaluation of programs attended, emerging issues within the area of specialty and guidance in the development of a certificate program in industrial hygiene. The chairperson of this committee will also serve as the continuing education representative on the advisory committee for the North Carolina OSHERC.

A listing of the membership of the advisory committee is included as Attachment C.

5. Summary

The next year will be utilized in further refinement of courses currently offered and development of those new courses as defined by a comprehensive needs assessment. The advisory committee will continue to provide input on policy and direction of the program. The numbers and variety of courses will expand as will the instructional staff involved. The evaluation process will continue to be used to identify any weakness in courses offered and to insure program quality.

ANNUAL STATISTICAL REPORT - PART II - A
 CONTINUING EDUCATION COURSES BY PROGRAM AREA (7-1-1994 to 6-30-1995)
 GRANTEE INSTITUTION: UNIVERSITY OF NORTH CAROLINA

PROGRAM TITLE	PERSONS	DAYS	P-DAYS	TRAINEE BY DISCIPLINE											TRAINEE BY EMPLOYER						
				RN	III	SA	PP	IM	Other	PI	FG	SG	LG	FC	JC	AC					
Sampling and Evaluating Airborne Asbestos Dust (NIOSH 582)	6	4.5	27.0	0	0	3	1	0	0	2	2	4	1	1	0	0	0	0	0		
Sampling and Evaluating Airborne Asbestos Dust (NIOSH 582)	18	4.5	81.0	0	0	7	5	0	3	3	11	3	0	0	0	0	0	4	4		
Sampling and Evaluating Airborne Asbestos Dust (NIOSH 582)	14	4.5	63.0	0	0	5	4	0	0	5	7	6	0	0	0	0	0	1	1		
Sampling and Evaluating Airborne Asbestos Dust (NIOSH 582)	4	4.5	18.0	0	0	3	0	0	0	1	3	0	1	0	0	0	0	0	0		
Fundamentals of Industrial Hygiene	27	5.0	135.0	0	0	3	16	0	0	8	19	6	1	0	0	0	0	1	1		
Fundamentals of Industrial Hygiene	18	5.0	90.0																		
Fundamentals of Industrial Hygiene	41	5.0	205.0	0	0	19	13	1	0	8	27	6	5	1	0	0	0	2	2		
Industrial Ventilation Design, Part I	24	2.5	60.0	0	0	7	6	0	0	11	7	7	1	0	0	0	0	9	9		
Industrial Ventilation Conference	160	5.0	800.0																		
Industrial Ventilation Design, Part I	22	2.5	55.0	0	0	13	6	0	0	3	11	10	1	0	0	0	0	0	0		
Respiratory Protection Program	37	4.5	166.5	0	1	7	11	0	0	18	28	6	2	0	0	0	0	1	1		
Respiratory Protection Program	30	5.0	150.0	0	2	9	13	0	0	6	21	5	2	0	0	0	0	2	2		
Industrial Hygiene Sampling - Chemical Contaminants	13	4.5	58.5	0	0	7	5	0	0	1	9	0	4	0	0	0	0	0	0		
Industrial Hygiene Sampling-Chemical Contaminants	16	5.0	80.0	0	0	8	5	0	0	3	7	4	2	0	1	0	0	2	2		
Industrial Ventilation Design, Part II	11	2.5	27.5	0	0	4	4	0	0	3	4	6	1	0	0	0	0	0	0		
Industrial Ventilation Design, Part II	11	2.5	27.5	0	0	8	2	0	0	1	4	6	1	0	0	0	0	0	0		

ANNUAL STATISTICAL REPORT - PART II - A
 CONTINUING EDUCATION OUTPUTS BY PROGRAM AREA (7-1-1994 to 6-30-1995)
 GRANTEE INSTITUTION: UNIVERSITY OF NORTH CAROLINA

Program Area: Industrial Hygiene

PROGRAM TITLE	PERSONS	DAYS	P-DAYS	MD	TRAINEES BY DISCIPLINE							TRAINEES BY EMPLOYER						
					RN	III	SA	PP	IHM	Other	PI	FG	SG	LG	FC	IC	AC	
Asbestos Identification by Polarized Light Microscopy	5	4.0	20.0	0	0	2	2	0	0	1	3	2	0	0	0	0	0	
Asbestos Identification by Polarized Light Microscopy	8	4.0	32.0	0	0	2	0	0	0	6	6	2	0	0	0	0	0	
Asbestos Identification by Polarized Light Microscopy	6	4.0	24.0	0	0	6	0	0	0	0	6	0	0	0	0	0	0	
Asbestos Identification by Polarized Light Microscopy	4	4.0	16.0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	
Statistical Analysis and Interpretation of Industrial Hygiene Sampling Data	8	2.5	20.0	0	0	4	3	0	0	1	5	2	0	0	0	0	1	
Statistical Analysis and Interpretation of Industrial Hygiene Sampling Data	16	2.5	40.0	0	0	14	1	0	0	1	7	8	0	0	0	1	0	
Introduction to Exposure Assessment Modelling	11	2.5	27.5	1	0	6	3	0	0	1	5	5	0	0	0	0	1	
DuPont Exposure Monitoring	9	5.0	45.0	0	0	4	3	0	0	2	9	0	0	0	0	0	0	
Nonionizing Radiation and Fields: An Overview	14	2.5	35.0	0	0	7	5	0	0	2	6	7	1	0	0	0	0	
Nonionizing Radiation and Fields: An Overview	20	2.5	50.0	0	0	11	8	0	0	1	5	12	0	0	0	0	3	
Industrial Hygiene Calculation Techniques	14	2.5	35.0	0	0	5	6	0	0	3	8	4	0	1	0	0	1	
Applied Radiation Protection	8	2.5	20.0	0	0	0	4	0	0	4	3	3	0	0	0	0	2	
Comprehensive Industrial Hygiene (CIH) Review	25	5.0	125.0	0	1	20	3	0	0	1	12	12	0	0	0	0	1	
Comprehensive Industrial Hygiene (CIH) Review	23	5.5	126.5	0	0	13	9	0	0	1	12	8	1	2	0	0	0	
Comprehensive Industrial Hygiene (CIH) Review	25	5.0	125.0	0	0	17	6	0	0	2	16	9	0	0	0	0	0	
TOTAL INDUSTRIAL HYGIENE	648	121.0	2785.0	1	4	212	146	1	3	103	269	140	24	4	1	1	31	

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PROGRAM TITLE	PERSONS	DAYS	P-DAYS	Program Area: Occupational Medicine														
				MD	RN	III	SA	PP	HM	Other	PI	PG	SG	LG	FC	IC	AC	
Concepts of Biohazard Science	13	2.5	32.5	1	0	5	5	0	0	2	0	0	0	0	0	0	0	3
Applied Industrial Toxicology	26	2.5	65.0															
Applied Industrial Toxicology	33	2.5	82.5	5	4	17	5	0	0	2	15	13	1	0	0	0	0	4
TOTAL OCCUPATIONAL MEDICINE	72	7.5	180.0	6	4	22	10	0	0	4	23	15	1	0	0	0	0	7

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 CONTINUING EDUCATION OUTPUTS BY PROGRAM AREA (7-1-1994 to 6-30-1995)

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PROGRAM TITLE	PERSONS	DAYS	P-DAYS	TRAINEE BY DISCIPLINE										TRAINEE BY EMPLOYER						
				RD	RN	IH	SA	PP	IIM	Other	PI	FG	SG	LG	FC	IC	AC			
Fundamentals of Occupational Safety	27	2.5	67.5	0	0	1	16	0	0	10	0	10	15	0	12	0	0	0	0	
Certified Safety Professional (CSP) Review	37	5.0	185.0	0	0	12	21	0	0	4	0	4	27	5	1	3	0	0	1	
Fundamentals of Occupational Safety	22	2.5	55.0	0	0	2	13	0	0	7	0	7	15	5	1	1	0	0	0	
Certified Safety Professional (CSP) Review	31	5.0	155.0	0	0	10	20	0	0	1	0	1	19	6	3	0	1	1	1	
Ergonomics in the Workplace	27	2.5	67.5	1	1	5	9	0	0	11	0	11	10	7	2	0	0	0	8	
Advanced Occupational Safety	31	2.5	77.5	0	0	1	19	0	0	11	0	11	13	3	15	0	0	0	0	
Advanced Occupational Safety	32	2.5	80.0	0	1	3	24	0	0	4	0	4	24	7	1	0	0	0	0	
Contractor Safety Management	13	2.5	32.5	0	0	1	10	0	0	2	0	2	8	3	2	0	0	0	0	
Contractor Safety Management	14	2.5	35.0	0	0	3	9	0	0	2	0	2	12	1	0	0	0	0	1	
Confined Space	2	5.0	10.0	0	0	0	0	0	0	2	0	2	2	0	0	0	0	0	0	
Developing and Managing an Effective Confined Space Safety Program	17	2.5	42.5	0	0	4	10	0	0	3	0	3	6	6	1	0	0	1	3	
Developing and Managing an Effective Confined Space Rescue Program	10	2.5	25.0	0	0	2	7	0	0	1	0	1	5	4	1	0	0	0	0	
Complying with OSHA	39	5.0	195.0	0	0	1	16	0	0	22	0	22	23	0	13	0	0	0	3	
Complying with OSHA	31	5.0	155.0	0	3	5	15	0	0	8	0	8	19	11	0	1	0	0	0	
OSHA COMPLIANCE FOR CONSTRUCTION	10	8.0	80.0																	
Construction Safety	11	8.0	88.0																	
Complying With OSHA	24	5.0	120.0																	
TOTAL OCCUPATIONAL SAFETY	378	68.5	1470.5	1	5	50	189	0	0	88	0	88	198	58	52	5	1	2	17	

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 CONTINUING EDUCATION OUTPUTS BY PROGRAM AREA (7-1-1994 to 6-30-1995)
 GRANTEE INSTITUTION: UNIVERSITY OF NORTH CAROLINA

Program Area: Other

PROGRAM TITLE	TRAINEE BY DISCIPLINE													TRAINEE BY EMPLOYER						
	PERSONS	DAYS	P-DAYS	MD	RN	III	SA	PP	HM	Other	PI	FG	SG	LG	FC	IC	AC			
Introduction to Ergonomics in the Workplace	26	1.5	39.0	0	4	5	6	1	0	10	17	9	0	0	0	0	0			
Train-the-Trainer for Environmental Occupations	6	4.5	27.0	0	0	2	3	0	0	1	4	0	2	0	0	0	0			
Workers' Compensation Claims Management and Cost Containment Strategies	24	2.5	60.0	1	7	1	9	1	0	5	19	2	0	0	0	1	2			
Workers' Compensation Claims Management and Cost Containment Strategies	24	2.5	60.0	0	9	3	6	0	0	6	12	9	1	0	1	1	0			
12th Annual Workers' Compensation Conference	229	1.0	229.0	9	64	3	32	12	0	109	173	0	13	15	0	7	21			
Legal Concerns of Occupational Safety and Health Professionals	10	2.5	25.0	0	2	3	4	0	0	1	4	6	0	0	0	0	0			
Ergonomics in the Workplace	30	2.5	75.0	0	3	3	11	1	0	12	22	8	0	0	0	0	0			
Asbestos Operations and Maintenance	6	2.0	12.0	0	0	0	0	0	0	6	4	0	1	0	0	0	1			
Asbestos Operations and Maintenance	0	2.0	0.0																	
Asbestos Operations and Maintenance	8	2.0	16.0	0	0	0	0	0	0	8	8	0	0	0	0	0	0			
Asbestos Operations and Maintenance	16	2.0	32.0	0	0	0	0	0	0	16	16	0	0	0	0	0	0			
Asbestos Operations and Maintenance	26	2.0	52.0																	
Asbestos Operations and Maintenance	21	2.0	42.0																	
Asbestos Operations and Maintenance	12	2.0	24.0	0	0	0	2	0	0	10	12	0	0	0	0	0	0			
Asbestos Operations and Maintenance	13	2.0	26.0	0	0	0	0	0	0	13	13	0	0	0	0	0	0			
Asbestos Operations and Maintenance	17	2.0	34.0																	
Asbestos Operations and Maintenance	9	2.0	18.0	0	0	1	0	0	0	8	0	9	0	0	0	0	0			
Supervising Asbestos Abatement Projects Refresher	6	1.0	6.0	0	0	5	0	0	0	1	6	0	0	0	0	0	0			

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 CONTINUING EDUCATION OUTPUTS BY PROGRAM AREA (7-1-1994 to 6-30-1995)

GRANTEE INSTITUTION: UNIVERSITY OF NORTH CAROLINA

Program Area: Other

PROGRAM TITLE	TRAINEEES BY DISCIPLINE													TRAINEEES BY EMPLOYER					
	PERSONS	DAYS	P-DAYS	MD	RN	III	SA	PP	HM	Other	PI	FG	SG	LG	FC	IC	AC		
Supervising Asbestos Abatement Projects Refresher	31	1.0	31.0	0	0	5	4	0	0	22	25	1	3	1	0	0	1		
Supervising Asbestos Abatement Projects Refresher	12	1.0	12.0	0	0	0	1	0	0	11	0	12	0	0	0	0	0		
Supervising Asbestos Abatement Projects Refresher	33	1.0	33.0	0	0	7	1	0	3	22	23	1	3	3	0	0	3		
Supervisor Refresher	13	1.0	13.0	0	0	4	2	0	0	7	8	0	3	0	0	0	2		
Supervising Asbestos Abatement Projects Refresher	33	1.0	33.0	0	0	6	5	1	0	21	15	4	5	4	0	0	5		
Management Planning for Asbestos Refresher	14	0.5	7.0	0	0	3	1	0	1	9	6	0	2	4	0	0	2		
Management Planning for Asbestos Refresher	19	0.5	9.5	0	0	4	1	0	0	14	14	1	1	0	0	0	3		
Building Inspection for Asbestos Refresher	36	0.5	18.0	0	0	6	4	3	0	23	16	0	9	10	0	0	1		
Building Inspection for Asbestos Refresher	37	0.5	18.5	0	0	8	5	0	1	23	19	0	3	10	0	0	5		
Inspector and Management Planner Refresher (TSCA Title II)	50	1.0	50.0	0	0	13	8	0	0	29	35	3	5	2	0	0	5		
Building Inspection and Management Planning Refresher	106	1.0	106.0	0	0	23	16	2	0	65	45	6	11	28	0	0	16		
Building Inspection and Management Planning Refresher	38	1.0	38.0	0	0	12	5	0	0	21	18	5	7	6	0	0	2		
Building Inspection and Management Planning Refresher	28	1.0	28.0	0	0	6	1	0	0	21	14	1	3	9	0	0	1		
Building Inspection for Asbestos Refresher	38	1.0	38.0	0	0	5	2	0	0	31	26	2	1	3	0	0	6		
Initial Building Inspection for Asbestos	5	3.0	15.0	0	0	0	0	0	0	5	5	0	0	0	0	0	0		
Initial Building Inspection for Asbestos	32	3.0	96.0	0	0	6	7	0	0	19	22	3	3	4	0	0	0		
Initial Building Inspection for Asbestos	25	3.0	75.0	0	0	4	6	0	0	15	9	2	10	3	0	0	1		

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CONTINUING EDUCATION OUTPUTS BY PROGRAM AREA (7-1-1994 to 6-30-1995)
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PROGRAM TITLE	PERSONS	DAYS	P-DAYS	THAINEES BY DISCIPLINE										THAINEES BY EMPLOYER						
				HD	RN	III	SA	PP	HM	Other	PI	EG	SG	LG	FC	IC	AC			
				RD	RD	RD	RD	RD	RD	RD	RD	RD	RD	RD	RD	RD	RD	RD		
Building Inspection for Asbestos	13	3.0	39.0	0	0	2	2	0	0	0	9	5	1	2	3	0	0	2		
Building Inspection for Asbestos	16	3.0	48.0	0	0	6	1	0	0	9	13	0	0	3	0	0	0	0		
Initial Management Planning for Asbestos	12	2.0	24.0	0	0	3	3	0	0	6	8	1	1	2	0	0	0	0		
Initial Management Planning for Asbestos	9	2.0	18.0	0	0	3	0	0	0	6	4	0	4	0	0	0	0	1		
Management Planning for Asbestos	7	2.0	14.0	0	0	2	2	0	0	3	2	2	1	1	0	0	0	1		
Management Planning for Asbestos	8	2.0	16.0	0	0	2	1	0	0	5	6	0	0	2	0	0	0	0		
Initial Supervising Asbestos Abatement Projects	21	5.0	105.0	0	0	3	1	0	0	17	6	0	5	1	0	0	0	9		
Initial Supervising Asbestos Abatement Projects	17	5.0	85.0	0	0	1	1	0	0	15	17	0	0	0	0	0	0	0		
Supervising Asbestos Abatement Projects	9	5.0	45.0	0	0	4	1	0	0	4	7	0	0	0	0	0	0	2		
Designing Asbestos Abatement Projects Refresher	15	1.0	15.0	0	0	7	1	0	0	7	8	2	3	1	0	0	0	1		
Designing Asbestos Abatement Projects Refresher	31	1.0	31.0	0	0	10	2	0	1	18	18	2	4	6	0	0	0	1		
Designing Asbestos Abatement Projects Refresher	29	1.0	29.0	0	0	10	1	1	0	17	20	2	5	1	0	0	0	1		
Surviving the Safety and Health Financial and Budget Battle	8	2.0	16.0	0	0	6	2	0	0	0	8	0	0	0	0	0	0	0		
LEAD Operations and Maintenance	0	2.0	0.0																	
Indoor Air Quality	28	2.5	70.0																	
Indoor Air Quality	32	2.5	80.0	2	4	15	6	0	0	5	16	8	2	2	0	0	0	4		
Supervising Lead Abatement Projects	26	3.5	91.0	0	0	2	4	0	0	20	11	4	2	3	0	0	0	6		
Supervising Lead Abatement Projects	1	4.0	4.0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0		
Supervising Lead Abatement Projects	25	4.0	100.0																	

ANNUAL STATISTICAL REPORT - PART II - A
CONTINUING EDUCATION OUTPUTS BY PROGRAM AREA (7-1-1994 to 6-30-1995)

GRANTEE INSTITUTION: UNIVERSITY OF NORTH CAROLINA

PROGRAM TITLE	PERSONS	DAYS	F-DAYS	TRAINees BY DISCIPLINE										TRAINees BY EMPLOYER						
				RV	IH	SA	PP	HM	Other	PI	FG	SG	IG	FC	IC	AC				
				MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD				
Building Inspection for Lead	17	3.0	51.0	0	0	0	1	0	0	0	16	10	0	1	5	0	0	1		
Building Inspection for Lead	11	3.0	33.0	0	0	2	0	1	0	8	7	0	1	1	1	0	0	2		
Violence in the Workplace	13	2.5	32.5	0	4	1	6	0	0	2	11	1	1	1	0	0	0	0		
TOTAL OTHER	1381	120.0	2344.5	12	97	217	177	23	6	732	788	307	118	133	1	9	108			

ANNUAL STATISTICAL REPORT - PART II - B
 SUMMARY OF CONTINUING EDUCATION OUTPUTS (7-1-1994 to 6-30-1995)

CHARTER INSTITUTE: UNIVERSITY OF NORTH CAROLINA

PROGRAM AREA	COURSES	PERSONS DAYS	P-DAYS	TRAINEES BY DISCIPLINE										TRAINEES BY EMPLOYER							
				RN	IH	SA	PP	HM	Other	PI	FG	SG	LG	FC	IC	AC					
Occupational Medicine	3	72	7.5	180.0	6	4	22	10	0	0	4	23	15	1	0	0	7				
Occup. Health Nursing	5	278	12.5	644.5	1	108	1	5	0	0	5	82	11	1	4	5	16				
Industrial Hygiene	31	648	121.0	2785.0	1	4	212	146	1	3	103	269	140	24	4	1	31				
Occupational Safety	17	378	68.5	1470.5	1	5	50	189	0	0	88	198	58	52	5	1	17				
Other	57	1381	120.0	2344.5	12	97	217	177	23	6	732	788	107	118	133	1	108				
GRAND TOTAL	113	2757	329.5	7424.5	21	218	502	527	24	9	932	1360	331	196	146	8	13	179			

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GRANTEE INSTITUTION: UNIVERSITY OF NORTH CAROLINA

Program Area: Hazardous Substances

PROGRAM TITLE	PERSONS DAYS	P-DAYS	TRAINEES BY DISCIPLINE										TRAINEES BY EMPLOYER						
			MD	RN	IH	SA	PP	IHM	Other	PI	EG	SG	LG	FC	IC	AC			
Certified Hazardous Materials Manager (CIHM) Review	7	3.0	21.0	0	0	0	1	0	0	0	0	6	5	1	1	0	0	0	0
CIHM EXAM	5	0.5	2.5																
Emergency Spill Response/HAZWOPER 24-hour (cancelled)	4	3.0	12.0																
Hazardous Material Spill Control HAZWOPER - 24 Hour	10	3.0	30.0																
TOTAL HAZARDOUS SUBSTANCES	211	53.0	452.0	0	0	14	32	0	4	128	86	12	71	1	0	0	0	0	

APPENDIX I ERC FACULTY 1992 - 1995

OCCUPATIONAL AND ENVIRONMENTAL MEDICINE

Woodhall Stopford, M.D., M.S.P.H. (Program Director):

Dr. Stopford is Director of the Duke Occupational and Environmental Medicine Education Program. He has been involved in research, teaching a clinical practice which focuses on Occupational and Environmental Medicine and Toxicology since 1973, Program Director for the Occupational Medicine Residency Program since 1981, and Director for all Occupational and Environmental Medicine training activities since 1983. Dr. Stopford is trained in internal medicine, health sciences research and industrial hygiene and is board certified in Internal Medicine and Occupational Medicine. He has a Master's of Science of Public Health degree in Environmental Sciences and Engineering (Industrial Hygiene) from the UNC School of Public Health. He is on the advisory board for the industrial hygiene core curriculum at the UNC School of Public Health. His current research and teaching interests focus on clinical and environmental surveillance techniques for workers exposed to heavy metals and neurotoxic chemicals and the evaluation of populations with airways disease related to exposure to irritants and sensitizers. Dr. Stopford acts as the Occupational physician and/or medical consultant to industry both locally and nationally. He co-chairs the Academic Medicine Section of the American College of Occupational Medicine.

Linda Frazier, M.D. (Associate Director):

Dr. Frazier became Associate Director of the residency in 1992. She has extensive experience in OEM curriculum development under project EPOCH-Envi, which she directs. She was director of the General Internal Medicine fellowship program at Duke prior to specializing in occupational and environmental medicine. She has experience administering grants and projects. She has published extensively in medical education topics including OEM training. She coordinates our liaison with Duke medical student activities in OEM. She teaches OEM topics in both the Duke Family Medicine Residency Program and the Duke Internal Medicine Residency Program. She has a clinical and research interest in injury prevention and musculoskeletal disease. Her current research work includes surveillance for cumulative trauma disorders using workers compensation data, and surveillance for silicosis under SENSOR.

John M. Dement, Ph.D., C.I.H. (Director, Research Training):

Dr. Dement has recently joined our faculty from his positions as director of the Office of Occupational Health and Technical Services of the National Institute of Environmental Health Sciences. In addition to his administrative responsibilities, he provided expert technical assistance to special Institute initiatives and projects related to occupational and environmental health. He also provided exposure assessment expertise to Institute epidemiologic research activities. His research interests have focused on exposure assessments for epidemiologic studies of populations exposed to pneumoconiotic and carcinogenic dusts and fibers. As a member of our faculty, Dr. Dement will continue to focus on research and research training in occupational and environmental epidemiology.

John W. Cromer, Jr., M.D., M.S.P.H.:

Dr. Cromer has received training at NIOSH as an investigator doing health hazard evaluations on various exposed employee groups and has been trained as an industrial hygienist. Dr. Cromer acts as the industrial physician or as a consultant to several industries in the Wilmington area of North Carolina. Prior to beginning his full-time medicine practice, he was a full-time faculty member of our program. Dr. Cromer continues to actively teach in our program and has the on-site managerial responsibility for our practicum site experience with his practice.

George W. Jackson, M.D.:

Dr. Jackson is the Chief of the Division of Occupational and Environmental Medicine with overall responsibility for all education, research and service activities of the Division. He is also the Director of the Duke Employee Occupational Health Service. Dr. Jackson has received training at the CDC as a medical epidemiologist and is board certified in Preventive Medicine. His current research, teaching and practice interests involve the management of occupational health problems, and the application of employee assistance programs to help troubled workers. He is nationally known for his research in

programs to identify and assist workers with substance abuse. He is currently involved in the implementation of health promotional programs for Duke employees and surrounding industries. Dr. Jackson recently served as a member of the Institute of Medicine committee which reported on the status of Occupational and Environmental Medicine practice and needs in the primary medical care arena.

Gwendolyn Powell, M.D., M.S., M.P.H.:

Dr. Powell is Corporate Medical Director for Glaxo, Inc., and acts as the practicum site advisor for residents taking training at Glaxo. She is a member of the Division's adjunct faculty and is board certified in Occupational Medicine. Dr. Powell has initiated a major prospective epidemiology research program to assess factors that influence the development of allergic disease among animal handlers. In addition to acting as a practicum site advisor, Dr. Powell participates in our Occupational Medicine seminar series, particularly in subjects related to risks associated with the manufacturer of pharmaceuticals, allergy to laboratory animals and risk to the pregnant worker.

Merril Eisenbud, D.H.C., Sc.D., B.S.E.D.:

Dr. Eisenbud is internationally known for his research in Beryllium disease and radiation health effects. He is acting as a research preceptor for studies involving the epidemiologic assessment of workers exposed to known toxins. He also conducts specific seminars in the area of radiation health effects as well as disease associated with heavy metal exposure.

D.K. Broadwell, M.D., M.P.H.:

Dr. Broadwell is board certified in Aerospace Medicine/Internal Medicine and has recently joined our faculty from NASA. He has a clinical and research interest in substance abuse, measuring worker impairment, and the neuropsychiatric effects of solvent exposure.

Craig Stenberg, Ph.D.:

Dr. Stenberg directs Duke's Occupational Mental Health Programs. He teaches a course at University of North Carolina, School of Public Health in occupational mental health. His primary research interest has focused largely on the origin, development, and socialization of anger. He has been especially concerned with problems which result from the inability to express negative emotions appropriately or to detect them accurately in others. He presently serves as a member of the Insurance Committee of the North Carolina Psychological Association and is involved in several research projects in the area of managed mental health care and employee assistance programs.

Dennis J. Darcey, M.D., M.P.H., M.S.P.H.:

Dr. Darcey is an occupational physician with training in both Occupational Epidemiology and Industrial Hygiene. His research interests involve the monitoring of workers for the effects of acute exposure to toxins, the environmental assessments of populations exposed to airborne toxins, the use of biomarkers for assessing absorption after acute industrial and environmental exposures and the neurophysiologic assessment of workers exposed to heavy metals.

Samuel Moon, M.D., M.P.H.:

Dr. Moon has expertise in the area of ergonomics, occupational musculo-skeletal problems, and disability case management. He directs the biannual ERC ergonomics course and serves on the ERC Continuing Education Committee. Dr. Moon will have responsibilities for acting as a practicum site advisor for trainees within the Duke Employee Occupational Health Service, as a general program advisor, and as a preceptor in musculoskeletal medicine clinics for our residents.

Jerry Tulis, Ph.D., M.S.:

Dr. Tulis is the Director of the Biohazard Science Program and Program Chair of the Biohazard Science Curriculum at Duke. Dr. Tulis' clinical and research interests focus on biological and environmental hazards in the home and workplace.

Gary Greenberg, M.D., M.P.H.:

Dr. Greenberg is Medical Director of the Division's Occupational Health Service. He initiated the Division's inpatient consultation service and continues to have the primary responsibility for this service. Residents are expected to be involved in the evaluation of all cases on this service. Dr. Greenberg acts as the liaison between our Division and the Department of Internal Medicine. He, in conjunction with Dr. Frazier, has developed a set of didactic materials for the training of primary internal medicine residents in occupational medicine.

Gregory Smith, M.D., M.P.H.:

Dr. Smith is the environmental medical epidemiologist within the State of North Carolina's Environmental Epidemiology Section. Dr. Smith acts as the practicum site preceptor for our Program's elective experience within the State's Division of Environmental Epidemiology. Dr. Smith chairs our Residency Advisory Committee. A major thrust of this Committee has been to broaden in the focus of training within the Program to include aspects of Environmental Medicine.

Ricky Langley, M.D., M.P.H.:

Dr. Langley has recently joined our faculty from an academic position within the Department of Preventive Medicine and Public Health Policy at East Carolina University. Dr. Langley's research focus is on work-related injuries and illness associated with farming.

David G. Warren, M.D.:

Dr. Warren joins us from the Department of Health Administration at Duke where he coordinated the MD-JD and JD-MHA joint degree programs. He is on the editorial board of the Journal of Health Politics, Policy and Law and will continue his interest in this area as he develops a course in Ethics and Environmental Law.

Dr. Edward Thalmann, M.D.:

Dr. Thalmann joins our faculty after completing his occupational medicine residency at Duke. Prior to joining our residency, he was Director of Diving Biomedical Technology and the Decompression Research Programs at the Naval Medical Research Institute. Dr. Thalmann has assumed the directorship of the Divers Alert Network, a teaching and research program in recreational diving at Duke. Dr. Thalmann will offer our residents a course in hyper/hypobaric physiology and act as a preceptor in a longitudinal experience in clinical hyperbaric medicine. He acts as a resident advisor for residents in the Underseas Medicine/Occupational & Environmental Medicine residency tract.

Dr. David Siebens, M.D.:

Dr. Siebens joins our faculty after completing his MPH at the University of North Carolina's School of Public Health. Prior to accepting an academic position, he worked as a consulting physician to IBM and the Duke Occupational Health Service. He acts as a clinical preceptor and advisor to our residents and as an instructor in the Duke School of the Environment.

OCCUPATIONAL HEALTH NURSING

Dr. Bonnie Rogers, Dr.PH., M.P.H., B.S.N. (Program Director):

Dr. Rogers is Associate Professor with tenure. She has a solid background in the field of Occupational Health Nursing and has contributed significantly to the body of knowledge in occupational health and Occupational Health Nursing. She has extensive research experience, more than 75 publications, is involved in professional activities in Occupational Health Nursing, and serves on nationally recognized Editorial Review Boards including Associate Editor, Journal of Hospital Occupational Health, Nursing Outlook, Journal of Occupational Health Psychology, and the Journal of Occupational Rehabilitation. She teaches both the OHN I and II courses, develops field observational visits for the students, facilitates independent study courses for the students, helps coordinate students' interdisciplinary activities, directs the OHN continuing education courses, and oversees the administrative, educational and research aspects of the OHN Program. She advises OHN students and thereby serves as primary thesis/paper advisor. She continues research on ethical issues in occupational settings, occupational hazards to health care workers, and clinical Occupational Health Nursing problems. Several of these projects provide research opportunities for students. Dr. Rogers has received several major professional achievement awards, and has recently published two books: Occupational Health Nursing Guidelines for Primary Clinical Conditions, OEM Press, 1992 (currently in second edition press), and Occupational Health Nursing: Concepts and Practice, W.B. Saunders, published in April, 1994. The Program Director is active in professional activities related to research. Current examples include elected member, Research Committee, Sigma Theta Tau International (STTI), Chairperson, Research Committee, STTI, Alpha Alpha Chapter; Chair, Research Committee, NCAOHN; and research grant reviewer for AAOHN and STTI. Dr. Rogers currently serves as President, AAOHN. She was appointed for a 2-year term to the Institute of Medicine Committee on Enhancing Environmental Health Content in Nursing Practice. The publication report of this committee's work is now completed to be disseminated later this year.

Dr. Wendie Robbins, Ph.D., M.S., M.S.N., B.S.N.:

Dr. Wendie Robbins has joined the Occupational Health Nursing faculty this past year. Dr. Robbins has completed her PhD in epidemiology, University of California, Berkeley, where she has been doing work related to biomarkers and exposures. Dr. Robbins' background is as a nurse practitioner and public health nurse so she will help with the Epidemiology/Occupational Health Nursing PhD and Occupational Health Nurse Practitioner option described later. She is also involved in teaching and advising, has a joint appointment in the Department of Epidemiology, and also has a scientist appointment at NIEHS for her research. She also teaches in the Occupational Health Nursing Advances Forum and OSHERC Institutes (CE).

Ms. Judith Ostendorf, M.P.H., B.S.N.:

Ms. Judith Ostendorf is part-time with the OHN Program. Ms. Ostendorf's primary responsibilities include coordinating the OHN practicum courses taken by OHN/PHN students, serving as reader for master's papers and theses, advising and developing, participating in, and co-coordinating continuing education courses. For example, Ms. Ostendorf teaches in the OHN Basic Theory and Update course, in the OHN Certification Review Courses, and in the OSHERC Institutes. Dr. Rogers, Ms. Ostendorf and Mr. Coble, who teaches the Safety course, are currently revising that course to include an ergonomics component. Ms. Ostendorf will collaborate in teaching that segment of the course. Ms. Ostendorf is a graduate of this program with an MPH and is a certified occupational health nurse. She has extensive Occupational Health Nursing experience (13 years) and is a good teacher (by observation). She was selected as an OSHA Nurse Intern in 1992 and completed an ergonomics project which resulted in a compliance evaluation tool now used by OSHA inspectors. Ms. Ostendorf also received the AAOHN Medique Leadership Award in 1993. Ms. Ostendorf is a member of AAOHN, Sigma Theta Tau and is President-elect, N.C. Tarheel AOHN.

Dr. Jean Norburn, Ph.D., M.S., B.S.N.:

Dr. Jean Norburn teaches the research class where preliminary research proposals for the OHN students are developed. Dr. Rachel Stevens teaches about leadership and policy in the Public Health Nursing courses. Jean Norburn is an editor/lecturer whose faculty appointment in the Curriculum has been increased from 25% to 50%. She provides lectures to students on writing, publishing and research proposal development, and provides lectures in the OHN course on resume development, research grant proposals, and critiques students work. Jean Norburn provides extensive service to the OHN students during the writing/revising of their master's papers and theses, which is invaluable. She also teaches test taking skills in the OHN Certification Review courses, and teaches in the OHN Advances course. Drs. Moon, Stopford (medicine), Flynn (IH) and Mr. Boylston (safety) provide lectures in the OHN Program related to interdisciplinary functioning, and also teach in the Certification Review courses. Contributions of each range from 2-6%.

INDUSTRIAL HYGIENE

Dr. Michael R. Flynn, Sc.D., M.S.P.H., (ERC Director, Program Director):

Dr. Michael Flynn's primary research interests lie in the control aspects of industrial hygiene and particularly in ventilation. He is currently involved with applications of computational fluid mechanics to the control of airborne contaminants. He is a member of the ACGIH Industrial Ventilation Committee and has served as a reviewer for the NIH Safety and Occupational Health Study Section and has conducted internal reviews for NIOSH. Dr. Flynn teaches ENVR 241, Industrial Ventilation Design (with laboratory) and ENVR 149, Health Hazards of Industrial Operations, which focuses on field surveys and makes several visits to local industries. He also teaches ENVR 247, Microenvironmental Air Flow Modeling, a course designed to introduce engineers to computational fluid dynamics and applications in the industrial hygiene arena. He is certified by the ABIH in comprehensive practice of Industrial Hygiene. Prof. Flynn serves as Interim-Director of the ERC.

Dr. Richard Kamens, M.S.P.H.:

Dr. Kamens' research interests lie in the areas of indoor air pollution and in gas-particle interactions. He is particularly interested in exposures to polynuclear aromatic hydrocarbons (PAH) associated with combustion of fuels. Current work addresses heterogeneous gas and particle phase reactions and kinetic simulation modeling of atmospheric nitroPAH and other PAH derivatives in indoor and outdoor environments. He teaches ENVR 366 Measurement of Gas Particle Interactions.

Dr. David Leith, Sc.D., MS.c.:

Dr. Leith is interested in aerosol science, particularly those aspects that concern the generation and control of small particles. He has authored or co-authored over 70 publications concerned with (1) engineering controls for particle collection that include cyclones, filters and scrubbers, (2) methods to measure contaminant concentrations, and (3) fundamental aspects of aerosol physics. He teaches two academic courses, ENVR 145L, Aerosol Science Laboratory, and ENVR 245, Air Pollution Control. Presently Prof. Leith is involved with research related to improving the efficiency of filters used to remove metal-machining fluid mists from recirculated air.

Dr. Stephen M. Rappaport, Ph.D., M.S.P.H.:

Dr. Rappaport has interests in all aspects of the assessment of exposure to chemical hazards in the workplace. With over 70 peer-reviewed publications in the literature he has pursued methods of air and biological monitoring, development of statistical sampling strategies, evaluation of occupational exposure limits, development of assessment practices for epidemiological studies, and recently, in the development and application of protein biomarkers of exposure to genotoxic chemicals. He has been a member of numerous professional committees including the Safety and Occupational Health Study Section (NIH, DIRG) and the Environmental Health Committee of the Science Advisory Board for the U.S. Environmental Protection Agency. He has organized national and international workshops and symposia in the area of exposure assessment. He teaches ENVR 246, Advanced Methods of Exposure Assessment. He is board certified in comprehensive practice by the American Board of Industrial Hygiene. He is co-director with Prof. David Savitz (Epidemiology) of the Occupational and Environmental Health Program, an interdisciplinary research program in the School of Public Health which provides doctoral and post-doctoral training in Environmental Epidemiology and Exposure Assessment, with funding from NIEHS.

Dr. Parker C. Reist, Sc.D., S.M.:

Dr. Reist's interests lie in the general area of aerosol science. This includes research on aerosol generation, aerosol sampling and air cleaning devices, as well as research dealing with the fundamental properties of aerosol behavior. He has over 80 publications on various topics dealing with aerosol science and industrial hygiene including a textbook on aerosol science. He is a registered professional engineer (PA, inactive) and has been certified by the American Board of Industrial Hygiene. Dr. Reist teaches two courses, ENVR 145, Introduction to Aerosol Science, and ENVR 244, Industrial Hygiene Instrumentation.

Dr. Lori A. Todd, Ph.D., M.S.:

Dr. Todd has interests in the evaluation of exposure to chemical and biological agents, development of innovative methods to measure chemicals, historical reconstruction of past exposures to chemicals and physical agents, and use of expert systems to aid in making decisions in the workplace. She is a member of numerous professional societies and is a member of the Gas and Vapor Detection Committee of the American Industrial Hygiene Association. She teaches two courses, ENVR 141, Air and Industrial Hygiene (with D. Fox), and ENVR 242, Theory and Practice of Exposure Evaluation and is a certified industrial hygienist.

Dr. Jim Watson, Ph.D., M.S.:

Dr. Watson's research interests lie in the areas of low-level radioactive waste management and radon indoors and in water. His research focuses on characterizing radon concentrations indoors and in groundwater in North Carolina and improving the methods for measuring them. He also conducts research on the implications of use of granular activated carbon for removal of radon from drinking water. Dr. Watson serves as Chairman of the U. S. Environmental Protection Agency Radiation Advisory Committee.

APPENDIX II
NIOSH TRAINING GRANT PROGRAM GRADUATES
Academic Year 1992-1995

Academic Program: Occupational & Environmental Medicine

NAME	DEGREE RECEIVED	DATE ENTERED	DATE PROGRAM COMPLETED	DATE DEGREE AWARDED	CURRENT EMPLOYMENT STATUS (Job title/employer)	CURRENT BUSINESS ADDRESS (Or last known)
Edward, Thalmann*	NA	7/1/94	6/30/95	NA	Ass't Clinical Prof. Hyperbaric Unit	PO Box 3823 Duke Univ. Med. Ctr. Durham, NC 27710
Robert L. Tippens	MPH	7/1/93	6/30/95	7/1/95	Physician, Baptist Hospital	Nashville, TN 37205
Robert Campbell	MPH	7/1/91	6/30/93	7/1/93	Physician, 3M Corp.	3M Center St. Paul, MN 55144
Dana Windhorst	MPH	8/1/91	7/31/93	7/1/93	Medical Director, Central Plains Clinic	1100 E. 21st Street Sioux Falls, SD 57105
Douglas Campbell	NA entered with MPH	8/16/91	8/14/92	NA	Director, Env. & Occ. Med. Consultants	5102 Chapel Hill- Durham Blvd. Durham, NC 27707
Everett D. Walker	NA entered with MPH	7/1/91	6/30/92	NA	Medical Assoc. Occ Health Atlanta, GA	100 Tenth Street Atlanta, GA 30309

* Please specify by asterisk those Program graduates that did not receive NIOSH financial support.

** Please also specify specialty area as noted on degree. In Occupational Medicine please specify if resident or other graduate.

APPENDIX II
NIOSH TRAINING GRANT PROGRAM GRADUATES
 Academic Year 1992-1995

Academic Program: Industrial Hygiene

NAME	DEGREE RECEIVED	DATE ENTERED	DATE PROGRAM COMPLETED	DATE DEGREE AWARDED	CURRENT EMPLOYMENT STATUS (Job title/employer)	CURRENT BUSINESS ADDRESS (Or last known address)
Ahn, Zkwangseog	MSEE	8/92	12/94	1994	University of North Carolina	Health & Safety Office Chapel Hill, NC 27599
Ajemian, Robert*	MSPH	8/28/95	5/95	1995		40 Congers Street, Apt. 1501-B Bloomfield, NJ 07003
Altmore, Brent A.*	MSEE	8/93	8/95	1995	Industrial Hygiene Engineer	Environmental Health & Eng. 255 Washington St. Newton, MA 02158
Austin, Meredith L.	MSPH	8/92	5/94	1994	Marine Safety School	Reserve Training Center Yorktown, NY
Bhattacharyya, Runa*	MSEE	8/92	8/95	1995		38 Dr. K. D. Mukherje Road, Behala, Calcutta 7000606, INDIA
Bodurov Catherine	MSPH	8/90	8/92	8/92		Georgia Technical Research Institute Atlanta, Georgia 30338
Bradley D. Lackey	MSPH	1991	1993	1993		217 Green Street, #5 Chapel Hill, NC 27516
Brantley, Charles*	MSPH	8/90	8/92	8/92		U.S.C.G. 8th CG Dist 501 Magazine Street New Orleans, LA 70130
Cooper, Steven J.*	MSPH	8/93	5/95	1995		2953 Foster Grand Rapids, MI 49505
Dennis George	PhD	1992	1994	1994	Assistant Professor Western Kentucky University	1500 Bryant Way Bowling Green, KY 42103

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APPENDIX II
NIOSH TRAINING GRANT PROGRAM GRADUATES
 Academic Year 1992-1995

Academic Program: Industrial Hygiene

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Eileen Lloyd	MSPH	1991	1993	1993	Industrial Hygienist State of California	1436 San Jaouin Richmond, CA 94804
Frankel, Russel		8/92	8/95	1995	Oregon Occupational Safety & Health Division	9500 SW Barbour Blvd Suite 200, Portland, OR 97219
Happy, Susan	MSEE	8/90	8/92	8/92		N. C. Dept: of Labor Compliance Bureau 214 West Jones Street Raleigh, N.C. 27603
Hodson, Laura	MSPH		8/94	1994	Industrial Hygienist	Research Triangle Institute P. O. Box 12194, Research Triangle Park, NC 27709
Hsu, Chang Fu*	MSPH	8/92	12/94	1994		P. O. Box 3803 Chapel Hill, NC 27515
Jeffrey Lanning	MSEE		1994	1994		Southern Research Institute Research Triangle Park, NC 27707
John McAneny	MSPH	1992	1994	1994		404 Jones Ferry Rd Carrboro, NC 27510
Johnson, Jeffrey	PhD	8/93	8/95	1995	Merck & Company, Inc	Merck Manufacturing Division, 3517 Radium Springs Road, Albany, GA 31707

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APPENDIX II
NIOSH TRAINING GRANT PROGRAM GRADUATES
 Academic Year 1992-1995

Academic Program: Industrial Hygiene

NAME	DEGREE RECEIVED	DATE ENTERED	DATE PROGRAM COMPLETED	DATE DEGREE AWARDED	CURRENT EMPLOYMENT STATUS (Job title/employer)	CURRENT BUSINESS ADDRESS (Or last known address)
Kesler, Marc D. *	MSEE	8/90	8/95	1995	University of North Carolina	Dept. of Environmental Sci. & Eng., School of Public Health, Chapel Hill, NC 27599-7400
King, Jeffrey L.	MSPH	8/90	8/92	8/92		Occidental Chemical Corp Occidental Tower P. O. Box 809050 Dallas, TX 75380-9050
Kuen-Yuh Wu*	MSEE	1990	1993	1993	Currently Enrolled Ph.D. Program	School of Public Health University of North Carolina Chapel Hill, NC 27599
Premkumar Muthedath	MSEE		1994	1994		226 McCauley Street Chapel Hill, NC 27514
Richard Baldauf*	MSEE	1991	1993	1993		442 Riverview Lane Melbourne Beach, FL 32951
Rogelio Tornero-Velez	MSPH		1994	1993	Dortoral Program	School of Public Health University of North Carolina Chapel Hill, NC 27599
Roger W. Nelson*	MSEE	1991	1993	1993	U. S. Armed Forces	2572 58th Avenue South St. Petersburg, FL 33712

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APPENDIX II
NIOSH TRAINING GRANT PROGRAM GRADUATES
 Academic Year 1992-1995

Academic Program: Industrial Hygiene

NAME	DEGREE RECEIVED	DATE ENTERED	DATE PROGRAM COMPLETED	DATE DEGREE AWARDED	CURRENT EMPLOYMENT STATUS (Job title/employer)	CURRENT BUSINESS ADDRESS (Or last known address)
Steven Danielczyk*	MSPH	1991	1993	1993	US Coast Guard	COMMATDEA (MOH) Coast Guard Building 408 Atlantic Avenue Boston, MA 02210-2209
Thomas, Gary W.*	MSEE	8/90	8/92	8/92		Naval Hospital, Patuxent River, MD 20670-5370
Thomas, Johnathan*	MSEE	8/93	5/95	1995	U. S. Air Force	Bioenvironmental Engineering 96 AMS, Eslin AFB, FL 32542
Timothy Mukoda *	MSPH	1991	1993	1993	U.S. Air Force	1550 Thousand Oaks Apt. 1510 San Antonio, TX 78232
Tomasko, Marie S.		8/92	5/95	1995		107 Friar Lane Carrboro, NC 27510
Tracy Zontek*	MSPH		1994	1994		1550 Thousand Oaks Apt. 1510 San Antonio, TX 78232

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APPENDIX II
NIOSH TRAINING GRANT PROGRAM GRADUATES
 Academic Year 1992-1995

Academic Program: Occupational Health Nursing

NAME	DEGREE RECEIVED	DATE ENTERED	DATE PROGRAM COMPLETED	DATE DEGREE AWARDED	CURRENT EMPLOYMENT STATUS (Job title/employer)	CURRENT BUSINESS ADDRESS (Or last known address)
Roslyn Padgett	MPH	1989	1992	1992	OHNP Manager Northern Telecom Research Triangle Park NC	Northern Telecom Research Triangle Park NC
Ruth Barlow	MS	1990	1992	1992	Health Services Manager	Cooper Tools Apex, NC
Sheila Higgins	MPH	1990	1992	1992	Consultant	United Parcel Service Raleigh, NC
Judy Ostendorf	MPH	1989	1993	1993	Health Services Manager	Goodmark Foods Garner, NC
David Machles	MPH	1990	1994	1994	Consultant	Dimensions Raleigh, NC
Katherine Jenifer	MPH	1990	1994	1994	Employee Health Manager	Cape Fear Hospital
Kathleen Buckheit	MPH	1990	1994	1994	Health Specialist	NC Ergonomics Resource Center Raleigh, NC
Patricia A. Terrill	MPH	1991	1994	1994		
Susan Finch	MPH	1992	1994	1994	Case Manager	Glaxo, Inc. Research Triangle Park
Lisa Pompeii	MS	1993	1995	1995	Reserach Associate	Dept. of Epidemiology UNC-CH Chapel Hill, NC
Tina Hamblen	MS	1993	1995	1995	OH Manager	General Electric Mebane, NC

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