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**ABSTRACT**

Issued by the National Air Pollution Control Administration (NAPCA), this directory covers program and course offerings through the Institute for Air Pollution Training (IAPT), Research Triangle Park, North Carolina. Officers of the Triangle Universities (Duke, North Carolina, North Carolina State) Consortium on Air Pollution are listed first, followed by IAPT resident and adjunct faculty members. Eligibility requirements, schedules of residential and other courses (1970-71), access to fellowships and stipends, and other general information are furnished relative to IAPT activities and facilities. The following courses are described in detail: 23 advanced IAPT courses in engineering and enforcement, air pollution surveillance, and laboratory techniques; eight specialist training programs by the California State Department of Public Health and seven institutions of higher education; and sponsored graduate programs at the University of Chicago and 30 other universities. Two introductory courses and six NAPCA training locations are also noted. (LY)

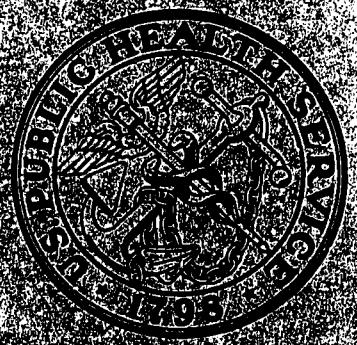
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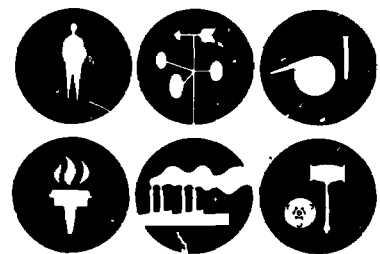


# National Air Pollution Control Admini



# Commission on the Causes and Prevention of Violence

ED048566



**Bulletin of Air  
Pollution Training Courses  
July 1970  
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**Office of Manpower Development**

**Extramural Programs Branch**

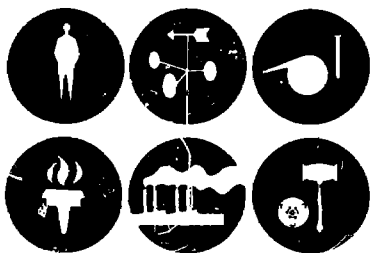
**Institute for Air Pollution Training**

**Planning and Special Projects**

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Public Health Service  
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National Air Pollution Control Administration  
Office of Manpower Development  
Research Triangle Park, North Carolina 27709  
Post Office Box No. 12055

July 1970



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Pollution Training Courses  
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**Extramural Programs Branch**

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Orientation in Air Pollution (course 416)

### Engineering and Enforcement Section

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Combustion Evaluation (course 427)  
Control of Gaseous Emissions (course 415)  
Control of Particulate Emissions (course 413)  
Field Enforcement (course 444)  
Source Sampling (course 450)  
Special Topics in Engineering and Enforcement (course 441)  
Statistical Air Pollution Data Evaluation (course 426)  
Visible Emissions Evaluation (course 439)





**1970-71 Course Descriptions  
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Engineering  
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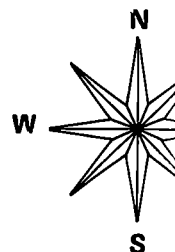
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The Office of Manpower Development  
is located in the Research Triangle Park  
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Chapel Hill 12 miles

Research Triangle Park

6 miles Raleigh-Durham





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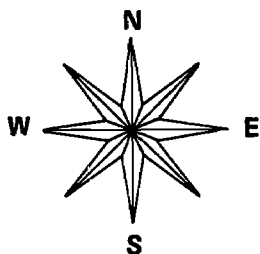
Durham 15 miles ● Duke University

Chapel Hill 12 miles ● University of North Carolina

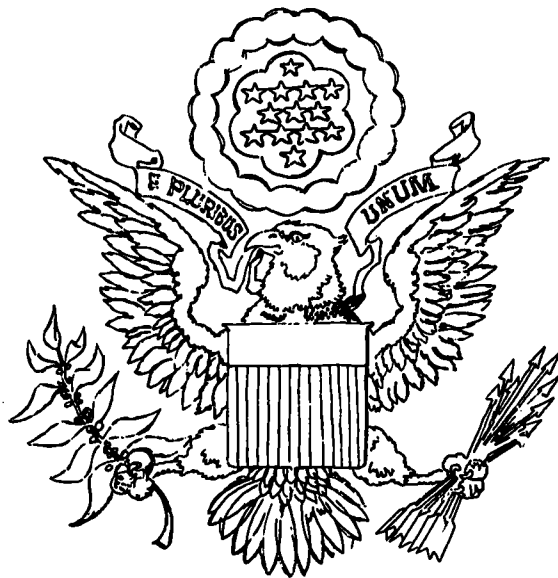
**Research Triangle Park** ● Institute For Air Pollution Training  
Office of Manpower Development

6 miles Raleigh-Durham Airport  Served by several major airlines

● North Carolina State University  
Raleigh 16 miles



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# Introduction

## The Office of Manpower

The Clean Air Act as a government cooperative program government designates air pollutants on health and economical methods of control. Using this information to set quality standards and air quality control regions.

Since such standards affect people living in air quality areas, the Clean Air Act also requires establishing standards or methods of opportunity for all states to participate in the determination of methods and timing of

Through its Office of Air Quality Control Administration, the EPA is to improve the training of personnel of the Act.

The Office of Manpower

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The Extramural

The Planning and

The Institute for a variety of training opportunities toward two objectives: currently employed individuals and train individuals seeking



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### **The Office of Manpower Development**

The Clean Air Act as amended provides the framework for State and Federal government cooperation in controlling air pollution. Under the Act, the Federal government designates air quality control regions in major metropolitan areas across the country and issues air quality criteria describing the effects of various air pollutants on health and property. Information on the most effective and economical methods of controlling pollutants and their sources is also issued. Using this information, the States are required by the Act to formulate air quality standards and to develop plans for their implementation in each of the air quality control regions so designated.

Since such standards will determine the quality of the air that millions of people living in air quality control regions must breathe for years to come, the Clean Air Act also requires that States hold public hearings before either establishing standards or methods of enforcing them. Such public hearings provide an opportunity for all segments of the community to make a meaningful contribution in the determination of air quality goals, and in decisions related to the methods and timing of programs for reaching these goals.

Through its Office of Manpower Development, the National Air Pollution Control Administration conducts a variety of activities designed to enlarge and to improve the trained manpower resources necessary to carry out the provisions of the Act.

The Office of Manpower Development has three major operations:

- The Institute for Air Pollution Training
- The Extramural Programs Branch
- The Planning and Special Projects Staff

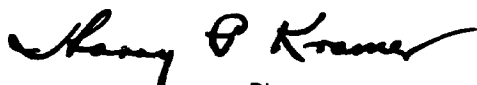
The Institute for Air Pollution Training designs, develops, and conducts a variety of training courses, seminars, and workshops. These are directed primarily toward two objectives: (1) to improve the knowledge and skills of personnel currently employed in State and local air pollution control agencies, and (2) to train individuals seeking employment in such agencies. Heavy emphasis is placed

upon the basic elements of control agency implementation plans. Institute activities are now being expanded to permit the presentation of courses in strategically located training centers across the nation; State and local control agency personnel will thus have ready access to training opportunities.

The Extramural Programs Branch administers a program which leads to traineeship awards and special fellowships for students seeking long-term training in air pollution control or related activities at colleges, universities, and other institutions of higher learning. Increased emphasis is now being placed upon career opportunities at the under-graduate and associate degree levels.

The Planning and Special Projects Staff conducts studies related to the manpower required to control the quality of our air. The report to the President and the Congress by the Secretary of Health, Education and Welfare entitled "Manpower and Training Needs" reflects the program responsibility of this group. It is the focal point for program planning within the Office of Manpower Development and for the career development of all professional NAPCA personnel.

Efforts begun last year led to the formal establishment on January 5, 1970, of the first university consortium designated the TRIANGLE UNIVERSITIES CONSORTIUM FOR AIR POLLUTION. It includes Duke University, University of North Carolina and North Carolina State University. The objective is to facilitate and coordinate joint cooperative actions by and among these universities in educational and research activities related to air pollution control. Efforts are currently underway in several heavily populated major industrial centers to develop similar consortia. In addition to the activities described above, a major goal of the consortia will be to provide guidance, counsel and technical assistance to the State and local air pollution control agencies.



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July 15, 1970

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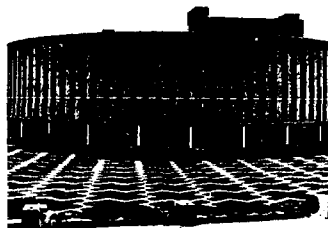
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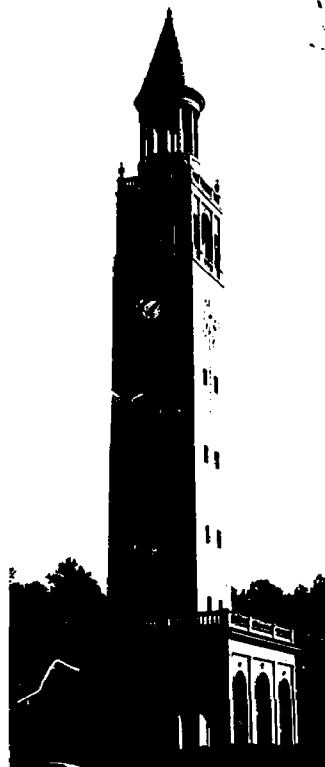
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Duke University



North Carolina State University



University of North Carolina

**Triangle Universities Air Pollution Consortium**

will facilitate and coordinate joint and cooperative action by and among the Triangle Universities of North Carolina in the promotion of research and educational endeavors related to air pollution.

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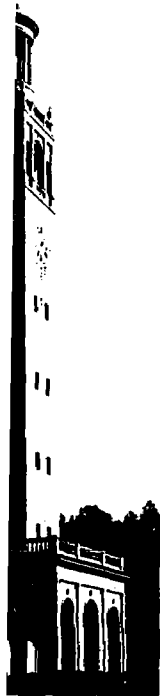
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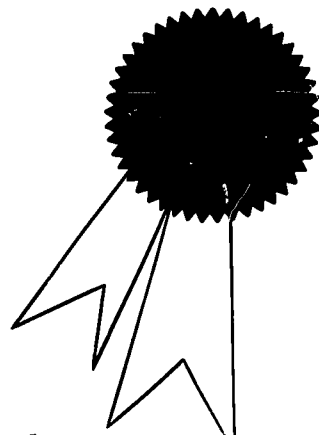
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# ● **Special Pre-entry Training**

## **Principles and Practice of Air Pollution Control**

The responsibility of the Federal Government (NAPCA) to provide leadership and assistance to State and local air pollution control agencies, in the recruitment and development of qualified personnel, is a major theme of the 1967 Clean Air Act and subsequent amendments.

In order to meet these growing manpower needs classroom and on-the-job training are combined in a special 12-week course in air pollution control to be presented in Houston, Texas during the summer of 1970 by the Institute for Air Pollution Training. The program is sponsored by the National Air Pollution Control Administration and selected State and local agencies. Participants are encouraged to seek career opportunities in this critically important environmental field.

The program is divided into two 6-week sessions identified as Phase i and Phase ii.

### **Phase i: Special 6-weeks classroom training\***

For the first 6-weeks, the student receives classroom training in the principles and practice of air pollution control, such as identification of sources, effects, pollution control technology, legal bases for control, and program administration. In addition, classroom training is given that develops basic skills related to sampling, plume evaluation, laboratory analyses, field studies, and data evaluation.

Classroom training will be conducted by the Office of Manpower Development's Institute for Air Pollution Train-

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### **Phase ii**

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## Practice of Air Pollution Control

of the Federal Government (NAPCA) to and assistance to State and local air pol-  
encies, in the recruitment and development  
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quent amendments.

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Training. The program is sponsored by the  
ution Control Administration and selected  
encies. Participants are encouraged to seek  
ities in this critically important environ-

is divided into two 6-week sessions identi-  
d Phase ii.

### 6-weeks classroom training\*

6-weeks, the student receives classroom  
principles and practice of air pollution con-  
entification of sources, effects, pollution  
ogy, legal bases for control, and program  
n addition, classroom training is given that  
kills related to sampling, plume evaluation,  
ses, field studies, and data evaluation.

ining will be conducted by the Office of  
oment's Institute for Air Pollution Train-

ing. Adjunct and university faculty plus State and local air  
pollution control agency personnel will participate.

### Phase ii 6-weeks on-the-job training

For the second 6-weeks the student works in either a  
State or local air pollution control agency, applying the  
skills and concepts gained in the classroom. At all times, the  
students are under the direct supervision of control officers.  
As a working member of an air pollution control program,  
there is an opportunity to participate and observe:

#### Technical Services

- Laboratory analysis
- Surveillance (monitoring)

#### Field Services

- Inspection
- Complaint investigations
- Legal actions
- Source identification and registration

#### Engineering Services

- Permit systems
- Source testing

Negotiations leading to future employment oppor-  
tunities for course participants are encouraged during the  
on-the-job training period.

\*Phase i: Classroom training is referred to as the special 6-week  
course in the suggested study sequences described on pages 20 - 23.



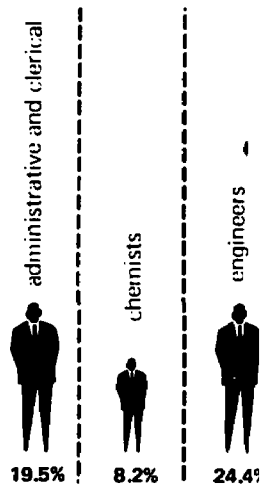


Figure One: 1969 Distribution of State Personnel

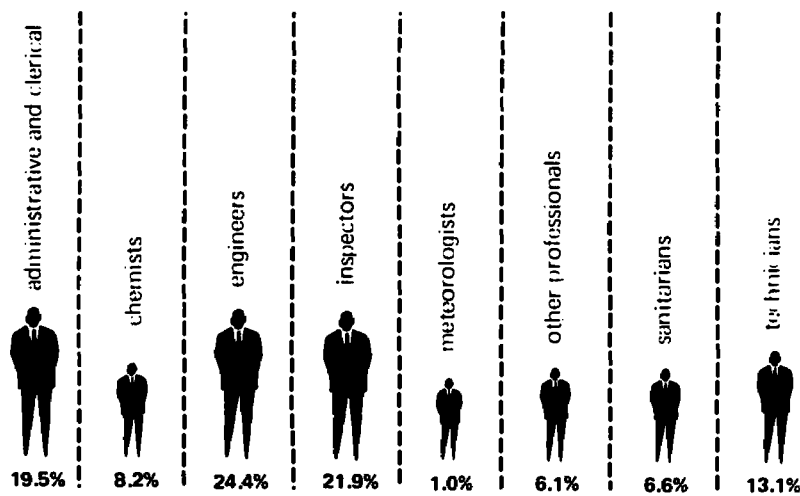
# Office of Manpower Development Planning and Special Projects

Designing programs to meet national manpower and training needs in the field of air pollution control is a primary responsibility of the Planning and Special Projects Staff. Major emphasis is placed upon providing support and assistance at State and local levels. Programs are designed to increase the national resource of qualified professional and technical manpower to make employment opportunities in air pollution control more attractive to applicants, to find more efficient means of utilizing existing manpower, and to upgrade the technical competency of air pollution control agency personnel.

The Planning and Special Projects Staff has the additional responsibility of assuring the most effective career development and training of NAPCA professional, managerial and technical personnel. A continuing evaluation of human resources program responsibilities and personnel management is required in

order to insure maximum development planning is effective. NAPCA's multidisciplinary approach to solving air pollution problems is the application of a broad range of career disciplines.

Thus, the functions of the Office of Manpower Development Planning are to mine national manpower resources, to assist air pollution control agencies in identifying these needs and to insure the growth of NAPCA management



● Figure One: 1969 Distribution (by occupation) of State and Local Manpower

# Manpower Development and Special Projects

training needs in the field of the Planning and Special Projects Staff. Support and assistance at the national resource of make employment opportunities applicants, to find more personnel to upgrade the technical

order to insure maximum benefits for both the individual and NAPCA. Career development planning is essential to the effective utilization and retention of NAPCA's multidisciplinary staff. There is no single occupational field involved in solving air pollution problems, but rather, the distinctive requirements involve the application of a broad spectrum of skills and knowledge in more than 50 career disciplines.

Thus, the functions of the Planning and Special Projects Staff are to determine national manpower and training needs in cooperation with State and local air pollution control agencies; coordinate the program planning required to meet these needs and to insure the continuing career development and scientific growth of NAPCA managerial, professional and technical personnel.

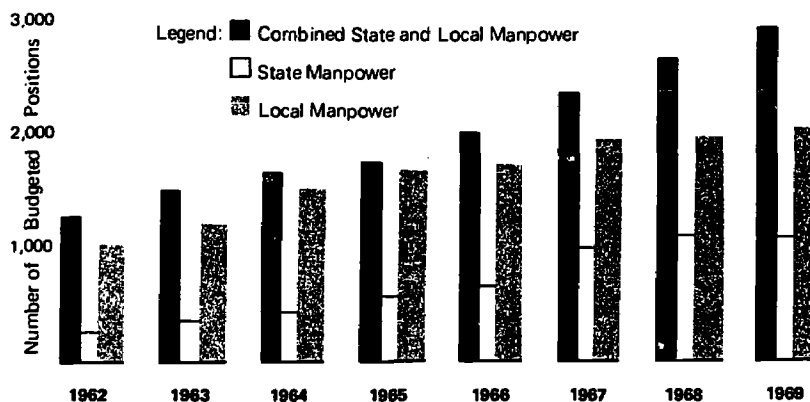


Figure Two: Growth in Budgeted Positions, 1962 to 1969

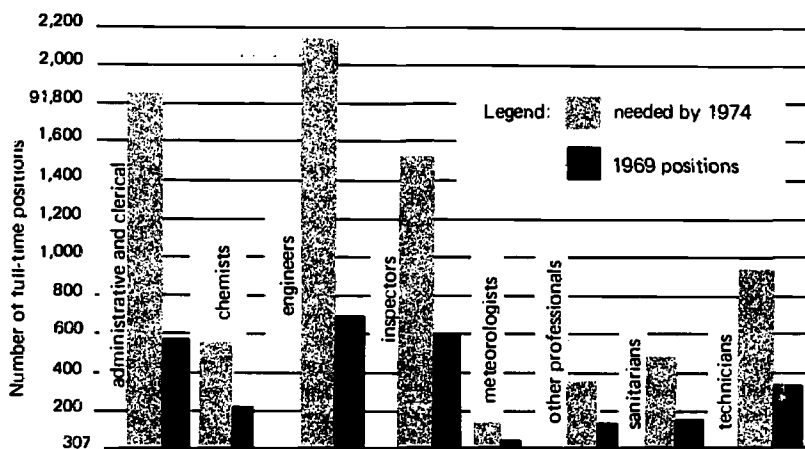
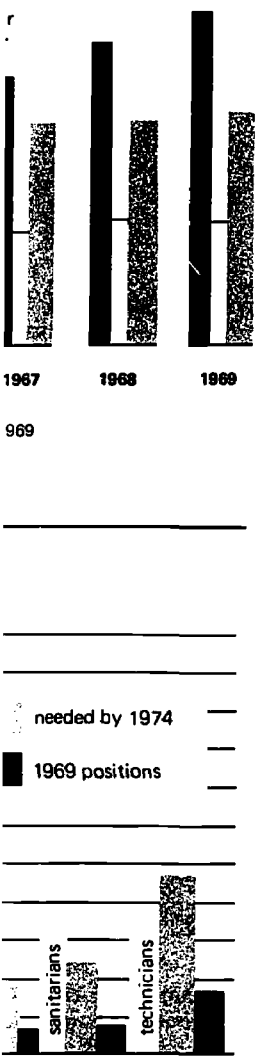


Figure Three: Manpower needed by Occupation through 1974

1970 Dates	Cour	Numbr
July 6-10	422	
July 7 - 9	439	
July 13-17	420	
July 20-24	435	
July 27 - 31	422	
August 3-7	435	
August 3-7	420	
August 17-21	422	
August 24-28	422	
August 24-28	409	
August 24-28	450	
September 9 - 11	439	
September 14-18	420	
September 14-18	409	
September 14-18	431	
September 21-25	450	
September 21-25	444	
September 28- October 2	431	
September 28- October 2	423	
September 28- October 2	409	
October 5-9	450	
October 5-9	420	
October 5-9	431	
October 5-9	444	
October 13 - 15	439	
October 12-16	409	
October 19-23	444	



## ● Chronological Schedule of

1970 Dates	Course Number	Course Title
July 6-10	422	Introduction to Air Pollution Control (RTP)*
July 7 - 9	439	Visible Emissions Evaluation (New England Area)
July 13-17	420	Air Pollution Microscopy (RTP)
July 20-24	435	Atmospheric Sampling (RTP)
July 27 - 31	422	Introduction to Air Pollution Control (New York Metropolitan Area)
August 3-7	435	Atmospheric Sampling (RTP)
August 3-7	420	Air Pollution Microscopy (New York Metropolitan Area)
August 17-21	422	Introduction to Air Pollution Control (RTP)
August 24-28	422	Introduction to Air Pollution Control (Ohio Area)
August 24-28	409	Analysis of Atmospheric Inorganics (RTP)
August 24-28	450	Source Sampling (RTP)
September 9 - 11	439	Visible Emissions Evaluation (RTP)
September 14-18	420	Air Pollution Microscopy (West Coast Area)
September 14-18	409	Analysis of Atmospheric Inorganics (RTP)
September 14-18	431	Air Pollution Control Technology (RTP)
September 21-25	450	Source Sampling (RTP)
September 21-25	444	Air Pollution Field Enforcement (New York Metropolitan Area)
September 28-October 2	431	Air Pollution Control Technology (New York Metropolitan Area)
September 28-October 2	423	Diffusion of Air Pollution—Theory and Application (U.S. Weather Bureau Central Region Headquarters)
September 28-October 2	409	Analysis of Atmospheric Inorganics (RTP)
October 5-9	450	Source Sampling (RTP)
October 5-9	420	Air Pollution Microscopy (Gulf Area)
October 5-9	431	Air Pollution Control Technology (Chicago Metropolitan Area)
October 5-9	444	Air Pollution Field Enforcement (New England Area)
October 13 - 15	439	Visible Emissions Evaluation (RTP)
October 12-16	409	Analysis of Atmospheric Inorganics (RTP)
October 19-23	444	Air Pollution Field Enforcement (RTP)

(RTP)\* Research Triangle Park, North Carolina 27709

## 1970-1971 Institute for Air Pollution Training Courses

Course			Course	
1970 Dates	Number	Course Title	1971 Dates	Number
October 20 - 22	439	Visible Emissions Evaluation (RTP)	March 22 - 26	422
October 26-30	450	Source Sampling (RTP)	March 22 - 26	413
October 26-30	411	Air Pollution Meteorology (RTP)	March 29 -	415
November 2-6	409	Analysis of Atmospheric Inorganics (RTP) *	April 2	
November 2-6	431	Air Pollution Control Technology (Gulf Area)	March 29 -	422
November 2-6	444	Air Pollution Field Enforcement (West Coast Area)	April 2	
November 2-6	450	Source Sampling (RTP)	March 29 -	422
November 16-20	450	Source Sampling (RTP)	April 2	
November 16-20	431	Air Pollution Control Technology (West Coast Area)	April 5 - 9	435
November 16-20	444	Air Pollution Field Enforcement (Gulf Area)	April 19 - 23	405
November 16-20	411	Air Pollution Meteorology (Ohio Area)	April 19 - 23	415
November 30- December 4	429	Gas Chromatographic Analysis of Air Pollutants (RTP)	April 19 - 23	422
December 7-11	431	Air Pollution Control Technology (RTP)	May 3 - 7	435
December 7-11	429	Gas Chromatographic Analysis of Air Pollutants (RTP)	May 3 - 7	420
			May 4 - 6	439
Course			May 10 - 14	438
1971 Dates	Number	Course Title	May 10 - 14	407
January 11 - 15	411	Air Pollution Meteorology (RTP)*	May 18 - 20	439
January 11 - 15	413	Control of Particulate Emissions (Gulf Area)	May 24 - 28	427
January 18 - 22	415	Control of Gaseous Emissions (Gulf Area)	May 24 - 28	426
January 25 - 29	408	Analysis of Atmospheric Organics (RTP)	June 7 - 11	427
January 25 - 29	413	Control of Particulate Emissions (Ohio Area)	June 7 - 11	426
January 25 - 29	411	Air Pollution Meteorology (West Coast Area)	June 7 - 11	436
February 1 - 5	415	Control of Gaseous Emissions (RTP)	June 7 - 11	447
February 8 - 12	408	Analysis of Atmospheric Organics (RTP)	June 21 - 25	436
February 8 - 12	413	Control of Particulate Emissions (RTP)	June 21 - 25	447
February 15 - 19	422	Introduction to Air Pollution Control (RTP)	June 21 - 25	436
February 15 - 19	413	Control of Particulate Emissions (RTP)	June 21 - 25	447
March 1 - 5	422	Introduction to Air Pollution Control (Chicago Metropolitan Area)	June 21 - 25	447
March 1 - 5	408	Analysis of Atmospheric Organics (RTP)		
March 1 - 5	415	Control of Gaseous Emissions (RTP)		
March 8 - 12	413	Control of Particulate Emissions (West Coast Area)		
March 8 - 12	435	Atmospheric Sampling (Chicago Metropolitan Area)		
March 15 - 19	415	Control of Gaseous Emissions (West Coast Area)		
March 15 - 19	422	Introduction to Air Pollution Control (Gulf Area)		

\*This course reserved for chemical and physical science technicians only.

# Air Pollution Training Courses

	1971 Dates	Course Number	Course Title
valuation (RTP)	March 22 - 26	423	Diffusion of Air Pollution - Theory and Application (RTP)
rology (RTP)	March 22 - 26	413	Control of Particulate Emissions (Chicago Metropolitan Area)
heric Inorganics (RTP) *	March 29 -	415	Control of Gaseous Emissions (Chicago Metropolitan Area)
ol Technology (Gulf Area)	April 2		
Enforcement (West Coast Area)	March 29 -	422	Introduction to Air Pollution Control (West Coast Area)
(RTP)	April 2		
ol Technology (West Coast Area)	April 5 - 9	435	Atmospheric Sampling (West Coast Area)
Enforcement (Gulf Area)	April 19 - 23	405	Sampling and Identification of Aero-Allergens (RTP)
rology (Ohio Area)	April 19 - 23	415	Control of Gaseous Emissions (New York Metropolitan Area)
ic Analysis of Air Pollutants (RTP)	April 19 - 23	422	Introduction to Air Pollution Control (New England Area)
ol Technology (RTP)	May 3 - 7	435	Atmospheric Sampling (New England Area)
ic Analysis of Air Pollutants (RTP)	May 3 - 7	420	Air Pollution Microscopy (RTP)
	May 4 - 6	439	Visible Emissions Evaluation (Chicago Metropolitan Area)
rology (RTP)*	May 10 - 14	438	Column and Thin-Layer Chromatographic Analysis of Atmospheric Pollutants (RTP)
te Emissions (Gulf Area)	May 10 - 14	407	Medical and Biological Topics in Air Pollution (Gulf Area)
Emissions (Gulf Area)	May 18 - 20	439	Visible Emissions Evaluation (Ohio Area)
heric Organics (RTP)	May 24 - 28	427	Combustion Evaluation (Chicago Metropolitan Area)
te Emissions (Ohio Area)	May 24 - 28	426	Statistical Data Evaluation (RTP)
rology (West Coast Area)	June 7 - 11	427	Combustion Evaluation (West Coast Area)
Emissions (RTP)	June 7 - 11	426	Statistical Data Evaluation (Chicago Metropolitan Area)
heric Organics (RTP)	June 7 - 11	436	Determination and Measurement of Atmospheric Metals (RTP)
te Emissions (RTP)	June 7 - 11	447	Meteorological Instrumentation in Air Pollution (RTP)
te Emissions (West Coast Area)	June 21 - 25	436	Determination and Measurement of Atmospheric Metals (RTP)
ng (Chicago Metropolitan Area)	June 21 - 25	447	Meteorological Instrumentation in Air Pollution (RTP)
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Pollution Control (Gulf Area)			

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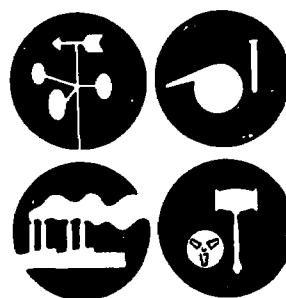
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# Institute for Air Pollution Training



## Eligibility Requirements

An acceptance committee within the Office of Manpower evaluates course applications forwarded to the Institute and notifies applicants whether they meet the qualification requirements for the course or course. An important consideration in evaluating eligibility is the applicant's background, experience in air pollution and potential for career development.

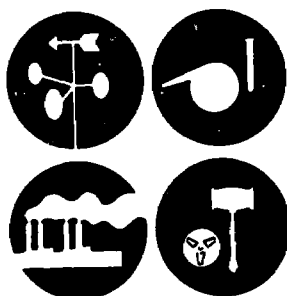
The broad spectrum of courses offered by the Institute ranges from basic training designed for personnel with to highly specialized learning modes designed to meet of more sophisticated air pollution control personnel. Many courses require completion of written tests and/or study assignments by the applicant prior to course.

## General Information

No tuition or registration fee is charged for the courses presented by the Institute. Since the applications should be forwarded as early as possible. Trainees are expected to provide for their own housing. To provide training service to a maximum number of the number of applicants from a single agency for any. To apply for admission to the courses presented by the complete one of the application blanks inserted at the. A separate application form is required for each course.

## Training Faculty

A full-time staff of specialists, as well as a number of adjunct faculty members, plan, develop, and conduct. Lecturers and consultants who can contribute significantly from their specific knowledge and experience are drawn. Administration personnel, other Federal, state and local universities, and industry.



### **Eligibility Requirements**

An acceptance committee within the Office of Manpower Development evaluates course applications forwarded to the Institute for Air Pollution Training and notifies applicants whether they meet the qualification requirements for the course or courses selected.

An important consideration in evaluating eligibility is the applicant's background, experience in air pollution control, and potential for career development.

The broad spectrum of courses offered by the Institute ranges from basic training designed for personnel with little or no experience to highly specialized learning modes designed to meet the needs of more sophisticated air pollution control personnel.

Many courses require completion of written tests and/or study assignments by the applicant prior to course attendance.

### **General Information**

No tuition or registration fee is charged for the courses presented by the Institute. Since the size of classes is limited, applications should be forwarded as early as possible.

Trainees are expected to provide for their own housing, meals, and transportation while attending courses.

To provide training service to a maximum number of organizations the number of applicants from a single agency for any one course necessarily may be limited.

To apply for admission to the courses presented by the Institute complete one of the application blanks inserted at the back of this bulletin, pp. 88-96.

A separate application form is required for each course.

### **Training Faculty**

A full-time staff of specialists, as well as a number of adjunct faculty members, plan, develop, and conduct the courses.

Lecturers and consultants who can contribute significantly from their specific knowledge and experience are drawn from National Air Pollution Control Administration personnel, other Federal, state and local agencies,

universities, and industry.

### **Training Objectives**

The Office of Manpower Development and the Institute for Air Pollution Training offer a variety of short-term technical courses in the field of air pollution control for scientists, engineers and other professional personnel assigned responsibility in this area of environmental concern. Effective means for detailed consideration and appraisal of the newest developments in specific areas are provided, together with an opportunity for practice in the use and application of current control techniques. Visual aids, closed-circuit television, laboratory demonstrations, problem sessions and panel discussions are programmed into course presentations. Laboratory and field practice under the guidance of experts is included in the course schedule, where applicable. Active participation by each trainee is mandatory.

### **Technical Courses**

Highly specialized, technical courses of from one to several weeks duration are conducted in the fully equipped classrooms of the Institute for Air Pollution Training, and at a number of locations throughout the country. Technical courses, usually at the postgraduate level, provide intensive training in the basic elements and methodology of air pollution control plus an opportunity for laboratory practice. In addition, a few introductory or orientation courses and several broad-coverage courses are offered for those in technical administrative positions who wish to acquire an overall perspective in specific scientific areas. Agenda for all courses are available upon request in advance of course presentations.

### **Technical Seminars**

The Office of Manpower Development and the staff of the Institute for Air Pollution Training upon request will, counsel and participate in planning the presentation of technical seminars and workshops designed to meet specific needs. Symposia which provide a forum for the exchange of ideas and information, are also supported. These meetings bring together experts from throughout the United States and the world. Announcement of many such seminars, workshops, and symposia is made by publication in scientific journals; attendance at others is restricted to an individually invited audience.

To improve the design of short courses, it has been necessary to accept certain concepts and definitions related to the level of learning intended for a specific topic. These levels of learning, first specified by the course designer, are then utilized as guides in the preparation of specific lessons. They are used in course descriptions to help those interested in training to understand the objectives and emphasis of each course.

The levels of learning\* chosen for the above purposes are defined and described on the opposite page. Note that the descriptions are given in terms of (1) the instructor's responsibility and (2) the anticipated reaction of the student.

# Levels of Learning

For a given topic and a fixed set of student qualifications, the levels of learning generally indicate a more difficult training task in progressing from the "Familiarity" level to the "Application" level. The same concept does not necessarily exist in comparing one topic with another or one set of student capabilities with another.

Inquiries are requested from those interested in additional information or clarification on course content or objectives.

\*Principles and Technique of Instruction  
Academic Instructor and Allied Officer School, Air University,  
Maxwell A.F.B., Alabama, August 1964.

The table below defines the levels of learning\* used in this Bulletin of Courses

Levels of Learning	Definition of Learning	Teacher-supplied support material
<b>Familiarity</b>	Initial acquaintance with verbal or symbolic material in a unit or specific lesson.	Basic "what," "when," and "where" of material in unit.
<b>Knowledge</b>	Acquisition of factual information simple recall of verbal or symbolic material.	Support in terms of the "when," and "where" of factual or symbolic material.
<b>Understanding</b>	Comprehension of concepts and ideas for, and the background of the concept or idea.	Support in terms of the "why" and "whys" of the concept or idea and its implications.
<b>Application</b>	For mental application: Use of facts, principles, ideas, or concepts for interpreting situations and in solving problems both real and hypothetical. For physical application: Physical ability to perform an integrated sequence of related actions.	For physical application: Clear-cut explanation-demonstration of the skill. Supervision of student performance to insure that he uses the same sequence of actions as taught in the explanation-demonstration.

ing\* used in this Bulletin of Courses

Definition of Learning	Teacher-supplied support material	Mental functions employed to achieve this learning
Acquaintance with verbal and symbolic material in a unit or specific lesson.	Basic "what," "when," and "where" of material in new unit.	Awareness of, or initial link with material.
Retention of factual information and the recall of verbal or symbolic material.	Support in terms of the "what," "when," and "where" of the factual or symbolic material.	Simple recall, association of material with previously learned facts.
Comprehension of concepts and their meaning, and the background or context of a concept or idea.	Support in terms of the "hows" and "whys" of the concept or idea and its implications.	Comparison and contrast, development of a concept, comprehension of implications of concepts. Insight.
Mental application: Use of facts, principles, ideas, and concepts for interpreting situations and in solving problems, real and hypothetical. Physical application: Ability to perform a coordinated sequence of actions.	For physical application: Clear-cut explanation-demonstration of the skill. Supervision of student performance to insure that he uses the same sequence of actions as taught in the explanation-demonstration.	For physical application: Establishment of stimulus-response conditioning of reflexes to the intellectual solution of mechanical problems.



### Special pre-entry training

In order to meet growing manpower needs, classroom and on-the-job training are combined in a special 12-week course in air pollution control to be presented in Houston, Texas during the summer of 1970 by the Institute for Air Pollution Training. The program is sponsored by the National Air Pollution Control Administration and selected State and local agencies. Participants are encouraged to seek career opportunities in this critically important environmental field.

The program is divided into two 6-week sessions identified as Phase i and Phase ii.

#### Phase i: Special 6-weeks classroom training\*

For the first 6-weeks, the student receives classroom training in the principles and practice of air pollution control, such as identification of sources, effects, pollution control technology, legal bases for control, and program administration. In addition, classroom training is given that develops basic skills related to sampling, plume evaluation, laboratory analyses, field studies and data evaluation.

Classroom training will be conducted by the Office of Manpower Development's Institute for Air Pollution Training. Adjunct and university faculty plus State and local air pollution control agency personnel will participate.

**\*Note:** Phase i Classroom training is referred to as the special 6-week course in the suggested study sequences described on pages 20-24.

422  
*Introduction  
to Air Pollution  
Control*

Suggested study  
sequence of Eng  
and Enforcemen  
training courses

422  
*Introduction  
to Air Pollution  
Control*

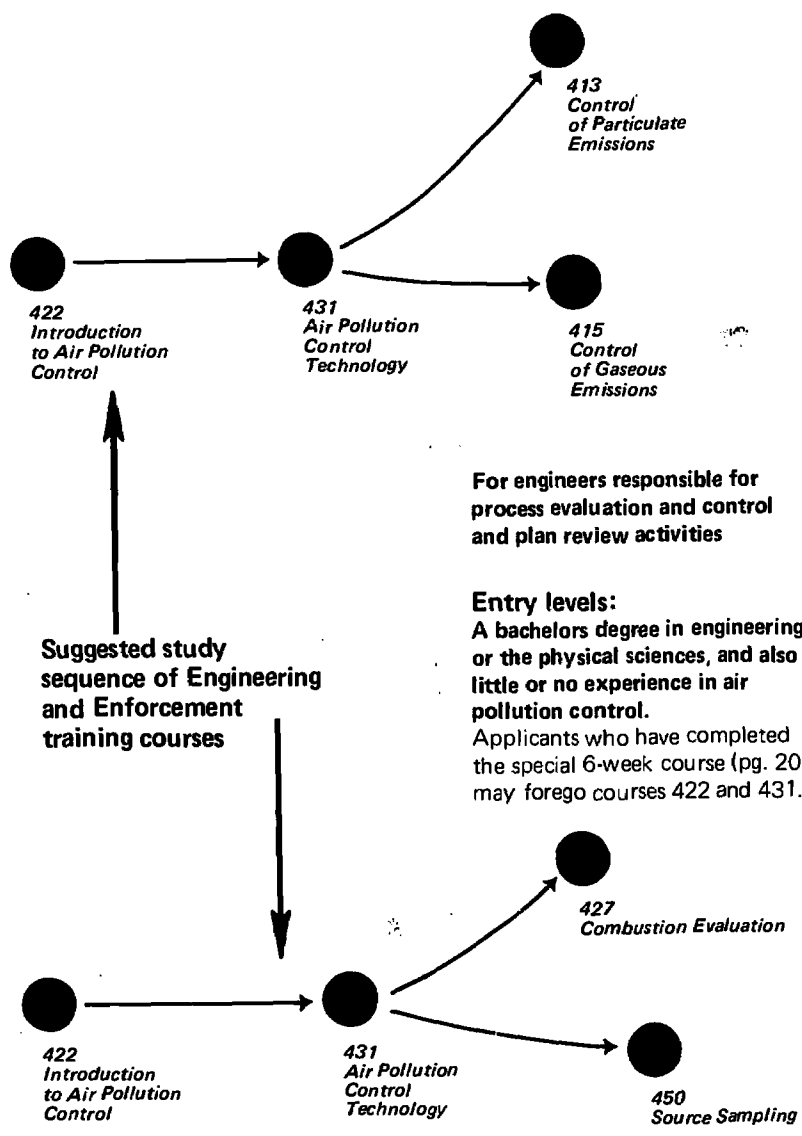
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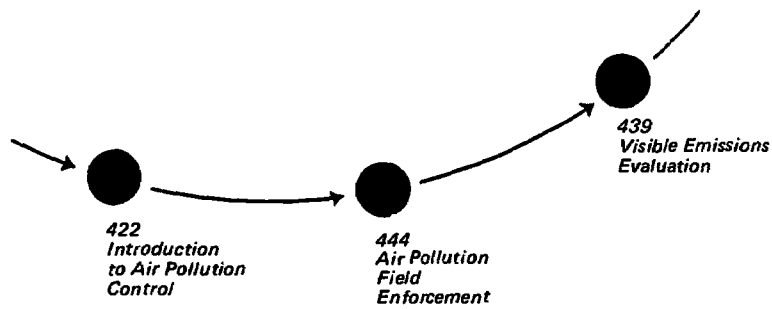
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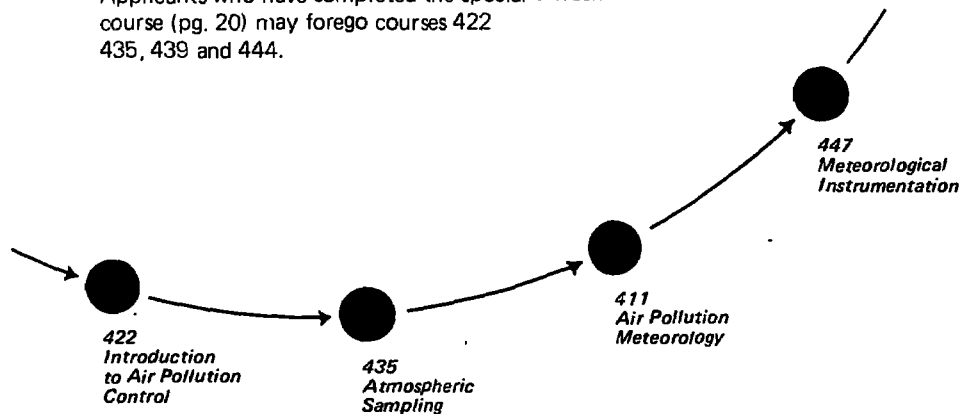




**Entry levels:**

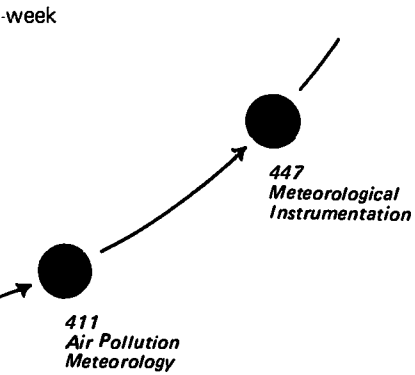
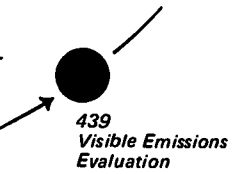
**For engineers, chemists, biologists  
and sanitarians (with little or no education  
or experience in air pollution control)  
responsible for field studies and  
enforcement activities.**

Applicants who have completed the special 6-week  
course (pg. 20) may forego courses 422  
435, 439 and 444.



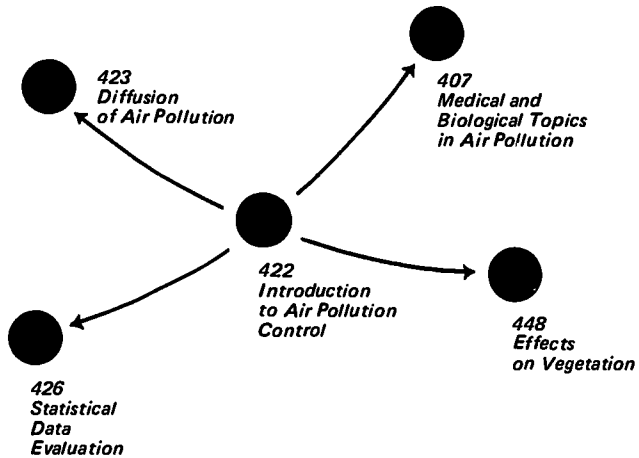
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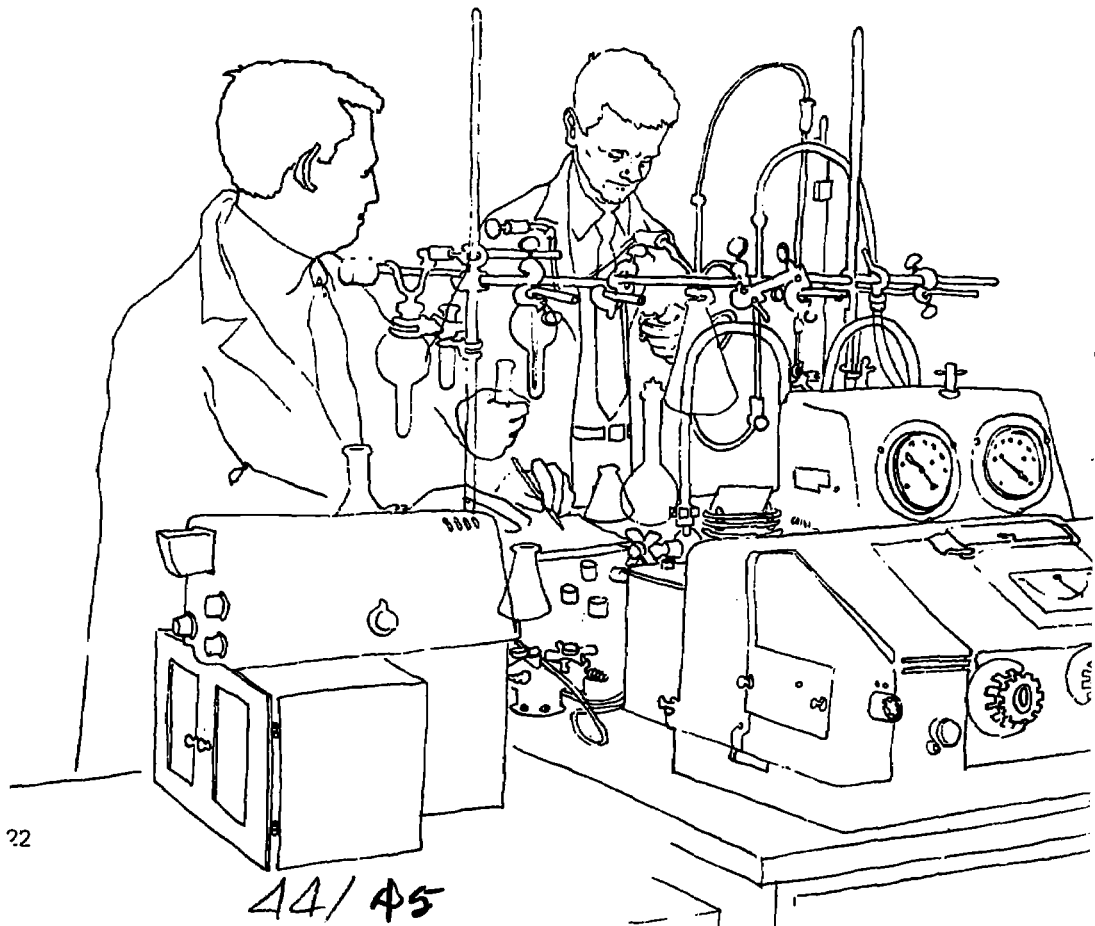
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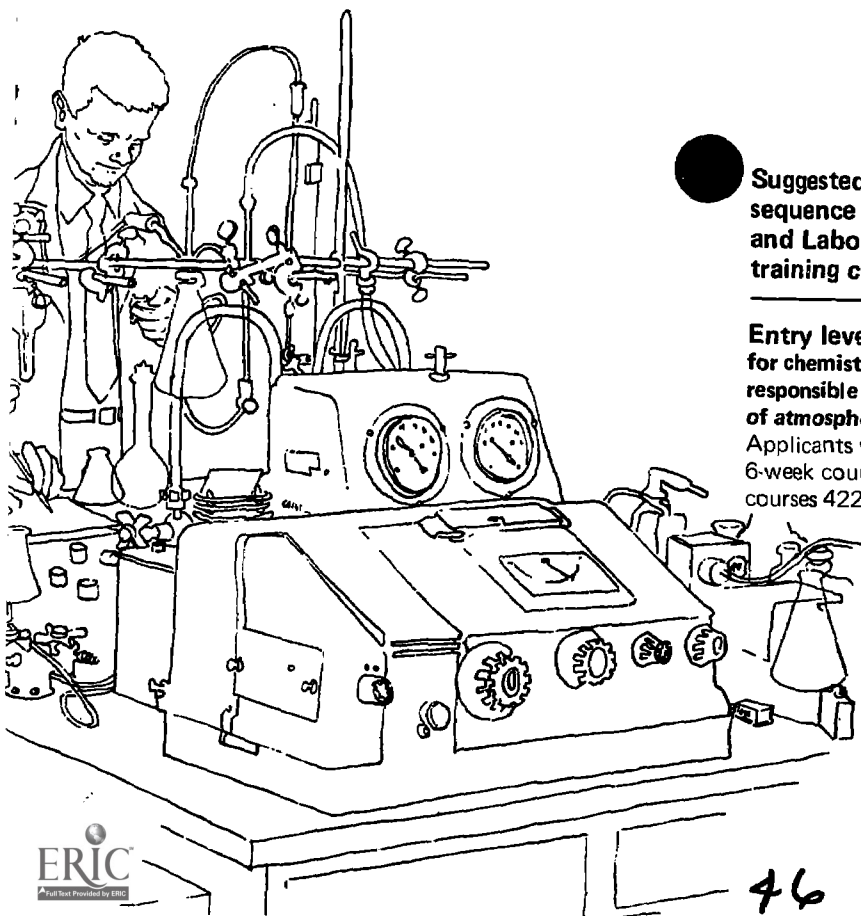


### Special Topics

\*Course 422 (or equivalent experience) is a prerequisite. Applicant may then choose any course or sequence of courses.



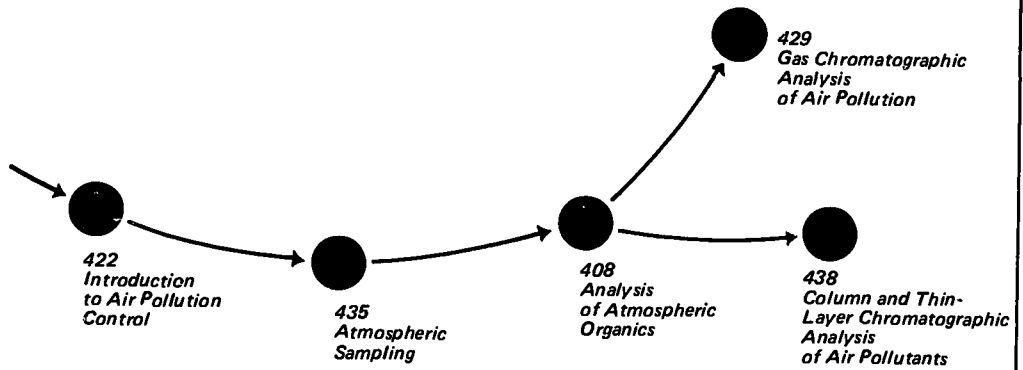
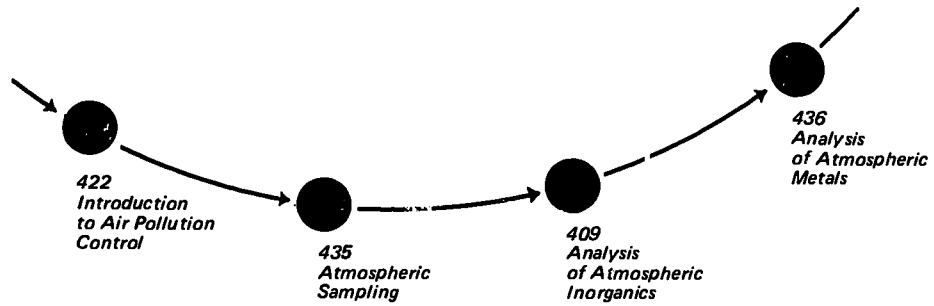
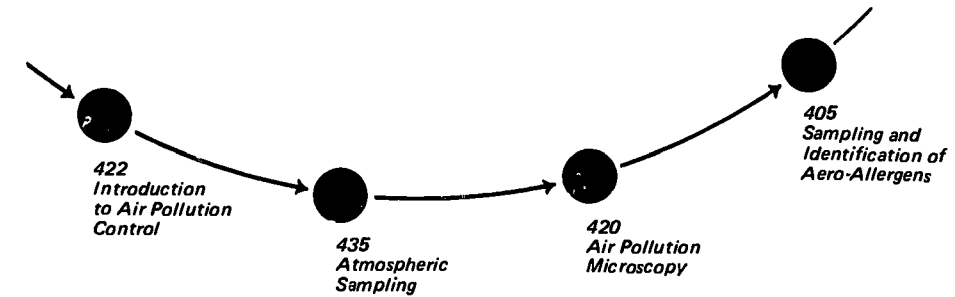




● **Suggested study  
sequence of Surveillance  
and Laboratory Techniques  
training courses**

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**Entry levels:  
for chemists and chemical technicians  
responsible for the analysis  
of atmospheric and source sampling.**  
Applicants who have completed the special  
6-week course (pg. 20) may forego  
courses 422 and 435.



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Sampling and  
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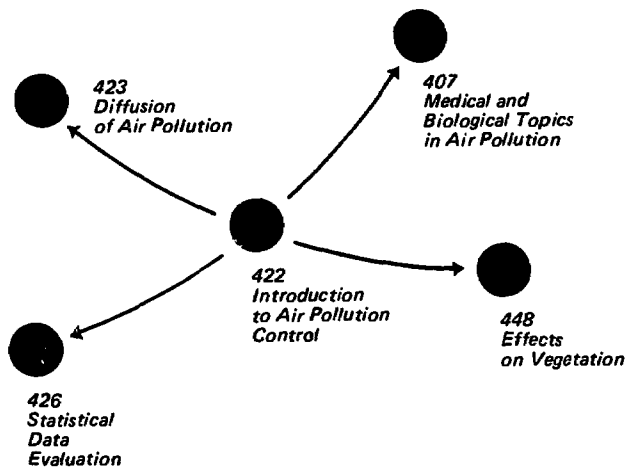
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Analysis  
of Air Pollution

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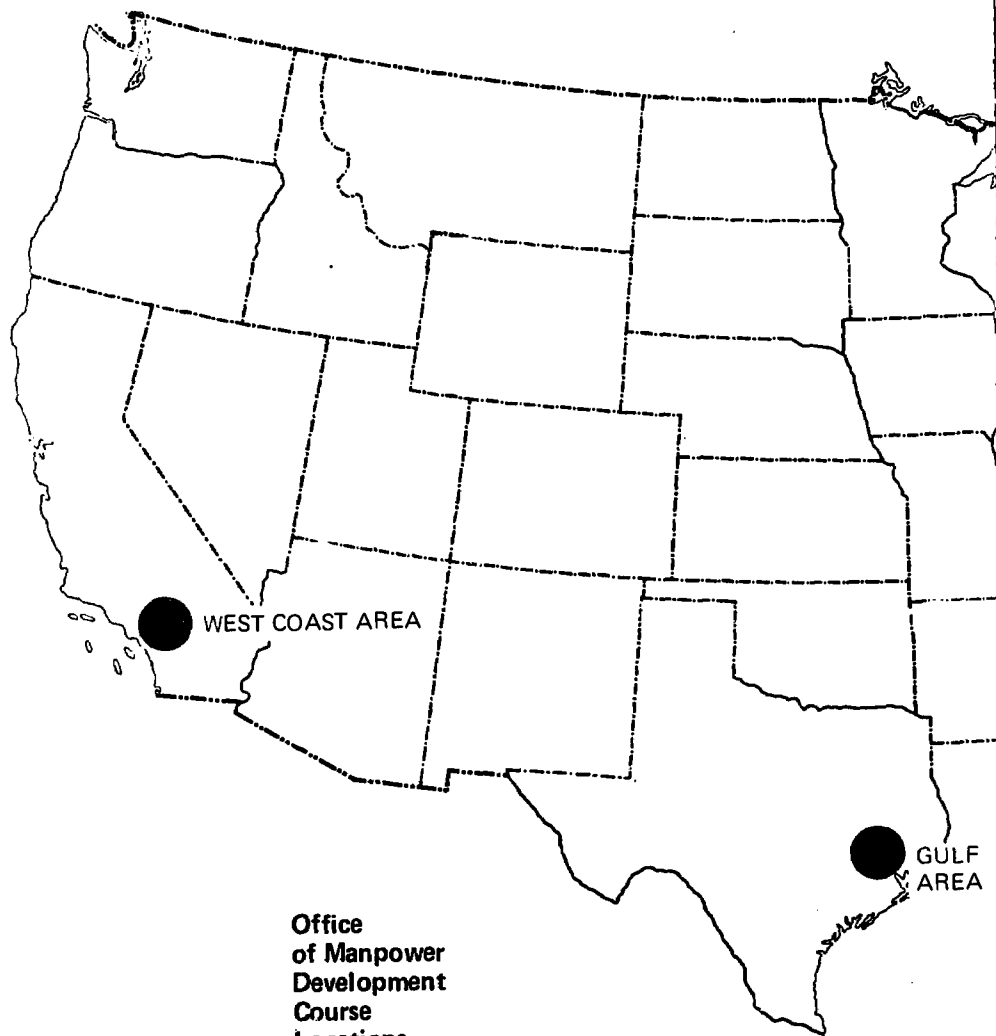
438  
Column and Thin-  
Layer Chromatographic  
Analysis  
of Air Pollutants

### Special Topics

\*Course 422 (or equivalent experience)  
is a prerequisite.  
Applicant may then choose any  
course or sequence of courses.



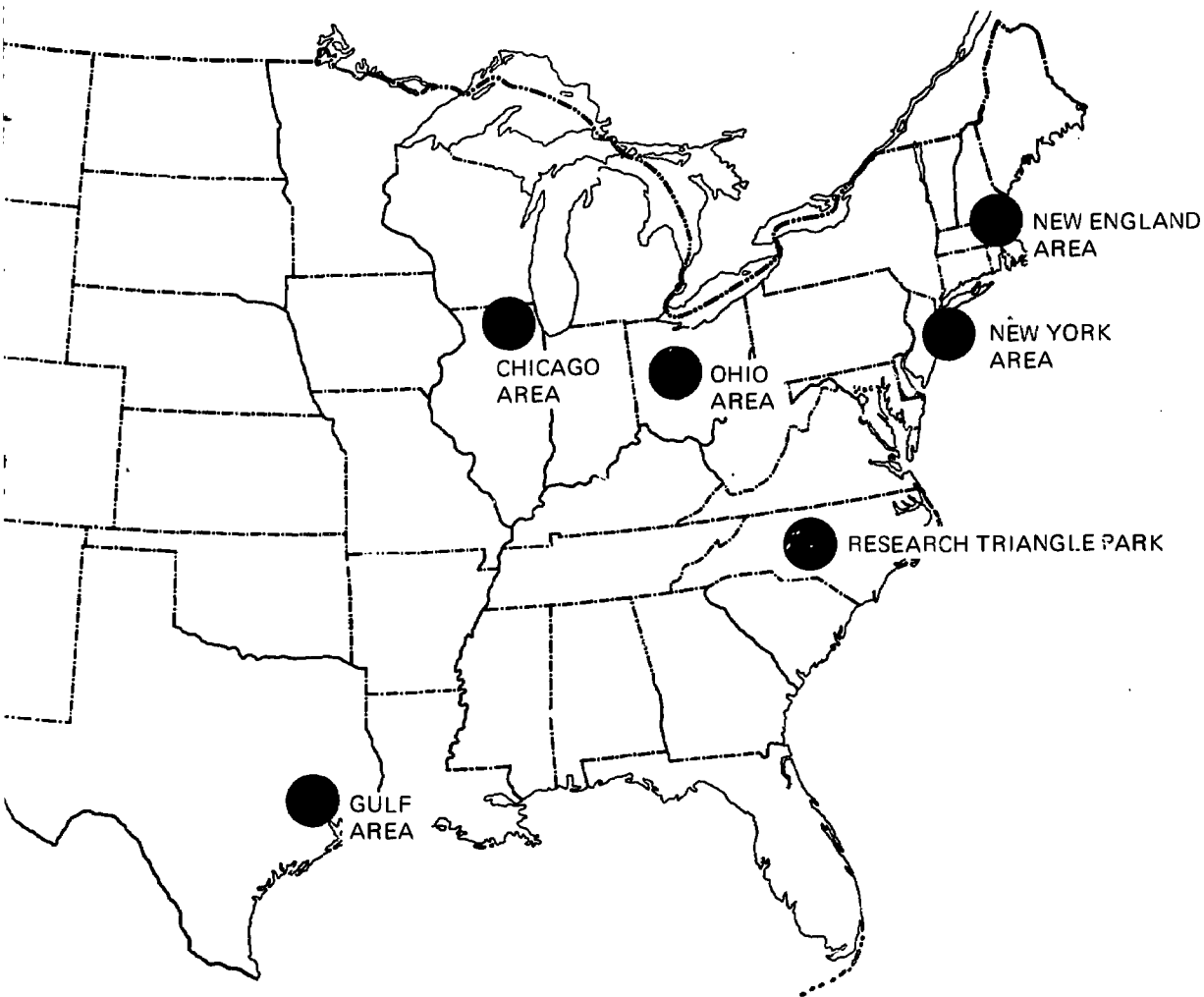




**Office  
of Manpower  
Development  
Course  
Locations**

*1970-71 courses offered by the Institute for Air Pollution Training will  
North Carolina and the 6 training locations pictured above.*

—————> *Applications for all training  
Institute for Air Pollution Training, P.O. Box 12055, Research Triangle  
Field and resident course schedules appear on pages 48-51. Application*



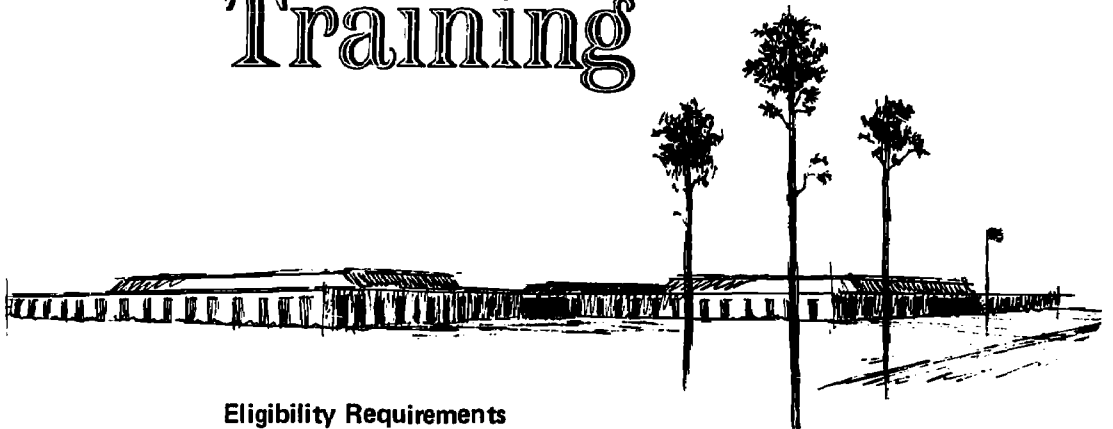
*the Institute for Air Pollution Training will be presented at Research Triangle Park, training locations pictured above.*

*Applications for all training courses must be sent to the Registrar.*

*Training P.O. Box 12055, Research Triangle Park, North Carolina 27709.*

*See the back of this brochure on pages 48-51. Application forms are provided on pages 88-96.*

# Institute for Air Pollution Training



## Eligibility Requirements

An acceptance committee within the Office of Manpower Development evaluates course applications forwarded to the Institute for Air Pollution Training and notifies applicants whether they meet the qualification requirements for the course or courses selected.

An important consideration in evaluating eligibility is the applicant's background, experience in air pollution control, and potential for career development.

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Many courses require completion of written tests and/or study assignments by the applicant prior to course attendance.

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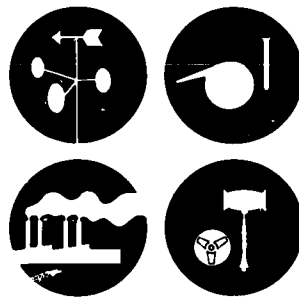
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# Course Descriptions



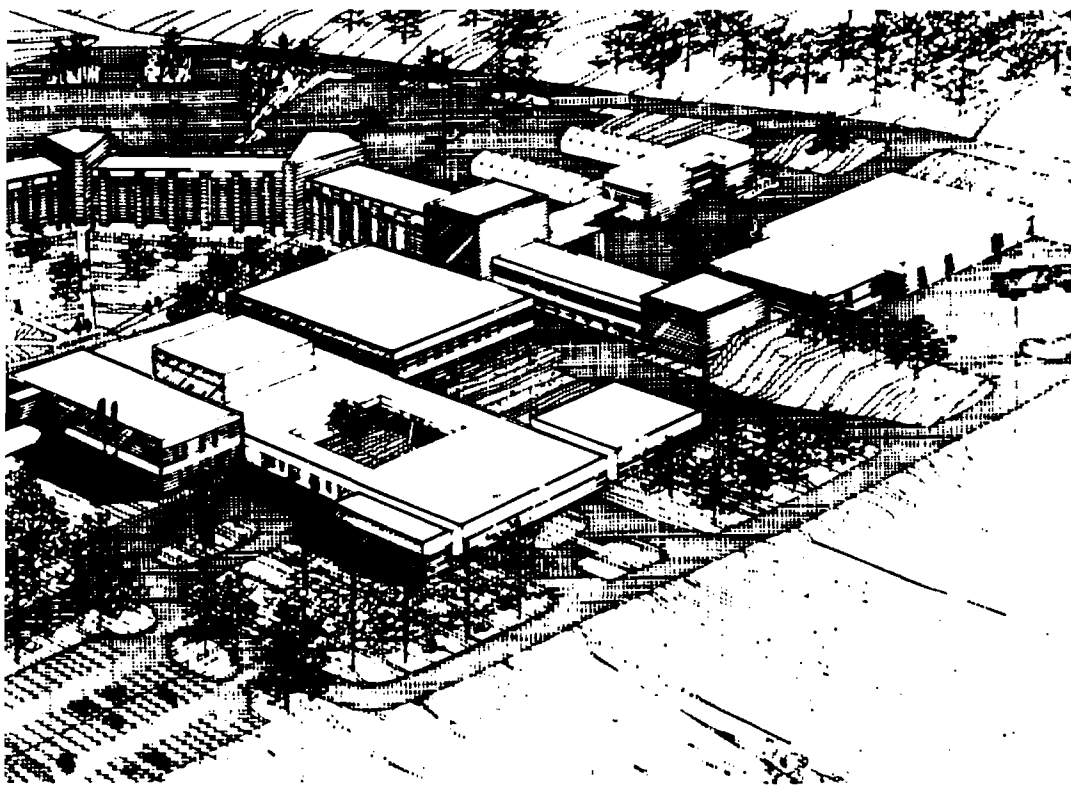


**The new National Air Pollution Control Administration Technical Center**

is being constructed on a 48-acre site in Research Triangle Park, North Carolina. The 320,000 square foot complex, to be completed in 1970, will contain a variety of offices, laboratories, controlled temperature and humidity environmental rooms and chambers, dynamometer-equipped automobiles, and several irradiation chambers, agricultural chambers, and two greenhouses. Approximately 900 persons will occupy the new building.

The first phase of the complex is scheduled for completion in the fall of 1970.

The Office of Manpower Development is scheduled to move into the new building. Enlarged chemical laboratory facilities, new engineering laboratories, additional classroom space, and completely equipped audiovisual studios are outstanding features of the new quarters of the Institute for Air Pollution Training.



### **Control Administration Technical Center**

le  
Carolina. The 320,000 square foot complex, to be three stories high, ,  
laboratories, controlled temperature  
and chambers, dynamometer—equipped automobile laboratories,  
agricultural chambers, and two greenhouses.  
occupy the new building.

is scheduled for completion in the fall of 1970.

Development is scheduled to move into the new building during the winter of 1971.  
ries, new engineering laboratories,  
ompletely equipped audiovisual studios are outstanding features  
e Institute for Air Pollution Training.

416

**Orientation in Air  
1 Day**

This introductory program is designed to provide a broad understanding of the problems of air pollution in the community. It is directed toward technical and non-technical personnel from various government agencies, industry, educational institutions, and private citizens. It is especially suitable for those having little or no previous background in air pollution.

The individual sessions are followed by a late afternoon panel discussion or question and answer period. The agenda may be varied somewhat to suit the individual situation, with special emphasis on the air pol-

**Introductory  
Courses**



422

**Introduction to Air Pol  
5 Days**

This introductory course is designed for persons interested in a general overview of the air pollution problem or new to the field of air pollution control. To facilitate the setting of lesson objectives and to achieve continuity in instruction, the course is specifically designed for professionals in air pollution control agencies. Upon completion of the course, each student should have gained an understanding of the importance and use of emission inventories, receptor inventories, and atmospheric and meteorological surveys. The bases for setting air quality standards and control regulations, as well as those standards and regulations in use today, are covered in the course. In addition, each student receives instruction in current methods of measuring and controlling air pollutants.

# 416

## Orientation in Air Pollution 1 Day

This introductory program is designed to provide a broad understanding of the problems of air pollution in the community. It is directed toward technical and technical personnel from various government agencies, industry, educational institutions, and private citizens. It is especially suitable for those having no or no previous background in air pollution.

Each individual session is followed by a late afternoon panel discussion or question and answer period. The agenda may be varied somewhat to suit the individual situation, with special emphasis on the air pol-

lution problems of the area in which the course is being presented. Topics covered include:

- The air pollution problem
- Effects of air pollution
- Sources of air pollution
- Meteorological fundamentals
- Measurement of air pollution
- Control methods
- Current trends and approach to air pollution problems in the local area

# 422

## Introduction to Air Pollution Control 5 Days

This introductory course is designed for persons interested in a general overview of the air pollution problem or new to the field of air pollution control. To facilitate the setting of lesson objectives and to provide continuity in instruction, the course is specifically designed for professionals in air pollution control agencies. Upon completion of the course, each student should have gained an understanding of the importance and use of emission inventories, receptor locations, and atmospheric and meteorological surveys. The bases for setting air quality standards and local regulations, as well as those standards and regulations in use today, are covered in the course. In addition, each student receives instruction in current methods of measuring and controlling air pollutants.

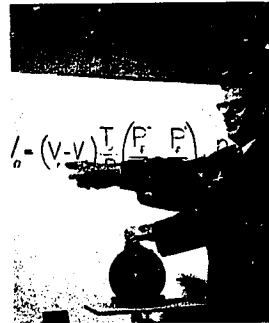
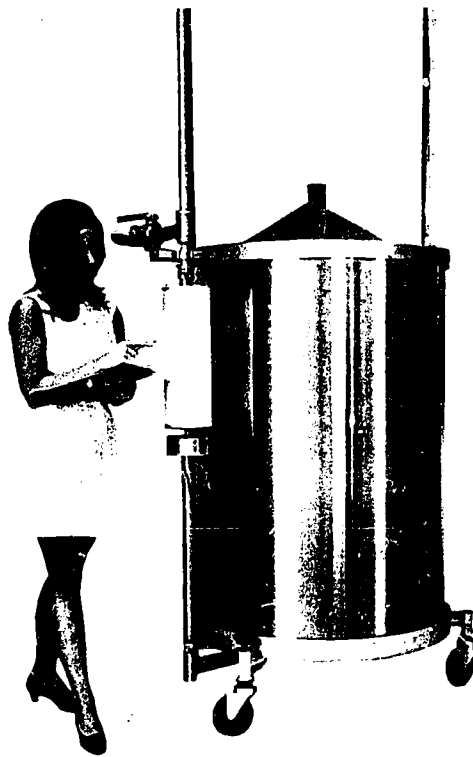
The legal approaches to air pollution abatement are reviewed.

This introductory course establishes a foundation for the material presented in more highly specialized courses. Course content includes:

- Sources of pollutants
- Effects of pollutants
- Air pollution meteorology
- Measurement of ambient air quality
- Ambient air quality criteria and standards
- Technical approaches to control of air pollution emissions
- Legal approaches to control
- Program management







# Engineering and Enforcement



## 413

### Control of Particulate Emissions 5 Days

By gaining an understanding of fundamental particulate collection mechanisms (gravitational settling, inertial separation, filtration, etc.) engineers and other technical personnel will be able to evaluate, from a theoretical standpoint, particulate collection devices. During group problem sessions, the trainees will apply these principles by analyzing selected collector applications. With additional information (empirical data) the knowledge gained in this course will assist the trainee in conducting plan reviews. Topics include:

- Particle size technology
- Control of coarse particles
- Control of fine particles
- Industrial applications

## 45

Source S  
5 D

Engineers and chemists who act as leaders of source stack-gas sampling teams receive in this course the basic information needed to enable them to make appropriate decisions and, with further field experience, to improve their performance.

Trainees are given a comprehensive source sampling assignment, requiring them to perform: site pre-survey, sampling train design, site preparation, source testing, and calculation and presentation of

# 413

## Control of Particulate Emissions 5 Days

By gaining an understanding of fundamental particulate collection mechanisms (gravitational settling, inertial separation, filtration, etc.) engineers and other technical personnel will be able to evaluate, from a theoretical standpoint, particulate collection devices. During group problem sessions, the trainees will apply these principles by analyzing selected collector applications. With additional information (empirical data) the knowledge gained in this course will assist the trainee in conducting plan reviews. Topics include:

- Particle size technology
- Control of coarse particles
- Control of fine particles
- Industrial applications

# 415

## Control of Gaseous Emissions 5 Days

This course is designed for engineers and other technical personnel responsible for evaluating gaseous pollutant collectors. At the conclusion of the course, the students will understand the operational characteristics of gaseous control equipment, and be able to apply these principles when analyzing industrial situations involving the selection of pollution control equipment. With additional information (empirical data) the knowledge gained in this course will assist the trainee in conducting plan reviews. Major topics include:

- Adsorption
- Absorption
- Combustion control equipment
- Odor control

# 450

## Source Sampling 5 Days

Engineers and chemists who act as leaders of source stack-gas sampling teams receive in this course the basic information needed to enable them to make appropriate decisions and, with further field experience, to improve their performance.

Trainees are given a comprehensive source sampling assignment, requiring them to perform: site pre-survey, sampling train design, site preparation, soiling, and calculation and presentation of

the results. Topics include:

- Basic theory
- Source sampling fundamentals
- Gas flow measurements
- Collection devices and media
- Analytical procedures
- Design of source sampling trains
- Sampling train aids
- Considerations at the source
- Source sampling monitors



**Faculty**  
**Engineering and Enforcement Section of the**  
**Institute for Air Pollution Training**

William F. Todd,	B.S., Chemistry M.S., Chemical Engineering
Dennis P. Holzschuh,	Associate of Science Mechanical Engineering Technology B.S., Civil Engineering
Tommie A. Gibbs.	B.S., Civil Engineering
Joe W. Riley, Jr.,	B.S., Chemical Engineering
Roger T. Shigehara,	M.S., Air Pollution B.S., Chemical Engineering
Walter S. Smith,	B.Ch.E., Chemical Engineering
Darryl Von Lehmden,	

# 439

## Visible Emissions Evaluation 3 Days

This course is designed for air pollution control personnel responsible for the establishment and operation of agency-sponsored training schools involved with visible emissions evaluation.

Instruction provides the trainee with an understanding of the comparative devices and techniques used to evaluate visible emissions based upon the Ringelmann Smoke Chart (U.S. Bureau of Mines Information Circular 7718) and equivalent opacity concepts. The student will be familiar with the legal concepts of plume evaluation systems, typical code limitations currently in use, and the methods employed to certify and recertify clients in the practice of making visual evaluation of plumes.

The student will also obtain a knowledge of the systems, construction components, maintenance, and operation of equipment used to train emissions evaluation personnel. Agenda items include:

- Training techniques, materials, and equipment
- Ringelmann and equivalent opacity systems
- Plume observations methods
- Combustion equipment design and operation
- Plume generator construction, operations, and maintenance

Legal aspects of visible emissions evaluation

Air

*Prerequisites for this course are:*  
*Introduction to Air Pollution Control*

This course is designed for professional personnel concerned with Field Inspection. Instruction is provided in the field control operation of equipment units in industrial and commercial plants.

The specific laws and policies of selected agencies are covered. Inspection techniques and in collecting data and evidence are also included.

At the close of the course, the student should have an appreciation for the operational problems and techniques utilized in air pollution control.



# 444

## Air Pollution Field Enforcement 5 Days

*Prerequisites for this course are:  
Introduction to Air Pollution Control (422) or equivalent experience.*

This course is designed for professional personnel concerned with Field Inspection. Instruction is provided in the field control operation of equipment units in industrial and commercial plants.

The specific laws and policies of selected control agencies are covered. Inspection techniques employed in collecting data and evidence are also included.

At the close of the course, the student should have an appreciation for the operational problems and techniques utilized in air pollution control. This in-

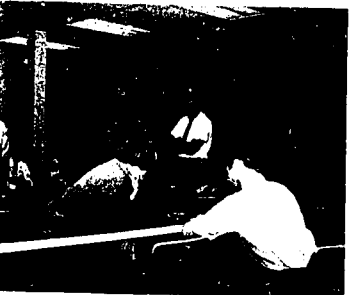
cludes a theoretical framework of the inspection process with its basis in law and highly operational know-how. The trainee should be able to directly use the experience gained in this course in field inspection. Topics include:

- Field enforcement administration
- Assembly and review of evidence
- Permit systems
- Odor investigation
- Source registration





Faculty members working on a research and education program at the Institute for Learning, Training, Research Triangle Park, NC.



Faculty members working on computer assisted education program at the Institute for Air Pollution Training, Research Triangle Park, North Carolina.



# 431

## Air Pollution Control Technology 5 Days

This course is designed for technical personnel who make field inspections of sources of air pollution. At the conclusion of the course the students will be familiar with the general operating principles and selected industrial applications of the major particulate and gaseous air pollutant control devices. This course does not include a mathematical analysis of these control devices, and is suggested as a survey course prior to enrollment in courses 413, 415, 449, 450. Topics include:

- Control of coarse particles
- Control of fine particles
- Control of gaseous pollutants
- Applications of control equipment

# 441

## Special Topics in Engineering and Enforcement 2-5 Days

(By special arrangement upon written request)

The content of this seminar is adjusted to meet the needs of groups in specific geographical locations. Topics for discussion are carefully selected and designed to seek solutions to the problem areas described by the requestors. Arrangements for this special presentation are made through a written request to the appropriate NAPCA Regional Director. See pages 14-15.

Sta

Prerequisite: Basic College Statistics  
(enrollees are required to complete a  
for home study prior to reporting da

This course is designed for professionals responsible for the collection and analysis of air pollution data. It is intended to provide the student with a thorough understanding of the concepts and applications of statistics to Air Quality Studies. At the end of the course, the student should be able to apply statistical methods to his work. The lectures and problem sessions are intended to give a thorough knowledge of basic graphic and statistical techniques for analyzing air pollution data. The lectures will give the student a working knowledge of statistical methods.

Designed for engineers and other personnel involved in the evaluation of combustion processes, the emphasis is directed toward the air pollution potential of the various combustion processes covered in this course.

At the conclusion of this course the trainees will be familiar with combustion principles and be able to make mental calculations. Utilizing these principles, students will be able to evaluate the air pollution potential of fossil-fuel energy sources and waste incinerators.

# 426

## Statistical Data Evaluation 5 Days

Prerequisite: Basic College Statistics or equivalent training (enrollees are required to complete a programmed text in basic statistics for home study prior to reporting date for the course.)

This course is designed for professionals responsible for the collection and analysis of air pollution data. It is intended to provide the student with a thorough understanding of the concepts and application of statistics to Air Quality Studies. At the end of this course, the student should be able to apply statistical methods to his work. The lectures and problem sessions are intended to give a thorough knowledge of basic graphic and statistical techniques for reporting air pollution data. The lectures will give the student a working knowledge of statistical methods and de-

scribe some of the advantages and disadvantages of the methods. Major agenda topics include:

- Storage and retrieval of air pollution data
- Principles of data handling
- Basic concepts of sampling
- Experimental design and analysis
- Linear regression
- Time series analysis
- Techniques for analyzing special air pollution data

# 427

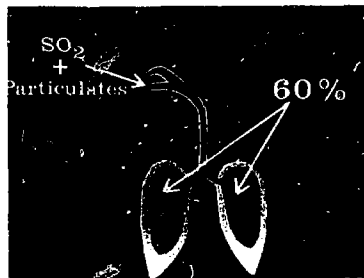
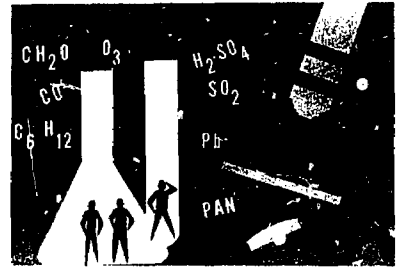
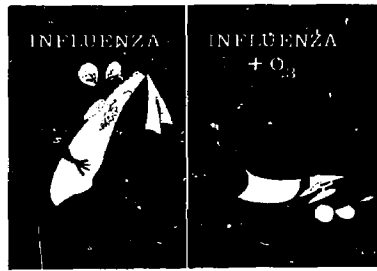
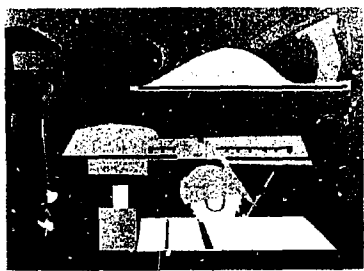
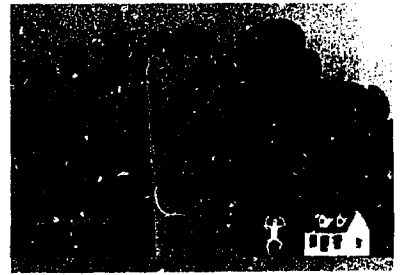
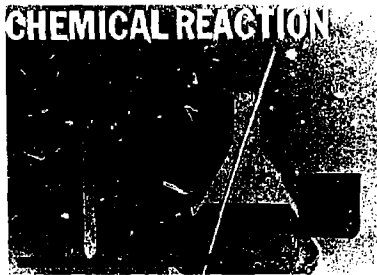
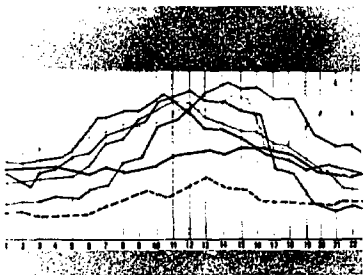
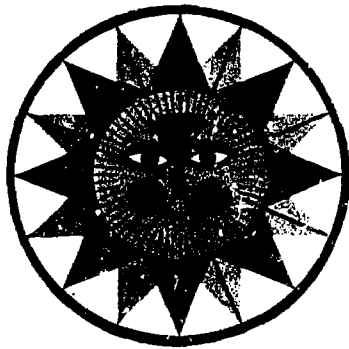
## Combustion Evaluation 5 Days

Designed for engineers and other personnel engaged in the evaluation of combustion processes. Specific emphasis is directed toward the air pollution potential of the various combustion processes covered in this course.

At the conclusion of this course the trainees will be familiar with combustion principles and fundamental calculations. Utilizing these principles, the students will be able to evaluate the air pollution potential of fossil-fuel energy sources and waste disposal incinerators.

They will also be able to evaluate the operational characteristics of combustion devices designed to reduce the emissions of air pollutants into the atmosphere. Given a criteria, the knowledge gained from the course will assist the trainees in conducting plant reviews. Major topics are:

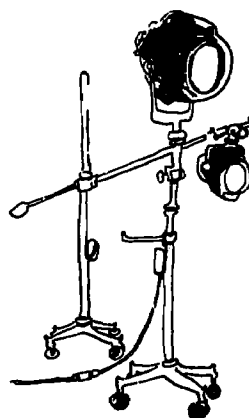
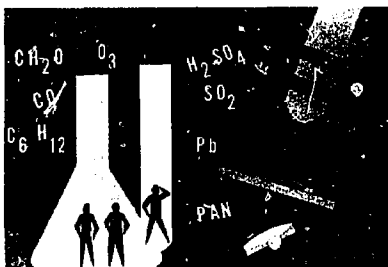
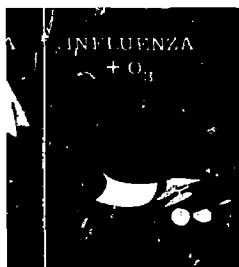
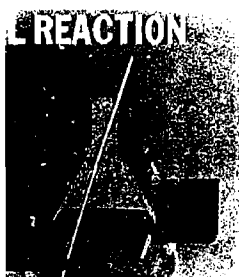
- Combustion fundamentals
- Fossil-fuel burning
- Burning of solid wastes



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**Institute Specialists  
Design a Wide Variety of Audiovisual  
Classroom Support Materials**

Because the need for trained air pollution control personnel is immediate, every effort is being made by the Institute of Air Pollution Training to accelerate instruction. Through its Training Services Section, the Institute has developed a variety of highly sophisticated audiovisual materials as teaching aids. These materials facilitate communication of the most current techniques to students and are used in all course presentations. In addition, the lecture outlines, laboratory and field demonstrations, and the graphics used in the printed materials for each course are continuously upgraded to provide the most current coverage in content.

Closed-circuit television and video tapes are now used in several course presentations and the most recent innovations and technical advances in the use of color television as an educational tool are programmed for use in the near future.

**A systematic approach to air quality management**

CONTROL EQUIPMENT • SOURCE DATA  
 EMISSION INVENTORIES • EFFECTS  
 ECONOMIC FACTORS • METEOROLOGY  
 LEVELS OF AIR POLLUTION  
 AIR POLLUTION CONTROL REGULATIONS

**Computer Assessment**

**INPUT**

**Output**

**Display of existing air quality**

Isopleths of concentration  
 Computer map of air quality  
 Oblique view of air quality

**Control Alternatives**

Change in effective stack height  
 Change in type of fuel  
 Installation of control equipment  
 Change in raw materials  
 Process change  
 Proper site selection  
 Eliminate the source

**Display of improved air quality**

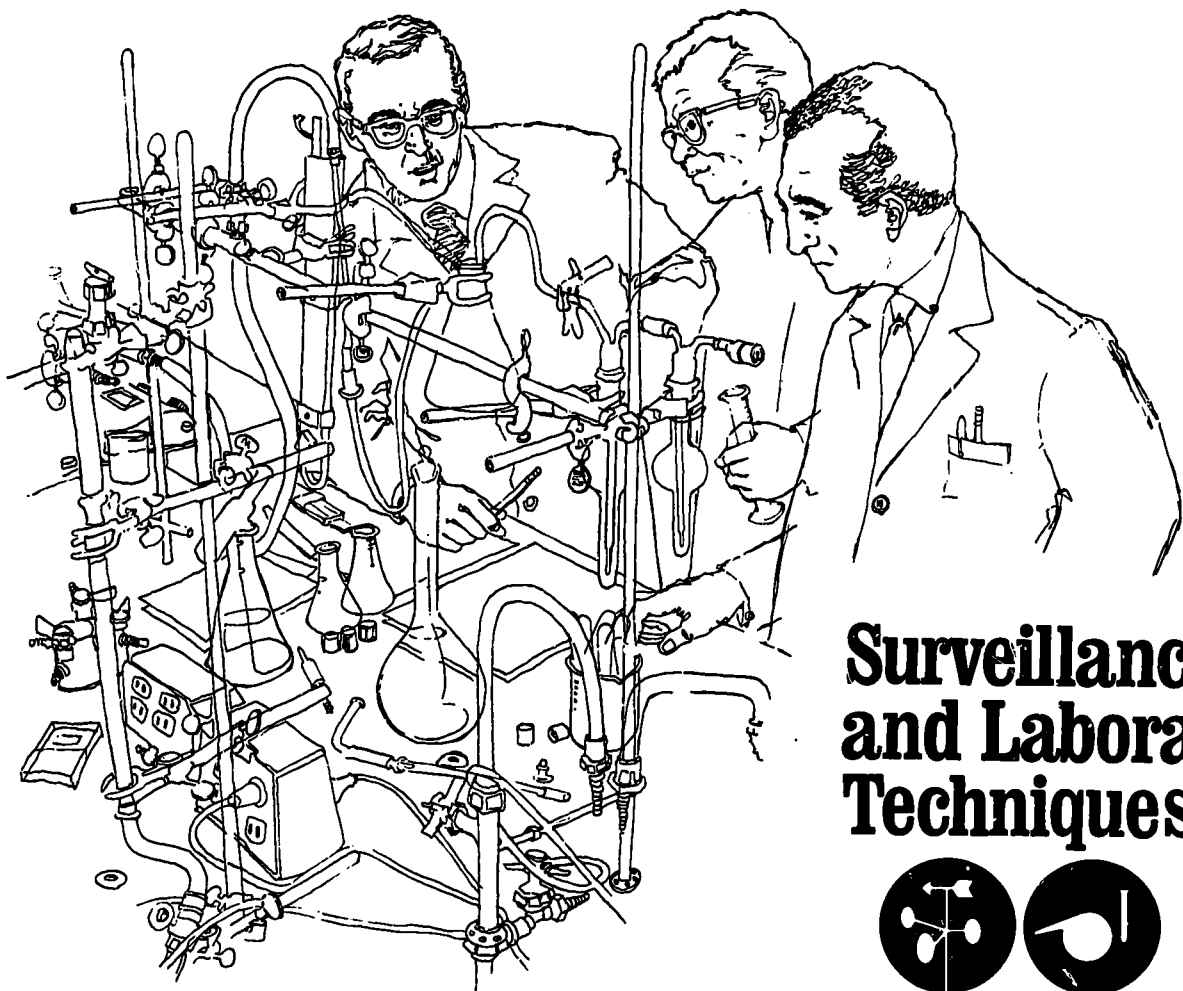
**NEW OUTPUT**

Oblique view of air quality

**DESIRED AIR QUALITY THROUGH SYSTEMS ANALYSIS**

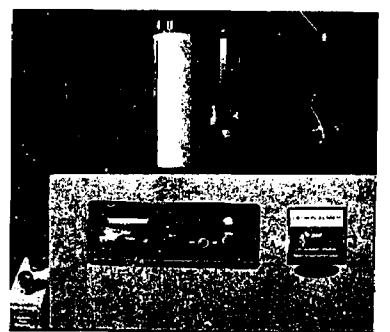
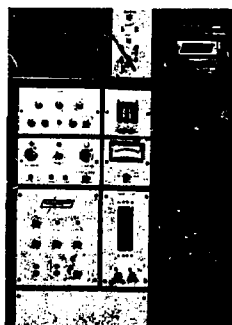
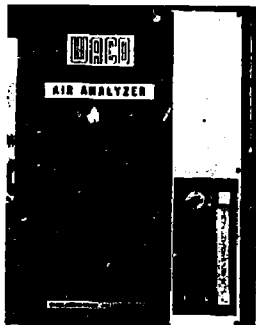
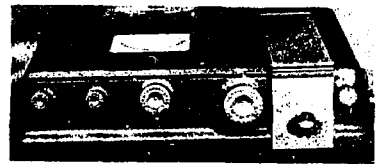
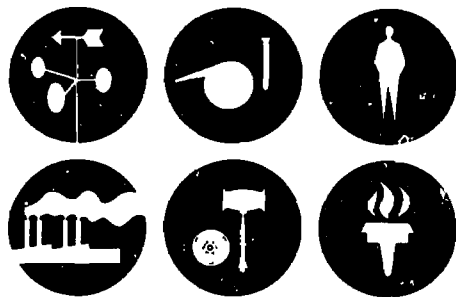
**IMPLEMENTATION PLANS CONSIDER**

Engineering Consideration  
 Administrative Arrangements  
 Construction/ Enforcement Schedules  
 Demographic Factors  
 Realistic Time Schedules

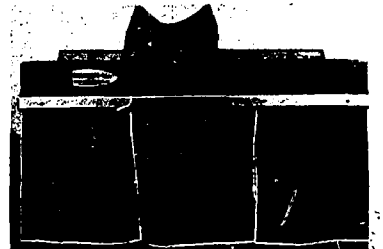
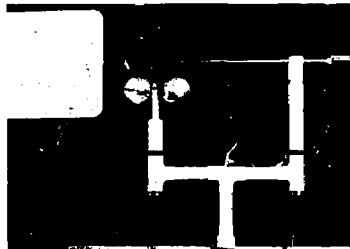
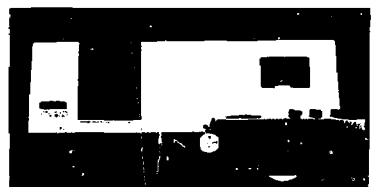
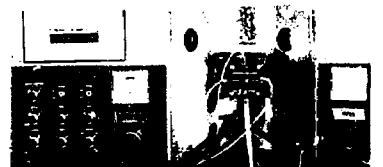
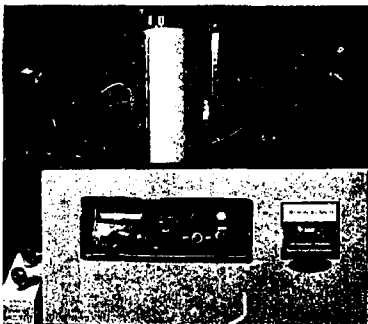
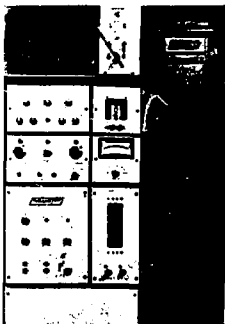
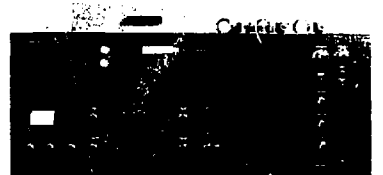
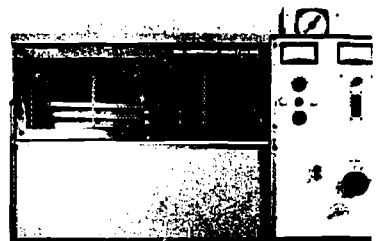
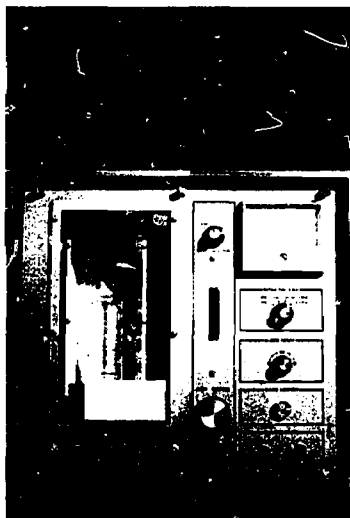
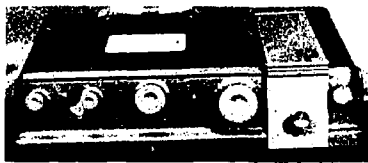


# Surveillance and Laboratory Techniques



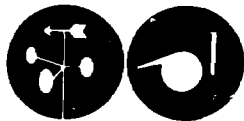


Faculty, and trainees attending courses, at the Institute for Air Pollution Training work with an interesting variety of up-to-date laboratory instrumentation.



ity, and trainees attending courses, at the Institute for Air  
ation Training work with an interesting variety of up-to-date  
ratory instrumentation.





**Faculty  
Surveillance and Laboratory Techniques Section  
of the Institute for Air Pollution Training**

James L. Dicke,	B.A., Chemistry B.S., Meteorology M.S. Meteorology
Stephen B. Baruch,	B.A., Political Science M.P.A., Public Administration
Alfred H. Campbell,	B.S., Biology M.S., Biology
Thomas A. Clark, Ronald J. Drago,	B.S., Chemistry B.S., Chemistry
Edward J. Hanks, Jr.,	Associate of Science Chemical Technology
Thomas A. Hartlage, Ronald C. Hilfiker,	B.S., Chemistry B.S., Atmospheric Science M.S. Meteorology
Donald A. Nelson,	B.E., Electrical Engineering J.D., Law
Eugene G. Raybuck, Karl J. Zobel,	B.S., Science B.S., Biology M.S., Bacteriology

**440**

**Special Topics in Surveillance  
and Laboratory Techniques  
2-5 Days**

(By special arrangement upon written request)

The content of this seminar is adjusted to meet the needs of groups in specific geographical locations. Topics for discussion are carefully selected and designed to seek solutions to the problem areas described by the requestors. Arrangements for this special presentation are made through a written request to the appropriate NAPCA Regional Director, See pages 14-15.

73

**411**

**Air Pollution Met  
5 Days**

Meteorological effects and the role they play in the transport and diffusion of air pollution are delineated in this course presentation. It is designed for engineers and other professional personnel responsible for measuring air pollution levels or for measuring and evaluating meteorological parameters which affect the diffusion and concentration of pollutants in the atmosphere. Each participant calculates estimates of continuous-release pollutant concentrations and becomes familiar with meteorological instrumentation and correct instrument exposure. Discussions are held which enable the trainee to evaluate air pollution control factors related to site selection, control programming, and the planning and interpretation of surveys, as well as sources of meteorological information and

**423**

**Diffusion of Air Pollution  
5 Days**

This course is designed for meteorologists working in air pollution and atomic energy fields who have had no formal training in atmospheric turbulence and diffusion. The course covers the development of selected theories of diffusion from the 1920's to the present, with emphasis on Pasquill's method as modified by Gifford. The application of diffusion formulas to actual situations is discussed so that the students can evaluate the accuracy of his calculations. The trainee estimates pollutant concentrations by Pasquill's method. He learns to discuss recent diffusion studies on the basis of statistical theory of turbulence and become familiar with specialized instruments and tech-

# 411

## Air Pollution Meteorology 5 Days

Meteorological effects and the role they play in the transport and diffusion of air pollution are delineated in this course presentation. It is designed for engineers and other professional personnel responsible for measuring air pollution levels or for measuring and evaluating meteorological parameters which affect the diffusion and concentration of pollutants in the atmosphere. Each participant calculates estimates of continuous-release pollutant concentrations and becomes familiar with meteorological instrumentation and correct instrument exposure. Discussions are held which enable the trainee to evaluate air pollution control factors related to site selection, control programming, and the planning and interpretation of surveys, as well as sources of meteorological information and

the availability of additional professional assistance. Topics include:

- Meteorological fundamentals
- Effects of meteorological parameters on transport and diffusion
- Meteorology and air pollution effects in urban areas
- Atmospheric diffusion estimates
- Effective stack height
- Meteorological instruments and exposure
- Analysis of air quality and meteorological data
- Air Pollution surveys
- Forecasting air pollution potential
- Meteorological models for air pollution control strategies

# 423

## Diffusion of Air Pollution — Theory and Application 5 Days

This course is designed for meteorologists working in air pollution and atomic energy fields who have had no formal training in atmospheric turbulence and diffusion. The course covers the development of selected theories of diffusion from the 1920's to the present, with emphasis on Pasquill's method as modified by Gifford. The application of diffusion formulas to actual situations is discussed so that the students can evaluate the accuracy of his calculations. The trainee estimates pollutant concentrations by Pasquill's method. He learns to discuss recent diffusion studies on the basis of statistical theory of turbulence and become familiar with specialized instruments and tech-

niques for use in the field.\* Topics include:

- Statistical theory of turbulence
- Atmospheric spectra
- Diffusion equations
- Estimates of pollution concentrations
- Results of recent diffusion studies
- Specialized turbulence instrumentation
- Diffusion modeling

\*Non-meteorologists requesting admission to this course should have completed Course 411 (Air Pollution Meteorology) or present evidence of similar prior training with their application.

# 447

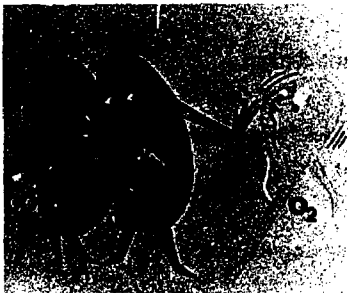
## Meteorological Instrumentation in Air Pollution 5 Days

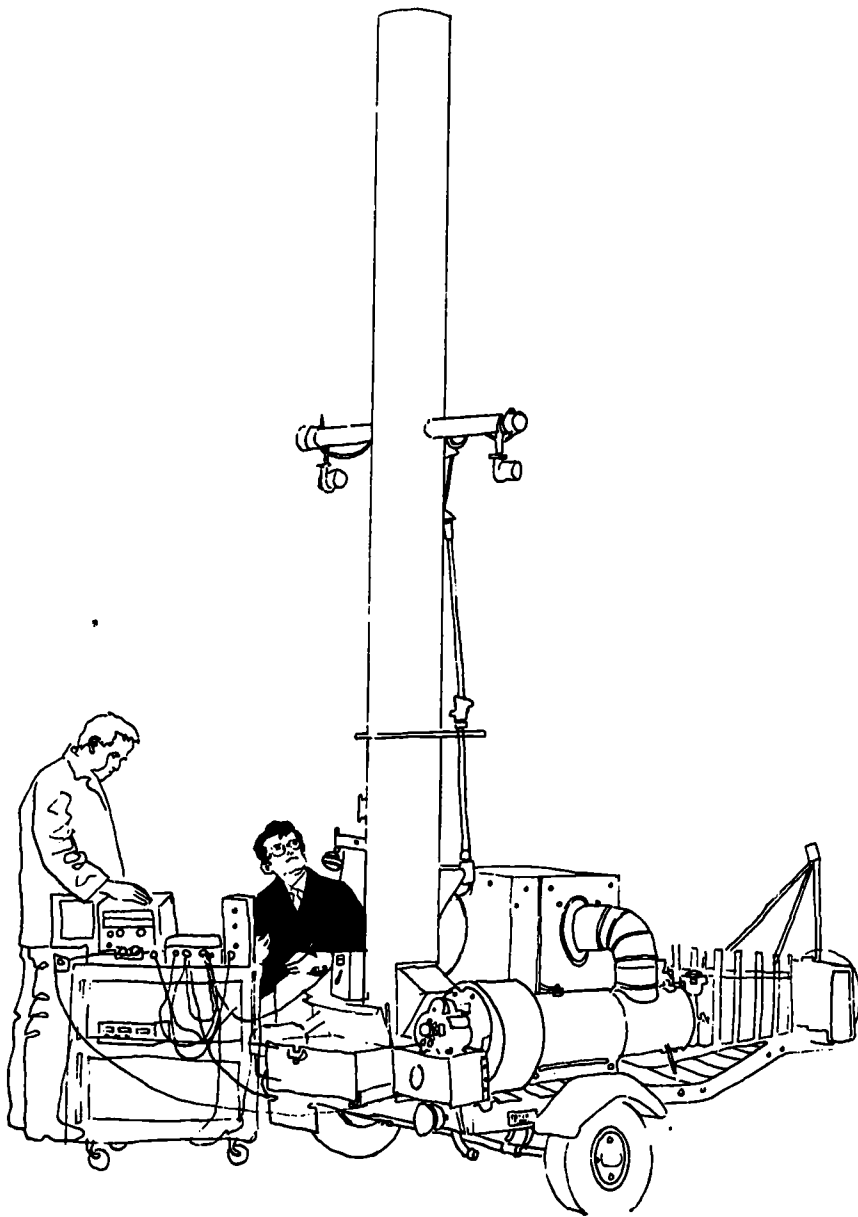
*For non-meteorologists, Course 411 is a prerequisite for this course.*

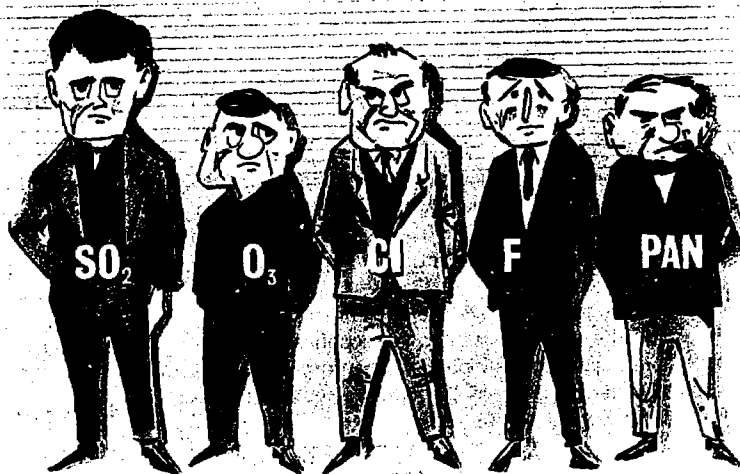
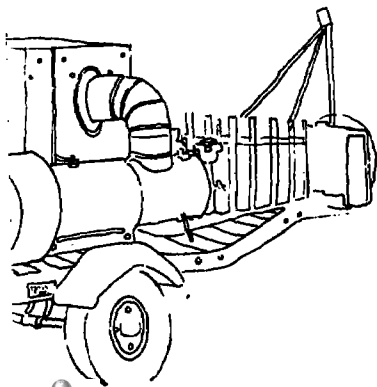
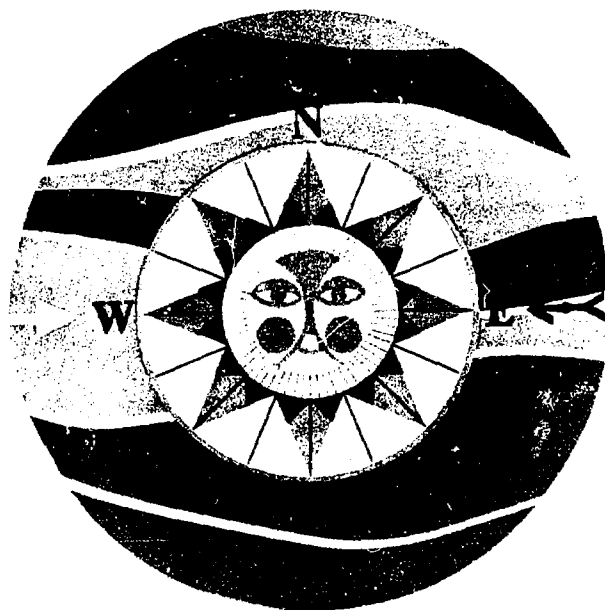
This course is designed for engineers and technical personnel responsible for designing, procuring and maintaining air pollution measuring instrument systems and networks that include meteorological sensors. At the conclusion of the course the trainee will understand the physical principles upon which instrumental sensing and recording of those weather elements important in air pollution are based. The student becomes acquainted with the desirable properties of a meteorological instrument system, their application and limitations with respect to specific types of measurement programs, and the evaluation of these properties by observing demonstrations and working exercises in the laboratory. The trainee becomes familiar with meteorological data reduction methods and computer programs for processing these

data into tabulations and summaries. The student will also become familiar with existing air quality and meteorological instrument systems and telemetered networks. Topics include:

- Characteristics of meteorological instruments
- Principles of wind measuring systems
- Response characteristics of wind sensors and recorders
- Temperature measuring sensors for atmospheric stability
- Lapse rate measuring systems
- Telemetry in air pollution meteorology
- Data reduction methods and computer programs for meteorological tabulations and summaries
- Integrating meteorological and air quality instrumentation systems







# 435

## Atmospheric Sampling 5 Days

Offered for chemists, engineers, and technicians responsible for atmospheric sampling and analysis, this course is designed to enable the students to select and apply air quality sampling methods. The objective of the course is to familiarize the student with different sampling techniques and to clarify physical and chemical principles upon which such techniques are based. Approximately 40 percent of the student's time in the course will be spent in the laboratory observing and participating in sampling procedures. Lecture topics are:

Behavior of gases and suspended particulates  
Methods of sampling for particulates, including:  
Deposition sampling

Impactors and impingers  
Filtration  
Electrostatic precipitators  
Thermal precipitators  
Design of sampling systems, including a discussion of air movers and air-measuring devices  
Evaluation of filter media  
Grab sampling  
Freeze out and condensation  
Adsorption  
Absorption  
Sampling for respirable dusts  
Sample site selection  
Preparation of controlled concentrations

# 409

## Analysis of Atmospheric Inorganics 5 Days

Designed for professional chemists or other accredited personnel responsible for the analysis of atmospheric inorganics. The objective of this course is to guide the student in the selection of appropriate analytical methods.

Emphasis is placed on the recommended procedures for the determination of atmospheric concentrations of gaseous and particulate inorganic pollutants. Special emphasis is placed on the commonly-accepted major pollutants.

Laboratory sessions comprise approximately 50 percent of the course, and each student develops proficiency in selected sampling and analytical procedures. Major topics include:

Analysis of fluorides  
Analysis for oxides of nitrogen  
Analysis for sulfates and chlorides  
Analysis for sulfur compounds  
Calibration of sampling trains

Other topics discussed include:

Analysis for oxidants  
Analysis for oxides of carbon  
Automatic and continuous monitoring

# 435

## Atmospheric Sampling 5 Days

Impactors and impingers  
Filtration  
Electrostatic precipitators  
Thermal precipitators  
Design of sampling systems, including a discussion of air movers and air-measuring devices  
Evaluation of filter media  
Grab sampling  
Freeze out and condensation  
Adsorption  
Absorption  
Sampling for respirable dusts  
Sample site selection  
Preparation of controlled concentrations

### Laboratory sessions:

#### Calibration of these air-measuring instruments:

Wet test meter  
Dry test meter  
Rotameter  
Limiting orifice meter  
Calibration of a high-volume sampler  
Calibration of a tape sampler  
Determination of collection efficiencies  
Introduction to continuous monitoring instrumentation  
Dynamic and static methods of calibration of continuous monitoring instruments

# 409

## Analysis of Atmospheric Inorganics 5 Days

### Procedures. Major topics include:

Analysis for fluorides  
Analysis for oxides of nitrogen  
Analysis for sulfates and chlorides  
Analysis for sulfur compounds  
Calibration of sampling trains

### Other topics discussed include:

Analysis for oxidants  
Analysis for oxides of carbon  
Automatic and continuous monitoring

Analysis for metals  
Electrical methods of analysis  
Optical methods of analysis  
Measurement of radionuclides in the atmosphere

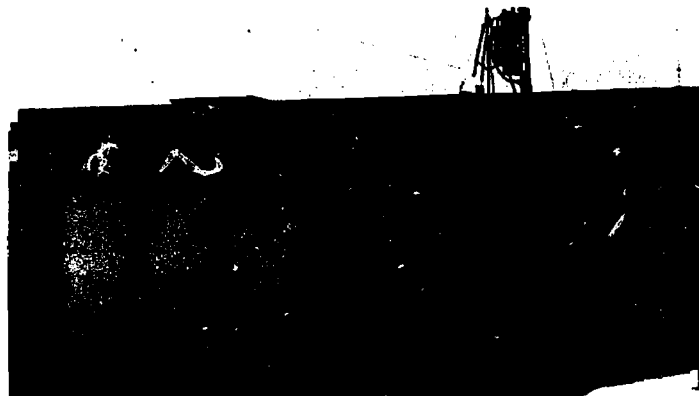
### Laboratory sessions:

Determination of sulfur dioxide (manual method)  
Determination of nitrogen dioxide (manual method)  
Determination of oxidants (manual method)  
Continuous monitoring of selected pollutants

Mobile Air Sampling Units are used by engineers, chemists and meteorologists assigned to sample ambient air quality during air pollution episodes.



This new building at Durham, North Carolina houses the equipment used for the evaluation and comparison of new instruments and analytical methods used for continuous monitoring studies of atmospheric pollutants.

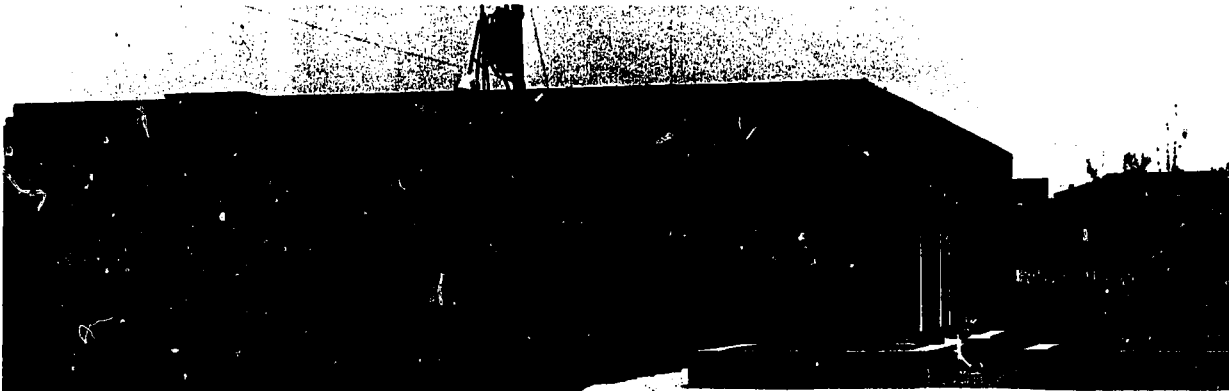




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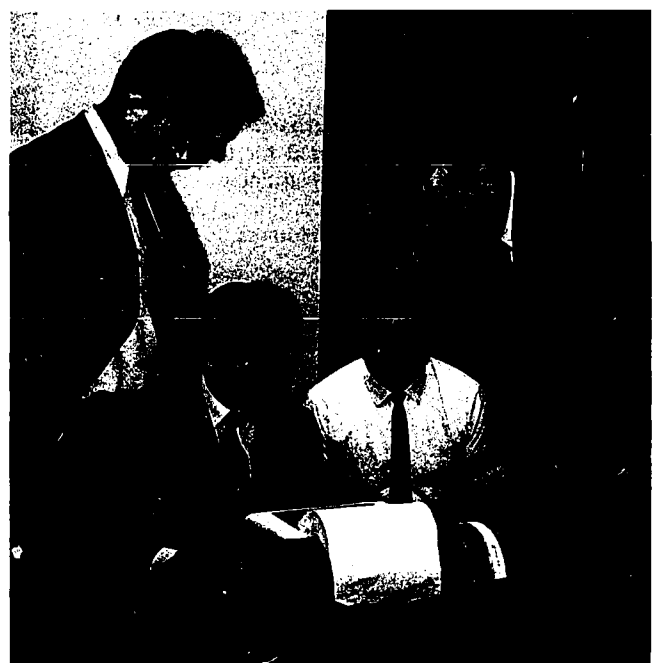
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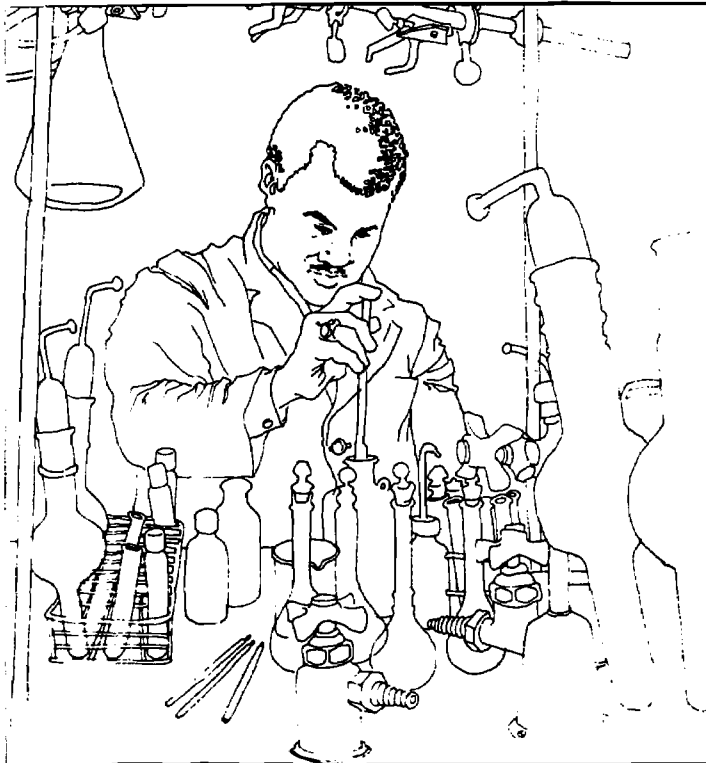




Training Strategies Model Demonstration  
presented by the Institute for Air Pollution  
Training at Research Triangle Park,  
North Carolina, October, 1969.







## Analysis of .

A fundamental knowledge of organic chemistry prerequisite for this course, which is designed for chemists and others responsible for chemical analysis of atmospheric samples. The objective is to provide course participants with an opportunity to perform specific analytical procedures for measuring organic pollutants in the ambient air, under the supervision of trained technicians. In this course, approximately 50 percent of the student's time will be spent in laboratories, separating, identifying, and measuring organic pollutants. Topics will include:

- Nomenclature of organic compounds
- Sampling for organic compounds

# 429

## Gas Chromatographic Analysis of Air Pollutants 5 Days

Emphasis in this course is placed on the application of gas chromatography in air pollution investigations. It is designed for chemists and others responsible for the measurement of atmospheric pollution, and specifically those who have little or no experience with the technique of gas chromatographic analysis.

The course objective is to introduce the student to the basic theory of gas chromatography and develop an understanding of the operational role of the various components of a gas chromatograph, including

the column, carrier gas, sample injector, detector, and recorder.

Approximately 50 percent of the student's time spent in the laboratory, setting up and calibrating gas chromatographs and performing qualitative and quantitative analysis of unknown samples. Topics include:

- Basic theory of gas chromatography
- Gas chromatographic column parameters
- Characteristics of the flame ionization detector

# 408

## Analysis of Atmospheric Organics 5 Days

A fundamental knowledge of organic chemistry is a prerequisite for this course, which is designed for chemists and others responsible for chemical analysis of atmospheric samples. The objective is to provide course participants with an opportunity to perform specific analytical procedures for measuring organic pollutants in the ambient air, under the supervision of trained technicians. In this course, approximately 50 percent of the student's time will be spent in laboratories, separating, identifying, and measuring organic pollutants. Topics will include:

Nomenclature of organic compounds  
Sampling for organic compounds

Theory and application of column chromatography  
Introduction to thin-layer chromatography  
Introduction to gas chromatography  
Absorption spectroscopy  
Activation analysis of air pollutants  
Preparation of controlled atmospheres

Laboratory sessions will cover:

Separation of organic pollutants  
Ultra-violet absorption analysis  
Visible absorption analysis  
Gas chromatographic analysis  
Infrared analysis

# 429

## Gas Chromatographic Analysis of Air Pollutants 5 Days

the column, carrier gas, sample injector, detector, and recorder.

Approximately 50 percent of the student's time is spent in the laboratory, setting up and calibrating gas chromatographs and performing qualitative and quantitative analysis of unknown samples. Topics include:

Basic theory of gas chromatography  
Gas chromatographic column parameters  
Characteristics of the flame ionization detector

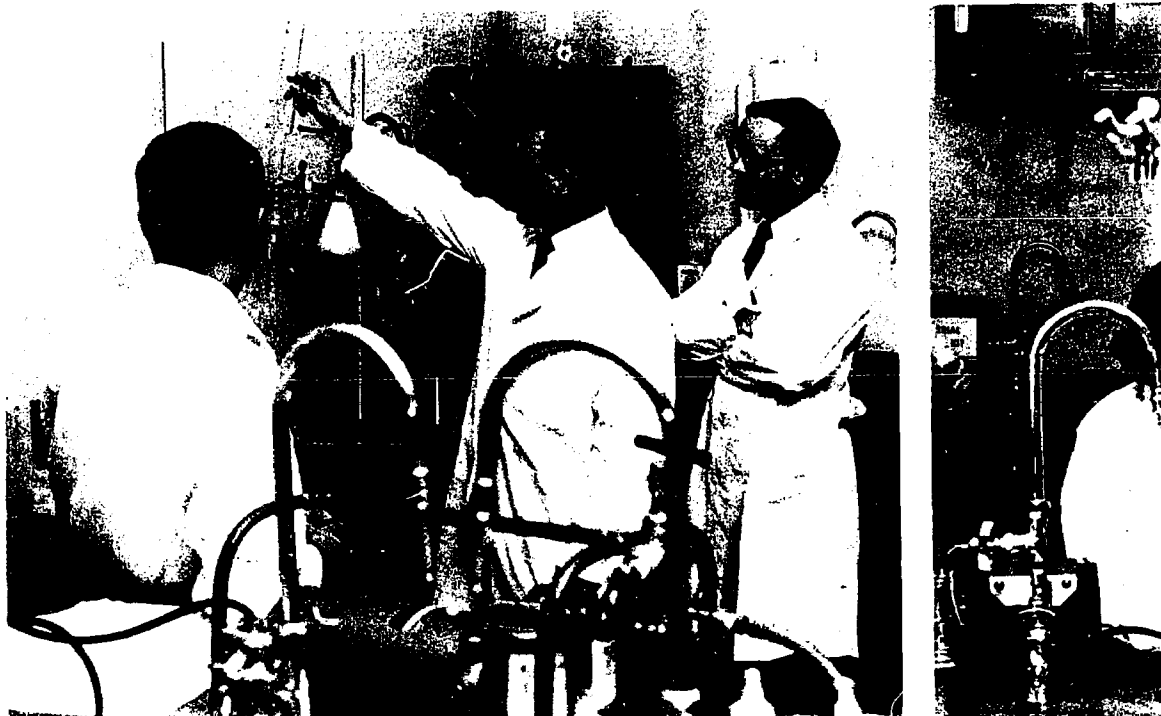
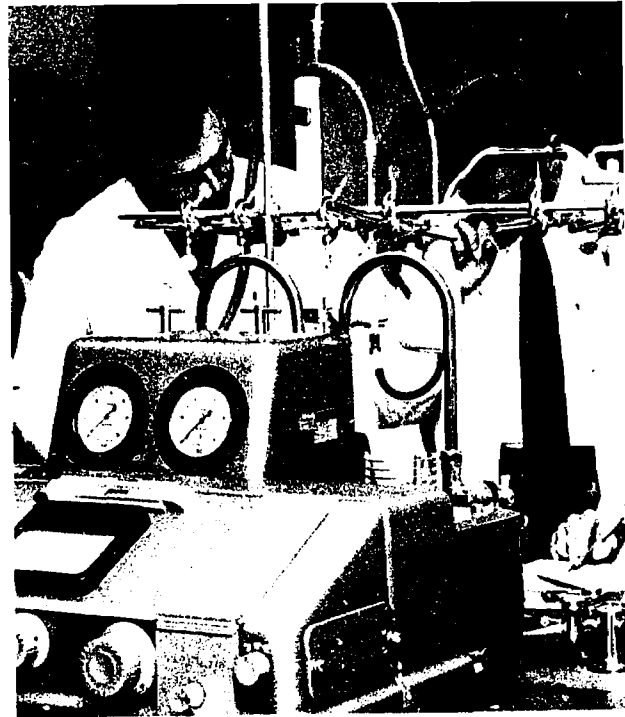
Characteristics of the electron capture detector  
Sample handling in gas chromatography  
Calculations in gas chromatography

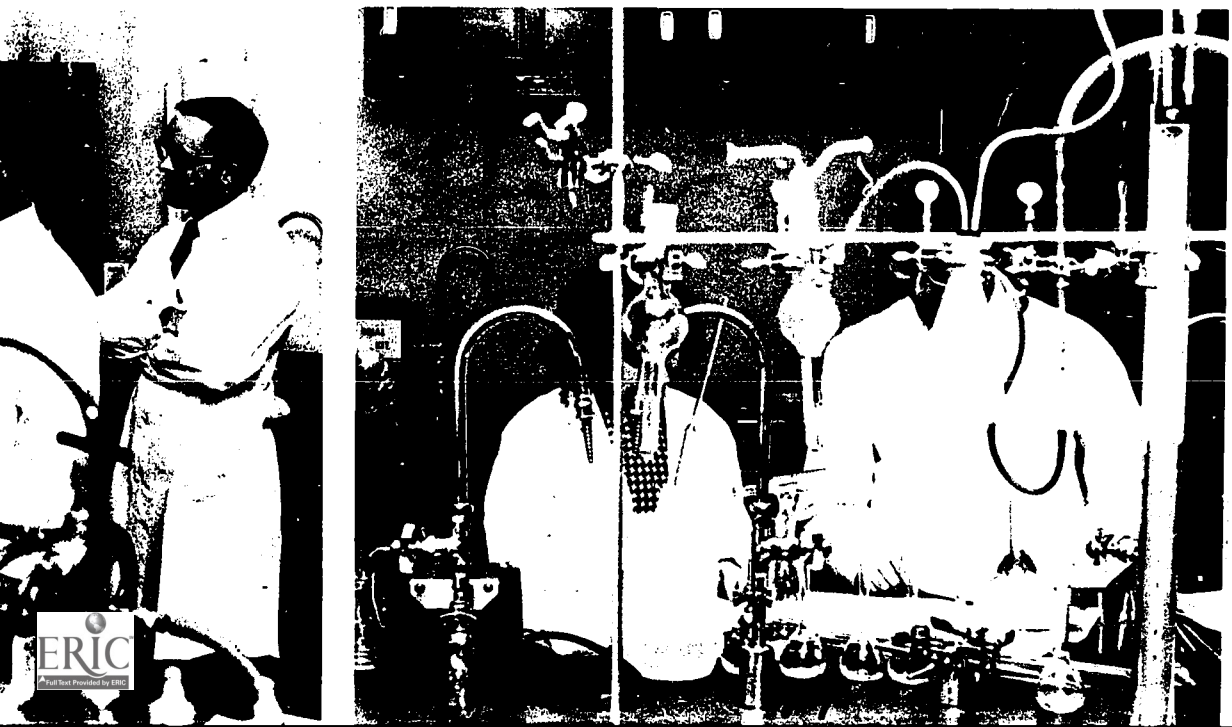
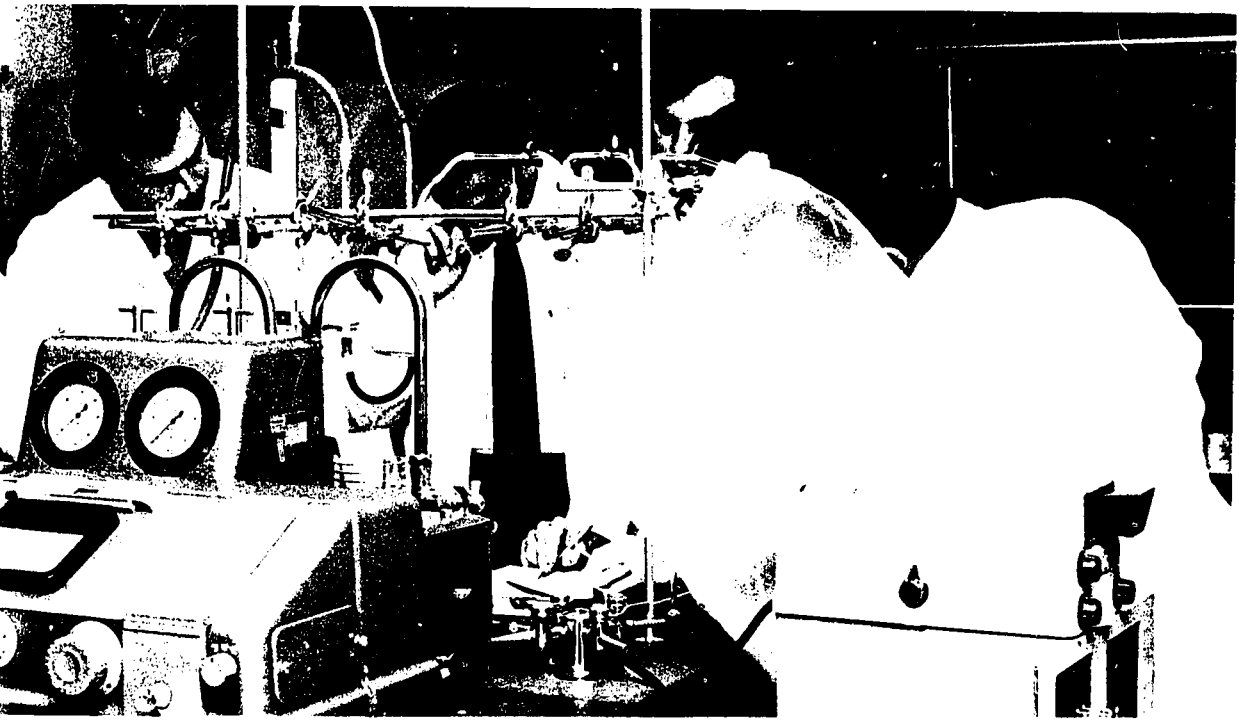
Laboratory sessions:

Setting up and calibrating gas chromatographs  
Determination of aliphatic hydrocarbons  
Determination of aromatic hydrocarbons  
Determination of polynuclear hydrocarbons

43

Trainees attending Analysis of Atmospheric Inorganics course were one of the first groups to work in the Institute's new laboratories at Research Triangle Park.











# 448

## Effects on Vegetation 3 Days

(By special arrangement)

Instruction in this course is designed specifically for State, county, and local agricultural agency personnel. Participants receive basic knowledge and instruction in the methods used to identify various types of air pollution damage to vegetation. Special emphasis is given to data evaluation and procedures recommended for assessing and tabulating economic losses. Topics include:

- Air pollution injuries to vegetation
- Compiling reports
- Data evaluation

- Diagnosing plant problems
- Effects of gaseous pollutants
- Effects of particulate pollutants
- Methods of assessing air pollution injury to vegetation

The primary objective of this special course is to develop a national network of qualified specialists, who upon completion of the course, will participate in follow-up surveys designed to compile data pertaining to air pollution damage to vegetation.

# 438

## Column and Thin-Layer Chromatographic Analysis of Air Pollutants 4 Days

This course is designed to provide participants with an opportunity to discuss the theory and applicability of specific methods and their advantages and disadvantages. It will not produce thoroughly experienced chromatographers, since such proficiency can only be obtained with extensive practice and application.

In the separation and analysis of atmospheric particulate pollutants, professional chemists must select and apply the most appropriate method from a variety of chromatographic techniques.

Laboratory sessions make up approximately 50 percent of course time. Subjects include:

- Introduction and theory of chromatography
- Fundamentals of column, thin-layer, and ion-exchange chromatography

- Comparison of the various methods
- Spot detection and plate documentation
- Chromatography of heterocyclics
- Chromatography of hydrocarbons
- Quantitative and qualitative chromatography
- Chromatography of filter extract
- Chromatography of pesticides

Laboratory sessions:

- Familiarization with commonly used equipment
- NASN procedure for analysis of benzpyrene
- Column separation of polynuclear aromatic hydrocarbons
- Two-dimensional chromatography (procedure and detection)
- UV-Visible analysis of column extracted fractions

8

## Vegetation

Diagnosing plant problems  
 Effects of gaseous pollutants  
 Effects of particulate pollutants  
 Methods of assessing  
 air pollution injury to vegetation

The primary objective of this special course is to develop a national network of qualified specialists, who upon completion of the course, will participate in follow-up surveys designed to compile data pertaining to air pollution damage to vegetation.

8

## Chromatographic Analysis of Air Pollutants

Comparison of the various methods  
 Spot detection and plate documentation  
 Chromatography of heterocyclics  
 Chromatography of hydrocarbons  
 Quantitative and qualitative chromatography  
 Chromatography of filter extract  
 Chromatography of pesticides

### Laboratory sessions:

Familiarization with commonly used equipment  
 NASN procedure for analysis of benzpyrene  
 Column separation of polynuclear aromatic hydrocarbons  
 Two-dimensional chromatography (procedure and detection)  
 UV analysis of column extracted fractions

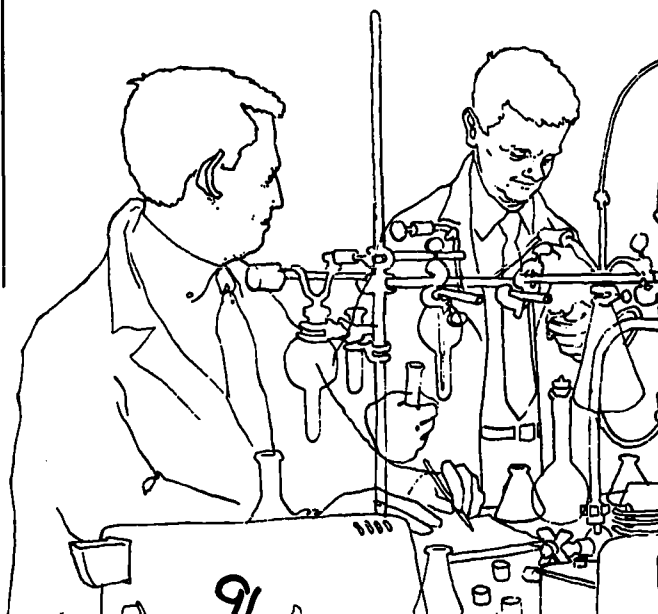
407

## Medical and Biological Topics in Air Pollution 3 Days

The level of instruction in this course is directed toward professional workers in the biological sciences, such as public health officials, physicians, air pollution control administrators, biologists, engineers and chemists.

Students are given a basic knowledge of the health effects of air pollution on the population of the community and a familiarization with the biomedical aspects of air pollution. Topics include:

Air pollution and health  
 Toxicology of particulate and gaseous pollutants  
 Air pollution and allergy  
 Air pollution and carcinogens  
 Photochemical smog and eye irritation  
 Biomedical criteria of ambient air quality



# 420

## Air Pollution Microscopy 5 Days

This course is designed for chemists, engineers and other professional personnel responsible for the identification of airborne particulates. Laboratory sessions enable the student to recognize and identify atmospheric particulates.

Instruction is designed to afford the trainee a basic understanding of the procedures required to obtain representative samples of atmospheric pollutants that are characterized by microscopic examination.

The course consists of lectures, laboratory exercises, and field exercises. The trainees obtain a knowledge of the component parts of the polarizing microscope and their functions. They are also familiarized with the special sampling and sample handling techniques used in microscopic analysis. During the laboratory sessions the trainees prepare slides. They also examine pure substances, plus samples which they have collected. Topics include:

- Sampling for particulates
- Optics and illumination
- Polarization and the polarizing microscope
- Morphology of natural particulates
- Morphology of industrial dust and combustion products
- Micrometry – counting and sizing
- Crystal morphology
- Measurement of refractive index
- Dispersion staining
- Photomicrography

## Sampling and Ident

Instruction in this course is designed to enable the trainee to discuss and use various allergen sampling equipment, to identify selected aero-allergens, and to perform calculations necessary to arrive at a quantitative assessment of the allergens present in an atmospheric sample. This course is specifically designed for professional workers concerned with the sampling and identification of atmospheric allergens.

Trainees spend approximately one-half of the course time in laboratory sessions and field exercises which include setting up sampling equipment and

## Determination and M

This course is designed for chemists and other scientific personnel responsible for the qualitative and quantitative determination of metals present in the atmosphere. A fundamental knowledge of analytical chemistry is necessary.

Students are given a working knowledge of separation and analysis techniques for the metallic pollutants present in ambient air. Approximately 60 percent of the student's time is spent in the laboratory, separating, identifying, and measuring metallic pollutants. Subjects include:

- Sampling for metallic compounds
- Separation techniques

# 405

## Sampling and Identification of Aero-Allergens 5 Days

Instruction in this course is designed to enable the trainee to discuss and use various allergen sampling equipment, to identify selected aero-allergens, and to perform calculations necessary to arrive at a quantitative assessment of the allergens present in an atmospheric sample. This course is specifically designed for professional workers concerned with the sampling and identification of atmospheric allergens.

Trainees spend approximately one-half of the course time in laboratory sessions and field exercises, which include setting up sampling equipment and

collecting allergen samples. Later, in the microscopy laboratory, they identify and count the allergens in the collected samples. Topics include:

- Allergen sampling devices
- Sample preparation and handling techniques
- Human response to airborne allergens
- Dispersion and climatological effects of pollens and spores
- Counting and sizing techniques
- Biology and morphology of pollen
- Biology and morphology of fungus spores

# 416

## Determination and Measurement of Atmospheric Metals 5 Days

This course is designed for chemists and other scientific personnel responsible for the qualitative and quantitative determination of metals present in the atmosphere. A fundamental knowledge of analytical chemistry is necessary.

Students are given a working knowledge of separation and analysis techniques for the metallic pollutants present in ambient air. Approximately 60 percent of the student's time is spent in the laboratory, separating, identifying, and measuring metallic pollutants. Subjects include:

- Colorimetric methods of analysis
- Polarographic analysis
- Emission spectroscopy
- Atomic absorption spectroscopy

Laboratory sessions:

- Particulate sampling preparation, including sampling, ashing, and acid digestion
- Colorimetric analysis by formation of metallic complexes
- Operation of an emission spectrograph and interpretation of data
- Polarographic analysis of metals
- Atomic absorption analysis of metals

Sampling for metallic compounds  
techniques

# Institute for Air Pollution Training

# Schedule of Resident Courses 1970-1971

*All Resident Courses are scheduled for presentation  
at the National Air Pollution Control Administration facilities at Research Triangle Park, N.C., 27709.  
Applicants will receive advance notice of classroom and/or laboratory locations.*

1970 Dates	Course Number	Course Title
July 6-10	422	Introduction to Air Pollution Control
July 13-17	420	Air Pollution Microscopy
July 20-24	435	Atmospheric Sampling
August 3-7	435	Atmospheric Sampling
August 17-21	422	Introduction to Air Pollution Control
August 24-28	409	Analysis of Atmospheric Inorganics
August 24-28	450	Source Sampling
September 9 - 11	439	Visible Emissions Evaluation
September 14-18	409	Analysis of Atmospheric Inorganics
September 14-18	431	Air Pollution Control Technology
September 21-25	450	Source Sampling
September 28- October 2	409	Analysis of Atmospheric Inorganics
October 5-9	450	Source Sampling



1970 Dates	Course Number	Course Title	1970 Dates	Course Number	Course Title
October 12-16	409	Analysis of Atmospheric Inorganics	November 2-6	450	Source Sampling
October 13-15	439	Visible Emissions Evaluation	November 16-20	450	Visible Emissions Evaluation
October 20-22	439	Visible Emissions Evaluation	November 30-December 4	429	Visible Emissions Evaluation
October 19-23	444	Air Pollution Field Enforcement	December 7-11	431	Air Pollution Meteorology
October 26-30	450	Source Sampling	December 7-11	429	Analysis of Atmospheric Inorganics
October 26-30	411	Air Pollution Meteorology			
November 2-6	409	Analysis of Atmospheric Inorganics			

1971 Dates	Course Number	Course Title	1971 Dates	Course Number	Course Title
January 11-15	411	Air Pollution Meteorology	April 19-23	405	Analysis of Atmospheric Inorganics
January 25-29	408	Analysis of Atmospheric Organics	May 3-7	420	Control of Gaseous Emissions
February 1-5	415	Control of Gaseous Emissions	May 10-14	438	Control of Gaseous Emissions
February 8-12	408	Analysis of Atmospheric Organics	May 24-28	426	Control of Gaseous Emissions
February 8-12	413	Control of Particulate Emissions	June 7-11	436	Control of Particulate Emissions
February 15-19	422	Introduction to Air Pollution Control	June 7-11	447	Control of Particulate Emissions
February 15-19	413	Control of Particulate Emissions	June 21-25	436	Control of Particulate Emissions
March 1-5	408	Analysis of Atmospheric Organics	June 21-25	447	Control of Particulate Emissions
March 1-5	415	Control of Gaseous Emissions			
March 22-26	423	Diffusion of Air Pollution-Theory and Application			

\*This course reserved for chem



	1970 Dates	Course Number	Course Title
Atmospheric Inorganics	November 2-6	450	Source Sampling
Emissions Evaluation	November 16-20	450	Source Sampling
Emissions Evaluation	November 30-	429	Gas Chromatographic Analysis of Air Pollutants
on Field Enforcement	December 4		
Sampling	December 7-11	431	Air Pollution Control Technology
on Meteorology	December 7-11	429	Gas Chromatographic Analysis of Air Pollutants
Atmospheric Inorganics			

	1971 Dates	Course Number	Course Title
on Meteorology	April 19-23	405	Sampling and Identification of Aero-Allergens
i Atmospheric Organics	May 3-7	420	Air Pollution Microscopy
Gaseous Emissions	May 10-14	438	Column and Thin-Layer Chromatographic Analysis of Atmospheric Pollutants
: Atmospheric Organics			
Particulate Emissions	May 24-28	426	Statistical Data Evaluation
on to Air Pollution Control	June 7-11	436	Determination and Measurement of Atmospheric Metals
Particulate Emissions	June 7-11	447	Meteorological Instrumentation in Air Pollution
i Atmospheric Organics	June 21-25	436	Determination and Measurement of Atmospheric Metals
Gaseous Emissions	June 21-25	447	Meteorological Instrumentation in Air Pollution

\*This course reserved for chemical and physical science technicians only.



The following courses have  
at the locations listed on the  
Additional information may  
from the Registrar of the In.  
at Research Triangle Park P.  
Application forms are provi

# Institute for Air Pollution Training

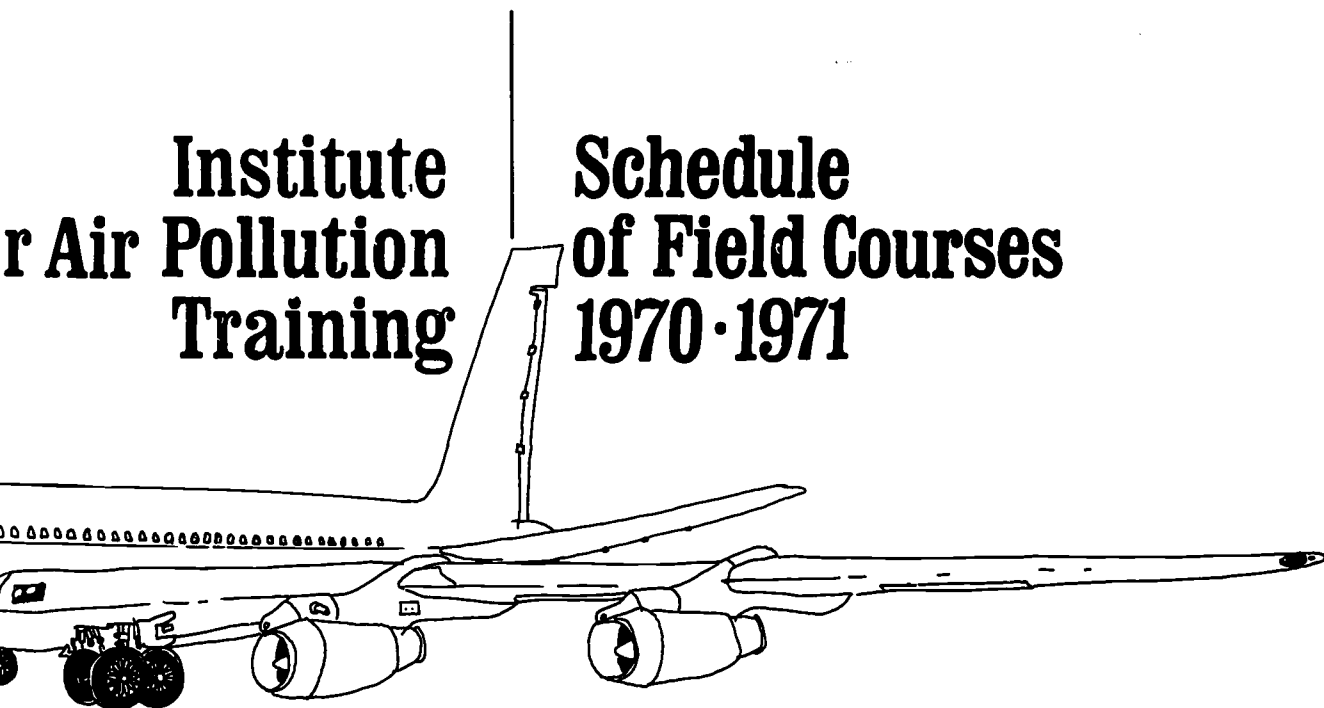


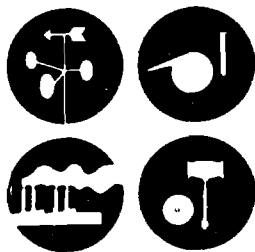
*The following courses have been scheduled for presentation at the locations listed on the opposite page.*

● *Additional information may be obtained from the Registrar of the Institute for Air Pollution Training, at Research Triangle Park P.O. Box 12055, N.C. 27709. Application forms are provided on pages 88 to 96.*

# **Institute for Air Pollution Training**

# **Schedule of Field Courses 1970-1971**





# 1970

	Course Number	Course Title
<b>Chicago Metropolitan Area</b>		
October 5-9	431	Air Pollution Control Technology
<b>Gulf Area</b>		
October 5-9	420	Air Pollution Microscopy
November 2-6	431	Air Pollution Control Technology
November 16-20	444	Air Pollution Field Enforcement
<b>New England Area</b>		
July 7 - 9	439	Visible Emissions Evaluation
October 5-9	444	Air Pollution Field Enforcement
<b>New York Metropolitan Area</b>		
July 27 - 31	422	Introduction to Air Pollution Control
August 3-7	420	Air Pollution Microscopy
September 21-25	444	Air Pollution Field Enforcement
September 28-October 2	431	Air Pollution Control Technology
<b>Ohio Area</b>		
August 24-28	422	Introduction to Air Pollution Control
November 16-20	411	Air Pollution Meteorology
<b>West Coast Area</b>		
September 14-18	420	Air Pollution Microscopy
November 2-6	444	Air Pollution Field Enforcement
November 16-20	431	Air Pollution Control Technology

# 1971

## Chicago Metropolitan Area

March 1-5  
 March 8-12  
 March 22-26  
 March 29-  
 April 2  
 May 4 - 6  
 May 24-28  
 June 7-11

## Gulf Area

January 11-15  
 January 18-22  
 March 15-19  
 May 10-14

## New England Area

April 19-23  
 May 3 - 7

## New York Metropolitan Area

April 19-23

## Ohio Area

January 25-29  
 May 18 - 20

## West Coast Area

January 25-29  
 March 8-12  
 March 15-19  
 March 29-  
 April 2-6  
 April 5-9  
 June 7-11

# 1970

# 1971

Course  
Number

### Chicago Metropolitan Area

March 1-5	422
March 8-12	435
March 22-26	413
March 29- April 2	415
May 4 - 6	439
May 24-28	427
June 7-11	426

### Course Title

Introduction to Air Pollution Control
Atmospheric Sampling
Control of Particulate Emissions
Control of Gaseous Emissions
Visible Emissions Evaluation
Combustion Evaluation
Statistical Data Evaluation

### Gulf Area

January 11-15	413
January 18-22	415
March 15-19	422
May 10-14	407

Control of Particulate Emissions
Control of Gaseous Emissions
Introduction to Air Pollution Control
Medical and Biological Topics in Air Pollution

### New England Area

April 19-23	422
May 3 - 7	435

Introduction to Air Pollution Control
Atmospheric Sampling

### New York Metropolitan Area

April 19-23	415
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Control of Gaseous Emissions
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### Ohio Area

January 25-29	413
May 18 - 20	439

Control of Particulate Emissions
Visible Emissions Evaluation

### West Coast Area

January 25-29	411
March 8-12	413
March 15-19	415
March 29- April 2-6	422
April 5-9	435
June 7-11	427

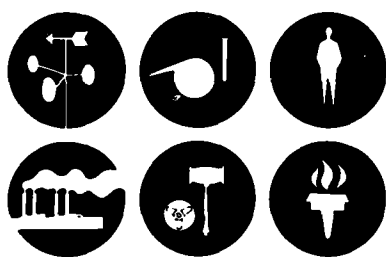
Air Pollution Meteorology
Control of Particulate Emissions
Control of Gaseous Emissions
Introduction to Air Pollution Control
Atmospheric Sampling
Combustion Evaluation



National  
Air Pollution Control Administration  
Office of Manpower  
Extramural Program

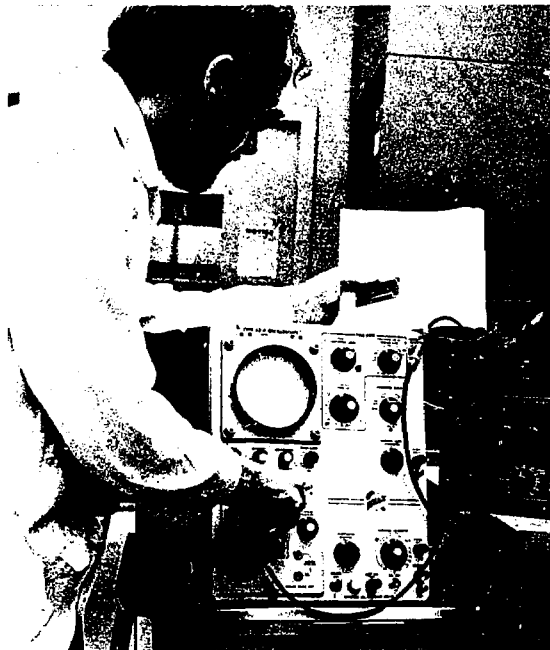


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# Extramural Training Programs in Air Pollution

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE  
Public Health Service  
Environmental Health Service  
National Air Pollution Control Administration  
Office of Manpower Development  
Extramural Programs Branch  
Research Triangle Park, North Carolina 27709  
Post Office Box No. 12055  
January 1970



Pulse characteristics being checked from a "hot wire" anemometer detector unit, for application to liquid aerosol studies.



Aspirating a liquid sample into an Atomic Absorption Spectrophotometer. This unit determines trace metal concentrations in solution.

Divers making ready for a 200 foot dive in research submarine to observe stability of incinerator residue on ocean floor.

One phase of an overall program to evaluate respiratory responses to various dusts and for gases is the insertion of a guinea pig into a dust exposure chamber.

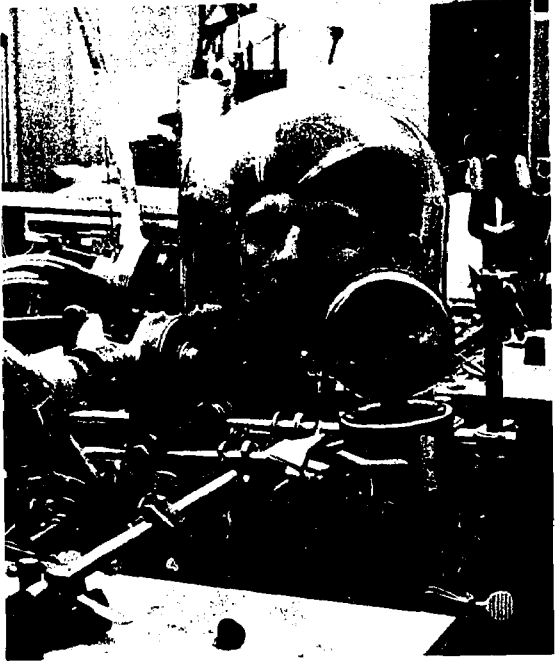






'hot wire'  
liquid aerosol

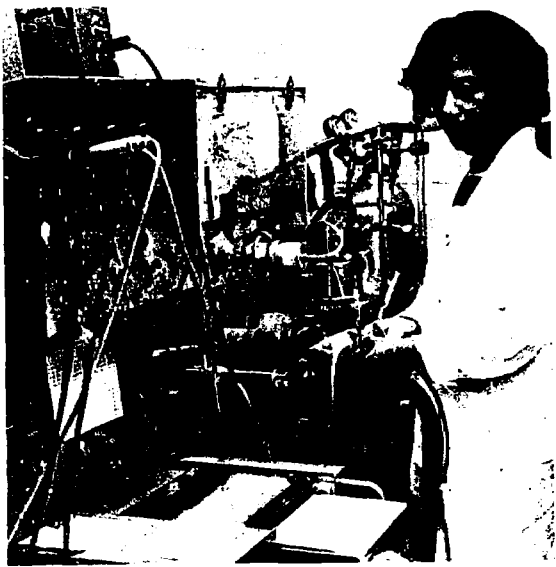
Aspirating a liquid sample into an Atomic Absorption Spectrophotometer. This unit determines trace metal concentrations in solution.



Body Plethysmograph measures flow resistance and compliance of lungs.

search sub-  
ocean

piratory re-  
tention of a



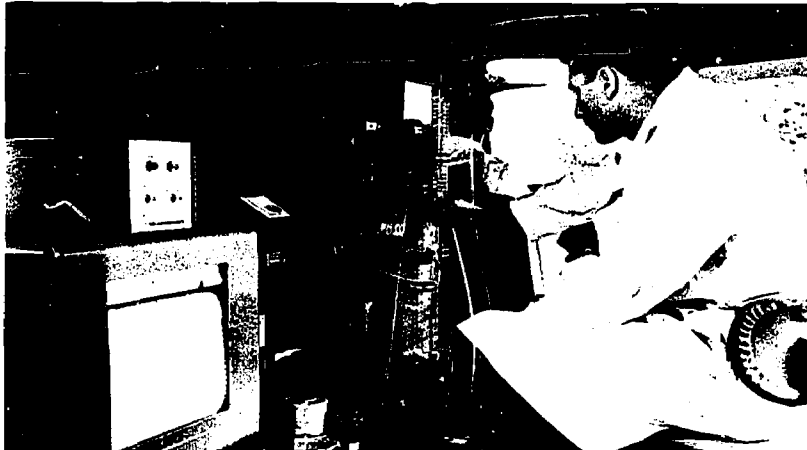
# Introduction

The Clean Air Act, as amended and subsequent amendments make provision for the development of qualified air pollution control personnel.

The Office of Manpower Development, National Air Pollution Control Administration, which has prime responsibility for this task, develops training opportunities at recognized institutions throughout the country.

In addition, this office awards a limited number of fellowships to qualified scholars who wish to pursue graduate studies in air pollution control at a recognized institution of their choice.

This catalogue lists the institutions that offer graduate and specialist training programs supported by this office and describes briefly the purpose, content, and requirements of these programs and of the air pollution special fellowship program.



**Above:**  
The interior of one of the air pollution sampling trucks operated by researchers in the New York University School of Engineering and Science. NYU carries on approximately \$2 million in air pollution-related research in medicine, engineering and science. It also operates graduate educational programs to train air pollution specialists in each of these fields.

**Above right:**  
West Virginia University graduate students attend a Morgantown, West Virginia city council meeting to see how local legislators think and function. In air pollution control, the scientific facts alone are not enough - the health and economic implications of the facts have to be explained to the public and fitted into political-governmental realities.

**Lower right:**  
Laboratory work at the University of Cincinnati.





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The purpose of the Graduate Training Program is to provide graduate level education for students to pursue careers in air pollution control.

## Graduate Training Program

graduate level education for qualified students who wish  
in air pollution control.

# Graduate Training Programs in Air Pollution and Biometeorology

## General Information:

Stipends are awarded for the support of persons who are interested in a career in the field of air pollution control.

The university program director has complete authority for the selection of students, and for the allocation of funds from a graduate training grant, the student must meet the minimum eligibility requirements:

1. Possess at least a Bachelor's degree.
2. Meet the usual requirements of the granting institution for admission as an advanced student, and be eligible for enrollment, as a regular full-time student.
3. Be appointed on a full-time basis.
4. Be a citizen of the United States, or a permanent resident of the United States for permanent residence. A non-immigrant visa may be appointed with prior approval.

Institutions receiving grants for the Graduate Training Programs in the following pages together with courses given, should list the names and addresses of program directors. For further information, programs and stipend levels may be ascertained by contacting the program directors.

# e g Programs llution eteorology

## **General Information:**

Stipends are awarded for the support of persons engaged full-time in preparation for a career in the field of air pollution control.

The university program director has complete responsibility for the selection of students, and for the allocation of funds thereto. To receive a stipend from a graduate training grant, the student must meet the following minimum eligibility requirements:

1. Possess at least a Bachelor's degree.
2. Meet the usual requirements of the graduate school of the grantee institution for admission as an advanced student, and be enrolled, or eligible for enrollment, as a regular full-time graduate student.
3. Be appointed on a full-time basis.
4. Be a citizen of the United States, or a non-citizen admitted to the United States for permanent residence. A non-citizen holding a temporary visa may be appointed with prior approval of the awarding unit.

Institutions receiving grants for the Graduate Training Program are listed in the following pages together with courses given, degrees conferred, and the names and addresses of program directors. Information regarding these programs and stipend levels may be ascertained by contacting the program directors.



### **Committee for Institutional Cooperation**

This graduate program aims to educate three types of environmental scientists: (1) the student who majors in biology and minors in meteorology, (2) the student who majors in meteorology and minors in biology, and (3) the engineering student seeking to become competent in the biometeorological aspects of air pollution. The program utilizes climatic chambers, biotrons, and field stations and draws upon the faculties of these CIC institutions. A student can obtain a doctorate in his major field, e.g., engineering, meteorology, physiology, geography, or zoology. For his minor, he concentrates on courses with a biometeorological orientation.

A candidate seeking admission to the program should have a broad undergraduate background in the animal, plant, physical, engineering, or medical sciences. His undergraduate record should indicate a capacity for graduate work. In addition, the candidate must be accepted or be currently enrolled as a student in good standing in a CIC graduate school and a department compatible with the program. The selection of trainees is made by the Executive Committee of the CIC Biometeorology Graduate Program.

Participating universities are:

University of Chicago, Chicago, Illinois  
University of Illinois, Champaign, Urbana, Illinois  
Indiana University, Bloomington, Indiana  
University of Iowa, Iowa City, Iowa  
University of Michigan, Ann Arbor, Michigan  
Michigan State University, Lansing, Michigan  
University of Minnesota, Minneapolis, Minnesota  
Northwestern University, Evanston, Illinois  
Ohio State University, Columbus, Ohio  
Purdue University, Lafayette, Indiana  
University of Wisconsin, Green Bay, Wisconsin

Inquiries concerning this program should be addressed to the Program Director: Dr. Frederick Sargent, II, Dean, College of Environmental Sciences, University of Wisconsin, Green Bay, Wisconsin, 54301.

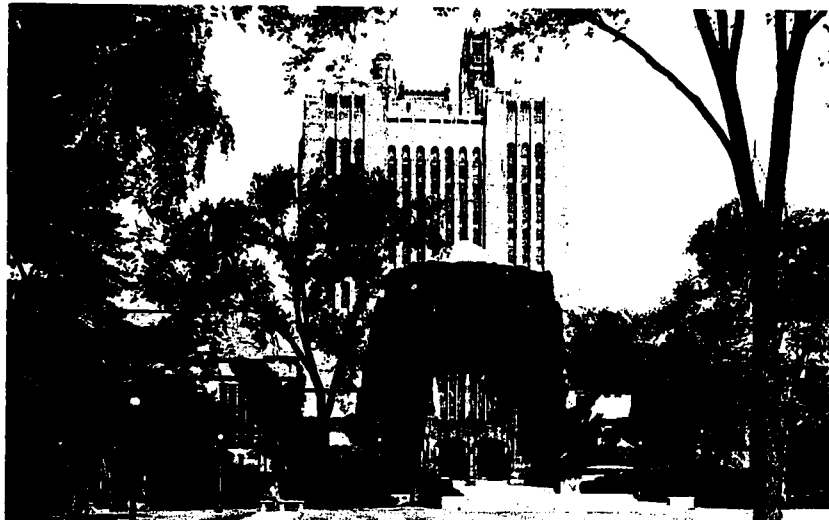
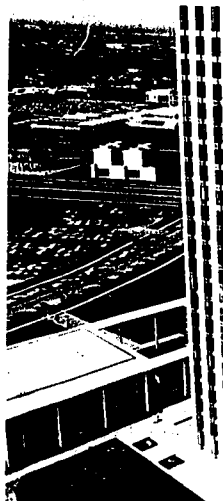


(left) The Kline Biology tower at Yale University houses research laboratories for the Biology and Molecular Biology departments.

(below left) Sterling Memorial Library at Yale University. There are more than four million books in the Yale Library, and most of them are housed in this building.

(right) This tower and low-rise dormitories in the foreground are only one half of the University of Kentucky's 22 million dollar residence hall complex.

(below right) This new building complex at the University of Southern California includes (left to right): The Von Klein Smid Center for International and Public Affairs, Social Sciences building, and the Waite Phillips Hall of Education.

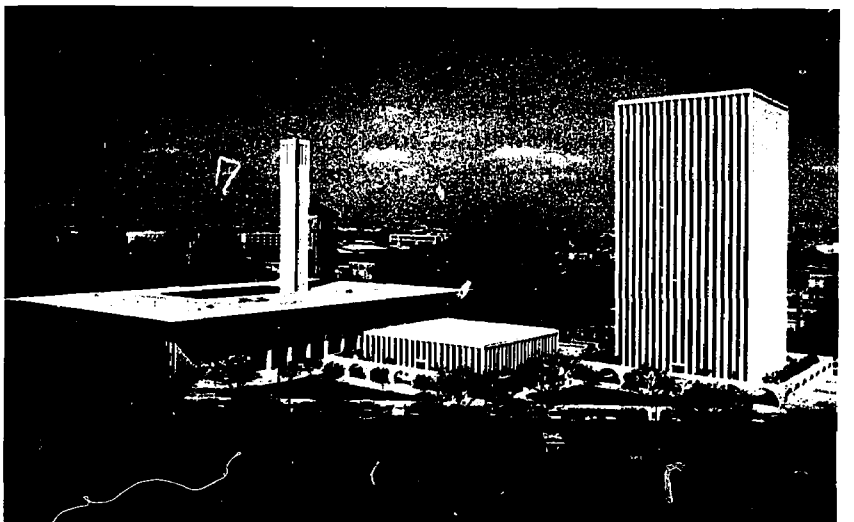


(left) The Kline Biology tower at Yale University houses research laboratories for the Biology and Molecular Biology departments.

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(below right) This new building complex at the University of Southern California includes (left to right): The Von Klein Smid Center for International and Public Affairs, Social Sciences building, and the Waite Phillips Hall of Education.



# Sponsored Graduate Programs

## University of Southern California Los Angeles, California

The purpose of the training program in the School of Medicine is to provide two years of advanced training for M.D.'s in Applied Pulmonary Physiology and Pulmonary Diseases, with a foundation and orientation in the basic aspects of air pollution and its biological effects on health.

Trainees engage in independent research under supervision of a senior member of the faculty and attend weekly seminars and other clinical conferences, seminars, and lectures.

The training program has four segments:

### 1. Basic Atmospheric Sciences

The purpose of this segment is to provide formal training in depth in specific aspects of the total air pollution problem which are important for future pulmonary physician-physiologists.

### 2. Thoracic Medicine

The purpose of this segment, covering a 6-month period is to provide intensive and realistic experience in the management of patients with pulmonary disease and an understanding of the natural history, pathophysiology, and social and environmental factors related to respiratory diseases.

### 3. Pulmonary Physiology

During this 1-year period, trainees receive detailed instruction concerning ventilatory function, respiratory gas exchange, and applied physiology of exercise.

### 4. Independent Study and Research

During the final six months, each trainee is encouraged to select a problem in the field of pulmonary physiology, pathology, or disease with or without relevance to air pollution and to pursue it in depth.

For additional information write to the Program Director: Dr. Clayton G. Loosli, Hasting Professor of Medicine, School of Medicine, University of Southern California, 2025 Zonal Avenue, Los Angeles, California 90033.

## Yale University New Haven, Connecticut

The objective of the program is to provide advanced training in other specializations in relationships between air pollution and health.

Four semesters of research and a thesis are required.

Air pollution program includes:

Control of Air Pollution  
Reading in Health  
Epidemiology  
Public Health  
Air Pollution  
Respiratory

For additional information write to the Program Director: Dr. Clayton G. Loosli, Hasting Professor of Medicine, School of Medicine, University of Southern California, 2025 Zonal Avenue, Los Angeles, California 90033.

## University of Illinois Chicago, Illinois

This university has a program in Biometeorology.

Doctoral programs in geography and air pollution are discussed in the program plan.

For additional information write to the Program Director: Dr. Clayton G. Loosli, Hasting Professor of Medicine, School of Medicine, University of Southern California, 2025 Zonal Avenue, Los Angeles, California 90033.

**University of Southern California**  
Los Angeles, California

The purpose of the training program in the School of Medicine is to provide two years of advanced training for M.D.'s in Applied Pulmonary Physiology and Pulmonary Diseases, with a foundation and orientation in the basic aspects of air pollution and its biological effects on health.

Trainees engage in independent research under supervision of a senior member of the faculty and attend weekly seminars and other clinical conferences, seminars, and lectures.

The training program has four segments:

**1. Basic Atmospheric Sciences**

The purpose of this segment is to provide formal training in depth in specific aspects of the total air pollution problem which are important for future pulmonary physician-physiologists.

**2. Thoracic Medicine**

The purpose of this segment, covering a 6-month period is to provide intensive and realistic experience in the management of patients with pulmonary disease and an understanding of the natural history, pathophysiology, and social and environmental factors related to respiratory diseases.

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During the final six months, each trainee is encouraged to select a problem in the field of pulmonary physiology, pathology, or disease with or without relevance to air pollution and to pursue it in depth.

For additional information write to the Program Director: Dr. Clayton G. Loosli, Hasting Professor of Medicine, School of Medicine, University of Southern California, 2025 Zonal Avenue, Los Angeles, California 90033

**Yale University**

New Haven, Connecticut

The objective of this program in the School of Medicine is to develop environmental epidemiologists and other specialists to study and research the interrelationships between air pollution and human health.

Four semesters, one 10-week summer session, and a thesis are required for the M.P.H. degree.

Air pollution related courses offered in this program include:

- Control of Community Air Pollution
- Air Sampling and Analysis
- Readings in Air Resources and Pollution
- Health Effects of Air Pollution
- Epidemiology (research)
- Public Health Practice (research)
- Air Pollution Meteorology
- Respiratory Physiology

For additional information write to the Program Director: Eric W. Mood, Associate Professor of Public Health, School of Medicine, Yale University, New Haven, Connecticut 06510.

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**University of Chicago (CIC Affiliate)**  
Chicago, Illinois

This university is one of eleven which offer the CIC Biometeorology Program.

Doctoral programs are available in meteorology, geography and ecology. Biometeorological aspects are discussed in their relationship to these fields.

● For additional information pertaining to the CIC Program please see page two.

**University of Florida**  
Gainesville, Florida

The purpose of this program offered by the Department of Environmental Engineering is to provide advanced, specialized education for graduate engineers and scientists in air pollution control. The program is arranged individually for each student. In addition to specialized air pollution studies the student acquires a knowledge of the broad aspects of environmental engineering and an understanding of the principles and problems of related disciplines. To achieve this all students are required to participate in a departmental core program. Degree programs include the Doctor of Philosophy and the thesis and non-thesis Masters.

Ph.D. candidates attend the entire series of air pollution courses and do additional work in environmental engineering to complete the major portion of their program. In addition to his major, the student may select a minor in another discipline; however, this is not required in any of the degree programs. A dissertation based on original research is required.

Air pollution related courses offered in this program include:

- Man and His Environment
- Occupational Health
- Atmospheric Pollution
- Environmental Instrumentation
- Air Pollution Sampling and Analysis
- Air Pollution Control
- Meteorology
- Environmental Micrometeorology

For additional information write to Program Director: Dr. Robert S. Sholtes, Air Pollution Research Laboratories, Department of Environmental Engineering, University of Florida, Gainesville, Florida 32601.

**University of Illinois (CIC Affiliate)**  
Champaign, Urbana, Illinois

This university is one of eleven which offer the CIC Biometeorology Program.

Doctoral programs are available in meteorology, geography and ecology. Biometeorological aspects are discussed in their relationship to these fields.

The Department of Geography offers courses for undergraduates and graduates in climatology. Three graduate courses are conducted jointly with the Department of Physiology and Biophysics: Fundamentals of Bioclimatology, Experimental Bioclimatology, and Advanced Bioclimatology. Advanced undergraduate and graduate instruction in air pollution control is provided by the College of Engineering; graduate courses in physiological ecology are provided by the Department of Zoology. Controlled environmental chambers for studying small animals and human beings are housed in the Physical Environment Unit, Department of Physiology and Biophysics, and Department of Zoology. Computer facilities are available in the Digital Computer Laboratory.

For additional information pertaining to the CIC Program please see page two.

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**Purdue University (CIC Affiliate)** Lafayette, Indiana

This university is one of eleven which offer the CIC

Instruction in meteorology and biometeorology is offered by the Departments of Geosciences, Agronomy, and Animal Sciences and includes Survey of Meteorology, Introduction to Meteorology, Micrometeorology, Microclimatology, Statistical Climatology, Biometeorology, Physical Meteorology, Environmental Instrumentation, Environmental Physiology of Domestic Animals, and Bioclimatology of Domestic Animals.

Facilities include the Herrick Laboratories, containing two large environmental chambers in which

**University of Illinois** (CIC Affiliate)  
Champaign, Urbana, Illinois

This university is one of eleven which offer the CIC Biometeorology Program.

Doctoral programs are available in meteorology, geography and ecology. Biometeorological aspects are discussed in their relationship to these fields.

The Department of Geography offers courses for undergraduates and graduates in climatology. Three graduate courses are conducted jointly with the Department of Physiology and Biophysics: Fundamentals of Bioclimatology, Experimental Bioclimatology, and Advanced Bioclimatology. Advanced undergraduate and graduate instruction in air pollution control is provided by the College of Engineering; graduate courses in physiological ecology are provided by the Department of Zoology. Controlled environmental chambers for studying small animals and human beings are housed in the Physical Environment Unit, Department of Physiology and Biophysics, and Department of Zoology. Computer facilities are available in the Digital Computer Laboratory.

For additional information pertaining to the CIC Program please see page two.

**Northwestern University** (CIC Affiliate)  
Evanston, Illinois

This university is one of eleven which offer the CIC Biometeorology Program.

The concepts of biometeorology are included in a year-long graduate course entitled "Perspectives in Environmental Biology and Behavior." This course is staffed by approximately 36 visiting authorities. The general topics include the geophysical environment, bioclimatology, physiological ecology, animal behavior, systematics and evolution, community interrelationships, community evolution, and biogeography.

Research training efforts are directed toward investigations of mechanisms and functional roles of biological rhythms, especially with respect to their relationships to fluctuations in the physical environment.

For additional information pertaining to the CIC Program please see page two.

**Purdue University** (CIC Affiliate) Lafayette, Indiana

This university is one of eleven which offer the CIC Biometeorology Program.

Instruction in meteorology and biometeorology is offered by the Departments of Geosciences, Agronomy, and Animal Sciences and includes Survey of Meteorology, Introduction to Meteorology, Micrometeorology, Microclimatology, Statistical Climatology, Biometeorology, Physical Meteorology, Environmental Instrumentation, Environmental Physiology of Domestic Animals, and Bioclimatology of Domestic Animals.

Facilities include the Herrick Laboratories, containing two large environmental chambers in which

both temperature and humidity can be controlled, and three smaller chambers in which only temperature can be controlled over a rather limited range. Temperature and humidity programming equipment have been installed in the large chambers. The Department of Agronomy has a mobile micrometeorology field laboratory, which is operated in cooperation with the Environmental Science Services Administration agricultural weather service.

For additional information pertaining to the CIC Program please see page two.

## University of Kentucky

Lexington, Kentucky

The objective of the Graduate Program in Air Pollution Control offered in the College of Engineering is to provide academic and research training leading to the M.S. and Ph.D. degrees. Engineers will be prepared to participate in virtually all phases of activities of Federal, state, and municipal agencies, health departments, and industrial or research establishments involved in the prevention and abatement of atmospheric pollution.

The requirements for the M.S. degree, which can be completed in twelve months, are: five 3-semester-hour core courses, three 3-hour courses selected from optional courses or from suitable elective courses re-

placed by two additional courses. A seminar is scheduled one afternoon every two weeks to acquaint trainees with the latest developments in the field. M.S. degrees are awarded in chemical engineering, civil engineering, and mechanical engineering. Students with B.S. degrees in chemistry or physics are also eligible for the program.

Air pollution related courses offered in this program include:

Fundamentals I: Atmospheric chemistry and thermodynamics, meteorological concepts and stack diffusion.

Fundamentals II: Source control, gaseous and

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## Harvard University

Boston, Massachusetts

The air pollution training program is offered by the staff of the Kresge Center for Environmental Health. This center is composed of the Departments of Environmental Health Sciences, Physiology, and Sanitary Engineering. Fundamental and applied research on the biological, physical, and chemical aspects of air pollution control play a major role in the activities of the center, and this is reflected in the training program. Through the cooperation of other Graduate Schools within the university, related courses are available on the planning, administrative and economic aspects of the subject.

Individuals specializing in air pollution control may pursue a program leading to the degrees of Master or Doctor of Science in Hygiene. Students receive intensive training in air pollution control, supplement-

ed by a broad background in environmental health, including industrial hygiene, radiological health, and toxicology.

Since experience has shown that protection of the air environment requires trained personnel in a variety of basic disciplines, this program encourages the participation of engineers, physicians, and students holding degrees in chemistry, physics, mathematics, biology and pharmacy.

Harvard offers the following:

Community Air Pollution  
Meteorological Aspects of Air Pollution  
Identification and Measurement of Air Contaminants, I and II  
Acrosol Technology



Air Pollution Engineering is leading to all be pre- health de- blishments of atmos-

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placed by two additional courses. A seminar is scheduled one afternoon every two weeks to acquaint trainees with the latest developments in the field. M.S. degrees are awarded in chemical engineering, civil engineering, and mechanical engineering. Students with B.S. degrees in chemistry or physics are also eligible for the program.

Air pollution related courses offered in this program include:

Fundamentals I: Atmospheric chemistry and thermodynamics, meteorological concepts and stack diffusion.

Fundamentals II: Source control, gaseous and

particulate pollutant separation, legal and administrative aspects.

Engineering and Economics: Combustion principles, fuels and emission and field sampling.

Air Sampling and Analysis: Statistics of sampling, analytical procedures and laboratory determinations.

Public Health Aspects: Epidemiology, effects on the environment, solid waste disposal and water pollution interrelation.

For additional information, write to the Program Director: Dr. Robert B. Grieves, Professor and Chairman of Chemical Engineering, University of Kentucky, Lexington, Kentucky 40506.

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Since experience has shown that protection of the air environment requires trained personnel in a variety of basic disciplines, this program encourages the participation of engineers, physicians, and students holding degrees in chemistry, physics, mathematics, biology and pharmacy.

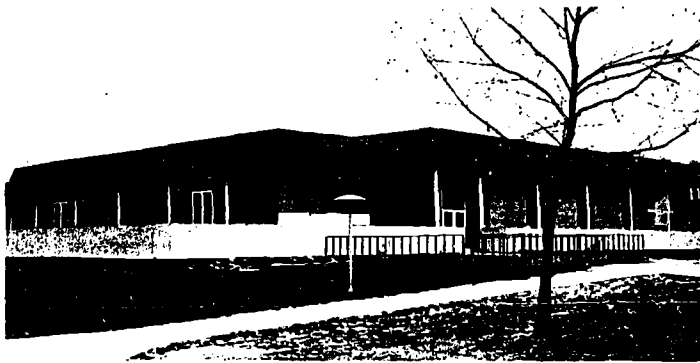
Harvard offers the following:

Community Air Pollution  
Meteorological Aspects of Air Pollution  
Identification and Measurement of Air Contaminants, I and II  
Aerosol Technology

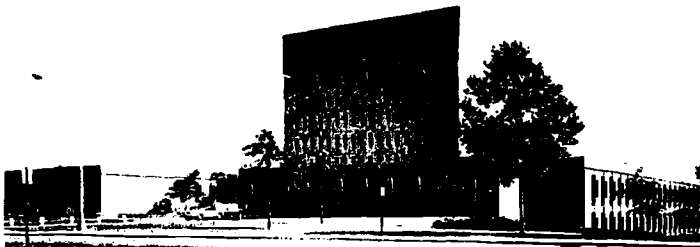
Biostatistics and Epidemiology

Basic Problems in Occupational Health and Industrial Environments  
Environmental Control  
Urban Environmental Service Systems  
Legal Protection of Environmental Quality  
Operations Research in Environmental Health Engineering  
Human Physiology  
Principles of Toxicology

Further information may be obtained by contacting: Dr. Dade M. Moeller, Associate Director, Kresge Center for Environmental Health, Harvard School of Public Health, 665 Huntington Avenue, Boston, Massachusetts 02115.



Chrysler Center for Continuing Engineering Education, University of Michigan.



Institute of Science and Technology at the University of Michigan.



Astronomy buildings at the University of Michigan.



A pioneering air pollution wind tunnel at the New York University School of Engineering and Science. Elaborate scale model tests in this tunnel have solved scores of atmospheric pollution problems and led to advances in pollution research and control technology.

**University of Iowa** (CIC Affiliate) Iowa City, Iowa

This university is one of eleven which offer the CIC Biometeorology Program.

Doctoral programs are available in meteorology, geography and ecology. Biometeorological aspects are discussed in their relationship to these fields.

The Department of Physiology and Biophysics conducts a laboratory course in environmental physiology. This department has several environmental chambers and a summer biological station (The Lakeside Laboratory), where courses in field biology are taught. The department also offers courses in medical physics. Other basic science departments conduct

courses in toxicology, chemobiodynamics, mammalian radiobiology, microbial physiology, and population biology (ecology). The Department of Preventive Medicine and Environmental Health teaches three courses related to biometeorology: Environmental Biology, Epidemiology, and Industrial Hygiene. The Department of Geography offers courses in climatology and cartology. Biometeorological research in the Department of Physiology and Biophysics deals with mammalian responses to hostile environments including studies on hibernation and space effects.

For additional information pertaining to the CIC Program please see page two.

**Indiana University**  
Bloomington, Indiana

This university is one of eleven which offer the CIC Biometeorology Program.

Indiana University offers a graduate program in environmental meteorology, and physiology are among the research areas. Courses are available in natural resources and ecology. Research facilities include environmental chambers among various rooms and a 2-man laboratory. The University Corporation for Atmospheric Research graduate students.

For additional information pertaining to the CIC Program please see page two.

**University of Michigan** Ann Arbor, Michigan

The purpose of the air pollution program offered in the School of Public Health is to train graduate students of engineering and physical sciences in research and in the development of air pollution control methods and to increase the number of air-pollution-oriented scientists available to government and industry.

Graduate degree candidates in the Departments of Engineering and Meteorology as well as in the School of Public Health are eligible to participate in the interdepartmental air pollution training program. All participants study the four core courses listed below.

All Master's degree candidates attend an interdepartmental seminar for two semesters. Ph.D. candidates are required to attend a total of four semesters and to present a report on their research and thesis project.

Air pollution related courses offered in this program include:

- Combustion and Air Pollution Control
- Health Factors in Air Pollution
- Interdisciplinary Seminar in Air Pollution
- Air Pollution Meteorology

Two additional courses are required of Ph.D. candidates and Master's candidates in the air pollution program for more than one year:

- Analysis of Air Pollutants
- Advanced Seminars in Air Pollution

For additional information write to the Program Director: Professor Harold J. Magnuson, M.D., Chairman, Department of Industrial Health, School of Public Health, W5634 University Hospital, University of Michigan, Ann Arbor, Michigan 48104.

**University of Michigan**  
Ann Arbor, Michigan

This university is one of eleven which offer the CIC Biometeorology Program.

Degree programs in environmental meteorology and the College of Public Health, M.P.H. are available in the Department of Environmental Health. The Department has well-equipped laboratories for air pollution problems. In addition, the Department offers M.S. and Ph.D. degree programs in the Departments of Meteorology and Mechanical Engineering. The Department is working with other departments on air pollution problems.

For additional information pertaining to the CIC Program please see page two.

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courses in toxicology, chemobiodynamics, mammalian radiobiology, microbial physiology, and population biology (ecology). The Department of Preventive Medicine and Environmental Health teaches three courses related to biometeorology: Environmental Biology, Epidemiology, and Industrial Hygiene. The Department of Geography offers courses in climatology and cartology. Biometeorological research in the Department of Physiology and Biophysics deals with mammalian responses to hostile environments including studies on hibernation and space effects.

For additional information pertaining to the CIC Program please see page two.

**Indiana University (CIC Affiliate)**  
Bloomington, Indiana

This university is one of eleven which offer the CIC Biometeorology Program.

Indiana University provides a strong graduate program in environmental biology. Limnology, population ecology, and environmental and high altitude physiology are among the areas of especially active research. Courses are available in climatology, conservation of natural resources, and environmental biology. Research facilities include several environmental chambers among which are environment-controlled rooms and a 2-man altitude chamber. The facilities of the University Computing Center are available to graduate students.

For additional information pertaining to the CIC Program please see page two.

Air pollution related courses offered in this program include:  
 Combustion and Air Pollution Control  
 Health Factors in Air Pollution  
 Interdisciplinary Seminar in Air Pollution  
 Air Pollution Meteorology

Two additional courses are required of Ph.D. candidates and Master's candidates in the air pollution program for more than one year:  
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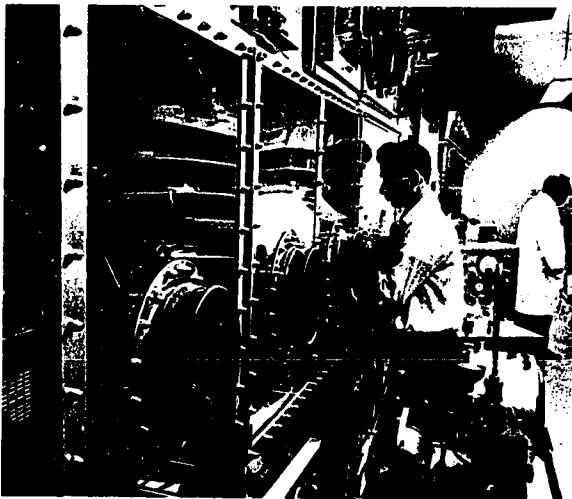
**University of Michigan (CIC Affiliate)**  
Ann Arbor, Michigan

This university is one of eleven which offer the CIC Biometeorology Program.

Degree programs which emphasize air pollution problems are available in the School of Public Health and the College of Engineering. In the School of Public Health, M.P.H. and Ph.D. degree programs are available in the Departments of Industrial Health and Environmental Health. The former department has well-equipped laboratories associated with air pollution problems. In the College of Engineering, M.S. and Ph.D. degree programs are available in the Departments of Meteorology and Oceanography, Mechanical Engineering, and Chemical and Metallurgical Engineering with emphasis on air pollution control. All three departments have research activities and laboratories working on current air pollution problems.

For additional information pertaining to the CIC Program please see page two.

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Generations of laboratory animals are born, live and die in these isolation chambers at the New York University Institute of Environmental Medicine, enabling researchers to study the effects of long term, low-level exposure to various types and combinations of air pollutants.



Graduate students in meteorology at the New York University School of Engineering and Science study the recorded trajectories of "tetroons", constant-altitude balloons flown over New York City in a New York University-United States Weather Bureau study of how air circulation patterns influence the movement, dispersion, and mixing of air pollutants over the Metropolitan area.



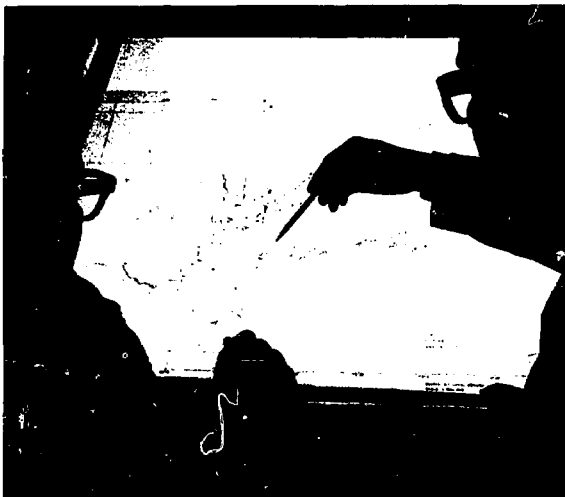
Automobile test laboratory at Ohio State University.

Air sanitation laboratory, Rogers' Hall, Ohio State University.





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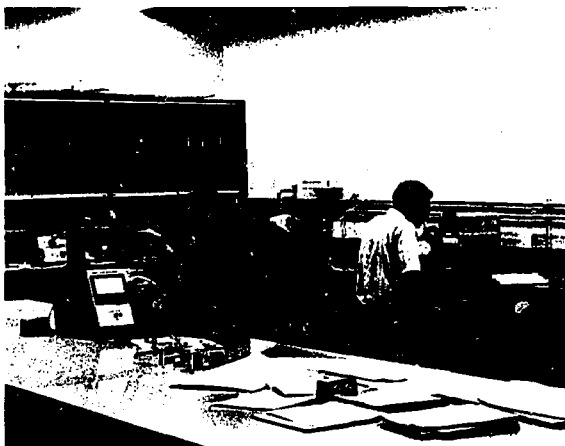
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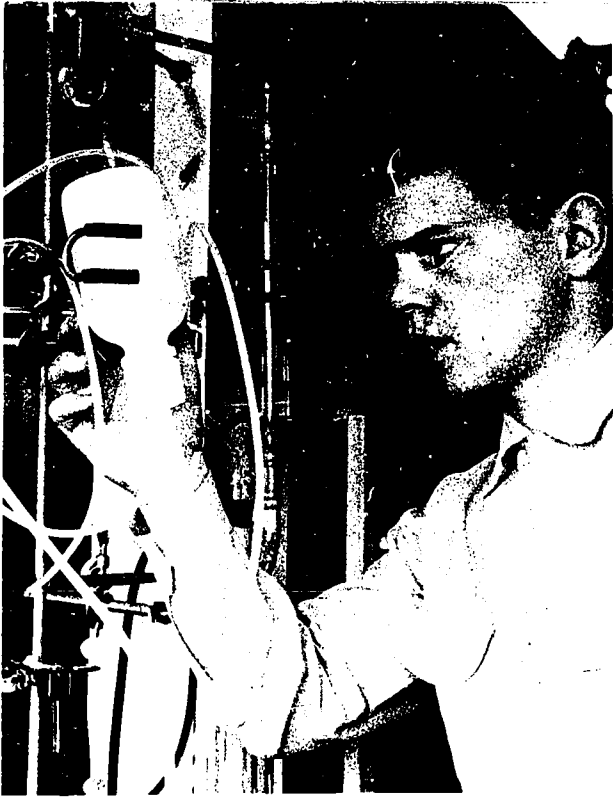


New York University's own extensive air pollution research program and the university's location in New York City make all advanced pollution research and control equipment available to graduate students in the NYU Air Resources Training Program.



Air sanitation laboratory, Rogers' Hall, Ohio State University.





A laboratory study at the University of Minnesota.

**New York University** New York, New York

The purpose of this program is to offer graduate students a coordinated interdepartmental program leading to the M.S. degree in either civil engineering, chemical engineering, or meteorology\* with a strong common minor in the field of air pollution. In this way it is intended not only to train students to participate in air pollution control and research programs, but also to increase their technical competence in the field of individual specialization.

The training course covers a full calendar year. Formal course work is taken in the fall and spring semester; the summer is devoted to thesis research or to participation in an existing on-campus research project and the writing of a research paper.

All students are required to take the five courses listed below. The total requirement for the Master's degree is 36 units. Additional course electives, including research thesis or other departmental requisites for the degree, comprise the balance. The degree is

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York University

**Oregon State University** Corvallis, Oregon

This program provides academic and research training for the M.S. and Ph.D. degrees to prepare engineers and scientists for professional careers in atmospheric pollution control in public and private agencies and industries concerned with solving air pollution problems.

Requirements for the M.S. degree are 30 hours in the major field and 15 hours in the minor. For the Ph.D. degree, approximately 135 hours are required, of which 80 are in the major and 30 to 50 are allotted to the thesis.

Individual programs are adjusted to fit the student's interests and needs.

Air pollution related courses offered in this program include:

Fundamentals of Air Sanitation  
Measurement and Control of Air Pollutants  
Industrial Hygiene  
Seminar on Atmospheric Environment  
Thesis

For additional information write to the Program Director: Dr. Richard W. Boubel, Professor of Mechanical Engineering, Oregon State University, Corvallis, Oregon 97331.

**Oregon Tech**  
Klamath Falls,

Air pollution  
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**New York University** New York, New York

The purpose of this program is to offer graduate students a coordinated interdepartmental program leading to the M.S. degree in either civil engineering, chemical engineering, or meteorology\* with a strong common minor in the field of air pollution. In this way it is intended not only to train students to participate in air pollution control and research programs, but also to increase their technical competence in the field of individual specialization.

The training course covers a full calendar year. Formal course work is taken in the fall and spring semester; the summer is devoted to thesis research or to participation in an existing on-campus research project and the writing of a research paper.

All students are required to take the five courses listed below. The total requirement for the Master's degree is 36 units. Additional course electives, including research thesis or other departmental requisites for the degree, comprise the balance. The degree is

granted by the Department which has academic jurisdiction over the student.

Air pollution related courses offered in this program include:

- Air Pollution Analysis
- Air Pollution Chemistry
- Microclimate and Dispersion of Pollutants
- Environmental Health Engineering-Air Pollution Engineering Control
- Air Pollution Effects

Additional related courses are available in the Department of Aeronautics and Astronautics and the School of Environmental Medicine.

For additional information write to Program Director: Dr. James P. Friend, Associate Professor, Department of Meteorology and Oceanography, New York University, Bronx, New York 10453.

**Oregon Technical Institute**  
Klamath Falls, Oregon

Air pollution control technicians are trained in a 2-year associate degree program supported in part by a supplement to the grant to Oregon State University. Special emphasis is placed upon the training of air pollution control technicians. Students receive a sound foundation in basic sciences and instruction in air pollution measurement techniques. Standardization of sampling and analytical techniques for all common air pollutants is emphasized. High school graduates or junior college students may contact Associate Professor E. A. Wellman, Department of Environmental Health Technology, Oregon Technical Institute, Klamath Falls, Oregon 97601.

Air pollution related courses offered in this program include:

- Fundamentals of Air Sanitation
- Measurement and Control of Air Pollutants
- Industrial Hygiene
- Seminar on Atmospheric Environment
- Thesis

For additional information write to the Program Director: Dr. Richard W. Boubel, Professor of Mechanical Engineering, Oregon State University, Corvallis, Oregon 97331.



**Michigan State University (CIC Affiliate)**  
Lansing, Michigan

This university is one of eleven which offer the CIC Biometeorology Program.

Instruction in meteorology, climatology, and ecology is available. The Department of Agricultural Engineering offers Introduction to Meteorology, Introduction to Meteorology Laboratory, Microclimatology, Measurement Systems, Physical Meteorology, Dynamic Meteorology, and Atmospheric Turbulence. The Department of Geography offers Physical Geography, Climates of the World, and Advanced Physical Climatology. Facilities are available for research in micrometeorology, agricultural meteorology, plant and animal ecology, and environmental biology.

**Ohio State University (CIC Affiliate)**  
Columbus, Ohio

This university is one of eleven which offer the CIC Biometeorology Program.

The College of Biological Sciences offers courses concerned with plant and animal physiology and ecology and environmental biology. In the Department of Preventive Medicine of the College of Medicine, courses are available on environment and man, environmental toxicology, industrial engineering, physical measurements, numerical computation, environmental physiology, and preventive medicine. The Department of Geography and the Institute of Polar Studies offer courses in meteorology and climatology.

Ohio State has a variety of facilities and programs related to biometeorology. These facilities are used to evaluate the impact of air pollutants on swine physiology and behavior. An extensive analog computational facility is available for the solution of a variety of problems in systems analysis.

**University of Minnesota (CIC Affiliate)**  
Minneapolis, Minnesota

This university is one of eleven which offer the CIC Biometeorology Program.

The following ecologically oriented courses of interest to a biometeorologist are offered by the Department of Ecology and Behavioral Biology: Entomology, Fisheries, and Wildlife, Zoology, Soil Science, Population Dynamics, Experimental Ecology, Ecology of Soil Microorganisms, Structure and Function of Ecosystems, Wetland Ecology, Soils and the Ecosystem, Theory and Practice in Environmental Measurement, Physiological Ecology, Insect Ecology, and

Ecological Physiology. Courses relating to air pollution control are offered by the School of Public Health and College of Engineering.

Facilities are available for research on environmental biology, chronobiology, air pollution, and agricultural meteorology.

e) **Ohio State University (CIC Affiliate)**

Columbus, Ohio

This university is one of eleven which offer the CIC Biometeorology Program.

The College of Biological Sciences offers courses concerned with plant and animal physiology and ecology and environmental biology. In the Department of Preventive Medicine of the College of Medicine, courses are available on environment and man, environmental toxicology, industrial engineering, physical measurements, numerical computation, environmental physiology, and preventive medicine. The Department of Geography and the Institute of Polar Studies offer courses in meteorology and climatology.

Ohio State has a variety of facilities and programs related to biometeorology. These facilities are used to evaluate the impact of air pollutants on swine physiology and behavior. An extensive analog computational facility is available for the solution of a variety of problems in systems analysis.

In addition, two field stations are maintained by the university for a variety of year-round teaching and research programs.

The Wildlife Research Unit, a cooperative unit of the university and the State of Ohio, has available for basic ecological research 3000 acres of marshland located along the south shore of Lake Erie. This unit also is equipped to measure climatic parameters and is able to track, by telemetry, the movements of both game birds and mammals.

Associated with the university is the Institute of Polar Studies, which is concerned with a broad spectrum of cold-region research, including biometeorology.

Ecological Physiology. Courses relating to air pollution control are offered by the School of Public Health and College of Engineering.

Facilities are available for research on environmental biology, chronobiology, air pollution, and agricultural meteorology.



The University of Minnesota at Minneapolis

## University of Cincinnati Cincinnati, Ohio

The University of Cincinnati offers a graduate training program in air pollution within two departments with the objective of providing a broad base of essential fundamental principles, a depth of knowledge in specialized fields, and research training under the guidance of experienced scientists and engineers. The student may elect to take his degree program in either the College of Medicine, Department of Environmental Health, or the College of Engineering, Division of Environmental Health Engineering. Under the auspices of the interdepartmental Center for the Study of the Human Environment students receive the opportunity to participate in other departments such as Chemical and Metallurgical Engineering, Chemistry, Community Planning, Geography, Sociology, and Anthropology. Different programs are available leading to the degrees of M.S. or Ph.D.

Available at the Department of Environmental Health are well-equipped laboratories for research in

measuring and monitoring pollutants, toxicology, biological sciences, and environmental medicine, as well as library and computer facilities. Available at the Division of Environmental Health Engineering are chemical, microbiological, and pilot-plant laboratories. New facilities being constructed include air pollution control laboratories.

Air pollution related courses offered in this program include:

- Air Pollution Chemistry
- Air Pollution Control Methods
- Air Sampling and Analysis
- Automotive Air Pollution and Control
- Biological Effects of Air Pollutants
- Design of Air Pollution Control Systems
- Environmental Health Seminar
- Environmental Health and Community Planning
- Environmental Hygiene Technology

## University of Minnesota Minneapolis, Minnesota

The Air Pollution Control Training Program of the Environmental Health Section of the School of Public Health has the following aims: (1) to increase the number of competent, well-trained engineers, chemists, and other scientists available for research and training in the technical aspects of air pollution and air pollution control; (2) to prepare selected individuals for service in air pollution control programs; (3) to indoctrinate students of different disciplines and from different departments of the university with the problems of air pollution in community life.

A candidate for the M.S. or M.P.H. degree in environmental health with specialization in air pollution control attends the core curriculum and elective courses suitable for his academic background,

The candidates for the Ph.D. degree are selected

individuals who possess a suitable science background. In a minimum 3-year program, the trainee majors in environmental health and selects a minor program related to his previous academic training.

Air pollution related courses offered in this program include:

- Elements of Public Health I, II, III
- Environmental Health
- Epidemiology I
- Public Health Administration
- Biometry
- Sanitary Biology
- Public Health Seminar
- Environmental Health Seminar

Specialty courses offered for the M.S. or M.P.H. Degree are:

Introduction to the Air Pollution Problem

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Air pollution related courses offered in this program include:

- Air Pollution Chemistry
- Air Pollution Control Methods
- Air Sampling and Analysis
- Automotive Air Pollution and Control
- Biological Effects of Air Pollutants
- Design of Air Pollution Control Systems
- Environmental Health Seminar
- Environmental Health and Community Planning
- Environmental Hygiene Technology

- Environmental Sanitation
- Epidemiology
- Fuels and Fuel Technology
- Industrial Ventilation
- Introduction to Biostatistics
- Introduction to Environmental Health
- Introduction to Toxicology
- Physiology and Biological Chemistry
- Public Health Meteorology
- Seminar in Experimental Design
- Small Particle Technology
- Toxicologic Aspects of the Environment

For additional information, write to: the Program Director: Professor J. Cholak, Department of Environmental Health, University of Cincinnati, Cincinnati, Ohio 45219; or to Professor John N. Pattison, Division of Environmental Health Engineering, University of Cincinnati, Cincinnati, Ohio 45221.

individuals who possess a suitable science background. In a minimum 3-year program, the trainee majors in environmental health and selects a minor program related to his previous academic training.

Air pollution related courses offered in this program include:

- Elements of Public Health I, II, III
- Environmental Health
- Epidemiology I
- Public Health Administration
- Biometry
- Sanitary Biology
- Public Health Seminar
- Environmental Health Seminar

Specialty courses offered for the M.S. or M.P.H. Degree are:

- Introduction to the Air Pollution Problem

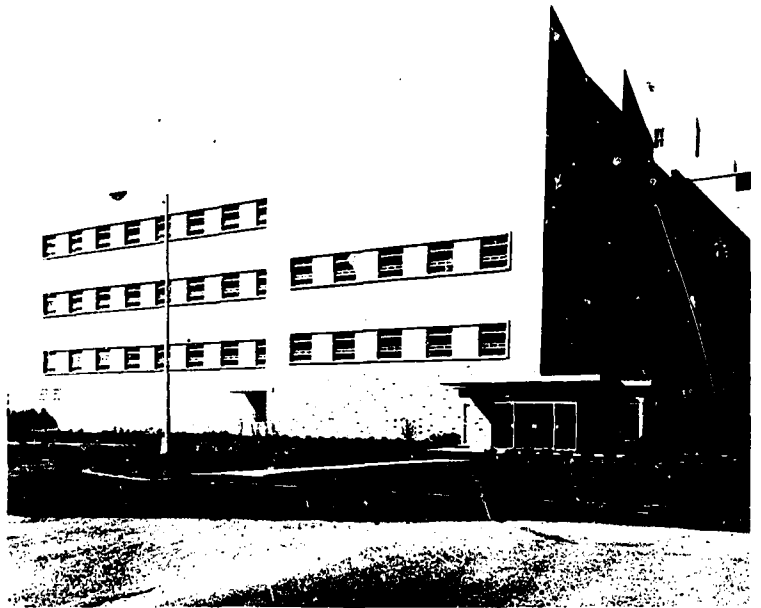
- Air Pollution Control
- Air Analysis
- Air Pollution Projects
- Topics in Air Pollution Control
- Industrial Hygiene Engineering
- Particle Technology
- Air Pollution Meteorology

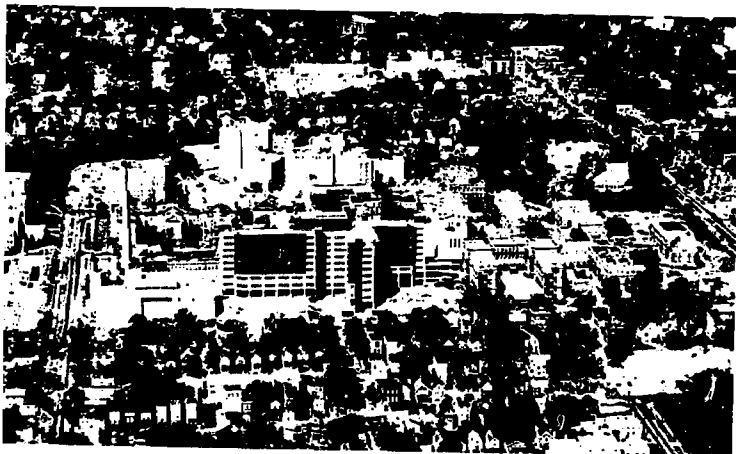
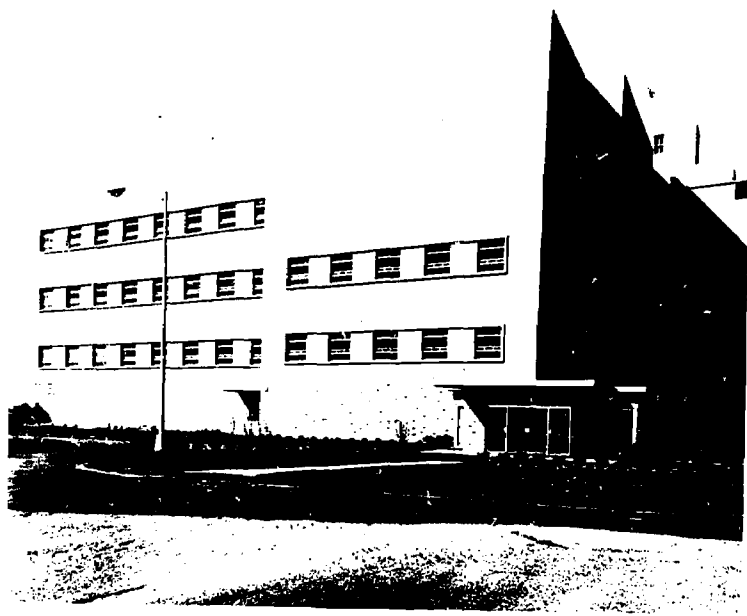
The curriculum for the doctoral degree is designed to accommodate the academic background and desire of each student. Courses are available in all departments of the university.

For additional information write to the Program Director: Dr. Gaylord Anderson or Professor Harold Paulus, School of Public Health, University of Minnesota, Minneapolis, Minnesota 55455.

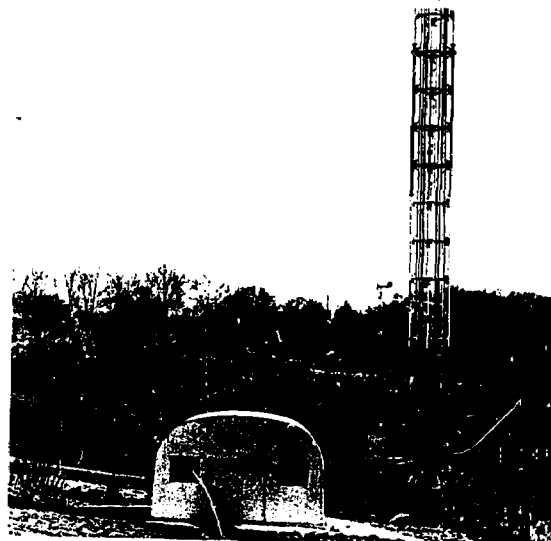
(right) Kettering laboratory at University of Cincinnati Institute of Environmental Health.

(below) Aerial view of portion of University of Cincinnati.

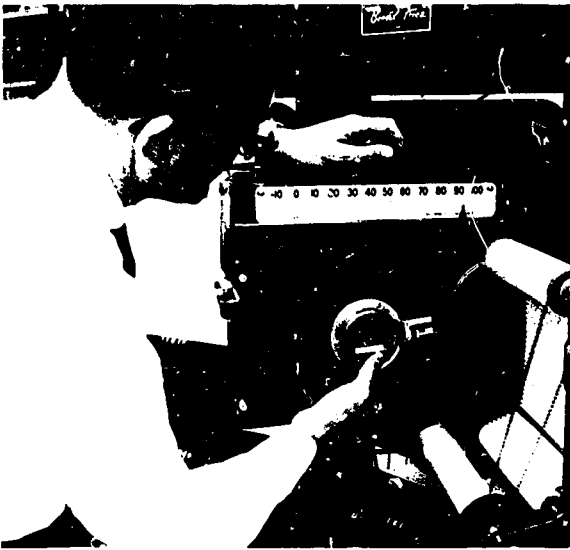




Physics project in laboratory at Drexel University.



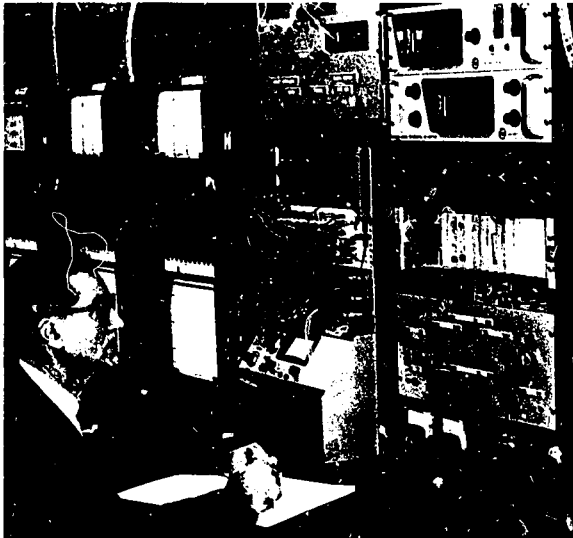
Meteorological equipment used in field study at Drexel University.



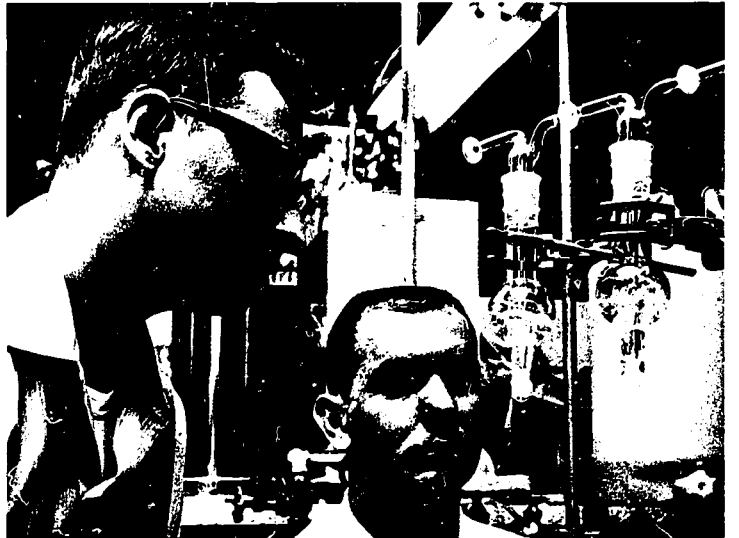
eteorologist at work in Physics laboratory at Drexel University.



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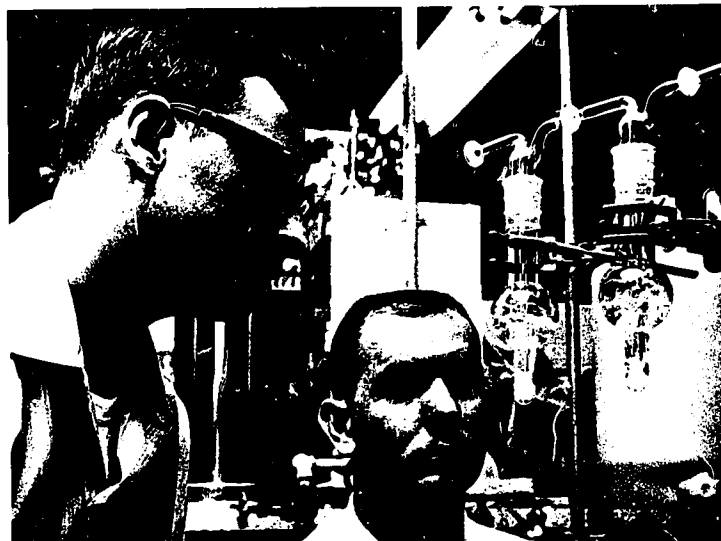
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Instructor, right, demonstrates apparatus for study of air pollution to two students in training program for air pollution technicians operated by the Pennsylvania State University under sponsorship of the U.S. Public Health Service.



Smog Eubbler apparatus, used for air pollution studies, is checked by two students participating in training program at The Pennsylvania State University. The program is sponsored by the U.S. Public Health Service in cooperation with Penn State's Center for Air Environment Studies.



**Drexel Institute of Technology** Philadelphia, Pennsylvania

The Air Resources Curriculum is a graduate program in Environmental Engineering and Science, and is one phase of "The Center for the Study of the Environment," which provides a broad base of training in physical and social environmental sciences, applicable to all areas of concern. The multidisciplinary program offers intensive specialized training in several specific areas: air resources, water resources, radiological health, occupational health, solid waste, food technology, and the socioeconomic effects of the environment. Air Resources was the first specialty course offered when the program was initiated in 1963, and the other courses have been added since.

The present Air Resources Curriculum (45 credits) leads to an M.S. degree in one year (three quarters). A doctoral degree may also be obtained.

Air pollution related courses offered in this program include:

- Air Pollution Control Processes
- Air Pollution Distribution and Effect
- Air Pollution Sources
- Air Resources Management
- Air Sampling and Analysis
- Biostatistics
- Combustion Theory
- Environmental Chemistry
- Environmental Health
- Environmental Physiology
- Environmental Systems Analysis
- Epidemiology
- Human Factors Engineering
- Incinerator Design
- Industrial Location and Regional Development
- Industrial Ventilation

**Temple University** Philadelphia, Pennsylvania

The objective of this program, conducted by the School of Pharmacy, is to offer research training in the toxicology of air pollutants, leading to the Master of Science and Doctor of Philosophy degrees.

The 12-month curriculum at the Master of Science level is designed to provide the trainee with a suitable background to perform biomedical research related to air pollution studies. No thesis is required.

The Doctor of Philosophy program affords an opportunity for specialization in the disciplines available at the School of Pharmacy. Thesis research pertains to the toxicology of air pollutants.

Air pollution related courses offered in this program include:

- Epidemiology
- Biostatistics
- Radioecology
- Toxicology I-II
- Respiratory Pharmacology
- Isotope Methodology
- Absorption Spectroscopy
- Public Health Administration
- Analysis of Air Pollutants
- Plant Ecology
- Socio-Economic Aspects of
- Air Resource Management

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Pennsylvania

Air pollution related courses offered in this program include:

- Air Pollution Control Processes
- Air Pollution Distribution and Effect
- Air Pollution Sources
- Air Resources Management
- Air Sampling and Analysis
- Biostatistics
- Combustion Theory
- Environmental Chemistry
- Environmental Health
- Environmental Physiology
- Environmental Systems Analysis
- Epidemiology
- Human Factors Engineering
- Incinerator Design
- Industrial Location and Regional Development
- Industrial Ventilation

- Meteorology
- Particle Dynamics
- Public Health Administration
- Radiobiology
- Radiological Health
- Solid Waste Systems
- Toxicology
- Transport Processes
- Urban Sociology
- Water Resources Management
- Operations Research

For additional information write to the Program Director: Dr. Henry C. Wohlers, Professor Environmental Science, Environmental Engineering and Science, Drexel Institute of Technology, 32nd and Chestnut Streets, Philadelphia, Pennsylvania 19104.

Air pollution related courses offered in this program include:

- Epidemiology
- Biostatistics
- Radioecology
- Toxicology I-II
- Respiratory Pharmacology
- Isotope Methodology
- Absorption Spectroscopy
- Public Health Administration
- Analysis of Air Pollutants
- Plant Ecology
- Socio-Economic Aspects of Air Resource Management

- Tissue Culture Techniques
- Seminar I-II
- Research Projects

Summer Research Projects and Field Experience

The following areas of concentration are included in the work toward the Doctor of Philosophy degree. A Ph.D. degree may be obtained in any of the areas of analytical chemistry, radiochemistry, microbiology, physiology, pharmacology and biochemistry.

For additional information write to the Program Director: Dr. Samuel Elkin, Professor, Department of Chemistry—School of Pharmacy, Temple University, 3223 N. Broad Street, Philadelphia, Pennsylvania, 19140.



A project demonstration at the University of Pittsburgh

**University of Pittsburgh**  
Pittsburgh, Pennsylvania

The three major purposes of the air pollution training program in the School of Public Health are (1) to develop practitioners in the field of air pollution control for positions in government and industry, (2) to develop high caliber researchers in aerosol physics, and (3) to make air pollution courses available to candidates in other programs.

In cooperation with the Graduate School of Engineering and the Division of Natural Sciences, an interdepartmental, interschool program has been developed for students working toward degrees in chemical engineering, civil engineering, or chemistry. In these programs, the student enrolls in air pollution courses in addition to the courses pertinent to his major field of study.

Requirements for the Master of Science degree are 36 to 38 credits. In addition to the air pollution courses listed below, degree programs include courses in biostatistics, epidemiology, physiology, and toxicology.

Air pollution related courses offered in this program include:

- Water and Air Chemistry
- Principles and Laboratory
- Air Pollution Principles
- Air Pollution Measurements
- Properties of Dusts, Smokes, and Mists
- Air Pollution Practice

For additional information write to the Program Director: Dr. Morton Corn, Professor of Industrial Health and Air Engineering, Graduate School of Public Health, University of Pittsburgh, 130 DeSoto Street, Pittsburgh, Pennsylvania 15213.

**Pennsylvania State University**  
University Park, Pennsylvania

The Graduate Air Center for Air Environment is an interdepartmental center offering M.S. and Ph.D. degrees.

In this program students receive graduate credit for graduate courses while attaining their M.S. or Ph.D. by doing the course sequence in air pollution in the interdisciplinary problems in air pollution program. Additional academic requirements are substantial and difficult.

Graduates of the program pursue careers in research, administration, and advanced professional work with training and experience.

Air pollution related courses include:

- Introduction to Air Pollution
- Control of Air Pollution
- Air Pollution and Small Particles
- Air Pollution and Biological Systems
- Public Planning and Administration
- American Law and Air Pollution

For additional information write to the Program Director: Dr. William L. Miller, Department of Environmental Studies, 300 Pennsylvania State University, University Park, Pennsylvania 16802.

**University of Pittsburgh**  
Pittsburgh, Pennsylvania

The three major purposes of the air pollution training program in the School of Public Health are (1) to develop practitioners in the field of air pollution control for positions in government and industry, (2) to develop high caliber researchers in aerosol physics, and (3) to make air pollution courses available to candidates in other programs.

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Requirements for the Master of Science degree are 36 to 38 credits. In addition to the air pollution courses listed below, degree programs include courses in biostatistics, epidemiology, physiology, and toxicology.

Air pollution related courses offered in this program include:

- Water and Air Chemistry
- Principles and Laboratory
- Air Pollution Principles
- Air Pollution Measurements
- Properties of Dusts, Smokes, and Mists
- Air Pollution Practice

For additional information write to the Program Director: Dr. Morton Corn, Professor of Industrial Health and Air Engineering, Graduate School of Public Health, University of Pittsburgh, 130 DeSoto Street, Pittsburgh, Pennsylvania 15213.

**Pennsylvania State University**  
University Park, Pennsylvania

The Graduate Air Pollution Training Program in the Center for Air Environment Studies is a coordinated interdepartmental program leading to the M.A., M.S., and Ph.D. degrees.

In this program the students fulfill the requirements for graduate degrees in the established professions while attaining special competence in air pollution by doing thesis research, by following a minor course sequence in the field, and by participating in the interdisciplinary activities of the Center. Thesis problems in air pollution may be either of the traditional academic research nature or may involve a substantial and difficult system or program design.

Graduates of this program are prepared to pursue careers of research, professional practice, government administration, and other activities requiring advanced professional training in a discipline coupled with training and research of the air pollution problem.

Air pollution related courses offered in this program include:

- Introduction to Air Pollution and Control Administration
- Air Pollution Seminar
- Small Particle Technology
- Air Pollution Effects on Biological Systems
- Public Planning and Development Administration in the United States
- American Local Government

For additional information write to the Program Director: Dr. William J. Moroz, Center for Air Environment Studies, 301 Engineering Unit "C", Pennsylvania State University, University Park, Pennsylvania 16802.

### **University of Utah** Salt Lake City, Utah

The interdepartmental air pollution training program provides a broad training in the sources, control, distribution, measurement, fate, and economic effects of air pollutants. Biological effects from the molecular to population levels are stressed. The integrated air pollution research program, and field trips, provide students with practical experience in air pollution problems. An academic background in air pollution science is provided by a group of core and related elective courses offered by participating Departments of Engineering, Meteorology, Biological Sciences, Economics, Geography, and Sociology.

Student selection is based on a sound background in their field, high academic record, and an interest in air pollution. The major discipline is optional, but the

thesis research problem must be directly related to air pollution. Upon completion of the program, students receive their M.S. or Ph.D. degree in their major department with a minor in air pollution science. The degree requirements for the M.S. are 33 hours in the major subject and 12 hours in the minor, and for the Ph.D., 60 hours in the major and 30 hours in the minor. Trainees develop a broad understanding and technical skill in the overall field of air pollution enabling them to evaluate and interpret an air pollution situation and to recommend, initiate, or conduct the proper course of action.

Air pollution related courses offered in this program include:

- Environmental Toxicology
- Air Pollution Methods and Evaluation

### **Vanderbilt University** Nashville, Tennessee

The Air Pollution Training Program at Vanderbilt University is one of the options available to graduate students in the Sanitary and Water Resources Engineering Department of the School of Engineering. Courses of study lead to both the M.S. and Ph.D. degrees. Requirements for the M.S. degree are 24 semester hours of coursework and a thesis (or 30 hours of coursework), preparation of a comprehensive research report, and an oral presentation of the research results. The Ph.D. degree requires a dissertation based on an individual research effort and a total of 72 semester hours of graduate work, of which no more than 24 hours credit may be given for the independent study and dissertation research. In addition, a qualifying examination in the major and two minors is required for admission to candidacy for the Ph.D. degree. Before taking the qualifying examination the Ph.D. candidate must present evidence of a reading knowledge of two foreign languages. Minor fields may

include other engineering disciplines, natural and physical sciences, economics and law. Current research areas include the effect of terrain on the dispersion of air pollutants by the atmosphere, the dispersion of carbon monoxide from urban intersections, the effect of community attitudes on air pollution legislation, health aspects of air pollutants, and the relationship of the ambient concentration of air pollutants to concentrations in enclosed spaces.

Air pollution related courses offered in this program include:

- Atmospheric Pollution
- Advanced Air Resources Engineering
- Geophysical Fluids
- Epidemiology
- Radiological Aspects of Sanitary and Water Resources Engineering
- Unit Operations

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Air pollution related courses offered in this program include:

Environmental Toxicology  
Air Pollution Methods and Evaluation

Advanced Seminar  
Radiological Health  
Atmospheric Diffusion  
Ecological Physiology  
Environmental Microbiology  
Ecology  
Environmental Sanitation  
Atmospheric Turbulence  
Community Systems  
Sanitation Biology

For additional information write to the Program Director: Dr. Michael Treshow, Associate Professor, Biological Sciences, Center for Environmental Biology, University of Utah, Salt Lake City, Utah 84112.

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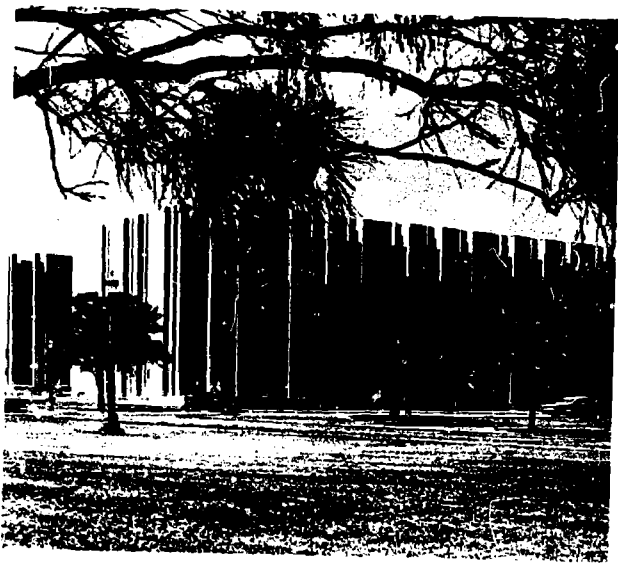
include other engineering disciplines, natural and physical sciences, economics and law. Current research areas include the effect of terrain on the dispersion of air pollutants by the atmosphere, the dispersion of carbon monoxide from urban intersections, the effect of community attitudes on air pollution legislation, health aspects of air pollutants, and the relationship of the ambient concentration of air pollutants to concentrations in enclosed spaces.

Air pollution related courses offered in this program include:

Atmospheric Pollution  
Advanced Air Resources Engineering  
Geophysical Fluids  
Epidemiology  
Radiological Aspects of Sanitary and  
Water Resources Engineering  
Unit Operations

Process Dynamics  
Instrumentation  
Advanced Hydraulics  
Mechanics of Fluids  
Statistics  
Numerical Methods for Engineers  
Boundary Value Problems  
Complex Variables  
Advanced Engineering Mathematics  
Sanitary Chemistry  
Physical Chemistry  
Microbiology  
Individual Research and Study

For additional information write to: Dr. Karl B. Schnelle, Jr., Associate Professor of Sanitary and Air Resources Engineering, Box 1683-Station B, Vanderbilt University, Nashville, Tennessee, 37203.

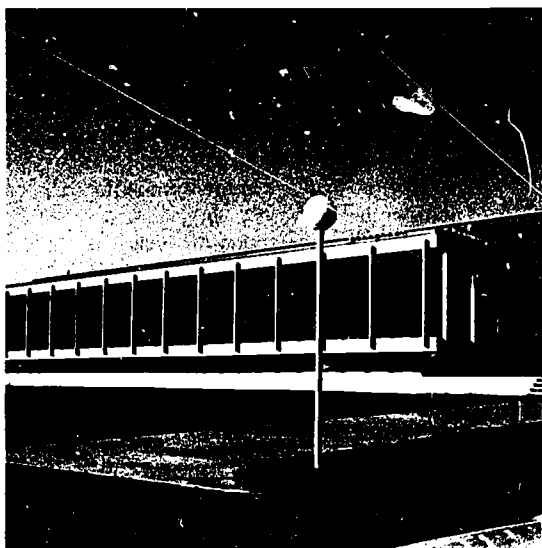


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(above left)—The new Olin E. Teague Research Center houses Texas A & M University's space research facilities computer installation and Institute of Statistics. Space-related projects conducted by the university include studies of cosmic ray activities on spacecraft structures and solid propellants for rocket fuel.

(above center)—Texas A&M University's new \$7 million cyclotron complex greatly enhances the institution's nuclear research capabilities. A unique feature of the A&M "atom-smasher" is its mating with a powerful IBM 7094 computer, allowing monitoring while the giant 300-ton machine is in operation.

(above right)—The Nuclear Science Center at Texas A&M University houses the most powerful reactor on any campus in the Southwest. The reactor will soon have its power increased tenfold.

(pictures at left) Installing apparatus in an aircraft for measurements of atmospheric particulate matter. The device used here is a miniaturized version of the Integrating Nephelometer developed on Research Grant AP 00336. This instrument continuously records the quantity responsible for visibility degradation in the atmosphere.



### **Texas A&M University** College Station, Texas

Air pollution training offered by the Department of Plant Sciences is limited to students in the areas of biology, biochemistry, meteorology, and sanitary engineering. Students obtain their degree in one of these departments. The training covers two broad areas: (1) the quantitative and qualitative measurements of pollutants and (2) laboratory training in fumigation and analytical techniques. All trainees participate in the research activities of the air pollution laboratory. Selected trainees serve for limited periods of time with state, county, and city air pollution agencies.

Twice monthly seminars are held on some subject germane to air pollution. One is conducted by an academic, medical, or governmental employee working in the field of air pollution control. The other is usually held in connection with a field trip to an industrial plant or governmental air pollution control agency.

Air pollution related courses offered in this program include:

- Applied Climatology
- Agricultural Meteorology
- Environmental Measurement and Interpretation
- Environmental Physiology
- Experimental Analysis in Environmental Engineering
- Environmental Engineering Analysis for Urban Areas
- Environmental Engineering Design for Urban Areas

For additional information write to the Program Director: Dr. Howard G. Applegate, Associate Professor, Department of Plant Sciences, Texas A&M University, College Station, Texas 77843.

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### **University of Washington** Seattle, Washington

The air resources program is designed to provide specialized training in air resources engineering for engineering candidates, seeking the M.S. degree, who expect to join air pollution control programs in Federal, state or local governments, private industry, or consulting firms. It is also designed for study and research leading to the Ph.D. degree.

The program is sponsored by the Department of Civil Engineering with the cooperation of the Department of Atmospheric Sciences. Supplemental courses are available from other engineering disciplines, health sciences, social and political sciences, and public administration.

The M.S. degree program (one year) requires a thesis. Requirements for the doctorate include a program of study and research acceptable to the candidate's advisor and a supervisory committee. A disser-

tation that is a significant contribution to air pollution knowledge and a general examination in air resources in a minor supporting field are also required.

Air pollution related courses offered in this program include:

- Air Resources Engineering I, II
- Air Resources Management
- Topics in Environmental Health Engineering and Gas Cleaning
- Chemistry of Air Pollution
- Aerosol Science and Technology I, II

For additional information write to the Program Director: Dr. August T. Rossano, Jr., Research Professor, Department of Civil Engineering, College of Engineering, University of Washington, Seattle, Washington 98105.

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Air pollution related courses offered in this program include:

- Applied Climatology
- Agricultural Meteorology
- Environmental Measurement and Interpretation
- Environmental Physiology
- Experimental Analysis in Environmental Engineering
- Environmental Engineering Analysis for Urban Areas
- Environmental Engineering Design for Urban Areas

For additional information write to the Program Director: Dr. Howard G. Applegate, Associate Professor, Department of Plant Sciences, Texas A&M University, College Station, Texas 77843.

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tation that is a significant contribution to air pollution knowledge and a general examination in air resources in a minor supporting field are also required.

Air pollution related courses offered in this program include:

- Air Resources Engineering I, II
- Air Resources Management
- Topics in Environmental Health Engineering
- Air Conditioning (Industrial Ventilation and Gas Cleaning)
- Chemistry of Air Pollution
- Aerosol Science and Technology I, II

For additional information write to the Program Director: Dr. August T. Rossano, Jr., Research Professor, Department of Civil Engineering, College of Engineering, University of Washington, Seattle, Washington 98105.

## West Virginia University

Morgantown, West Virginia

The purpose of this program in the Department of Civil Engineering is to provide trainees with a technical background in the methods of obtaining concerted action for the improvement of public health practices, community planning, conservation of natural resources, and industrial development as they relate to the air pollution problem.

Course work totalling 30 hours plus a project, or 36 hours of course work are required for the M.S.E. degree. The program can also lead to a Ph.D. degree.

Air pollution related courses offered in this program include:

- Properties of Air Pollutants
- Air Pollution Control Engineering
- Air Pollution Control Standards
- Air Pollution Control Programs
- Solid Waste Disposal

For additional information write to the Program Director: Dr. Benjamin Linsky, Department of Civil Engineering, College of Engineering, West Virginia University, Morgantown, West Virginia 26506.

## University of Wisconsin (CIC Affiliate)

Madison, Wisconsin

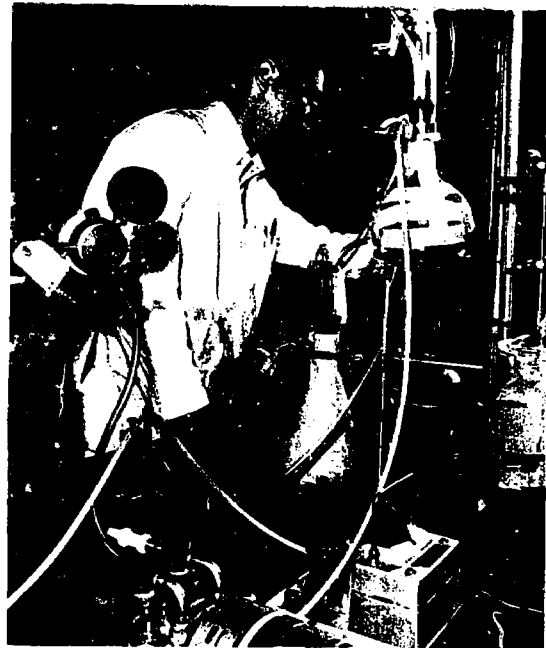
This university is one of eleven which offer the CIC Biometeorology Program.

At the University of Wisconsin, the Department of Meteorology offers a full range of courses leading to a Ph.D. degree, including courses on turbulent diffusion, dynamic climatology and instrumentation, and courses with biological application (biometeorology and microclimatology). Other strong related disciplines are offered at the University of Wisconsin, including environmental health, preventive medicine, ecology, and molecular biology. In addition, the Biotron, a controlled environment facility for plants and animals, is available.

For additional information pertaining to the CIC Program please see page two.



Graduate students take air pollution samples, from a coal-fired heating plant at West Virginia University, under normal test conditions. Another part of this class assignment was to measure the undesirable effects on a nearby building site.



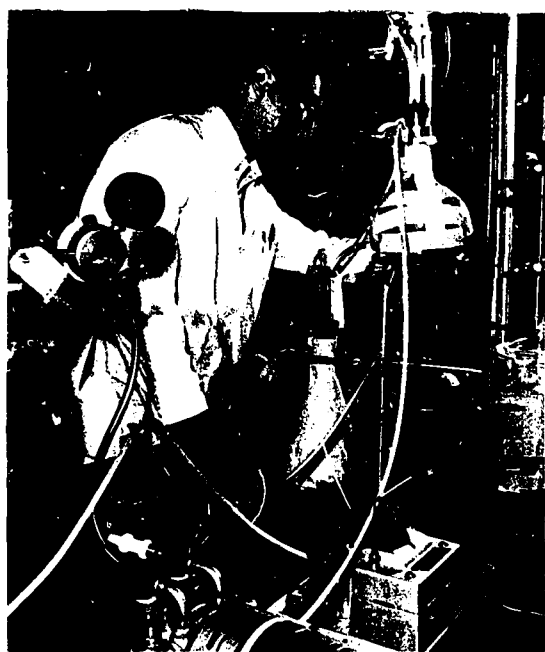
Graduate students in air pollution control at West Virginia University's College of Engineering have to master many trades. In this experiment the student is producing a special mixture of air pollutants to which various manufactured articles will be exposed. The results will be used in the development of standards of acceptability for soiled surfaces. The bottles are taped as a safety measure.



Special equipment is used to determine the sizes of particles in air. The equipment is being used in an air pollution control engineering safety measure.



Sucking out a match flame as blowing out one. The flow of air is explained by the College of Engineering. The student does his best to suck the flame. The velocities generated at the tip of the flame are about the same as a few inches away. Air velocity is essential for designing air pollution control. (right) is a principle with an air velocity sampler.



Graduate students in air pollution control at West Virginia University's College of Engineering have to master many trades. In this experiment the student is producing a special mixture of air pollutants to which various manufactured articles will be exposed. The results will be used in the development of standards of acceptability for soiled surfaces. The bottles are taped as a safety measure.

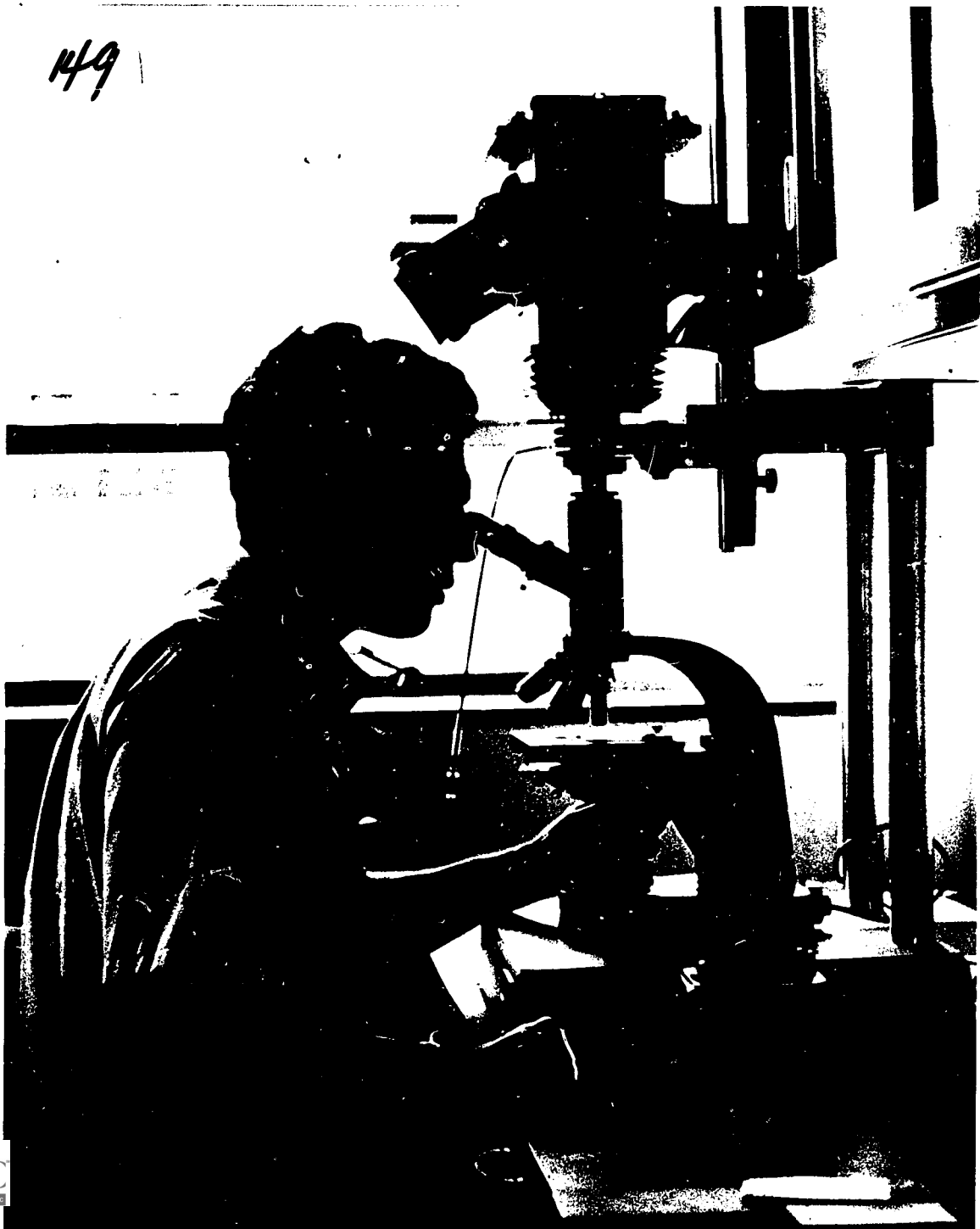


Special equipment had to be developed to count and determine the sizes of small droplets and bits of dust. This instrument is being used at West Virginia University's College of Engineering both in research and in training air pollution control engineering specialists. The bottles are taped as a safety measure.



Sucking out a match (left picture) isn't the same thing as blowing out one. This fundamental principle of the flow of air is explained at West Virginia University's College of Engineering to a graduate student, as he does his best to suck out the flame. Although the air velocities generated at your lips by sucking and blowing are about the same, the results are vastly different a few inches away. An understanding of this principle is essential for designing dust and gas traps to prevent air pollution. (right picture) Demonstrates the same principle with an air velocity meter and a high-volume air sampler.

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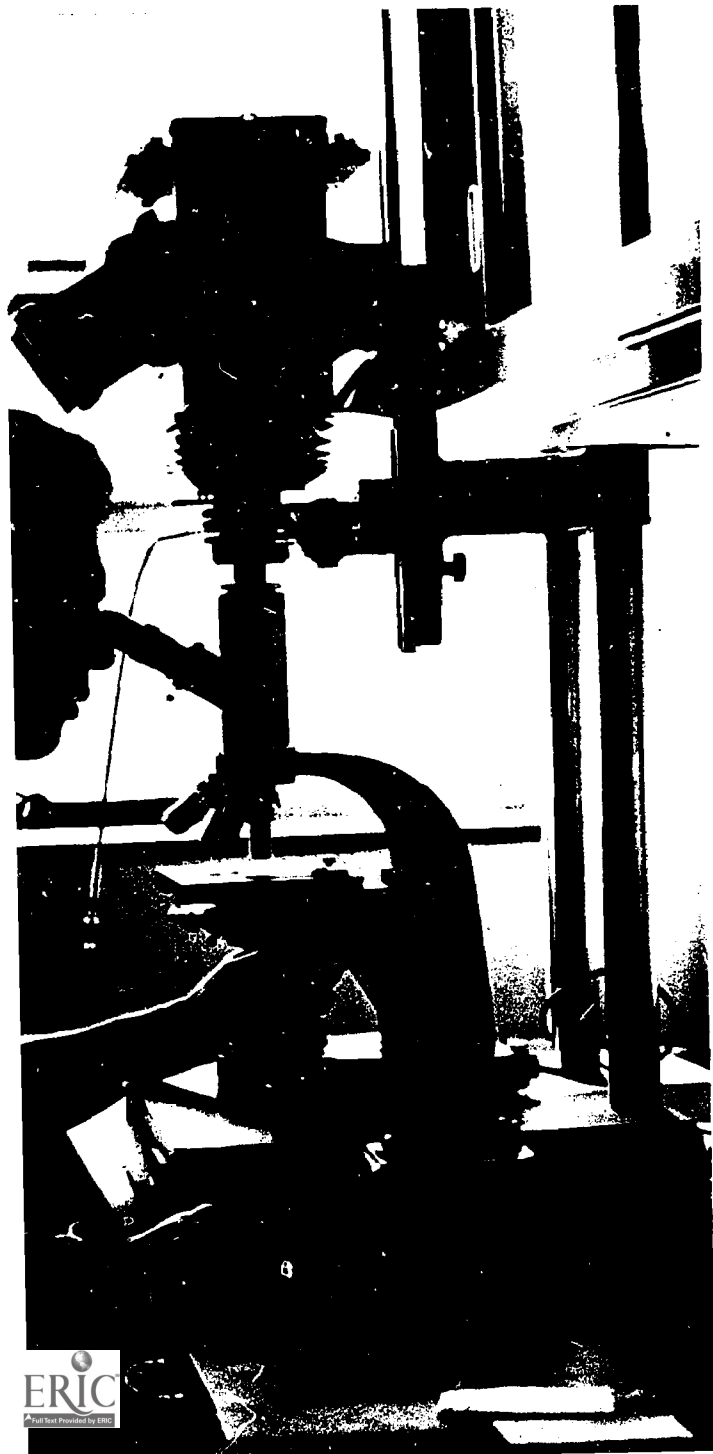
Faculty member explains precipitator sampler to



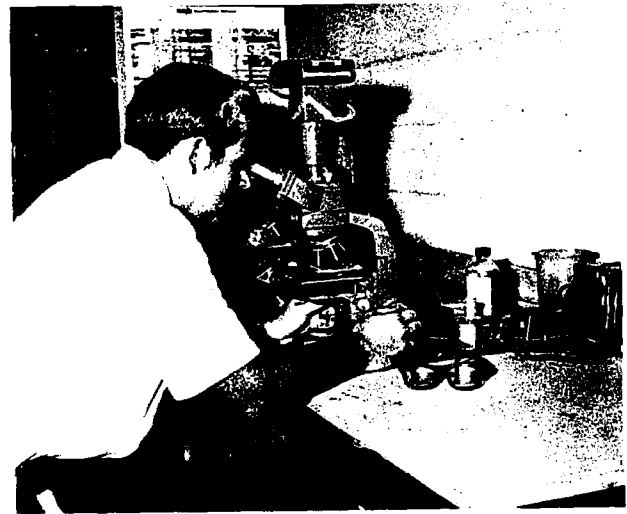
Purdue University student studies matter collected by "fall

(left) Microscopic study of the structure of a particle

(lower right facing page) tape sampler before precipitation monitoring station on



Faculty member explains the operating principles of an electrostatic precipitator sampler to Purdue University students.



Purdue University student uses microscope to examine particulate matter collected by "Roto-Rod" sampler.

(left) Microscopic study, as an aid in air pollution abatement, of the structure of a particle reveals their possible origin.

(lower right facing page) Students at Purdue university check-out tape sampler before putting it into operation at the environmental monitoring station on campus.



The annual Air Pollution Control Conference at Purdue University complements training and research activities. The Director of Research Activities, Environmental Health Service, U.S. Department of Health, Education and Welfare, is shown delivering the keynote address to the 250 engineers and scientists who attended the 1969 conference. His topic was "The Role of Air Pollution in Total Environmental Health."



### Purdue University Lafayette, Indiana

The interdisciplinary graduate program at Purdue University provides specialists training to students pursuing careers in air pollution control. Supplemental training is offered to trainees in allied fields who will impinge on the overall environmental problems of man. The integrated training and fundamental research activities provide opportunities to participate in many areas of air pollution control. In all cases, the specific plan of study is tailored to the student's needs and desires. Master of science and doctor of philosophy degrees are offered.

Air pollution related courses offered in this program include:

Air pollution and its effects

Air sampling,  
Air pollution  
Chemical kinetics  
Theoretical air  
Microclimatology  
Biometeorology  
Chemical analysis  
Systems design  
Environmental

For additional  
coordinator: Dr.  
Engineering, Pur  
47907

### The University of Texas at Austin Austin, Texas

This graduate program in environmental health engineering is designed for students looking toward a career in the field of air pollution control. It is a fully coordinated program which complements activities in other environmental areas. Modern facilities and equipment for training purposes are available, and strong supporting courses are provided. A close working relationship exists with the university's Southwestern Medical School in Dallas, and a special course program will be arranged for those students who wish to spend at least one semester in the School of Public Health.

Courses offered  
to air pollution control  
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Air sampling, analysis, and instrumentation  
Air pollution technology and control theory  
Chemical kinetics of pollutants  
Theoretical and applied meteorology  
Microclimatology  
Biometeorology  
Chemical analyses in environmental engineering  
Systems design and application to natural Resources  
Environmental toxicology

For additional information write to the program  
coordinator: Dr. David L. Brenchley, School of Civil  
Engineering, Purdue University, Lafayette, Indiana  
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f Texas at Austin Austin, Texas

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Courses offered in this program which are related  
to air pollution control include:

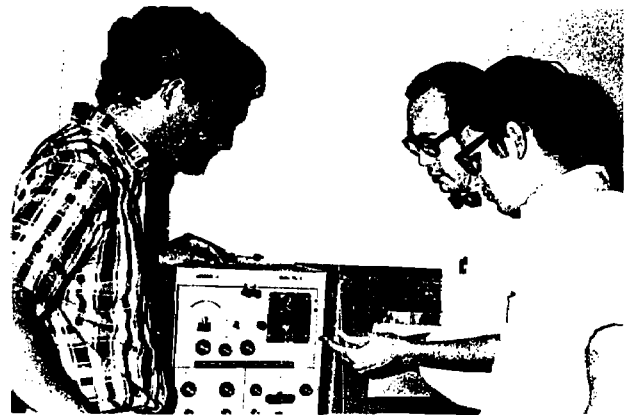
Air sampling and analysis  
Air pollution control methods  
Industrial hygiene and toxicology  
Environmental health engineering: principles  
Environmental health engineering: physiology  
Physics of the atmosphere

For additional information, write to the program  
director: Dr. Earnest F. Gloyna, Professor, Depart-  
ment of Civil Engineering, The University of Texas at  
Austin, Austin, Texas 78712.





California State Polytechnic College students gain experience through field studies.



California State Polytechnic College faculty member discussing laboratory measurements with students.



Discussion of the operating principles of SO<sub>2</sub> analyzer during a California State Department of Public Health training conference.



A laboratory study at the University of Massachusetts of SO<sub>2</sub> removal by water scrubbing uses an unusual packing device



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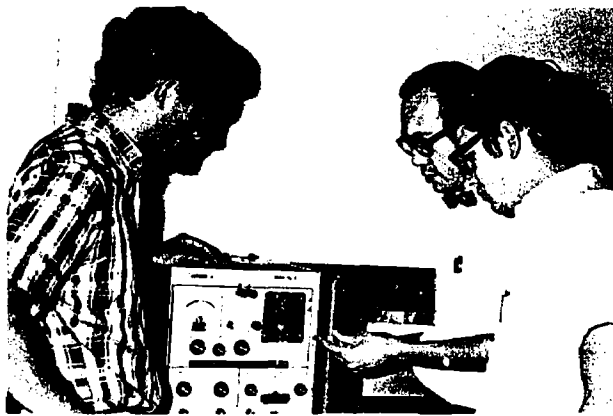
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California State Polytechnic College faculty member discussing laboratory measurements with students.



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A laboratory study at the University of Massachusetts of SO<sub>2</sub> removal by water scrubbing uses an unusual packing device



## University of Massachusetts Amherst, Massachusetts

The University of Massachusetts offers an inter-departmental program leading to a master's degree in chemical engineering, environmental engineering within the division of civil engineering, or public health. Air pollution training is offered within the framework of the professional objectives of each department. One calendar year master of science programs are offered by the departments of chemical and civil engineering, (approximately 32 credits); a 2-year program (approximately 39 credits) is offered by the school of public health. Core courses for all program participants are:

- Air pollution control processing
- Micrometeorology
- Air sampling and air analyses
- Introduction to air pollution
- Air pollution seminar

The department of environmental sciences offers a course in biological effects of air pollution and provides research opportunities in air pollution studies.

The balance of credits required for the master's degree may be obtained from supporting departmental courses, by thesis, and/or by completion of special problem assignments.

For additional information, write to program directors: Dr. T. H. Feng, (Civil Engineering), Dr. D. D. Adrian (Civil Engineering), or Dr. H. A. Peters (Public Health, University of Massachusetts, Amherst, Massachusetts 01002.

(Left) University of Massachusetts graduate student using a newly purchased chromatograph to analyze air samples.

**University of Maryland, College Park, Maryland**

The College of Engineering at the University of Maryland offers an interdisciplinary graduate study program in air pollution control leading to the degrees of master of science and doctor of philosophy.

Air quality conservation embraces so many disciplines and specializations that in-depth knowledge in all the areas of concern is difficult to obtain. This knowledge is essential, however, to those engineers, chemists, public health officials, and other specialists who are now being called upon to restore and conserve air quality. This program is directed to those who aspire to such responsibilities and places emphasis upon the engineering aspects of air resource management.

Qualified college graduates from all areas of engineering and science may enroll and work toward a degree in air pollution control through one of the three participating areas — chemical engineering, civil engineering, or meteorology. Core courses are:

- Air pollution
- Air sampling and analysis
- Seminar in atmospheric pollution
- Meteorology of air pollution
- Control of air pollution sources
- Air pollution biology

Other courses may be selected from the University curriculum to provide background and specialization of particular value to trainees seeking careers in air pollution control.

For additional information, write to the program director: Dr. Gerhard Israel, Assistant Professor in Meteorology and Civil Engineering, Department of Civil Engineering, University of Maryland, College Park, Maryland 20742.

**The Johns Hopkins University, Baltimore, Maryland**

The Johns Hopkins University offers a master's program in air pollution control and a doctoral study program of the atmospheric environment. The programs are cooperative efforts of the departments of geography and environmental engineering and chemistry at the Homewood campus, and the department of environmental health and environmental medicine at the School of Hygiene and Public Health.

The one-year master's program provides additional education for bachelors of the physical, biological, and engineering sciences who wish to apply their knowledge and capabilities to the challenging field of air pollution control. Students enroll for courses in statistics and in epidemiology, in addition to the following:

- Air pollution control and strategy
- Air pollution control and evaluation laboratory
- Biological and physiological effects of air pollution
- Atmospheric dispersion and diffusion
- Air science and management seminar

Students may also select optional courses given by the chemistry, meteorology, and environmental medi-

The University of Maryland conducts short courses in visible emissions evaluation to train smoke observers for plume evaluation and law enforcement, since the State of Maryland limits visible emissions from sources of air pollutants.



Maryland

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- Air pollution control and strategy
- Air pollution control and evaluation laboratory
- Biological and physiological effects of air pollution
- Atmospheric dispersion and diffusion
- Air science and management seminar

Students may also select optional courses given by the chemistry, meteorology, and environmental medi-

cine departments, and these additional program offerings:

- Chemistry of air pollutants
- Photochemistry
- Aerosol physics
- Aerosols, airborne disease, and the respiratory tract

A master's essay which may be completed during the summer months is required. The subject should be a selected facet of the air pollution problem and must demonstrate the student's maturity and ability to synthesize ideas.

A student seeking the doctor of philosophy degree may enroll in any department at the university. He may arrange any program of studies consonant with his own interests and capabilities that will enable him to conduct research on problems related to the study of the atmospheric environment. The university's requirements for the degree must be satisfied, however, including the submission of a dissertation describing an original research contribution.

For additional information, write to the program director: Dr. Jerome Gavis, Department of Geography and Environmental Engineering, The Johns Hopkins University, Baltimore, Maryland 21218.

The University of Maryland conducts short courses in visible emissions evaluation to train smoke observers for plume evaluation and law enforcement, since the State of Maryland limits visible emissions from sources of air pollutants.



# Specialists Training Programs

## GENERAL INFORMATION

*There are presently six programs oriented to various academic levels designed to train air pollution control specialists. The areas stressed in these programs range from the administrative to the technical aspects of air pollution control.*

*Application for financial assistance in any of the following programs should be sent directly to the program director of the specialists program*

## University of Southern California Los Angeles, California

This 6-month program is designed to train air pollution control administrators and is sufficiently flexible, in scope and depth, to produce a working understanding of the administrative aspects of air pollution control concepts and operations. In addition, a review of the engineering, physical sciences, and biological-medical elements provides an appreciation of the technical components related to air pollution control.

Each program includes workshops based on four core courses, plus one weekly seminar at the university, coupled with field investigations and study visits to industries, laboratories, and other operating and research agencies. Specifically, field training includes estimates, investigation of complaints, laboratory analysis of contaminant samples, and the evaluation of pollution control systems.

## University of California Riverside, California

The program offered by the Department of Life Sciences, University of California, Riverside, is an undergraduate research training program. Undergraduates and high school-level students participate in research programs for a 10-week summer period and usually continue these activities, to a limited degree, during the academic year. The purpose of the program is to orient and involve science students with the specific biological problems related to air pollution control, to teach modern techniques of biological research, and to demonstrate how these techniques can be used to outline and solve relevant air pollution problems.

**University of Southern California**  
Los Angeles, California

This 6-month program is designed to train air pollution control administrators and is sufficiently flexible, in scope and depth, to produce a working understanding of the administrative aspects of air pollution control concepts and operations. In addition, a review of the engineering, physical sciences, and biological-medical elements provides an appreciation of the technical components related to air pollution control.

Each program includes workshops based on four core courses, plus one weekly seminar at the university, coupled with field investigations and study visits to industries, laboratories, and other operating and research agencies. Specifically, field training includes estimates, investigation of complaints, laboratory analysis of contaminant samples, and the evaluation of pollution control systems.

Seminar and field exercises are integrated throughout the program to allow comparison of theory and practice and to promote comprehension of the interrelationships between administration and technology. In addition to lectures, discussions, and field exercises; learning techniques include management simulation exercises, decision-making games, and role-playing and case-study analysis. In lieu of a dissertation, qualified applicants can earn up to 12 hours of graduate credit toward a graduate degree in public administration.

Institutes begin the second week of January and July each year.

For additional information, write to the Program Director: Professor Frank J. King, Air Pollution Control Institute, University of Southern California, Civic Center Campus, 206 South Spring Street, Los Angeles, California 90012.

**University of California** Riverside, California

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A unifying seminar series during the summer period teaches the trainees how their specific interests are related to air pollution control and acquaints them with specific air pollution problems. The goal of this program is to introduce future biological scientists to the modern techniques of biological research and to clearly demonstrate how these techniques can be used to solve current and future air pollution problems.

For additional information write to the Program Director: Irwin P. Ting, Associate Professor of Biology, Department of Life Sciences, University of California, Riverside, California 92502.

### **Cooper Union**

New York City, New York

The program at Cooper Union offers students in civil, mechanical, chemical and electrical engineering an M.S. degree. This M.S. study plans to produce professional engineers well versed in thermodynamics, mass transfer, and the fundamental properties and behavior of dilute particle-gas systems. The major emphasis is placed on the technical fundamentals with secondary emphasis on general air pollution control. This knowledge enables the students to develop exploratory designs for the control of atmospheric contaminants at their source.

Air pollution related courses offered in this program include:

Material Science

Numerical Analysis

Transport Phenomena

Thermodynamic Behavior

Graduate Humanities Seminar

Aspects of Air Pollution I and II

Air Pollution Control Systems I and II

Six elective credits may be taken in engineering design from specialized courses in chemical, civil, mechanical or electrical engineering. Thesis work is oriented to exploratory design in air pollution control. For additional information, write to the Program Director: Dr. Aaron J. Teller, Dean, School of Engineering and Science, Cooper Union, 51 Astor Place, New York, New York 10003.

### **Pennsylvania State University**

University Park, Pennsylvania

This program is designed to train air pollution control administrators and air pollution control technicians. The administrative trainees receive ten weeks of intensive training in engineering and physical sciences, and biomedical, socioeconomic and administrative areas.

Trainees are selected from junior and senior undergraduate students and control agency personnel may obtain up to eight hours of graduate credit. A basic criteria for selection is the student's indication of pursuing a career in air pollution control.

Technician training applicants are selected from 2-year engineering schools. These trainees receive nine weeks of intensive training in the theory, installation, operation, and maintenance of the instruments and equipment used in air pollution control.

For further information, write to the Program Director: Dr. William J. Moroz, Center for Air Environment Studies, Pennsylvania State University, University Park, Pennsylvania 16802.

### **Portland State**

Portland, Oregon

The Department of training in air pollution control and master's degree programs.

Undergraduate students participate in air pollution control courses as electives and master's degree students devote a significant portion of their thesis work with a local air pollution control agency.

Graduate students in air pollution control are suitable for the master's degree program in air pollution control.

Air pollution control courses include:

Introduction to Air Pollution

Aerosols and Air Pollution

Atmospheric Chemistry and Air Pollution

Air Pollution Control Projects

Air Pollution Control Equipment

Air Pollution Control Meteorology

For additional information, write to the Program Director: Dr. William J. Moroz, Center for Air Environment Studies, Pennsylvania State University, University Park, Pennsylvania 16802.

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### Portland State College Portland, Oregon

The Department of Applied Science offers a program of training in air pollution control at the baccalaureate and master's levels.

Undergraduate students in the physical sciences participate in the program by selecting air pollution courses as electives. Their training includes air conservation and meteorology, studied in their junior and senior years respectively. In the intervening summer they devote a 10-week period to in-service training with a local air pollution control agency.

Graduate students take the full sequence of air pollution control courses, plus approved electives suitable for their academic background. The M.S. degree program requires a thesis.

Air pollution related courses offered in this program include:

- Introduction to Air Conservation
- Aerosol Technology
- Atmospheric Reactions
- Air Pollution Instrumentation
- Projects in Air Pollution
- Air Pollution Seminar
- Meteorology

For additional information write to the Program Director: Dr. Frank P. Terraglio, Associate Professor of Applied Science, Portland State College, P.O. Box 751, Portland, Oregon 97207.



**Santa Fe Junior College**  
Gainesville, Florida

Santa Fe Junior College offers a 2-year training program in air pollution technology designed to produce technicians to work in industry and various health facilities.

The program includes the elements of a general college education, mathematics, chemistry, physics, and biology, with specialized training courses in air pollution control technology which are supplemented by participation in a continuing county-wide air pollution survey designed to provide field experience.

Approximately 75 course hours qualify the graduate for the Associate of Arts degree.

A special option for students interested in a 4-year program leading to a baccalaureate degree in one of the science or engineering fields can be arranged on an individual basis.

Air pollution related courses offered in this program include:

- Introduction to Air Pollution
- Pollution Sources
- Air Pollution Sampling
- Air Pollution Control
- Air Pollution Field Survey

For further information, write to the Program Director: Mr. Robert W. Sterling, Director, Engineering Occupations Programs; or to Mr. John M. Turner, Instructor, Santa Fe Junior College, 723 West University Avenue, Gainesville, Florida 32601.

**California State Department of Public Health**

Advanced and specialized education and training in air pollution control are provided in this cooperative effort with the California Air Resources Board and the University of California at Berkeley. Successful current practices and new analytical methods to assess both indoor and outdoor air pollution are emphasized. Instructors are staff members of the California State Department of Health.

The annual 3-day session uses a workshop and lecture format to consider preselected problem areas. Recurring topics are maintenance and calibration of the instrumentation designed for air sampling and analysis and methods for solving analytical problems related to industrial hygiene. To highlight significant differences caused by good and poor practices, and the relevant chemical and physical principles, workshops and lectures are integrated.

The 1970 theme is measurement methods related

**California State Polytechnic College** San Luis Obispo

The environmental engineering department of the California State Polytechnic College offers a program in air pollution control which leads to a bachelor of science degree. Students are trained in basic science and engineering with strong emphasis on chemistry and specific work in the design, control, and effects aspects of environmental quality. Laboratory experiments and field exercises are emphasized. The program includes the following air pollution courses:

- Meteorology, I and II
- Industrial environments

**California State Department of Public Health** Berkeley, California

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The 1970 theme is measurement methods related

to established air quality standards. Procedures and instrumentation will be discussed for the measurement of:

- Ozone
- Nitrogen dioxide
- Sulfur dioxide
- Hydrogen sulfide, and
- Visibility (particulates)

The program is designed for the technical staffs of air pollution control agencies, health departments, educational institutions, instrument manufacturers and vendors, physicians, industries, and other public and private agencies concerned with air pollution control.

For additional information, write to Dr. Peter K. Mueller or Mr. Emmett E. Jones, California State Department of Public Health, 2151 Berkeley Way, Berkeley, California 94704.

**California State Polytechnic College** San Luis Obispo, California

The environmental engineering department of the California State Polytechnic College offers a program in air pollution control which leads to a bachelor of science degree. Students are trained in basic science and engineering with strong emphasis on chemistry and specific work in the design, control, and effects aspects of environmental quality. Laboratory experiments and field exercises are emphasized. The program includes the following air pollution courses:

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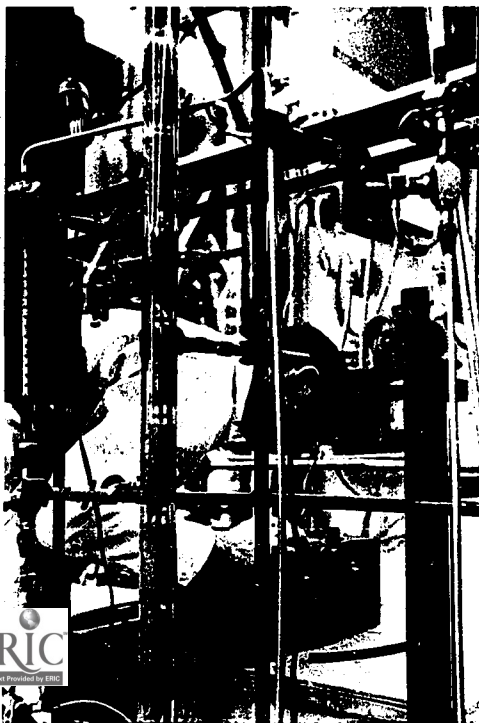
- Introduction to air pollution
- Air pollution measurements
- Environmental radiation surveillance
- Air pollution control

Graduate work leading to a master of engineering degree will be offered beginning in the fall of 1970.

For additional information, write to the program director: Dr. Harold M. Costa, Associate Professor, Environmental Engineering, California State Polytechnic College, San Luis Obispo, California 93401.



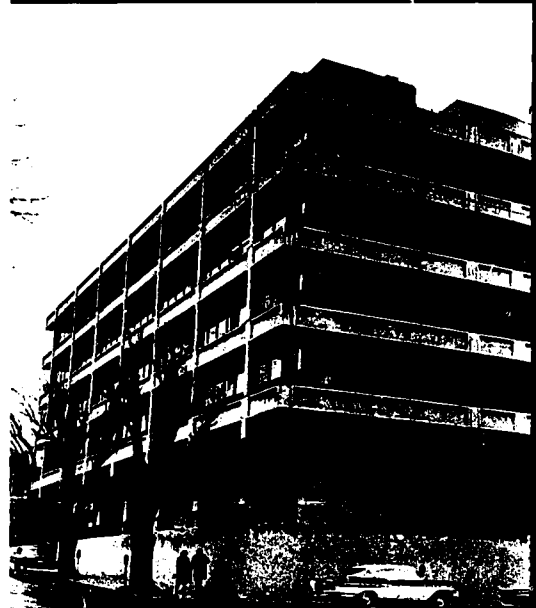
Instructor and students at Santa Fe Junior College working with A.I.S.I. Sampler



Laboratory study at Cooper Union

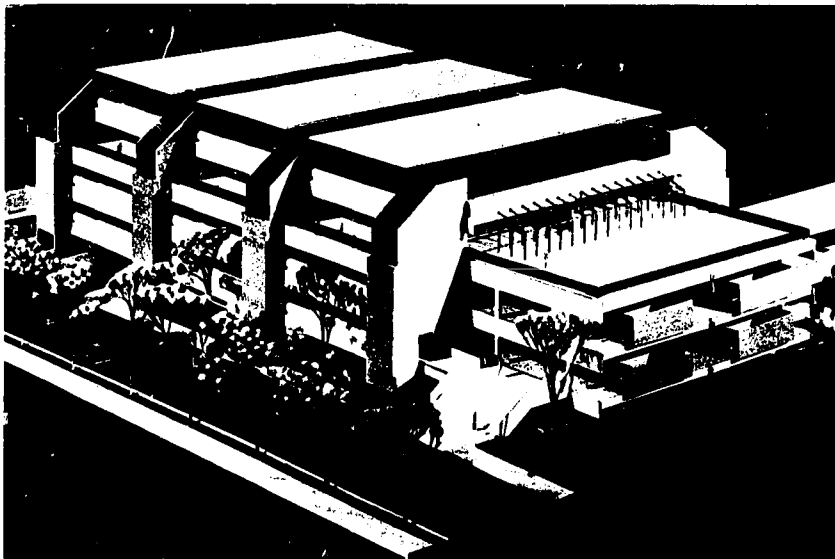
(above right) Portland State College's Science II will include two levels of underground parking, plus four levels of integrated science laboratories and classrooms.

(below right) Science I at Portland State College, first in a complex of four buildings, houses physics, biology, and chemistry lecture rooms and laboratories.





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# Special Fellowships

## General Information

As authorized by the Clean Air Act, as amended the Public Health Service and the National Air Pollution Control Administration have established a grants-in-aid program to increase the number and competence of professional personnel engaged in research and other activities related to the prevention and abatement of air pollution. A limited number of special fellowships for graduate-level study in the engineering and physical sciences, biomedicine and socioeconomic aspects of air pollution control are available to scholars desirous of obtaining such specialized training and instruction.

Air pollution special fellowships are awarded and administered in accordance with the following policies and procedures.

## Requirements:

A special fellow must be a citizen of the United States, a non-citizen national of the United States, or have been lawfully admitted to the United States for permanent residence. An applicant who is not a United States citizen or a non-citizen national must request the Office of the Immigration and Naturalization Service nearest his residence to verify that he was lawfully admitted to the United States for permanent residence. The request to the Immigration and Naturalization Service must be made on that agency's form N-585, available in any Immigration and Naturalization Service office.

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## Qualifications

To qualify for a fellowship, an applicant must have a bachelor's degree from a recognized institution or equivalent experience, and must be accepted for admission by an appropriate educational institution.

At the post-doctoral level, the applicant must have a doctoral degree from an institution offering a recognized degree.

In awarding the fellowship, consideration will be given to the adequacy, value and appropriateness of the program to be followed, the orientation of the research, and the qualifications, interest, and potential contribution of the applicant.



## Terms of Support

Fellowships are awarded on a 12-month basis. The fellow is expected to pursue a full-time training program. If support is desired for more than one year, justification of the additional training should be furnished at the time the initial application is made. Support for additional training will, in all cases, depend upon a satisfactory progress report from the sponsor and the availability of funds appropriated by the Congress for this program.

## How to Apply

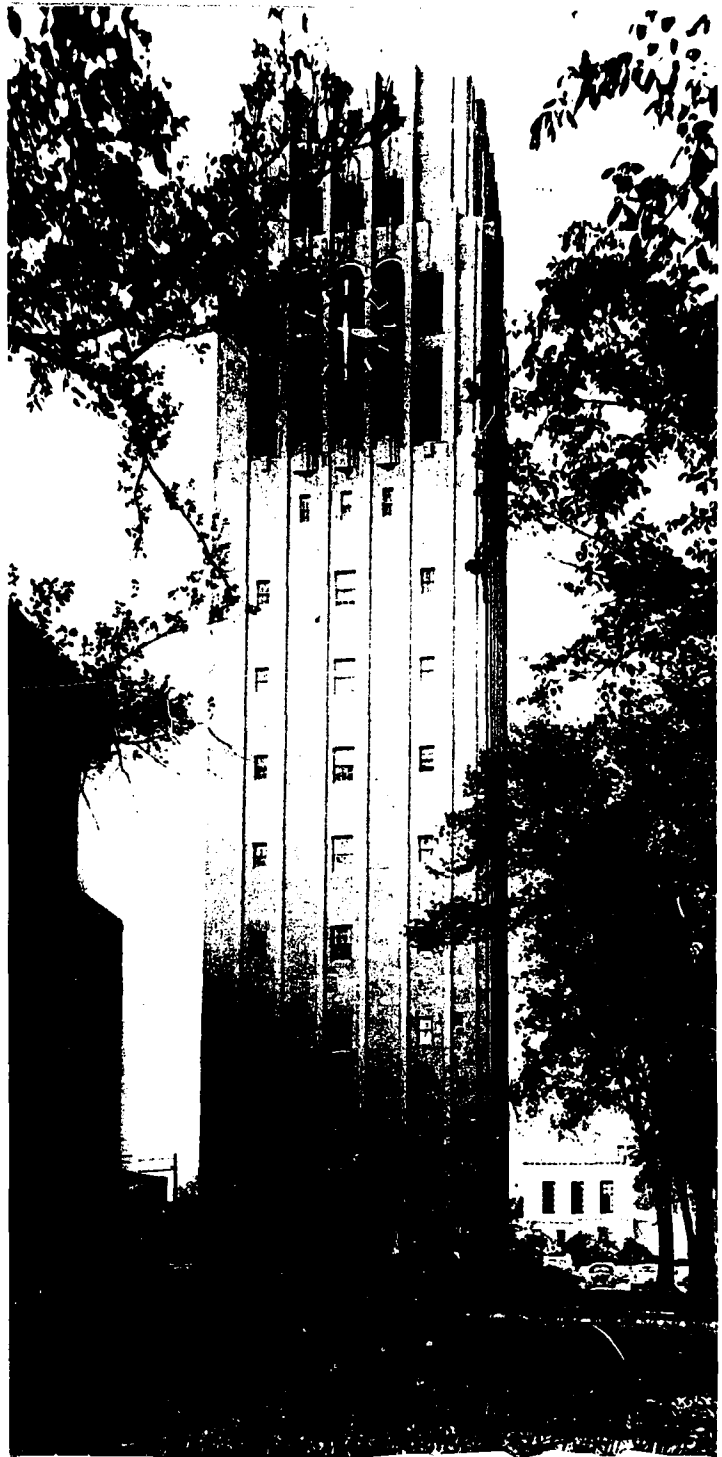
Applications for air pollution special fellowships may be secured from any of the ten Regional Offices of the Public Health Service (listed pp 14-15) or from the Chief, Extramural Programs Branch, Office of Manpower Development, National Air Pollution Control Administration, Post Office Box 12055, Research Triangle Park, North Carolina 27709.

**The following table shows deadlines for submitting applications and the corresponding review dates:**

Deadline for Receipt	Review Dates
April 1	October
October 1	February
January 1	June

Notification is given  
approximately two weeks after review.

Burton Memorial Tower, University of Michigan



**No tuition or registration fee is charged.**

Early application is advised, because course roster  
Trainees are expected to provide for their own ho  
To provide training service to a maximum number  
the number of applicants from a single agency, fo

# Application ● for Institute for Air Pollution Training Courses

● Please fill out both sides of the application form.

● A separate form for each course

Additional Application Forms may be obtained from  
of the National Air Pollution Control Administration  
or from the Registrar of the Institute for Air Pollution

● Please mail forms to:

Registrar,  
Institute for Air Pollution Training  
National Air Pollution Control Administration  
Research Triangle Park, North Carolina  
Telephone: (919) 549-8221, Ext. 210



**No tuition or registration fee is charged.**

Early application is advised, because course rosters are limited.

Trainees are expected to provide for their own housing and transportation while attending courses.

To provide training service to a maximum number of organizations,

the number of applicants from a single agency, for any one course, may be necessarily limited.

# tion itute for Air Pollution

● **Please fill out both sides of the application form.**

● **A separate form for each course is requested.**

Additional Application Forms may be obtained from any Regional Director  
of the National Air Pollution Control Administration  
or from the Registrar of the Institute for Air Pollution Training.

● **Please mail forms to:**

Registrar,  
Institute for Air Pollution Training,  
National Air Pollution Control Administration, P.O. Box 12055  
Research Triangle Park, North Carolina 27709  
Telephone: (919) 549-8221, Extension 531



U. S. Department of Health, Education, and Welfare

Public Health Service

National Air

# Course Application

1. Name of Applicant:

Mr. \_\_\_\_\_  
Miss \_\_\_\_\_  
Mrs. \_\_\_\_\_ (last)

Course Title \_\_\_\_\_

2. Course desired:

Place where given \_\_\_\_\_

Course Title \_\_\_\_\_

3. Previous courses attended:

Course Title \_\_\_\_\_

Course Title \_\_\_\_\_

\_\_\_\_\_ (name of organization or firm)

4. Sponsor or Employer:

\_\_\_\_\_ (street address)

\_\_\_\_\_ (city)

\_\_\_\_\_ (state)

5. Mailing address of applicant:  
(if different from above)

\_\_\_\_\_ (street address)

\_\_\_\_\_ (city)

\_\_\_\_\_ (state)

**Please fill**



Form Approved  
Budget Bureau  
No. 68-R0657

Welfare      Public Health Service      National Air Pollution Control Administration

# Course Application Form

Mr. \_\_\_\_\_ (last) \_\_\_\_\_ (first) \_\_\_\_\_ (middle initial)  
Miss \_\_\_\_\_  
Mrs. \_\_\_\_\_

Course Title \_\_\_\_\_ Course No. \_\_\_\_\_

Place where given \_\_\_\_\_ Dates \_\_\_\_\_

Course Title \_\_\_\_\_ Dates \_\_\_\_\_

Course Title \_\_\_\_\_ Dates \_\_\_\_\_

Course Title \_\_\_\_\_ Dates \_\_\_\_\_

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(name of organization or firm)

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(street address)

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(city) (state) (zip code) (telephone)

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(street address)

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(city) (state) (zip code) (telephone)



**Please fill out both sides of the application form.**

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\_\_\_\_\_  
(profession or occupation)

\_\_\_\_\_  
(position title)

**6. Professional Status:**

● Brief description of your present position \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Number of years education completed beyond high school \_\_\_\_\_

\_\_\_\_\_  
(college or university)

\_\_\_\_\_  
(date attended)

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(Major)

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(Degree)

**7. Education:**

\_\_\_\_\_  
\_\_\_\_\_  
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**8. Professional Experience:**

Total years experience in profession, including all public health experience \_\_\_\_\_

● Total years of air pollution control experience \_\_\_\_\_

\_\_\_\_\_  
(Signature of Approving Officer (where applicable))

\_\_\_\_\_  
Title

\_\_\_\_\_  
Signature of Applicant

\_\_\_\_\_  
Date

● Mail to: Registrar, Institute for Air Pollution Training  
National Air Pollution Control Administration  
Post Office Box No. 12055  
Research Triangle Park, North Carolina 27709  
Telephone (919) 549-8221, Extension 531

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We are pleased to send you our 1970-1971 Bulletin of Courses  
Perhaps some of your associates may also be interested in these training opportunities.  
Please use the space below to indicate  
personnel to be included on future mailing lists.

*Harry P. Kramer*

Director, Office of Manpower Development  
National Air Pollution Control Administration

Mail to: Registrar  
Institute for Air Pollution  
National Air Pollution Control Administration  
Post Office Box No. 120  
Research Triangle Park, NC 27709

# Applications for Future Mailings:

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 Miss \_\_\_\_\_ (last name) \_\_\_\_\_ (first name) \_\_\_\_\_ (middle initial)

\_\_\_\_\_ (profession) \_\_\_\_\_ (title)

\_\_\_\_\_ (street address)

\_\_\_\_\_ (city) \_\_\_\_\_ (state) \_\_\_\_\_ (zip code)

Mr. \_\_\_\_\_  
 Miss \_\_\_\_\_ (last name) \_\_\_\_\_ (first name) \_\_\_\_\_ (middle initial)

\_\_\_\_\_ (profession) \_\_\_\_\_ (title)

\_\_\_\_\_ (street address)

\_\_\_\_\_ (city) \_\_\_\_\_ (state) \_\_\_\_\_ (zip code)

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\_\_\_\_\_ (profession) \_\_\_\_\_ (title)

\_\_\_\_\_ (street address)

\_\_\_\_\_ (city) \_\_\_\_\_ (state) \_\_\_\_\_ (zip code)

Mr. \_\_\_\_\_  
 Miss \_\_\_\_\_ (last name) \_\_\_\_\_ (first name) \_\_\_\_\_ (middle initial)

\_\_\_\_\_ (profession) \_\_\_\_\_ (title)

\_\_\_\_\_ (street address)

\_\_\_\_\_ (city) \_\_\_\_\_ (state) \_\_\_\_\_ (zip code)

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Bulletin of Courses  
Interested in these training opportunities.

*Larry P. Kramer*

Director, Office of Manpower Development  
National Air Pollution Control Administration

# Future Mailings:

**Mail to: Registrar**  
Institute for Air Pollution Training  
National Air Pollution Control Administration  
Post Office Box No. 12055  
Research Triangle Park, North Carolina 27709

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Miss  
Mrs. (last name) (first name) (middle initial)

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Post Office Box No. 12055  
Research Triangle Park, North Carolina 27709**



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U. S. Department of Health, Education, and Welfare

Public Health Service

National Air Pollution Administration

# Course Application

1. Name of Applicant:

Mr. \_\_\_\_\_  
Miss \_\_\_\_\_  
Mrs. \_\_\_\_\_ (last)

Course Title \_\_\_\_\_

2. Course desired:

Place where given \_\_\_\_\_

Course Title \_\_\_\_\_

3. Previous courses attended:

Course Title \_\_\_\_\_

Course Title \_\_\_\_\_

4. Sponsor or Employer:

\_\_\_\_\_  
(name of organization or firm)

\_\_\_\_\_  
(street address)

\_\_\_\_\_  
(city)

\_\_\_\_\_  
(state)

5. Mailing address of applicant:  
(if different from above)

\_\_\_\_\_  
(street address)

\_\_\_\_\_  
(city)

\_\_\_\_\_  
(state)



Form Approved  
Budget Bureau  
No. 68-R0657

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tion, and Welfare

Public Health Service

National Air Pollution Control Administration

# Course Application Form

Mr. \_\_\_\_\_ (last) \_\_\_\_\_ (first) \_\_\_\_\_ (middle initial)  
Miss \_\_\_\_\_  
Mrs. \_\_\_\_\_

Course Title \_\_\_\_\_ Course No. \_\_\_\_\_

Place where given \_\_\_\_\_ Dates \_\_\_\_\_

Course Title \_\_\_\_\_ Dates \_\_\_\_\_

Course Title \_\_\_\_\_ Dates \_\_\_\_\_

Course Title \_\_\_\_\_ Dates \_\_\_\_\_

\_\_\_\_\_ (name of organization or firm)

\_\_\_\_\_ (street address)

\_\_\_\_\_ (city) \_\_\_\_\_ (state) \_\_\_\_\_ (zip code) \_\_\_\_\_ (telephone)

\_\_\_\_\_ (street address)

\_\_\_\_\_ (city) \_\_\_\_\_ (state) \_\_\_\_\_ (zip code) \_\_\_\_\_ (telephone)

applicant:

ab



**Please fill out both sides of the application form.**

\_\_\_\_\_  
(profession or occupation)

\_\_\_\_\_  
(position title)

**6. Professional Status:**

● Brief description of your present position \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Number of years education completed beyond high school \_\_\_\_\_

\_\_\_\_\_  
(college or university) (date attended) (Major) (Degree)

**7. Education:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**8. Professional Experience:**

Total years experience in profession, including all public health experience \_\_\_\_\_

● Total years of air pollution control experience \_\_\_\_\_

ERIC Clearinghouse  
APR 27 1971  
on Adult Education

\_\_\_\_\_  
(Signature of Approving Officer (where applicable)) Title

\_\_\_\_\_  
Signature of Applicant Date

● Mail to: Registrar, Institute for Air Pollution Training  
National Air Pollution Control Administration  
Post Office Box No. 12055  
Research Triangle Park, North Carolina 27709  
Telephone (919) 549-8221, Extension 531