# AAPSE NEWSLETTER

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"It is the duty of engineers . . . . . to place their analyses and design on as rational basis as can be obtained."

--T. R. Camp

CONTENTS

## GRADUATE CURRICULA IN WATER QUALITY ENGINEERING AND MANAGEMENT

At times it is important that we convey to others some concept of our objectives and goals in the education of environmental engineers or sanitary engineers. Such an occasion arose recently when it became evident that there was a need to describe, insofar as such a diffuse activity can be described, the process employed on most campuses for the education of sanitary engineers to top level officials of the Department of the Interior. The following statement was prepared for the purpose.

Although the Board of Directors of AAPSE does not officially endorse this statement, they considered it sufficiently accurate and appropriate to our interests to approve its release. Accordingly, the article was read and distributed substantially as published herein to a group of officials of the Federal Water Pollution Control Administration, including Mr. F. C. DiLuzio, Asst. Secretary of the Interior.

Undoubtedly some of the readers of the NEWSLETTER will take exception to parts of the statement. Some may suggest a clearer exposition. It is being published in this issue of the NEWSLETTER expressly to encourage discussion and comment. The function of the NEWSLETTER is to provide a vehicle for communication on matters pertaining to sanitary engineering education. This article should elicit some reaction and letters are invited. All letters on the subject (of reasonable length) will be published in the NEWSLETTER if addressed to the Editor.

### GRADUATE CURRICULA IN WATER QUALITY ENGINEERING AND MANAGEMENT

November 1967

The profession of sanitary engineering in the United States has its origin in municipal public works organizations and in state and federal health agencies. These organizations have been staffed by civil engineers who, by virtue of their further education and experience, were accepted by their communities as competent to plan, design, operate, and regulate municipal water and wastewater treatment works. This was the situation in 1920 and it is in large measure the situation today. The American community's technical services are provided by civil engineers. Has the education of these individuals kept pace with the changing requirements of our times? Or, as has been suggested, should we recruit a new team with modern concepts of water management and the technical know-how to implement them? The second question can be easily answered in the negative. We have an enormous investment in our present institution with its civil engineering base and its performance has generally been adequate. The first

question, that of the quality of our educational preparation, cannot be answered in such a categorical manner and is the principal thrust of this analysis.

There is no purpose in attempting a detailed description of the water problems we face today except to say that they have been with us for many years and have recently reached an intensity that have brought them to the fore of our national scene. A decade ago water pollution was mostly concerned with the enteric diseases and oxygen depletion by degradable organics. Today these problems still prevail, but others, such as eutrophication, toxicity, and salt buildup, have become of increased concern and have influenced markedly our research and development work. Perhaps it is most significant that we now view wastewater treatment and water purification as a continuum and are seriously examining direct recycle systems.

What are the currently available types of educational programs through which we prepare young men for careers in water management? Almost without exception they are graduate programs in engineering and applied science in which the entering student holds a baccalaureate degree in civil or chemical engineering or perhaps mechanical engineering and occasionally in chemistry or biology. The major divisions of these water resources engineering curricula can be characterized simply as shown in the attached figure. These programs differ among our universities, both in quality and emphasis, but the general divisions of the present and probable future degree offerings are as depicted. A majority of the programs are housed in civil engineering departments, but the courses, the examination committee members, and dissertation supervision are drawn from many departments. The masters curricula are professional engineering in objective, but have an increasing input of science, mathematics and the social sciences. They represent a practical compromise between breadth and depth, between the vast amount of needed knowledge and the willingness of the student to persevere, and among the many pressures brought on our faculty by their colleagues in the purer sciences on one hand any by government contract officers on the other. The doctoral curricula focus more on the mastery of particular disciplines and on research, but also strive to develop further the student's strengths as an engineer. On the other hand, the water resources management doctorate is patterned more after programs in the social sciences and on the application of modern mathematical and economic knowledge to regional problems and the planning process. (See page 4).

The financial support of these programs has been to a major degree from the institutions in which they reside. Since 1960 they have increased in size and quality through subvention

# WATER RESOURCES ENGINEERING EDUCATION

## HYDRAULIC ENGINEERING AND HYDROLOGY

1. Math. & Statistics
2. Adv. Fluid Mechanics
3. Hydraulic Structures
4. Hydrology
5. Electives & Research

## WATER QUALITY ENGINEERING (i.e., SANITARY ENGINEERING)

1. Chemistry
2. Biology
3. Math. & Statistics
4. Water Pollution Assessment
5. Process Engineering
6. Electives & Research

## WATER RESOURCES MANAGEMENT

1. Math & Statistics
2. Economics
3. Planning
4. Law & Institutions
5. Water Resources Eng.
6. Systems Analysis
7. Electives & Research

MASTERS (1-2 yrs)

(AREAS OF SPECIALIZATION)

## PROCESS THEORY AND DEVELOPMENT

1. Formal minors (2) in chemistry or chem. eng. or biology or math.
2. Additional courses in major & qualifying exam.
3. Languages & math.
4. Dissertation

## WATER POLLUTION ASSESSMENT

1. A formal minor in biology and one in chemistry or math or earth & marine sciences.
2. Additional courses in major & qualifying exam.
3. Languages & math.
4. Dissertation

## WATER RESOURCES MANAGEMENT

1. Formal minors (2) in economics or math & systems analysis or city & regional planning.
2. Additional courses in hydrology & water quality & qual. exam.
3. Languages & math.
4. Dissertation

DOCTORAL (2-4 yrs)

of the Public Health Service and now principally the Federal Water Pollution Control Administration. A high proportion of the students are supported by research and training grants provided by these agencies. A majority of these programs currently have the capacity to educate more students than are presently enrolled. Others could significantly increase their output with a judicious input of support for faculty and facilities. Few new programs are needed, but many of the existing ones would benefit materially by careful self-analysis and through an established federal education policy and an appropriately related support program.

What is needed to meet the nation's requirements for manpower and research in water quality management? First and most important, it is imperative that these needs be identified in specific and realistic terms. In fact, these needs are so great that it is almost impossible to devise any rational plans over the next several years until they have been identified. Consequently, the Board of Directors of the American Association of Professors in Sanitary Engineering proposes a course of action in the form of three recommendations.

1. A study should be initiated immediately of the nature and numbers of personnel required, now and in the future, by all sectors of the water quality management industry. The study should recognize the close relationship of water quality management to municipal and regional public works development, to the responsibilities of health agencies, and to the deep and growing concern of the general public for the quality of their environment.

2. A study should be initiated to identify the nation's total educational resources in the professional field of water quality engineering and management and in the quality related applied sciences sectors of chemistry, biology, oceanology, and the earth sciences. Particular attention should be given to the engineering centered professional programs; their subject content, the adequacy of their faculties and facilities, and their related doctoral level research activities. Moreover, a serious effort should be made to investigate the potential of specialized professionally oriented water quality programs in departments of chemical engineering, chemistry, biology and certain of the social sciences, as well as to determine the role of these disciplines within civil engineering departments and in joint interdepartmental programs.

AAPSE, with the completion of its Register of Graduate Programs in Sanitary Engineering, has a considerable wealth of experience and knowledge in assessing academic programs in all areas of water quality engineering and management. Its membership in over 40 schools across the U.S. are willing to cooperate with all Federal Agencies in this important endeavor.

3. It is proposed that FWPCA make a substantial effort to

establish a national consensus as to the ten most important problems in water quality management and the research and development needed to resolve them.

In establishing this consensus, all sectors of the profession should be represented, including the researchers in government, industrial and university laboratories; the consultants in private practice; and the engineers and scientists in our public works and public health institutions. In identifying each research and development problem, particular emphasis should be placed on the general objective of the needed study, the specific objectives that should be accomplished, and the detailed nature of the work programs required to meet these objectives. Here again, we believe that AAPSE can perform a valuable service in cooperation with the engineers and scientists of the Federal Agencies concerned with water quality management.

## NEW OFFICERS AND DIRECTORS FOR AAPSE

New directors for a three year term beginning in 1968 were elected by the members of AAPSE in October. The new directors are Professor E. F. Gloyna, University of Texas; Professor E. R Baumann, Iowa State University, and Professor D. J. O'Connor, Manhattan College. Professor Gloyna and Professor Baumann are continuing on the Board, both having been officers of the Association during the past year. Professor Gloyna has been President and Professor Baumann has served as Secretary-Treasurer. Professor O'Connor is a former Board member also, having served in 1964 and 1965.

In accordance with the newly revised Bylaws of the Association, a joint meeting of the 1967 Board of Directors and the new Directors was held in Washington, D. C. on November 12, 1967. Officers elected for a one-year term for 1968 included Professor Ben B. Ewing, President; Professor E. R. Baumann, Vice-President; and Professor W. W. Eckenfelder, Secretary-Treasurer. The current membership of the Board of Directors is listed on the cover of the NEWSLETTER.

## OCTOBER BUSINESS MEETING IN NEW YORK

A meeting of the membership of the Association was held in the Malmaison Suite of the Americana Hotel in New York City on the evening of October 9, 1967. The session was devoted to a report to the 50 members and guests of the activities, accomplishments, and plans of the Association. President Gloyna presided.

Secretary Baumann reported on the increase in membership during the past year from 42 members at 21 different schools to 75 members at 50 different schools. This increase reflects the interest