

TWO YEAR PROGRESS REPORT

Asian Institute of Technology

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SECTION 1

INTRODUCTION

This report covers the first two years of the Asian Institute of Technology (AIT), January 1968 through December 1969. The primary event of the period was the establishment of the AIT and its continued growth and success.

Included in this report are summaries of AIT objectives, enrollment and graduation activities, new research facilities, staff changes, academic program, publications, and visitors.

The AIT continued during 1968 and 1969 to increase its staff, its graduate student enrollment, and its facilities and program offerings. Major emphasis remains in areas of graduate study and research comprising civil engineering, which is the engineering of the basic facilities required in developing countries.

SECTION 2

THE BEGINNING OF THE ASIAN INSTITUTE OF TECHNOLOGY

The Asian Institute of Technology came into being on 24 November 1967. An International Board of Trustees was appointed and they met for the first time in Bangkok in January 1968 to assume control of the newly-established, independent institution. A list of the members of the Board of Trustees is given in Appendix I. At the first meeting, By-Laws were adopted, officers were elected, and a set of objectives set forth. The objectives which closely correspond with those historically set up by the SEATO Graduate School of Engineering, provide the following:

1. Educational opportunities at the masters and doctorate levels.
2. Through postgraduate diploma courses and short-term institutes, opportunities for practicing engineers in the region to keep abreast of technological developments and their application to the needs of the region.
3. Stimuli for the development of research by the establishment of a major research center within AIT.
4. Opportunities for faculty members from other educational institutions to study and conduct research at AIT.
5. A focus for the development of engineering education to meet the unique needs of the region.
6. Mechanisms for the introduction into the region of the latest developments in technology and for the development of their

application to its needs.

7. A center for the development of equipment for research and instructional laboratories.
8. An outstanding library to serve the needs of both AIT and the region.
9. A major computing center, designed and operated to serve AIT and other institutions in the region.
10. A regional focal point and catalyst for the development of professional activities, including conferences and seminars, and a center for the publication of technical information for the region.

At its first meeting, the Board elected Dr. Milton E. Bender, Jr. as President of the Institute; Dr. Puey Ungphakorn, Governor of Bank of Thailand, as Chairman of the Board of Trustees; and Mr. Oscar Mapua, President of Mapua Institute of Technology in the Philippines, as Vice-Chairman of the Board.

The AIT has truly singular characteristics that make it different from any other educational institution. First, it has a unique charter enacted by the Royal Thai Government whereby the Institute is given full authority and complete latitude to develop its academic programs, to select its students, to set its own standards, and to award its own degrees. It has the authority to establish branches anywhere in the region. The charter provides for an international faculty and broad

regional activities. The International Board of Trustees is self-perpetuating and each Trustee, by terms of the Charter, serves as an individual and not as a representative of a government. In short, AIT is as free from governmental controls and as non-political as its founders could conceive.

The heritage received from the SEATO Graduate School of Engineering includes many accomplishments spanning an eight year period from September 1959 to November 1967. During the eight years as the SEATO Graduate School of Engineering, a total of 175 students received the Master of Engineering degree. The AIT graduated its first class under the new Royal Thai Government Charter on 4 May 1968, when 52 students graduated representing the Philippines, Thailand, Pakistan, and Taiwan. The total number of students who received Master of Engineering degrees from 1959 through 1969 is 282.

The primary purpose of AIT is to prepare Asians for the technological challenges of Asia's developing needs. Large scale transportation systems need to be built, water resources should be developed for irrigation and power, industrialization must take place, cities must be provided public water and sewerage facilities, and so on. This will require many engineers which are currently in short supply in Asia. Educating more engineers in the Western universities is not the answer as testified by the serious "brain drain" of Asians to Western countries. The solution must be the development of Asian institutions oriented to the needs of

Asia to produce Asian engineers. The role of the AIT is that of catalyst and focal point to assist in this great task of developing, at a greatly accelerated rate, engineering capability in Asia. The Asian Institute of Technology is there to stay.

SECTION 3

ENROLLMENT AND GRADUATION ACTIVITIES

Enrollment of students and graduation of scholars are the most important functions of the AIT. The enrollment and graduation activities during 1968 and 1969 are summarized in this section.

Enrollment

Enrollment of students at the Institute has displayed an upward trend each year since the inception of the school in 1959 when 19 students enrolled for the curriculum in hydraulic engineering, the only option available at the time. In 1966, the enrollment of students exceeded 100 for the first time. In 1967, 151 students from eight countries registered.

The enrollment at AIT continued its healthy growth during 1968 and 1969. A total of 161 students including 106 new students and 55 second year students began the academic year on 13 August 1968. The students were registered in five areas of study as follows: environmental engineering, 17; hydraulics, 43; soils, 31; structures, 37; and transportation, 33.

With the beginning of the 1969-70 academic year on the 18th of August, the Asian Institute of Technology began its second decade of instruction and research to serve the countries of the region. As in almost every year since its inception, the Institute entered the new academic year with a record enrollment of new students.

The reorganization of the academic structure which took place during the summer months of 1969 resulted in the following five divisions:

Environmental Engineering; Geotechnical Engineering; Structural and Engineering Mechanics; Transportation Engineering; and Water Science and Engineering. First year students who entered these Divisions in August 1969 totalled 111 as follows: environmental (13); geotechnical (22); structural (27); transportation (23); and water science (26).

Second-year students continuing in their work toward the Master of Engineering degree totalled 73. By division of study, these students were enrolled in: environmental (6); geotechnical (16); structural (21); transportation (12); and water science (18).

The present student body at the Asian Institute of Technology is comprised of individuals from 15 countries, three of which (Indonesia, Portugal, and Singapore) had not previously sent students to the Institute. The enrollments by country since 1959 are listed in Table 1.

Graduation Activities

The first graduation in which the AIT awarded its own degrees was held on 4 May 1968. This graduation was the eighth since the institution was founded in 1959. His Majesty King Bhumibol Adulyadej of Thailand delivered the graduation address and conferred the Master of Engineering degree on 52 candidates. The degrees were awarded for satisfactory completion of at least 30 semester credits of course work and presentation of an acceptable thesis. The areas of study in which the degrees were awarded are as follows: hydraulic engineering, 9; public health engineering, 16; soils engineering, 8; structural engineering, 14; and transportation

TABLE 1

ENROLLMENTS AND GRADUATES OF
THE AIT BY YEAR AND COUNTRY

Enrollments																	
Year	Afghanistan	Brunei	Hong Kong	India	Indonesia	Korea	Malaysia	Pakistan	Philippines	Portugal	Singapore	Taiwan	Thailand	Turkey	United Kingdom	Vietnam	Totals
1959	-	-	-	-	-	-	-	1	3	-	-	-	15	-	-	-	19
1960	-	-	-	1	-	-	-	9	3	-	-	-	35	-	-	-	48
1961	-	-	-	1	-	-	-	8	4	-	-	-	35	-	-	-	48
1962	-	-	-	1	-	-	2	6	10	-	-	1	42	-	-	-	62
1963	-	-	-	-	-	-	5	19	16	-	-	3	49	-	-	-	92
1964	-	-	-	-	-	-	7	15	24	-	-	3	46	-	-	-	95
1965	-	-	1	-	-	-	2	18	30	-	-	4	42	-	-	1	98
1966	-	-	2	-	-	-	2	22	28	-	-	6	50	-	-	1	111
1967	-	1	2	-	-	-	4	24	35	-	-	14	69	-	-	2	151
1968	1	-	1	1	-	4	5	32	24	-	-	25	65	1	1	1	161
1969	1	-	1	7	2	3	10	30	18	2	2	34	68	1	1	4	184
Totals	2	1	7	11	2	7	37	184	195	2	2	90	516	2	2	9	1069
Graduates																	
1961	-	-	-	-	-	-	-	1	1	-	-	-	6	-	-	-	8
1962	-	-	-	1	-	-	-	5	2	-	-	-	14	-	-	-	22
1963	-	-	-	-	-	-	-	-	2	-	-	-	15	-	-	-	17
1964	-	-	-	-	-	-	-	3	3	-	-	1	20	-	-	-	27
1965	-	-	-	-	-	-	3	8	7	-	-	-	19	-	-	-	37
1966	-	-	-	-	-	-	3	6	14	-	-	2	14	-	-	-	39
1967	-	-	-	-	-	-	-	3	5	-	-	2	15	-	-	-	25
1968	-	-	-	-	-	-	2	10	10	-	-	2	27	-	-	1	52
1969	-	-	1	-	-	-	1	11	7	-	-	7	28	-	-	-	55
Totals	-	-	1	1	-	-	9	47	51	-	-	14	158	-	-	1	282

engineering, 5.

His Majesty's speech was delivered in Thai and an English translation is given below:

"I am happy to participate on this occasion in the conferring of Master of Engineering degrees at the Asian Institute of Technology. I am most pleased to have seen the well-founded activities and to have heard of the noble objectives of this Institute. The study of any branch of knowledge can be conducted in like manner anywhere in the world. However, it would be difficult to utilize knowledge by one and the same method. Different regions of the world vary in geography, natural resources, and economic and social structure as well as in the intellectual and spiritual backgrounds of the people. Graduates who have studied technical theory and have been trained to practice to suit local conditions will be able to carry out their work more perfectly. It is therefore appropriate that the Asian Institute of Technology has the unique objective of becoming an institution of higher learning and research in engineering in this region, with a view to increasing the number of highly qualified engineers trained to suit conditions particularly found in Asian countries. The Institute indeed meets the needs and requirements of the present situation and all Asians should be proud and pleased with its establishment. I believe that this Institute will be one of the greatest and most important; it will become a center of engineering activities and a venue for the exchange of ideas and knowledge by the leading engineers of Asia. It will be of great value in generating progress in the various countries of the region.

I admire the ability and determination of every graduate and wish to congratulate you on achieving this honor and success. I leave in your care my hopes and aspirations. I wish you happiness and prosperity in life, and all success in bringing about development and solidarity throughout Asia. I wish every happiness and well-being for all of you who have gathered for this ceremony. "

The opening address at the May 1968 graduation was delivered by Dr. Puey Ungphakorn, Chairman, AIT Board of Trustees.

On the 23rd of May 1969, H. E. Mr. Mauro Calingo, Ambassador to Thailand from the Republic of the Philippines, conferred the degree of Master of Engineering upon a total of 55 candidates. Four of the Master of Engineering degrees were awarded for study in environmental engineering, 15 for study in hydraulics, and 12 each for study in soils, structures, and transportation engineering. Including the degrees conferred at this Ninth Annual Graduation, 282 candidates from eight countries have to date received the Master of Engineering degree from the Institute. The number of graduates by country since 1959 are listed in Table 1.

Dr. Puey Ungphakorn, Governor of the Bank of Thailand and Chairman of the AIT Board of Trustees, gave the opening address at the graduation. In the absence of Dr. Milton E. Bender, Jr., President of the Institute, the President's Report was delivered by Dr. John K. Lubbock, Academic Dean. Following his awarding of the degrees, H. E. Mr. Calingo delivered the Graduation Address.

SECTION 4

STAFF CHANGES AND ACTIVITIES

The staff of AIT was strengthened considerably during 1968 and 1969. The changes that occurred are summarized below. Also discussed in this section are some of the staff activities that took place during this two year period.

Staff Changes

The AIT welcomed the following new members of the faculty during 1968 and 1969: Dr. Robert B. L. Smith from Manchester University, U.K. as Professor and Head of Structural Engineering, in June 1968; Dr. J.C.L. Chang from University of Pittsburgh, USA, as Academic Dean, June 1968; Professor William McGuire from Cornell University, USA, as Professor of Structural Engineering, in July 1968; Dr. John D. Nelson of Illinois Institute of Technology, USA, as Assistant Professor of Soils Engineering, in July 1968; Dr. Donald R. Drew from Texas A&M University, USA, as Professor of Transportation Engineering, in August 1968; Dr. Seng-Lip Lee from Northwestern University, USA, as Professor of Structural Engineering, in September 1968; Dr. E. W. Brand from Nottingham University, U.K., as Associate Professor of Soils Engineering, in September 1968; Dr. Hwa-Wei Lee from Edinboro State College, USA, as Librarian, in August 1968; Mr. David Hooton from the Rolls-Royce Company, U.K., in the Workshop assisting students with development of research equipment (Mr. Hooton came to AIT under the auspices of the British Voluntary Service Overseas (VSO) program);

Professor F. H. P. Williams, U.K., as Professor in the Division of Transportation Engineering, in August 1969 (Professor Williams' appointment was arranged by the British Ministry of Overseas Development under the Colomba Plan for technical assistance); Dr. Tongchet Hongladaromp, a graduate of the SEATO Graduate School of Engineering, as Assistant Professor of Structural Engineering, in July 1969; Dr. Pakorn Adulbhan, Chulalongkom University, Thailand, as Assistant Professor of Transportation Engineering; Dr. Hiroyoshi Shilgai, Japan, as Associate Professor in the Division of Water Science and Engineering, in September 1969; Robert S. Smith, U.S., Public Relations Advisor, in September 1969; Edward K. Noda, U.S., Assistant Professor of Hydraulics, October 1969; and Richard J. Frankel, Associate Professor of Civil Engineering (Sanitary), in December 1968.

Faculty who departed AIT during 1968-69 were: Dr. Gordon H. Flammer, Professor of Hydraulic Engineering at AIT since June 1966, returned to the U.S. in September 1968; Professor Edmund F. Schulz, Associate Professor of Hydraulic Engineering at AIT since February 1965, returned to the U.S. in August 1969; and Dr. D. W. Brand, Associate Professor of Soils Engineering, returned to the University of Nottingham in the U.K., after completing a one-year appointment at the AIT.

Some Staff Activities

At the 11th Conference on Coastal Engineering, Dr. Richard Silvester, Professor of Coastal Engineering at the AIT, reported on the "Application of Wave Diffraction Data." The paper was jointly authored with Mr. T. K.

Lim, a 1968 Master of Engineering graduate of the Institute. The conference, held in London the 16th to 20th of September 1968, was sponsored by the American Society of Civil Engineers and the Institution of Civil Engineers (London). Professor Silvester also presented a paper on tidal waves on the continental shelf at the 1969 Congress of the International Association for Hydraulic Research held in Kyoto, Japan in September.

Under the terms of a research contract with Netherlands Engineering Consultants (NEDECO), Professor John Hugh Jones and Dr. Donald R. Drew, Professors of Transportation Engineering, have conducted an analysis of the ship traffic problem due to the arrival of vessels at the Port of Bangkok. In addition to the conventional factors that affect marine turn-around time at a port -- the availability of berths, customs procedures, and the methods of handling cargo -- the operation of the Port of Bangkok is complicated by a limitation on the acceptance of ships during periods of low water level due to the presence of the bar channel at the mouth of the Chao Phraya River. Analysis of the problem was conducted using both a simulation model and an input-output model. The study led to an evaluation of the number of ships in queue at the bar and their expected waiting time in the future to the year 1990.

On the occasion of Coronation Day, the 5th of May 1968, His Majesty King Bhumibol Adulyadej dubbed Dr. Aroon Sorathesn, Professor of Environmental Engineering, as Knight Grand Cross of the Most Noble Order of the Crown of Thailand. This decoration, which was created by

King Chulalongkorn 99 years ago, was awarded to Dr. Aroon Sorathesn in recognition of his services to the Kingdom and the Royal Household. In addition to his duties as a member of the faculty of the Asian Institute of Technology, Dr. Sorathesn serves on numerous commissions

such as: the Registered Engineers Professional Council, the National Energy Authority, the National Survey Committee, the Committee on Atomic Energy for Peace, Committees on the Drainage and Water Supply for the Bangkok metropolitan area, the National Research Council, the University Council of Thailand, and the Committee for the Restoration of the Stupa at the Buddhist temple at Nakhon Pathom.

In order to study the preservation by atomic irradiation of sea food (fish, shrimp, and shellfish), Dr. Aroon Sorathesn visited Iceland for a period of nearly three months at the beginning of 1969. The scientific objectives of the study were to learn how best to preserve fish without destroying the taste, texture, or odor, and to control bacterial and chemical changes so no harm would come to consumers.

Dr. Aroon Sorathesn was appointed **Dean of Faculty of Engineering**, Chulalongkorn University in 1969. A member of the faculty at Chulalongkorn from 1950, Dr. Sorathesn has served on the AIT faculty since 1964 when he was invited to become the chairman of the major in public health (now environmental) engineering.

Until the date of its being chartered as an independent educational institution in November of 1967, the Institute was a graduate school under the **sponsorship** of SEATO; AIT continues to occupy premises on the

Chulalongkorn campus in Bangkok. The appointment of Dr. Sorathesn as Dean of Engineering at Chulalongkorn will assure the continuity of the close association which has existed between the two institutions over the past ten years.

Dr. Za-Chieh Moh, Professor of Soil Engineering, was elected President of the Southeast Asian Society of Soil Engineers, and Dr. John D. Nelson, Assistant Professor of Soil Engineering, was appointed as Secretary in the latter part of 1968. In addition to these two officers, the member countries are represented on the general committee of the SEASSE by the following representatives: Professor Sean Mackey (Hong Kong); Professor Chin Fung Kee (Malaysia); Mr. Khaja Azeemuddin (Pakistan); Mr. Jose C. Santos (Philippines); Mr. Chan Chee Wah (Singapore); Dr. Sirilak Chandrangsue (Thailand); and Mr. Buu Don (Vietnam).

Speaking on "The Application of Operations Research to Highway Engineering," Dr. Donald R. Drew, Professor of Transportation Engineering, in the latter part of March 1969 addressed the Bangkok group of the Institution of Highway Engineers (London). Drawing upon his research experience in the application of O-R techniques to problems in transportation systems, Dr. Drew systematically outlined a method by which these techniques can be used to aid in making decisions in highway engineering.

Dr. Za-Chieh Moh, Professor of Soil Engineering, in 1969 was appointed to the Committee on Information Retrieval of the Soil Mechanics

Division of the American Society of Civil Engineers. He also serves as Assistant Editor of the International Abstracts section of the ASCE Journal of the Soil Mechanics and Foundations Division. The committee has responsibility for evaluation of current research and literature, the preparation of state-of-the-art reports, and the preparation of Manuals of Practice for publication by the Society. Dr. Moh attended the Seventh International Conference on Soil Mechanics and Foundation Engineering in August 1969 as a voting representative. He also attended a summer institute at MIT in Cambridge, Massachusetts on "Prediction and Measurement of Stresses and Deformations in Soils" on his way to the International Soils Conference.

Dr. R. J. Frankel initiated cooperative research projects on "Demand for Potable Water in Small Communities of Thailand," "Benefits and Costs of Providing Potable Water to Small Communities in Thailand," and Analysis of Multiple State River Basin Development." The first two studies will be conducted in cooperation with the U.S. Peace Corps, the Sanitary Engineering Division of the USOM Department of Health and the Potable Water Project of the Thailand Office of Accelerated Rural Development (ARD). The third project will be joint research with Dr. N. L. Ackermann of the AIT.

Five Master's students were assigned research on the Algae Research Program directed by Dr. M. G. McGarry. Financial support of \$3,000 was provided by the Bangkok Sewerage and Drainage Planning Committee and construction materials were donated by the Siam Brick Products

Company and the Siam Cement Company. The pond fill was completed at the site of the Applied Scientific Research Corporation of Thailand and pond construction was started.

The Soil faculty sponsored a new research project on the Rangsit Test Embankment and Drainage Channel near Bangkok. A trial embankment and drainage channel was instrumented to determine the stability and settlement characteristics under the proposed bund and ditch design scheme at the new AIT site. The project is jointly sponsored by Scott Wilson Kirkpatrick (U.K. ODM) and AIT.

Dr. R. Silvester initiated new research projects during 1969 as follows:

- a. Sediment Erosion beneath Oil Rig Legs.
- b. Sewage Disposal into the Sea.
- c. Cooling Water Intakes in a Stratified Fluid.
- d. Forces on Pipe Entrances.

Dr. Silvester visited Perth, Western Australia late in May 1969 to advise on port selection along the northwest coast for a multi-million dollar iron ore project. He was requested by the mayor of Narathiwat in the south of Thailand to advise on means to maintain a channel through a river bar and prevent coastal erosion.

The head librarian, Dr. Hwa-Wei Lee, was invited to present a paper on "Computer Applications in Library and Information Services: The Current AIT Experiments and Future Plans," at the first Computer Application Symposium sponsored jointly by the Computer Science

Laboratory, Chulalongkorn University and U.S. Educational (Fulbright) Foundation in Thailand, at Hotel Siam Intercontinental, on 23-24-25 June 1969.

Dr. Lee also attended the Data Processing Seminar and Exhibition at the U.S. Trade Center between 23 and 27 June 1969.

SECTION 5

ACADEMIC PROGRAM

The academic program of the AIT continued to develop during 1968 and 1969. The academic structure of the Institute changed with the beginning of the 1969-70 academic year and the following five Divisions resulted:

1. Environmental Engineering
2. Geotechnical Engineering
3. Structural and Engineering Mechanics
4. Transportation Engineering
5. Water Science and Engineering

The President of the Institute recently approved the recommendation of the Academic Dean that the AIT offer two optional programs for the Master of Engineering degree. To date, the Institute's requirements for the Master of Engineering degree have comprised the satisfactory completion of a minimum of 30 semester-hours of course work and presentation of an acceptable thesis. The new option, to be effective in the 1969-70 academic year, enables students to achieve the Master of Engineering degree through 48 semester-credits of course work and a comprehensive examination.

In anticipation of being able to offer a Doctoral degree program in Transportation Engineering by August 1970, five new courses in the Division of Transportation Engineering were approved.

To help students improve their fluency in the English language, which is the medium of instruction at the Institute, pre-semester courses were taught during the summers of 1968 and 1969. A total of 68 students participated in 1968 and 46 in 1969. English courses have been taught nearly every year to enable incoming students to overcome their deficiencies in the use of the English language. An ad hoc committee studied the correlation between academic achievement and the results of the British Council test of English. It was concluded that students who are less well prepared academically need a stronger facility in the English language in order to cope with the engineering curriculum at the Institute.

The Asian Institute of Technology has added Coastal Engineering as an area of academic study and research, thus expanding its offerings in those areas of engineering expected to be of particular benefit to the region. The extensive shorelines of Southeast Asian countries, coupled with growing needs for ports, harbors, and coastal defense works, presage significant opportunities for coastal engineers to contribute to the economic development of the area.

The new area of study in Coastal Engineering at the Institute will be in charge of Dr. Richard Silvester, Professor of Coastal Engineering. Dr. Silvester is on leave from the University of Western Australia where he served for 17 years prior to being seconded to AIT by the Australian Government.

During the 1967-68 and 1968-69 academic years, in preparation for the inauguration of Coastal Engineering as a separate area of study,

courses in tidal and estuarine hydraulics and in coastal engineering were offered under the aegis of the hydraulics area of study. New courses available for students during the 1969-70 academic year included coastal sedimentation, inland waterways, and coastal modeling.

The Asian Institute of Technology is embarking on another pioneering effort for Southeast Asia in establishing study in Coastal Engineering. It is expected that a substantial number of civil engineering graduates will recognize the opportunities for professional practice which will be forthcoming and will embark on careers in coastal engineering by enrolling in this new area of study, one which is not offered elsewhere in Southeast Asia.

Public Health was renamed the Environmental Engineering Division in an effort to bring the name of this area of specialization into conformity with the practice of the World Health Organization and to follow a general trend. Also, certain changes in courses, aimed to better meet the needs of the region, have been effected. A new course in Tropical Water Pollution Control has been added and two new courses (Water Engineering Design, and Wastewater Engineering Design) have emanated from modification of an existing course to give a more thorough coverage of the practical aspects of the field.

SECTION 6

SPECIAL INSTITUTES AND SEMINARS

Several special summer courses, institutes, and technical sessions were sponsored by the AIT. A three week summer course on Coastal Engineering was conducted at the AIT from May 20 through June 7, 1968. Forty-five engineers from 12 countries attended the course. Topics discussed included erosion, harbor salting, design of breakwaters and graynes, and focus on piles and sea walls.

Engineering educators from a broad sweep of Asian countries convened at the AIT from the 16th through the 27th of June 1969 for an institute on experimental studies in hydraulic engineering. A total of 25 visitors participated in the lecture, laboratory, and demonstration course which was intended to enable engineering teachers and researchers to study the design, operation, and performance of a broad range of laboratory equipment and experiments useful as teaching aids and research tools. The course was aimed at both undergraduate and postgraduate programs. Participants in the course came from 11 Asian countries.

At the Seventh International Conference on Soil Mechanics and Foundation Engineering held in Mexico City in August 1969, the Asian Institute of Technology sponsored a specialty session on the engineering properties of lateritic soils. The session was of particular interest to technologists concerned with the engineering behavior of tropical soils. Determination of the engineering properties of lateritic soils,

interpretation of test results, and the utilization of lateritic soils for construction was discussed at the specialty session.

A seminar on the Engineering and Management of Technological Systems in Developing Countries was held at the Institute on the 22nd of October 1969. Dr. Frank E. Cotton, Jr., Executive Vice-President of the American Institute of Industrial Engineers, Dr. Donald R. Drew, Professor of Transportation Engineering, and Dr. Pakorn Adulbhan, Assistant Professor of Transportation Engineering presented papers during the one-day seminar.

SECTION 7

RESEARCH ACTIVITIES

The AIT carries out an active program of research in those areas of civil engineering related to environment, hydraulics, soils, structures, and transportation. Such a program of engineering research, directed toward the problems of Asia, is in keeping with the highest academic standards and is an essential element in the development of the Institute. Such a program develops competence on the part of students and adds to the fund of knowledge through the publication of new findings. Benefiting from the research programs are students, research associates, faculty, engineering firms and government agencies. Research efforts in hydraulics, transportation, structures, environmental engineering, and soils engineering are summarized in the remainder of this section.

Hydraulic Engineering Research

The development of water resources is vital to the technological progress of Southeast Asia. The means by which this natural resource can be utilized most effectively provides the Asian Institute of Technology with a vast array of research topics. Investigations are conducted by students as part of their thesis research and by staff members as faculty research.

Studies in hydraulic engineering are being carried out in the areas of coastal processes, open channel flow, sediment transport, partially-saturated flow in soils, systems analysis, and other topics of both theoretical and an applied nature. Typical research projects have been

concerned with channel roughness, salt-water intrusion, and the diffraction of waves caused by breakwaters.

Research is being conducted to determine the basic hydrologic patterns and to assemble data for Southeast Asia for the planning and design of engineering works. A fully instrumented meteorological station is operated in conjunction with the hydrologic research program.

Excellent and ever-enlarging laboratory facilities, coupled with diverse staff interests, enable research to be conducted over an unusually wide scope.

Transportation Engineering Research

Research conducted in transportation engineering consists primarily of projects devoted to traffic engineering, economic impact, and road construction materials. Basic work is being carried out to obtain a better understanding of the behavior of traffic, such as determining the lateral placement of vehicles on horizontal curves; traffic density-volume studies have been conducted at major street intersections, and an instrumented test car has been utilized in conducting car-following experiments.

Of special interest in developing countries in Southeast Asia are projects concerned with evaluating the economic impact of roads on rural development. Particular attention has been devoted to the economic effects of a rural transportation system in stimulating the shipment of farm produce to a wider market area and the flow of manufactured goods to the rural areas.

Research has been conducted on the stabilization of local lateritic materials with bitumen. An asphalt laboratory has been developed for research on applications of bitumastic materials for low-cost road construction under tropical conditions.

From 1960-1966, research on soils was included under Transportation Engineering. Reports of completed soils investigations continue to be listed in Transportation Engineering; current soils research is listed under Soil Engineering Research.

Structural Engineering Research

The structures laboratory has a testing area of approximately 450 square meters with a strong floor on which special purpose rigs are built for individual research projects. In addition, the main laboratory includes three large Denison testing machines and facilities for pre-stressing of concrete specimens. Reinforced concrete is a construction material of prime importance in Southeast Asia and an additional area exceeding 160 square meters is devoted to a concrete laboratory. The electronics shop, situated adjacent to the main laboratory, is available to assist in the instrumentation of experiments. Small-scale models play an important role in structural research; these are cared for in a special laboratory. Additional provision is made for the testing of cement, for constant temperature and humidity conditions for the curing of specimens, and for long-term loading tests under controlled conditions.

In addition to the graduate research projects in progress, all based on topics which have developed from design experience, the laboratories are able from time to time to serve the needs of practicing engineers who have unusual problems, although the facilities are not available for commercial testing.

Environmental Engineering Research

Environmental engineering research at the Asian Institute of Technology is primarily aimed at solving the regional problems of water and waste treatment in a manner which suits the environmental and economic conditions of the area. Quality aspects of water resource development and management and their public health significance are important considerations in the planning of projects for national development. The challenge of unique topics, demanding an original approach, stimulates the researcher in this field; an awareness of the urgency of the needs of developing countries assures him of the immediate usefulness of his work.

Ideal opportunities to pursue research into current and pressing problems were afforded by the Thai Government's decision to proceed with plans for the drainage and sewerage of Bangkok. Studies connected with stormwater collection, river pollution, and sewage treatment have been made in cooperation with interested authorities; the results are pertinent not only to this particular project but are widely applicable in tropical regions.

Research is also proceeding on the treatment of industrial wastes

in Southeast Asia; some of these studies are peculiar to tropical conditions. Through research, attempts have been made to rationalize design criteria for waste stabilization ponds and sludge drying beds for use in regions with a climate similar to Thailand. More fundamental work is being carried out on the progress of biological assimilation of wastes under the high temperature conditions of the tropical climate.

Water treatment studies have been concerned with local problems of iron removal from groundwater, coagulation treatment of highly-turbid waters, two-layer filtration, and the applications of ion exchange. Here a useful purpose is being served by introduction of the latest technology, resulting in better service to the community.

Soil Engineering Research

Soil is one of the most important materials involved in civil engineering projects; it is used either as a foundation to support structures or a construction material to be remolded and reshaped by the engineer. Unlike many other construction materials, natural soil is a complex, multiphase system comprising a skeleton of discrete mineral particles, the voids of which are filled with liquid and gas. Because of the inherent difficulties in idealizing a large soil mass, the practice of soil engineering is based on both a theoretical knowledge of soil behavior and on empirical methods resulting from experience gained from previous construction projects.

Because of the growing need for soil specialists in the rapidly developing countries of Southeast Asia, a separate area of study and

research in soil engineering was established in 1966. It was recognized at an early stage that many of the methods and techniques developed in temperate-zone countries could not be applied directly to tropical soils. Consequently, the soil engineering laboratory, which houses some of the most modern research equipment available, has been developed with an emphasis on local conditions and local needs.

Research in soil engineering at the Asian Institute of Technology is concerned primarily with problems common to the countries of Southeast Asia. Long-term programs include studies of the basic properties of lateritic soils and local clays, with particular regard to their efficient utilization as construction materials. Extensive investigations are being conducted on the fundamental properties of the highly compressible soil deposits of the lowland deltaic regions; these studies are aimed at solving the many foundation problems encountered in these areas. Special emphasis is placed on the compressive and strength characteristics of these deltaic soils, and on their behavior with respect to compaction and stabilization. There is also being conducted, employing both analytical and analog techniques, a program of study of seepage problems associated with deep excavations, earth dams, and groundwater flow.

SECTION 8

THE NEW AIT CAMPUS AT RANGSIT

As a result of a series of meetings held early in 1968, the Thai Council of Ministers transferred a 1,000 acre site in Rangsit District, 40 kilometers north of Bangkok, from the Ministry of Industries to Thammasat University to be used exclusively for higher educational developments. AIT will lease, on a long-term basis, approximately 400 acres of this land from Thammasat University for a token fee. The present plan is to move to the new site in 1972.

In July 1968 the Trustees approved a U.S. \$18,500,000 ten-year development plan. By January 1969 almost a third of this sum had been committed by the United Kingdom, Thailand, Australia, and the United States. (This amount is sufficient to start construction.) Commitments from other sources are expected in the near future. The AIT architects have begun preparing plans for the development of the new site and for construction of buildings.

An Asian Institute of Technology "Development Report and Master Plan" was completed by Robert Matthew, Johnson-Marshall and Partners in early 1969. Much of the report was based on earlier information developed by Cresap, McCormick, and Paget, Management Consultants. The "Development Report and Master Plan" includes site organization and the way it must be achieved in coordinated states.

Although the site is approximately 40 kilometers outside of Bangkok, the location has good, long-term values. Robert Matthew,

Johnson-Marshall and Partners, concluded that "its location on a major highway, the rapid growth of housing and commercial facilities between the airport along the highway, suggest that the combined AIT and Thammasat developments could result in even greater pressures for development along the communications corridor between the site and the airport. "

In planning the new campus, all of the following are being taken into account: the uniqueness of AIT as a graduate and research institution without an undergraduate program, the intention that it is to be a focal point for continuing education in the form of regional conferences, seminars and short courses, the truly international faculty and student body, the distance from Bangkok, and the flat terrain.

Eventually the campus will be largely residential with all of the students, a large part of the faculty and senior staff, and short-term participants in the continuing education programs living on campus. Careful thought has been given in the planning of the housing to provide individual privacy and yet the opportunity for social communication between people living in all segments of the housing. It is hoped that this will bring about better understanding between the people of the many nationalities involved.

The academic buildings will be the core of the new campus. The academic program is dynamic and must change to meet changing needs of the region, and the academic buildings will be designed

to provide maximum flexibility. The laboratories will not only provide for the research by students and faculty, normal for a graduate program, but will also provide for the large amount of research that must be done for industry and governments in the region. In the initial phase of construction, only buildings to accommodate present academic programs will be built. Buildings to accommodate other subject areas will be built later in the 10-year planning period.

The housing area for students will be built adjacent to the academic buildings with faculty and staff housing beyond student housing.

A complex east of the academic area will contain the library and computer center, the administration building, and the Institute Center.

The library will be computerized and modern in every respect. It is designed to serve the needs of AIT and many of the needs of the region. This library has exciting possibilities and can be of enormous benefit to the region.

The Institute Center will serve as a social center for students, faculty and staff, but more importantly, it will be the center for the programs of continuing education and will include, among other things, complete conference facilities and housing for short-term participants and visitors.

To compensate for the flat terrain, careful attention will be given to landscaping to create the most pleasant atmosphere possible.

AIT is a focal point for engineering education and for the engineering profession in a vast region. This campus must reflect its goals and provide the facilities in which to carry them out.

APPENDICES

APPENDIX I

BOARD OF TRUSTEES FOR THE ASIAN INSTITUTE OF TECHNOLOGY

The Charter of the Asian Institute of Technology vests all powers of the Institute in the Board of Trustees, a group of individuals consisting of not less than nine nor more than sixty members. The Charter also provides that the Board shall be international in character and composition to the highest degree possible and that it shall always include the President of the Institute. The following listing shows the members of the Board of Trustees as of July 10, 1969.

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Secretary General
Office of the National
Education Council
Sukothai Road, Dusit
Bangkok, Thailand

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Asian Institute of Technology
Henri Dunant Street
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63 Huynh Thuc Khang
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New Zealand Embassy
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Silom Road
Bangkok, Thailand

Mr. George Thery
Director
Banque de l'Indochine
Bangkok, Thailand

Dr. Puey Ungphakorn
Governor
Bank of Thailand
Bangkunprom
Bangkok, Thailand

Dr. Utai Voodhigula
Director-General
Department of Highways
Sri Ayudhia Road
Bangkok, Thailand

The officers of the Board as of July 10, 1969 were: Dr. Puey
Ungphakorn, Chairman; Mr. Oscar Mapua, Vice-Chairman; Dr. Milton
E. Bender, Jr., President; Mr. David L. McClintock, Secretary.

Original members of the Board not listed above are as follows:

Dr. Salvador Araneta
President
Araneta University Foundation
Rizal, Philippines

Mr. B. F. Bolt
Charge d'Affairs
New Zealand Embassy
Bangkok, Thailand

Mr. Chan Chieu Kiat
Deputy Director of Education
Ministry of Education
Singapore

H.E. Mr. A. H. Loomes
Australian Ambassador
Bangkok, Thailand

H.E. Tengku Ngah Mohamed
Malaysian Ambassador
Bangkok, Thailand

The Honorable D. J. Samuel
Shell Oil Corporation
Brussels, Belgium

Dr. Vidal A. Tan
President
Progressive Commercial Bank
Manila, Philippines

Dr. A. R. Zubair
Vice-Chancellor
West Pakistan University of
Engineering & Technology
Lahore, West Pakistan

APPENDIX II
PUBLICATIONS

Published Papers

Pescod, M. B. (1969) Photosynthetic Oxygen Production in a Polluted Tropical Estuary, Journal Water Pollution Control Federation (U. S.), v. 41, No. 8, pp. 309 - 321.

Brand, E. W. , and Hongnoi, M. , Effects of Method of Preparation on Compaction and Strength Characteristics of Lateritic Soils, Proc. Specialty Session on Engineering Properties of Lateritic Soils, Seventh International Conference on Soil Mechanics and Foundation Engineering, Mexico City, August 1969.

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Moh, Z. C. , Nelson, J. D. , and Brand, E. W. , Strength and Deformation Behavior of Bangkok Clay, Proc. Seventh International Conference on Soil Mechanics and Foundation Engineering, Mexico City, August 1969.

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Muktabhant, C. , and Ongskul, S. , Stabilization of Lateritic Soil with Sand, Proceedings Specialty Session on Engineering Properties of

Lateritic Soils, Seventh International Conference on Soil Mechanics and Foundation Engineering, Mexico City, August 1969.

Nelson, J. D., Sampling of Lunar Soil, Specialty Session No. 1, Soil Mechanics Aspects of Soil Sampling, Seventh International Conference on Soil Mechanics and Foundation Engineering, Mexico City, August 1969.

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Drew, D. R., Multilevel Approach to the Design of a Freeway Control System, Highway Research Record, Number 279.

Drew, D. R., Ramp Capacity and Service Volume as Related to Freeway Control, Highway Research Record, Number 279.

Drew, D. R., Traffic Characteristics for Implementation and Calibration of Freeway Merging Control Systems, Highway Research Record, Number 279.

Drew, D. R., A Moving Vehicle Merging Control System, Highway Research Record, Number 279.

Drew, D. R., Some Design Considerations of Digital Computer Control Systems Applied to Freeway Traffic Operations, Highway Research Record, Number 279.

Drew, D. R., Design of Freeway Entrance Ramp Merging Control Systems, Highway Research Record, Number 279.

Silvester, R., and Lim, T. K., Application of Wave Diffraction Data, Proceedings Eleventh Conference Coastal Engineering, Vol. 1, 1969, pp. 248 - 270.

Ackermann, N. L., and Shen, H. T., Pumping from a Shallow Water Aquifer in a Coastal Region, Proceedings of the XII Congress of the International Association for Hydraulic Research, Kyoto, Japan, September 1969.

Arbhabhirama, A., Free Streamline Analysis of Two-Dimensional Jet, Journal of Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 95, July 1969.

Arbhabhirama, A., Pinkayan, S., and Frankel, R. J. were requested by the Water Resources Division of the Economic Commission for Asia and the Far East (ECAFE) to assist in the preparation of the report "Water Management of Deltaic Areas with Emphasis on Salinity Control and Drainage," ECAFE, September 1969.

Student Theses

- 171 Muhammad Naseerul Haque Qureshi (Dr. William W. Lorell),
"Comparative Design of a 400-ft Steel Highway Bridge."
- 172 Prasit Wilailaksn (Professor Edmund F. Schulz), "Effect of
Length of Carryover Period on Serial Correlation of Runoff."
- 176 Fazal Mohammad (Dr. William W. Lorell), "Comparative Cost
Study of Reinforced and Prestressed Concrete Bridges in Pakistan."
- 178 Ruongrit Ammawat (Professor Edmund F. Schulz), "Comparison of
Piché and Class 'A' Evaporimeters."
- 180 Wu Sang Wang (Dr. Za-Chieh Moh), "Shear Strength Characteristics
of Bangkok Clay."
- 181 Mohammad Shamim Mozaffar (Dr. Arthur N. L. Chiu), "Load Dis-
tribution in an Unsymmetrical Columnless Slab-Type Stairway."
- 182 Likhit Kittisatra (Dr. Neil Jackson), "Moment - Rotation Charac-
teristics of Reinforced Concrete Beams Under Combined Bending
and Torsion."
- 183 Muhammad Sarwar Khan (Dr. Neil Jackson), "Model Analysis of
Two-Dimensional Stress Problems Using Framework Analogy."
- 184 Hemenegildo Valdez Manibog (Dr. Victor A. Pulmano), "Experi-
mental Investigation of the Lateral Stability of Prestressed Concrete
Beams."
- 185 Kanchit Malaivongs (Dr. Arthur N. L. Chiu), "The Structural Be-
havior of Brick-Infilled Steel Frames."

- 186 Romeo Amit Estanero (Dr. Neil Jackson), "Moment Rotation Characteristics of Reinforced Concrete Sections Under Combined Bending and Torsion."
- 187 Prinya Sutabutra (Dr. Chai Multabhand), "Compressibility of Compacted Bangkok Clay."
- 188 Olivia Bose Marinas (Professor M. B. Pescod), "Environmental Factors Affecting Algal Growth in Waste Stabilization Ponds."
- 189 Veera Vitayaudom (Dr. Surin Setamanit Tonsiengsom), "Iron Removal from Water Supplies."
- 190 Alfonso Sinda Teves, Jr. (Dr. Za-Chieh Moh), "Compressibility of Bangkok Clay."
- 191 Faiz Ahmad Chishti (Dr. Anat Arbhabharama), "Hydraulic Characteristics of Seepage Underneath Hydraulic Structures."
- 192 Javed Maqbool (Dr. Gordon H. Flammer), "Drag of a Hemisphere on a Boundary in Velocity Gradient Flow."
- 193 Gregoria Managase Alivio (Dr. Roscoe F. Ward), "Studies on High Rate Anaerobic Stabilization Ponds."
- 194 Teeracharti Ruenkrairergsa (Dr. Za-Chieh Moh), "Effect of Compaction Method on Pore Pressure Development."
- 195 Alfredo Fucoy Estoque (Dr. Arthur N. L. Chiu), "Spectral Analysis of Simulated Wind Records Including Time-Varying Means and Gusts."
- 196 Oseni Selorio Maribojo (Dr. Roscoe F. Ward), "Effect of Detention Time on Aerobic Stabilization Pond Performance in Southeast Asia."

- 197 Arcadio Pacquiao Sincero (Dr. Roscoe F. Ward), "Sludge Production in Coagulation Treatment of Water."
- 198 Chuanpis Phongphaiboon (Dr. Roscoe F. Ward, "A Study of High-Rate Aerobic Stabilization Ponds."
- 199 Udorn Chanpong (Dr. Arthur N. L. Chiu), "Stress and Stability Analysis of Guyed Towers."
- 200 Mushtaq Husain Dawood (Dr. Neil Jackson), "Use of Multi-purpose Reinforcing Bars in Folded Plate Structures."
- 201 Suthee Tongpatanakul (Dr. Arthur N. L. Chiu), "Structural Behavior of Brick-Infilled Reinforced Concrete Frames."
- 202 Arshud Mahmood (Dr. Robert D. Mackey), "An Investigation of Friction Between Wall Structures and Contained Materials."
- 203 Rogelio Cruz Lazaro, Sr. (Dr. Za-Chieh Moh), "Stabilization of Clayey Soils with Lime-Rice Hull Ash Admixtures."
- 204 Teck-Kong Lim (Dr. Richard Silvester), "Wave Diffraction."
- 205 Lertvit Tangkosakul (Professor John Hugh Jones), "Application of Queuing Models to Ship Turn-Around at the Port of Bangkok."
- 206 Rafael Talaid Apostol (Professor Edmund F. Schulz), "A Study of Rainfall on Luzon, Philippines."
- 207 Boonchuan Tantayanubutr (Professor John Hugh Jones), "Changes in Agricultural Land Use Along the Friendship Highway as Related to Terrain and Prior Development."
- 208 Yew-Chaye Loo (Dr. William W. Lorell), "Bridge Decks with Polygonal Stiffening Arches."

- 209 Wang Wong (Dr. Za-Chieh Moh), "Effect of Anisotropic Consolidation on Shear Strength of Bangkok Clay."
- 210 Pedro Dumlao Tandoc, Jr. (Professor William McGuire), "Stress Analysis and Stability Determination of Guyed Towers."
- 211 Silchai Thirawat (Dr. Za-Chieh Moh), "Thixotropic Characteristics of Compacted Bangkok Clay."
- 212 Syed Jawad Haider (Dr. Robert D. Mackey), "An Investigation of the Flow of Granular Materials Through Vertical Pipes and Orifices."
- 213 Prachit Chiruppapa (Dr. Chai Muktabhant), "Cast In-Situ Bored Piles in Bangkok Clay."
- 214 Theera Karot (Professor M. B. Pescod), "Two-Layer Filtration Studies."
- 215 Qamar Akhtar Shaikh (Dr. Robert D. Mackey), "An Investigation of Arching over a Flexible Trapdoor and Pressure Distribution Around It."
- 216 Horng-Ming Fan (Dr. Arthur N. L. Chiu), "Analysis of Dynamic Response of Multi-Mass Structural Systems Subjected to Actual and Simulated Wind Forces."
- 217 Syed Hasan Nasir (Dr. Chai Muktabhant), "Use of Lateritic Soils for Low Cost Housing."
- 218 Mahboob Ali Khan Qaimkhani (Professor M. B. Pescod), "Use of 30°C BOD in Southeast Asia."
- 219 Supoje Hualthanom (Professor John Hugh Jones), "Analysis of the Effect of Duration of Exposure on Glance Legibility of Thai-Character Highway Signs."

- 220 Soralux Tosukhowong (Professor M. B. Pescod), "Oxygen Demand of Bottom Muds in Bangkok. "
- 221 Sa-ngob Boripunt (Dr. Robert D. Mackey), "Investigation of Secondary Compression Phenomena in Bangkok Clay. "
- 222 Pranee Prohmmanee (Dr. Roscoe F. Ward), "Composting of Refuse with Sewage Sludge. "
- 223 Sermopol Ratasuk (Professor M. B. Pescod), "Atmospheric Reaeration in the Chao Phya River Estuary. "
- 224 Suvararat Limrat (Dr. Surin Sethamanit Tonsiengsom), "An Investigation into the Use of Tray Aerator for Iron Removal. "
- 225 Namtip Rattapan (Professor Aroon Sorathesn), "Bangkok Runoff Hydrograph. "
- 226 Tieu-Vuong Luong (Professor M. B. Pescod), "Effects of the Bangkok Climate on Sludge Dewatering. "
- 227 Kuang-chiu Tseng (Professor M. B. Pescod), "Principal Factors Affecting Sludge Drying on Sand Beds. "
- 228 Charin Tongkasame (Professor M. B. Pescod), "Anaerobic Treatment of Tapioca Starch Waste. "
- 229 Chakorn Rachatatevintr (Professor John Hugh Jones), "International Airline Passenger Interchanges Between Bangkok and Other Cities. "
- 230 Chaiwat Changwatchai (Professor John Hugh Jones), "Analysis of Selected Commodity Flows by Water Transport in the Chao Phya Basin. "
- 231 Charoen Boonyajantaranon (Professor Pichai Boonyakanjana), "Diffusion of Multiple Jet System. "

- 233 Suphat Vongvisessomjai (Dr. Anat Arbhabharama), "Theoretical Study of Fluctuation Characteristics of Water Tables in Circular and Strip Islands Due to Ocean Tides."
- 234 Srisook Chandrangsue (Professor John Hugh Jones), "Effect of Pavement Edge Markings on the Lateral Placement of Vehicles on Two-Lane Curved Roadways."
- 236 Ding-Tsai Chiou (Dr. Donald R. Drew), "Some Characteristics of Traffic Entering a Signalised Intersection With and Without a Red/Amber Period."
- 238 Kovit Kuvanonda (Professor John Hugh Jones), "Effect of the Korat-Nong Khai Highway in Northeast Thailand on Rail Transportation."
- 243 Chirapat Chotickai (Dr. Donald R. Drew), "Movement of Goods Wagons Through the Bangsue Freight Yard of the State Railway of Thailand."
- 246 Nibondh Hoisangwan (Dr. Robert B. L. Smith), "The Structural Behavior of Reinforced Concrete Wide-Flanged T-Beams."
- 247 Padoong Torranin (Dr. Subin Pinkayan), "A Tidal Mathematical Model of the Chao Phraya River."
- 248 Hung Tao Shen (Dr. Norbert L. Ackermann), "Pumping from a Shallow Water Aquifer in a Coastal Region."
- 249 Teliang Kung (Dr. Anat Arbhabharama), "Characteristics of Flow Past a Circular Disk Placed Near the End of a Circular Pipe."

- 250 Chau Yip Kee (Dr. Za-Cheih Moh), "Effect of Time on the Undrained Shear Strength."
- 251 Kraiwood Kiattikomol (Dr. Robert B. L. Smith), "The Estimation and Significance of the Tensile Strength of Concrete."
- 252 Jawed Husain Paliwala (Professor William McGuire), "A Comparative Study of Approaches for the Determination of the Ultimate Load Capacity of RC Columns Subjected to Axial Load and Biaxial Bending."
- 253 Shaiq Ur Rahman Khan (Professor William McGuire), "The Influence of Tie Spacing on the Failure of Reinforced Concrete Columns."
- 254 Supan Ongskul (Dr. Chai Multabhand), "Stabilization of Lateritic Soils with Sand."
- 255 Javalit Oravevatanakul (Dr. Robert B. L. Smith), "The Strength of Precast Concrete Girder Flanges."
- 256 Medhi Hongnoi (Dr. Edward W. Brand), "Effects of Method of Preparation on the Compaction and Strength Characteristics of Lateritic Soils."
- 257 Somchai Nirapathpongorn (Professor Pichai Boonyakanjana), "Circular Hydraulic Jump."
- 258 Boonek Pitugdamrongkija (Professor William McGuire), "Experimental Investigation of Yield Criteria for Orthotropic Slabs."
- 260 Vera Suwanakul (Dr. Chai Muktabhand), "Cast In Situ Piles in Bangkok Clay."
- 262 Aolad Hossain (Professor Edmund F. Schulz), "Water Balance in Northern Thailand."

- 263 Kitti Areeraksakul (Professor William McGuire), "The Behavior of Slender Upstand Reinforced Concrete Beams in Restrained Torsion."
- 264 Mirza Farrukh Mazhar (Dr. Za-Chieh Moh), "Effect of Methods of Preparation on the Index Properties of Lateritic Soils."
- 265 Rodolfo Corpuz Undan (Dr. Norbert L. Ackermann), "Forces of Submerged Jets on Rigid Circular Disks."

(Numbers for the following theses were unavailable at time of publication.)

Alejandro Ugdamín Abella (Dr. Anat Arbhabhirama), "Hydraulic Jump Within a Gradually Expanding Channel."

Manoon Arayasiri (Dr. John D. Nelson), "Shear Strength Characteristics of Bangkok Clay in the Weathered Zone."

Javed Anwar Aziz (Professor Mainwaring B. Pescod), "Treatability of Organic Wastes at 30°C."

Chinawood Buranarom (Dr. Robert B. L. Smith), "The Effect of Degree of Prestress on the Loading History and Failure of Prestress Concrete Beams."

Der-ruenn Charng (Dr. Norbert L. Ackermann), "Energy Dissipation in Open Channels by Large Semi-Circular Disk Roughness Elements."

Sudham Chatvalvong (Dr. Anat Arbhabhirama), "Effect of the Fluctuation of Water Level in a Reservoir on Seepage Gain or Loss."

Prathip Chiradejnant (Dr. Donald R. Drew), "Capacity and Operation of the Thonburi Bus Terminal."

Catalino del Rosario de la Cruz (Dr. Richard Silvester), "Pattern Forming Forces in Deltas."

Sardar Mohammad Amjad Durrani (Dr. Michael G. McGarry), "Long Term Biochemical Oxygen Demand."

Billy Enad Emphasis (Professor John Hugh Jones), "Effect of Transverse Pavement Markings on Speed and Deceleration of Vehicles."

Diti Hengchaovanich (Dr. John D. Nelson), "Shear Strength Characteristics of the Stiff Bangkok Clay."

Yaw-Huei Jiang (Dr. Richard Silvester), "Force on Flared Entrance to a Pipe."

Syed Ismat Kamal (Dr. Donald R. Drew), "Some Characteristics of a Mid-Block Bus Stop in Bangkok."

Surindr Kanjanophas (Dr. Edward W. Brand), "Compressibility of Bangkok Clay in the Weathered Zone."

Chumporn Komsartra (Professor Edmund F. Schulz), "Flood Peak of Small Watersheds."

Bamroong Kulratanayan (Professor Mainwaring B. Pescod), "Use of Polyelectrolytes in Treatment of Turbid Waters."

Kitcha Leksukhum (Dr. Robert B. L. Smith), "A Comparative Study of Bent-Up Bars with Other Forms of Secondary Reinforcement in Beams."

Pin-Sun Lin (Dr. Donald R. Drew), "Pedestrian-Vehicle Interaction at a Marked Mid-Block Crosswalk in Bangkok."

Syed Mohiuddin Mansur (Dr. Norbert L. Ackermann), "Sediment Motion in a Gravity Convected Flow."

Geronimo Dalope Mejia (Dr. Richard J. Frankel), "The Applicability of Ion Exchange for Hardness Removal from Waters in Thailand."

Pichai Nimityongskul (Dr. Robert B. L. Smith), "Effect of Aggregate Properties on the Elasticity and Creep of Concrete."

Boonjune Nithi-Uthai (Dr. Edward W. Brand), "Stabilization of Tropical Clays with Cement and Secondary Additives."

Eliodoro Jamilano Ravalo (Professor Edmund F. Schulz), "Comparison of Piché and Class 'A' Evaporation."

Sakdisithi Saengduang (Professor John Hugh Jones), "Passenger Movements on the State Railway of Thailand."

Suvit Siriyong (Dr. Norbert L. Ackermann), "Surface Disturbances Produced by Flow from Submerged Jets."

Bancha Vadhanasindhu (Professor John Hugh Jones), "Application of the Gravity and Opportunity Models to the Movement of International Airline Passengers Between Bangkok and Other Cities."

Narongsak Vichetpan (Dr. Richard Silvester), "Equilibrium Shapes of Coastline in Plan."

Ali Zafar (Professor John Hugh Jones), "Legibility of Urdu-Character Highway Destination Signs."

Reprints

- No. 25: "Ship Turn-Around Time at the Port of Bangkok, " by John Hugh Jones and W. R. Blunden; from the Journal of the Waterways and Harbors Division, American Society of Civil Engineers, Vol. 94, No. WW2, May 1968.
- No. 26: "The Bearing Capacity of Piles in Frictional Soils, " by R. D. Mackey; from Proceedings, Southeast Asian Regional Conference on Soil Engineering, Bangkok, April 1967.
- No. 27: "At Rest, Active and Passive Earth Pressures, " by R. D. Mackey and Donald Pearson-Kirk; from Proceedings, Southeast Asian Regional Conference on Soil Engineering, Bangkok, April 1967.
- No. 28: "Effect of Sulfates on Cement-Stabilized Lateritic Soils, " by Za-Chieh Moh and Ahmad Saeed Sheikh; from Proceedings, Southeast Asian Regional Conference on Soil Engineering, Bangkok, April 1967.
- No. 29: "Design Data for the Liquid-Liquid Jet Pump, " by R. Silvester and N. H. G. Mueller; from the Journal of Hydraulic Research, Vol. 6, 1968.
- No. 31: "Sediment Transport -- Long-Term Movement, " by Richard Silvester; from The Encyclopedia of Geomorphology, Reinhold, 1968.

Research Reports

- No. 3: Oxygen Balance in the Chao Phya River Estuary. M. B. Pescod
and Sermpol Ratasuk.
- No. 4: Engineering Characteristics of Undisturbed Soils in Bangkok Area,
by Alfonso S. Teves, Jr., and Za-Chieh Moh.
- No. 5: Strength Behavior of Soft Bangkok Clay During Undrained Shear,
by Za-Chieh Moh and Wu-Sang Wang.
- No. 6: A Review of the Engineering Characteristics of the Recent Marine
Clays in South East Asia, by John B. Cox.

APPENDIX III

VISITORS

Professor F. B. Bull, University of Adelaide, Australia, visited the Institute on the 17th-20th January 1968 and delivered two lectures:

Philosophy of Engineering and Techniques in the Analysis of Multi-Story Buildings.

Professor Peter C. G. Isaac, Professor of Public Health Engineering, University of Newcastle upon Tyne, and Member of the AIT Board of Trustees, on the 19th January 1968 lectured to the public health engineering students on Current Research in Public Health Engineering at the University of Newcastle upon Tyne.

Mr. Warren B. Warden, consulting engineer from Raleigh, North Carolina, on the 16th February addressed the transportation engineering students on Reduction to Practice of Research Findings.

Mr. H. C. Frijlink, Managing Director of Netherlands Engineering Consultants, lectured on the 11th March to the hydraulics students on Living Below Sea Level.

Professor L. K. Stevens, Professor of Structural Engineering, University of Melbourne, Australia, visited the structures laboratory on the 12th March 1968.

Dr. Michael A. Plint, Managing Director of Plint and Partners, Ltd., U.K., and adviser to the British Ministry of Overseas Development, visited President Bender on the 14th March 1968.

Mr. J. Stannard Baker, Director of Research and Development, The Traffic Institute, Northwestern University, visited Professor Jones on the 18th of March 1968.

Professor R. H. Evans, Professor Structural Engineering, University of Leeds, U.K., visited the Institute during the week of the 18th-22nd March 1968 and delivered four lectures: Preflexed, Prestressed Concrete Beams; Ultimate Strength of Reinforced Concrete and Prestressed Concrete Beams; The Limit State Approach to Design in Reinforced and Prestressed Concrete; and Nature of Bond and Bond Stress Distribution in Reinforced Concrete and Prestressed Concrete Beams.

Mrs. Rena G. Knight, representing the International Road Federation, visited the Institute on the 22nd March 1968 to examine and abstract the research on road engineering in progress.

Dr. Nathaniel S. Fox, Major, U.S. Corps of Engineers, on the 10th April 1968 visited Dr. Mackey and delivered an illustrated lecture on Soil Engineering in Vietnam.

Seventeen students from the University of Malaya Engineering Society toured the Institute on the 12th of April 1968.

Dean Cornelius Wandmacher, University of Cincinnati, Ohio, delivered a lecture on Engineering Ethics on the 30th April 1968.

Dr. William H. Abraham, Professor of Chemical Engineering at the University of the Philippines, and associated with the Ford Foundation, Manila, visited the Institute on the 3rd May 1968.

Professor Ali Macawaris, Officer-in-Charge of the College of Engineering, Mindanao State University, Philippines, visited the Institute on the 6th May to discuss teaching and research programs in hydraulic engineering with various members of the faculty.

Dr. William B. Ledbetter, Professor of Civil Engineering, Texas A & M University, visited the Institute on the 21st June 1968.

Mr. Peter Sammartino, Chancellor of Fairleigh Dickenson University, New Jersey, USA, and a group of university presidents, members of the International Association of University Presidents, visited President Bender and Dr. Chang on the 2nd July 1968 and toured the campus.

Dr. J. J. Alcocer, World Health Organization Representative to Thailand, called on President Bender on the 3rd July 1968.

Professor Robert A. Grace, Assistant Professor of Civil Engineering at the University of Hawaii, on the 5th July visited Professor Schulz and toured the hydraulics laboratory.

Professor A. R. Rao, Visiting Assistant Professor at Purdue University, Indiana, USA, visited the Institute on the 12th July 1968 and toured the hydraulics laboratory with Professor Schulz.

Dr. P. Selvanayagam, Professor of Civil Engineering at the University of West Indies, Trinidad, visited Dr. Chang on the 15th July 1968.

Mr. Douglas Gifford of the firm of Haley and Aldrich, consulting soil engineers of Boston, Massachusetts, visited Dr. Moh on the 16th July 1968.

Dr. Donald Joyce, Mathematician at Cambridge University, U.K., toured the AIT computer center and visited with Dr. R. B. L. Smith on the 30th July 1968.

Professor Kanduro Kaneshige, Professor Emeritus, University of Tokyo; Professor Alexander Keynan, Chairman of the National Council for

Development Research, Israel; and Dr. Abdus Salam, Professor of Theoretical Physics, Imperial College, London, all members of the Asian Regional Group of the United Nations Advisory Committee on the Application of Science and Technology to Development, visited President Bender at the Institute on the 7th August 1968.

Mr. David A. Wright, Acting Secretary-General of the South-East Asia Treaty Organization; General Autrey J. Maroun, Chief of the Military Planning Office; Mr. S. M. H. Rizvi, Director of Cultural and Economic Affairs; and Mr. M. J. Taylor, Deputy Director of the Public Information Office, visited Dr. Chang at the Institute on the 22nd August 1968.

Dr. V. M. Yevdjovich, Professor of Hydrology at Colorado State University, visited Professor Schulz on the 28th August 1968 and lectured to the hydrology students on Some Popular Misconceptions in Hydrology.

Mr. G. N. Alexander, State Rivers and Water Supply Commission, Australia, on the 4th September 1968 visited the Institute and lectured on Heavy Rainfall as a Stochastic Process.

Mr. C. E. Kline, Project Manager for Camp, Dresser & McKee, consulting engineers for the Bangkok drainage, sewerage and flood-protection systems, lectured to the environmental engineering students on Practical Aspects of Sewer System Design on the 17th September 1968.

Mr. Darwin H. Jepsen, Engineering Geologist, U.S. Bureau of Reclamation, on Methods of Approach to the Problem and Selection of Design Criteria for the Pa Mong Project.

Dr. H. P. Reinbach, retiring Manager of the Chemical Fertilizer Company, Ltd., Bangkok, and one time Chairman of the Board of Management of the SEATO Graduate School of Engineering -- predecessor of the Asian Institute of Technology -- on the 7th October 1968 called on President Bender to bid farewell.

Mr. S. G. Elliott, Resident Partner of the firm Scott, Wilson, Kirkpatrick & Partners of Hong Kong, on the 8th October 1968 lectured to the soil engineering students on Soil Mechanics Aspects of the Plover Cove Scheme at Hong Kong.

Mr. Douglas Muggeridge, Head of Overseas and Features of the British Broadcasting Company, London, accompanied by Mr. Peter Scanlon, First Secretary of the British Embassy, Bangkok, on the 8th October 1968 visited the Institute and met the President and the Academic Dean.

Dr. Harl P. Aldrich, Jr., Partner of the consulting soil engineering firm of Haley & Aldrich, Inc., Cambridge, Massachusetts, on the 10th October 1968 lectured to the soil engineering students on Selection of Foundation Systems.

Mr. Douglas Gifford, Soils Engineer with the Cambridge, Massachusetts, consulting engineering firm of Haley & Aldrich, Inc., on the 15th October 1968 lectured to the soil engineering students on Interpretation of Soil Test Data for the Bangkok-Thonburi Sewerage, Drainage and Flood Protection Project.

Dr. and Mrs. Choong Woo Lee, President of Korea University, visited President Bender and Dr. Chang on the 16th October 1968.

Mr. John Wright, Senior Lecture in Structural Design, University of Warwick, U.K., visited the Institute and delivered two lectures on the Application of Computers in the Analysis and Design of Structures on the 16th and 17th October 1968.

Dr. O. G. Ingles, Principal Research Scientist, C.S.I.R.O., Australia, on the 22nd October 1968 lectured on the Tunnelling Failure of Earth Dams to the soil engineering students.

Dr. J. Brinch Hansen, Professor at the Technical University of Copenhagen and Director of the Danish Geotechnical Institute, on the 25th October 1968 lectured to the soil engineering students on a New Bearing Capacity Formula.

Dean Jaime U. Kimhoko and Professor Louis Goodman, Ford Foundation Visiting Consultant in Engineering, both from Mindanao State University, with Dean Pedro Yap of the University of San Carlos, Philippines, visited the Institute on the 29th October 1968 to meet the Academic Dean and to discuss graduate programs with members of the faculty.

Dr. G. A. Leonards, Professor of Soil Mechanics at Purdue University, on the 11th February 1969 lectured on The Settlement of Pile Foundations in Granular Soils.

Dr. T. F. Gaskell, Scientific Adviser to the Information Department of the British Petroleum Department of the British Petroleum Company, Ltd., lectured on the 20th February 1969 on The Growing Importance of Oceanography.

Mr. Donald F. Jay, Chief of Overseas Operations, and Dr. Warren M. Tsuneshi, Chief of the Orientalia Division, both from the Library of Congress,

visited Dr. Hwa-Wei Lee and toured the AIT library on the 12th March 1969.

Dr. Z. M. Khilji, Professor of Civil Engineering at the West Pakistan University of Engineering and Technology, Lahore, on the 17th March 1969 lectured on the Effect of Properties of Coarse Aggregates on the Properties of Concrete.

Dr. A. J. Raudkivi of the Civil Engineering Department, University of Auckland, New Zealand, lectured to the hydraulics students on the 1st and 2nd April 1969 on Sediment Transportation.

Professor B. G. Neal, Professor of Applied Science at the Imperial College of Science and Technology, London, visited Dean Lubbock and on the 3rd and 4th April 1969 lectured on the Structural Design of Cooling Towers and on Interaction Relations in Plasticity.

Mr. E. A. Parsons, Consulting Engineer and occasional lecturer at the University of Newcastle upon Tyne, U.K., on the 8th April 1969 lectured on Civil Engineering as Related to Docks, Harbours, and River-side Construction.

Dr. G. S. Pandit, Professor of Structural Engineering at the M. R. Engineering College, Jaipur, India, on the 15th April 1969 lectured to the structural engineering students on Torsion in Concrete Members.

Dr. A. Aleti of the Sanitary Engineering Research Laboratory of the University of California at Berkeley, on the 29th of April 1969 lectured on Environmental Technology for Future Asian Cities.

Dr. Ian Douglas of the Department of Geography, University of Hull, U.K., on the 30th April 1969 lectured to the hydraulic engineering students

on Relating Sediment Yields to Storm Events and Catchment Conditions.

Mr. Robert DeLaine of the Department of Mechanical Engineering, Monash University, Australia, lectured on the 1st May 1969 to the hydraulic engineering students on Deriving Unit Graphs from Runoff Records.

Mr. Byron B. Cain, Jr., Vice-President of Ritter Pfaudler Asia, Ltd., on the 2nd of May 1969 lectured to the environmental engineering students on Water and Waste Treatment Equipment.

Dr. Severin Raynor, Professor of Mechanical Engineering, Northwestern University, U.S.A., visited the structural engineering laboratory and on the 9th May 1969 lectured on Solar Heating of Rotating Cylindrical Space Vehicles.

Dr. O. C. Zienkiewicz, Professor of Civil Engineering, University College of the University of Wales, Swansea, U.K., on the 12th and 13th May 1969 lectured to the structural engineering students on Recent Developments in Finite Element Analysis -- Isoparametric and Other Element Families and on A General Approach to Non-Linear Problems Solved by Finite Elements.

Sir Denys Lowson, Bt., a Trustee of AIT, accompanied by Mr. J. P. Malone, General Manager of Anglo-Thai Corp., Bangkok, visited President Bender on the 13th May 1969.

Dr. Kurt H. Gerstle, Professor of Civil Engineering at the University of Colorado and a former member of the faculty of the Institute, on the 20th May 1969 visited the structural engineering laboratory and lectured on Shakedown of Reinforced Concrete Beams.

Mr. C. D. Parker, Director of the Water Laboratories, Carlton, Australia, on the 21st May 1969 lectured to the environmental engineering students on Low Cost Waste Treatment.

Dr. W. Fisher Cassie, Professor of Civil Engineering, University of Newcastle upon Tyne, U.K., visited Dean Lubbock on the 26th May 1969. Professor Cassie served as Chairman of the Graduate School Advisory Panel (1962), and in 1964 as Chairman of the Expert Study Group which recommended the change from the SEATO Graduate School of Engineering to the Asian Institute of Technology.

Dr. P. W. Taylor, Senior Lecturer in Civil Engineering at the University of Auckland, New Zealand, on the 29th May 1969 lectured to the soil engineering students on Foundations for Earthquake-Resistant Structures.

Dr. J. A. L. Matheson, Vice Chancellor of Monash University, Australia, visited Dean Lubbock and Dr. Chang and toured the laboratories on the 12th June 1969. Dr. Matheson had previously visited the Institute in August of 1963.

Professor Hideo Kikkawa of the Department of Civil Engineering, Tokyo Institute of Technology, accompanied by Professor Nobuo Shuto of Chuo University, Tokyo, on the 16th June 1969 visited Dr. Chang and Dr. Silvester.

Dr. Kawi Kambhu of Clemson University lectured to the environmental engineering students on the Aerobic Thermophilic Process for Biological Treatment of Wastes on the 31st July 1969.

M. Duiliu Sfintesco, Director of Research of the Centre Technique de la Construction Metallique, France, on the 7th August 1969 lectured on Current Research at the French National Institute of Steel Construction.

Dr. Frank J. Ahimaz, Senior Research Engineer at the IIT Research Institute, Chicago, lectured to the hydraulics and structures students on the Application of Photoelasticity to Hydraulic Problems on the 15th August 1969.

Professor George M. Sicular, Ford Foundation Advisor, and Dr. Chin Kee Kean, Dean of the Faculty of Engineering, both from the University of Singapore, on the 15th August 1969 visited Dean Lubbock and Dr. Chang.

Dr. Ing. Gerhard Rouvé, Professor of Hydraulic Engineering, Indian Institute of Technology, Madras, on the 21st August 1969 lectured on Hydro Power in Europe and Recent Developments in Pump Storage Schemes.

Dr. I. R. Wood, Water Research Laboratory, University of New South Wales, Australia, on the 25th August 1969 lectured to the hydraulics students on Some Aspects of Stratified Flow.