

**CASE WESTERN RESERVE UNIVERSITY
UNIVERSITY DEVELOPMENT LINKAGES PROJECT**

ANNUAL ACTIVITY REPORT

Year 2, Annual Report: October 1, 1994-September 30, 1995

Date: October 30, 1995

Cooperative Agreement No. PCE-5063-A-00-3036-00

I. Activities and Progress toward Each Linkage Objective:

General:

1. In early January 1995, Vira Chankong (PI/PD, CWRU), Methi Wecharatana (Co-PI, NJIT), and Suwit Laohasiriwong (Co-PI, KKU) met in Bangkok to develop an action plan for the second year activities, and a strategic plan for Year 3 and beyond. They also met with Mr. Denny F. Robertson (Director, Office of Project Development and Evaluation), Khun Supanee Artachinda (Training Officer), and Khun Thongkorn Hiranraks (Project Management Specialist) of the USAID/Thailand mission in Bangkok: (i) to summarize activities of the UDLP during the first year; (ii) to discuss proposed activities for the second year; (iii) to explore various strategies after the closing of the Bangkok office of the USAID, and (iv) to explore possibilities for funding related activities. As a by-product of the meeting with the USAID officials, a joint NJIT-KKU workshop on hazardous waste management was planned and carried out during February at KKU, with the funding of \$37,000 coming from part of the USAID funds managed by the Department of Technical Economic Cooperation (DTEC, Thailand). This is also reported as an accomplishment in Objective 3 below.

2. A delegation from the US consisting of Dr. Vira Chankong (PI/PD, CWRU); Dr. Methi Wecharatana (Co-PI, NJIT); Dr. Gerald M. Saidel, Chair of the Department of Biomedical Engineering at CWRU; and Dr. Irving Lefkowitz, Professor Emeritus of Systems Engineering at CWRU, visited Khon Kaen University (KKU) during July 17-18 to participate in a Steering Committee meeting and a mini-conference on "Progress and Future Activities of the CWRU-NJIT-KKU UDLP". We were very fortunate that Dr. Ruth Frischer, UDLP Director, USAID, was able to join us in both events. During the mini-conference which was chaired by Dr. Vanchai Vatanasapt, KKU President, project participants gave up-to-date reports of what they were doing under each objective, provided highlights of their accomplishments, and described their future plans. This provided useful inputs to the steering committee meeting that followed. In addition to our honored guest, Dr. Frischer, and the delegation from the US, other key participants were Dr. Vanchai (KKU President), Dr. Suwit Laohasiriwong (KKU VP for Foreign and Public Affairs), Dr. Sompon Photinam (Dean of Medicine), Dr. Prakob Wirojkud (dean of Engineering), Dr. Darunee Rujkornkarn (Dean of Nursing). Also participating were associate deans of engineering, medicine and nursing, and Dr. Boonying Chareon,

Program Director of the KKU Biomedical Engineering program. The main issues discussed in the meeting were program strategies for the re-focused areas of activities namely Biomedical Engineering under objective 1; Community Nursing Collaboration, Community Health Education and Research Collaboration under objective 2; and Environmental Engineering Education and Research Center under objective 3. Also discussed was the funding strategy for Year 3 and after.

3. Mr. Hakon Torjesen, Co-PI, CWRU, made an administrative visit to KKU during October 17-19, as part of his trip to Vientiane, funded by the Laos project. He met with (i) Dr. Boonying Chareon, Program Director of the KKU Biomedical Engineering program, to discuss the progress of Biomedical Engineering; (ii) Dr. Sastri to firm up the details for the upcoming visit to KKU in February of Dr. Laura Holmes and Dr. John Quilty of the Community Health Center, MetroHealth Medical Center of Cleveland, an affiliate of CWRU; (iii) a number of faculty members in the Faculty of Medicine interested in short-term visits to CWRU; and (iv) Dr. Lawrence Dolan, a Program Officer at the USAID Mission in Bangkok, and Khun Supanee Artachinda, Training Officer, to discuss the progress and future of our UDLP.

The specific activities and accomplishments for each objective are now highlighted:

Objective 1

1.1 Biomedical Engineering

This is now the centerpiece of this objective toward which major efforts and resources will be directed. Here is the summary of accomplishments in the second year:

- The first year budget of \$130,000 was granted by the Royal Thai government (RTG) to KKU for the 1995 fiscal year to purchase the first set of priority equipment. Also, during this initial stage, KKU has allocated 200 square feet of office space to the program.
- As planned, Dr. J. Lawrence Katz, Professor of Biomedical Engineering, CWRU, re-visited the KKU Faculty of Engineering on December 11-25. He presented a short course on Biomechanics and Biomaterials to the engineering faculty in preparation for the upcoming Biomedical Engineering courses to be joint-taught at KKU. In addition, he spent a major part of his stay helping the KKU Biomedical Engineering task-force to (i) make the final refinements of the Biomedical Engineering curriculum, (ii) develop the course outlines of all the major and technical elective courses in the curriculum, and (iii) plan the purchase of equipment using the \$130,000 funds already approved by the Thai government. He also gave a series of introductory lectures on orthopaedic Biomechanics and Biomaterials to the faculty and students in the Department of Orthopaedic Surgery in the Faculty of Medicine. Finally, he

helped plan the upcoming scholarly visit to CWRU of Dr. Boonying Chareon of the Department of Electrical Engineering (Leader of the KKU task-force on Biomedical Engineering), Mr. Kittiwichatetapong of the Department of Mechanical Engineering (a key member of the taskforce), and Dr. Nalinthip Tamnantong of the Department of Rehabilitation, Faculty of Medicine. The trip was scheduled for three weeks beginning mid-May.

- Dr. Saowanant Bumrerraj, M.D., a faculty from the KKU Faculty of Medicine began her graduate program in the Department of Biomedical Engineering at CWRU in the spring semester of 1995 with a full scholarship from the Thai Government. Mr. Rujchai Ung-Atunyawee, a faculty from the KKU Faculty of Engineering, also with a full scholarship from the Thai government, came for a preparatory set of courses including English in May 1995 and started his graduate degree program in Biomedical Engineering at CWRU in the Fall semester of 1995.
- Dr. Gerald M. Saidel visited KKU during July 12-24. In addition to participating in the steering committee meeting and other administrative activities described above, he also met with the Biomedical Engineering group at KKU to review the curriculum and to discuss faculty and facility development plans. He gave two seminars for the faculty and students at KKU, one on the current issues in education and research in Biomedical Engineering and the other involving his own research areas. His trip report is enclosed as Attachment 2.
- After several comprehensive reviews of the proposed Biomedical Engineering curriculum, the revised version has been submitted for approval by the KKU University Council and for the eventual approval by the Ministry of University Affairs. The program moved ahead as planned when the first group of 20 students was admitted as part of the freshmen pool of the 1995-1996 academic year beginning June 1995.
- In preparation for the teaching of the BME courses expected to begin in earnest in 1996, three key KKU faculty members in the proposed Biomedical Engineering program (Dr. Boonying Chareon, Associate Professor Kittiwichatetapong, and Dr. Nalinthip Tamnantong, M.D.) visited CWRU from May 14 to June 2, 1995. The main objectives of their visit were: (i) to observe in person how various BME courses were taught at CWRU as well as to seek advice and teaching materials from instructors of those courses; (ii) to work out a tentative plan for the joint-teaching of courses by CWRU faculty particularly during the first few years of the program; and (iii) to explore possibilities for joint research projects in BME. They visited with almost all faculty members associated with the CWRU Biomedical Engineering department. They also visited all labs at the BME department, and at various hospitals associated with CWRU, as well as some key research centers at CWRU.

- In addition, a plan is now in progress to bring additional groups of KKU faculty for a two-week visit to CWRU beginning next April. The visitors will be the faculty from the Faculties of Medicine and Engineering who will be teaching several key courses in the BME program. Their main objective is to work with their counterparts at CWRU in the preparation of how to teach those bio-medical courses to engineering students. These visits will be funded by KKU, as KKU officials realize that this is indeed a new undertaking on which no one at KKU has ever had any experience, and that the success of the program depends, among other things, on the successful teaching of several fundamental courses by the faculty, particularly from the School of Medicine. The identified faculty and their respective courses are:

<u>Name</u>	<u>Rank</u>	<u>Department</u>	<u>BME Course to teach</u>
Channarong Arunnart	Assoc. Prof.	Anatomy	Human Anatomy for Biomed. Engr.
Chariya Chomvarin	Asst. Prof.	Microbiology	Microbiological Engineering
Vitoon Prasongwatana	Asst. Prof.	Biochemistry	Structure & Property of Biological Materials
Prachak Puapernpoonsiri	Assoc. Prof.	Pathology	General Pathology
Paiboon Buranarugsa	Asst. Prof.	Physiology	Physiology for Biomedical Engr. And Advanced Physiological Processes
Supot Chaisiri	Assoc. Prof.	Medicine	Cardiac Action, Rhythm and Control
Jitjaroen Chaiyakum	Asst. Prof.	Radiology	Medical Imaging Fundamentals, and Diagnostic Imaging
Polasak Jeeravipoolvarn, M.D., Professor		Orthopaedics	Biomechanics of Musuloskeletal Systems
Suchart Areemit, M.D.,	Asst. Prof.	Surgery	VP for Administrative Affairs of KKU

The first group scheduled for late April 1996 will include Dr. Vanchai Vatanasapt (former KKU President), two members from the above list, and a faculty member from the Faculty of Engineering. Again these trips will be funded mostly by KKU internal funds.

- As a result of the visit to CWRU last year by Dr. Wiroon Laopatarakasem, Professor of Orthopaedics Surgery at KKU, a joint research between him and Professor Joseph Mansour of the Department of Mechanical Engineering at CWRU was initiated. The project was a feasibility study to demonstrate the viability of a low-cost alternative to radiography, for detecting femoral fracture alignment using surface pressure measurement. The cost of the feasibility study (a one month stipend for a graduate student, and a small machine-shop cost to build a testing instrument) was funded by the UDLP. Preliminary results show that small misalignments may be detected by surface pressure measurement if we assume that the soft tissue over the bone is homogeneous. The next step is to try the concept by doing experiments using real legs (either animal or human) with fractured femurs, or by developing a more realistic surrogate limb. If the concept is proven feasible, Thailand Research Fund (TRF) has already indicated to Dr. Wiroon that it will fund a full scale joint research and development project. Additional sources of funding to be sought include NIH, NASA Research Initiation Grants, and the Whitaker Foundation.

1.2 Faculty Exchanges and Training in Other Health and Engineering Fields

- Ms. Pulsuk Siriput, a faculty member of the KKU Faculty of Nursing, and Ms. Rachaneewan Choosathan, former a faculty of the KKU Faculty of Nursing, came for a preparatory set of courses in English in July 1994 and began their doctoral programs in Nursing at CWRU in the Fall semester of 1994. Likewise, Ms. Marisa Krairiksh, also a faculty from the KKU Faculty of Nursing, came to attend preparatory English courses in July 1995 and began her doctoral study at the CWRU School of Nursing in the Fall of 1995.
- Dr. Thomas M. Daniel visited KKU on December 12-22. As the director of the Center for International Health at CWRU, Dr. Daniel specific objectives were: (i) to engage in dialogue concerning continued linkage relationships between CWRU and KKU in health-related areas; and (ii) to screen KKU medical students for exchange rotations at CWRU. As an expert in tuberculosis which is an important public health concern in Thailand, Dr. Daniel's objectives were: (iii) to present a series of lectures on tuberculosis emphasizing on both public-health related issues and research-oriented issues, as well as to demonstrate case-based teaching and learning techniques; and (iv) to explore possibilities for collaborative research in the public health area of tuberculosis and AIDS epidemiology. All objectives were achieved. He had productive meetings with KKU President Vanchai Vatanasapt (who has been a stark supporter of the UDLP linkage), VP for Foreign and Public Relations, Dean and Associate Deans of Medicine, Dean of Nursing, various medical department chairs, and key medical professors. He interviewed four pre-screened medical students, and accepted them for elective rotations at CWRU in March. Dr. Daniel also presented four lectures on tuberculosis, two emphasizing public health issues and two on research issues. Each was well-attended by about 100-200 medical staff, students and public health officers. He also conducted a successful case conference attended by more than 100 students and house officers. He initiated a research collaboration on tuberculosis with Dr. Wachara Boonsawat, a pulmonologist with a wealth of experience in public health, statistical methods and computers. Finally, he had a useful visit with USAID officers in Bangkok, including Denny F. Robertson, Director of the Office of Project Development, and Khun Supanee Artachinda, Training Officer.
- During November 14 to December 22, Dr. Karen Kauffman and Ms. Donna Myers were the first faculty members from CWRU to visit KKU. As part of the faculty exchange objective, they presented four seminars on graduate pediatric curriculum, community health practice in the U.S.A., and methodology and a case study in ethnography. They also: engaged in dialogues with members of the Faculty of Nursing on ways to improve the undergraduate on graduate nursing curricula; provided consultation and editorial assistance to junior faculty and MS students; provided advice and assistance on the planning of scholarly visits to the US of the nursing staff, including the visit to the US in March of 11 nursing faculty which

included CWRU as the point of convergent; and discussed possible collaboration in research and education in “participatory evaluation” and its relationships with the principles of primary health care (PHC).

- As planned during the visit by Dr. Sastri Saowakontha in 1994, two scholars from the MetroHealth Medical Center, a CWRU affiliate, visited KKU during February 20 to March 3, 1995. One of the scholars was Dr. Laura Holmes of the international health residency training program in medicine, and one of her objectives was to explore potential collaboration between KKU and CWRU/MetroHealth in terms of faculty/resident exchanges. She received a number of resumes from several faculty members interested in making a short-term visit to MetroHealth Medical Center as well as in doing residency there.

1.3 Student Exchange

During March 1-28, four KKU medical students took their elective rotations at CWRU as part of the medical student exchange program. This was the second year that Thai students were able to come to CWRU. The four students were interviewed by Dr. Thomas Daniel, Director of CWRU Center for International Health, who visited KKU under the UDLP faculty exchange program in December 1994. The KKU Faculty of Medicine paid the students’ travel expenses, the UDLP supported lodging and health insurance expenditure and the remaining expenses were borne by the students themselves. The four students participated in different subject areas: Miss Wiyada Kanwipat in Pediatric Pulmonology; Miss Phailin Phadungmatrwaragul in Pediatric Hematology & Oncology; Mr. Jesada Puangsaichai in Cardiology Medicine; and Mr. Taweessin Punnaniti in Neurology. At the final review session before they left for home, each student expressed great satisfaction with the experience and thanked the UDLP and CWRU for making the exchange possible.

Objective 2

The four clusters with the second year activities and progress are summarized below:

Cluster 1: Community Health Nursing Collaboration

This is by far the most progressive of all clusters under this objective.

- As mentioned above, Dr. Karen Kauffman and Ms. Donna Myers visited KKU during November 14-December 22. This was part of the 5-week Community Health Practicum organized by the KKU Faculty of Nursing for CWRU nursing faculty as conceived at the beginning of the project. This practicum (involving the Si Than village in Khon Kaen and other elements organized by the KKU Faculty of Nursing) is a high priority for CWRU. During their visit, Dr. Kauffman and Ms. Myers met

with personnel at various public health agencies including Department of Public Health Nursing at KKU, Northeastern Regional Training Center for PHC, Northeast Regional Infectious Disease Center, the Health and Environmental Department of the Municipal Office of Khon Kaen, Population and Community Development Association, and several provincial and district hospitals and public health centers. They also: participated in a seminar on theory, practice and application of Rapid Rural Appraisal in PHC; observed and participated in the carrying out of the role of nursing in PHC; conducted an ethnographic field study in the Sri Than village; and presented preliminary results of the ethnographic study to the Faculty of Nursing and made recommendations on nursing's role in education and training of village health volunteers.

- Following the successful visit to KKU by Dr. Karen Kauffman and Ms. Donna Myers in December, Dr. Rutja Phupaibul (Associate Dean of the KKU Faculty of Nursing) and Associate Professor Veena Isarankura visited their counterparts at CWRU during January 16-February 7, 1995. Their specific objectives were: to identify appropriate home health care model suitable for Thai families; to share expertise in Primary Health Care with the CWRU nursing faculty; to share experience and knowledge in nursing education and practice in Thailand; to compare teaching-learning and curriculum structure between the two schools of nursing; and to facilitate further collaboration between the two institutions. The two visitors were quite busy during the three-week visit. They gave a 1-day seminar on "Primary Health Care: A Strategy for Health for All"; gave a 1-hour lecture on Nursing Education and Practice in Thailand"; discussed the WHO Collaborating Center at CWRU; observed and participated in various teaching and learning activities with the CWRU School of Nursing; made study visits and field observations to various Home Health Care Services and Primary Care Services centers around the Cleveland area; observed how the community conducted participatory evaluation; discussed the theory-based practiced in nursing education with the CWRU Dean of Nursing and associates; and discussed future collaboration between the two institutions and explored possibilities for KKU faculty to attend graduate courses at CWRU. In addition, a joint research proposal on "Urban Primary Health Care: Development of the Model was drafted. The proposal sought a partial support of \$6,200 from the UDLP with the remaining expenses to be borne by the municipality of Khon Kaen.
- To support the proposed joint research project "Urban Primary Health Care: Development of a Model" above, the KKU Faculty of Nursing secured \$10,100 of support from the municipality of Khon Kaen to match \$5,000 from the Faculty and \$6,200 from the UDLP. The project has now begun.
- Following the above visit by the two senior officials, eleven faculty members from the KKU Faculty of Nursing made a one week stop at CWRU during March 5-12. This was part of their technical tour of the U.S. in which they initially separated into two groups, each one going through a different route during the initial part of the tour.

They then converged at CWRU. Most expenses were borne by KKU, with the CWRU School of Nursing provided \$1,500 of faculty time during the spring break and the UDLP picked up local transportation and miscellaneous expenses. The group attended the First Annual Hospice Conference, toured the Learning Resources Center and Computer Lab, attended a presentation by the Nurse-Midwifery faculty on "Women's Health"; discussed issues on gerontology and mental health with the nursing faculty; discussed nursing administration and curriculum with the Associated Dean and Dr. Karen Kauffman; visited a nursing health center; and visited with the President and Provost of CWRU.

In the plan for the upcoming year are: a short visit to KKU in October by Dr. Joyce Frizpatrick, CWRU Dean of Nursing, and Dr Doris Modly, Director of the CWRU International Program in Nursing; a return visit by Dean Frizpatrick (and possibly Dr. Modly) to plan a joint international conference on Nursing Informatics at KKU in 1997; a three week visit to CWRU by two senior faculty from KKU and 1-week visit by two other faculty from KKU in the Fall of 1995 as part of the faculty exchange program; and a 4-week visit to KKU by a senior faculty from CWRU to teach a research course and to participate in the joint research on "Urban Primary Health Care: Development of a Model" mentioned above.

Cluster 2: Community Health Training and Research Collaboration

This is a broadly conceived training and research agenda combining KKU's proven community health strengths in rural setting such as the Nam Pong area, with CWRU's community health experiences in an aging urban industrial community.

Again, as planned during the exploratory planning visit to Cleveland in July 1994 by Dr. Sastri Saowakontha, Dr. Jim Quilty of the Community Health program at the MetroHealth Medical Center joined Dr. Laura Holmes of the international health residency training program in medicine at MetroHealth in visiting KKU during February 20 to March 3, 1995. The purpose of the trip under this cluster of Objective 2 was to explore potential areas for further collaboration between KKU and CWRU/MetroHealth in the area of community health research and training. As a result of the trip, several areas of possible collaborative research and training were identified.

Cluster 3: Pediatric Community Health Training & Research Collaboration

This is also a broadly conceived training and research agenda building on a well established training collaboration between the Pediatric departments at KKU and CWRU. A summary of accomplishments under this active linkage during the second year follows:

- Dr. Karen Olness visited KKU on October 17-19, as part of her trip to Vientiane, funded by the Laos project. Dr. Olness met with Dr. Srivieng, Chair of Pediatrics, and several members of the Pediatric Department. A specific plan of actions to continue a three-way tie between KKU, Laos and CWRU was discussed. Also discussed were: (i) an implementation plan for a study of lead levels in children in Khon Kaen, proposed by Dr. Narumol who was at CWRU at the time; and (ii) possibilities for short-term visits to CWRU by a number of pediatric faculty members.
- A visit by the key Thai collaborator, Dr. Srivieng Phairojkul, Chair of the KKU Department of Pediatrics, to CWRU in the summer of 1995 was postponed to some time in 1996
- The project "Lead Level in Thai Children" conducted jointly by Dr. Karen Olness of the Rainbow Babies and Children Hospitals and her Thai counterparts, Dr. Srivieng Pairojkul and Dr. Niramol Patjanasontorn (formerly a fellow working with Dr. Olness in Cleveland) has been under way with some survey results coming in. The project budget of \$850 is sponsored by the UDLP.

In addition, through the CWRU-KKU UDLP connection, the collaboration between KKU and the Lao University of Health Sciences in Vientiane, Laos, has been strengthened many fold. Here are two examples.

- Through other CWRU-LAOS projects (spearheaded by Dr. Karen Olness and Hakon Torjesen) aimed at strengthening the community and child health training programs in Laos, the KKU faculty is now heavily relied upon. The Lao community health curriculum grew out of consultations and training programs at Khon Kaen for a dozen Lao faculty. A three-month intensive Lao post-graduate course in child health in early 1995 had about equal numbers of Lao and volunteer KKU and American pediatricians on the faculty. Faculty visits across the Mekong River now occur almost every month. A meeting between the basic science chairs of the Lao and KKU medicine faculties is planned for September, the first such meeting in memory. All this has acquired little or no UDLP funding, but it is acknowledged by all that it could never have occurred without the chemistry of the UDLP.
- USAID has just funded (October 1995) a new effort to help the Lao address the problem of unexploded ordnance in northern Laos. CWRU faculty will provide the medical/surgical component of this project, to help improve the ability of the small district hospitals in the area to respond to the victims of accidental detonations, which occur nearly every day. Concurrently, CWRU and KKU faculty are deeply involved under the UDLP in creating a new Biomedical Engineering department at KKU. The synergy between these two efforts is inescapable, and promises to draw both faculties into an intense collaboration with their Lao colleagues.

Cluster 4: Medical Anthropology Practicum and Research Collaboration

During the initial planning, this component was to involve practicum programs and dissertation research at KKU for CWRU graduate students in anthropology and the combined anthropology-nursing program. Since KKU has no core group focusing in this area and since funds for the UDLP need to be redirected to ensure success for other key components (in anticipation of the cut of funds for years 4 and 5), the activities in this cluster has been put on hold.

Objective 3

- In early October 1994, under a request from KKU to Dr. Methi Wecharatana, Dr. Armenante of NJIT presented a keynote address on Hazardous Waste Management at the international conference on Biotechnology at Khon Kaen University. Dr. Methi who were in Thailand at that time also attended the conference, and engaged in further discussions on the upcoming visits to NJIT of the faculty and staff of the KKU Environmental Engineering department.
- During October 19 to November 3, Dr. Wanpen Wirojkud, Chair of the KKU Environmental Engineering Department, and Associate Professor Vanasri Boonyaratapan visited NJIT. Their specific purposes were: to meet with key personnel at the environmental centers at NJIT, particularly the Hazardous Substance Management Research Center (HSMRC) and the Emission Reduction Research Center (ERRC); to firm up the plan for faculty exchange and faculty training for the upcoming year, including a possible participation in teaching at NJIT by qualified KKU faculty during their sabbatical leaves; to discuss a possible organization of a workshop for high-ranking officials in Thailand on Hazardous Waste Management; to participate in an Industrial Advisory Board (IAB) meeting for the NJIT environmental centers; and to discuss more specific details on the establishment of a regional center on Hazardous Waste Management in Northeast Thailand. All objectives were achieved satisfactorily.
- A GCMS machine worth 10 million bath (\$400,000) has been donated by Sahapatanapibul Corporation to the Department of Environmental Engineering for use in the project
- During the January 10 meeting with the officials of the USAID/Thailand Mission in Bangkok, it was learned that funds were available to support a workshop on key environmental topics, if that was to be held by February 20, 1995. Subsequently, a joint proposal to organize a workshop on Hazardous Waste Management for Thai officials and practitioners during February 15-17, 1995 was sent to USAID/Thailand Mission. The budget of \$37,000 was approved by the Department of Technical and Economic Development Cooperation of the Thai Ministry of Foreign Affairs, and the

USAID/Thailand. Accordingly, a team of four experts from NJIT and California Environmental Protection Agency traveled to Khon Kaen to conduct the workshop. The team consisted of Dr. Richard Magee (Executive Director of NSF-IUCRC on Hazardous Waste Management at NJIT), Dr. Marcus Healy (Director of Pollution Prevention Program HSMRC at NJIT), Mr. Suwan Songprasha (Hazardous Substances Officer, California EPA), and Dr. Methi Wecharatana of NJIT. The workshop was quite a success, despite the fact that it was organized on a very short notice and the preparation time was very limited. There were about 200 participants from the government agencies and industries from the whole country. The workshop covered general hazardous waste definitions and regulations, advanced technology in hazardous waste management and remediation, pollution control and prevention program, and a model of Industry-University Cooperative Research Center Program. While the three-day workshop was too short to cover all key environmental subjects in depth, the participants were well exposed to new technologies available for hazardous waste management and prevention. On request of many faculty members of KCU and invited participants, another meeting was held at KCU in mid-July to officially organize a team at KCU to work on the establishment of the Industry-University Cooperative Center on hazardous waste management for the Northeast region.

- NJIT, KCU, and the Association of Thai Professionals in America and Canada (ATPAC) organized a series of seminars and short courses at KCU in July and August of 1995. On July 17-18, Dr. Methi and Mr. Suwan Songprasha of California EPA conducted a two-day seminar on hazardous waste management. On July 23-25, Dr. Laxamee Levine of Florida EPA, Mr. Samuel Levine, VP of Post, Buckley, Schuh & Jernigan, Inc. of Florida, and Dr. Wane Komolprasert of US FDA gave a two-day seminar on solid waste landfill, regulations and design, and plastic recycle technology to about 100 participants. And on August 1, Dr. Methi gave a seminar on Emergency Response at Kosa Hotel, Khon Kaen, to about 200 participants from local and state government agencies, environmental engineers and experts from industry in northeast Thailand, and KCU faculty and students. Also on August 1, Dr. Methi gave a seminar to a group of 25 faculty from various KCU departments on the structure of the proposed Industry-University Cooperative Research Center for Hazardous Waste Management at KCU for the northeast region to be funded by Thailand Research Fund (see below).
- Dr. Methi Wecharatana was invited to Bangkok on April 13-20 to present the idea of establishing a University-Industry Cooperative Research Center (IUCRC) for Hazardous Waste Management in Khon Kaen and in Thailand to a group of 30 Thai experts in Energy and Environment, representing Thai industries and universities. The meeting was organized by Dr. Vicharn Panich, Director of the Thailand Research Fund (TRF), the potential sponsor of such a research center. Subsequently, TRF has agreed to provide the funding of \$4 million to establish and operate an IUCRC center on Environment for Thailand for the first four years. The proposed

IUCRC is to cooperate with the US IUCRC Center for Hazardous Substance Management (HSMRC) at NJIT, and will have a regional satellite center at Khon Kaen. In this regards, the Faculty of Engineering, KKU, pledges to match \$40,000 to support the establishment of such a satellite center at KKU.

- During December 7-8, Dr. Methi Wecharatana and Dr. John W. Liskowitz of NJIT made arrangements for Dr. Prakrit Kiravanich (Director-General of the Pollution Control Department (PCD) of Thailand), and Mr. Sirithan P. Boriboon (Deputy Director General) to meet with 20 senior officials from the US Department of Energy and Lockheed at the Idaho National Energy Laboratory (INEL) to negotiate a joint establishment of an International Center for Energy and Environment in Thailand, to be funded jointly by Thailand and the US DOE. The outcomes of the two-day meeting were: (i) staff of INEL and Lockheed would prepare a proposal to the PCD of Thailand to start the joint program on Environmental Training and Education; (ii) the US DOE would be looking into a way to fund Technology Demonstration in Thailand, with the initial budget of \$500,000 to be provided by the PCD of Thailand; (iii) the US DOE team at INEL would be led by Dr. Dennis Miller, the science advisor of the Assistant Undersecretary of the DOE. A follow-up meeting was scheduled for May 25, 1995 at the Office of the Waste Management Institute at the US DOE office in Washington D.C.. Key participants in the meeting were: Dr. Liskowitz of the IHTWM of NJIT, Dr. Carlton Wiles of the US DOE National Renewable Energy Laboratory (NREL), Dr. Dennis Millers of the US DOE Idaho National Engineering Laboratory (INEL), Bryant Mathur of the US DOE in Washington D.C., Robert Scola of the US DOD, Roy Nadeau of the EPA National Emergency Response in Edison, New Jersey, a representative from EPA in Washington D.C., a representative from the USAID-AEP program, and Alex Schwartkoff of the NSF IUCRC program. The purpose of the meeting was to discuss potential participation and funding for the establishment of a joint US-Thailand Center for Environment and Energy. The meeting generated a strong interest from every participant in the proposed center, with each group pledging to assess it own capabilities, roles and possible contributions on the proposed center.
- During June 11-14, Dr. Methi met with Dr. Ken Chong, a program manager of NSF, to discuss potential funding and support from NSF for the creation of a US-Thailand joint research program between NJIT and KKU, and for the establishment of an IUCRC center on Hazardous Waste Mangement at KKU. Dr. Chong agreed to explore further the potential of any joint activities between NSF and the two Thai funding agencies, namely the Thailand Research Fund (TRF) and the National Science and Technology Development Agency (NSTDA).
- On September 20, Mr Paul Weber of the Kenan Institute of North Carolina and Administrator of the US-Thailand Development Partnership (TDP) program funded by USAID visited Dr. Methi Wecharatana at NJIT to discuss potential funding to support the proposed Center for Hazardous Waste Management in Thailand.

Proposals will be prepared and submitted to the US-TDP program to support the UDLP linkage project at KKU.

- Ms. Netnampid Yossamol, a lecturer in the Environmental Engineering Department at KKU, was admitted to an MS program in the Department of Civil and Environmental Engineering at NJIT. She began her study in the Fall of 1995, instead of the Spring of 1995 due to some difficulty with the paper work regarding her visa. Ms. Yossapol's study, which is sponsored fully by the Royal Thai Government, is part of the planned faculty training program under this objective.
- Also as a part of faculty training program under objective 3, Ms. Paisri Wannasangthong, a visiting scholar from the Department of Environmental Engineering, began her 6-month practical training with Mr. Clint Brockway and two of his technicians at the HSMRC at NJIT, beginning September 1, 1995. The training program focuses on the use of GCMS and other environmental instrumentation in the HSMRC.

Objective 4

This is an objective that is scaled down so that the limited funds (due to cuts in Years 4 and 5) can be used to support key activities in the other three objectives. The plan is to hold one or two workshops on systems approach and creative problem solving per year either at KKU and/or at CWRU.

- As a sequel to the workshop on creative and effective problem solving conducted at KKU, Dr. Irving Lefkowitz, Professor Emeritus of Systems Engineering at CWRU, was invited to give seminars/workshops and teach courses in systems engineering at KKU during July 14-25. He also provided consultation on curriculum and research programs related to systems engineering. His trip report is enclosed as Attachment 2.
- An effort is still being made to recruit a KKU faculty and/or a newly graduated student interested in becoming a faculty at KKU to come for graduate training at the Systems Engineering Department at CWRU. The effort has paid off in a different way. We have so far been successful in attracting more than 10 Thai graduate students to the Systems Engineering program at CWRU. Many of these have indicated an interest in becoming a faculty at KKU when they return to Thailand.

II. Comment on Accomplishments and Problems Encountered

General

All facets of the project are progressing well in most cases. In general, there are two major concerns that we have faced in 1995. The two concerns and our plan to deal with them are:

1. The uncertainty with respect to USAID funding after 1996:

Once it became clear that funds for Years 4 and 5 were going to be cut, we have decided to sharpen our focus and concentrate only on activities that have the greatest potential for achieving our long-term goal in (i) making the desired impacts on KKU and the US institutions, and (ii) establishing sustainable corporations between KKU and CWRU & NJIT after the UDLP funds are no longer available. Accordingly, major efforts are now concentrated on (i) the establishment of the Biomedical Engineering program at KKU (Objective 1); (ii) collaborations in community nursing, community health research and education, and pediatric community health training and education (Objective 2); and (iii) collaboration in environmental research and education (Objective 3). Activities in Objective 4 have been scaled down to provide only short term faculty exchange and advanced training of the KKU faculty. Due to lack of appropriate expertise at KKU, the collaboration on Medical Anthropology practicum (Objective 2) has been put on hold.

Associated with this issue is the strategy for funding after 1996. Several rounds of discussion have been made among the project personnel. Since this is obviously the question about sustainability, we will address it in the next section.

2. The recruitment of qualified faculty members from KKU in key engineering areas to do graduate studies at CWRU and NJIT.

Our approach to this problem is to increase the pool of qualified candidates by recruiting from outside the current pool of KKU faculty, such as fresh recruits from the KKU graduating classes, or from existing or future Thai graduate students at CWRU and NJIT.

Specific issues and Comments:

Objective 1:

The establishment of the Biomedical Engineering Program at KKU, which is the centerpiece of Objective 1, is moving on schedule in terms of curriculum and equipment development, but slightly behind schedule in terms of faculty development. While there is no difficulty in securing scholarships from the Royal Thai Government to support the graduate training of faculty, identifying and recruiting appropriate existing KKU faculty for graduate training in BME at CWRU has not been easy. So far, two KKU faculty have joined an MS-Ph.D program at CWRU in 1995, and one more is being processed. The main reasons for this problem are: (i) many qualified faculty members are still reluctant to commit themselves as they still perceive the program as being uncertain due to the uncertainty of the UDLP support during the crucial initial stage, and (ii) many faculty members still need some time to upgrade their English test scores to qualify for even conditional admissions to CWRU graduate programs. A greater effort is being made to recruit fresh graduates from the graduating engineering classes at KKU. So far, there have been a number of students in the junior and senior years that have expressed strong

interest in taking the scholarships and joining the program. This will however delay the full development of the permanent BME staff, and make it even more critical that funds be sufficient to support joint-teaching operations of BME courses by the CWRU faculty during these forming years. Also, since many fundamental courses will be taught by the faculty in the Faculty of Medicine who have not taught those courses to engineering students before, KKU administrators have come up with special funds to send these instructors to CWRU to work with their counterparts to learn how to teach those subjects. This complements very well with the faculty exchange activities directly supported by the project funds.

Advanced graduate training in nursing is going precisely according to plan as there are now 3 Thai faculty members doing doctoral studies at CWRU. There is even a possibility that another member of the KKU Nursing faculty will join the doctoral program at CWRU sometime next year.

Objective 2

This objective is the most advanced particularly in terms of the linkages between the schools of nursing at CWRU and KKU, as well as between the two schools of medicine. Community Nursing Collaboration, and Pediatric Community Health Training and Research Collaboration are the two clusters that have well established counterparts who are actively working to improve their respective relationships. One other cluster---KKU-CWRU Community Health Education and Research---will also be explored further, as the two CWRU principals, Dr. Laura Holmes and Dr. John Quilty, are making another attempt to establish a linkage program with the KKU Faculty of Medicine in terms of faculty exchange and joint research. Again, the only cluster that has not made too much progress is Medical Anthropology. This is due partly to the fact that medical anthropology activities at KKU are not localized, making it hard to organize a focused interest group, and mainly to the fact that budget cuts have forced us to re-focus our activities elsewhere.

Objective 3

Almost all activities planned for Objective 3 are also progressing on schedule. Again, the advanced training of KKU faculty is slightly behind schedule, with only one junior faculty joining an MS program at NJIT in 1995, and one technical staff doing a six-month training at the HSMRC at NJIT. One more faculty plans to join an MS program at NJIT and another plans to do a six-month training program similar to the one currently underway.

Major efforts being put forth to establish a regional research center on Hazardous Waste Management at Khon Kaen are progressing beyond expectations. Commitments that have been received include: \$4 million from TRF; \$40,000 from the KKU Faculty of Engineering; and the donation of equipment worth \$400,000 from a Thai corporation.

In addition, a workshop for high-ranking Thai officials was held in February and funded by the USAID Bangkok mission.

Objective 4

The scaled down goal of this objective has been accomplished as a workshop on Systems Engineering was successfully held at KKU in July. The effort of developing a core of faculty at KKU in systems approach to problem solving is being pursued by recruiting from the pool of Thai graduate students at the Department of Systems Engineering at CWRU.

III. Progress Toward Ensuring Sustainability:

We reiterate our two-pronged approach for achieving sustainability: (a) joint creation of permanent programs that will continue to function long after the funded period of the UDLP project; and (b) promotion of stable and productive relationships at the individual and/or department levels. This is still the approach that we use, only that we have to do them at the accelerated basis because of the budget cut for the final two years.

In terms of promoting sustained collaboration at the institutional level, the NJIT-KKU joint effort to improve the Environmental Engineering Program at KKU and to establish a regional center for hazardous waste management in Northeast Thailand is moving along quite well. Commitments of financial support from industry (\$400,000 in equipment), from a Thai funding institution (\$4,000,000 from TRF), and from the KKU Faculty of Engineering itself (\$40,000) are the proofs that the activities under this objective will be sustained long after 1996.

The CWRU-KKU joint effort to establish a Biomedical Engineering educational and research program at KKU is another permanent program that will ensure a long-term linkage. As mentioned earlier, curriculum development and facility development are progressing according to plan. However, the development of permanent staff for the program needs more time, and a strategic plan is needed to ensure that KKU gets the necessary help in the teaching of specialized BME courses during the critical first few years of operations. Specifically, we need to ensure that there is enough funds to support two 4-week visits per year by CWRU faculty members to co-teach BME courses with the KKU faculty during the first three years beginning June 1996. To prepare for this need, we have (i) scaled down other activities and redirected the existing funds so that, with no-cost extensions permission from USAID UDLP, we will be able to support the above-mentioned visits for 1997 and 1998 (in addition to 1996), and (ii) sought and received additional supports for the BME program from local medical instrumentation industry and Thailand FDA. Both the industry and Thailand FDA have expressed enthusiastic in the program and have agreed in principle to give a number of scholarships (up to 20) to support students in the KKU BME program.

For the individual/department level approach, we have continued to **identify many promising counterparts and promote face-to-face interactions between those counterparts**. Again our objective is to promote partnerships that show strong commitment from both sides to develop joint research and to seek additional funding. This has already resulted in a number of quality faculty and student exchanges leading to a number of promising relationships as illustrated below.

- *A strong relationship between the CWRU School of Nursing and the KKU Faculty of Nursing with both fully committed to continue their collaborations:*

So far, several of their joint activities have been funded or partially funded from non-UDLP sources. For example, the joint research on “Urban Primary Health Care: Development of a Model” has received more than half of its funding from non-UDLP sources. Also, KKU has sent 13 of their faculty members to visit CWRU using mostly their own funds, and this type of visits will most likely continue for as long as the KKU Faculty of Nursing is capable of generating their own revenue through their international training programs. Finally, their plan to jointly organize an international conference on Nursing Informatics at KKU does not depend on UDLP funding.

- *A strong relationship between the departments of Pediatric Medicine at CWRU and KKU.*

A strong tie has already been established between Dr. Karen Olness of CWRU and the team of Dr. Niramol Patjanasontorn (formerly a fellow working with Dr. Olness in Cleveland) and Dr. Srivieng Phairojkul, Chair of the KKU Department of Pediatrics. They are working together on a joint research project “Lead Level in Thai Children”, and on the CWRU-KKU-LAOS connections sponsored mostly by non-UDLP sources as mentioned above.

- *A joint research project in the detection of femoral fracture alignment using surface pressure measurements*

between Professor Wiroon Laopattarakasem, Department of Orthopaedic Surgery, KKU and Professor Joseph Mansour, Department of Mechanical Engineering CWRU. With encouraging preliminary results, the prospect of the joint work developing into a full-scale investigation with a long-term funding from Thailand Research Fund (TRF) is very good.

- *Possible educational and research linkages between the departments of Medicine at MetroHealth Medical Center (an affiliate of CWRU) and at KKU.*

IV. Quantitative Outputs of the Linkage Activities for 1994

The types of activities under each objective can be summarized as follows:

	<u>Objective 1</u>	<u>Objective 2</u>	<u>Objective 3</u>	<u>Objective 4</u>
Advanced Faculty Training	<ul style="list-style-type: none"> • Biomedical Engr. • Other Engineering • Nursing • Resident Exchange 		<ul style="list-style-type: none"> • Env. Engr 	<ul style="list-style-type: none"> • Systems Engr
Faculty Exchange/Visiting Scholars	<ul style="list-style-type: none"> • Medicine • Nursing • Health Related • Engineering 	<ul style="list-style-type: none"> • Community • Health related 	<ul style="list-style-type: none"> • Env. Engr. 	<ul style="list-style-type: none"> • Systems Engr. • Creative PS
Student Exchange	<ul style="list-style-type: none"> • Medicine 			
Joint Research	<ul style="list-style-type: none"> • Health and • Engineering Related 	<ul style="list-style-type: none"> • PHC 	<ul style="list-style-type: none"> • IURRC 	<ul style="list-style-type: none"> • CPS

The numbers of trips/persons taken place during the second year (1995) and some details of the trips can be summarized in the two tables below.

	<u>Objective</u>				<u>General</u>	<u>Total</u>	<u>Comment</u>
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>			
Planning/Meetings (persons-trips)							
Steering Committee at KKU	0.5	0.25	0.5	0.5	1	2.75	Frischer (1), Chankong(1) Wecharatana(½), Saidel(¼), Excl. KKU participants
Exploratory/Planning at KKU	0.5	0.75	3			4.25	Torjesen(1), Saidel(¼), Wecharatana(3)
Exploratory/Planning at CWRU	1					1	Chareon(½), Nalinthip(½)
Exploratory/Planning at NJIT					3	3	Weber(1), Kirawanich(1), Boriboorn(1)
Advanced Training (persons)							
at CWRU	5					5	3 Ph.D. in Nursing 2 MS-Ph.D. in BME
at NJIT			2			2	1 MS, 1 6-mo training
Faculty Exchange/Visiting Scholars (person-trips)							
to CWRU	14	1				15	Phupaibul/Isarankul, 11 nursing faculty, Chareon(½), Nalinthip(½), Wichettupong(1)
to NJIT			3			3	Wirojkud(2), Boonyaratapan(1)
to KKU & Thailand	4.5	3	11.5	1		20	Saidel(½), Katz, Daniel, Olness, Kauffman/Myers, Holmes/Quilty, Lefkowitz, Wecharatana(4.5), Armenante, Magee., Healy, Songpracha(2), L.Levine, S.Levine, Komolprasert,
Student Exchange (person-trips)							
to CWRU	4					4	Medical Students

<u>Visitor</u>	<u>Visited Inst.</u>	<u>Date</u>	<u>Purpose</u>	<u>Objective #</u>
Hakon Torjesen, Center for International Health, CWRU	KKU	Oct 17-19	Planning	1&2
Dr. Karen Olness, M.D. Professor of Pediatrics, CWRU	KKU	Oct 17-19	Faculty Exchange	2
Dr. J. Lawrence Katz Professor of Biomedical Engineering, CWRU	KKU	Dec 11-25	Faculty Exchange	1
Dr. Thomas Daniel, M.D. Director, Center for International Health, CWRU	KKU	Dec 12-22	Faculty Exchange	1
4 KKU Medical Students	CWRU	Mar. 1-28	Student Exchange	1
Dr. Karen Kauffman and Ms. Donna Myer School of Nursing, CWRU	KKU	Nov 14- Dec. 22	Faculty Exchange	1&2
Dr. Rutja Phupaibul, Asse. Dean, Asse. Prof. Vanee Isarankura, Fac. of Nursing, KKU	CWRU	Jan 16-Feb.7	Faculty Exchange	2&1
11 faculty from KKU Faculty of Nursing	CWRU	March 5-12	Faculty Exchange	1
Dr. Laura Holmes, M.D. and Dr. Jim Quilty, M.D. MetroHealth Medical Center, an affiliate of CWRU	KKU	Feb.20-Mar.3	Faculty Exchange	1&2
Dr. Boonying Chareon, Mr. Kitti Wichettupong, Dr. Nalintip Tamnonthong, M.D., Faculties of Engineering and Medicine, KKU	CWRU	May 14- June 2	Planning Faculty Exchange	1 1
Dr. Vira Chankong, PI/PD, CWRU	KKU	July 11-20	Planning/Steering C.	1, 2, 4
Dr. Gerald M. Saidel, Chair Biomedical Engineering Department, CWRU	KKU	July 17-24	Planning, Faculty Exchange Steering Committee	1 1
Dr. Saowanun Bumrerraj, M.D., Mr. Rujchai Ung-Arunyawee Ms. Poonsuk Siripul Ms. Rachaneewan Choosathan Ms. Marisa Krairiksh	CWRU CWRU CWRU CWRU CWRU	Jan 1995 May 1995 July 1994 July 1994 July 1995	MS-Ph.D. study in BME MS-Ph.D. study in BME Ph.D. Study in Nursing Ph.D. Study in Nursing Ph.D. Study in Nursing	1 1 1 1 1
Dr. Methi Wecharatana (Co-PI, NJIT) Prof. Armenante, Env.Engineering, NJIT	KKU	Oct 1994	Faculty Exchange	3
Dr. Wanpen Wirojkud and Assoc. Prof. Vanasri Boonyaratapan Dept. of Environmental Engineering, KKU	NJIT	Oct. 19- Nov. 3	Faculty Exchange	3
Dr. R. Magee, Exec. Director of MSMRC; Mr. Suwan Songpracha, California EPA; Dr. Methi Wecharatana, Co-PI, NJIT Dr. M. Healy, Director of Pollution Prevention Program, HSMRC, NJIT;	KKU	Feb. 15-17	Faculty Exchange/ Visiting Scholars	3

<u>Visitor</u>	<u>Visited Inst.</u>	<u>Date</u>	<u>Purpose</u>	<u>Objective #</u>
Dr. Prakrit Kiravanich, Director General, Pollution Control Department (PCD, Thailand) Mr. Sirithan P. Boriboon, Deputy Director, PCD	NJIT & US DOE	Dec. 7-8	Planning	3
Dr. Methi Wecharatana, Co-PI, NJIT	TRF and KKU	April 13-20	Planning	3
Dr. Methi Wecharatana, Co-PI, NJIT	PCD, Thailand	July 10-13	Planning	3
Dr. Methi Wecharatana, Co-PI, NJIT	KKU	July 17-18	Steering C. Meeting ^(*) Faculty Exchange ^(*)	3 3
Mr. Suwan Songpracha, California EPA	KKU	July 17-18	Visiting Scholars	3
Dr. Wanee Komolprasert, US FDA, Dr. Laxamee Levine, Florida EPA Mr. Samuel Levine, VP of Post, Buckley, Schue & Jernigan, Inc.,	KKU	July 23-25	Visiting Scholars	3
Dr. Methi Wecharatana, Co-PI, NJIT	TRF	July 31	Planning	3
Dr. Methi Wecharatana, Co-PI, NJIT	KKU	August 1	Faculty Exchange	
Ms. Netnapid Yossapol, Environmental Engineering Dept., KKU	NJIT	August 1-	MS Degree Study	3
Ms. Paisri Wannasangthong Environmental Engineering Dept., KKU	NJIT	Aug. 1- Jan. 30, 96	Faculty Training	3
Mr. Paul Weber, Kenan Institute of North Carolina and Administrator of US-Thailand Development Partnership funded by USAID	NJIT	Sept. 20	Planning	3
Dr. Wanpen Wirojkud and Dept. of Environmental Engineering, KKU	NJIT and Florida Conference	Sept. 29	Faculty Exchange	3
Dr. Irving Lefkowitz, Professor Emeritus, Dept. of Systems Engineering, CWRU	KKU	July 17-24	Faculty Exchange	4

In addition:

- Three joint research/development projects are currently underway, with more than half of the funding coming from non-UDLP sources (\$7050 UDLP vs. \$15,100 non-UDLP), and with a great potential to receive a long-term funding from a major funding agency in Thailand (Thailand Research Fund).
- A major progress is being made in securing institutional and financial support to establish a regional Industry-University Cooperative Research Center on Hazardous Waste Management, with \$400,000 in equipment committed by a Thai corporation, \$4,000,000 operating funds committed by Thailand Research Fund, \$40,000 committed by the KKU Faculty of Engineering, and possible additional support in cash or in kind from a number of US agencies.

- A major progress is being made in obtaining support for the Biomedical Engineering program from local medical instrumentation industry and from related Thai agencies, with up to 20 scholarships (8 from Thai FDA) being committed in principle to support KKU students in their BME undergraduate studies at KKU.

V. Impact of the Linkage on Internationalization of CWRU and NJIT

The proposed project presents an excellent opportunity for CWRU and NJIT to enrich many of their academic and research programs based on the experience gained on how to adapt advanced technologies in engineering and medicine to solve development and public health problems in a developing region. Here are some examples:

- The joint research project on detection of femoral fracture alignment using surface pressure measurement provides CWRU researchers with a unique challenge of how to develop a low-cost yet effective procedure for detecting small bone fractures without costly and painful radiography. A successful development of such a procedure will be useful for application in rural hospitals.
- The community nursing practicum at KKU and the joint research on “Urban Primary Health Care: Development of a Model” have provided CWRU nursing faculty staff with a useful alternative model on how primary health care (PHC) could be delivered effectively to urban-rural communities. Several ideas from the experience are being tried in Cleveland, and a few joint publications are in preparation.
- An international conference on Nursing Informatics are being jointly organized by the Schools of Nursing at CWRU and KKU. The previous conference was held in Italy.
- A strong tie between the departments of Pediatric Medicine at CWRU and KKU has already resulted in a joint research project “Lead Level in Thai Children”, and in a powerful three-way CWRU-KKU-LAOS linkage collaborating in projects in Laos.
- There are possible linkages between the departments of Medicine at MetroHealth Medical Center (an affiliate of CWRU) and at KKU that will allow them to develop a residency exchange program, as well as collaboration on research.
- A possible joint research on tuberculosis between medical researchers at CWRU and KKU will clearly extend the international coverage of the research and database on the disease at CWRU.
- A successful establishment of an Industry-University Cooperative Research Center (IUCRC) on Environment in Thailand and a regional IUCRC satellite on Hazardous Waste Management at KKU will clearly go a long way in internationalizing the

operations of the environmental programs and centers at NJIT (particularly HSMRC and ERRC).

In addition to the direct benefits above, both CWRU and NJIT have so far enjoyed a tremendous boost in publicity in Thailand resulting in a very large increase in postgraduate enrollments from Thailand and in requests for collaboration from Thai government agencies and private institutions during the last two years. There is no doubt that our UDLP campaign in Thailand is a major reason for the increased publicity.

VI. Impact of the Linkage on Strengthening KKU

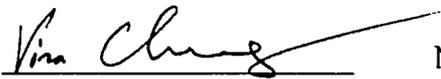
The obvious direct impact on KKU is that a number of its faculty members have now begun their advanced training programs at CWRU and NJIT, and several more will have opportunities to do so in the near future. The special arrangements with CWRU and NJIT through the UDLP make it easier for most KKU faculty to be admitted to a graduate degree program and to begin their studies, while completing whatever remedial work required.

The Biomedical Engineering will be one of its kind in Thailand and in Southeast Asia, and already has drawn national and regional interests. It will also be a program that will pull the strengths of two of the strongest faculties at KKU (Medicine and Engineering) to work on a common cause.

The KKU Faculty of Nursing has been the main beneficiary during the first two years of the UDLP. So far, 14 of its faculty members have visited CWRU, with many more planning to come. A joint research has begun, after a partial funding from the UDLP was used as a leverage to attract the rest of the funding from a local government agency. The KKU School of Nursing will be put on an international scene when it hosts an international conference on Nursing Informatics, which it is organizing jointly with the CWI.U School of Nursing.

A residency exchange program between the departments of medicine at KKU and the MetroHealth Medical Center in Cleveland, if successfully established, will be a major faculty development tool for KKU.

The anticipated regional center on hazardous waste management in the Northeast will mark an important first step in making KKU and Khon Kaen the center of research and service activities in environmental engineering. Such a center will be a major drawing card to attract quality researchers and academicians to KKU, which is one of the primary objectives of this UDLP.

Signature  Name/Title: Vira Chankong, PI/PD
Date: October 30, 1995

Attachment 1

Trip Report for the UDLP Project KKU visit in July 13-24, 1995

Professor Gerald M. Saidel
Chairman, Department of Biomedical Engineering, CWRU

In depth discussions with faculty and tours of the facilities of the School of Engineering and the Medical Center lead to the following recommendations for the BME program:

1. BME Programs

- a. The program and specific courses has been designed based on the CWRU program and the current KKU resources. As experience grows, changes will need to be made.
- b. The educational program should start at an undergraduate (B.S.) level with emphasis upon clinical applications.
- c. A M.S.-level program should be planned to complement the B.S. program and provide more sophisticated training for BME students

2. Teaching BME at KKU

- a. Team teaching with CWRU and KKU faculty is required.
- b. KKU faculty for each course should consist of at least one faculty member from the School of Engineering and one from the School of Medicine.
- c. The CWRU faculty should assist the KKU faculty in organizing and preparing the educational materials (primarily in English) for lectures and labs
- d. The KKU faculty should present the course material orally to students in Thai.
- e. BME courses that require CWRU faculty must be presented in one-month blocks during periods that do not conflict the the CWRU academic year
- f. BME courses should integrate use of instrumentation and computers available in the Medical Center.
- g. To facilitate the development of hands-on lab experiences for all BME courses, graduate students should be hired as lab assistants to work with faculty

3. BME Faculty Development

- a. Research collaborations are needed between KKU and CWRU faculty to help train KKU faculty in new aspects of BME
- b. KKU faculty should identify their research areas and priorities so that potential CWRU collaborators can be identified
- c. The collaborating team must write a research proposal that can be funded by some agency, e.g., Thailand Research Fund, FDA, industry
- d. More KKU graduates should be sent to CWRU for advanced (MS or Ph.D.) training. Students who start with a MS in a traditional engineering discipline would be able to complete the Ph.D. to KKU sooner.

4. Priorities and procedures for faculty visits between KKU and CWRU

- a. Faculty visits should have highest priority based on the order of the courses that need to be taught according to the program
- b. All faculty visits must be justified in writing at least two months in advance and have the approval of both the CWRU and KKU program administrators.
- c. Visits for potential research collaborations must be approved on the basis of a detailed written research proposal.

5. Recruitment of students into the KKU BME program

- a. Recruitment of students should be encouraged by special scholarships

- b. Both second and third year students should be accepted into the program, although program rearrangements will be required for third year students.

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Attachment 2

REPORT ON VISIT TO KHON KAEN UNIVERSITY

Dates: July 14 - 24, 1995

Dr. Irving Lefkowitz, Professor Emeritus of Systems Engineering
Case Western Reserve University, Cleveland, Ohio

I visited the Faculty of Engineering, of Khon Kaen University during the period July 17 through 21, 1995 for the purpose of providing assistance in their curricular and research developments in the area of process control. My visit was arranged under the auspices of U.S. A.I.D. Grant #342-2262 administered by Professor Vira Chankong of the Department of Systems, Control, and Industrial Engineering, Case Western Reserve University. My host at Khon Kaen University was Dr. Paisan Kongkachuichay, Chairman of the Department of Chemical Engineering.

A. PROPOSED AGENDA

It was arranged that I present two seminars of one hour duration each, and one three hour demonstration/workshop of new computer software for simulation of dynamic systems and design of feedback control systems. Abstracts of the proposed seminars are as follows:

Topic #1: Hierarchical Control of Industrial Processes

Our group at Case pioneered in the development of the hierarchical approach to computer control of industrial processes - an area of research in which we have been involved for the past 30 years. The rapid advances in computer technology in recent years have made implementation of the concepts and methodologies technologically and economically feasible so that they are becoming increasingly accepted practice in the control of modern plants in the chemical, oil, steel, paper, and related industries.

I propose to discuss hierarchical control as a concept and a framework for achieving integrated control of a complex multivariable process system where the objectives include maximizing efficiency and productivity while satisfying all of the technological and environmental constraints acting on the system. The ideas presented will be illustrated in the context of applications in the steel and oil industries.

Topic #2: Self-Tuning and Adaptive Control in Industrial Process Control

Self-tuning and adaptive control applied to PID (Proportional-Integral-Derivative Controller) and IMC (Internal-Based Model Controller) has become of such interest to industry that almost every major supplier of process control hardware includes such a feature in its current product line. The self-tuner determines, periodically or on demand, the optimum values for the controller parameters so as to maintain a good transient response of the process control loop, despite the effects of changes in process dynamics, disturbances, and operating conditions.

I propose to discuss the theoretical underpinnings of controller tuning and relate these to modern computer-based commercial realizations of loop-tuning and adaptive control. I will include a brief discussion of IMC control as it relates to one current approach to tuning.

The software that I brought with me to demonstrate included:

1. VISSIM (Version 2.0) software package for computer simulation of dynamic processes. This is a powerful, user-oriented, block diagram based package for simulating both linear and nonlinear systems, including dead time, continuous and discrete control systems, real-time communication capabilities, and many other features. Also included in the package is a control toolbox for implementing control system design.

2. PICLES software for analysis and design of process control systems. This is a special purpose package specifically developed for teaching process control to chemical engineering students.

B. EXPERIENCES

I spent three half days at the University during which time the following tasks were accomplished:

Day 1. Met with the Associate Chairman of the Chemical Engineering Department who discussed with me the schedule for my visit, introduced me to many of the faculty members, and took me on a tour of the Department facilities. I was also taken on a tour of the campus of Khon Kaen University.

With regard to the schedule, I was advised that there would not be time for me to give two seminars and that they would prefer my presenting Topic #1 on hierarchical control. The demonstration/workshop was, however, to be as originally scheduled.

I installed the PICLES software on one of the computers in the Computer Lab and gave a demonstration of its features and capabilities.

The laboratory facilities were quite limited by U.S. standards, but I was pleasantly surprised to be shown (1) a computer design laboratory with several 486 PC computers which included a number of software packages for engineering analysis and design, and (2) a process control laboratory with physical setups for studying control of simple level, pressure, and temperature processes. I did not get a feel, however, for how effectively the lab was being integrated into the undergraduate curriculum.

Day 2: I met first with Dr. Paisan Kongkachuichay, Chairman of the Department of Chemical Engineering. After apologizing for having had to be away the previous day, he filled me in on the composition and structure of the Department, and on some of its plans and goals. We then met with the entire faculty of the Department for an extended discussion on curricula and research with respect to process control. Apparently, the Department has currently only one course in control at the undergraduate level and none at the graduate level. I was advised that the Department was interested in developing a Master's program and hoped to be able to hire (or train) faculty with the needed expertise. One consideration that was discussed was the possibility of one of their junior faculty coming to CWRU for a period of graduate study, either with Dr. C. Brosilow in the Chemical Engineering Department, or with Dr. M. Buchner in the Systems Engineering Department.

I described briefly our courses in dynamic systems, computer simulation, and automatic control. I also identified a number of advanced topics in control that are covered in our advanced course. There was a useful interchange of comments and questions concerning laboratory experiments and the simulation packages I had brought with me to install on their computer. All in all, I thought the session went well.

I supervised the installation of the VISSIM software and demonstrated some of its features to a few of the interested faculty.

Day 3: I presented my seminar, "Hierarchical Control of Industrial Processes" to an audience of some 50 to 60 students and staff. The attendance was apparently more than expected since additional chairs had to be brought in for latecomers. Also, I noted that there were a number of people from other departments in attendance. The purpose and tenor of the seminar was to describe the state of the art of automatic control in the process industries, providing (to the students, in particular) a feeling for what represents current technology in the field so as to motivate interest in pursuing the field. In particular, I tried to make my talk relevant to the status of emerging industries in developing economies (as in Thailand). Judging from

the level of the attention displayed by the audience and comments following the talk, I thought the seminar was well received.

Following the seminar, I demonstrated the two software packages, PICLES and VISSIM. This was not as effective as I had hoped - for two reasons:

- a) Limited time available for the demonstration because of a late start,
- b) Ineffectiveness of the equipment for projecting the monitor image onto the screen (the room could not be made dark enough and there were too many people for the screen to be visible).

I did not feel, however, that this was really too much of a loss since, as I explained to the group, the software was very transparent and easy to use, and the User's Manuals (which I was leaving with them) was fairly straightforward.

C. GENERAL OBSERVATIONS

1. All of the people I interacted with were very friendly, courteous, and seemed genuinely appreciative of my efforts.
2. I suspect that there was more of a language problem than appeared on the surface, particularly among the students and staff who had not been to the U.S. for graduate study. This, I felt, limited the degree of effective interaction that I could have with them.
3. I did not feel that the Department used the limited time I had in Khon Kaen as effectively as they might have. This may have been due to scheduling problems and prior commitments.
4. There was no opportunity for in-depth, one-on-one working on specific problems, e.g., curricular and laboratory issues. A longer stay with a more specifically identified agenda might have been more useful.
5. Since the field of automatic control transcends the interests of several departments besides Chemical Engineering (e.g., Electrical and Mechanical Engineering), I feel that I could have made some contributions to these other departments had there been some collaboration with respect to my visit. Indeed, one of the attendees at my seminar from Electrical Engineering remarked as much to me after my talk.
6. Despite the negative tone of the above comments, my overall evaluation of my program at Khon Kaen was that it served a useful purpose and that it went well. In particular, I appreciated the hospitality of my hosts and their efforts to help make my stay in Khon Kaen pleasant and comfortable.