

## SCIENCE BULLETIN

National Science Council  
214 Roosevelt Road, Section III  
Taipei, Republic of China

## Earthquake Engineering Research Being Initiated in Taiwan

The National Science Council has decided to initiate an earthquake engineering research program as part of a 10-year earthquake research plan suggested by experts (*Science Bulletin* Vol. 3 No. 7). Dr. S. C. Liu, research fellow in earthquake engineering and structural dynamics of the Bell Telephone Laboratories, arrived in Taiwan last month at the invitation of NSC to exchange views with interested scientists on the matter. Out of the discussions has emerged a broad outline for the projected endeavor.

It was decided that the research would be pursued in three major areas. They are:

1) Strong-motion earthquake observation and data processing. Dr. S. K. Yiu, head of the NSC ad hoc group on earthquake research, is put in charge of this section.

2) Engineering-geological mapping of Taiwan with Professor Hung Ju-kiang of the National Taiwan University in charge. He is an expert in soil and rock mechanics.

3) Structural design of large construction projects. The man in charge of this sector is Professor C.T. Yeh whose specialty is structural dynamics. He is also the chief designer of the Taiwan Area Freeway project.

The earthquake engineering research program is designed to achieve the following objectives:

—Study on earthquake induced disasters and damages and preventive measures,

—Ascertaining Taiwan's earthquake characteristics that may affect engineering projects,

—Establishing a formula for analysing the quake-resistance of various structures and a building code.

—Promoting the development of teaching and research in earthquake engineering.

After a series of meetings, the experts have agreed on a number of spe-

cific projects to be tackled in the next 12 months. They include observation and numerical analysis of strong-motion seismograph in engineering structures, the relationship between earthquake damage and the geological faulting in Taiwan, the engineering-seismological characteristics of Taiwan's typical soil horizons, theoretical analysis of the earthquake reactions of engineering structures in Taiwan, and dynamic tests of engineering structures and models.

## Medical Diagnosis Goes Nuclear

The Veterans General Hospital on the outskirts of Taipei is going to inaugurate its new Nuclear Medical Center this month to give doctors a speedy and effective way of diagnosing illness.

The only one of its kind in Taiwan, the Center is equipped with modern facilities worth half a million U.S. dollars. It will be manned by 12 trained technicians under the direction of Dr. Peter S. H. Yeh, the director.

He said the Center would use technetium for examination of many vital organs such as brain, liver, lungs, kidneys, spleen, bones, thyroid gland and placenta. Because technetium is a universal isotope, it eliminates the trouble of using different isotopes for the examination of different organs.

However, Dr. Yeh said, there was a problem involved in using technetium because it is short-lived. The only way to solve this problem is to produce the isotope locally by using a special kind of generator. Because it is effective only for one week, the generator has to be constantly replace. In view of the short life span of the isotope, patients have to make

advance appointment with the Center.

Explaining the superiority of nuclear medicine, Dr. Yeh said isotope diagnosis is entirely different from the traditional X-ray diagnosis. Unlike X-ray which penetrates to the interior from the outside of the body, isotope searches for the trouble spots right inside the human body and can reach localities not accessible to X-ray.

Another advantage of isotope detection is its accuracy and speed. While X-ray photos may reveal to doctors suspected spots, the isotope tracer can indicate the exact locality of the trouble as well as the nature of the illness through the media of sound, light, image or figures.

Dr. Yeh summed up the merits of isotope analysis into these words: simplicity, accuracy, safety, and speediness.

The Veterans General Hospital will soon start to erect a building to house its Nuclear Medical Center. To be completed in two years, the building will occupy 2500 square feet of land with the interior designed by Dr. Yeh himself. Construction is expected to be completed in two years, he said.



# Report on Graduate Centers in Engineering and Science, ROC

by Dr. Joseph B. Platt

(Continued from Vol. 3 No.8)

## Recommendations:

I am fully aware of the problem of salary limitation in attracting the limited number of people who can plan and direct advanced research, teach specialized graduate courses in rapidly changing fields, and "set the tone" for their colleagues. I have no new suggestions except to say that the problem remains, and seems to be particularly acute in mathematics. The long-term future of the graduate centers depends on people who expect to be here for the long term, but for some additional years—perhaps five—it will continue to be most helpful to have visiting faculty to meet the needs of a year or two. Employing these few top people requires small portions of center budgets, but presents major problems of administration. Directing doctoral theses requires continuity of, at least three years, and the core of a center faculty should have long-

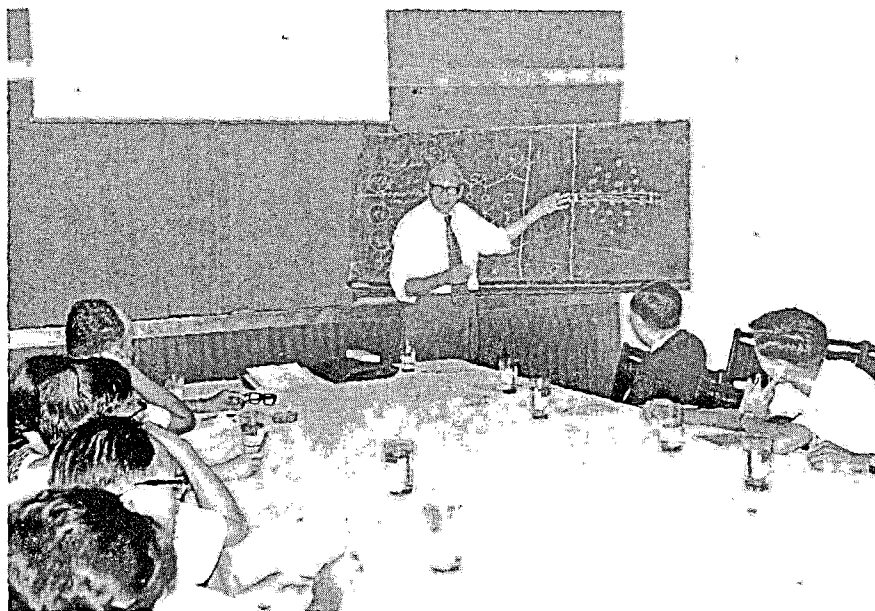
term appointments, but visitors will continue to be very helpful for some years to come. I suggest only that the Ministry of Education and the National Science Council remain sensitive to the need for special arrangements to meet particular needs for research direction in the Centers.

A considerably larger share of any increase in personnel budgets for the Centers should, I believe, be committed to new faculty posts. Good graduate teaching is hard work. A professor who is directing five graduate theses at the Ph.D. level—or ten at the master's level—has at least thirty hours' work a week to help these students, and if he also teaches a graduate course, he has a full load. These loads may not require more faculty when only five Ph.D. candidates are enrolled with several directors; they do require more faculty when thirty or forty are enrolled, as they should shortly be. *Recommendation:* I urge that each Center be asked to plan for the added faculty they need at the levels of graduate instruction they ex-

pect to have, and that these new faculty posts be authorized and filled. It is of course true that the standards for new appointments should be as high as possible, but in many cases qualified people can now be found.

For example, I learned that at the Chemistry Center at NTU the Chemistry staff of 19 faculty members teach undergraduate courses to 1,500 freshmen, plus 900 in organic chemistry, 800 in analytic chemistry, and 400 in physical chemistry. The remaining undergraduate courses are primarily taken by chemistry majors and have more nearly fifty students each. The department chairman teaches 9 hours a week (at Harvey Mudd College I would expect that 9 contact hours of teaching requires 40 hours/week to prepare, teach, and test) and also directs 2 Ph.D. candidates, 1 master's candidate and 4 senior (undergraduate) theses — plus the departmental administration. This sets a noteworthy example of diligence for his colleagues, but he can hardly be expected to seek more Ph.D. candidates. I am not arguing here for reduced undergraduate teaching loads. I am arguing that the graduate teaching load be understood as the Centers expand, and the appropriate faculty provided. It will, of course, require "mixture." I believe that both undergraduate and graduate teaching are improved when most faculty do both. But to increase the number of graduate students requires more total faculty—much more than any equivalent increase in undergraduates—and at this time it is particularly important to provide the people needed for a good start.

Another sizeable portion of any increased personnel budget for the Centers should, I believe, be provided for technical and management support personnel. I appreciate that any research director or faculty member worth his salt can always prove that he needs more technicians, stock clerks, secretaries and administrative assistants than he has. But he does need some, and how much depends on his responsibilities. It is a waste of money for a professor to repair apparatus that could be repaired faster and better by a technician paid half as much.



*Dr. Hendrik van Olphen of the National Research Council of the U.S. National Academy of Sciences made a lecture trip to Taiwan last month under the China-U.S. bilateral program. His lectures were about clay. Dr. Olphen is shown above lecturing on the topic "Rheological & Cooidal Properties of Clays, Application in Ceramics and Drilling Fluids" at the Mining Research & Service Organization, Ministry of Economic Affairs in Taipei on August 17.*

Recommendation: I urge that the National Science Council set aside some funds for additional technical support personnel for the Centers—machinists, electronic technicians, glass blowers, stockroom clerks, etc. and allocate these funds to those Centers demonstrating a need for them.

A special need arises for those graduate departments and Center directors, who are involved with industry. It is of course true that when the president of an industry goes to a university to explore possible cooperation, he expects to talk to the university president. When the research director visits, he expects to talk to the Center director; the industrial engineer expects to talk to a professor. But these visits require preparation, follow-up and arrangements; trains must be met, faculty participation arranged, reports written. If students are later employed, they should be introduced to the industry and their performance assessed when they return. If research or development contracts result, they must adhere to a time schedule and budget, progress reports must be made, funds accounted for and the final results reported both orally and in writing. Faculty members usually do these things neither willingly nor well. But a good administrative assistant can remove most of the burden from the president, the Center director or the department chairman after the assistant has learned his assignment. A graduate student in business administration can gain part-time employment and useful experience from such an assignment. At Cheng Kung, in engineering, it seemed to me that a need now exists for at least one such administrative assistant.

Recommendation: As the volume of industrial cooperation grows, I would urge that persons of this type be budgeted for those Centers which can demonstrate they need them.

High level technicians constitute a special problem. It makes no sense to have an item of scientific equipment costing more than US\$15,000—a magnetic resonance spectrometer, for example—which will be obsolete in ten years, stand idle for months because it needs a sophisticated but minor repair. But the technician who can repair it must have special training and command twice the salary in industry the university salary scales permit. The problem of maintaining

the geophysical equipment to be placed on the *Chiu Lien* is a particularly expensive case in point. In some cases it will be possible—as it usually is for computers—to arrange a maintenance contract with the manufacturer to keep the equipment working reliably. A suggestion I have heard, which makes sense to me, is that UIRI set up and manage a non-profit corporation to provide such maintenance service to those parts of the scientific community on Taiwan that need them. Fees could be set high enough to provide the wages needed to hold technicians, and the services would have to compete—favorably we hope—with commercial alternatives. The Documentation portion of the Document and Instrumentation Center could, for example, be transferred to the National Central Library, and the Instrumentation portion might, by arrangement between Tsing Hua University and UIRI, become the nucleus of the new Corporation.

When a complex and expensive new item of equipment is ordered, the Corporation might send a technician to the manufacturer for a maintenance training program with the expectation that on his return and following the expiration of the manufacturer's guarantee, that technician would not be hired away but would remain available to keep the equipment working. The considerable strength in design and pilot production of equipment which the Instru-

mentation Center now has would be utilized and strengthened as the volume of business grows.

It has been suggested that such a corporation might also manufacture laboratory equipment for use on Taiwan. I am skeptical of this proposal, although I would hope that one-of-a-kind or limited production runs—say less than 50 items of a particular equipment—might be produced at true cost including overhead. But it does seem to me that such a Corporation building on present machining and electronics capabilities, might have a real national service to provide as a model shop and pilot production operation, turning over new designs to private industry on Taiwan under licensing agreements. It was suggested to me that secondary school laboratory and scientific demonstration equipment could be produced this way which might be marketed in Taiwan and other Asian nations. This seems entirely possible to me and some of the equipment I saw may have a good market. On the basis of Harvey Mudd College's experience with the CHEM Study I believe however that consultation with secondary teachers and some trial teaching on a scale large enough to test a design and its market, would be required to ensure a manufacturer of a profitable potential market which would justify a licensing arrangement.

(To be continued)

## College Rocketeers to Launch Sounding Rocket

If everything goes according to plan, a seven-foot rocket will soar into the sky in central Taiwan this month carrying with it the hope of a group of space-minded students of the National Taiwan University.

The launching will be done by NTU's Rocket Study Society formed by space enthusiasts from the Departments of Mechanics, Electric Engineering, Civil Engineering, and Chemical Engineering. It took them one year to manufacture the single-stage rocket with the financial backing of the university authorities and technical advice from some of the faculty members.

Named NTU-1 Sounding Rocket,

the experimental "fire arrow" consists of a nose cone and the rocket body. Housed in the nose cone are data-recording and tracking instruments. Inside the rocket body are a parachute chamber, nose cone separation device, automatic apparatus to open the parachute, rocket engine and tail fins.

The launching will take place in Changhua where the budding rocketeers achieved partial success in a test firing earlier. The rocket is designed to reach a height of 15,000 feet. When the rocket reaches that altitude, the nose cone will separate from the rocket body and return to earth under the descent parachute with its precious cargo for further study.

# Bio-agents Being Raised to Combat Vegetable Insects

According to an ancient Chinese medical theory, poison of one kind may be employed undo the harmful effects of the poison of another description. Now scientists in Taiwan are trying out this theory in the agricultural field. For the first time they are using natural enemies to mop up whatever vegetable insects that may still remain after an initial application of insecticides.

Parasitic wasps, nematodes DD 136 and micro-pathogen (bacteria and virus) have undergone successful laboratory tests at National Taiwan University (NTU). They will soon be set in the field against diamond-back moths, cabbage worms and larvae of lepidopterans respectively.

It is a significant program with high economic value since these insects eat

up 5 to 15 per cent of vegetable crops on Taiwan every year, according to the Joint Commission on Rural Reconstruction (JCRR), which has five years.

It also has a calming effect on nanced the NTU test in the past consumers who are often alarmed at possible toxic residues on the vegetables after harvest, JCRR said.

NTU held a field demonstration last months at Yangmingshan for the benefit of farmers in the neighborhood. In their presence, parasitic wasps were released and nematodes DD 136 and micropathogen of bacteria and virus, sprayed on vegetables. Chemicals had already been applied, and their residual periods were over. According to Professor David Fung-yeen Yen of NTU, who is also a JCRR specialist, the method is both efficient and safe.

Fit for the integrated insect control method are Cruciferous vegetables, according to Yen. Insecticides such as Diazinon, Thiodan and DDVP, he said, should be used on the crops during their early stages. After the residual periods of the chemicals, which range from three to 21 days, the natural enemies should be allowed to combat the remnants so as to forestall their possible incidence in the future.

Safety is the biggest reward from this ingenious design, Yen pointed out, because it requires no insecticide application during the pre-harvest period. Not only are vegetables after harvest free from toxic residues, but chances for constant use of chemicals are also greatly reduced, he said.

According to K.K. Ho, NTU associate professor in charge of the laboratory work, a release cage containing 50 wasp cocoons is planted in the center of a 100-square meter truck farm. Each cocoon produces one wasp, which, after being released, must find a host insect to live on and lay eggs for multiplication. The wasps prey on the vegetable insects.

Parasitic nematodes and micro-pathogen to be sprayed on the crops later will cause septicemia on the insects, and kill them.

Now large quantities of such bio-

agents are being reared in the NTU Laboratory of Entomology. JCRR and PDAF have, in the meantime, selected 100 hectares of vegetable gardens, 20 each at Panchiao, Luchow, Shihlin, Chupei and Silo, to carry out a preliminary demonstration of this integrated vegetable insect control program this year.

## NSC-NSF Joint Meeting to Be Held in Nov.

The National Science Council and the U.S. National Science Foundation, implementing agencies of the China-U.S. Cooperative Science Program, will hold a joint staff meeting in Washington in November in connection with the bilateral program.

Topics suggested for discussion during the two-day meeting include presentation and review of first status report covering the period from January 23, 1969 to June 30, 1971, review of on-going activities (short-term visitors, long-term visitors, cooperative research & seminar), new activities, priority list in respect to all activities, information manual for US visitors, and special considerations.

## Plant Protection Center to Be Inaugurated Here

The Taiwan Agricultural Experiment Station in Taichung will have a Plant Protection Center to study the various problems of protecting agricultural crops. The scope of research activities will include plant pathology, pests, toxicity of insecticides, disposal of insecticide residue on crops, extermination of rodents, and weeding.

The project will be implemented over a period of five years with the support of the United Nations Development Programme (UNDP) at a total cost of US\$3,372,000. UNDP will contribute approximately one third of the money to pay for the salaries of foreign specialists, purchase of research facilities and fellowship for advanced training of Chinese personnel in foreign countries.

## Medical Scientist to Come as Long Term Visitor

The National Science Council and the U.S. National Science Council have jointly approved a six-month visit to Taiwan by Dr. Hsueh-hwa Wang of Columbia University as a long-term visiting scientist under the China-US Cooperative Science Program.

Peiping-born Dr. Wang will be in Taiwan from September 1, 1971 to February 28, 1972. The National Defense Medical Center in Taipei will be her host institution.

During her Taipei tour, Dr. Wang plans to carry out a cooperative research project with Dr. C. Y. Chai, professor and chairman of the Department of Biophysics, NDMC on the central nervous system control of regional blood flow in monkeys. She will also do some teaching in the form of lectures, seminars and discussions about planned and on-going research projects for the benefit of graduate students.