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SCIENCE BULLETIN

National Science Council
87 Ningpo West Street, Taipei
Taiwan, Republic of China

Consultations on Sino-US Program at D.C.

Two consultation meetings in connection with Sino-American science cooperation were held at Washington D.C. toward the end of October. Both had close bearing on the binational cooperative endeavor.

The first meeting took place October 27-28 between the China and U.S. Committees on Sino-American Science Cooperation jointly sponsored by Academia Sinica and the U.S. National Academy of Sciences. The U.S. National Academy of Engineering Sciences also attended the meeting as observers because some of the cooperative projects fall into the engineering field.

The agenda of the first meeting featured the following topics:

a. Review of progress report, with particular reference to the recommandations made at the industrial conference held in Taiwan last year under the joint auspices of the two national communittees.

b. Review of the status of the six graduate centers established in Taiwan at the recommendation of the joint committees.

c. Selection of a proper topic for the next Joint Committee Conference scheduled for next year.

d. Assistance to the Sino-US program under the binational science cooperation agreement signed between the two governments earlier this year.

The Chinese delegation was composed of Dr. Wang Shih-chieh, president of Academia Sinica and chairman of the China Committee; Dr. Tayou Wu, chairman of the National Science Council; Dr. Chen Ko-chung, former president of National Tsinghua University; Dr. I. C. Yuan, former director general of Academia Sinica; and Dr. Paul L. C. Hao, executive secretary of the China Committee.

The same Chinese delegation attended the second consultation meeting October 29-30. The meeting was between the National Science Council, executive agency of the Sino-US program on the Chinese side, and its U.S. counterpart the National Science Foundation. American participants also included scientists from the National Institute of Health, State Department, Department of Agriculture, Department of Interior, Atomic Energy Commission, and the National Aeronautics and Space Administration.

Major topics of discussion included: (1) review of cooperative research projects, (2) appointment of exchange scientists, and (3) establishment of working procedures for processing the various proposals under the binational cooperative agreement.

Dr. Wu presented a list of preliminary proposals for cooperative research for discussion. These proposals are: (*Continued on Page* 3)

R/C Chiu Lien Operational

Having undergone a four-month remodelling by the Chinese Navy, the Research Vessel Chiu Lien was finally commissioned for research work in early October. The National Science Council has assigned the Institute of Oceanography, National Taiwan University, to use the ship for carrying out various oceanographic research projects. The vessel, converted from a former U.S.N. tug, has the following measurements: length: 143 feet; beam: 33 feet; full distplacement: 900 tons; speed: 25 knots. She is now equipped with three laboratories: one for electronic instruments, one for chemistry, and another one for physics and biology. There are basic instruments aboard for oceanographic investigations. The ship can accommodate 32 crew members and 15 scientists for extended cruises. Chiu Lien's mission for the current academic year includes hydrographic and current measurement, submarine geology and geophysics study, and fishery resources investigations in the surrounding waters of Taiwan.

List of Preliminary Proposals for Joint Research Under Sino-US Program

At the first full-dress consultation meeting between NSC and NSF in Washington on October 29, NSC Chairman Ta-you Wu submitted a list of the preliminary Chinese proposals for cooperative research under the bilateral science cooperation agreement between China and the United States. The following ten projects are included in the list:

1. *Physical Oceanography*

The Taiwan Basin, which forms part of the continental shelf of the East China Sea, is geologically significant. Recent findings of the U.S. naval research vessel F. V. Hunt indicate probable presence of substantial oil reserves and other valuable mineral resources there. It is possible that similar natural resources also exist in Taiwan's offshore areas ranging from the Taiwan Strait to the South China Sea.

However, systematic and detailed geological mapping of these areas has never been undertaken. From the geophysical and geochemical viewpoint, relevant data forming the scientific basis for oil exploration and exploitation are far from adequate. The proposed project is designed to provide a better understanding of these areas by detailed and in-depth geological and geophysical investigations with the following objectives in mind:

(A) To find out the nature and configuration of the bottom,

(B) To classify the properties of sediments, and

(C) To identify the geophysical properties of the sea bottom and its distribution.

Another area of research is a variety of factors affecting sound transmission, such as temperature, salinity, pressure and even biological activities. A detailed study of these factors not only has the practical value in echo-sounding, but also can be applied to fish-detecting. Again very few investigations of sound transmissoin have been performed in the East China Sea and the South China Sea. A joint acoustic environment study in these areas are deemed necessary.

2. *Geothermal Resources in Taiwan*

There are nearly 100 hot springs scattered throughout the island of Taiwan. The hottest and most concentrated groups of hot springs and fumaroles are located in the Pleistocene Tatun Volcano Group about 15 kilometers north of Taipei City. The volcanic rocks occupy an area of nearly 320 square kilometers, in which many eruptive centers have been located. They are generally aligned in a northeast trend in two or three rows, suggesting a northeast fracture pattern in the underlying rocks tha allow escape of magma.

Numerous hot springs, fumaroles, solfataras, and mud pools are observed in the Tatun Volcano Group. These are grouped into 13 named thermal areas. The thermal belt is about 17 kilometers long and three kilometers wide. Chemical analyses of the waters and steam condensates from the belt show relatively high contents of S_4 and more or less Cl, with varying amounts of Na, Ca, Mg, and Fe.

Measurement of pH value of steam condensates from the Tatun thermal belt suggests highly favorable potential for power generating. Tentative estimates indicate the power-generating capacity of the Tatun themal belt to be 200,000 kw, and that of all geothermal areas in Taiwan to be 1,000,000 kw.

After prelimarinary geologic, geochemical, and temperature studies, four out of the 13 thermal areas in the Tatun Volcano Group have been given priority for geothermal exploration. The proposed approach for cooperative research calls for: (1) intensive field work in the Tatun thermal areas to complete and refine geological mapping, (2) extensive field work in all other geothermal areas in Taiwan for evaluatioin of exploitation feasibilities, and (3) operation of a pilot plant on recovery of mineral resources from steam condensates in the Tatun area.

3. *Copper Mining in Eastern Taiwan*

Exploration in eastern Taiwan has discovered a highly promising ore body in the Chimei area. Among the findings are several mineralized outcrops and an anomaly zone with total copper content above 500 ppm against background of 50 ppm and covering an area of about 800 meters long and 200 meters wide. The highest copper content was found to be 4300 ppm. An assy of rock samples taken from 54 test pits inside the anomaly zone showed that the average copper content to be between 0.2% to 2%. It has been confirmed that the ores are a type of porphyry copper deposit.

A preliminary estimate indicates that eastern Taiwan may be developed to yield up to 50,000 tons of copper a year. The consensus of foreign experts is that advanced research and sophisticated investigation are fully warranted. The proposed cooperative research envisions (1) evaluation of the copper deposits in Chimei and nearby districts, (2) examination of current exploration work with a view to upgrading accuracy and efficiency by the use of modern scientific knowledge and technology, and (3) operation of a pilot plant to test mining and smelting technology with a view to future planning and personnel training.

4. *Study on Autonomic Nervous System*

The proposed project can be divided into two parts: (1) on the effects of brain steam activition on the plasma free fatty acid, and (2) on emesis induced by streptomycin, dihydrostreptomycin and neomycin.

It has been shown that plasma free fatty acid increases during exercise or electric stimulation of the sympathetic mechanism of the hypothalmus and mid-brain. Whether this free fatty acid increases during stimulation of the medullary sympathetic mechanism is yet to be determined. The present proposal is an attempt to compare the change of plasma free acid in the same monkey during electrical as well as reflex activation of the hypothalmus, mid-brain and medulla oblongata.

During the course of combating an epidemic of infection of cats in the animal quarter, it is observed that

ntramuscular administration of streptomycin into the animals elicited ventromedial hypothalmic lesions. On the other hand, evidences from studies of food dilution and gastric loading suggest that they are capable of behavioral adjustment of caloric intake. These experiments were limited to carbohydrate. It is not known, however, whether or not hypothalmic rats are sensitive enough to intragastric fat to manifest an adjustment of caloric intake. The purpose of the proposed research project is to find an answer to this question.

5. *Study of Feeding Behavior*

Early scientific tests showed that hypothalmic hyperphagic rats on fat diet gained weight more rapidly and for a longer time than the rats on carbohydrate diet. These rats were also found to eat a constant volume independently of whether high carbohydrate or high fat diet was provided. The results suggest that animals become indifferent to the caloric value of the food after having received repeated emesis. Preliminary study showed that streptomycin 30 mg/kg, dihydrostreptomycin 60 mg/kg and neomycin 25 mg/kg elicited emesis in all animals being tested. Since little information concerning the emesis evoked by streptomycin and related antibiotics are available at the present time, it is deemed interesting and meaningful to study the mechanism of these antibiotics in causing emesis.

Both parts of the research call for extensive research experimentation on monkeys. It is believed that the low cost of monkeys in Taiwan is highly attractive to the American scientists. While the bulk of the experimentation work will be done in Taiwan, part of the analysis and evaluation may be done in the United States.

6. *Artificial Propagation of Gray Mullet*

A continued research on the artificial propagation of the grey mullet has been planned for the period July 1969 to June 1970 with financial support from the Rockefeller Foundation administered through the Joint Commission on Rural Reconstruction. The project is now underway at the Tungkang Shrimp Propagation Center of the Taiwan Fisheries Research Institute at Pingtung in southern Taiwan. The objectives are: (1) to improve methods on induced spawning, (2) to study the ecology, physiology and feeding habits of the mullet larvae and fry, (3) to conduct feeding experiments with natural larvae and fry, and (4) to conduct experiments on spawner culture. The proposed cooperative research covers only certain phases of the grey mullet study.

7. *Biological Aspects of Water Pollution*

The objectives of this project are to provide Taiwan with:

(1) A monitoring network capable of identifying suspect effluents and assessing their impact on water quality. Such data will have application in the location of new industries and communities as well as supplying the basis for pollution control measures.

(2) A biological inventory of its waters.

(3) A research resource for the investigation of specific pollution problems.

Early research will be essentially descriptive, concerned primarily with taxonomy and water chemistry. Once a base line has been established, the research will evolve to a physiological-ecology level where mechanisms of toxicity and population responses to ecosystem stress will be emphasized.

8. *Ecological Survey of Subalpine Grassland Communities as a Foundation for Conservation Studies*

The objectives of the project are: (1) To evaluate the interchange of grassland and forest, (2) to study the role of animal life in the succession of vegetation of both types, and (3) to provide the ecological foundation for grassland management in relation to water and soil conservation and proper land use.

9. *Systematic and Ecological Studies of Taiwan Fishes*

Professor Johnson T. F. Chen and his colleagues at the Tunghai University have built up a collection of about 1,300 species of marine fishes from the waters adjacent to Taiwan since 1958. Although this is by far the most comprehensive collection of fishes in Taiwan, it is believed the total number of species in these wasters exceeds 2,000. An intensive three-year research program is proposed for completing the systematic review of fishes of Taiwan. The completed monograph in English would amount to three volumes of about 1,000 pages each. This monograph will provide a standard reference work for ecological studies of marine fishes of the Pacific area.

10. *Biological Studies on the Growth and Aging of Mosquitos and Biting Midges Suspected to Be Disease Vectors in Taiwan*

The objectives of the proposed project are: (1) to extend the cooperative studies begun in 1967-68 when Dr. Paul S. Alexander spent a year's leave of absence as a research associate in Dr. C.A. Lang's laboratory at the University of Lousville, and (2) to develop biochemical facilities at Tunghai University for study of mosquito and midge biology.

According to the Criteria for Priorities agreed upon between NSC and NSF last summer, cooperative research will emphasize mutual interest and mutual benefit. It was further agreed that indigenous features of Taiwan's geography, climate, and socio-economic structure should be fully utilized in cooperative research undertakings. It is believed that oceanography, geology, seismology, meteorology, botany, zoology, tropical diseases, anthropology, etc. will be fields which may readily attract the interest of American scientists in this connection.

(Continued from Page 1)

a. Physical Oceanograph

b. Geothermal Resources in Taiwan

c. Copper Mining in Eastern Taiwan

d. Physiology: Study of Autonomous System

e. Physiology: Study of Feeding Behavior

f. Marine Biology: Artificial Propagation of Grey Mullet

g. Environmental Biology: Water Pollution

h. Environmental Biology: Water and Soil Conservation

i. Environmental Biology: Study of Taiwan Fish

j. Environmental Biology: Study of Mosquitos.

(See separate story for details)

After the conference the delegates paid a courtesy call on Dr. Lee A. Dubridge, President Nixon's science advisor, and acquainted him with the conclusions and resolutions of their meetings.

UIRI Reports on

The Preservation of Bananas

As a subtropical island, Taiwan provides optimum condition for banana growing. Annual export of the fruit to the Japanese market reaches some US$54 million. However, banana spoilage during shipment is a big problem, as the fruit cannot stay fresh for more than three days even in room temperature. As much as US$3 million worth of bananas was lost during shipment in 1966. To reduce the spoilage loss, a number of measures have been taken, including the use of carton packing and the use of freighters with refrigerating facilities. Now a far more effective weapon has been introduced. To produce a new type of product rather than the fruit, the Union Industrial Research Institute of the Ministry of Economic Affairs has carried out a number of experiments in its agricultural chemistry laboratory. The studies include the controlled atmosphere packaging, gama irradiation, and dehydration. The results are briefly described as follows:

A. Controlled Atmosphere Packaging of Bananas

For delay in ripening and increase of storage life of bananas, pasteurization and CA (controlled atmosphere) packaging have been investigated. So far as pasteurization is concerned, the fungicides, F/1991 (1-butyl carbamolyl-2-benizimidazole acid, methyl ester) or polyoxin, in 1000 ppm showed significant effects and they almost completely control the crown rot of this fruit during storage. In the CA experiments, bananas packed in 0.05mm polythylene bags are found to have an effective extension of storage life. In the case of packing 16 Kg of bananas in a difinite size polyethylene bag, 0.4 cu. ft. of air is applied instead of the same volume of mixtures of oxygen and nitrogen in any effective ratio, showed statistically no significant difference at 0.05 level. In accordance with a quality standard, the pasteurized and CA packed bananas are extremely similar in quality to bananas just harvested. After packaging, bananas could be stored at least for 30 days at temperatures from 12° to 20°C; and about 15 days, from 25° to 30°C.

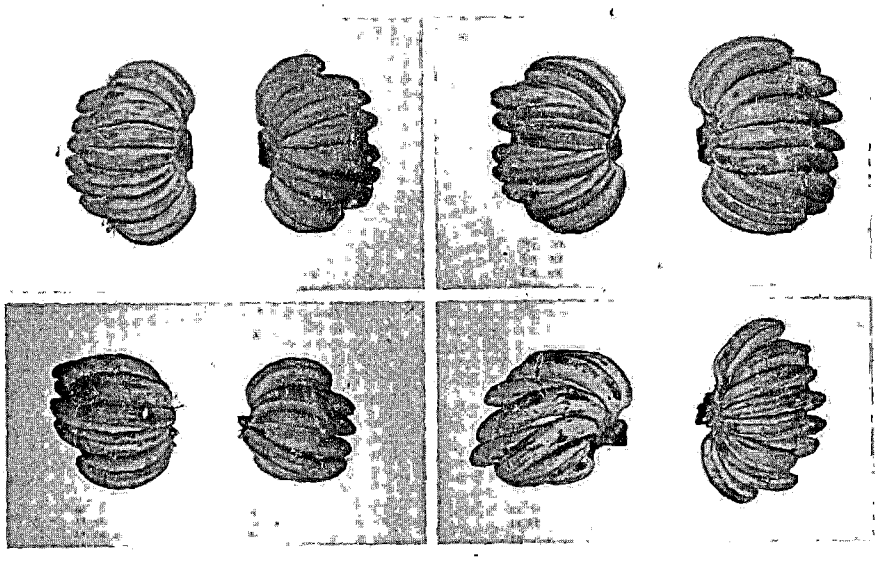
B. Gama Irradiation of Bananas

Gama irradiation of green bananas are investigated through the use of cobalt-60 to delay the ripening and to increase the storage life of this fruit. Ventilation is necessary in the radiation chamber and the radiation temperature is kept at 12°C in order to minimize any radiation damage when the bananas are exposed to gamma rays under air.

Experimental results demonstrate that the applied dose of 20-30 krads is optimum and effective by showing a delay in sugar formation, starch disappearance and respiratory activity. In consequence, the irradiated bananas stored at 12° to 20°C or 25° to 30°C result in prolonged delay in ripening of about 7 and 6 days respectively.

C. Freeze-drying and Solvent-drying of Bananas

Dried banana chips have been successfully prepared by both freeze-drying processes in this laboratory. In comparison, the freeze-dried sample remains better in taste than the solvent-dried samples. However from the standpoint of economy the solvent-drying process is preferable as its processing cost is less than 1/5 of that of freeze-drying.



Untreated banana bundles on the left side of the pictures show signs of decay on the skin. Those on the right side which have been packaged under controlled atmosphere or irradiated with gama-ray stay fresh.

News Roundup

The National Science Council has approved a total of 881 research grants for college teachers and research workers for the current academic year. Ninty of the grants are awarded to those working at the six Science Research Centers, and the rest are distributed among the various universities and research institutions.

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Dr. Wong Chung-ming, director of the Office of Saline Water, Department of Interior, will visit Taiwan November 14-16. He will give a lecture at the National Tsinghua University, his alma mater, before leaving. Dr. Wang is one of the few American siensts of Chinese ancestry to hold high posts in the federal government.

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The National Science Council approved nine more visiting professors and associate professors last October for the current academic year. The appointees, mostly incumbents, are Prof. Fumitomo Watanabe, Prof. Hsu Hsien-hui, Associate Prof. Cheng Yin-min, Associate Prof. Chiu Kun-yuan, Associate Prof. Chen Ching-chih, Prof. Cheng Ping, Prof. Kao Yi-han, Associate Prof. Hsieh Wu-hsiung, and Prof. Chou Yuan-hsin. They were appointed to one-year and half-year tenures.