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SCIENCE BULLETIN

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Oceanographic Research Projects for 1969-70 Ready to Be Launched

Repair of the research vessel Kiu Lien, acquired from the United States last spring, is scheduled to be completed in mid-September. The ship has physical, chemical and biological laboratories on board and is equipped with fundamental instruments for field work. The newly-established Institute of Oceanography of the National Taiwan University has accordingly worked out a list of research projects for the coming academic year, designed to make maximum utilization of the equipment available. The research plan is summarized as follows.

I. Geological and Geophysical Investigation

Located on the continental shelf in the East China Sea, the Taiwan Basin extends in the north-north-eastern direction from the northern coast up to the latitude of 31° N. This is an important area of geological significance for the exploration of mineral resources. The research vessel Hunt of the U.S. Navy Oceanographic Office has recently made a seismic refraction survey with spark method in that area. The results indicate the possible presence of a certain quantity of submarine petroleum resources.

To gain a thorough understanding about that area, the Institute is planning to start investigations by echo-sounding and bottom sampling. Geophysical investigations will be undertaken later when equipment is available. The objectives of the study are to find out (1) the nature and configuration of the bottom and (2) the physical, biological and mineralogical properties of the sediments. The field work consists of: (1) echo-sounding with PDR, (2) bottom sampling, (3) B.T. and Hydro-casts, (4) surface temperature and salinity measurements, and (5) observation of color and transparency of the sea water.

II. Investigation of Upwelling Phenomena

A picture taken from an earth satellite reveals that there are indications of upwelling phenomena on both sides of southern Taiwan. The upwelling may be caused by the influence of either submarine topography or the distribution of water properties. And in turn the upwelling will influence the distribution of nutrients and may possibly shed some light on better fishing ground.

The Institute is planning to carry out detailed studies on both sides of southern Taiwan in the year 1969-1970. Two cruises will be made in that area and during each cruise a set of stations will be run for concentrated observations. Hydrographical, chemical, biological and geological data will be obtained for study at each station. The objectives for the investigation are twofold: (1) the scope and intensity of the upwelling and (2) its cause and the influence on the distribution of nutrients. Items of field work: (1) echo-sounding with PDR, (2) bottom sampling, (3)

2nd-Yr. Funding for Master Science Development Plan

The National Science Council has finalized the FY1970 budget estimate for the funding of the 12-year Master Science Development in its second year with the total sum amounting to NT\$324,100,000. The figure represents an increase of NT\$50,000,000 over the FY1969 expenditure.

The biggest spending item in the budget estimate is study on science education and training of scientific manpower. Over NT\$132,745,600 is allocated for the purpose. Other major items are basic science research, (NT\$115,250,000), humanities and social sciences (NT\$7,500,000), industrial and applied science research (NT\$18,500,000), agricultural development (NT\$20,000,000), marine transportation and meteorological research (NT\$10,000,000), medical research (NT\$10,000,000), and miscellaneous spendings (approximately NT\$6,500,000).

In making appropriations for the

various projects under the development plan, NSC will stress coordination, keep track of their progress, supervise the implementation and evaluate performance. Advisers and experts will be enlisted to make regular checkups during the different stages of project implementation.

As the executive agency of the Master Science Development Plan, NSC will be beefed up to cope with its expanded activities. A revised organizational chart has been submitted to the Executive Yuan (Cabinet) for approval. The revised NSC constitution calls for the activation of five sections—basic sciences & mathematics, engineering and applied sciences, biological, agricultural & medical sciences, humanities and social sciences, and science education.—to deal with the administrative end of the operation, while its special committees will take care of project screening before appropriations.

hydro-casts for temperature, salinity, dissolved gas and nutrients samples, (4) recording of surface temperature and salinity data, (5) wave observation, (6) primary productivity measurements of phytoplankton, (7) collection of zooplankton samples.

III. Hydrographic Study

The sea east of Taiwan is a place of great oceanographic significance both in the physical and biological aspects. The main flow of Kuroshio current runs northward along the east coast of Taiwan, while on the right-hand side of the main flow there are counter currents and eddies of different sizes. All the physical and chemical properties and productivity are subject to seasonal variation. During the past four years of CSK, three sections of observation stations were made in that area. But as the cruises were made only twice in a year and the time distribution was not convenient, so the seasonal variation still is not clear. The Institute is planning to make a further study in that area in the year 1969-1970. The observations will be concentrated on one section parallel to the latitude of 24° 45' N. at least once every three months. Items of field work will include: (1) hydro-casts, (2) current measurements with GEK, (3) water sampling for analysis, (4) Meteorological observations, (5) wave observation, (6) plankton sampling, and (7) primary productivity measurements.

IV. Fishery Biology Research Projects

(1) Study of sardine and anchovies resources in the surrounding waters of Taiwan—Sardine and anchovies are important fish resources in the surrounding waters of Taiwan. In order to understand the distribution, migration, race composition, age, spawning season and population dynamics of these fishes and their environment, the Institute is planning to carry out the environmental survey of fishing grounds in the East China Sea and around the Pescadores in the year 1969-1970. Cruises will be made in the spawning season. Fish finder measurement and midwater trawling will be applied during these cruises to estimate the scope of these resources.

Beside collection of statistics of catch landed by purse seiners and hand liners, measurements of body length, determination of sex ratio,

maturity and scale reading will also be made. The data obtained will be studied with the hydrographical data to correlate fish migration with environmental conditions.

(2) Study of tuna resources—To assess the maximum sustainable yield and to achieve management of tuna fishery, the Institute is planning to carry out a research project to collect data of local fishing operations and also to study the regional and seasonal changes of gonad maturity, sexual ratio, length frequency and feeding habits of the yellow-fin tuna and big-eye tuna. Fish finder measurement and fishing experiments will also be applied during the cruises.

(3) Study of demersal resources—The laboratory investigation of demersal fish resources caught in the South China Sea and the East China Sea will be made. The purpose of this project is to obtain information of fishing activities of Chinese trawling fleet operating in the South China Sea and the East China Sea, including fishing efforts, catch composition and biological studies of the economically important species. Based on these results, scientific evaluation on the abundance and dynamics of the demersal fish resources in various fishing grounds can be made. The Institute is planning to carry out the biological and statistical studies by collecting fish samples and catching logs from the fishing vessels. The field investigations in the South Sea will be carried out in July-August, 1970.

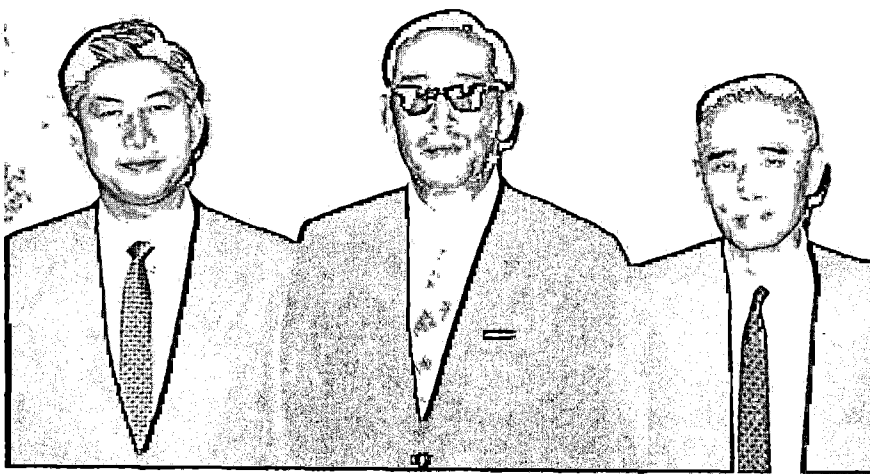
ROK Science Mission Visits Taiwan

A three-member Korean science mission arrived in Taipei August 17 for a week-long visit at the invitation of the Council for International Economic Cooperation and Development. Headed by Dr. Sang Keun Chun, research coordinator, Ministry of Science and Technology, the mission spent most of its stay visiting research and economic setups.

Dr. Chun, a Purdue-trained chemical engineer, said another objective of his visit was to familiarize himself with matters concerning the promotion of science and technology in this country. He called on Dr. Ta-you Wu, chairman of the National Science Council, on August 19, and attended a briefing on NSC's various activities.

Dr. Chun observed the Republic of China and the Republic of Korea have much in common. Therefore, he said, exchange of visits and experience would be beneficial to both countries. He informally suggested that scientists and science administrators of the two nations meet regularly to discuss matters of common interest just as the economic people have been doing. He was referring to the Sino-Korean economic cooperation conference held annually.

The other two members of the Korean mission are Mr. Man Kyo Shin, and Mr. Young Sup Bang, both of the same ministry.



Dr. Sang Keun Chun (left), chief of the Korean science mission, poses with Minister Chul Soon Moon (center) of the Korean Embassy and Prof. K. P. Zi, executive secretary of the National Science Council, at a NSC dinner in honor of the visitors.

Engineering Center & Its Activities

The Engineering Science Research Center, one of the five graduate centers established in July 1964, is sponsored by Taiwan Provincial Cheng Kung University with National Taiwan University and National Chiao Tung University as co-sponsors. It represents the joint efforts of the three universities to upgrade, at an accelerated rate, the training and research programs in the field of engineering sciences.

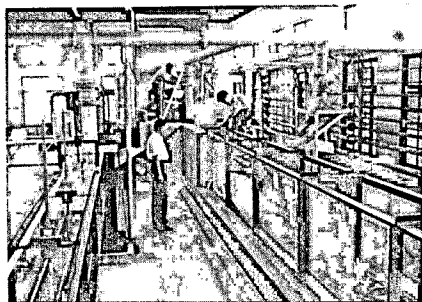
The center is an associated organization of eight graduate schools in three geographical areas: Taipei, Hsinchu and Tainan. Besides the three Ph.D classes in electrical/electronic engineering inaugurated last year, the fourth one in chemical engineering will be set up next year. In the academic year 1968-69, the enrollment climbed to 214 graduate students, 206 master degree candidates and 8 doctorate candidates.

During the current year, the Center's faculty consists of two special chairs, one research professor, five full-time professors, five visiting professors, six visiting associate professors, and 34 research workers. However, it is still understaffed for its ever-increasing load of research and training activities.

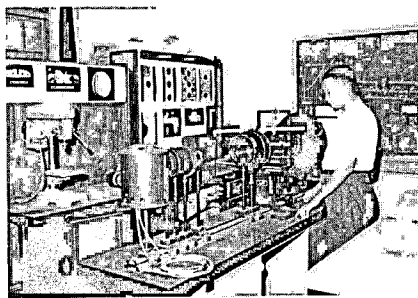
The Center has also 13 advisors to assist the Center in planning and recruitment of research talents. They are all senior scientists holding responsible positions in American universities and research organizations.

During the academic year 1968-69 the Center took up 31 research projects of engineering and applied sciences. With a few exceptions, all the projects yielded satisfactory results. The following is a brief description of some of the research projects carried out by the associated graduate schools of the Center.

1. Techniques of Floating-zone Refining and Single Crystal Pulling of



Parshall Flume



Photoelastic Polarizer

the Germanium Semiconductor Materials. (by T. H. Loh, NTU)

The purpose of the project is to improve the technique of preparing semiconductor materials in Taiwan. The research worker used a modified vertical zone refining process for ultra-purification of germanium ingot to overcome some troubles happened. The ultra pure undoped poly-crystalline germanium bar was then remelted and pulled into a single crystal bar by the Czochralski method with an n-type germanium seed of (111) direction. The result was good.

2. Application of Transfer Matrices to Structural Analysis. (by C. C. Yu, NNTU)

The worker illustrated how to apply the transfer matrices to structural analysis with effectiveness. The continuous beams, frames without joint translations, and frames with joint translations were discussed in detail. He found that the two different ways in approach to structural analysis, the action method and the displacement method, could be unified by using the transfer matrices.

3. Measurement of Total Electron Contents and Scintillation in the Ionosphere. (by C. Shu, K. H. Pai and J. C. Ma, H. Chen, NTU)

The radio transmissions from earth satellite had been found to be useful in the measurement of ionosphere electron contents and in detection of large-scale irregularities in the ionosphere. The workers pointed out two of the possible types of measurement: (1) The rotation of the plane of polarization due to propagation through an anisotropic medium, and (2) the Doppler shift or RF phase-comparison techniques.

4. Lambda Functions and Their Applications on Dipole Antenna calculations. (by C. I. Chang, CTU)

Lambda functions are a class of

functions relating to the Bessel functions, and have many applications in antenna theories. The worker illustrated that, applied to radiation theory of short dipoles and associated antennas, Lambda functions could simplify expressions and descriptions. He also described some basic applications on dipole antenna calculations.

5. Microwave Circuit for IMPATT Diode. (by T. S. Wen and W. S. Chang, CTU)

Having made IMPATT diodes in the previous year, the workers continued to develop a suitable microwave circuit for effective use of these diodes as microwave generators. Among many circuits they developed for use with IMPATT diodes, they found out that the best one was the microstrip circuit. Not only the microstrip circuit greatly reduced the physical volume of the assembly, but also it eliminated the individual package of the diodes.

6. The design of the control systems of a modern digital computer. (by P. Y. Huang, Ho R. Wang and F. C. Kung, CKU)

This project provided a design of the control system of general-purpose computer. The design made it possible to have a FORTRAN-compiler system incorporated into the hardware to obtain a higher speed of program execution.

7. Synthetical Design Method of Automatic Control System. (by I. B. Huang, CKU)

In synthesis of automatic control, the closed-loop system function must be first determined from the specifications. Then an appropriate compensator must be designed to realize the pole-zero location of the closed-loop system.

The worker presented a simple chart, by which the constants of compensator (either lead, lag or lead-lag network) could be easily determined with an accurate result.

8. A Study on Plastic Media Trickling Filter for Treatment of Sewage and Industrial Wastes. (by J. F. Kao and C. T. Li, CKU)

The workers used P. V. C. slates as trickling filter media to determine the mean residence time at different hydraulic loading and filter depth. Their research result proved that the P. V. C. slates of horizontal wave type with rough surface was the most suitable filter media.

9. Optimization of Distributed-Parameter Systems in Chemical Industry. (by Y. P. Shih, CKU)

This project provided the optimal control of a thin-wall heat exchanger.

The worker gave an integral equation with time delays to represent the input-output relationship of the system. Then necessary condition for the optimization of the system is derived by the method of finite perturbation of the control (input) variable. 10.

Polarographic Studies of Metal Chelates. (by T. T. Lai CKU)

The purpose of the project is to polarographically investigate the complexations of uranium(VI) and lead (II) with L-glutamine.

For uranium(VI) complexes, $\text{UO}_2 \text{G}^{+2}$, $\text{UO}_2 \text{G}_2^{+2}$ and $\text{UO}_2(\text{OH})\text{G}_2$ were identified at $\text{PH} \angle 22.5$, $\text{PH} 2.5-4.1$ and $\text{PH} 4.1-5.2$ respectively. For lead(II) complexes, PbG^{+2} , $\text{Pb}(\text{OH})\text{G}^+$ and $\text{Pb}(\text{OH})\text{G}^{+2}$ were formed at $\text{PH} 2.0-5.0$, $\text{PH} 5.0-7.0$, and $\text{PH} 7.0-8.5$ respectively.

11. Studies on Polymerization of Butadiene by Infrared Spectrophotometer. (by S. C. Li, CKU)

The worker concluded that the IR spectra of all the sodium-, butyllithium-, and lauroyl peroxide-catalyzed polybutadienes had the same band in 6.25 micron, which indicated the microstructure of diene. The microstructures of the three polymers are the polybutadienes and their related compounds.

12. Structural Elucidation Via Photolysis and Gas-Liquid Chromatography. (by C. Y. Tsao, CKU)

With the photolysis-GLC technique a number of ethyle ethers, n-propyle ethers, n-butyl ethers and phenyl ethers were chromatographically purified and photolytically decomposed by means of mercury-resonance UV radiation.

The photolytic degradation products were programmed in a sensitive gas-liquid chromatograph and resulted in "finger print" reproducible peaks were calculated into retention indices, ΔI -values and I -values, which could serve as guidances for structural understanding.

The worker concluded that structural elucidation established by retention indices was proved to be superior or complementary to IR spectrometry.

Archeologists Rediscovering Taiwan

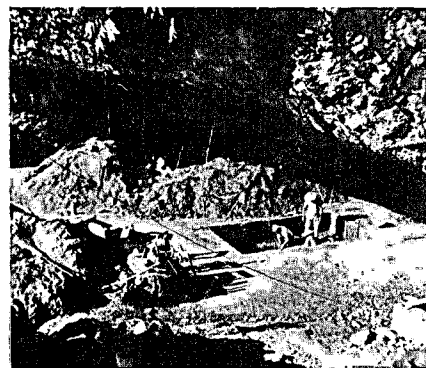
Archeologists in Taiwan are increasingly convinced that the island was part of the Chinese mainland in the remote past, and that it not only belonged to the cultural area of South China and the Indo-China Peninsula but had close affinity with the ancient culture of North China. Their belief has been strengthened by the discovery of black pottery culture in various parts of the island and the unearthing of bronze arrowheads at the estuary of the Tanshui River which are of the same type as those of the Yin era excavated on the China mainland. The discovery of the Neolithic remains and artifacts of later ages has given the archeologists hope that continued excavation on a systematic scale will eventually lead to findings to substantiate the suspected existence of Mesolithic or even Paleolithic cultures comparable to those of North China.

Since 1896 more than one thousand stone age sites and an enormous amount of archeological materials have been widely discovered on the island except for the areas at altitudes exceeding 2,000 meters above the present sea level. But all the sites and artifacts found are the remains of the Neolithic agricultural communities and later people, and no reliable material of Paleolithic and Mesolithic ages has ever been reported. An excavation made by a joint party of the Departments of Archaeology-Anthropology and Geology, National Taiwan University, at three marine-eroded caves on a cliff of a massive agglomerate block on the Pacific coast between the end of 1968 and February of 1969, first revealed rich materials of a preceramic hunting and fishing culture in their deposits.

A few thousand stone implements found in preceramic context are all made of water-worn pebbles, and the majority of them are flake tools struck from natural pebbles. Although retouched forms are rare, signs of use are marked in most cases. Pebble choppers worked on one side also occur, but bifacial artifacts worked from both sides are absent. The materials from three caves seem to represent three different cultural phases. Those from the highest cave are all large-size stone implements made of coarse rocks such as silicious

sandstone, and may be regarded as the earliest assemblage in the culture sequence. Among the more than one hundred specimens obtained in the second high cave, two are of a type not seen in the first assemblage. They are small stone implements made of fine material. The assemblage of the lowest cave, which is markedly different from the above described ones, obviously represents the latest phase of this culture. The amount of small-size stone implements made of fine materials, such as quartz, quartzite, chalcedony, and flint, increases considerably. In addition, bone implements appear in this assemblage. Most of the preceramic materials of the two higher caves came from a grayish clay layer which is covered by lateritic reddish clay in each cave. According to Prof. C. C. Lin who has made an intensive study of the cave deposits, the grayish clay of the two caves can be dated back to the Pleistocene age.

In view of the bright prospects looming ahead, the National Science Council has approved a four-year research program. Beginning with this fall, a series of large-scale excavations will be made by the Department of Archaeology and Anthropology with Prof. Sung Wen-hsun in charge. Prof. Lin Chao-chi, a geologist, will take up the geological end of the study. Dr. Li Chi, who returned from the United States recently, said Dr. Carleton Coon, a famed archeologist and anthropologist of the Harvard University, will visit Taiwan shortly to help identify the fossils unearthed on the Pacific coast.



Excavation in progress at one of the three caves on the eastern Taiwan coast.