

# SCIENCE BULLETIN

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## Kuo Nan-hung's Accession to Chairman of the National Science Council and His Administrative Program

In the most recent Cabinet shuffle Kuo Nan-hung was appointed chairman of the National Science Council (NSC). On March 10 of this year he delivered a report to the Education Committee in the Legislative Yuan, outlining the principles of his administrative program and the work NSC will promote in the future. A summary of his report follows.

The work that NSC will promote in the future will differ both in goals and strategy. It will be divided into two parts. The first will be work directed by NSC, with the co-operation and aid of other ministries and agencies. The second will be work directed by the ministries and agencies concerned, with the co-operation and aid of NSC.

The work that will be directed by NSC is explained below.

*A. The work of promoting important science and technology development can be divided into the following four categories.*

1. Promote goal-oriented research projects undertaken jointly by industry and academia. Select leading, key research topics, and encourage academia, research agencies and private industry to cooperate in conducting research that is vertically integrated and horizontally divided. Developing patented products and undertaking technology transfers are the results principally aimed for.

Besides continuing those projects already underway, such as the Micro Kernel Operating System Technology, research items for co-operation between industry and academia will be chosen from among the following fields.

(a) Technologies related to upgrading industry: communications and information industry, semiconductors, consumer electronics, high-grade materials, pharmaceuticals and agricultural technology.

(b) Technologies related to popular welfare and development: telecommunications, resource development, architectural technology, the integration of disaster prevention and environmental protection technologies, preventative and curative medicine and food technologies.

(c) Forward-looking technologies: biological technology, the integration of opto-mechanical and optoelectric technologies, high-definition television, and the technologies related to the manufacture of chemical products for special purposes.

2. Promote space technology. Space technology is an integration of many high-tech fields, and thus can carry forward the development of high-tech industries, foster and concentrate skilled manpower, and expand opportunities for multilateral, international cooperation.

The foremost goal of the space program is to establish a systematized project and a basic structure for ROC space technology. This process can be divided into two stages. The first stage is to establish the fundamental structure and basic technologies of the space system, and design and manufacture the ROC's first scientific satellite.

The second stage will involve implementing a number of special cases through our own efforts, working toward developing a telecommunications satellite, to get a real grasp of our ability to apply space technology. At the same time, we will analyze our domestic space technol-

ogy needs and strengthen space technology research and development to ensure that we get the greatest return for our investment. Moreover, we shall take the initiative and map out every possible avenue of application in order to carry forward the development of related industries.

Our goal is to establish technology teams that can provide information and training and train skilled personnel.

3. Develop ocean technology. Ocean technology, like space technology, is new technological territory for development. NSC participated in surveys conducted by the research ship Ocean Researcher 1, from which it built a good foundation in ocean technology. In the future, NSC will continue to strengthen its abilities and resources related to developing ocean technology. We will undertake this work with two newly built small marine survey and research ships, and a few submersible ships.

4. Promote global change research. Global change research is a large-scale science and technology research program now under active development in countries around the world. The Taiwan region is situated precisely between the world's largest land mass and its largest ocean, and thus has a unique geographical position. A variety of related research undertaken in the region will make several key contributions to this program.

For these reasons the NSC will continue to direct and promote this program in order to coordinate with global research internationally, and augment the understanding in the international community of several

unique change phenomena in the Taiwan region.

*B. In academic research, NSC will continue to offer assistance in two categories: independent research projects, and goal-oriented research projects. The principles guiding NSC assistance efforts are as follows.*

1. In subsidizing basic research at academic institutions, NSC shall work with the strengths of each, rather than attempt to make them all equal in all areas.

2. Promote intergrated allocation of resources within each academic field and assist universities in establishing research groups with special talents.

3. Strengthen controls and assessment procedures to raise the quality of research results.

4. Promote engineering technology from the point of view of sustainability and applicability, and widen the application of patented results.

5. Strengthen encouragement of international periodicals that can express the unique features of the ROC.

*C. In expanding international science and technology cooperation, the principles guiding NSC are as follows.*

1. Promotion of international science and technology cooperation can be divided into two categories: standard academic exchanges, and substantive cooperation in important science and technology fields. The stress of the former is on establishing channels for international academic exchanges and signing bilateral international cooperation agreements. The latter stresses areas where the strengths and weaknesses of the two parties mesh, regional concerns, and mutual

interest. Based on these considerations, the NSC engages in academic exchanges and science and technology cooperation abroad.

2. In participating in international academic exchanges and conferences, the ROC needs to strengthen its delegations by sending representatives with the highest academic credentials. The ROC also needs to maintain the continuity of its participation in international cooperation activities. This will be done in order to show the strengths and special nature of science and technology in the ROC.

3. NSC will coordinate its efforts with the Ministry of Education and other ministries and agencies concerned to set up general subsidies for international science and technology exchanges. Coordinating its efforts in this way will help NSC avoid promoting work of different standards and duplicating the investment of resources.

4. NSC will continue to strengthen cooperation between academia and business, and vigorously strengthen research cooperation in this area with international research institutions.

5. NSC shall publish a biomedical science journal aimed at the international market in order to enhance international academic exchanges. NSC will also consider publishing the results of NSC-sponsored research projects in the journal, in order to establish its academic standing.

*D. In developing the Hsinchu Science-Based Industrial Park, NSC will appraise the project on the basis of the 10-year operations plan. By 1996 there will be 200 high-tech companies operating in the park, with a total business volume of NT\$220 bil-*

*lion (US\$8.46 billion).*

Because of limited land, however, the park cannot meet the projected demand. It is therefore imperative that the park be expanded, and that we seriously consider choosing an appropriate site to establish a branch science-based industrial park.

*E. In raising the general science and technology knowledge level of the entire population, NSC shall undertake the following.*

1. NSC will continue with the following activities: sponsor science and technology touring exhibitions; publish science and technology newsletters in both English and Chinese editions; publish a series of books that offer brief introductions to important science and technology subjects; produce television programs on science and technology themes; and make arrangements with newspapers and special publications to print articles which introduce new scientific knowledge. All of these endeavors are aimed at broadening the science education of the general public.

2. In the future, the subject matter and contents of NSC news releases will stress newsworthiness, new knowledge, how the topic relates to daily life and educational value. This will be done both to increase the circulation of our general knowledge science and technology reports, and to arouse interest and concern for science and technology among the people of the ROC.

3. NSC will research and sponsor training programs for technical and scientific writing, and provide seminars on this topic for news and NSC staff, in order to improve their skills at writing reports which are vivid and lively.

## Second Private-Sector Science Symposium

The Second Private-Sector Science Symposium, organized by Science Monthly magazine and the Hsi Yi Foundation, and sponsored by the Association for Science Education, was held on Jan. 8-9, 1993 in National Taiwan University's Szuliang Hall. The theme of the symposium was "Science Education - Welcoming the Scientific Taiwan of the 21st Century." With more and more people in the Republic of China becoming concerned about science education, participation was heavy;

every session during the two-day symposium was full - so full, in fact, that the number of participants far exceeded the hall's capacity and the organizers had to set up closed-circuit monitors outside the hall to show the proceedings.

During the opening ceremony, former Minister Without Portfolio Kuo Nan-hung presented an address on "An Engineering Technology Fund to Cope with the Globalization of Economic Competition." At the closing ceremony, Nobel Laureate

Lee Yuan-che talked on "Science and Education in an Internationalized World." Physicist Wu Chien-hsiung took time from her busy schedule to deliver a talk on "Female Scientists."

To keep the symposium from becoming nothing more than a big science social event, many preparatory meetings were held over a period of almost a year. People concerned about science were invited to carry out discussions about the symposium's theme so as to assure the best

presentations possible.

The organizers arranged for the presentation of six papers. Prof. Huang Wu-hsiung of National Taiwan University's Mathematics Department talked on "Science Education Within General Education"; he introduced appraisal theory's appraisal of science, explained the principles of general education through development of cognition, and proposed integrated planning for 28 required common credits with the different schools developing their own characteristics in general education. Three female scientists – Wang Hsiu-yun, Chang Chueh, and Wu Chia-li – took "Women and Science – Another Possibility for Science" as their subject and pointed out the difficulties faced by women in the world of science today. They expressed the hope that everybody would pay more attention to the potential of women in science and eliminate the traditional conceptual and systemic strictures, so that the women who make up half of the world's population will be able to give full expression to their potential and bring about a greater utilization of the human resources available in society.

Prof. Yang Jong-hsiang of National Taiwan Normal University's Biology Department lectured on "Science Education in Primary and Middle Schools: Current Status and Problems," pointing out that the polarization of scientific achievement among the Republic of China's primary and middle school students is quite serious. Whenever the nation's outstanding students join the International Mathematics Olympiad, the gold, silver, and bronze prizes they win put the ROC among the top ranks of participating nations. Low achievers, on the other hand, are on a level with those of impoverished African states.

In his paper on "The Response of Science Education to the Information Society," Prof. Hua Yang of National Central University's Mathematics Department stressed that in the future, science education must not suffer distortion because of the promotion of information education. The computer is just a kind of tool, he noted; it should be properly used in science education, but should not be allowed to limit science education. Only through correct science education can citizens be developed to have the strong decision-making powers they need to make the proper choices in a society characterized

by the explosion of information.

Shih Yen-ping, President of National Ocean University, delivered a lecture on "Higher Education and Learning Development," in which he discussed the implementation and assessment of various science programs from the aspects of policy and administration, as well as the development of university personnel from the aspect of human resources supply and demand. He also criticized the negative influence of the "Statute for the Employment of Technical Personnel." Prof. Su Jong-ching of National Taiwan University's Department of Agricultural Chemistry presented a talk on "The Principles of University Science Education in the 21st Century," in which he advocated the use of life sciences as a general education that roots itself at home and casts its vision over the whole world, thereby serving the purpose of cultivating scientific personnel with wide-ranging knowledge and understanding.

To allow the various suggestions raised at the symposium to achieve concrete results, the organizers invited Prof. Liu Yuan-chun of Soochow University's Physics Department and Prof. Huang Jung-tsun of National Taiwan University's Department of Psychology to read all of the papers carefully prior to the meetings and write a draft "Concrete Proposals for the Improvement of Science Education in the ROC." These proposals were presented to the participants for discussion and the creation of a consensus during the final afternoon of the symposium, so that concrete proposals could be submitted to the concerned organizations. The preliminary proposals included the following:

1. "Hope engineering" in Taiwan should be vigorously pursued so as to help low-achieving students through equitable and reasonable resources.

2. Science education curriculums should be properly planned with attention to the linking nature of science education so that primary schools, middle schools, high schools, and junior colleges are not treated as separate and unconnected units of the science education system.

3. The current system that separates major and minor departments for students in their freshman and sophomore years of college should be replaced with a system that separates schools but not departments.

4. Different universities should be allowed to carry out their own planning for the 28 required credits so as to provide a more complete and balanced content for general education.

5. Teaching materials should be diversified so as to meet the differing needs of students at different levels, and the writing of teaching materials should be made more specialized and more in tune with life.

6. The content of information education should be properly planned so as to prevent its diverging from the theme of science education and thereby producing a negative result.

7. Science programs should be made "transparent" so as to effect the proper distribution of limited resources.

8. A good and reasonable assessment system for the evaluation of various aspects of schools and instructors should be established.

9. A professional skill licensing system should be promoted and popularized so as to clearly demarcate the boundary between general education and professional education.

10. Except for arts departments, there should be no further differentiation of departments under the new normal college system so as to cultivate primary school teachers for a healthy class teacher system.

11. Teacher sources should be diversified, and a normal education law revision should be formulated and enacted as quickly as possible.

12. Vigorous efforts should be made to improve the educational and systemic difficulties that women face so that the scientific potential of women can be fully manifested.

Most of the above proposals involve old issues that have been raised at different venues before, and the fact that they are raised time after time indicates a need for greater efforts in the areas of planning and execution. Taiwan hopes to join the ranks of developed countries in the 21st century, and the enhancement of science education is needed for the upgrading of industry and the rooting of technology. It is hoped that the proposals and expectations raised at this symposium will be used by the related government agencies as a reference in the formulation of policy so as to effect an early completion of preparations for entering the 21st century and the inauguration of a new age of science in Taiwan.

# The NSC Search for Partners for Cooperative Projects

The Engineering and Applied Science Division of the NSC along with its subdivision, the Engineering Technology and Promotion Center, has begun actively searching for industrial partners to a score of academic research projects. Inquiries have been placed with a variety of industrial guilds and associations and private enterprise in an attempt to locate appropriate partners with the ultimate goal of promoting academic and industrial cooperation on mission-oriented research projects so that key technologies and devices can be firmly rooted in Taiwan. The Taiwan Electric Appliance Manufacturers' Association was the first partner arranged to cooperate on such a project.

Dr. C. L. Wu, Director of the Engineering and Applied Science Division, says that the NSC has devoted a considerable budget to these efforts. Last year, NT\$300 million was allocated to such promotional

tasks, and NT\$400 million has been set aside for fiscal year 1994. Some of the twenty programs currently being carried out include compound materials, machine parts and devices, variable pitch lead screw, submicron technology, and information technology software.

New technologies developed as a result of many of the numerous academic research projects sponsored by the NSC have been suitable for transfer to industry. For instance, in the area of electronic machinery, there are at least 45 different research results to be used in industries. In the past, the NSC contacted individual corporations separately to discuss cooperation; promotional possibilities, as such, were limited. In fiscal year 1993, the NSC began actively communicating with relevant industrial associations to better understand industry's need for R&D on upstream key parts and devices. In this way, the NSC can be better informed and can better de-

termine the feasibility of R&D cooperation or technology transfer opportunities.

The Taiwan Electric Appliance Manufacturers' Association is the first partner to be negotiated. The next targeted group is the Taipei Computer Association and other relevant organizations. Parties interested in participating in research projects can invest from 15% to 45%, depending.

Mr. H. K. Hsu, Executive Administrator of the Taiwan Electric Appliance Manufacturers' Association, indicated that, although research has been carried out through the Industrial Technology Research Institute (ITRI) in the past, this is the first time the association has cooperated directly with the NSC. Mr. Hsu is sure that this project will most certainly be beneficial to upgrading industrial technology standards.

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