



# SCIENCE BULLETIN

National Science Council  
2 Canton Street  
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## Seventh Board Meeting Of Science Advisers Ends

The Seventh Board Meeting of the Executive Yuan's Advisers for Science and Technology was held in Taipei April 8-12 with seven foreign advisers attending. They are Dr. F. Seitz, Dr. P. Aigrain, Dr. J.M. Pettit, Dr. I.L. Bennett, Dr. S.H. Wittwer, Dr. K.G. McKay and Mr. Bob O. Evans.

Premier Yu Kuo-hwa, speaking at the closing session, made comments on the recommendations submitted by the advisers on each of the six subjects discussed.

Mentioning the public concern over excessive cost overruns in the construction of nuclear power plants, Premier Yu said he agrees with a separate recommendation made by Dr. K.G. McKay with respect to the bidding process.

He said in the procurement of large, sophisticated systems, the traditional practice of awarding the contract to the lowest bidder must be modified.

Premier Yu wound up his remarks by pledging that the advisers' recommendations will be implemented with diligence.

The following are excerpts from the premier's speech:

To the General Policy and Basic Sciences Group, led by Dr. Seitz and Dr. Aigrain, I understand you have spent long hours in studying the measures we have taken since last year to improve the environment of our academic community. These were merely the initial steps taken in an effort to provide some flexibility to our budget and personnel systems. We plan to do more in the immediate future. The goal is to attract more overseas Chinese to return and at the same time to persuade our own talent not to join the brain drain. This task must be done with the full cooperation of Dr. Pettit's Group on Manpower. Dr. Pettit wisely pointed out that we should place more emphasis on our postgraduate programs, and that we should reward students not

only for their intelligence, but also for their creativity, leadership, and entrepreneurship. Moreover, he pointed out that education is a slow process, which I take to mean that we should move now. And move we will with all deliberate speed.

### Public Health

Dr. Bennett's Group on Health and Environment made a strong and timely recommendation for us to upgrade the quality of our public health laboratories. These include laboratories for food, for drugs, and for toxic materials. It is most important that we not only set up a viable national standard in health-related matters, but also rigorously enforce such a standard. The public Health Administration, I

believe, will begin to draft action plans to consolidate our available manpower so that laboratory facilities could be more fully utilized and laboratory services more efficiently rendered. I am in complete agreement with the principle emphasized by Dr. Bennett that there must be clear definition of responsibility and delegation of authority, so that each laboratory knows exactly what its responsibilities and authorities are.

### Agri. vs. Industry

Dr. Wittwer of the Agricultural Group rightly reiterated the importance of agriculture in a rapidly industrializing society. I completely agree with his views. While the relative weight of agriculture is eclipsed by



Premier Yu Kuo-hwa addressing the opening session of the Seventh Board Meeting of the Executive Yuan's Advisers for Science and Technology. From left: Dr. F. Seitz, Premier Yu, Dr. Pierre Aigrain, Minister without Portfolio K.T. Li, Dr. J.M. Pettit, Minister without Portfolio Ma Chi-chuang, Dr. K.G. McKay, Mr. Bob O. Evans.

industry, agricultural productivity can be substantially increased through research. Dr. Wittwer has recommended three areas calling for concentrated efforts, namely, plant cell and tissue culture, pig breeding, and fish disease control. These are certainly among the most important areas. And they all require inputs of modern biotechnology. Indeed, our people responsible for biotechnology applications have included both the medical and the agricultural community as end users. I urge the National Science Council, which fosters biotechnology research, to work hand in glove with the Council of Agriculture.

### Right Direction

I am gratified to learn that both Dr.

McKay and the Technical Review Board for Telecommunications have found the Telecommunications Laboratory moving in the right direction and beginning to offer highly useful service. The Laboratory is working closely with its sister organizations, such as the Data Communications Institute, and is addressing itself to a few top priority areas. The series of specific recommendations are well taken and are most appreciated. They all stressed the need for interface between telecommunications and the computer industry. The proposed cooperative undertakings between the Telecommunications Laboratory on the one hand, and the Electronics Research & Service Organization, the Institute for Information Industry, and microprocessor developers in our universities on the other, should be strongly supported.

### Recommendations

Mr. Evans of the Electronics Group has made four excellent and specific recommendations. The one that we should continue to give emphasis to the computer disk drive and the TV industry is a logical extension of last year's recommendations. The idea that we should develop a microprocessor strategy based on microprocessor "independence" is a sound approach.

Last but not least, Mr. Evans outlined his views on the VLSI project. He suggested that we should put in more research rather than just doing development work. This is a most forward looking recommendation. I encourage the Electronics Research & Service Organization to move ahead in this direction, and I also expect our relevant university faculties to lend their full support.

## Premier Yu Says Gov't Committed To Building Tech-oriented Society

*(In his open speech at the Seventh Conference of the Executive Yuan's Advisers for Science and Technology, Premier Yu Kuo-hwa said the ROC government is committed to building a technology-oriented society in Taiwan as soon as possible. The following is the full text of his speech.)*

It is a great pleasure for me to meet you as a group for the first time. Many of you have worked with my government for a number of years, and know the aspirations of our people as well as the constraints of our society quite well. While there is a clear consensus that we must build here a technology-oriented society as soon as possible, the government is firmly committed to reach this goal in a most effective way and with all deliberate speed. We know your experience, wisdom and expertise will help us to shorten the process of development a great deal. As friends of the Republic of China, you are here to help, and your time is not compensated in an ordinary way. Our people have high expectations in your advices and suggestions, and I hope you will take such expectations as extraordinary rewards. Like my predecessor, Premier Sun, I have assigned the key personnel in my administration to work as your counterparts, under the coordination of Dr. K. T. Li, minister without portfolio, and Dr. Chen Li-an, chairman of the National Science Council. It is therefore incumbent on me to spell out what are expected of you, both individually and as a group, before you

carry out your next round of work.

The Board of Advisors for Science and Technology was conceived under the Science and Technology Development Program. Your foremost mission, I would like to point out, is to help us to form an appropriate strategy to reach our goal of science and technology development. This should be instilled into our national policy. The policy must be as aggressive and forward looking as possible, yet it must also be feasible and practicable. Therefore it must strike a delicate balance. I hardly need to point out that the Republic of China, with all her 36,000 square kilometers of land area and her 19,000,000 people, is a small economy, without much natural endowment of resources and with only a beginner's exposure to modern technology. The planning process is more important than usual. We must learn how to be selective, yet not to leave out components that will be important in the future. We must make heavy investments, yet must avoid premature investments for grandeur. We will make mistakes, but it is more important that we know how to amend for the mistakes. Above all, we must be ready to make adjustments. The responsibility for policy making squarely rests with the government, but we hope you will tell us the opportunities to grasp and the pitfalls to avoid as we go along.

### Strategic Technologies

The story of the eight technologies

selected by the government as of strategic importance provides a case in point. Both information science and telecommunications were selected as strategic areas for concentrated development. Yet it was you, and especially Dr. Evans and Dr. McKay, who point out to us that the two are complementary and should be implemented in a manner that is mutually supportive. Two Technical Review Boards were established for the Computer Group and the Telecommunications Group. At the promoting of Dr. Evans and Dr. McKay, the two TRB's are having joint sessions now before the Board Meeting, I am sure this interface will go a long way to assure the success of both groups.

The Electro-Optics Group and the Biotechnology Group, two other areas identified by us as strategic technologies, represent a slightly different example. These two areas were identified at a time when we know we did not have a critical mass of manpower at home but a lot of them worked abroad and therefore the work has to proceed differently while we have succeeded to attract more experts to come back, we have to strengthen our training & research program at home. In biotechnology, we realized this from the beginning the manpower issue, and we wanted to build up linkage between the upstream research and the downstream industries. The Development Center for Biotechnology was formed last year, and we made the

# 256K CMOS DRAM Developed in ROC

The Republic of China's VLSI research has taken a quantum jump by successfully developing a 256K CMOS DRAM. In announcing the technical breakthrough, the Industrial Technology Research Institute (ITRI) said last month only two other countries have accomplished the feat.

The 256K CMOS DRAM wafer is six inches in diameter. It contains 200 chips each containing the equivalent of 256,000 transistors.

The product is jointly developed by ITRI's Electronics Research & Service Organization (ERSO) and Vitelic Taiwan Corp. ERSO and Vitelic are planning to develop a 1M (1024K) CMOS DRAM with the target date set for the second half of 1986.

Dr. Hu Ding-hua, vice president of ITRI, said that the 256K CMOS

DRAM (complementary metal-oxide semiconductor dynamic random access memory integrated circuit) is the most advanced and powerful computer chip being marketed today. Besides Vitelic and ERSO, Intel Corp. and Hitachi Corp. are the only other companies in the world which have the capability to produce this product.

Dr. Hu also indicated that demands for 256K CMOS DRAM in 1988 are expected reach US\$4 billion in value, because such chips, as compared with 256K NMOS (n-channel MOS) DRAM ICs, consume very low electric power, operate at very low working temperatures, and have very high reliability.

Meanwhile, ITRI's Energy and Mining Laboratory has successfully developed kind of amorphous-silicon solar battery, which is of high commercial value, and will transfer the related technologies to the private sector for mass production.

Amorphous-silicon is a newly-developed material especially for producing semi-conductors. In many countries, this material has been widely used in manufacturing of calculators, portable tape recorders, radio sets, wrist watches, light meters and toys.

In view of the potential of this battery, the Energy and Mining Laboratory decided to develop this

technology several years ago and established a laboratory last year especially for this purpose.

RCA of the United States and several electronics companies in Japan, such as Fuji, Sanyo and Sharp, are rumored to have cast large amounts of money and manpower into developing this technology in recent years.

The first amorphous-silicon solar battery was produced by RCA in 1976. It is estimated that by 1990, the market for this battery will reach billions of U.S. dollars.

ITRI Director Fang Hsien-chi said recently that the solar battery industry is a branch in the semi-conductor industry. The breakthrough in this technology indicates that the nation's semi-conductor industry has entered another stage, Fang said.

## *ROC's R/D Investment To Quadruple by 1993*

Investment in research and development in the Republic of China will reach NT\$59.1 billion by 1993 under its 10-year science development program. The figure represents a four-fold increase over the present level.

In terms of GNP percentage, the R/D investment in 1993 will reach 1.5 percent, as compared with 0.73 percent at present.

The long-range science development plan also envisions 72 percent increase in sci-tech manpower.

By 1992, the sci-tech manpower will reach 32,000 persons, averaging 15 for every 100,000 citizens, as compared with 10 at present.

The emphasis will be shifted from development to research by the time the 10-year plan is completed, and R/D investment in the private sector will increase from the present 53 to 60 percent of the total input.

The long-range development also sets these objectives:

—The number of engineering researchers will rise to 21,000 persons, twice the present strength. Medical scientists will number more than 4000, more than doubling the present manpower. But the number of agricultural scientists and basic science researchers will be slightly down.

—Investment in engineering R/D will be raised to NT\$44.9 billion, about 4.5 times the present amount. R/D fund in the agricultural sector will drop from the present 16 to 9 percent of the total R/D input, while that for basic science and medical research will be maintained at the present level.

*(Continued from p.2)*

National Science Council the supervisory agency as the council was also busy with investments in the upstream institutions. The Development Center for Bio-technology was therefore instructed to make their report to Dr. Seitz and Dr. Aigrain's Group on Basic Science and General Policy in the spring of 1984. This obviously worked well. Last July, the government also set up the Electro-Optics Group under the National Science Council. The notion was the same: In order to have this area established, we must stress on the linkage between electro-optic devices and the modern approach to surface science and laser physics. Manpower needs to be built up with both recruitment from abroad and cultivation at home. I am hopeful that the Basic Science Group among my advisors will assist the Electro-Optics Group by helping us to beef up the upstream education and research.

The world of modern science and technology is a rapidly changing one. I suppose the key to success lies in changing with the times. My government is in a process of stepping up our effort in science and technology, and of readjusting our priorities in the allocation of resources. Your input in this readjustment process, both individually and as a group, is highly appreciated. My government and myself, while fully aware of our responsibilities in decision-making, stand to benefit from your advices and your insights in these matters. I wish you every success in your meetings, as well as your having a pleasant stay in my country in our brief, balmy spring climate.

## **Government Earmarks NT\$3.3 B for Industrial R/D in Fiscal 1986**

The Executive Yuan has approved an NT\$3.37 billion budget for science-technology development for fiscal year 1986, which begins July 1.

The plan, initiated by the office of Science and Technology Advisers under the Economics Ministry, will include 17 research and development projects in the following areas:

- Very large scale integrated circuits;
- Computer industry;
- Industrial and factory automation;
- Super precision technology application;
- New industrial materials;
- Key chemical technology;
- Measurement equipment inspection;
- Data information;
- CAD-CAM center for fixture and computer peripherals;
- Welding technology;
- Biological technology;
- Shipbuilding design;
- Open tow web forming;
- Productivity.

# Conclusions and Recommendations Group 8 — Electronics & Information

The Sixth Board Meeting  
of

The Advisors for Science and Tech.  
The Executive Yuan

By Bob O. Evans

(Continued from last issue)

## 3.2 Applications Software

In my opinion early R.O.C. success in the system control program business is doubtful. The studies now being conducted of application programming to determine which areas have requirements and which areas are growing are necessary steps in deciding whether and where to invest in applications program development.

Additionally I suggest it may be worthwhile to examine the top five or ten most successful PC application programs (e.g. Lotus 1-2-3, VisiCalc, etc.) and examine whether producing Chinese versions as well as other Far East nations versions could be economically and quickly accomplished. I suspect that, for example, a Chinese version of Lotus 1-2-3 has subtle requirements which the Chinese understands and can implement effectively to produce the best "native" versions of such programs. Moreover, such work would be a learning experience thus a desired acceleration of R.O.C. software expertise.

## 3.3 Software Engineering Project

I was pleased to see the organization and plans for the software engineering project. That is of important to the foundation R.O.C. must establish.

I was troubled to see the Phase II software tool and process plan recently submitted to MOEA only grows to 24 headcount in FY85 and stays at that level through FY1988. In my opinion this is far less than must be expended if R.O.C. is serious about software business. Thus I recommend

a significant strengthening of the software tool plan and suggest headcount of 24 average in FY85; 32 in FY86; 40 in FY87 and 50 in FY88. This investment is most important and will be rewarded many times over in the knowledge developed for local software industry alone.

## 3.4 Software Applications

I agree with the thrust of the "big five" program aimed at graphics, spread sheet, word processing, communications and file management. Hopefully the products that emerge can be competitive enough to be profitable in their own right. At the worst they will be a beneficial learning experience for the companies that participate. It may take two or more rounds of redesign before R.O.C. software products are fully competitive but the "big five" program is an important step in the right direction.

## 3.5 Software Productivity/Quality Tools

I described University of Maryland Professor Raymond Yeh's work on software tools and that Professor Yeh is President of a new company, International Software Systems, Inc. now growing from a small base and aiming to produce a variety of software productivity and quality tools. I also described ISSI's joint venture with PRC and Prof. Yeh's consultancy with senior PRC government. However because of his personal ability and my perception of ISSI's plans and their relevancy to recommended R.O.C. software directions, I suggested that appropriate R.O.C. representatives soon meet with Professor Yeh and ISSI to at least understand the detail of the software tools his company is developing and from this better learn the appropriate R.O.C. focus. Preferably, an affiliation between R.O.C. and ISSI may be mutually beneficial.

For example, if Professor Yeh would agree to grow part of ISSI in R.O.C. utilizing availability of low interest capital and other R.O.C. attributes, the new software company would move swiftly move R.O.C. into software tool development.

I committed to contact Professor Yeh upon return to the United States telling him of my discussions in R.O.C. and asking him to consider briefing R.O.C. software professionals when they call.

## 3.6 Chinese Language Processing

When the R.O.C. professionals visit ISSI in College Park, Maryland to examine their plan for a new family of software productivity and quality tools, the group should also review Professor Yeh's Chinese language processor which is operating in prototype form. It may well be that Professor Yeh's version is not relevant considering the III work with IBM on the 5550, but it would be prudent to understand whether one or the other is superior and, if so, why.

## 3.7 Chinese Programming Language

While I agree that a Chinese programming language is not an immediate priority, I do not accept that it is ultimately not important. More dialog on this subject could be enlightening thus I suggest that Dr. T. C. Chen of the Chinese University in Hong Kong be invited to R.O.C. for lectures and discussion on this subject such intellectual discussions can better focus thinking on whether a Chinese programming language is important in the long term.

