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China.

ASSISTANCE TO THE SERVICE CENTRE OF TESTING  
TECHNOLOGY IN EAST CHINA

DP/CPR/81/030

P. R. CHINA

FINAL REPORT\*

Prepared for the Government of the People's  
Republic of China  
by the United Nations Industrial Development Organization  
acting as Executing Agency for the United Nations Development Programme

Based on the work of Mr. Ted Chang  
Expert in Structure Analysis of Organic Substances  
under the post 11-04

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

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## I. NATURE OF SERVICES

As an expert in structural analysis of organic substances, the primary function of this assignment was to improve the servicing capabilities of the host location in organic analysis, structure determination and trace analysis.

## II. THE HOST LOCATION

The Shanghai Institute of Testing Technology, or SITT.

## III. SUMMARY OF THE TRIP

The duration of this trip was 15 days, from May 5 to May 19, 1985. The actual time stayed in China was 13 days, of which 11 days were spent in Shanghai. During this period, I gave a total of ten three-hour presentations including six lectures and two discussion meetings at SITT, a plenary lecture to the Shanghai Association of Science and Technology, and a seminar at the Department of Chemistry of Beijing University. The following lists the daily activities of this trip.

May 5.....Departed USA.

May 6.....Arrived Beijing, China.

May 7.....Reported to the UN mission in China. Left Beijing for Shanghai.

May 8, AM....Toured the future sites and the present facilities of SITT.

PM....The first lecture, "Modern Analytical Chemistry"  
Introduction to the latest developments in analytical instrumentations, especially the mass spectrometry.

May 9, AM....The second lecture, "Soft Ionization Techniques--I".

PM....The third lecture, "Soft Ionization Techniques--II".  
Described various ionization techniques. Emphasized the recently developed fast atom bombardment.

May 10, AM...The fourth lecture, "Combination Analysis".

Illustrated the powerfulness of various combination analytical techniques, such as GC-MS, LC-MS, ICP-MS, TGA-GC-MS and TLC-MS.

- May 10, PM...The first discussion meeting.  
 Questions and answers session for practical problems  
 encountered at the participating institutes.
- May 11, AM...The fifth lecture, "Special MS techniques".  
 Introduced several innovative techniques for specific  
 applications, such as collision activation, MS-MS,  
 triple stage quadrupole, ...etc.
- PM...Toured Shanghai Medicinal Chemistry Institute and  
 Shanghai No. 2 Medical School.
- May 13, AM...The sixth lecture, "Mixture Analysis".  
 Reviewed recent approaches in trace analysis,  
 especially the environmental analysis.
- PM...The second discussion meeting.  
 Technical exchanges with members of SITT concerning  
 the existing research problems and future directions.
- May 14.....Plenary lecture to the Shanghai Association of  
 Science and Technology.  
 "Recent Developments and Future Trends of Mass  
 Spectrometry and their Contributions".
- May 15.....Toured Shanghai and vicinity.
- May 16.....Departed for Beijing.
- May 17.....Seminar, Beijing University.  
 "Fast Atom Bombardment Mass Spectrometry".
- May 18.....Reported to the UN mission, found closed on Saturday.  
 Returned to Shanghai.
- May 19.....Departed Shanghai, returned to USA.

#### IV. GENERAL OBSERVATION

As a whole, this trip was very exciting, successful and rewarding. The hosting institute, SITT, and other participating institutes were grateful for the support of UNIDO on this project. This appreciation was apparent from the enthusiasm of lecture attendants and the hospitality of SITT. The SITT managements made their full effort to accommodate the comfortability of the invited UN experts. They also skillfully arranged the programs so that the maximum benefit was attained for all attendants. I would like to take this opportunity to express my sincere appreciation and admiration to Director Ji Ming-Yan, and especially to Managers Wang Gen-Rong and Wu Zhi-Ying for their hospitality and friendship during my memorable two week stay in China.

SITT is the leading institute of testing technology in the central coastal China. Its function is somewhat similar to the combination of the National Bureau of Standard and American Society of Testing Methods of the United State. Traditionally, the emphasis of SITT has been in inorganic analysis. It is no surprise that SITT has excellent facilities and personnels in inorganic analysis and surface analysis. They are comparable to many major laboratories outside China, except those leading laboratories. The separation chemistry is improving, but needs to be further strengthen. The organic analysis is the weakest link. I shall discuss this in detail in the comment section.

Most of the SITT's work are service oriented. Basic research are comparatively limited. In my opinion, the SITT has no sufficient resource, instrument-wise, personnel-wise and financial-wise to carry out basic research. However, some fundamental research related to SITT's function should be emphasized and encouraged to establish the authority of SITT in these fields. With the current government policy which encourage the creativity, enthusiasm is in the air everywhere. Most scientists appeared eager to undertake meaningful projects. However, because of the neglect of the past decade, many scientists seemed at lost on how and what to initiate the research projects. More clear guidelines are needed from the management on such matters.

## V. COMMENTS AND RECOMMENDATIONS

There were several subjects which came to my attention during my stay in China. I would like to comment on these subjects and make appropriate recommendations when necessary.

### A. Organic Analysis Capability of SITT.

As was mentioned previously, the organic structural analysis is the weakest link of SITT. It is understandable that SITT is trying very hard to improve this situation. However, it should be realized that "Rome was not built in one day". An outstanding scientific laboratory is the combined results of talented scientists, modern instrumentations, properly selected and managed research projects, and finally sufficient time to establish tradition and authority. The SITT is at least a decade behind in all these aspects. It should be accepted that by simply purchasing some modern instruments and a few experts will not change the situation overnight. The key to success is relentless hard working, which unfortunately is not an easy answer. This is especially difficult for Chinese scientists because they have been isolated from the world scientific community for the last couple of decades. I shall not make specific recommendations at this moment, because the following subjects deal with similar situations and recommendations are to be followed.

### B. Technical Information.

Poor availability and utilization of scientific information are just a couple of reasons hindering the technical advancements in many Chinese institutes. In general, Chinese scientists are sufficiently exposed to "macro" information, but pathetically lacking "mini" information. For example, they are very familiar with recent sophisticated instruments, yet on the other hand have little knowledge of where and how to obtain supporting parts and chemicals. Unfortunately, these "mini" information are essential for daily research work. Devoid of this information, Chinese scientists are placed in great disadvantage and can not fully utilize their modern instruments.

### Recommendations:

- 1) Whenever scientists attend foreign meetings, ask them not only to follow major developments but also to collect "mini" information. These type of information are readily available in ACS meetings or Pittsburg Conference.
- 2) Attempt to have the institute on the mailing lists of instrument companies. Most companies are willing to reply all requests.
- 3) It is understandable that smaller companies can not cover too many foreign institutes. A concerted information center in major cities may encourage smaller companies to send their catalogs regularly.

### C. On invited Experts

China invites considerable number of visiting experts every years. However, the effectiveness and productivity of these experts often are not satisfactory. Part of the failure comes from the selection procedure, where Chinese institutes seek after top name experts. Often, these experts established their reputation decades ago, but currently are not actively involved in research work. Some experts, on the other hand, present lectures too advanced for general audience to comprehend. In addition, too much time are wasted on translation. In my opinion, what Chinese scientists need most are those experts who can introduce new ideas, new technologies, new research approaches and new research practices. Furthermore, the main objectives should be to improve the average scientific level thus having long lasting impacts. It is wasteful to spend several thousand dollars of precious national resource to invite a "famous" expert to give a couple of lectures which can be learned from his publications.

### Recommendations:

- 1) Select the visiting scholars based on their current activities and not on their past reputation.
- 2) Try to engage the experts into daily operation and also for an extended period. The most useful part of experts are their ways of approaching the problems and not their lectures.
- 3) If available, invite Chinese speaking experts. The efficiency is at least three times more effective.



#### D. Research Projects.

During the discussion meetings, several scientists raised the issues of under-recognition of analytical chemists and the difficulties in finding research projects which will lead to recognition. I pointed out that this is an universal problem for analytical chemists and made a few suggestions.

#### Recommendations:

- 1) Analytical chemists spend most of their time on routine service work. They are considered as the operators of instruments, therefore, are not major contributors to projects. One way to break away from this unfair treatment is become an expert in your speciality and make your customers believe they are receiving analytical results from the authority. This is easy to say than done. Nevertheless, if one concentrates his effort in one area, however small, he will become the expert of this particular area. Then, after a couple of publications, the recognition will follow automatically.
- 2) Select research subjects which have impacts on current or future issues of China. This is the simplest way to attract recognition.
- 3) Do not afraid to choose a big subject. However, when this big subject is divided into several sub-subjects, each sub-subject should be realistic and attainable. The big title is to claim the authority and the sub-subjects are to prove one's capability.
- 4) Group effort should be encouraged. The main objective should be to establish the authority of SITT and not to make a couple of individual experts.

#### E. Maintenance of Sophisticated Instruments.

With increased complexity, the maintenance of modern instruments has become a major problem everywhere. This is especially true for China since many instruments are made outside China. It is common that a minor instrumental breakdown could result as several weeks of instrumental downtime because the spare parts or the serviceman is not available immediately. A well coordinated efforts among users will minimize such unnecessary disasters.

Recommendations:

- 1) In addition to the operating scientists, employ an electronic engineer to take care of all sophisticated instruments of the institute. This will minimize the dependency on the instrumental companies. It will also avoid the embarrassment of having unnecessary instrument downtimes which are caused by minor breakdowns.
- 2) Contact users of similar instrument or instrumentations and have periodical exchange of information and experience on instrumental behavior and maintenance.
- 3) Coordinate a spare parts exchange system among users in the vicinity. Minimize repetitive stocking of the same spare parts so that a wider choice of spare parts are available.

F. Occupational Safety

One subject disturbed me most during my visit in China is the awareness of occupational safety hazard. This is common phenomena throughout the institutes I visited. Most scientists are unfamiliar to handle toxic or hazardous materials, especially those chemicals which are insidious and have long-time effects. Even some basic safety precautions, such as safety glasses, flammable solvent containers, exhausting system, ...etc., are not being taken seriously. China is moving into modern technologies. If they take precautionous measurements at this moment, they could avoid many painful mistakes and consequences which industrial nations are suffering now.

Recommendations:

- 1) Familiarize with safety regulations and safety practices of industrial countries, such as the OSHA regulation of the United State.
- 2) Implement some basic safety practices to initiate awareness of safety among laboratory workers.
- 3) Include safety consideration into the design of new laboratories and remodeling of old laboratories.
- 4) Invite an expert to give presentation on hazardous material analysis, hazardous wastes treatment, safety regulations, safety precautions and practices.