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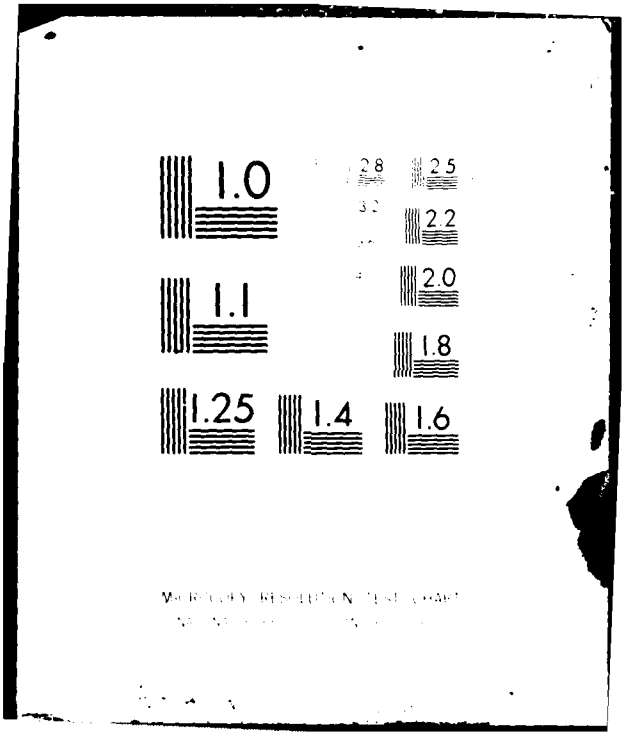
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The Florida State University

Department of Statistics

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STATISTICS AT THE CHINESE UNIVERSITIES

by

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STATISTICS AT THE CHINESE UNIVERSITIES

Ralph A. Bradley, Florida State University

1. Background and Introduction

This session on Statistics in China: The American Viewpoint and the Chinese Viewpoint was arranged by our Committee on International Relations in Statistics under the chairmanship of Tore Dalenius. It results from exchange visits of statisticians from the United States and the People's Republic of China assisted by a grant from the United States International Communication Agency. The exchange was arranged by the American Statistical Association and the National Statistical Society of China. The key people in the arrangement were Fred C. Leone, ASA Executive Director, and Li Chengrui, Vice President of NSSC and Deputy Director of the State Statistical Bureau in Beijing (Peking).

The American delegation consisted of Lester R. Frankel, Audits and Surveys Inc., New York, Fred C. Leone, Mervin E. Muller, the World Bank, Washington, D.C., S. James Press, University of California, Riverside, California, Victor Tsou, the Veterans' Administration, Washington, D.C., and myself. We were accompanied by Marion E. Bradley, Vera Frankel and Barbara Muller. The delegation assembled in Hong Kong and the itinerary, with dates in May, was as follows: Beijing 8-11, Xian 12-13, Shanghai 14-16, Hangzhou 17-19, and Kwangzhou (Canton) 20-21. Local accommodations and transportation were arranged by our hosts. We are indebted particularly to Mr. Li Chengrui and Mr. Wu Hui, the latter with us for this session, for the excellent arrangements made.

The delegation of statisticians from China is with us here in Detroit. It consists of Wang Yifu, Vice President of NSSC, Director of the Statistical Bureau of Beijing Municipality, President of the Statistical Society of Beijing, Wang Shouren, NSSC Council Member, Deputy Director, Institute of Applied Mathematics, Chinese Academy of Science, Chen Ying Chong, Honorary President, Statistical Society of Canton Province, Gui Shizuo, NSSC Director, Vice President, Shanghai Statistical Society, Professor of Statistics, Fudan University, and Wu Hui, NSSC Deputy Secretary General, Division Chief, State Statistical Bureau. We are pleased that Mr. Wang Yifu is a speaker at this session. Mr.

Wang Shouren and I both had the privilege of being students of the distinguished Professor P. L. Hsu, he at Peking University and I at the University of North Carolina. Mr. Chen Ying Chong and his colleagues waited out our late arrival in Kwangzhou, after which he hosted a superb dinner for our group. Because of prior commitments, the Bradleys had to leave Kwangzhou early the following morning. Imagine our surprise to find Mr. Chen waiting in the hotel lobby at 5:30 A.M. to accompany us to the airport and breakfast before our departure. This illustrates the care and hospitality accorded us throughout our visit to China. (The highlight of the session on Statistics in China was the surprise presentation (by Professor James Press acting on behalf of the University of Washington, Seattle) to Professor Gui Shizuo of his Master of Science degree earned some thirty years earlier -- See Figure 1.)

The itinerary of the Chinese delegation began in Washington with visits to U.S. Government statistical agencies, July 28-August 2, New York stops at the United Nations statistical offices and at Audits and Surveys Inc., August 3,4, a visit to Bell Laboratories, August 5, and tours of Harvard University, August 6, and the University of Wisconsin, Madison, August 7,8. The delegation is in Detroit for our meetings (See Figure 2) and will proceed to the Upjohn Company, Kalamazoo, August 14-16, the University of Michigan, August 17,18, and the University of California, Riverside, August 19,20. Both the American and Chinese delegations were chosen to give good coverages of specializations in statistics. This itinerary was designed to give broad insight into American activities in statistics.

The itinerary of the American delegation to China has been given very briefly above. As the delegation arrived at each of its destinations, the initial effort was to complete the agenda for the visit. Preliminary agendas developed by our hosts included formal meetings with members of the local statistical society, sight-seeing,

and usually a formal dinner. Sight-seeing opportunities were welcomed, as indicated by the picture of the delegation in Figure 3, but we did seek to visit with university and research groups and to find opportunities to discuss statistics informally with small groups of statisticians whenever possible. Visits to universities, an agricultural experiment station, and a commune were arranged on our requests. Each member of the group went to China prepared to give lectures on each of several topics and lectures were given in each city except Xian. While in Peking, the delegation was received by Mr. Feng-Yi, Vice Premier for Science and Technology, and an extended discussion on statistics and computing took place. Mr. Feng-Yi emphasized particularly China's need for computers and computer software. It is worth noting that, on May 22, 1981, there was a report that Mr. Feng-Yi had appointed a research chemist to head Academia Sinica, the Chinese Academy of Science, and given it more authority to determine science policy. Figure 4 is a picture taken at the reception of the Vice Premier.

The title of this presentation, "Statistics at the Chinese Universities," was selected prior to our visit to China. I am taking the liberty now to broaden my paper to say something about NSSC and the provincial and municipal statistical societies. In addition, a brief review of education in China in the postwar years is provided to give some perspective. My observations on statistics at the Chinese universities are necessarily limited, being based on a briefing by Mr. Wang Shouren in Beijing, visits to Peking and Fudan (Shanghai) Universities, and discussions at the Agricultural Research Academy of Hangzhou.

2. The National Statistical Society of China

The National Statistical Society of China was founded in November, 1979. Its stated purpose is to support research in statistical science. The Statutes of NSSC establish

1. Thirty Years Late: Gui Shizuo receives his degree from James Press.

2. ASA Reception for the Chinese Delegation in Detroit: The author and three guests, left to right, Wu Hui, Wang Yifu, Chen Ying Chong

3. Approach to Ming Tombs: The ASA delegation gets a horse -- (Head to Tail) Frankel, Bradley, Leone, Muller, Press, Tsou.

4. The Author meets Vice Premier Feng-Yi at Reception.

policies: (i) Marxist-Leninist-Mao Tse-tung Thought will provide guidance, (ii) Statistical theory will be integrated with practice, (iii) A hundred flowers will be allowed to blossom and a hundred schools of thought contend, (iv) Statistical theory and methodology will be promoted for use both at home and abroad, and (v) The Society will serve China.

Certain tasks were set forth in the Statutes also. They are not very different from tasks assumed by the ASA. Their tasks, somewhat reworded, are to (i) Organize and encourage academic statistics, (ii) Promote use of modern statistics in China, (iii) Disseminate information on statistics through lectures and publications, (iv) Assist and improve statistical work in government, (v) Arrange international statistical exchanges, and (vi) Honor contributions of individuals and institutions in statistics.

Governance of NSSC is achieved through an elected General Assembly or Representative Assembly, a Council, a Standing Council, a Secretariat, and elected officers, President, Vice Presidents, and Secretary General. The General Assembly is the "supreme authority" and consists of representatives elected by members. It meets once every 2 to 4 years and is responsible for revision of the statutes, policies and tasks of the society, review of Council reports, and the election of Council members. The Council has members with four-year terms, meets annually, and determines the "working program" of the society. The Standing Council represents the Council when it is not in session and consists of members elected for four-year terms and includes the officers of the society. Within the Standing Council is the Secretariat, which handles day to day business under the direction of the Secretary General and the Undersecretary General, the latter appointed by the Standing Council. In a rough way, the Council, Standing Council, and Secretariat correspond to the Board of Directors, the Executive Committee, and the Washington staff of the American Statistical Association. The office of NSSC is in Beijing.

NSSC has individual and "corporate" members. Individuals with certain experience in statistics may apply for membership through provincial, municipal or autonomous regional statistical

societies. The present annual membership fee is 1 yuan, a relatively small fee. Individuals who have made important contributions to statistics may be invited to become honorary members of NSSC. Members have certain designated responsibilities and privileges: (i) The right to vote and to stand for election, (ii) Priority for participation in the activities of the Society, (iii) Priority to obtain publications of the Society, (iv) The right to make suggestions and criticisms of the Society, (v) The right to request assistance in solution of statistical problems, (vi) Responsibility for reporting on statistical research conducted, (vii) The duty to support the regulations of the Society, and (viii) The requirement of paying annual membership dues.

The People's Republic of China consists of 29 provinces, 213 municipalities, and a number of autonomous regions. Provincial, municipal, and autonomous regional statistical societies have been formed or are in the process of being formed. It is these societies that become corporate members of NSSC. There are no corporate members in the sense that ASA has corporate members and we might use the designation of affiliated societies or perhaps Chapters. NSSC and its regional societies have been organized in parallel with the State Statistical Bureau and its regional statistical offices. Indeed, memberships and leadership overlap substantially. During our visit to China, the regional statistical societies acted as our hosts.

NSSC has been active in its short history. Mr. Wang Yifu, in his presentation at this meeting, gives some additional information. He reports that NSSC has 450 individual members, 22 corporate members with 8 more in prospect, 56 directors (Council members), and 8 Vice Presidents. Two national statistical symposia have been held and 18 regional ones. The first issue of a new journal, Statistical Research, has been published and papers presented at the 42nd Session of the International Statistical Institute translated. NSSC has been accepted as a member society of ISI.

3. Education in China

Understanding of statistics in universities in China will be enhanced through some background

information on education in China. My principal source is the encyclopedia of Kaplan, Sobin and Andors (1979). It will be seen that the modern history of education in China indicates both serious efforts to educate the masses and chaotic changes.

1949-52: Efforts towards educational reform were initiated in 1949 with a systematic plan promulgated in 1951. The plan provided for Preschool Education (ages 3-7), Primary Education (ages 7-12) together with a separate program for uneducated youths and adults, Middle Schooling (ages 12-18), Higher Education, and Political Education. The Middle Schooling included six-year schools, short courses for workers, spare-time schools, and vocational schools with technical and teacher-training divisions. Higher Education included specialized and technical colleges as well as universities. Political Education was conducted by institutions "providing 'revolutionary political training' for cadres." Programs of study at all levels of education required central approval and uniformity at all levels of education was sought. Major gains in promoting literacy were made.

1953-57: China's first Five-Year Plan was initiated in 1953. This led into a period of major Soviet influence, a time for strengthening central planning and administration, and a setting in which to pursue industrial expansion after the preceding years of reconstruction. There were many Soviet technicians and advisors in China and Chinese students studied in Russian universities. Translated Soviet texts were used in schools, Russian replaced English as the major foreign language studied, and Soviets held positions in Chinese universities. The natural sciences became the core of curricula in primary and middle schools where comprehensive technical education was stressed. Schools in cities were linked with local economic enterprises.

1958-59: The years 1958 and 1959 were the years of the Great Leap Forward. Communes were formed and some 80 percent of the population today are said to be commune members. Self-supporting schools were set up in factory and commune units and a new type of agricultural middle school was developed with students spending half of the day in technical school and

half of the day at farming. The emphasis of the period was on uniting theory with practice. School enrollments increased. By 1959, there were 50 million preschool students, more than 92 million primary school children, and some 12 million middle school students. The success of the first Five-Year Plan led to optimism. There was direct interaction of educational institutions with productive labor. Middle schools and institutions of higher education set up thousands of small industrial enterprises and farms, many of them ill-conceived and impractical.

1960-62: The forward momentum of the Great Leap Forward ended in the 1960-62 period and it became a time of readjustment. There was the break with Russia and the withdrawal of Soviet technicians. Many of the small new industries failed because of poor planning, problems of supply and demand, and poor quality production. Drought and natural calamities reduced agricultural output. The educational content of the schools was poor. There were severe shortages of teachers for the new schools and, by 1960, more than 90 percent of the rural, part-time schools had been eliminated. In 1962, the time allocated for productive labor by students had been reduced to one month per year and school curricula were revised to reduce the twelve years of primary and middle school education to ten.

1963-65: Economic conditions improved again by 1963. The emphasis in 1963-65 was on the Socialist Education Movement. The Movement related to political goals and focused on the issue of class struggle and communist indoctrination, particularly of the young. The call in 1964 was to turn intellectuals into laborers and revolutionaries. Some 300,000 educated youths were moved to rural and underdeveloped areas to take up production work. Mao pressed for complete reform of the educational system and opposed rigid examinations. By the end of 1965, the half-work, half-study program of the Great Leap Forward had not only been reinstated, but became the basis for all schooling in China. The vaccilations of the educational system of the early 1960's were a precursor to the chaos of the Cultural Revolution.

1966-69: The Cultural Revolution arose out of political struggle and affected China's political, cultural and educational climate for more than ten years. Schools and universities bore the brunt of the revolution. Higher middle schools and universities were closed for six months in 1966 to adapt to new doctrine. The entrance examination system for universities was abolished and, within a few months, the entire school system was closed. Mao Tse-tung Thought was to be taken as the guide to action in the cultural revolution. The Red Guards formed late in 1966. Teachers were harassed, not permitted to teach and, in some cases, sent to hard physical labor. Education was at a standstill.

Schools were ordered reopened in the Spring of 1967. But revolutionary committees and propoganda teams took over the schools and universities. Rural primary schools were controlled by commune production teams and urban schools were to be maintained by factories and commercial enterprises. By 1969, most schools had reopened except for universities. However, there had been major changes. Urban middle school students spent four days a week in the classroom and two days at commune or factory work. Of the 24 class periods per week, twelve were devoted to study of Mao Thought and study in the remaining periods was limited to political theory, language, mathematics, military training and industrial and agricultural production. The six years of middle school had now been reduced to four.

1970-76: Institutions of higher education began to resume instruction in 1970. Academic entrance examinations no longer existed. Work experience or military service became criteria for university admission for middle school graduates and all academic requirements were dropped for older peasants and workers. Candidates for admission were recommended by their local work units with political attitudes given important weight. By 1975, the admission policies were under debate and academic standards were almost non-existent. Premier Chou En-lai died in January and Chairman Mao Tse-tung in September of 1976. The Cultural Revolution continued officially into 1977. China had lost

nearly a generation of well trained young people. Even now, as Chinese scholars are sent abroad for advanced training, they appear to be individuals who completed university studies prior to the Cultural Revolution.

1976- : Immediately after the death of Mao, much attention was directed to the "gang of four." In essence, they have been blamed for all of the ills of the Cultural Revolution and this is the situation today. College entrance examinations were reinstated in 1977 and 5.7 million aspirants are said to have taken the examinations in that year. Some students were permitted to enter the universities directly from the middle schools without the prior requirement of two to three years of labor experience. Budgets have been increased for science and education generally and it has been stated that China has a need to train in the shortest possible time a group of experts in science and technology who are first rate by world standards.

It is clear that a major effort is being made to improve the universities. The first group of undergraduates admitted under the new admission examinations will complete their four-year degrees late in 1981. There is an increasing flow of students being sent abroad for advanced training to fill university posts in the future. They are badly needed because, even though faculties have been reassembled to the extent possible, there is a dearth of well qualified young faculty members. It was reported recently in Science (Volume 213, July 24, 1981, pp. 420,421) that China is to receive 200 million dollars from the World Bank for "the support of higher education, particularly graduate education and research in science and technology." (China joined the World Bank as a member in May, 1980). A substantial part of the loan will be used to obtain science research equipment. The encyclopedia reports restoration of post-graduate courses of instruction in 1977-78. In our visits to universities, some graduate students were reported, possibly assisting with instruction or engaged in directed individual study, but formal post-graduate courses in statistics did not seem to exist and plans for the future were at best very preliminary.

English has become again the major foreign language. Many teachers of English have been brought into the country -- we met some of these teachers. Members of the ASA delegation were often approached on the streets by individuals interested in Americans and anxious to try their English. National television devotes much time to educational purposes. English and mathematics courses are so taught and a program on the use of common logarithms was viewed and appeared to be very thorough. China today seems very eager to improve its educational research programs and to benefit from greatly increased contact with the Western World.

4. Statistics at the Chinese Universities

In preliminary discussions in Beijing, Mr. Wang Shouren provided the ASA delegation with a short briefing on statistics in universities in China. He noted that Professor Pao-Lu Hsu had inspired work in statistics in China through his teaching and research at Peking University. By 1956, he had established a small teaching and research group at that university. As his health failed and his formal teaching was interrupted by the Cultural Revolution, Hsu is said to have held discussions on statistics with small groups of students in his home on the campus of Peking University. P. L. Hsu died in 1970 and a memorial celebration on the 70th anniversary of his birth was held recently at the University. The reader may wish to turn to Anderson, Chung and Lehmann (1979), Anderson (1979), Chung (1979), and Lehmann (1979) for a brief biography of Hsu and discussions of his contributions to statistics and probability.

Mr. Wang Shouren noted that, before 1964, some ten universities in China had teaching and research groups in probability and mathematical statistics. There were no separate departments of statistics, but some 500-600 students per year graduated with major training in mathematical statistics. Peking University, Sun Yat Sen University in Kwangzhou, and a science and technology university that I interpret to be Qing Hua University in Beijing were mentioned specifically as among the best. It was noted that there had been no recent graduates because of the Cultural Revolution, but that

students were again studying probability and mathematical statistics in the universities.

Prior to the Cultural Revolution, students were enrolled in a five-year undergraduate program. The program included three and a half years of mathematics with courses in linear and matrix algebra, topology, real variables, functional analysis, probability and mathematical statistics. During the Cultural Revolution, graduates were sent to factories and their training in mathematics and statistics was not used.

Mr. Wang Shouren estimated that Chinese universities now have nearly 50 teachers of probability and statistics (Professors and Associate Professors), perhaps a shockingly small number. Courses in probability were noted to include Markov chains, point processes, control theory, and queueing theory. Courses in mathematical statistics include order statistics, estimation, multivariate analysis, experimental design, reliability theory, time series and quality control. In addition to NSSC, there is a section of the Chinese mathematical society interested in probability and mathematical statistics that has held conferences on probability and multivariate analysis. Mr. Wang Shouren noted that there are Chinese students studying statistics at Harvard University, University of Wisconsin, Madison, University of California, Berkeley, and Stanford University. More students are expected to go abroad for training as the need for more faculty is acute.

The ASA delegation as a group visited three universities: Peking University, Fudan University, and Sun Yat Sen University. Individual members of the delegation visited one or two other universities or colleges. Two of us gave lectures at institutes of the National Academy of Science in Beijing. Most of the delegation visited the Agricultural Research Academy of Hangzhou. The author did not visit Sun Yat Sen University and must base his comments on the visits to the two other universities, the Agricultural Research Academy, and the Institute of Systems Science. In all of this, one has concerns for possible misconceptions and we apologize to our readers and to the Chinese if we have somehow been inaccurate. Press (1981), re-

porting on his impressions of China, says "I feel like we saw a flower while we were riding by, very quickly, on a horse -- never getting a real chance to touch the flower, or to smell it; but we did see it." (Apparently his allegorical horse was more mobile than the one he acquired in Figure 3.) The three universities visited are among the best in China. They receive the best students on the basis of the university entrance examinations. (In applying for university admission, prospective students may express preferences for both universities and major fields of study, but they may be assigned to other universities and to other fields of study.)

Peking University: The ASA delegation visited Peking University on the afternoon of May 8. We were received by a group of faculty members representing programs in mathematics, statistics, economics and computing. There was a general presentation on the programs of the university with special emphasis on programs in the Department of Mathematics. Statistics is taught in a number of departments, as is too often the case in American universities, but the main program is in the Department of Mathematics.

Peking University was said to have the highest quality students -- only 4 percent of the students are accepted who take the unified university entrance examinations and the best of these are assigned to Peking University. Current enrollment was indicated to be approximately 8,000. The University has 22 departments, 12 of which are in the natural sciences and technology. All students in these areas receive some training in statistics.

Enrollment in the mathematical sciences exceeds 500 and some 50-60 are postgraduate students. The Department of Mathematics has 8 teaching and research groups, the areas being geometry and algebra, theory of functions, differential equations, probability and mathematical statistics, information theory, numerical analysis, applied mathematics, and general mathematics. There is a new Department of Computer Science that has been established recently.

In response to a question about placement of graduates, it was noted that the first degrees will be awarded late in 1981. Graduates will be assigned to work by the government. It is expected that most will be placed in higher education, institutes for teaching, or research work. In some cases, mathematics graduates may be assigned to computer programming.

The delegation was given a tour of the campus, a very nice campus, and a vist to the library, which is said to have an excellent collection of ancient Chinese documents.

Fudan University: Our group visited Fudan University on May 15. We were received by the Dean of the College of Natural Sciences and Liberal Arts, along with a number of faculty members, including Professor Gui Shizuo representing statistics. The Dean reviewed the College, noting that there were eight departments in Liberal Arts: Chinese, languages, history, journalism, philosophy, political economics, international politics, and world economics, and seven departments in Natural Sciences: mathematics, physics, biology, chemistry, computer science, nuclear energy science, and management. The University has seven research institutes associated with departmental areas: literature research, Chinese history and historical geography, world economics, modern physics, electric power, genetics, and mathematics. Faculty members working in the research institutes have reduced teaching assignments. Apparently the research institutes sometimes take on government research projects.

Fudan University was establisned in 1905 and celebrated its 76th anniversary in May, 1981. The present organization was arranged in 1952. It is a teaching and research university and one of the best in China. Data that we were given are as follows: Teaching staff, 2171 (Professors and Associate Professors, 315, Lecturers, 1066, and teaching assistants), Students: Undergraduates, 5,200, Graduate Students, 382, Foreign Students, 61. The People's Republic of China is making an effort to attract foreign students, particularly from Taiwan.

Discussion included questions about the University and an exchange of ideas on teaching statistics. Statistics is taught in several

departments as is the case in many American universities. At Fudan University, statistics is taught in Economics, World Economics, Mathematics, Biology, and Management.

The ASA team visited the university computing center which was established fairly recently. Those facilities were fairly limited by modern standards with major use of paper tape input.

Agricultural Research Academy of Hangzhou: A visit to the Agricultural Research Academy of Hangzhou was arranged on May 18 at the request of the ASA delegation. We were received by Mr. Yang Ji-Zong, Vice President of the Academy, and a number of his senior research staff.

The Academy is an agricultural research station with 56 hectares of experimental land. It consists of 11 Institutes (departments) doing research on rice, plants, soils, plant protection, animal breeding, silk, micro-organisms, radiation applications, horticulture, regionalization, and information, to use their terms. The Academy has 1106 workers, including 24 professors and 245 research assistants.

Discussion began with representatives of several of the research institutes describing research in progress. Rice is a major research crop. There was a suggestion that they are measuring 80 variables on each of 8000 varieties of rice and are beginning to use a computer at a university to store this data so that new crosses can be classified. This suggests an attempt to use a computer to compensate for lack of statistical help. The discussion turned to use of statistics in agricultural research.

It was noted that there was no statistician in the Academy but that agricultural training included statistical training. Professor Gao Ming-Wei, an agronomist from Zhejiang Agricultural University, was present and explained that agriculture students studied probability and statistics as part of a freshman mathematics course and that they take a year of work in biostatistics and experimental design in their third year of study. It was said that researchers in the Academy design their own experiments and used such methods as t-tests, split-plot designs, randomized block designs, regression, and genetic variance components. We noted that they should seek to develop more sta-

tistical support for their research programs.

After the group discussion, visits were made to a laboratory where silk worm breeding experiments were in progress and to the fields where rice breeding plots were viewed. Both of these experiments were replicated and seemed to be carefully controlled. Both experiments were dealing with first generation crosses, suggesting that the agricultural research is only now resuming after disruptions caused by the Cultural Revolution.

It is clear that the universities in China are just becoming reestablished. University students seem carefully selected and the quality should be high. Whether the primary and middle school training of these students has been adequate is not known. Present undergraduate programs in mathematics seem appropriate and statistics is being included in these programs. It seems likely that there is a shortage of well trained faculty in most areas.

Planning for formal graduate training in probability and statistics is beginning. In final meetings in Beijing with Mr. Li Chengrui, he asked advice on a course program for new Master of Science degrees in statistics. There was an implication that a formal program was to be developed centrally and imposed on the universities. The only initial response could be "Let one hundred flowers blossom." We suggested that different universities had different emphases and that programs in statistics should develop in mathematical statistics, biostatistics, and industrial statistics in various places. At the same time, suggestions were made on desired core courses. It was suggested also that a joint ASA-NSSC curriculum committee might be formed to assist China on curriculum development in statistics, possibly holding meetings while the Chinese delegation was with us in Detroit. There was no Chinese follow-up on this suggestion.

Our visits to the Chinese universities were brief and did not allow time for discussions

with individuals on their activities. There was no emphasis on research in statistics in any of the presentations. This is not surprising when one considers the time and effort that must have been required to reinstate undergraduate programs.

China has never had Ph.D. programs in statistics, but plans to develop them in the future. We have already noted the desire to initiate master's programs -- they may include the course work that our students would take in a doctoral program with the additional requirement for the Ph.D. being completion of a dissertation. If China is to develop good graduate programs in statistics, it seems likely that faculty should be concentrated in a small number of the better universities to develop the faculty strength necessary.

5. Institutes of Academia Sinica

There are a number of Institutes associated with the Chinese Academy of Science. James Press visited the Institute of Applied Mathematics and the author visited the Institute of Systems Science; both gave technical lectures that were well received.

The Institute of Applied Mathematics has four divisions: Mathematical Statistics, Probability, Applied Mathematics, and Cybernetics. Some twenty students were associated with the Institute, one of them in statistics. The Institute of Systems Science has six divisions: Control Theory, Operations Research Administration (quality control, reliability theory, input-output analysis), Operations Research Mathematics (combinatorial theory, graph theory, programming), Statistical Mathematics (inference, data analysis, industrial statistics, information theory), Mathematical Physics (differential equations, methods of topological spaces), and Basic Mathematics. Professors in charge of these divisions are respectively Guan Zhao-Zhi, Liu Yuan-Zhang, Xu Guo-Zhi, Zhang Li-Qian, Ding Xia-Xi, and Wu Wen-Jun. The six divisions have some 120 people with 87 being research staff and the remaining administrative staff. Control Theory is the largest division with 26 members on the research staff while Statistical Mathematics has 20.

These institutes appear to be research institutes. One expects them to take on projects for the government as did the institutes at Fudan University. The author was presented with some reprints of research papers and some books in Chinese, which were apparently elementary texts in statistics written for introductory courses. The staff in statistics seemed competent in theoretical areas but seemed to have little experience in applied statistics. The author was fortunate to have Mr. Cheng Ping as an interpreter for his lecture; Mr. Cheng Ping was a student of Professor D. R. Cox in London for two years. The audience responded to the author's lecture well and asked a number of insightful questions that suggested good understanding. The Institute may give training courses in statistics for industry groups, but this was not fully confirmed.

6. Concluding Remarks

After the initial formalities at his reception for the ASA delegation, Vice Premier Feng-Yi asked "Now tell me what is wrong with Chinese statistics." This was a difficult question at the beginning of our visit, but surely much needs to be done.

Lester Frankel is speaking in this session ~~on the future~~ for survey research in China and Mr. Wang Yifu is speaking on statistical work in the People's Republic of China. The governmental statistical system is largely a reporting system with data fed through the system from initial reporting units through provincial or municipal statistical offices to the State Statistical Bureau. Probably too much data is collected too often; the system needs to be streamlined. More frequent use of survey sampling methods is indicated.

The Chinese universities have been reestablished and undergraduate education seems to be back on track. Graduate programs in statistics must be developed. There is a need to train many new faculty members in statistics. This need is recognized and a beginning has been made; we can expect many more students from China in the future. There may be a need to concentrate faculty in statistics in several of the better universities to establish bases for

the proposed graduate education. Graduate programs in statistics must have different orientations -- statistical theory, biostatistics, and engineering statistics. The effect of the Cultural Revolution on the universities has been disastrous.

Current efforts in research in statistics seem very limited. More research will be possible in association with new graduate programs and as new faculty members are trained.

Members of the ASA delegation repeatedly sought to find examples of use of statistics in applications, particularly in industry and science. Faculty members in universities and research workers in institutes seemed to have little association or experience with such applications. We have noted some use of statistics in agricultural research and there is use of applied statistics in the State Statistical Bureau.

The answer to Vice Premier Feng-Yi must be that much must be done to improve statistics in China. However, we were impressed that statisticians in China had made strenuous efforts to keep up with developments in modern statistics under great difficulties. They were energetic and enthusiastic; China will make rapid progress in statistics if present plans for the future are given consistent support. We believe that the exchanges initiated now between statisticians in China and the United States can lead to real mutual benefit in the future. We value our new friends in statistics.

On a more personal basis, our visit to China was most pleasant. We found the people we met warm and friendly and interested in us and the Western World. Information was given to us freely and, indeed, the whole country seemed open and eager for modernization. For those who may have the opportunity to visit China in the future, we recommend the articles by Rosenthal (1981) in the New York Times. The book by White (1978) provides some war-time background that enhances understanding of the political development of the People's Republic of China.

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