

PEREGRINATIONS WITH JOSEPH NEEDHAM IN CHINA, 1943-44

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In the last few years, as interest in China has mushroomed in a new lease of life, more and more people in the United States have had an opportunity of learning about Joseph Needham and his magnificent effort to expound the Science and Civilization of China to the Western World. Among my academic friends, whenever it is revealed that I once worked with him, I would invariably be asked this question: why was it that a leading investigator in the exciting field of chemical embryology would give up a successful research career and turn himself into a historian of Chinese science and culture?

The biographical articles by Lu Gwei-Djen¹ and Ts'ao Tien-Chin² in the present collection will throw much light on this question. For readers who wish to delve deeper into the problem, the essay on "The Making of an Honorary Taoist" by Henry Holorenschaw³, written on the occasion of Needham's seventieth birthday, should provide additional insight and illumination.

Compared to the above authors, my association with Needham was decidedly short, just a little more than a year during 1943-44. Since then our paths have crossed only occasionally, about once or twice each decade. So why do I presume that there is anything of interest to readers of this *Festschrift* that I can add to our understanding of the phenomenon of Joseph Needham? In my defence I should state that my association with Needham, though brief, was intensely eventful, and, at least from my own vantage point, absolutely unforgettable. For more than a year, I had the unique privilege of observing Needham in action at close range, as secretary, aide-de-camp, interpreter, time keeper, travelling companion and collaborator. We shared the rigors of travel in wartime China, all the way to the Northwest along the Old Silk Road to Tunhuang beyond the Great Wall, and through the Southeast over lush hills and vales to Foochow by the East China Sea. We shared moments of exhilaration, frustration, danger, relief, joy and despair. I could not help but learn a good deal about Needham, the man, the scientist, the humanist, the historian, the philosopher, the politician and the organizer.

Moreover, the close contact I had with Joseph Needham has, in retrospect, taken

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1 Lu Gwei-Djen "The First Half-life of Joseph Needham", this volume pp. 1-33

2 Ts'ao Tien-chin "From 'Pao-Pu Tse' to Mawangtui" 從泡於子到馬王堆, this volume pp. 77-83

3 Henry Holorenschaw "The Making of an Honorary Taoist" in *Changing Perspectives in the History of Science*, M. Teich and R. Young Eds. (D. Reidel Publishing Co. Boston, 1973)

on a larger significance with the realization that it occurred at a turning point in his life. For the first time he had come face to face with China! How would he react to her? He himself has admitted that he had fallen in love with Chinese culture in Cambridge in the late 1930's. But there is no guarantee that a romantic attachment born from afar would necessarily survive, much less prosper, after a confrontation with reality. When he first arrived in early 1943 he saw a China with its back to the wall, exhausted after years of external aggression and internal strife. The government was tired, the economy stagnant, and all intellectual and cultural life in disarray. This China was a far cry from the glories of the Han, Tang, Sung and Ming dynasties. I was privileged to observe, at this critical juncture, in numerous daily encounters, how Needham reacted to the reality of China, and how China, in turn, responded to him.

The first time I met Joseph Needham was on a cool, misty morning at the home of Professor and Mrs. Ho Wen-chun 何文俊, near the campus of West China Union (Hua Hsi 華西) University, outside the city of Chengtu, the capital of Szechuan province. The date was May 1, 1943. He had arrived in the area on April 27, and had specifically arranged to stay with a Chinese family. Rather diffidently I rang the door bell. Mrs. Ho came to the door. I apologized for the early hour, probably before breakfast, and explained who I was and why I needed to make an appointment to see the distinguished visitor from England. She let me in and asked me to wait in a study at the other end of the house. About ten minutes later Needham appeared. Wearing a loose blue Chinese gown, with his hair slightly disheveled, he loomed large and forbidding, but his manner softened as soon as he started to speak. I introduced myself. He took a blank card from the desk and proceeded to write my name in Chinese. After a couple of starts he wrote down all three characters correctly. He took out his date book, perused it, and said that he would be tied up all day, but he would be able to see me on the next morning. We agreed on a time for me to come back. I said goodbye and left.

A few days before his arrival I had received a letter from Needham, which, at first sight, was notable chiefly for the prominent seals and stamps displayed on the envelope and on the letter itself. Among the stamps was one which stated "Sino-British Science Cooperation Office". These impressive looking seals and stamps endowed the letter with an undeniable air of authority. The letter itself was short and to the point. He needed a secretary desperately and Professor Gordon King⁴ had recommended me highly. Would I consider joining his office? But there were conditions: "do you mind typing at dictation on scientific matters? can you drive a car? are you willing to travel around with me to Lanchow, Kukong etc.?" The letter ended with a P. S. saying that he would see me after his arrival in Chengtu.

The letter sounded awfully attractive. I had been in Chengtu for almost three

4 Gordon King, Professor of Obstetrics and Gynaecology, Hong Kong University, escaped from Hong Kong after it fell to the Japanese on Christmas Day, 1941. He joined the staff of Shanghai Medical College at Koloshan in Chungking, and was instrumental in helping many Hong Kong University students settled in Chinese academic institutions.

PLATE XI



Joseph Needham as Scientific Counsellor, British Embassy, and
Director, Sino-British Science Cooperation Office, Chungking(重慶)
1943

PLATE XII



Joseph Needham in Chêngtu, Szechuan (四川成都)
with Ho Wên-Chün (何文綬, agriculturist), Phêng Yün-Hua
(彭韻華, Ho's wife), and Lo Chung-Shu (羅忠恕, philo-
sopher) 1942

months, and still nothing concrete had developed in regard to my role within the proposed Technical Institute of the Chinese Industrial Cooperatives (CIC). The only satisfying thing I did was teaching chemistry to the boys in the Baillie School⁵, where I was staying. While I enjoyed the cultural and educational facilities of the Hua Hsi campus, and the company of friends, I wanted to do something substantive and challenging. Needham's office might just offer such an opportunity. From what had been reported in the newspapers Needham was clearly one of the "younger" scientific leaders in Britain. It would be an interesting experience to travel about the country with him. But would he find me acceptable? I did not drive and my typing skill was woefully inadequate.

These were some of the thoughts circling in my mind when I presented myself at the appointed hour at the Ho's residence on the next day. I was ushered into the study; my heart sank when I saw two other persons already waiting for him. After a while Needham appeared, this time in neat army khaki shirt and shorts. He looked less formidable and more approachable, probably because the uniform fitted him well, and he clearly had had his breakfast. He fetched the ubiquitous cards and wrote down the names of the other visitors in Chinese. I was to see him go through this routine hundreds of times. He would write down the full name, any courtesy or pen names, the professional affiliation, the scientific discipline and other tidbits of information about the individual that were of interest. The accessory information could be in Chinese or English or any other language, e.g. Latin, Greek, German or French, as he might deem appropriate. These cards would soon grow into an extensive registry of scientists in China.

After what seemed like an interminable wait, the visitors departed and my interview with Needham began. I told him about my background, education and interests. I confessed I did not know how to drive a car, but played down the fact that my typing skill was negligible. Fortunately he did not seem particularly concerned about these issues. He talked about the circumstances under which he became interested in Chinese culture and language, the influence his younger Chinese colleagues at Cambridge had on him, his appreciation of the accomplishments of Chinese scientists under trying war time conditions, and his effort to set up an organization to help them obtain books, journals, equipment and materials from abroad. He expressed the hope that such an organization could become the forerunner of an international science cooperation network after the war. An hour quickly passed. He said the job was mine if I wanted it. I replied that I was happy to accept, if the CIC, my current employer, would raise no objection. Needham offered to contact the head of CIC in Chengtu and work out a mutually satisfactory arrangement with him. He would immediately request official approval for hiring me from the British Embassy in Chungking. As soon as it was received, I could immediately consider myself a member of his staff. By this time, he had suddenly realized that he was late for his luncheon appointment. We left the house

5 A technical school for boys run by the Chinese Industrial Cooperatives.

together and continued our conversation as we walked leisurely to his meeting place on the campus.

On the whole I was pleased with the result of the interview. I was encouraged by the fact that Needham had chosen to stay with a Chinese family in the local neighborhood, rather than with a Western family on the campus, in one of the spacious houses equipped with modern comforts and conveniences. It indicated to me that he was mentally attuned and physically ready to endure the discomforts of travel in China and to mingle with the people in their own modest surroundings. I was impressed by the ease with which he wrote the names of his visitors in Chinese, which clearly denoted an admirable command of the written language. Considering that he had acquired the language late in life, on top of his achievements in chemical embryology, and his proficiency in Latin, Greek, French and German, his grasp of Chinese was, it seemed to me, quite extraordinary. Above all, he was approachable. He was willing to explain his plans and aspirations patiently and in a manner that I, in my youth and naivete, could appreciate and understand. There was no doubt that I would learn a great deal by my association with him.

About two weeks later, the approval from Chungking arrived. In the meantime I had managed to secure access to a typewriter on campus for a short period each day and was practicing on it furiously. I also attended all the lectures which Needham was scheduled to give. Most memorable to me were the lectures on "The Life of Sir Frederick Gowland Hopkins" and "Why Modern Science did not Develop in China". The affection and esteem that Needham felt for Hopkins was most touching. I was startled, as were many others in the audience, to hear, for the first time, Needham declare that in the Middle Ages, science and technology were more advanced in China than in Europe. Why then, he would ask, did modern science develop in Europe and not in China? I would of course, hear this theme repeated again and again many times during the next twelve months. A vigorous discussion would often ensue. He would casually mention his intention to devote some of his time to investigate this problem after the war, but even he, I presume, would have been astonished, if he could have been told at that time, at the eventual length, breadth and depth of his commitment to this task.

On May 17, I met with Needham for the first time as a member of his staff. He was pleased at the occasion, since it represented the first step, albeit a small one, in his effort to build up an effective organization for the Sino-British Science Cooperation Office. Arrangements were made for me to join him on May 25, on a trip through central Szechuan to Loshan 樂山, Wutongchiao 五通橋, Lichuang 李莊, Luhsien 瀘縣 and Chungking 重慶⁶. This left me plenty of time to wind up my affairs, bid farewell

⁶ My account of this journey and of the others which follow will deal primarily with events of particular interest in advancing my own appreciation of Joseph Needham, but will also include such other descriptive details as may be necessary to preserve the continuity and flavor of the narrative. For a more complete account of some phases of our peregrinations, and for Needham's reports on the activities of the scientific institutions we visited, the reader is referred to specific articles in *Nature* and in "Science Outpost: Papers of the Sino-British Science Cooperation Office" J. Needham and D. Needham, Eds. (Pilot Press, London, 1948).

to friends, pack up my few belongings and be fully ready for our departure on May 25.

JOURNEY THROUGH CENTRAL SZECHUAN:

May 26—June 15, 1943

Perhaps as a reminder of the vicissitudes of travel in wartime China we received news on May 23 that the Wuhan University car sent from Loshan to fetch us had broken down and was being repaired. Our departure was postponed to May 26. As a consolation for my disappointment at the delay, Needham lent me the galley proof of "Time, the Refreshing River"⁷ to read; while he himself took advantage of the extra day available by going shopping for books in the city with Professor Ho Wen-chun.

On the morning of May 26, I arrived promptly at the Ho's residence at 7 o'clock and found the household in a state of minor commotion. Needham had received a tetanus shot a couple of days ago. When he woke up this morning, he had found his arm visibly swollen. Someone was dispatched to look for the doctor who had given him the inoculation. About an hour later the doctor came. He examined Needham and pronounced him fit to travel. In the meantime the Wuhan University car had arrived. After moving our luggage into the car, and saying goodbye to everyone, we left at about 9:30 a.m..

The road took us through the southwestern section of the flat, fertile Chengtu plain. It was sunny and bright, but there was a slight haze cast over the whole landscape. We crossed the Min River 岷江 at Hsinchin 新津, had lunch at Meishan 眉山, enjoyed a tea break at Chiachiang 夾江, then continued the journey and arrived at Loshan at about 5:30 p.m..

Loshan is located at the confluence of two rivers, the Min and the Tatu 大渡. It is quite hilly. We saw magnificent vistas from many vantage points high on the hills above the rivers. If it had been clear we would have seen Mount Omei 峨眉山, the famous Buddhist shrine which lies directly west of Loshan. Our principal host at Wuhan University, Professor Kao Shan-yin 高尙蔭 had suggested that we might consider taking a side trip up to Mount Omei, but in view of the tight schedule ahead of us, Needham declined the invitation. I wonder now if he could have resisted the temptation as easily if Mount Omei had been a Taoist shrine.

During the next five days we visited Wuhan University, the Polytechnic College and the National Forest Products Research Station⁸. The Colleges of Art and Law and the central library of Wuhan University were housed in a Confucian Temple, an association whose symbolism appealed greatly to Needham. The chemistry and physics departments were located in the Li family temple 李家祠 perched high over the city wall. As we moved from one laboratory or unit to another, Needham would record the names and particulars of the people we met and I would note down needed items of equipment or material which we might be able to obtain for them from India. The

7 J. Needham "Time, the Refreshing River" (George Allen and Unwin Ltd., London, 1943)

8 J. Needham "Science in Western Szechuan" *Nature*, 1943, 152, 343, 372. See also *Letters I in Science Outpost* pp. 40—46.

biology department occupied a separate building away from the city, where Professor Kao Shan-yin presided over the only non-medical microbiology research laboratory in Free China at that time. In the same building we met Professor Shih Sheng-han 石聲漢, the plant physiologist, who had ingeniously built all kinds of apparatus out of the simplest available materials.

Needham gave several lectures. At the end of his lecture at the Polytechnic, he suddenly delivered a short speech in Chinese, which, as one might expect, was enthusiastically received. I was pleasantly surprised, since I was able to understand him quite well. Up to that point I had only heard him speak a few words of conversational Chinese such as welcome, please sit down, goodbye etc. The National Forest Products Research Station was housed in another temple beneath a tall pagoda. I remember our visit there particularly well because of its proximity to the Lingyun-shan 凌云山 giant Buddha, a 360 ft high statue carved out the cliff right by the river.

On the 1st of June, we left Loshan by car, crossed the river and came to Wutong-chiao, the center of a chemical industrial complex owned by the Yung Li 永利 Company. We stayed there two nights. On the first afternoon we toured a wood dry distillation plant, a new salt well, and the research laboratories. On the next day we went by boat downstream to see a low temperature carbonization plant at Hsiba 西壩, and a complex of chemical and mechanical factories at Hsintangku 新塘沽.

Our next stop was Lichuang, which could be reached only by boat. Professor Shih Sheng-han of Wuhan had arranged with the salt commission for us to travel on a salt transport boat down the Min River to Iping 宜賓 where we could catch a passenger steamer to Lichuang. To make sure that there would be no hitch, he decided to come along with us. On the morning of June 3, he suddenly materialized as we arrived at the dock to embark on the boat. Two salt boats were scheduled to leave that morning: we had been reserved space on the new one.

The boats were of simple traditional design. The front section was reserved for the crew who were poised standing up on each side to row on long oars. The central section was covered with a semicircular roof, under which the passengers could lie comfortably on their bedding or recline as if on a couch. In the rear was another covered section occupied by the owner and his family. There were quite a number of other passengers besides the three of us. We all huddled in the main cabin as the boat took off some time in mid morning. The boatmen suddenly started to bellow out in unison a rhythmic chant, reminiscent of the first few bars of the Song of the Volga Boatmen. The chants gave the impression that the men were stretching every ounce of their energy to move the boat, which was clearly not the case since the boat was going downstream on a fast flowing river.

We had lunch at Chienwei 犍爲 where several passengers left the boat. We continued the trip and arrived at a small village called Machang 馬場 at about 4:00 p. m. when the remaining passengers left us. The owner had some business on shore and decided to spend the night there. After dinner, the crew erected a roof over the front part of the boat and were soon fast asleep under the shelter. We too tried to get a

PLATE XIII



Joseph Needham with Wang Chia-Chih (王家楫, third from the right) at the meeting of Chinese Chemical Society, Beipei, Szechuan (四川北碚) 1943

PLATE XIV



Joseph Needham (fourth from the left) and Sir Frederick Eggleston (Australian Ambassador, third from the right) visiting a power alcohol factory in Szechuan; the manager, Chang Chi-Hsi (張季熙), is between the two visitors

1943

good night's rest, but for a long time there was an interminable pounding noise due to repairs being done to the partner salt boat anchored nearby.

On the next morning, our boat left early and soon came to another village, Nichihtan 泥溪坦, where we stopped for breakfast. The owner then announced, to our consternation, that he could not go on further until the partner salt boat had completed its repairs and caught up with him. He was noncommittal as to when the partner boat would arrive. It could be in a few hours, or it could be on the next day. What were we to do? We were scheduled to catch the steamer due at Iping at about noon. After agonizing over the situation for a while, we decided to hire a smaller boat to take us to Iping, and, if necessary, all the way to Lichuang.

Thus it came about that shortly after 9:00 a.m. on June 4, 1943, we found ourselves floating down the Min River on a little boat towards Iping. We felt frail and helpless, like a leaf drifting in the autumn wind, as the boat swayed up and down over the mighty currents. The central cabin was so small and its roof so low that there was scarcely room for us to lie down or sit up comfortably. We stayed inside the cabin in a crouched position whenever it rained too hard for us to sit outside in the open. It was a misty and rainy day. We saw on one side of the river sheer cliffs rising up from the water and vanishing high into the drifting mist, and on the other, soft green fields and gentle hills dotted with groves of trees. It seemed to me that the scene could have been lifted straight out of a Northern Sung landscape painting.

The intermittent rain and our somber situation moved Shih Sheng-han to recall a favorite poem written to the tune of the Beautiful Lady Yu 虞美人. The poet was Chiang Chieh 蔣捷 who lived at a turbulent time which saw the demise of the Sung Dynasty and the rise of the Yuan. Shih wrote it out for us. Needham was much taken by it, and with our help, proceeded to translate it into English⁹:

"As a young man, listening to girls singing in a tower,
I heard the sound of the rain,
While the red candle burned dim in the damp air.
In middle age, travelling by boat on a river,
I listened to the rain, falling, falling:
The river was wide and clouds drifted above;
I heard the solitary cry of a teal borne on the west wind.
And now in a cloister cell I hear the rain again,
My hair is grey and sparse;
Sadness and Happiness, separation and reunion, seem all one,
They move me no more.
Let the rain drop all night on the deserted pavement
Till the day dawns."

9 The poem by 蔣捷 (竹山) as remembered by Shih Sheng-han read as follows:

少年聽雨歌樓上	紅燭昏羅帳
中年聽雨客舟中	江闊雲濤湧
而今聽雨僧廬下	鬢已蒼蒼也
悲歡離合幾無情	一任佳陰點滴到天明

As the middle aged passengers on this boat, travelling down the river while listening to the rain, Needham and Shih were particularly sensitive to the sentiments expressed in the poem, so melancholy yet so beautiful.

As if to counteract the gloom, Shih introduced us to an altogether different kind of poem, one which is carefree and gay, a Song of Liangchou 涼州詞 by Wan Han 王翰 who lived in the Tang Dynasty¹⁰. It is probably the best known reference to grape wine in the Chinese literature. The talk of wine naturally led to thoughts of food, and one food we all enjoyed was mushrooms. In the midst of our discussion on mushrooms, we saw a line of people walking in single file in the rain on a path through the rice fields on shore, each carrying an umbrella. They resembled a line of marching mushrooms. Shih suddenly announced, "We have just discovered a new species of mushrooms, *Homo basidiomycte*."

Such diversions helped us to pass the time and assuage our hunger. We did not arrive at Iping, where the Min joins the Changchiang 長江, until almost 3:00 p.m.. The steamer was long gone. We bought some bao-dze 包子 for lunch and continued the trip down stream. The weather started to clear. The rain stopped completely. Our two boatmen worked with greater gusto as the river became even swifter and more treacherous than before. At about 5:00 p.m. we arrived at Lichuang, where a group of professors from Tongchi 同濟 University had been waiting patiently on the dock.

The warm reception we received was doubly welcome as we were tired and slightly dizzy after swaying back and forth on the little boat all day. We were installed in a new, but simply constructed and sparsely furnished, guest house consisting of a living-room, two bedrooms, kitchen and bath. A caretaker and a cook took care of all our needs. Needham occupied one bedroom, while Shih and I shared the other. It was a most convenient arrangement, since we could set our own pace and not have to worry about being polite to our hosts all day until retiring to bed. Unless we were invited out we would have our meals in the guest house prepared by the cook who consulted us each morning about the menu for the day. Needham was delighted that bread was available in Lichuang and he could have toast for breakfast every morning.

Professor Shih stayed with us for two nights and left on the morning of June 6. Before departure he executed for me, on two little scrolls, the poems he had taught us on the little boat, each in a style of calligraphy appropriate to the poem's content. He presented Needham with a scroll on which was inscribed "Rjeng tao ming cheng, Ti tao ming shu 人道敬政，地道敬樹", which Needham has ingeniously rendered into a Popian couplet:

Nature from growing trees we best discern,
And man's estate from social order learn.

As I waved goodbye to the tall, lean figure walking down the hill to the dock, I wished earnestly that it would not be long that we could enjoy his company again.

¹⁰ 涼州詞:

葡萄美酒夜光杯	欲飲琵琶馬上催
醉臥沙場君莫笑	古來征戰幾人回

After our arrival at Lichuang the weather continued to turn for the better. The sun came out, the clouds dispersed, the air was dry and cool, and at night the stars shone in full glory in the clear sky. The weather was beautiful while we visited Tongchi, often known as the Chinese-German University, since many of its professors were trained in Germany and spoke German well. Needham was glad to have had the chance of speaking German and giving several lectures in German.

The main facility of Tongchi was housed in a beautiful temple dedicated to Ta Yu 大禹, the legendary founder of the Hsia Dynasty and tamer of the great flood. Needham called him the first hydraulic engineer of China and was particularly delighted to take part in a festival held in honor of Emperor Yu in the temple on June 6. He was conscious of the pivotal role of waterworks to the development of civilization in China, and had been much impressed by the ancient irrigation works he saw in Kuanhsien 灌縣 northwest of Chengtu.

Needham had spoken so much German during the day that he would sometimes forget himself and spoke to me in German when we were alone in the guest house at night. One evening, he was in a rather playful mood. He asked me a question and I responded in German. He stood up, stretched out his right arm in a "grand gesture", and made a statement in German. He then abruptly sat down, allowing the full weight of his body to drop all at once on the flimsy rattan chair. One of its legs gave way with a loud crack. With great agility he leaned forward and averted a disaster. I said that this was a warning to him not to throw his weight around. He laughed, I laughed, and we had a good laugh together.

One member of the Tongchi staff, Professor Tong Ti-chou 童第周 had met Needham many years before in Belgium. He and his charming wife were still conducting an active research program under most trying conditions at Lichuang. Their work impressed Needham very much, who particularly savored the rare chance of talking shop at length with a fellow embryologist, and in a language, French, in which he was highly proficient.

On June 7, the fifth day of the fifth month in the old lunar calendar and the festival 端午節 commemorating the drowning of the ancient poet Chu Yuan 屈原, we had *tsung-dze* 粽子 for breakfast. Later in the morning we went to the river to watch the dragon boat race. Needham enjoyed the race but did not show much enthusiasm for the *tsung-dze*.

In the next few days we visited the several institutes of the Academia Sinica located in the vicinity of Lichuang: the Institute of History, Institute of Sociology, Archeological Museum and Institute of the History of Chinese Architecture. Here was probably the greatest concentration of intellectual power devoted to the study of Chinese civilization in the world at that time. The excitement that Needham felt during these visits can best be gauged by quoting Needham himself. In a letter to Dorothy Needham¹¹ he stated:

11 *Letters I, Science Outpost* p. 44.

"My numerous inquiries about History of Science problems caused a general stir and various members of the Institute were running about digging out interesting stuff they'd come across, e.g. passages about firecrackers in 2nd Century A. D.: accounts of great explosions, and decrees forbidding the sale of gunpowder to the Tartars in 1076 A. D., i.e. 2 centuries before Bertholds's alleged original discovery in the West."

He could hardly believe the archeological treasures he saw in these humble buildings: Chou and Han bronzes, Shang oracle bones, and bamboo tablets on which the ancient classics were written: things he had read about and now he could see them with his own eyes. Personally, I was most delighted with the bronzes, which I saw for the first time in my life and have enjoyed seeing again and again ever since.

It was at the Institute of History that Needham first met Wang Ling 王鎔, an assistant research fellow there who was later to become his first collaborator in Cambridge after the war in the Science and Civilization in China project. His discussions with Wang Ling, and distinguished scholars such as Fu Ssu-nien 傅斯年, Tao Meng-ho 陶孟和, and others reinforced his suspicion that among the printed texts handed down through the ages there must have remain buried countless items of interest to the history of science and technology in China, which had to be identified, studied and brought to the attention of scholars in the West.

On the morning of June 12, we got up early, packed, had breakfast, and made our way gingerly along the muddy paths in the misty rain down the hill to the dock. Poor Needham started to feel a slight toothache, but with all the well wishers surrounding him he did not wish to make a fuss. The steamer was scheduled to arrive at 8:30 a.m. but it was 10:00 a.m. when it finally came. We were relieved that the people who had been waiting to see us off could now return to their regular Saturday chores. We said goodbye and boarded the boat. It was dirty, damp and crowded. We managed to find two seats to the rear of the boat. Unfortunately, the people near us were spitting right and left into the river, which must have added considerably to Needham's level of discomfort. We settled down, and had the eggs and buns we had brought on board for lunch. The weather continued to be miserable. It rained very heavily at times. We passed through several particularly violent rapids and the boat swayed steeply from side to side.

At about 3:00 p.m. we reached Lushien and disembarked. A party from the 23rd Arsenal, our next stop, immediately found us and took us on board an elegant motor boat. We continued downstream and arrived at the Arsenal site at 4:30 p.m.. After a long walk, we were installed in a comfortable guest house, where the bath room actually had hot and cold running water. We had a good rest and Needham's toothache felt much better.

The next two days, June 13 and 14, were spent visiting the numerous installations at the 23rd Arsenal. Our principal guide, the chief engineer, a Dr. Huang, turned out to be an overseas Chinese from Vancouver, Canada. We toured a chloralkali plant, the Research Laboratories and Library, a nitrocellulose plant, an alcohol and ether unit, a power station, the water treatment facility, and manufacturing plants for nitric acid,

phosphoric acid, glycerol, liquid air, cyanamide, gun cotton and protective clothing material. It was a most extraordinary place as the whole industrial chemical complex was housed in a huge natural cavern by the river. We marvelled at the amazing feat of moving all the heavy equipment, the massive piping, the distillation columns etc. up the gorges and assembling them together at this unusual site. Because Needham was in a khaki uniform he was probably thought of as a visiting military dignitary. The sentries we passed would salute him. To my astonishment, he would salute them back smartly and with great dignity.

On June 15 we got up at 3:30 a.m. and by 4:30 a.m. were waiting dutifully at the dock. At 5:00 a.m. the steamer arrived, right on time. This was a much larger and cleaner vessel than the one we took two days ago. We were comfortably placed at a table in the dining room, and tea and refreshments were readily available. As we sailed towards Chungking we reviewed our experience of the last two weeks. One thing that stuck out was the importance of water transport in the economy of the province. Both Lichuang and the 23rd Arsenal could not have existed without the river. The river was their lifeline and the lifeline for countless other villages and towns in Szechuan.

The steamer arrived at Chungking at 3:30 p.m.. We were met by British Embassy staff who helped us with our luggage and took us by car to the Embassy compound. As I passed through the city, I felt a certain sense of satisfaction in having completed my first journey with Needham.

FIRST SOJOURN IN CHUNGKING:

June 15—August 7, 1943

There was a host of mail waiting for Needham when we arrived. He went through it quickly and was overjoyed to find that he had received approval from London to initiate the supply service to help scientists in China purchase equipment and chemicals from India and Great Britain. In order to catch the diplomatic mail leaving on the next day, we worked late that night to tabulate and evaluate all the requests we had received during the recent trip and to prepare the first buying list of the Sino-British Science Cooperation Office. We finished the list and were pleased that the business of the office had gotten off to a good start. In the next several days, with the help of other Embassy personnel, such as the Cultural Attache, Mr. John Blofeld, we obtained all the supplies and services we needed, and soon the office was functioning in an orderly manner.

The compound of the British Embassy in Chungking consisted of a series of terraces carved out of the hill. On each terrace were long, narrow buildings, usually single storied, each with an outside veranda adjoining a row of offices. The buildings were connected by a network of steps and walks. Needham's office unit was located in a corner of the building on the lowest terrace, right next to the wall of the compound. From our windows, we could see several houses which looked as though they might crumble at any time. Large patches of plaster on the outer walls had fallen off ex-

posing the bamboo matting behind. The general air of dilapidation was aggravated by the rainy weather when greenish molds would suddenly appear as if overnight on all kinds of surfaces, typewriter cover, leather shoes, dispatch cases, and the plaster of external walls. But all the molds disappeared quickly when the rains stopped and the sun came out with a vengeance. Day after day the temperature reached 100°F accompanied by a humidity close to 100%. That was our first experience of the torrid summer for which Chungking was justifiably famous.

Fortunately, by the time the heat wave descended on us, our office had already settled into a regular routine. Needham worked hard to mobilize support for his mission, through reports and memoranda to the home base in London, and through dialogues with the British Ambassador and his staff as well as with numerous Chinese government officials involved in science and technology. I was kept busy answering inquiries, typing letters and reports, scheduling appointments, arranging visits, translating documents and interpreting for visitors when the occasion required it. Needham and I would have dinner together about once a week, usually at one of the better Cantonese restaurants, or for a Western meal at Victory House, a hostel for visiting foreign dignitaries where Needham was staying. One day I took him for *dim sum* 點心, a Cantonese style tea lunch which he enjoyed very much. From then on we would often have *dim sum* when we had visitors to entertain for lunch.

Time passed quickly. We became more and more preoccupied with preparations for the trip to the Northwest. Needham was assigned a 2½ ton Chevrolet truck from the fleet of the Royal Air Force. He immediately had the inscription "Sino-British Science Cooperation Office" in Chinese 中英科學合作館 painted boldly on both sides of the body. We hired a Cantonese driver-mechanic, Kuang Wei 鄺威, who turned out to be a most loyal and resourceful colleague. We obtained the necessary travel documents and appropriate introductions to the institutions we were to visit. We assembled oil drums (to store liquid fuel), and various tools and spare parts for the truck, as well as items such as campbeds, a portable stove, oil cloth, canned food etc. that would be useful in the event we were stranded in some out of the way place. One day we took the truck out for a dry run. It performed smoothly. We felt proud of the solidly built vehicle, and could not possibly have imagined the agonies it was to cause us in the months to come.

The itinerary planned for the Northwest trip was simple. We would first go to Chengtu, then proceed all the way to Lanchow 蘭州. From Lanchow we would travel along the old Silk Road through the Kansu corridor to the oilfields at Laochunmiao 老君廟, the only producing oil field in Free China. After a side trip to Tunhuang 敦煌 we would come back to Lanchow, continue on to Sian 西安 and then return to Chengtu and Chungking. We expected the whole trip to last about 2 months. The starting date was August 7, 1943.

JOURNEY TO THE NORTHWEST:

August 7, 1943—January 21, 1944

We left Chungking on our office truck on August 7 as planned. Besides Joseph Needham, Kuang Wei and myself, the party included Miss Liao Hung-ying 廖鴻英, agricultural chemist¹², and Dr. Edward Beltz, American petroleum geologist^{13,14}. A second truck of the same model from the British Embassy, carrying Sir Eric Teichman¹⁵, a driver, a mechanic and a servant, was also leaving on that day for the Northwest with the British Consulate at Urumchi as its destination. The two trucks were to rendezvous from time to time along the way to provide help for each other as needed.

We arrived at Chengtu late in the afternoon of August 8, and started out bright and early on August 11, having taken on Miss Chen Tzu-hsin 陳自信, a new graduate of the Hua Hsi School of Pharmacy, who was going to her first job at the Northwest Epidemic Prevention Bureau in Lanchow. After a night at Chibtung 梓潼, we passed through famous Chienmenkuan 劍門關 (Sword Gate Pass), as Ed Beltz gave us a running commentary on the geological history of the strange rock formations, and stayed the night at Kuangyuan 廣元. On the 13th we pushed up a steep, winding road into the narrow Djialing 嘉陵 River gorge, crossed into Shensi, and descended into the Hanshui 漢水 River valley. When we reached the ferry crossing at Baocheng 褒城 at 7:30 p.m., we saw, a few vehicles ahead of us, Sir Eric's truck. Sir Eric (or Tai as we called him) was staying the night at the China Travel Service (CTS) hotel, but by now all the hotels were full. Fortunately, there was space in an inn nearby where our party could put up campbeds for the night while Kuang Wei and I slept in the truck.

After crossing the river on the 14th morning we heard that the road ahead to Miaotaidze 廟台子 was washed out, and would not be open for at least two days. At Tai's suggestion we all traveled 15 kms east to Hanchung 漢中, an old historic town where we could have a more pleasant rest than at Baocheng.

At Hanchung the CTS hotel was again full. We drove to the China Inland Mission compound where the Moore family kindly agreed to put us up. Everyone had a bath and a good rest. Early on the next morning, Sunday, August 15, Needham and I attended High Mass at the local Roman Catholic church. It was an interesting experience for me since I had never attended a Catholic High Mass before. The whole service was in Latin. I had been brought up in the Anglican Church and knew the liturgy

12 Liao Hung-ying was at that time an employee in another section of the British Embassy. She was on temporary loan to Needham's office.

13 Dr. Edward W. Beltz, 1891—1970, was a petroleum geologist on the staff of Standard Vacuum Oil Company, with vast experience in petroleum exploration work in Africa, Dutch East Indies and the Philippines. After his retirement in 1949 he continued to be engaged in petroleum exploration work in Canada and Alaska.

14 In addition to the above, the truck also carried Professor Robert Paine of Fudan University to Chengtu and Professor Lo Chung-shu 羅忠恕 of Hua Hsi University to Mien Yang 勉陽, north of Chengtu.

15 Sir Eric Teichman was Counselor to the Ambassador, British Embassy, Chungking. He was retiring from the Foreign Service and was on his way to Alma Ata via Urumchi to fly back to England.

of the Holy Eucharist well in both English and Chinese. Even with my limited knowledge of Latin, it was quite easy for me to follow the main parts of the service. Needham was fascinated to see all the Chinese men and women around him humming in Latin and thought for a moment that he had been transported back to a place in Europe. He was delighted to note that some of the music heard at the Mass was the same as that used at the Church of Thaxted, in Essex near Cambridge, with which he had been associated for many years.

Later that morning Tai heard that the road to Miaotaidze was now open. He decided to move on while we opted to stay another day. Early on the 16th morning, we left Hanchung, passed Baocheng, and made our way up another winding narrow gorge. We met our first major crisis at Wukuanho 武關河 where the road had been washed away and there was a chaotic line of trucks and mule carts stuck on each side of the single lane temporary road or *bientao* 便道 which had been constructed out of boulders and pebbles.

On the next day, after more than 24 hours at the impasse, we had somehow made our way to the head of the line. We started to control the traffic ourselves, and shortly thereafter got across. There was general jubilation, which unfortunately proved to be short lived. Soon we discovered that in going over the boulders we had broken the left rear spring. We continued cautiously up the gorge to Miaotaidze and stayed the night at a beautiful CTS hotel housed in an ancient Taoist temple, Liuhoumiao 留侯廟. The temple consisted of a series of pavilions and courtyards flanked by groves of huge trees in a spacious valley surrounded by majestic mountains. After what we had been through, it seemed to be the very kind of place that one would envision Taoist immortals to linger and make their home.

Early on August 18 we continued our climb up the gorge to the top, and descended on the other side to Shuanshipu 雙石舖. Here the road forked into two branches, both meeting again at Huadjialing 華家嶺 before going on to Lanchow. The more direct one went through Tienshui 天水, while the other went around by way of Sian and Pingliang 平涼. We found that old Tai had gone ahead *via* Sian, since the road to Tienshui was closed when he came through. But now the road *via* Tienshui was again passable, and Needham decided to take the shorter route.

We went to see Rewi Alley¹⁶ of the CIC at the Baillie School at Shuanshipu and arranged to have the broken spring repaired at the CIC machine cooperative. While waiting for the repairs we visited several cooperatives in the vicinity and stayed at the CIC hostel for two nights. One evening after dinner, the Baillie school boys gave us an impromptu performance of folksongs, mostly songs of the Northwest. One was a love song from Tsinghai with a haunting melody, which I still remember well today.

16 Rewi Alley, founder and mainstay of the Chinese Industrial Cooperatives, writer and poet, still lives in China today. His concept of small scale, locally controlled industrial enterprises has been re-discovered and developed in the West in the 1970's by the Appropriate Technology movement. See for example, E. F. Schumacher "Small is Beautiful" (Harper and Row, Publishers, New York and London, 1973).

PLATE XVI



Kuang Wei (關威, driver) and Lao Yü (老于, mechanic)
at Tunhuang, Kansu (甘肅敦煌) 1943

Soon we all joined in the singing. Needham sang several English folk songs for us and gave a demonstration of the Morris dance. That was to be our last carefree evening for a long time.

With the spring repaired we left Shuanshipu on August 20 in good spirits, taking along Rewi Alley and 3 boys to Lanchow. Soon we crossed into Kansu, and we ran into one *bientao* after the other, with huge sections of the road washed away or covered with mud slides. It was a vivid illustration of the havoc that the rain could inflict on typical loess country. We stayed the night in Huihsien 徽縣 and the the next night at Niangniangba 娘孃壩 where we slept in the manger of an inn in full view of pigs, donkeys and ducks.

We left early on the 22nd and arrived at Tienshui at 9 a.m. where we had an excellent brunch. Then disaster struck. On our way up a steep hill beyond Tienshui, we heard a rapid puffing noise which suggested a leak in the cylinder head gasket. The noise got progressively worse as we drove through Chinan 秦安 and up another narrow gorge. The truck stalled just past a village called Bieyudjen 碧玉鎮, where we spent the night in a tiny inn. We were dismayed to discover that we had no spare gasket with us, old Tai having taken all the spares with him in his truck.

Kuang Wei and Ed Beltz worked valiantly all day on the 23rd, taking the cylinder head down, repairing the gasket and reassembling the engine. The engine started at 3 p.m. but after going up a long, steep *bientao*, the truck stopped at the edge of a precipice. We slept in or under the truck. Everyone was up at dawn on the 24th. The weather was crisp, clear and cold. Kuang Wei and Ed Beltz installed a new gasket which we had fabricated from heavy canvas, cellulose and glue. To our amazement, the truck started. We moved up the hill, and climbed around a bend to a less precarious position just before the engine died.

It was obvious by now that we could not get out of this place without a new authentic gasket, and the best way to get one quickly was to catch up with old Tai at Huadjialing or Lanchow. And so, shortly thereafter, when a northbound army truck came by, Needham and I, with our documents, hopped on it. We arrived at Huadjialing at about 4 p.m., and found that old Tai had left for Lanchow that morning.

Huadjialing was the highest point on the road to Lanchow. It was windy and cold. Needham and I commiserated with each other as we stood outside the CTS hotel and watched the setting sun cast a golden glow over innumerable ranges of mountains which stretched between us and the western horizon. Even this beautiful scene could do little to assuage our despondency.

We continued the ride against a cold wind and a driving rain in the army truck on the 25th and arrived at Lanchow in mid-afternoon. A short rickshaw ride took us to the Lichishe 勵志社, where Sir Eric received us charmingly. Needham recounted our misfortunes, and old Tai agreed to give us a new gasket and to send his truck back with us on the next day. I visited the local truck supply shops and bought an extra gasket as a safety precaution.

At about 7 a.m. on the 26th we took off in old Tai's truck with his driver and

mechanic. We came through Huadjialing in a drizzling rain at 1:30 p.m., and reached the disaster scene at 3:30 p.m.. There was rejoicing all around as the new gasket was being installed. The rain stopped. A beautiful rainbow greeted us as we resumed our journey. We spent the night at an inn at Tungwei 通渭.

On the 27th we left early in the morning mist, but our bright hope was soon shattered. After going for about 25 kms the engine suddenly started to lose power, leak oil, and make a knocking noise. With great difficulty the truck struggled up to Huadjialing and stopped dead at the top. After dismantling the engine we saw the cause of the trouble: two main bearings burnt and one connecting rod bent.

On the next morning, sorrowfully we lifted the disabled engine on to Tai's truck, piled in our luggage and left for Lanchow. Only Kuang Wei stayed on behind to mind the engineless chassis. We reached Lanchow at 4:30 p.m., dropped off Rewi Alley, the boys, Hung-ying and Tzu-hsin at the CIC Baillie School, checked in at the Lichishe, and unloaded the engine at the CIC machine shop.

In the next several days Needham and I went on a round of visits to scientific and technological institutions in the Lanchow area, such as the Kansu Science Education Institute, the Kansu Machine Works (KMW), the Northwest Epidemic Prevention Bureau (NWEPB), numerous factories administered by the Natural Resources Commission (NRC) and cooperatives in the CIC Federation¹⁷. It was strange to find Chen Tzu-hsin already at work at her station when we toured the NWEPB on September 1, having just seen her on the previous day at a luncheon she gave us before she moved to the NWEPB hostel. But my mind was mostly preoccupied with the fate of the engine and truck. We had to bring the truck from Huadjialing to Lanchow. Tai's men and others that we approached thought the task was too dangerous while the rains lasted. Fortunately, the men of the Friends' Ambulance Unit (FAU) in Lanchow, after several discussions with us, agreed to take on the job.

And so, on the afternoon of September 5, Needham, Hung-ying and Tzu-hsin waved goodbye to me as I was picked up by two FAU drivers in a sturdy Dodge truck. Earlier that morning we had all said goodbye to Ed Beltz who was leaving with old Tai to go to the oilfield. Soon it started to rain. The *bientaos* were particularly slippery and we did not reach Huadjialing until noon on the next day. Kuang Wei heard the sound of the truck and rushed out to meet us. The sun woke us up early on the 7th. The road had dried out considerably and we took off. Pushing on cautiously, we arrived at Lanchow at dusk, and parked the chassis in the CIC machine shop.

During the next ten days we visited the CIC machine shop daily to check on the progress of the repairs, i.e. to babbitt and fit the damaged bearings on the crankshaft, to install a new connecting rod, to reline the brakes and to ensure that the engine was in good working order. In view of the numerous troubles we had, we thought it would be foolhardy to venture further into the Northwest without a competent mechanic, and we were fortunate to be able to borrow one, Yu Te-hsin 余德新, at short notice from

17 J. Needham, "Science and Technology in the Northwest of China", *Nature*, 1944, 153, 238

the Kansu Machine Works. By September 17, the repairs were completed, the truck performed satisfactorily in test drives, and we were ready to go¹⁸.

We left Lanchow on the morning of the 18th on the revitalized truck carrying Needham, Rewi Alley, two Baillie School boys, Sun Kuang-chun 孫光君 and Wang Wan-sheng 王萬勝, Kuang Wei, Yu Te-hsin (Lao Yu) and myself. The engine did not run well, and, in spite of continuing adjustments, we only got as far as Hoko 河口, 44 km from Lanchow, where we stayed the night. We did better on the next day, when we lunched at Yungteng 永登, 112 km, and drove all the way to Wuwei 武威, 272 km, by evening. At 1:00 p.m., 134 km, we had a pleasant surprise in meeting Ed Beltz in a southbound Kansu Petroleum Administration (KPA) truck stuck for a few minutes on the roadside. He was optimistic about the potential for increased production at the oilfield. On the other hand, we also had the ill fortune to blow another cylinder head gasket between Kulang 古浪, 212 km, and Wuwei. But this time, with a spare on hand it was no longer a disaster. We slept poorly overnight in Wuwei in a noisy truck drivers' inn¹⁹.

The cocks crowed loudly before dawn on the 20th. Soon Kuang Wei and Lao Yu were busy working to replace the blown gasket with a spare. The day before, as we approached Wushaling 烏沙嶺 we had passed several columns of soldiers, presumably conscripts from Szechuan, on their way northbound to Sinkiang. They were poorly equipped. Some were no older than 12 or 13. Others were obviously very sick, tottering pitifully along in the rear. Rewi Alley had seen many such groups going north at Shuanshipu. He had heard that 88 soldiers had died there one night. This morning we saw more squads of soldiers passing through Wuwei. Needham witnessed a country girl who tried to give a bundle of clothes to a soldier being hit by a guard with a rifle. He was greatly distressed by what he saw, and shocked at the injustice of the system which tolerated the existence of what amounted to a form of institutionalized brutality.

We waved goodbye to Wuwei at 10:30 a.m.. By now we had left the loess country behind, and were travelling through the arid Hohsi 河西 corridor, flanked by the snow capped Chilienshan 祁連山 to the southwest and barren hills of the Gobi desert to the northeast. The road frequently ran along the ruins of the Great Wall, and we would meet camel caravans from time to time moving deliberately in single file as they had done for centuries before the advent of the modern truck. And our truck was performing poorly. We went through Yungchang 永昌, and arrived at Shandan 山丹, 446 km, at 5:45 p.m.. Shandan turned out to be a lovely little city, with wide streets, huge trees, and beautiful low buildings graced by traditional, curved roofs. It was sparsely populated. I saw people spinning wool for the first time in my life. Both Needham

18 *Diurnal II, Science Outpost* pp. 141—150

19 The old name for Wuwei is Liangchow 涼州, the very same city that featured in the title of the poem "The Song of Liangchow" 涼州詞 that we learnt while sailing down the Min River in Szechuan (10). From what I saw of the city I could only infer that in the Tang Dynasty Liangchow had to be a more prosperous city than it was in 1943.

and Alley were much taken by Shandan, Needham for its alchemical connotation²⁰ and Alley for its potential as a site for a cooperative²¹.

On the 21st morning we left Shandan, had lunch at Changyeh 張掖, 510 km, an oasis with irrigated rice cultivation, and spent the night at Kaotai junction 高台, 589 km, site of another fertile oasis. The next day we departed Kaotai junction at 8:00 a.m. in a dust storm, which gradually cleared up as we drove on. The sky was all clear when we reached Chiuchuan 酒泉, 740 km, at 1:00 p.m.. We checked in at the New Life Guest House²², and had a western style lunch. Then we called at the KPA office, where the manager welcomed us warmly and telephoned the guards at the oilfield about our arrival there on the next day.

The weather was clear and bright on the 23rd. We picked up Mr. Wu Tso-rjen 吳作人, the painter, at the KPA office, and left Chiuchuan at about 8:00 a.m.. Mr. Wu was on a commission to do an oil painting of the oilfield. He had studied in France and Belgium and spoke French fluently. Soon we reached Chinyukuan 嘉峪關, 705 km, which is the western terminus of the Great wall. The gate, wall and ramparts were still in good condition, including the Temple of Kuan Ti 關帝. After taking some pictures, we drove on and at 812 km turned left on to a side road leading to the oil field. We arrived there at about 2:30 p.m.. The site is known as Laochunmiao 老君廟 because the local people had at one time put up a temple there in honor of Lao-tze.

The oilfield was a fantastic place, a modern petrochemical complex right in the middle of a desolate, windswept plateau, flanked by snow capped mountains to the south and endless Gobi to the north²³. We were there three days, visiting oil wells, refineries, laboratories, residential facilities, hospital, school etc.. We took down a long list of chemicals, materials and equipment that we might be able to get for them expeditiously from India. Technologically it was a most exciting place. But the weather was dreary and cold. Needham caught a cold but he sprang back quickly to health with large doses of hot lemon tea.

By now it was diagnosed that the piston rings of the engine were loose, hence the continual oiling of the plugs. The oilfield machine shop replaced the loose piston rings. They did not have Chevrolet rings on hand and had to use Ford parts. By the 26th the repairs were completed, and the engine seemed to be running smoothly. However, on the 27th morning when we had said goodbye to our hosts, the engine would not start. After towing the truck around for an hour, it finally started, and we moved steadily downhill towards the main highway. But shortly before we reached the junction, the engine died. Kuang Wei and Lao Yu worked on it all afternoon to no avail. We spent the night at a little village nearby called Chuchinbao 赤金堡.

20 Joseph Needham's Chinese courtesy name 宗誠 is 丹橙, so he should naturally have an affinity for 牡丹. The hills nearby could, indeed, at one time have been mined for cinnabar.

21 Later Shandan did become a CIC and Baillie School Center through the effort of Rewi Alley.

22 新生活招待館. Needham referred to them as Military Guest House in *Science Outpost*. They were probably set up originally for the convenience of Russian aid convoys that operated in the early days of the Sino-Japanese war. Signs in Russian were still up in the lavatories.

On the 28th morning the truck started, but worked only intermittently as we struggled on. We reached Yumen 玉門, 884 km, at 1:00 p.m.. A mechanic from a Tea Company convoy helped Kuang Wei and Lao Yu to locate the trouble and they replaced the feed-pump diaphragm. We took off the next morning at about 9:00 a.m. The road surface was excellent and the truck worked like a dream. Everyone was elated. We arrived at Anhsi 安西, 1018 km, just before noon, had lunch and left at 1:30 p.m.. But now the road rapidly deteriorated. Much of it was just tracks made by army trucks over the bumpy gravel desert. Progress was slow. By about 6:30 p.m., as we were approaching the southern edge of the Tunhuang oasis, we drove straight into the setting sun, and strayed off the pavement into the drifting sand. All efforts to dislodge the truck failed. We lit a fire, and had hot cocoa and canned beans for dinner. All of us slept well in the unloaded truck, in spite of the howling of wolves and neighing of horses that were heard during the night.

In commemoration of our common plight that night Wu Tso-rjen composed a poem²³ which had been translated by Needham:

Weary eyes once gazed over the far-stretching desert,
 Now again the wind is rising beyond the borderlands,
 Rushing whirling sands put the warhorses to flight
 Where now the sounds of engines mingle with the goldbright dustclouds,
 The heavens close down upon the wide open wastes,
 And the Great Bear now sinks near the horizon,
 Suddenly the sound of teals is wafted towards the wanderers.
 Each note bringing with it new sadness, as of old.

On the next morning, September 30, with the aid of several peasants, we succeeded in pushing the truck out of the sand, and arrived at Tunhuang, 1158 km, at about 10:30 a.m.. After paying a courtesy call on the magistrate, we stocked up with a rich assortment of fruits (including the famous *Hami gua* 哈密瓜), had lunch and started out for Chienfotung 千佛洞 at 1:30 p.m.. The road continued to be poor and we did not get there until 4 p.m.. We settled in one of the three temples on the oasis, which was being used by the Ministry of Education as a research station. It was still sunny and bright. We had a quick look at the grottos. From one of the steps outside a cave high on the cliff I could see the green oasis nestled below and the light of the setting sun glistening over the barren hills across the valley. A numinous quality filled the air and cast a spell of incredible serenity over the entire scene.

On the next day we toured as many of the caves as we could, following our individual inclinations. Needham was busy taking photographs and notes. With the image of the wonderful works of art still fresh in our minds, we all felt, when we gathered in the evening for dinner, that the trials and frustrations we had endured to reach this

23 The original of Wu Tso-rjen's poem is given below:

平流垂頓倍	筆過風又生
旋沙驚戰馬	飛鐵逐金盤
碧嶽大崩合	天銀南斗沉
忽聞皇雁語	一旬一越辛

unique site were eminently worthwhile.

On Saturday, October 2, we left early in the truck as planned. But soon a menacing noise developed, and after a series of tests it was determined that the main bearings on several connecting rods were burnt. By late afternoon we had maneuvered the truck back to the temple. I was dispatched with little Wang on two donkeys across the desert to Tunhuang to send telegrams to Chungking, Lanchow and the Oilfield to seek help. We returned to Chienfotung on the next day. By then it was obvious that the party was going to be stranded here for quite some time, and Needham decided that I should return to Lanchow and fly to Chungking as soon as possible to carry on the work of the office.

And so on the afternoon of October 4, I left Chienfotung again by donkey and arrived at Tunhuang at dusk. A Highway bus took me to Anhsi on the 6th, Yumen on the 7th and Chiuchuan on the 8th. After waiting for a day I got on a KPA truck, and arrived at Changye on the 10th, Yungchang on the 11th and Kulang on the 12th. All the vehicles that I travelled on required continuous adjustment of one sort or another along the way. On the 13th the KPA truck, with a full load of oil drums and seven passengers on board, slid into a ditch near the 96 km marker. Miraculously only one person was slightly injured. After a night at a farmhouse, I got on a military Chevrolet truck on the 14th morning. But it was having spark plug trouble and 20 kms later it blew a gasket. Luckily, I soon caught a Highway bus, reached Lanchow at about noon, and checked in at the Lichihshe.

For the next two weeks I made frequent visits to the China National Aviation Corporation (CNAC) office to check on the status of my application for a seat on a flight to Chungking. The CNAC agent was reasonably optimistic that I could obtain a seat on an extra plane scheduled for November 2nd, but my chance of getting one on a regular flight was quite remote. I sought help from all the organizations that we had had contact with before, NRC, KPA, KMW, Foreign Ministry Lanchow Office, Provincial Government etc. Our CIC friends also solicited help on my behalf from influential government officials whom they had known well on a personal basis. Those were most frustrating days for me. I was fortunate in that I had gotten to know Tzu-hsin and Hung-yin quite well on our way from Chengtu. Their sympathy, moral support and companionship did much to lift my depressed spirits.

On November 1st I was told by CNAC that the extra flight scheduled for November 2nd had been commandeered for other duty. I would have to wait for the next extra flight, whenever that might be. A day later, I received word that Needham and his party had left Chienfotung but had gotten only as far as Chiuchuan. They were in desperate need of six spark plugs, one set of piston rings, and a new piston and connecting rod. With remarkable luck I was able to buy all these items on the local market on the next day. Arrangements were quickly made to have the parts brought up to Chiuchuan on the next NRC truck.

On the evening of November 10, when I returned to the hotel after dinner I found a note from Kuang Wei saying that he had just arrived with the truck at Lanchow

and that Dr. Needham was staying at the CIM Hospital across the river. I immediately rang Needham up and briefly exchanged notes with him on what had happened to each of us in recent days.

I met Needham, Kuang Wei and Alley on the 11th morning and received a first hand account of the most recent saga of the truck²⁴. The engine had been transported by a KPA truck, repaired at the oilfield and brought back to Chienfotung. The party left on the 27th, and arrived at Yumen on the 31st. On November 1, after they had dropped off two KPA mechanics at the turn-off for the oilfield, the engine developed a grinding noise, which upon examination, was found to be due to a broken piston. After removing the broken piston, the truck managed to limp, with 5 working cylinders, into Chiuchuan late in the evening. They had no luck in obtaining a new cylinder locally, and no idea when the spares they had requested from Lanchow would reach them. And so on the 5th they pushed on down the Hosi corridor to arrive at Lanchow on the 10th, miraculously without a new major disaster, having to contend only with ignition adjustments and a broken back spring which was repaired at Shandan.

Two days later we thanked Lao Yu as he went back to his regular duties at the KMW. The truck was moved to the KPA depot at Shildien 十里店, where the engine was overhauled several times. It was a dismal experience. Each time the engine was thought to be ready, and the reassembled truck taken out for a test drive, something new wrong with it would be found, and back to the depot it would go. Eventually, several crankshaft bearings were rebabbited more than once, and a new crankshaft, as well as a new piston and connecting rod, new piston rings, and a new battery had to be installed.

In the meantime we redoubled our efforts to secure a seat for me on a CNAC flight to Chungking. When Wu Tso-rjen appeared in Lanchow in mid November, after having completed his assignment at the oilfield, his help was also enlisted. But as time passed, it soon became obvious that it would make much more sense for Needham, instead of me, to fly back to Chungking. First of all, his presence at the office would be far more valuable than mine. Secondly, except for the visit to Sian, he had virtually completed all that he had set out to do in the Northwest. Moreover, it seemed unthinkable to us that CNAC could actually refuse to give him a passage. Thus, by the beginning of December we withdrew my application and concentrated our efforts on getting a passage for Needham.

Since Needham and I were staying on opposite sides of the river we both spent a good deal of time crossing the river each day. I particularly enjoyed returning from the CIM Hospital by sheepskin raft, which gave me the sensation of sitting right on top of the churning current. As the weather got colder, chunks of ice began to appear on the water and by early December the whole river was solidly frozen. It was an awesome sight to see the mighty river turned into a solid sheet of ice all within the space of two weeks.

By the second week of December, all the work that could be done on the truck

24 *Letters III, Science Outpost* pp. 151—164

had apparently been done, but there was still no assurance of Needham's airline passage. On December 9 we celebrated Needham's birthday with a special dinner, which he presided over appropriately in a Chinese gown. Two days later, he was invited to dinner by the Provincial Governor, and he repeated his plea for help with the plane passage. The next flight was due on the 14th, and still there was no word. On the 14th morning, however, we received a call from CNAC suggesting that we take Needham to the airport and wait there, which we did. That afternoon at 2:00 p.m. we waved Needham goodbye as he entered the plane, which had arrived from Chungking about an hour earlier. A few minutes later, he was off.

The truck left Lanchow on December 17 for its return journey to Chungking carrying Liao Hung-ying, Kuang Wei and myself, as well as other passengers for part of the way²⁵. More disasters came upon us, resulting in frustrating delays in Huhsien, 2 days, Shuanshipu, 10 days, and Chengtu, 9 days²⁶. We finally arrived at Chungking on January 21, 1944, having been away altogether for 5 months and 2 weeks. Kuang Wei and I breathed a great sigh of relief when, on that afternoon, we turned over the truck to the British Embassy garage. It even felt good to be in Chungking again.

SECOND SOJOURN IN CHUNGKING:

January 21—April 8, 1944

It was like a homecoming when we finally arrived at the office late in the afternoon of January 21. Needham welcomed us with open arms. That night at dinner Hung-ying and I recounted to him the latest, and I hoped the last, series of misadventures we had experienced with the ill-fated truck. He agreed that under no circumstances should he be persuaded to take the truck back, and that he would make every effort to get a new vehicle from the Embassy.

In the next several days, I spent most of my time trying to catch up with the latest developments at the office. I was amazed at the progress Needham had already made in securing support for his mission. He had been given an allotment for cargo space

25 When we left Lanchow the party also included Rewi Alley and the two Baillie School boys; Derek Bryan, British Consul at Chengtu; Wu Tso-rjen; and Li Shu 李樹, a friend of Kuang Wei's who doubled as the truck mechanic. Rewi Alley and the boys left us at Shuanshipu, but we picked up George Hogg and two boys. At Chengtu, we said goodbye to Bryan, Wu Tso-rjen, Li Shu and George Hogg and the two boys. Two British consular officers, Armstrong and Cooper travelled with us from Chengtu to Chungking.

26 We burnt one main bearing right on the first day, but managed to push on to Shuanshipu on five cylinders. The clutch had to be replaced at Huhsien, and the main bearings were rebabbited at Shuanshipu. Soon after leaving Shuanshipu, we had more troubles with the bearings, and a leak in the radiator. The oil leak became so bad that we soon exhausted our ration of lubricating oil and had to replace it with vegetable oil. At Chengtu the engine was overhauled, and the crankshaft realigned.

It was reassuring to have Derek Bryan, as an official of the British Government, with us on the major portion of this trip. His support was invaluable whenever difficult decisions on what repairs had to be done were required. I was surprised but delighted to learn at Chengtu that he and Liao Hung-ying had become engaged. Evidently, the troubles we had with the truck had so monopolized my attention that I was completely oblivious to the romance that had been brewing right in front of my eyes.

on the regular flights of the Royal Air Force over the hump. Now he could be sure that the equipment and materials we had ordered for Chinese scientific institutions from India would be transported expeditiously to Kunning for distribution in China. Indeed, some of the shipments we had ordered last summer had already arrived and were being sent to their destinations in Szechuan.

Moreover, he had received approval from the British Council to rent or construct a suitable building in Chungking to house the expanded organization he had proposed. The staff of the organization would be enlarged by enlisting the service of other senior scientists from Great Britain. The first person recruited under the new scheme was none other than Dr. Dorothy Needham 李大斐 who was expected to leave London for Chungking in the very near future.

As it turned out, the expansion of senior staff would occur even sooner than he had anticipated. On the afternoon of February 2nd, Needham suddenly brought to the office two unexpected visitors. According to their accent they were obviously English, but judging by the clothes they had on, it must have been quite a few years ago since they were last seen in England. They talked animatedly, but in a hushed tone. When they left Needham told me, with a big grin, that they were Professor and Mrs. William Band 班威廉, who had just arrived from Yenan after spending two years in the Border Region²⁷. Band had agreed to stay on in Chungking as a member of the British Scientific Mission, but his appointment would have to be considered tentative until formal approval had been received from the Chinese Government. He started work in the office a few days later, but until our departure on April 8, had kept a low profile.

The last journey from Lanchow to Chungking had been physically exhausting for me. By the time I reached Chungking I had acquired a slight but persistent cough. By early February, my cough was appreciably worse, and Needham became quite concerned. He called up Professor Gordon King and arranged for me to have a thorough physical examination at the Shanghai Medical College at Koloshan 歌樂山. King kindly invited me to stay at his house for a reset. I was at Koloshan from February 6 to 16. The examination revealed no serious ailment. The clean air at Koloshan and King's hospitality evidently did the trick, for when I returned to Chungking the cough was gone and my general health was very much improved.

Dorothy Needham arrived at Chungking on February 17. With the presence of two new members of the Mission, and Needham himself as prolific a writer as ever, it soon became apparent that we needed a professional secretary, i.e. a stenographer-typist, at the office. Needham hired Miss Hsieh Yu-wen 謝幼文, who, to my great relief, immediately took over all the routine secretarial duties in a most competent and efficient manner.

27 William Band, from Liverpool, England, taught Physics at Yenching University, Peking, from 1929—1941. He and his wife Claire escaped from Peking with Michael and Hsiao Li Lindsay, when the Japanese started the Pacific War, and found their way into areas controlled by the Eighth Route Army. For details of their experience see Claire and William Band, "Two Years with the Chinese Communists" (Yale University Press, New Haven, 1948).

Office buildings were scarce at that time in Chungking. We only saw one house which might have been suitable as the headquarters of the SBSCO but it was too small. By early March, Needham had decided that a new building should be constructed. A site was found, a plan of the building approved, a contractor engaged and a contract signed, all within a space of about three weeks. The new building was scheduled to be ready for occupation in September, 1944.

At the same time, preparations for our trip to the Southeast had begun in earnest. A 1½ ton Chevrolet truck was to be transferred to Needham by the British Military Mission. Contacts were made with the institutions we were to visit during the trip. A mechanic, Lin Mei-hsin 林梅興 was hired to help Kuang Wei maintain the truck in working order along the way. It was considered essential that we be inoculated against several infectious diseases endemic in parts of Southeastern China, e.g. plague, typhoid and cholera. The inoculations were completed over a two week period, and caused no more than minor discomfort.

The new truck arrived from Kunming on March 24. The first thing done to it was the painting of the sign "Sino-British Science Cooperation Office" in Chinese, on both sides of the chassis. We stocked up all manner of spare parts we could think of. Minor repairs were completed. Travel documents and fuel purchase permits were obtained from appropriate authorities. The departure date was set for April 8, 1944. We expected to be back in Chungking by the end of June.

The itinerary planned for the Southeastern trip was as follows:

- a) Truck *via* Tsunyi 遵義 to Tushan 獨山, then train through Kuangsi and Hunan to Kukong 曲江: visit institutions around Kukong.
- b) Truck *via* Kiangsi to Fukien: visit Changting 長汀, Yungan 永安, Nanping 南平, Foochow 福州, and Shaowu 紹武.
- c) Return to Kukong; train to Kueilin: visit institutions near Kueilin: train to Tushan; truck to Chungking.

On April 6, we drove the truck out to Shapingba 沙坪壩 to attend a meeting of the Chinese Natural Science Society, and it appeared to be in fine working condition. We were ready for the long trip.

JOURNEY TO THE SOUTHEAST:

April 8—July 21, 1944

On the morning of April 8, the SBSCO van left Chungking with Joseph Needham, Kuang Wei, Lao Lin and myself on board. After a night at the NRC steel mill at Sanchi 三溪, we experienced, on the next day, the thrill of negotiating the famous *Seventy-two Turns*, where the highway made 72 consecutive hairpin bends to descend the side of a steep mountain. On the 10th morning we arrived at Tsunyi and stopped there for a day to visit Chekiang University²³. We continued the journey through Kueiyang, and reached Tushan, the railhead, at 5 p.m. on April 12. At the station we made

23 J. Needham "Science in Kueichow and Kuangsi" *Nature*, 1945, 156, 496.

arrangements to send the van ahead by flatcar but found we had only enough money to pay for its passage up to Liuchow 柳州. On the next morning the van left; Needham and I waited till the evening to get on the passenger express train.

Needham loves trains, and this was his first train ride in China. He was full of enthusiasm for the steady progress of the train. At day break, it went through a series of switchbacks and came down the mountain into a narrow valley. From then on, all day our eyes feasted on a panorama of unending successions of karst peaks which rose like sugarloaf islands from the flat valley floor. The train reached Liuchow at 6 p.m. We booked a flatcar for the van, left at 8:45 p.m., and arrived at Kueilin at 6 a.m. on April 15. We spent a restful day at Kueilin and made arrangements for the British Consul to pay for the continued transport of the van by flatcar from Liuchow to Kukong.

On the 16th we boarded the 2:30 p.m. express for Hengyang 衡陽 and ran into a group of American airmen. One of the two interpreters with them, Miss Chou Bao-ling 周寶玲, was a fine soprano and seemed to possess an inexhaustible repertoire of Chinese folk songs. She sang a series of Chinese folk songs to us and I was kept busy writing down the lyrics and tunes of all those that appealed to Needham. After a quiet night, we arrived at Hengyang West station early the next morning in a drizzling rain. Since the passenger train was not to leave the East station until the evening, Miss Chou kindly offered to give us a lift to the U.S. Air Force Guest House, where we could rest for the day. We soon found out that the Guest House was a long way from the city, and I became quite concerned as to how we were going to get back to the station in the evening. But everything turned out well. After a sumptuous breakfast, the base commander invited us to rest in his room, where we spent the day reading and translating the songs we had written down the day before. After dinner, a jeep took us to the station in good time to catch the train.

We arrived at Kukong early on the morning of April 18 and were met by a representative of the British Liaison Office. He took us to the British Military Mission (BMM) depot outside the city, and we made arrangements to have the van serviced there upon its arrival from Liuchow. After lunch we returned to the railway station to catch the train to Hsienjenmiao 仙人廟. But no sooner had we gotten on the train at 1:50 p.m. an air raid alarm was sounded and all the passengers dispersed with their luggage into a forest near by. For a long time nothing happened, but just as we thought that this might have been a false alarm, seven Japanese planes came into view and circled around the city several times before they left. A little while later two more planes came over and circled the city. The all clear was sounded shortly after 4 p.m. and the train finally started from the station half an hour later.

We reached Hsienjenmiao at 6 p.m. and were greeted warmly by representatives of Lingnan 嶺南 University, who took us to the university Guest House. The campus was located in a beautiful grove of camphor trees. All the buildings looked new and neatly kept. The porches and verandas on the dormitories reminded me of bungalow style buildings so common in Malaya and Singapore. It was certainly the most attrac-

five temporary campus we had seen in China thus far. In the next three days, Needham gave lectures, visited facilities and held several group discussions with the staff²⁹. Unfortunately, the day after his arrival he started to feel uneasy in his stomach, which tended to dampen somewhat his normal exuberance.

After our return to Kukong on April 22, Needham was advised to stay with the Medical Director at Hohsi 河西 Hospital, which was affiliated with Lingnan University Medical College, so that the condition of his stomach could be monitored. In the next several days we visited Lingnan Medical College, called on the Governor of Kuangtung, and browsed in a number of bookshops. The only thing that marred our leisurely pace was a telegram from Kuang Wei received on the evening of April 24th, which stated that they had been detained in Liuchow because we had neglected to pay a fare for the luggage and oil drums in the van. They were required to pay a fine of \$16,900. On the next morning, frantically we called on the Chief of the Railway Bureau at Kukong to seek clarification and guidance, and arranged with BMM to transmit the money to Kuang Wei.

Needham soon recovered from his minor indisposition and on April 27, we left Kukong at 7 p.m. by train to arrive at Pingshek 坪石 at 10:00 p.m.. We stayed there for a week visiting the different colleges of Chungshan 中山 (Sun Yat-sen) University, as well as the Agricultural College of Lingnan. Chungshan was the largest single University we had visited in China. In the main campus complex were the colleges of Arts, Science, Law, Engineering and a Teacher's College, with a total enrollment of about 2,500 students. The Agricultural College was located at Liyuanbao 栗源堡 about 20 kms away. Needham was particularly impressed by the two agricultural colleges where a considerable amount of interesting research work was going on²⁹. Among the scientists we met were Professors Pu Chih-long 蒲益龍 and Li Tsui-ying 利翠英 who were to become in later years pioneers in the application of biological methods for the control of insect pests in China.

We arrived at Lochang 樂昌, the home of Chungshan University Medical College, from Pingshek on the afternoon of May 4. The college and its teaching hospital were housed in a new, modern building. Several of its staff had been trained in Germany which gave Needham another welcome chance to speak German. We left Lochang on the next evening and arrived at Kukong at 9 p.m.. To our delight we found that Kuang Wei and Lao Lin had arrived with the van on April 30, having paid the fine with a loan from a relative at Liuchow, and obtained funds from the British Consul at Kueilin to pay the flatcar fare to Kukong.

The series of visits in Kuangtung had been especially gratifying to me, since I was able to see many of my friends from Hong Kong who were studying or working in these institutions. What we could not have realized was that we were actually seeing the last days of the life of these institutions in those particular surroundings. Soon their very existence would be shattered by the final Japanese drive of the war. By the

29 J. Needham "Science and Technology in China's Far South-East" *Nature*, 1946, 157, 175.

time we came through Kukong again in less than 4 weeks, all the institutions we had visited were once again in disarray, having been required to disband or disperse all their physical equipment and personnel further into the interior.

We completed our preparations for the next phase of our journey on May 6, and left early on the following morning. After crossing the mountainous border between Kuangtung and Kiangsi we arrived at Kanhsien 贛縣 at about 3 p.m., where we stayed at the CTS hotel. Kanhsien had been severely bombed. It was now almost a completely rebuilt city, and was the center of the flourishing Southeastern CIC Federation. We had to stay there an extra day as we were not able to have our order for alcohol filled until the afternoon of May 8.

The CTS hotel at Kanhsien was one of the most pleasant and well run CTS hotels that we had encountered in China. It consisted of several simple wooden pavilions enclosing a lovely garden. The rooms though small were comfortable and spotlessly clean. It was the last place where, I would have thought, my skill as an interpreter and diplomat would be put to a test. On the 8th morning, we came to the hotel restaurant for a Western breakfast. The fried eggs, ham and coffee were fine, but the toast was too light for Needham who likes his toast extra dark, in fact, more accurately, well burnt. We asked the waiter to have the toasts browned further. The cook in the kitchen, however, had his own ideas on what constituted proper toast, while Needham, on this occasion, was determined to have his way. After sending the toasts back two more times, and noticing the discomfiture of the waiter, I said to him, "We have here a famous but very eccentric Professor from England. Please tell the chef not to worry about getting the toasts burnt; that's the way he really likes them and the carbon is good for his digestion." We had no further trouble after that.

We left Kanhsien early on the 9th but did not get very far. Shortly after Yutu 零都 we found that the generator had stopped charging. We returned to Yutu, where the machine shop of the Highway Bureau agreed to rewind the armature for us. On each of the following two mornings we tried to leave, but had to turn back because of either a still-faulty generator or a flooded section of the road further ahead. And so, unexpectedly, we spent three nights in a little inn at Yutu. We slept on our campbeds in a room practically without any furniture. There wasn't much we could do except talk or sing or listen to the rain. Needham taught me several songs including *Gaudeamus igitur*, the Communist Internationale and the Nazi Horst Wessel. We also whiled away a good deal of time translating Chinese folksongs in their original metre so that they could be sung in English. It was fun but I don't think we were particularly successful.

By the 12th the flood had subsided enough to let us through. After Rjeichin 瑞鑫, the road surface deteriorated rapidly as the van wound its way up another mountain. We had trouble with the fuel feed, but managed to struggle into Chanting by 3:30 p.m. just after the all clear for an air raid had been sounded.

We soon found our way to Amoy 廈門 University where we were received by the Acting President Wang Teh-yao 汪德耀 whom Needham had known in Roscoff and Paris many years before²⁹. This was indeed a homecoming for me since I had worked

as an instructor at the Chemistry Department of Amoy University in the Spring and part of the fall of 1942³⁰. I was pleased to renew the acquaintance of several professors such as Hsieh Yu-min 謝玉銘 (Physics) and Tsai Chi-rui 蔡啓瑞 (Chemistry)³¹.

Needham has provided a lively and detailed account of our journey through Fukien, and particularly of our frantic rush through Kiangsi, Kuangtung and Hunan to cross the key railway bridge at Hengyang before it fell to the Japanese onslaught³². My narrative of the next phase of the trip will, therefore, be very brief. We left Chanting on the 16th, spent 1½ days visiting provincial research institutions in Yungan, and arrived at Nanping late afternoon on the 18th. Between Yungan and Sanyuen 三元 we saw many groups of sick soldiers being marched to a hospital(?), perhaps stricken by malaria or bubonic plague.

We were up before 4 a.m. the next day to catch the steamer down the Min 閩 River to Foochow, where we spent four days. Needham stayed at the British Consulate and I at a hotel right across the street. The Consul, Mr. Tribes and Mrs. Tribes, who was American, took excellent care of us. Foochow was, at that time, the only former treaty port still in Chinese hands, and it had received relatively little damage during its brief occupation by the Japanese.

Needham was much intrigued by the Foochow Club where the foreign community used to congregate. The spacious lounge and the handsome library were a vivid indication of the wealth, power and prestige that the foreign community had once enjoyed. We toured the boat-building yard and the boat engine factory. But the main attraction of Foochow for Needham were the bookstores. There were two very large bookshops dealing in old Chinese classics and several modern stores such as the Commercial Press. After spending two days going through their stocks, Needham bought two rattan trunks of old books, having had to buy first two rattan trunks of the right size. He was beaming with pride when we brought the two trunks back to the consulate.

In between the book hunts we had the pleasure of trying out Foochow's unique bath-house, which was fed by hot water from volcanic springs. After disrobing an attendant would give one a sort of combined scrubbing and massage which left one completely clean and relaxed. After the bath, we were served a lunch while still wrapped in our drying towels. Among the dishes were fish and chicken cooked in a delicious, red sauce, made with a mash containing *Monascus* yeasts 紅楮, used in the fermentation of red rice wine. It was a new experience for Needham. This type of sauce, while quite common in Foochow and Amoy cuisine, was practically unknown in other styles

30 I escaped from Hong Kong after its occupation by the Japanese in February, 1942. In the fall of 1942 I received an invitation from Dr. I. B. Tayler to join the CIC Technical Institute in Chengtu. I visited my paternal grandmother near Foochow before I left in early December, 1942, making my way *via* Kanhsien, Kukong, Koeilin, Kueiyang and Chungking to reach Chengtu on February 6, 1943.

31 I particularly enjoyed seeing again Professor and Mrs. Arthur Lee and Professor and Mrs. Ling Ken 林庚 who were most helpful to me when I first arrived at Changting in 1942. While in Changting we also called on Liao Hung-ying's brother.

32 *Diurnal III, Science Outpost* pp. 213—222

of Chinese cooking.

On the afternoon of May 24, we left Foochow by steamer going up the river and arrived at Nanping at 4 p.m. on the 25th. That evening Needham lectured to the students at Huanan 華南 Girls College. We left early on the next morning and spent the better part of the day at the Provincial Pine Root Gasoline Works near Chienou 建甌, which was started by Ling I 林一, to crack pine terpenes to gasoline. Needham was most impressed. It was in his words "a very fine show indeed, demonstrating indomitable pertinacity in the face of every obstacle²²." We pushed on to Chienyang 建陽 that evening.

The 26th morning was spent at Chinan 暨南 University with President Ho Ping-sung 何炳松, the historian. In the afternoon we reached Shaowu, and crossed the river to the campus of Fukien United 福建協和 University (FUU). The next three days were spent at FUU. Needham was very much impressed by the excellent library, with a splendid collection of classical Chinese books, and the biological laboratories under the direction of Dr. Tseng Tso-hsin 鄭作新. On Sunday, the 28th, Needham gave a sermon at the University Chapel, on "The Two Faces of Christianity and the Conception of the Kingdom of God". I have heard him talk on the subject before, but in this liturgical environment it seemed to have acquired a special numinous quality.

We heard news over the radio on the 29th that the Japanese offensive we all dreaded had probably started. The next day we wound up our stay at Shaowu by visiting Chichiang 之江 University and the Provincial Agricultural Entomology Station where Ma Chun-chao 馬竣超 was making an extensive entomological survey of the region.

On the 31st morning, with the help of a battery borrowed from FUU's Chemistry Department, we started the van and resumed our journey. All went well until late afternoon, about 11 kms after Nanfeng 南豐, when we had trouble with the fuel feed and the engine stalled. The battery was too weak to start the engine again. Needham hopped on a bus back to Nanfeng to stay the night at the Catholic Mission and to bring help the next morning. Meanwhile, several peasants came to help us push the truck; but the engine would not budge. We slept in the van and gave the mosquitoes a grand feast.

An FAU truck passed by us the next morning with the news that Needham would be along shortly. Indeed, a little while later Needham appeared in a Farmers Bank Truck. The engine started but the fuel feed continued to give us trouble until we had the brilliant idea of bypassing the feed pump altogether and siphoning the alcohol through a rubber hose, under manual control, directly to the carburettor. The van ran beautifully. We made it to Ningtu 寧都 by 4:30 p.m. and were able to buy a new battery and a new feed pump diaphragm. After a comfortable night at the CTS hotel, we drove on and arrived at Kanhsien in the afternoon of June 2. We left Kanhsien at 5:30 a.m. on June 3, and after making a detour to visit the tungsten mines near Tayu 大庾, reached Kukong at 3 p.m.. We rushed to the railway station, where the station master told us that he could give us a flatcar if we came back at 6 p.m.. After consulting with the BMM office, it was decided that Needham and I should stay with the

van until we had it safely across the bridge to the west side of the river at Hengyang. The van was indeed placed on a flatcar at 8 p.m., but the train did not leave the station until 1 a.m. on June 4.

With numerous stops due to air raid alarms, the train merely crawled along, and we did not arrive at Hengyang East station until 9 a.m. on June 6. The station master assured us that our flatcar would be shunted across the river in 3 to 4 hours. It was a day of tremendous air activity. We watched squadron after squadron of P40's landing or taking off at an airfield east of the station, presumably going to or returning from the frontline near Changsha 長沙. As the hours passed and nothing happened, I grew increasingly impatient and nervous. Needham, however, was surprisingly calm, absorbed much of the time in his Chinese-English Dictionary. Finally, at about 5 p.m. we were coupled on to several coal carriages. By 7 p.m. we had reached the approach to the bridge, but continued to be shunted back and forth for a long time. I fell asleep, and by the time I woke up at 11:30 p.m., we had already crossed the bridge and were parked in the West station.

Shunting started again at about 4:30 a.m. on June 7. Needham and I took our luggage down from the flatcar and waved the van goodbye. We washed up with hot water sold by a young girl at the platform. I bought a newspaper and immediately showed Needham the headline: *Opening of Second Front in Europe*. It was an exhilarating moment: the news greatly buoyed our spirits. We paid for our train tickets and got on the southbound express leaving at 7:30 a.m.. After a long and tedious ride we arrived at Kueilin at 1 a.m. on the 8th, and spent the rest of the night at the British Consulate³³.

Later on that morning, after reading a letter from Dorothy, Needham informed me that I had been awarded a Scholarship for postgraduate study by the British Council and was expected to leave for England in the fall. I asked him whether I could request to have the scholarship held for me until the next year. He promised to look into the idea.

Kuang Wei and Lao Lin showed up on the 9th morning with the van, and spent the following two days to get ready for the next phase of the journey. On the 10th Needham and I visited three NRC factories in the vicinity of Kueilin, the 2nd and 4th Electric Works (motors and other equipment) and the Radio Plant. We started for Liangfeng 良慶 on the 11th morning, and spent four days there. The Academia Sinica Guest House where we stayed overlooked several spectacular karst pinnacles across a broad plain. It was undoubtedly the most scenic spot that we had stayed at in China. Liangfeng was the home of the Kuangsi Science Institute, Kuangsi University and three Institutes of the Academia Sinica, Geology, Physics and Psychology³⁵. Particularly impressive was the Institute of Geology under the direction of Dr. Li Se-Kuang 李四光, where he gave us a long discourse on the distortions produced in rocks under glaciation.

33 Two days later Changsha fell to the Japanese and the great bridge at Hengyang was blown up. Hengyang itself held out for several more weeks.

Another interesting research project that we visited was the extraction of natural rubber from indigenous Kuangsi plants e.g. *Ficus pumila* and *Chonomorpha macrophylla* by Professor Peng Kuang-chin 彭光欽 of the Chemistry Department of Kuangsi University.

On the 16th we started out from Liangfeng, drove through Lipu 荔浦, Pinglo 平樂 and Chungshan 鍾山, and reached Papu 八步 by 5 p.m.. We spent the next day touring the tin mine at Shuiyenba 水岩坝, and a coal mine nearby. The tin mine was memorable in that its power plant was hidden in a cavern within a stately karst pinnacle. On the 18th we returned to Lipu, but continued going west. After replacing a punctured rear tyre, we moved on and arrived at Liuchow after dark. On the 19th the tube of the punctured tyre was repaired and we drove on to Shatang 沙塘 in the afternoon to visit the Ministry of Agriculture's Experiment Station and the College of Agriculture of Kuangsi University²³. Shatang was a flourishing center of agricultural research with well equipped laboratories and spacious experimental farms. It was heartbreaking to realize that all the well ordered activities that we saw were soon to be dispersed or disbanded altogether. The effect of the Japanese advance had already touched everyone's life. The atmosphere was now like the calm before a storm. The order for evacuation was expected at any moment.

Professor Peng Kuang-chin appeared at Shatang on the morning of the 21st. He had just arrived from Liangfeng in preparation for the dispersal of Kuangsi University to points further West. We had a long discussion on the war situation. Hengyang was about to fall to the Japanese, who would, undoubtedly, drive further south through Kueilin, Liuchow and Nanning to join up with their forces in Indo-china. After a gloomy lunch with the Experiment Station staff we returned to Liuchow. By this time Needham had come to the conclusion that I should accept the scholarship and not wait, since it was impossible to predict what the British Council would do next year or how far the Japanese advance would penetrate into Kueichow or Szechuan. In the meantime I should start taking action on getting a replacement for myself. He was willing to accept whoever I proposed. Furthermore, in view of the war situation, the return trip by railway and truck was likely to be another long drawn out process, and it would save him a lot of time to fly to Chungking from Kueilin. He agreed to my request to spend about a week's holiday in Liuchow before starting on the long trek back to Chungking.

At the train station we made arrangements for the van to be loaded on a flatcar that evening. We saw Needham off on the afternoon express to Kueilin. Kuang Wei and Lao Lin were told to expect me at Tushan in about ten days as they departed with the van on the flatcar that night.

I had a pleasant time in Liuchow visiting several friends. By the 27th I was ready to leave, but the avalanche of refugees had already started and all the westbound trains were full. Finally I climbed on board a train on the 29th and after being stranded numerous times at various stations along the way, eventually made it to Tushan on July 4. I found the van and Lao Lin. They had arrived on the 29th, and Kuang Wei, not realizing the chaotic condition on westbound trains had gone to visit his brother

at Kuciping 桂平. We could only hope he would have the sense to turn back at Liuchow. A telegram from Needham was waiting for me saying that he had arrived at Kunning on the 25th, and would be in Chungking on the 30th. All hotels at Tushan were full to the brim. The first night I slept in the truck. On the 5th I was invited to put up my campbed at the FAU depot, which was a great improvement.

Two days later another telegram arrived from Needham, stating that I should return to Chungking at once so as to be ready to leave for England before the end of August, and should get a successor as soon as possible. Actually, by this time I had already decided to invite Ts'ao Tien-chin³⁴ to be my successor. I wrote to him immediately, urged him to accept the offer and asked him to send us his response directly to the SBSCO in Chungking.

On the 8th evening, Kuang Wei returned. We left Tushan on the next morning, and arrived at Kueiyang in the evening. The Highway buses to Chungking were all booked and I had to wait until the 18th before I could get a seat. Arrangements were made for the van to be serviced at the BMM depot in Kueiyang³⁵. On the 17th I said goodbye to Kuang Wei and Lao Lin. On the next morning I left Kueiyang. Three days later, early on July 21, 1944, I was once again walking through the familiar gateway of No. 5 Consulate Lane in Chungking.

LAST SOJOURN IN CHUNGKING:

July 21—October 1, 1944

It was still early morning when I knocked at the door of the Needhams' flat in the Embassy compound. After breakfast we went down to the office where I was introduced to our new colleague, Miss Chiu Chiung-yun 邱瓊雲, a physiologist from Chengtu, who had just joined the organization. Professor Band had by now received clearance from the Chinese government and was inclined to talk a little more freely. He kindly arranged for me to stay at the Canadian Mission where he and his wife had been regular boarders in recent months.

The Needhams were already preparing for a Southwestern trip to Kunming and Western Yunnan. They intended to travel by BMM convoy on August 1 to Kueiyang, pick up the SBSCO truck there, and proceed on to Kunning. And they were counting on my successor to be on the trip with them. Fortunately, on the very next day, a letter arrived from Tien-chin saying that he was glad to accept Needham's offer and would come to Chungking as soon as he could get a seat on the Highway bus. Three days later, on the 25th, to my great relief, Tien-chin arrived. In the next several days, he barely had time to get acquainted with his duties, and to receive the various inocula-

34 I had met Ts'ao Tien-chin in Chengtu in February 1943 as a fellow employee of the CIC Technical Institute. We both enjoyed German lieder, and I greatly admired his beautiful Mandarin accent. No doubt I had hoped that by associating with him some of his accent might rub off on me. I had visited him in Chengtu on the way to the Northwest and again upon my return.

35 My records are not clear on when Needham had decided to leave the van in Kueiyang. He could have done it before he left Liuchow for Kueilin, or transmitted the decision by telegram to me at Tushan.

tions thought to be necessary for travel in a sub-tropical region.

By now considerable progress had been made on the construction of the new SBSCO building. The foundation and brick pillars were up as were the wooden frames for the walls and the joists and beams for the roof. Mr. Tsao, the contractor, invited the whole staff to dinner on the 29th to celebrate the imminent completion of the new office, and we had a most enjoyable time together. Yet for me it was an occasion tinged with sadness since I realized it was to be my last dinner with the Needhams in China. Early on August 1 I said goodbye to the Needhams as they boarded the BMM convoy, and on the next day I said goodbye to Tien-chin who left by Highway bus for Kueiyang.

Originally, we had hoped that I would leave for England at the end of August or beginning of September. As it turned out the travel arrangements, passport, visa, health certificate, inoculations, foreign exchange and airline reservation, all took much longer than expected. The office was now running smoothly under the care of William Band and Chiu Chiung-yun. I helped with the daily operations as much as possible and still had time to reflect on what I had learnt about Joseph Needham in my peregrinations with him during the past year. Indeed, this became my principal pastime for five days in the middle of August when a severe cold kept me in bed at the height of Chungking's summer heat.

What I had found to be most endearing about Joseph Needham, the man, was his exuberant spirit. What he cared for, be they people, institutions, objects or ideas, he cared for with zest and generosity. Thus, the experience I shared with him seemed, for me, to take on a heightened awareness. When things went poorly, as when we faced continuing mechanical disasters with the truck on the way to Lanchow, the frustrations appeared doubly painful. When things were right, as when we managed to get the van across the river at Hengyang ahead of the Japanese advance, the relief and joy were especially sweet.

As for Needham the scientist I was most impressed by his encyclopaedic knowledge and boundless curiosity. Although a basic researcher, he showed as much concern for applied science and technology as he did for basic science. He seemed to know something about everything and a great deal about many things. I had accompanied him on visits to hundreds of university departments, research institutes and factories, involving the widest range of scientific and technological activities, from astronomy to genetics, from steel furnaces to textile mills; yet he never failed to find some aspect of the problem at hand that would excite his interest and curiosity.

His deep involvement in facts and ideas, however, had in no way diminished his basic humanistic impulse. It was expected that Needham would have great empathy for the scholars and scientists who were his constituency in China. But to my surprise he also displayed a remarkable, natural sympathy for the common people. He had a proclivity for noticing attractive qualities in ordinary people we met in towns, villages, and the countryside, that I, perhaps through familiarity, had missed altogether, such as the kindness and dignity of the innkeeper, the courtesy of the salesman, the winsomeness of the young girl selling water by the train etc.. This humanistic impulse,

no doubt forms the basis of his love for folk music and dancing, and his predilection for unorthodox ideas outside the mainstream of official dogma.

Yet, he showed formidable skill as politician and organizer. In spite of his sympathy for the common people, he was highly effective in dealing with those who held the purse strings and the reins of power. It was a great tribute to Needham's political skill that within a relatively short period of time he was able to win the support of the British Council and the British Embassy to provide the considerable funds not only to establish the supply service, but also to construct a new building and to expand the SBSCO organization.

I was particularly charmed by Needham's love for tradition and ritual. I never saw him as comfortable and content as he was in old temples such as the Confucian Temple at Loshan, the Ta Yu Temple at Lichuan or the Taoist Temple at Miaotaidze. He took particular delight in taking part in historical ceremonies such as the Ta Yu Festival at Tongchi. At first I attributed the singular attraction these places held for him to be due to their historical connotation. As I got to know him better, and learnt about his commitment to liturgical religion, I realized that they would, of course, appeal to him even more as monuments where the sense of the numinous of the Chinese people could find outward expression.

Lastly, I reserved a special admiration for Joseph Needham, the gifted writer. In the course of my association with him I had typed or read many of his reports, memoranda and letters. They were always well written and a pleasure to read. His urge to write was, in part, reflected in his zeal for translating materials from Chinese into English, for example, the poems that I have already been referred to earlier^{9,23}. During our stay in Lanchow, and our travels in the Southeast, we shared many enjoyable hours translating Chinese folk songs. I had probably learnt more about writing in English from him, in these sessions, than I had from all my previous teachers put together.

These then were the qualities in Needham that had made the deepest impression on me at a time when our peregrinations had just drawn to a close. But perhaps of greater interest to readers of this *Festschrift* would be my perception of what Needham saw in China that had the greatest impact on him. I would have said they were:

First, the land and its people. By people I mean the common people that we encountered during our travels, the peasants, the laborers, the shopkeepers, the soldiers, etc. that practically merged into the geographical background. Through his extensive travels Needham was able to experience at first hand the amazing diversity and beauty of the landscape: the magnificent mountains, turbulent rivers, barren deserts, loess hills, green valleys and fertile plains. And through his numerous contacts with the people during these travels, he would gain an appreciation of their condition of life, their poverty and hardship, their aspirations and hopes, and their industry, determination, and tenacity.

Second, the historical links to the past. Sights linking the present to the past were everywhere, and made travelling doubly exciting and enjoyable to Needham. Ancestral, Confucian, Taoist, and Buddhist temples, Moslem mosques, the ruins of the Great Wall, the camel caravan along the Old Silk Road, the Cave Temples at Chienfotung, the

old bookstores in Foochow, were all vivid reminders of China's past, and heightened his perception of the factors that influenced the development of Chinese civilization.

Third, the scientific and intellectual community. Needham saw what they had been able to accomplish in teaching, research and manufacturing under the most difficult conditions, often in makeshift facilities far from their original homes. He expressed admiration for their accomplishments and brought offers of concrete material help, as if "giving charcoal during a snow" 雪中送炭. He gave of himself tirelessly in lectures, discussions, and personal contacts to lessen their sense of isolation from the latest developments in science and technology in the West. It was only natural that in return he received great encouragement to pursue his interest in the history of science in China and a wealth of information related to this topic in the old classical literature.

In short, what Needham saw and experienced in China broadened his sympathy for its people, deepened his understanding of its history and strengthened his love for its culture.

Returning now to my last days in Chungking, I continued to monitor progress on the construction of the new office and prepare for my departure. By the middle of September the interior was almost completed, and we could start moving in some of the furniture. But I was unable to fulfill my secret wish of participating in the formal occupation of the new quarters of the SBSCO. When I finally received my long awaited plane reservation it was for a CNAC flight leaving for Calcutta on October 1, 1944, one day before the new office was to be formally occupied.

It was a cool misty morning when I said goodbye to the Bands and Chiu Chiung-yun and left for the airport. The flight to Kunming was uneventful, but I was unable to see anything on the ground below due to a heavy overcast. The plane stopped at Kunming for about half an hour; however, the transit passengers were not allowed to disembark. I was sorely disappointed for through the window I could see Joseph and Dorothy Needham and Tien-chin leaning on a fence waving to me. Soon I was off again. As I caught glimpses of snow-capped mountains peering through the clouds, scenes of my travels with Needham during the past year flashed through my mind: the little boat drifting down the Min River to Lichuang, the broken down truck at the edge of a precipice at Bieyudjen, the camel caravan along the Great Wall near Shandan, the train switching back and forth down the mountain to Kuangsi, the fighter planes landing and taking off as we waited to cross the bridge at Hengyang, and lastly, Joseph, Dorothy and Tien-chin waving to me at the airport at Kunming.

And now, thirty-six years later, as I write these concluding lines, the same scenes again appear before my mind's eye. Not surprisingly, I have enjoyed immensely reliving these experiences in recent weeks as I laboured to complete this memoir, in order to join friends and colleagues across the seas to honour Joseph Needham on his eightieth birthday. I cannot help wondering whether in celebrating Needham's birthday, I am actually also celebrating my own good fortune in having been a witness to events attendant upon the birth of what we might call today the Second Half-life of Joseph Need-

ham, which has been, of course, inextricably intertwined with the Science and Civilization of China Project. Indeed, we are all celebrating on this occasion the bridges of understanding that Needham has built to draw two great continents of civilization closer together. He has said³⁶:

It is true that the basic melodies are the same,
But the scores are written so differently
That hardly anyone listens to both,
And few there are who cross the barrier to and fro.

Surely, few have crossed the barrier as exuberantly and successfully as Needham has. He has brought the ideals of *Civitas Dei* and *T'ien Hsia Ta Tung* 天下大同 together as one, to the end that many around the world, following his example, will be able to declare, in truth, that "within the four seas, all men are brothers"^{37,38}.

Summary

Peregrinations with Joseph Needham in China, 1943-44

Huang Hsing-Tsung

During 1943-44, I was associated with Joseph Needham for more than a year as his personal secretary and interpreter. I witnessed the founding of the Sino-British Science Cooperation Office in Chungking, and accompanied him on his extensive peregrinations to scientific and technological institutions in wartime China. The first journey we took together was through central Szechuan. We travelled by car from Chengtu to Loshan and Wutongchiao, by row boat down the river to Lichuang, and finally by modern passenger steamers to Luhsien and Chungking. The second journey was to the Northwest. A Chevrolet truck took us from Chungking to Chengtu, Hanchung, Shuanshipu, Tienshui, Huadjialing and Lanchow, and from Lanchow to the oilfield at Laochunmiao and the cave temples near Tunhuang. The trip was plagued right from the start by an unending series of mechanical troubles with the truck, causing us to be stranded in unlikely and out of the way places. The numerous lengthy repairs needed prolonged the trip from the two months as planned to more than five months. The third journey was to the Southeast, when we travelled by truck, and, wherever possible, by train, to Kueilin, Kukong, Kanhsien, Changting, Foochow and Shaowu. The return trip was particularly memorable for our frantic dash through Kiangsi, Kuangtung and

³⁶ Excerpts from 'A Poem for a Chinese Friend', *Science Outpost* p. 105.

³⁷ *Lun Yu* 論語 xii, v. 5.

³⁸ I am grateful to the Editorial Committee in Shanghai, China for their kind invitation, and to Dr. Lu Gwei Djen of Cambridge, England for her encouragement, to participate in this *Festschrift*.

Hunan in order to cross the vital railway bridge at Hengyang before the city fell to the advancing Japanese onslaught.

In spite of the frustrations and hardships, these peregrinations gave Needham a unique opportunity to observe at first hand the many facets of China, the diversity and beauty of the landscape, the character and condition of the people, the rich heritage of its culture, and the struggles and achievements of the scientific and intellectual community. These peregrinations were, undoubtedly, a major factor in the alchemy that transformed Needham, the chemical embryologist, into Needham, the historian of Chinese science and civilization.