# NEEDHAM RESEARCH INSTITUTE NEWSLETTER

Newsletter No. 11 — EAST ASIAN HISTORY OF SCIENCE TRUST — January 1992

## NSF FELLOWSHIP

The National Science Foundation, Washington, is supporting a Research Fellowship for US citizens which will be tenable at the Institute from 1 October 1992 to 30 September 1993. Enquiries should be made to the Director, and applications should reach him by 1 March 1992.

## GIFTS

The Institute expresses its deep thanks to the Cavendish Laboratory for the gift of a fine glass fronted show case, one of several which were made in 1873 to house and display articles of apparatus or other equipment. The case stands in the K.P Tin Hall with examples of replica bronzes, miniature shoes made for women and illustrated books which explain various items of Chinese science and medical practice.

The Institute also wishes to thank Professor Francesca Bray and Dr Toalster for contributions towards running expenses, and the following for gifts to the library: R. Bertschinger; A. Butler; Ch'uan Ch'en; Chou Io; P. Craddock; C. Daniels; Shiran Du; Guo Fu; Guo Zhu; Ho Peng-Yoke; Ishida Ichirô; Liang Lijuan; C. Lindqvist; Nakaoka Tetsurô; W. Pachow; Pei Pu-yen; R. Provine; R. Ptak; D. Wagner; Wu Hung-hsi; Wu Shan; Xu Mingqi; Yamada Keiji; WM Zhong; and Weifeng Zhuang.

## RESIGNATIONS AND APPOINTMENTS

Lord Roll of Ipsden announced his resignation as a Trustee in November, after six years service as Chairman. Dr Loewe resigned his position as Deputy Director from February. Mrs W. Chen joined the staff as Assistant Secretary in July, and Ms Jovana Muir as Research Assistant to Dr Needham in August. Mr Tsukahara Tógo spent three months of his term as an Anglo-Daiwa Fellow from October to December.

It is with deep regret that we report that Professor Lu Gwei-Djen (Mrs Needham) died on 28 November 1991.

## NEW POST IN CHINESE SCIENCE AND MEDICINE

A generous grant from the Chiang Ching-kuo Foundation has provided initial funding for the establishment of a Lectureship in the History of Chinese Science and Medicine at the School of Oriental and African Studies, University of London. This is the first British academic post directly relevant to the work of the NRI, and the Institute looks forward to developing closer academic contacts with SOAS as a result of this initiative.

## VISITORS

The following are among the visitors whom the Institute has been glad to welcome recently: Ch'en Tzu-ping (Taipei); Michael Clark (Newcastle upon Tyne); Tuong Dang (Computer Laboratory, Cambridge); Deng Wei (Peeking Film School); Richard Dyson (St Faith's School, Cambridge); Stephen Greig (Wellcome Institute, Cambridge); Fung Kay Ho (Wembley); Jamal Nazrul Islam (University of Chittagong); Jia Aibing (St Faith's School); Young-sub Kwon (Brunel University); Shiam-far Kung (Cambridge); Michael Lesk (New Jersey); K. Luong (London); Ma Ken-wen (Wellcome Institute, London); Caroline Phua (Singapore); Roderich Ptak (Universität Mainz); Shih Chi (Taipei); Immanuel Wallerstein (State University of New York); Wang Chih-nan (Taipei); and Wu Ai-lun (Taipei).

## POST-GRADUATE SCHOLARSHIPS FROM TAIWAN

In response to a recent approach from Professor Ho Peng-Yoke the National Science Foundation of the Republic of China has agreed to offer scholarships for post-graduate students from Taiwan who wish to visit Britain to carry out doctoral research in the History of Chinese Science and Technology. These scholarships will be tenable either in the University of Cambridge or in London, with the NRI acting as host to the students. The Minister of Education has also written to Professor Ho indicating that his Ministry will now consider adding the title 'History of Science and Technology' to its existing regulations for postgraduate scholarships. The NRI naturally welcomes this new opportunity for contact with talented young Chinese scholars.

## LINKS WITH HISTORIANS OF SCIENCE

A main policy aim of the Institute is to deepen and broaden its links with historians of science outside the East Asian field. This August the Annual Meeting of the British Association for the Advancement of Science at Plymouth saw important progress in that direction. The Presidency of the History of Science section of the BA for 1990–91 was held by the Director of the NRI, Professor Ho Peng-Yoke, while the Recordership was held by Dr. Christopher Cullen, who in addition to his post at the School of Oriental and African Studies in London is also a Senior Research Fellow of the Institute. The section's programme included a session on the life and work of Michael Faraday chaired by Professor Sir Brian Pippard F.R.S.: the speakers were Dr. Geoffrey Cantor (University of Leeds), Dr. David Gooding (University of Bath) and Dr. Frank James (Royal Institution). There were also sessions on the origins of palaeontology and on the roots of scientific creativity, held jointly with the Geology and Psychology sections of the BA. A packed audience heard a series of talks on the history and practice of acupuncture by Professor Ma Kanwen (China Academy of Traditional Chinese Medicine, Beijing), Elizabeth Hsü (National Science Foundation, Washington, Research Fellow, NRI), and Dr. Paul Marcus (Chairman, British Medical Acupuncture Society). These were preceded by the Presidential Address, in which Professor Ho gave an account of the origins and present work of the Institute. He paid tribute to the generosity of the financial support, much of it from East Asia, which has supported this unique British initiative in the field of the History of Science.

## PRESIDENTIAL ADDRESS

History of Science Section
British Association for the Advancement of Science

Historians of science are aware of the contributions made by the ancient civilisations to the early development of science and technology, particularly those of the ancient Greeks. Science in Renaissance Europe was very much indebted to Arabic learning and to what Francis Bacon referred to as the most significant inventions known during his time, namely gunpowder, printing and the compass, all of which Dr. Joseph Needham has demonstrated had originated in China. Britain came into the forefront of science in the 17th century during the scientific revolution and has maintained a leading role in science and technology for more

## CORRECTION

In Newsletter No. 10 it was stated that Professor Liu Zuwei has been responsible for planning the new Chinese translation of *SCC*. The name should be changed to Professor Lu Jiaxi.

than three hundred years. Indeed I wish the British Association well in the part that it can play to help Britain maintain this role through the coming century.

Western science was first brought to China by the Jesuits, but as one can read, for example from Dr. Needham's works, China had already developed its own form of science since ancient times. Some branches of traditional Chinese science, such as mathematics and astronomy, easily fused with the new science from Europe so that after the fusion had taken place in China one can hardly distinguish traditional Chinese mathematics from mathematics, or traditional Chinese astronomy from astronomy – there is no longer any traditional Chinese mathematician or traditional Chinese astronomer nowadays.

Dr. Joseph Needham noted that traditional Chinese mathematics and the physical sciences were the first to fuse with western learning, with the biological sciences coming later, but we have yet to see the day when fusion takes place in the medical sciences. When it will be or whether fusion will ever occur, I am not able to predict. Incidentally the history of Chinese medicine seems to be setting the contemporary trend in research on the history of Chinese science in the Western world. Dr. Needham himself is at present writing the medical volume of his monumental work *Science and Civilisation in China*. One of the three speakers this afternoon, Elizabeth Hsü, is working on the history of Chinese medicine under a National Science Foundation Fellowhsip (Washington) in the Needham Research Institute in Cambridge which is named after its founder, Joseph Needham. The Recorder of the British Association, Dr. Christopher Cullen, himself engages in research on Chinese medicine and is also a Senior Research Fellow of the Needham Research Institute. He delivered the first Joseph Needham lecture in Cambridge this year, under the title *New windows on Chinese Medicine; sickness and healing in a Ming Dynasty novel*.

I have already referred to the leading role played by Britain in the advancement of science and indeed this is what the present conference is about, the British contribution to science. It may be a pleasant surprise for many to know that Britain has also been playing another role in a rather quiet way and without putting a burden on her tax-payers. Let me tell you briefly what this is all about.

In the year 1937 three young Chinese scientists came to Cambridge to do their doctoral degrees in biochemistry. Not only did they succeed in getting their degrees, but they also managed to influence Dr. Needham to the point of diverting his interest from biochemistry to the Chinese people and their culture. During World War Two, Dr. Needham served as Director of the Sino-British Science Co-operation Office in Chungking, where he befriended many Chinese scientists and gained the respect and love of the Chinese people for the work he did for them.

After the War, Dr. Needham returned to Cambridge and embarked on the project of writing a series of books on the history of science in China, under the title *Science and Civilisation in China*, originally intended to be only in seven volumes. Volume 1 appeared in 1954, volume 2 in 1956, and volume 3 in 1959. By then he had already gained a reputation as the world authority on the history of Chinese science. The success of the first three volumes of the series, the ever growing amount of research material that had been accumulated and the encouragement from the Cambridge University Press resulted in the gradual increase of the number of physical volumes of the series. To date fifteen physical volumes have gone through the Press, three are on the way there, and about a dozen more have yet to be written.

This monumental work of Dr. Needham began in the Gonville and Caius College in Cambridge, first in Rooms K1 and K2 and then at the Master's Lodge. In 1976 Dr. Needham retired as Master of Gonville and Caius College; he then had to find somewhere else to carry on his work and to house his books. Meanwhile he had formed a Trust to which he donated his own library. The Trustees and the Cambridge University Press found him some sort of accommodation, first in a prefabricated building and then in one of Cambridge's older buildings at Brooklands Avenue. The place was given the name "East Asian History of Science Library", but space was never adequate.

In the 1980's the Trustees were invited to erect a new building at a site within the grounds of one of Cambridge University's newest colleges – Robinson College. The Institute houses the library and provides sufficient working space for the *Science and Civilisation in China* project. Money for the building was provided mainly by the people of Hong Kong and a Chinese banker in Singapore, with a sizeable contribution from the Kresge Foundation of the United States of America. The whole building was completed in May 1991 and houses the Needham Research Institute which runs the East Asian History of Science Library and looks after the whole project of *Science and Civilisation in China*. Furthermore, it has taken on new academic activities, such as (1) helping in the training of young historians of East Asian science by assisting them to secure financial grants and offering them facilities in the Institute, (2) providing working facilities for scholars of East Asian science, (3) creating links with institutions in East Asia in the promotion of the history of East Asian science. The focal position of the Institute for the history of East Asian science is generally recognised. For example the people in Osaka, Kyoto and Nara in Japan are now mounting a 200 million pound project to build an International Institute of Advanced Studies. That building is expected to be completed by the end of 1992, and within this new Institute there will be a Centre of East Asian History of Science. Recognising the important position of the Needham Research Institute, the Japanese organisers have been seeking advice from Cambridge in the hope of building a tie between the two institutions.

In addition there is an excellent working relationship between the Needham Research Institute and the related centres of research both in mainland China and in Taiwan. Scholars have come from across the Atlantic and from East Asia to do research at the Institute. Fellowships are provided for example by The Daiwa Anglo-Japanese Foundation, and the National Science Foundation, Washington. Research grants to help Dr. Needham are provided by the National Institute for Research Advancement in Japan and the Chiang Ching-kuo Foundation in Taiwan. The latter has also provided a generous grant for the writing of an abridged version of Dr. Needham's work, known as the *Shorter Science and Civilisation in China*, and a subvention for the purchase of books in the Library.

Dr. Needham is now in his 91st year. He is relying on collaborators in Europe, North America and East Asia to write the other volumes of the *Science and Civilisation in China* series. In this way The Needham Research Institute plays an important role as a centre for international co-operation. This is a British contribution to international goodwill and understanding through the study of the history of science.

I am afraid that everyone must have waited long enough to listen to what the speakers this afternoon have to say on traditional Chinese medicine. Without further ado, I hand the floor to the next speakers.

H.P.Y.

# THE JOSEPH NEEDHAM LECTURE, 2 MAY 1991

The editor of the Newsletter has kindly offered me space for a summary of the lecture that I delivered at the invitation of the NRI and of Gonville and Caius College. I hope that an expanded version of the lecture will eventually appear in print, and rather than offer a precis of what I said I think it would be better to offer some less formal reflections on the topic that I chose.

First a few words on my choice of topic. My lecture title was 'New Windows on Chinese Medicine: Sickness and Healing in a Sixteenth Century Novel'. As this title implies, I was attempting to use a fictional source, in this case the erotic novel *Jinpingmei*, to investigate aspects of pre-modern Chinese health care that do not readily appear in the 'official' medical literature. By the term 'official' I refer both to government sponsored medical compilations and to the many books written by private individuals who located themselves somewhere within the broad traditions of the great medical classics. I do not mean to denigrate studies of such sources in any way. But quite apart from the desire to open up a new line of investigation for its own sake, I was driven by a sense that there were dangers in assuming that the official literature enabled us to form a picture of what Chinese health care was actually like.

In the first place, we can be sure that Chinese people did not give medical men anything like the same degree of deference in health matters that we do today in Europe and America. The almost god-like authority of modern practitioners was only acquired after a strenuously fought nineteenth-century public relations effort ostensibly based on claims that their therapy was scientifically based. In the second place the Chinese medical literature as we have it today is drawn

from only one of the many types of health care agent we know to have been active in pre-modern China — the literate male classical practitioner. Most ordinary Chinese people would never have consulted one of these in their lives. Any health care they received would have come from such persons as family members with a smattering of lore, local herbalists, 'wise women', priests, and perhaps from time to time an itinerant medicine vendor who might have some pretensions to book-learning.

As I read through the *Jinpingmei* I was struck by the way in which its author's references to medical matters were thoroughly consistent with the pluralistic and eclectic model of health care systems that most scholars agree is our best bet as a working hypothesis for pre-modern China. The prosperous but unscholarly household described is visited by several different types of healer in the course of the lengthy narrative. Not unexpectedly there are a number of literate male classical practitioners. Even here, however, there are some unexpected sidelights on their relations with clients and the ways in which status was validated. Thus, for instance, it is taken for granted at one point that a patient will be more likely to trust a healer who has been trained in the State Medical College, Taiyiyuan, despite the usual consensus amongst historians that this institution played little or no role outside the official bureaucracy.

But it is in the richness of its references to the wider variety of healers that the interest of the *Jinpingmei* lies. We read of the activities of Daoist and Buddhist priests and nuns, of what seems to be a pox doctor, of midwives and various other women. In addition the ordinary characters of the novel express their views on health care questions in detail. From my point of view the most interesting case is that of Old Woman Liu, wife of a blind fortuneteller and charm vendor. She functions in effect as the family practitioner for the women of the household and their children, despite the strong disapproval of the male characters. Her therapies range from spirit possession rituals, similar to those mentioned in other literary sources and authenticated by modern anthropologists, to drug prescriptions which make good sense on the basis of the contemporary pharmaceutical literature. Unlike the classical male practitioners in the novel, she also uses acupuncture and moxibustion. Wherever possible the women prefer her services to those of male healers. It is not for nothing that she draws the sarcastic tribute of a manservant who calls her 'The Lady Doctor'.

Of course throughout we must remember that we are dealing with a fictional document written by a single man rather than an objective survey carried out by a medical anthropologist in a time-machine. Undoubtedly the author makes the medical references in his text for a variety of dramatic purposes. It does not seem to me, however, that he has any particular medical axe to grind which would bias his treatment of health care matters unacceptably. In addition I have frequently been able to cross-check his medical references in contemporary non-fictional sources, and the correspondence is close. Incidentally, one conclusion that follows from this is that it may not be possible to draw a firm boundary between specialist medical literature and what was accessible to any educated person.

My lecture was no more than a preliminary exploration of some fascinating territory. I hope it will stimulate further work in a field that is so wide and rich that there is no risk of researchers running out of topics or treading on one another's toes. I am deeply grateful to the sponsors of the lecture for giving me the opportunity of undertaking this research, and I hope that Joseph Needham himself will find it an acceptable tribute to his own role as one of the most successful starters ever of academic hares for others to follow.

Christopher Cullen

# CO-OPERATION WITH KANSAI SCIENCE CITY

In the belief that, after having developed into one of the world's leading economic powers, Japan should make a greater contribution to world peace and prosperity in the 21st century by extending and developing the present knowledge of the fundamental sciences and by promoting creative academic research, the people of the three cities of Kyoto, Osaka and Nara are building a new city which will have access to traditional culture as well as modern science and research facilities. This is the so-called Kansai Science City, located in Kei-Han-Na hills, between the three cities mentioned. Among the many projects in this new city is the International Institute of Advanced Studies. Construction of the building begins this year and is expected to be completed by the end of 1992. The Director of the Institute is Dr. Michio Okamoto, formerly President of Kyoto University.

It is proposed that there will be a 'Center for the History of East Asian Science' within the International Institute of Advanced Studies. The two persons charged with the responsibility of planning this unit are Professor Kunio Gotō of St. Andrew University outside Kyoto and Professor Shigeru Nakayama of Kanagawa University. Discussions between these two scholars and Professor Ho Peng-Yoke have been taking place since 1990, to explore areas of mutual co-operation. The first meeting took place in Osaka in September 1990 when it was proposed to hold a workshop which duly took place in Kyoto on the 19th and 20th January 1991. Professor and Mrs. Gotō subsequently visited the Needham Research Institute to attend the Opening Ceremony of the South Wing on the 10th May 1991. The following is a brief report of the proceedings of the workshop, which was held in January.

The workshop, attended by 29 persons, was held at the Kyōdai Kaiken, (Kyoto University Association), near Kyoto University. It began at 1.00 p.m. on 19th January with an opening speech by Professor Michio Okamoto, Director of the International Institute of Advanced Studies. He was followed by four speakers who reported on research in the history of science in China and in Japan, i.e.:
Shigeru Nakayama, on Research in the History of Japanese science in Japan; S. Coleman, on Research in the history of Japanese science in Britain and the United States of America; Ho Peng Yoke, on Research in the history of Chinese science at The Needham Research Institute, Cambridge; Keiji Yamada, on Research in the history of Chinese science in Japan.

A general discussion followed the reports. The meeting adjourned for dinner, at which a speech was made by the Chairman of the Council of the International Institute for Advanced Studies, Azuma Okuda.

On the second day of the workshop, Professor Kunio Gotō presented a report on the previous discussions held between himself and Professor Ho Peng Yoke. The whole session, lasting from 9.30 a.m. to 12.00 noon, was devoted to discussions and recommendations. The following points directly relating to The Needham Research Institute were discussed:-

(1) the possibility of NRI helping with the production of English translations of Japanese texts on the history of science, particularly those pertaining to East Asia and perhaps also with their publication, with renumerations for translators and the cost of publication to be borne by Kansai.

(2) the Japanese are very grateful that NRI is looking after scholars from Japan under the Anglo-Daiwa Foundation scheme, and feel that Japan should take the responsibility for seeking funds to look after Japanese scholars working in the NRI.

(3) the hope that mutual help will continue between Japanese libraries, the NRI collections, including means of enriching the Japanese holdings of NRI.

(4) the feasibility of using NRI as an outpost or agency for the Kansai International Institute for Advanced Studies, the parent body of the proposed Center.

Co-operation between the proposed Center and the Institute of the History of Natural Sciences in Beijing was also discussed.

The Workshop ended at 12.00 noon.

H.P.Y.

# A KOREAN BRONZE MIRROR

Sungsil University Museum, Seoul, preserves a bronze mirror made between the 4th and the 1st centuries B.C. in Korea's Bronze Age. It is often referred to as *tanyu semun' gyong*, being a bronze mirror with twin knobs and a fine linear geometric pattern, with a diameter of 21.2 centimetres.

It is believed that the mirror was discovered in the area of Chungchong-Namdo Province in the 1960's. The ingenuity and delicacy of the geometric design and the elaborate moulding technology are of staggering quality, and this mirror illustrates the culmination of moulding technology.

A close-up look at the mirror reveals that the accomplishment of the design still remains a mystery, with 13,000 circles and straight lines drawn on a circular area which is less than 20 centimetres in diameter. How could it have been possible for those who lived in the 4th century B.C. to accomplish the work? Or how long did it take? Those are at present unanswerable questions.

Despite the admiration of the mirror expressed by many scho-

lars, no systematic attempt has been made to investigate the process of construction, but an experiment has recently enabled me to review the design of this bronze mirror. In the course of this research several remarkable facts have come to light.

The following are some of the findings. The design of the mirror was based on three major concentric circles. In the inner part, five bold concentric circles were laid out, and a total of 3,340 lines including rectangles, diagonals, numerous parallels and oblique lines were then engraved.

The middle part was covered with ten 0.5 millimetre-interval fine lines, at intervals of 0.5 mm. 3-layer to 5-layer fine or bold lines at an interval of 1 cm were then inserted: and 48 equally divided rectangular shapes were engraved with diagonals. Then the area was drawn with approximately 4,230 lines at intervals of 0.35 mm.

The outer part was covered with eight figures consisting of 30 concentric circles at points of the inscribed square; the remaining space was decorated with about 5,730 parallels and crossing oblique lines.

Such a design makes the total number of lines engraved on the bronze mirror approximately 13,300. As it is far from easy to draw fine lines at intervals of 0.3 mm, even with modern drawing instruments, the question of how and where such a design was drawn and of how a mould was cast is a mystery. Moreover, the flawless manner in which the bronze mirror was moulded is far beyond our comprehension.

This is clearly one of the mysteries of the Bronze Age in the Korean Peninsula. In an age in which neither compasses nor precise rulers were available, the craftsman must presumably have constructed drawing instruments on his own, and it must have taken the best technician his whole life to fulfil such a work. Several twin knob bronze mirrors have been found in the southern part of the Korean Peninsula alone, thus suggesting that the bronze technique was at its best in Korea during that age.

It is not yet known whether these bronze mirrors were made from moulds of stone, clay or wax. Research conducted by a Japanese experimental archaeologist, demonstrating that a clay mould reproduces the best form of bronze mirror, appears to be convincing. In any case, with its unique and delicate designs, perfect and precise moulding technique, extremely refined craftsmanship, and unmatched aesthetic sense, the bronze mirror with twin knobs preserved in Sungsil University Museum may be judged to be a monumental work in the manufacturing technique of Korean bronze mirrors.

In addition to their unique overall design, these bronze mirrors are characterised by the peculiarity of alloy ingredients. One example found in Pongsan, northwestern Korea, from ruins of the 4th to the 3rd century B.C. proved to be of zinc-bronze which consisted of Cu, Sn, Pb, Zn, Fe in proportions of 42.19%, 26.70%, 5.56%, 7.36%, 1.05%, of the whole respectively. Referred to as Korean bronze, the zinc-bronze relics have been and are being discovered at Bronze Age ruins in the Korean Peninsula.

The two most characteristic bronze objects from Bronze-age Korea (*c.* 1000–300 B.C.) are bronze daggers and mirrors with peculiar features. Zinc-bronze discovered from the 10th century B.C. ruins was believed to have originated from a unique source different from that of China. The originating source of the technique has not yet been fully known. It is certain, however, that the technique was developed in the broad area ranging from the northern part of the Korean Peninsula to the Liaotung Peninsula.

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