The Sixth Column

A "Chinese" Appraisal of a Book on Chinese Science

How would a scientist living in China review **Scientific and Engineering Manpower in Communist China, 1949–1963** (National Science Foundation, Washington, D.C., 1965. 608 pp. Paper, $2) by Chu-yuan Cheng?

Let us imagine our reviewer to be one of the "1200 prominent scientists and engineers of Communist China" listed and described in appendix 4—the first Who's Who in Communist China's Science and Engineering. He is one of the 616 in the list who have been trained in the West, and one of 332 who are politically active—a member of the Communist Party and one of the most prominent of the "several hundred scientists and engineers" elected deputies to the National People's Congress of 1965 (p. 265). He is a key member in a number of China's top research policy bodies (p. 15)—the head of one of the institutes and member of a number of committees of the Chinese Academy of Sciences (pp. 16–31, 322–366). The citations of his writings in the text and bibliography show him to be a world-renowned research leader as well as one of the men who have been shaping China's research policy since 1949.

As he has done often in the past, our reviewer writes his memo for private circulation in the hard core of research-policy makers who are working intensely to make China's basic and applied research in all key fields "approach the most advanced levels attained in the world" (*1*). Most members of this group have successfully ignored the past oscillations of the party line: the "blooming and contending" movement of May 1956 (p. 257), the "anti-rightist campaign" of June 1957 (p. 260). Our reviewer can afford to ignore also the current "great cultural revolution" (*2*) aiming "to sweep away a horde of monsters that have entrenched themselves in ideological and cultural positions" in China. Professional party leaders being numerous in the research policy community, the reviewer uses the party jargon in his memo perhaps more than he is ordinarily inclined to. Such is our reviewer, and this is his review, for which I bear no responsibility:

"Americans are strongly supporting research abroad. For instance, during the last three years they have allotted for this purpose 15 million dollars to India and a like sum to countries in Latin America (*3*). So far they haven't produced a single serious study that I know of on the research-policy problems of these countries. Yet this is their third scholarly book (*4*) since 1961 on the development and use of research in our country. This book deals with the key problem of our research policy: the training, the quantity and quality, and the utilization and employment of scientists and engineers in basic and applied, social and natural sciences. The forewords by officials of the National Science Foundation, which sponsored these studies, indicate that the effort to appraise our research policy will continue. This is my proposal for a consistent policy toward such studies.

"Americans are producing these studies in order to base their policies on realistic appraisals of our strengths and weaknesses. I suggest that we turn their efforts to our own advantage. As Chairman Mao has said, 'Correct ideas can come only from social practice, from the three kinds of social practice, namely, production struggle, class struggle and scientific experiment' (*5*). The social practice of the Americans in doing scientific research, in planning it and developing it, is much greater than ours. 'The long term prospects,' says the author on page 8, 'for Communist China's scientific development, as well as the growth in scientific and engineering manpower, will be contingent upon the leadership's ability to overcome many related problems.' Using the objective methods derived from the imperialists' greater experience, the author then proceeds to identify and analyze some of these 'related problems' of ours, thus pointing the ways to their solution. As a matter of conscious policy we have been making a considerable effort to learn from the enemy in matters of technology. During its first five years, my institute alone has taken apart, reconstructed, and sometimes improved 875 complex apparatuses and processes imported from imperialist countries, and 690 of them are now being produced or used in our factories. It is equally important, though more difficult, that we proceed to do the same thing with their inventions in social technology. I suggest that we start by making systematical use of all such studies as this book.

"The history of our Party teaches that in learning from the class enemy we must carefully sift the chaff of his class bias from the rational, scientific kernels he produces to pursue his aggressive policies toward us. The author repeatedly recognizes 'the Chinese Communist progress in scientific manpower and scientific research' (p. 276). Blinded by class prejudice, however, he does not attempt to learn from our social practices. He does not even consider the possibility that our progress in science has been achieved *because of* and not, as he says, *in spite of* (p. 276) our political system and the past policies of the Party, From our point of view, this is the most welcome result of the author's class bias. There are many others: his tendency, for example, to stress exclusively the negative and to ignore the proven positive results of our 'mass science' policy: his unproved assumptions (chapter 4), based on fragmentary materials from one of our discussions, about the alleged sacrifice of quality to quantity in our training of scientific and technical manpower. The class bias of the imperialists and their scholars serves us as a sixth column in the enemy camp. It has successfully prevented them so far from studying and objectively analyzing such problems as the social and historical roots of communism, the social forces giving rise to its spread throughout the world. Above all, it has kept them from studying objectively the policies of communist countries as positive factors in their internal growth and development. The major methodological lesson we can learn from this is that we must not tolerate a similar sixth column in our midst—the biases arising from our theory and preventing us from learning rapidly from practice

(*6*). We must study objectively the social and historical roots of the continuing development of the imperialists' economy, science, and technology. Above all, we must not allow our own ideological biases to prevent us from studying objectively our own policies to see how often our science has indeed developed in spite and not because of them. This much—and there is much more—we can learn from the negative aspects of this book.

"Guided by the idea that science is one of 'the three great revolutionary movements,' that it should be one of 'the five loves' of all of us, and that we must catch up with world science, dozens of institutions all over China during the past 17 years have been producing scientists and engineers, building institutes, and carrying on major and minor projects, without anybody's having an overall view of these activities. Our 1956 plan reflected the state of the Russian planning of science at that time; it was only a sketch of the principal directions we thought our research should develop in. Since then we haven't produced anything resembling a review of where we are with respect to even that plan. Our research has been growing anarchistically, as we say the capitalist economy grows. It has been growing on the basis of the initiative of state and party officials and individual scientists, without anyone's considering the total process with any kind of objectivity. On page 6 of this book the author says: 'Another major handicap in the study is the general unreliability of Chinese Communist statistics . . . Statistics for scientific and technical manpower are even scarcer, since the government has not issued annual or cumulative figures in the field . . . The dearth of statistics is also reflected in the absence of concrete data with respect to scientific and technical manpower in both the First Five-Year Plan and the draft of the Second Five-Year Plan.' To this perfectly true statement I would add: this is our major handicap in developing an objective research policy. The government has not issued such and other needed statistics because it does not have any to issue. None of our major research-policy bodies knows how many researchers we are producing, where they are employed, what fraction of our national resources we invest in research, and how we distribute it among the various branches of research. The indicative planning of all the essential elements of research resources, the statistical methods necessary for such planning, are a recent social invention developed primarily in the imperialist countries. They are using this invention with increasing effectiveness. Starting from their own experience, American specialists are asking themselves questions about our research resources which we haven't asked ourselves. By a patient collation of thousands of scattered data from hundreds of our sources the author of this book has drawn the first overall picture anyone has produced of the state of our research-manpower resources. No test I could think of has shown that this picture is wrong. From the three major studies produced by the imperialists I conclude that the best books about China's science are written not in China but in the U.S.A.

"Our social theory must not prevent us from importing and using effectively the new social technology invented abroad. To catch up with the world's best science, we must develop the world's best scientists—best in number and in quality. This study can help us to estimate where we are in relation to this goal. In this case it is the misapplication of one of the most important thoughts of Mao Tse Tung—'Politics must be in command'—to the field of statistics that prevents us from importing this key product of the scientific revolution. Theoretical and applied statistics is as much a science as physics, chemistry, or astronomy. The methods of statistics must be independent of politics as are the methods of any other branch of natural science. As with physics and chemistry, 'politics must be in command' only in the use of the results for political goals. If applied, as we have done and are still doing, to the methods of statistics (*7*) and to the publication of statistical data, the slogan leads straight to the destruction of statistics as an essential tool of development policies.

"This study shows that the imperialists know our present strength in research manpower and many of our weaknesses. They learned them from our own public sources and data, which it is impossible to keep secret. They did not keep the results of their study secret. They publish such studies so that any scholar in the U.S.A. and abroad can critically examine the method on which the study is based, its conclusions, and its predictions, and can publicly criticize and correct them and thus help the imperialists to form a realistic picture. Our continuous secrecy in these matters does not prevent the enemy but only ourselves from learning about our science and technology.

"There are, besides these, numerous other lessons we can learn from this and from the previous studies of our science by the imperialists. I suggest that we do so by openly discussing such studies in our central science-policy bodies.

"Basing himself on the thoughts of Chou En-Lai and Mao Tse Tung, the author concludes his appraisal with these words (p. 287): 'Communist China . . . will eventually build up a sizable scientific force, although not by 1967, as scheduled. More likely, it may be another 20 to 30 years.' We are preparing a number of surprises for our enemies both East and West, of the kind the Russians shocked the Americans with in 1957 by launching the first satellite. We must use these surprises for political gains as the Russians have so skillfully done with their space program. The most effective political weapon we can have, however, is not in individual projects but in the acceleration of the overall growth of our science and technology. To shorten the '20 to 30 years' we will have to import from abroad the social inventions for the development and use of research, and improve them by skillful use of the strong points of our social system and Party policies."

Setting aside our Chinese scientist's review, I turn with interest to an article in the *Peking Review* of 24 June 1966 (reprinted from *Renmin Ribao* of 19 June) by Lin Piao, considered to be the successor of Mao. Having Chinese statistics on my mind, I note with interest that he says, "China has a population of 700 million." Leafing further in the same issue, I see that Chou en Lai speaks of the "650 million people of China." Thus our reviewer's observations about the lack of appreciation of statistics in his country are confirmed by the highest authority.

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References and Notes

1. Chou En-Lai, "Report of the proposals for the second five-year plan for the development of the national economy," in *Eighth National Congress of the Communist Party* (Foreign Languages Press, Peking, 1956), vol. 1, p. 316. This goal is also defined elsewhere in that volume, and in other documents, some of

them cited in the book under review—for example (p. 287), a speech by Chou En-Lai in February 1963.

2. Editorial in *Renmin Ribao*, "Sweep away all monsters," reprinted in *Peking Review*, 3 June 1966. Concerning my assumption that our reviewer can ignore the oscillations of the party line, see note *6*.
3. Table C-38 in "Federal Funds for Research, Development, and other Scientific Activities," vol. 14, *National Science Foundation Publ. 65–19* (1965).
4. The others: L. A. Orleans, "Professional Manpower and Education in Communist China," *National Science Foundation Publ. 61–3* (1961); S. H. Gould, Ed., *Science in Communist China* (AAAS, Washington, D.C. 1961).
5. Mao Tse Tung, "Where do man's correct ideas come from?", *Current Background* (Hongkong), No. 740 (31 Aug. 1964).
6. The argument I have attributed to the imaginary reviewer concerning the relative priorities of social practice and theory, as well as my assumption that he is free to utter the argument, is based on actual events in China. A hard core of scientists and engineers engaged in some major basic and applied research projects in China has not, so far, been affected by the shifts in party line mentioned earlier; and during the last few years a number of them have carried on in the party's theoretical journal *Hung-ch'i* and elsewhere an intense debate on such issues as: which is primary in the natural sciences—the criterion of practice, the experiment, or the theory? How can one be at the same time "professionally expert and politically red"? For the best review of the debate on the first question, see Ho Tsu-hsiu (described on page 435 of the book under review as a member of the Institute of Atomic Energy and the Institute of Mathematics—both in the Chinese Academy of Sciences—and of the Laboratory of Theoretical Physics in the Joint Nuclear Research Institute at Dubna, U.S.S.R.); "More on the question of the criterion of practice in the study of natural sciences," *Hung-ch'i*, No. 10, 23 May, 1964. In this article, Ho Tsu-hsiu sharply attacks those who deny the relative truth of theories. His conclusion that "practice is the criterion for the testing of truth, and practice can accurately distinguish the correct and mistaken knowledge . . . Practice, knowledge and again practice. . . . This is precisely an important law in the development of truth," is the basis of my imaginary reviewer's argument.

   All of this debate is carried on in Marxist terminology by prominent scientists who are both red and expert. One startling Marxist conclusion is to be found in an article by the historian of science Yin Mei-ch'in headed "Can we defend the viewpoint of 'only professionally proficient but not politically red' by citing Newton's case?" (*Chun-Kuo Ch'ing-nien Pao*, 3 Apr. 1965). Yin debates there against two physicists who have suggested that Newton was, after all, a good scientist, though he was not politically red. To this Yin replies: "Newton indeed knew nothing about Marxism-Leninism because he died before Marx was born. It is precisely because it was improbable for Newton to learn thoroughly and master the Marxist theory of dialectical materialism that his contributions—however impressive and significant—had their serious limits."
7. C. M. Li, *The Statistical System of Communist China* (Univ. of California Press, Berkeley, 1962).

Food Crops in India

Introduction to Agricultural Botany in India (vol. 1. Asia Publishing House; Taplinger, New York, 1965. 480 pp., illus. $18), by G. V. Chalam and J. Venkateswarlu, was written as a textbook for use in Indian agricultural colleges, and as a supplementary reference work for graduate students and research workers who need information about crops grown in India. In the first of the two projected volumes, three chapters, encompassing 81 pages, are devoted to the basic principles of reproduction in plants, to genetics in relation to plant breeding, and to the plant-breeding procedures used in crop improvement. A glossary at the end sets out the meanings of over 530 terms.

The main body of the book is devoted to chapters on rice, wheat, barley, oats, maize, sorghum or great millet, and to other members of the family Gramineae (Bajra or pearl millet, ragi, Italian or foxtail millet, barnyard millet, little millet, proso or hog millet, and kodo millet). Each of these chapters contains a great fund of information on the history, origin, taxonomy, morphology, physiology, cytology, inheritance, breeding, and special aspects of the respective crops. In addition to treatment of the basic principles, much attention is given to summarizing and tabulating existing knowledge, and many literature citations are included. For example, the chapter on rice contains a 3-page tabulation of mutations and a 14-page listing of the early, medium, and late varieties grown in the various Indian states, which gives the parentage, sowing season, duration, yield, and quality of rice produced. The chapter on wheat contains a 9-page table setting out the main improved varieties of wheat grown in India, and their origins, regions and conditions of suitability, and main characters. The book is well illustrated with textual drawings and a useful series of halftone plates.

Volume 2, now in process of publication, will contain chapters on oilseeds, pulses, fibers, spices, and tubers. Thus in the two volumes there will be brought together a summary of much that is known of the major crops of India and of what has been done to improve their productivity. These volumes should be most useful to anyone preparing for or undertaking plant-breeding work in India or in any other country where similar crops are grown.

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The Nature and Functions of Sleep

During the past several years there has been a marked increase in research on the phenomena of sleep. The increase can be traced to the now widely known discovery by Aserinsky and Kleitman [*Science* **118**, 273 (1953)] of rapid conjugate eye movements (REM's) during sleep and to the subsequent series of studies by Dement and Kleitman [*Electroencephalog. Clin. Neurophysiol.* **9**, 673 (1957); *J. Exp. Psychol.* **53**, 339 (1957)] which led them to conclude that REM's reflect visual scanning activity in dreams and that REM periods might be used as an objective definition of the dream state.

One manifestation of the high level of interest which these proposals stimulated is the impressive list of relatively up-to-date books now available summarizing various aspects of research on sleep. **The Psychology of Sleep** (Scribner, New York, 1966. 281 pp., illus. $6.95), by David Foulkes, and **Sleep** (Coward-McCann, New York, 1966. 335 pp. $5.95), by Gay Gaer Luce and Julius Segal, are the most recent additions to the list.

The volume by Luce and Segal is a popular discussion of research on sleep. It is a much expanded version of an earlier monograph written by Luce for the National Institute of Mental Health and summarizes recent research findings in the area of sleep for the public and interested scientists. Its scope is broad, beginning with a discussion of biological clocks and including useful, up-to-date summaries of material on the biological, psychological, and medical aspects of sleep. It emphasizes the future—the kinds of practical applications which may one day develop from the basic research now in progress. There is some degree of oversimplification and overgeneralization present, but remarkably little for a book of its type. The book is obviously the product of skilled science writers who are as devoted to educational objectives as they are to the interests of their general public.

Foulkes's book is concerned primarily with "sleep mentation"—reports of dreams, thoughts, and images described by subjects after being awakened in the laboratory. Great emphasis is placed on comparisons among sleep onset, REM sleep, and non-REM sleep in terms of the relative frequency with which awakenings elicit