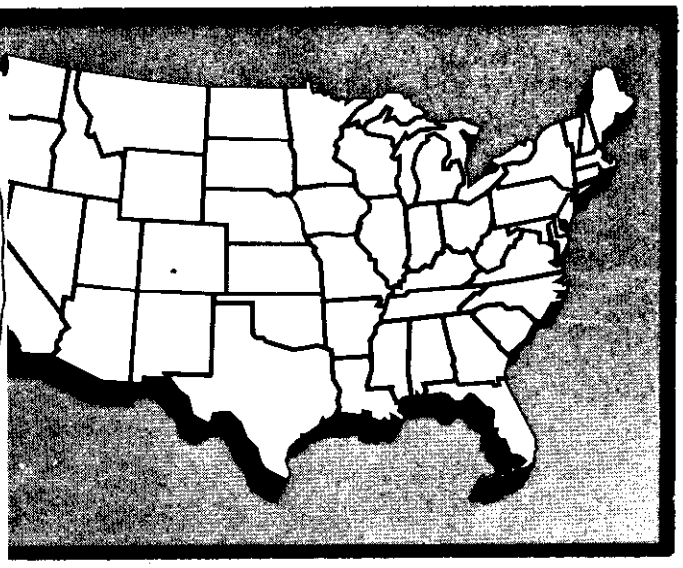

R&D Policy in China after the cultural revolution

Alexander Schnarch

The objetive of achieving closer ties between research and application has led to drastic changes in the relationships between R&D's operations and the universities, industrial plants and the workers.

In 1966-69, China was convulsed by and upheaval, called the Great Cultural Revolution. The country began to experiment with new ways of organizing science and production, in order to relate science, research and development to the immediate needs of industry and agriculture. Research institutes were urged to combine production with research and even to establish their own factories, in an effort to reduce the gap between research and production.

The negative aspects of the educational system prior to the Cultural Revolution were summed up in the Chinese slogan "san t'o li" (three separations or three divorces), divorce from proletarian politics, from workers and peasants, and from production. The solution —according to Maoist policies— is to develop new ways of serving the interests of workers and peasants, to eliminate practices prejudicial to their interests, and to reorganize structures and procedures so that education and production, theory and practice are more intimately related.

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It is said that the Cultural Revolution is directly linked with Chinese tradition, and true understanding of it calls for study of the origins of the Communist Movement *(1)* In the present context, however, we are only interested in the description of some of its immediate effects on industry and university, since its consequences are not only reflected in these institutions, but extend to every aspect of Chinese society.

Changes in Technical Education

Before the Cultural Revolution, universities developed according to the Soviet pattern. But the revolution aroused criticism of this model, which "divorced the universities from the mas-

ses". On August 8, 1966, the Central Committee of the Communist Party issued an important statement, the tenth point of which refers to educational reform: "To reform the old educational system together with the old principles and methods of teaching is an extremely important task in the Great Cultural Proletarian Revolution going on".

...In all teaching establishments there must be a total application of policies stated by comrade Mao Tse Tung which say that education must serve proletarian policies and be combined with productive work, in such a way that all of those who receive education will be able to develop morally, intellectually and physically and become educated workers with a socialist conscience" *(2)*.

One of the elements that sparked off this revolution, was that the student selection at universities tended —according to the critics— to reconstitute an intellectual caste, because certain sectors were excluded *(3)* In effect, before 1966, students were admitted to institutions of higher learning on the basis of entrance examination scores. The Ministry of Higher Education would, in consultation with other ministries, establish quotas for various universities and departments and determine the enrollment distribution pattern throughout the country. Students would then go to designated examination centers and take examinations in five or six fields of study, including a foreign language. After 1958, exemption could be made for workers, peasants and veteran cadres who could be recommended by local education authorities in lieu of taking the national examination, and could be tested only by the institution to which they applied *(4)*. But even then the great bulk of the population remained outside. For example, in 1958 approximately 37 percent of the college students were of worker-peasant origin, this accounting for 85-90 percent of the population.

When schools began enrolling students in 1969 and 1970, after a three-year break, it was stipulated that only those who had worked for at least two years after leaving school would be eligible for admission. The Science and Education Group of the State Council would determine allotments, in consultation with university officials, and candidates would be recommended by fellow workers and approved by the local revolutionary committee. The criteria for admission were: political consciousness (as demonstrated in work and attitudes), cultural level (the ability to do academic work), health and family background. Since 1972, enrollment procedures have been systematized into a four-step process: voluntary application (permitted but not required), recommendation by the masses;approval by the local Party Committee; and examination by the school. The last, it should be noted, is secondary.

The Role of the Universities

Contrary to most other countries, which assert that universities or other institucions of higher learning must be politically nonpartisan or neutral, China is overtly political in its educational system in that it is designed to foster a particular class interest. This is not a uniquely Chinese position, but it harmonizes with the writings of Marx and Engels on the classist character of education.

The universities —according to Mao— must combine learning, production and scientific research. Students should no longer "study behind closed doors" learning abstractions that have little relevance to China's pressing needs. Emphasis should be placed on the immediate and the practical, on eliminating deprivation and inequality and building a solid foundation for future growth. Students and faculty should participate in production, discover its needs, and conceptualize new ways of meeting them. Conversely, factory workers should participate in education. Master workers and technicians should teach their skills part-time, and while teaching, learn new techniques to take back to their work units. There is strong emphasis on reciprocity in worker-scholar relations. Text books, especially of foreign origin, should all be rewritten, making them more succinct and apposite. And study of books of any sort should

occupy a smaller proportion of students' time *(5)*

Several chages have taken place in didactic methodology, one of the most significants, being the introduction of workers, peasants and working soldiers both as teachers and students. "Such members of the labor fource bring practical experience and problems to the classroom, the first for dissemination and the second for solution. Upon graduation, it is anticipated that, armed with theoretical science, these individuals will themselves serve as a focus for education of others. In addition, they will be in a position to combine theory with practice" *(6)*. Collective learning is also promoted, aimed at raising individual competence. No grades or academic titles are awarded to graduates, but only a certificate so that they cannot be differentiated from other workers lacking that privilege.

In general, the aim is a closer relationship between the university and the productive sector. Many universities not only work at production, but also operate their own factories. Peking University has seventeen departments with over sixty specialities, and a teaching staff of over two thousand (February 1973); there are ten science departments, each of which operates its own factory. In addition, the university has established formal links with more than sixty industrial plants and with numerous agricultural units.

Triple Union Groups

Industrial and mining enterprises began to be affected by the Cultural Revolution in early 1967. This stage was ushered by a *People's Daily* editorial on December 16, 1966 entitled: "Welcome to the extension of the Great Cultural Revolution to indstrial and mining enterprises".

To the Chinese way of thinking, in capitalist factories, the separation between manual and intellectual work is manifested in the distinctions between immediate production work, assigned to workers, and the work of the engineers and technicians who direct the productive processes and make decisions concerning the introduction of changes in the work processe, machinery needs etc. One of the aims of the cultural Revolution was to eradicate this aspect of work divisions.

One of the results of this struggle has been the constitution of what in China are denoted "groups of triple union"; that is to say, groups responsible for technical matters and composed of workers, technicians and composed of workers, technicians and cadres. These groups are responsible for the technical transformation of factories, technical rennovation, innovation, etc. They try to avoid the dimenation of scientific and technological theoretical knowledge on one side and "practical" knowledge on the other" the first having been the exclusive domain of engineers or technicians, while "practical" knowledge was once considered to be composed of simple details calling for simple manual skills. The Chinese claim that the primacy of theory, "tied to the bourgeois conceptions and the capitalist division of work", tends to make every production procedure in capitalis society that is not theoreticaly justified, unacceptable.

The Cultural Revolution has shown that millions of innovations were blocked by technicians because they did not think them in accord with the scientific and technical conceptions that they had been taught.

The "triple union group" has facilitated introduction of a considerable number of technical innovations. These innovations are not only applied to the production of new machinery but also to modification of existing equipment. These are no longer considered immutable and unchangeable things, but objects which the workers themselves can transform.

The fifth point of the August declaration, calls on the people to "develop the scientific innovations and start a technical revolution to reach and surpass the advanced international levels". Campaigns for technical innovation are encouraged throughout the country and there is exchange of experience between different factories, at national conferences held for this purpose.

Researchers as Workers

Through the activity of the "groups" not only are technical personnel changed, but the nature of the relationship between workers is altered. And to this must be added the participation of the engineers and technicians in manual work. In effect, in China administrative and technical staff must share in productive labor, for four reasons: 1) In the first place, in order to assure that the cadres will have direct contact with reality and practical problems, the decision makers are not allowed to remain chained to their desks, but rather to acquire concrete knowledge of the problems by spending time at the work site. 2) In the second place, participation of cadres in manual work is conceived as a way of ensuring essential contact with the masses, and set apart from them, with different habits and customs. 4) Another purpose of this program is to elevate the concept of manual work *(7)*.

Another aspect of the Cultural Revolution in industry, is the restriction of the role of material and individual incentive and, the preponderance of non-economical and collective stimulus. Planning problems, insertion of enterprises in the plan, the plan elaborations, etc. are also interesting, but beyond the scope of our analysis.

Chinese global economic policy until 1969 is defined in an important article *(8)*, that contains and emphasizes the original characteristics of the method undertaken, and that is different from and, in a way, conflicts with Soviet methods *(9)*. The great principles of independence and autonomy are noted, but the study of that which is positive in foreign countries is also proclaimed. The article recalls Mao's concept of "to take agriculture as base and industry as a dominant factor", and demands that the efforts be extended to heavy industry and its mechanization, and calls for a related regional industrial autonomy.

In general, different authors agree that the changes in Chinese industry's structures and the participation of the masses in technologicalinnovation campaigns is beginning to bear fruit. In most of the important sectors (atomic energy, space, and electronics), they have made remarkable progress. Also, China can be pround of the road it has traversed in metallugy, chemistry and in the great implementation of civil engineering. The remaining weak spots are mechanical construction, even though the machine tool sector has greatly progressed. Also, automobile and railway construction remains insufficient, civil aircraft construction is non-existent, and electrical construction seems to be handicapped by the lack of copper needed for bobbins *(10)*.

Basic vs Applied Research

One of the most interesting aspects of contemporary Chinese science, is its preoccupation with policy was emphasized and developed during the Cultural Revolution as an integral part of the general policy of "integrating with production" and "serving the people".

One June 3, 1966 the Committee of the Academy of Sciences, published a statement on scientific research that has been summed up in the following points *(11)*:

a) The "science for science" thesis must be combatted.

b) It is necessary to prevent experts, technicians and scientists from becoming aristocrats of spirit and separating themselves from workers and peasants.

c) Scientific experimentation must be closely linked to agricultural and industrial production.

d) Research on specialized institutes must be tied to research done by workers and peasants.

e) It is necessary to eradicate worship of authority and increase the efforts to train the young generation.

Before the Cultural Revolution, most Chinese scientists stayed in their laboratories essentially working at fundamental research or on the publications of their scientific work. Even when they were interested in industrial and technology development, their acquaintance with concrete problems was limited. The Cultural Revolution caused a great disturbance among scien-

tists and created some difficulties, that were later overcome. To fight against the abstract conception of science, they were advised to read and to study Mao's work, that "gives courage to man and sharpens his intelligence leading him to change his attitude towards the technical innovations and encouraging him to develop technology in a revolutionary way".

The Chinese maintain that they are not against theoretical research, but that industrial and agricultural production should be the basis for construction of theories. Even very long-term exploratory research is acceptable, they said, although "we must still handle correctly its relationship to production".

Visitors to China, generally direct attention to a lack of basic research and note that "the research is highly applied: there is no fundamental or curiosity-oriented research as in Canada and many other countries" *(12)*, but the results of certain investigations —like research into the structure of insulin— indicate that the interpretation of these criteria may be very flexible. This has led Dean and Macioti to conclude that a certain amount of basic research has been going on, and their impression is "that while there way well be no "pure" basic researh in China, very likely a certain amount of "oriented" basic research continues" *(13)*.

Factory Colleges

According to the new scientific policy, scientific workers work at specific factory or in agricultural communes, and workers and peasants spend some weeks or months at appropriate laboratories learning techniques. The universities must combine teachning, production and scientific research. Thus stundents participate in production and workers in education.

In order to increase contact with workers and peasants, each faculty member at Peking University rotates periodically between teaching, research and manual labor in a productive unit. In addition workers and peasants spend time in laboratories working on projects related to their needs. In Sheinin's view, bringing researchers to practical work helps: a) familiarize the scientist with practical problems of production, which requiere solving, and b) permits the scientist to teach fundamental theory to applied practitioners *(14)*.

In addition, a great variety of technical and engineering colleges or institutes are directly related to special production needs. An increasing number of them are being operated by factories on the model of the July Twenty-one University at the Shanghai Machine Tool Plant. Referring to procedures being used there to train technicians, Mao Tse-Tung asserted: "it is essential to shorten the period of schooling, revolutionize education, put proletarian politics in command, and follow the road of the Shanghai Machine Tool Plant in training technicians from among workers and peasants with practical experience and they should return to production work after a few years study" *(15)*. A report about the results of this experience, which was circulated throughout the country, stated that workers with a few years practical experience, fiven technical training, functioned far more effectively as technicians than graduates of the nation's prestigious colleges who had never worked in a factory.

Factory schools modeled on the July Twentyone University have recentrly been established all over the country. Factories establish colleges oriented directly towards serving the needs of the plant. These schools primarily provide very specialized high level vocational training, but the emphasis is always on acquiring theory that will enable the student to be creative and to desing new products. Some of the best students are transferred into research institutes.

Teachers in the factory-run schools are mostly technicians and veteran workers from the factories, although many schools call on comprehensive or polytechnical universities for assistance. In relation to this experience, Seybolt concludes: "The factory colleges are still experimental, but early results indicate that they are an effective and inexpensive way of raising the technical competence of factory workers, and accelerating research and development" *(16)*.

In the agricultural field as well similar institutions have been developed. But, of course, not all the technological institutes are of this type, and they coexist with the traditional ones, which now also pay more attention to practical needs of productive unit, modifying their pedagogic methods, admission systems and curricula, as we have seen.

Summary

In short, the problems related to the ties between industry and the universities have been extensively studied and some original experiments have been performed. A number of technical universities are operated by industries themselves while universities operate their own factories Teaching, production and scientific research are integrated with one another. Not only do workers and peasants go into the universities as students and teachers, but scientific workers are also sent to factories to search for research subjects and promote discussions on technical innovations.

In China, relations between abstract knowledge, and the practice of production have been modified. The problems are no longer conducted in the name of theories. It is interesting to point out that when the primacy of practice is socially acknowledged, several transformations that can not yet be subjected to theoretical analysis have, nevertheless, been developed. An example of this, in the field of medicine, is the use of acupunture.

In educational and research activities, China has put some interesting theories into practice, particularly since the Cultural Revolution, and its scientific-technologic model is not only original but of interest for other nations. An appreciative report was given by an eminent Chinese-born scientist, *(17)*, after a trip to China: "Yang feels that American universities could benefit from some of the Chinese experience, and suggests that educators and university administrators visit China and study Chinese educational innovations. After all, he said, there is a movement here to become more practical and to be more integrated with social problems" *(18)*.

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