

Chapter 8

Theory Attached to Practice

Chinese Debates over Basic Research from
Thought Remolding to the Bomb, 1949–1966

Zuoyue Wang



In 1963, the Chinese Academy of Sciences (CAS), which had come under repeated political attacks in the past for pursuing impractical “theory in detachment from practice,” sought to take advantage of an interlude of ideological liberalization by codifying the optimum proportions of its various programs. The Academy formulated a set of “work regulations” governing four types of research, which it would engage in during the coming decade: “15–20 percent basic research, 35–45 percent applied basic research, 30–40 percent applied research, and 5–10 percent extension research.”¹

Both the contents of the above policy pronouncement and the fact that it was made at all reflected the central position of the debate over basic and applied research—in its various semantic guises—in the politics of science and technology policy of the People’s Republic of China (P.R.C.) under Communist leader Mao Zedong both before and after 1963. The objective of this chapter is to use the basic/applied debate to explore the interactions of historical forces at work in shaping Chinese science and technology policy during the Mao era, which started with the founding of the P.R.C. in 1949 and ended with his death and the termination of the Cultural Revolution in 1976. In what forms did the basic/applied debate emerge in Maoist China as a matter of politics, policy, and rhetoric, and how did it reflect and shape the relationships between the party state and the scientific elite? Did the course of the debate fit, for example, into the pattern of repeated shifts, back and forth, between the techno-bureaucratic “regularization” and the radical “mobilization” models of Mao-era science policy and politics as observed by the China

scholar Richard P. Suttmeier (1974) and others? And finally but crucially, did the debate manifest itself differently when one moves the focus from the civilian sector and public arena—the focus of most of the studies done so far—to that of the secret world of national security science and technology?

In this chapter, I explore the above questions by examining three distinct phases when the basic/applied debate was key to Chinese science policy and politics: the “Thought Remolding” campaign in the early 1950s to convert a mostly Western-trained and influenced Chinese scientific elite into loyal followers of Communist ideology through a drive to “attach theory to practice”; the paradoxical late 1950s, marked by the decision to build the atomic bomb and political turmoil that led to the emergence of the articulation of the hybrid category of “applied basic research,” adopted by the CAS; and then the liberal early 1960s, when the bomb project both drove a pragmatic science policy and shaped the theory/practice or basic/applied debate. Underlining all three periods was the question of balance between needs for political control of scientists and engineers and those for achieving developmental and national security objectives.

“Science for Science’s Sake” and the Thought Remolding Campaign

When the Communist party-state launched the so-called Thought Remolding campaign in 1951 during the Korean War and a brutal anti-embezzlement drive, one of its main objectives was to force Chinese scientists (and other intellectuals) to abandon any illusion of the legitimacy of “science for science’s sake” and to serve the practical needs of the state wholeheartedly. The phrase “science for science’s sake” was often subsumed under the broader label “theory detached from practice,” which was used to attack intellectuals both inside and outside science throughout the Mao years. In the early 1950s, such labels were also dangerously associated with bourgeois values imported from the enemy United States, where many of the senior scientists had received their graduate education, even though by then the American discourse had replaced the concept of “science for science’s sake” or “pure science” with the politically more palatable “basic research.”² For example, a commentary in the official *People’s Daily* in early 1951 compared those who sought to pursue “objective” science regardless of its political implications or practical uses to the person who exclaimed “what a sharp chopper!” even after his head was cut off. “To those gentlemen,” it continued more ominously, “who uphold ‘science for science’s sake’ and who continue to send their scientific reports and papers to research organs of the American imperialists, aren’t you afraid that your scientific reports would be tainted by the sacred blood of the

Korean People's Army and the Chinese People's Volunteers?" (Yang 1951). This hostile political environment became particularly menacing in the form of shaming or struggle sessions ("criticism and self-criticism"), in which Western-trained senior scientists had to engage in self-criticism of their past bourgeois ways, including beliefs in personal interests and pure science. Such self-criticisms were often followed by painful denunciations and damaging revelations by one's colleagues and former students, which pressured everyone to engage in ever more destructive self-criticisms.

The remarkably detailed and systematic diaries of Zhu Kezhen, a meteorologist who had received his Ph.D. from Harvard University in 1918 and who was appointed as vice president of the CAS in 1949, chronicled both the party-state directives and some of these shaming sessions, including his own in 1951–1952.³ For example, on 8 November 1951, Zhu noted that he read the published text of a speech by the Chinese premier Zhou Enlai, "On the Issue of the Remolding of Intellectuals," that was delivered on 29 September 1951 (Zhou [1951] 1984). Marking the official start of the Remolding campaign, Zhou's speech was moderate in tone but already highlighted, in Zhu's paraphrasing, "the problem of knowledge, which needs to be tied to practice."⁴ On 10 January 1952, Zhu attended a Remolding session at the Institute of Botanic Taxonomy of the CAS, and recorded one criticism that was aimed at the senior scientists at the institute: "the compilation of *The Flora of Hebei Province* was useless and not enough attention was paid to the windbreak forests in the Northeast."⁵ In preparing for his own self-criticism, Zhu had to acknowledge that he himself was deeply influenced by Charles William Eliot, president of Harvard in 1869–1909, especially in terms of the ideal of "science for science's sake."⁶ At the actual criticism sessions, Zhu, along with several other senior scientists, was forced to admit the sin of "worshipping America." Meanwhile, the unrelenting pressure from both the Remolding and anti-embezzlement campaigns reached a breaking point when Liu Dawei, a CAS scientist in Shanghai, and his wife committed suicide and Wu Youxun, the veteran physicist serving as vice president of the CAS, attempted suicide in early 1952, among other such cases.⁷ These incidents helped to moderate the campaigns within the CAS, but not within the universities (Y. Wang 2014: esp. 21, 35, 46).

The attacks on "science for science's sake" can be traced back to Mao Zedong's famous "Talks at the Yanan [Yanan] Forum on Literature and Art" in May 1942 during the Rectification campaign. Mao implored writers and artists to make their work useful for the masses. "Is this attitude of ours utilitarian?" he asked, and then answered yes: "We are proletarian revolutionary utilitarians and take as our point of departure the unity of the present and future interests of the broadest masses, who constitute over 90 per cent of the

population; hence we are revolutionary utilitarians aiming for the broadest and the most long-range objectives.” He then concluded that “there is in fact no such thing as art for art’s sake, art that stands above classes or art that is detached from or independent of politics” (Mao [1942] 1965: 86). Mao’s early emphasis on revolutionary utilitarianism was extended from art to science in the 1950s. To Mao and his fellow ideological enforcers, “science for science’s sake” was not just an issue in the academic debate over the relationship between basic and applied research, but one of political standing and class identity, sometimes carrying with it deadly consequences during the Remolding campaign and afterward. Indeed the text of these Mao talks was required reading during the Thought Remolding campaign which itself was explicitly modeled after the original Rectification campaign (Y. Wang 2014: esp. 13, 17, 56).

Once the Thought Remolding made it clear that “science for science’s sake” had no place in Chinese science and science policy, the party-state pushed scientists to work on practical problems. On 21 May 1952, for example, at a high-level CAS meeting, Lu Dingyi, the party’s propaganda chief, emphasized that “the priority of scientific research has to be applications,” mentioning specifically agriculture and the oceans.⁸ Shortly afterward, when the government removed the notorious Chinese Lysenkoist Le Tianyu from his position as director of the Academy’s Workshop for Genetic Breeding due to his unusually harsh treatment of Western-trained scientists, it also redoubled its push for the biological theory of Ivan Michurin that had been promoted by Lysenko in the Soviet Union and Le in China.⁹ Le was removed partly because he did not carry out the Soviet program correctly and effectively. The point of the government’s campaign for Michurinism, Zhu Kezhen noted in his diary, was for biologists “to serve the state in increasing agricultural production.”¹⁰ A widely publicized article on the Le case in the authoritative *People’s Daily* made this point explicitly and ominously: “The greatness of Michurinian biology was that it thoroughly serves to enhance agricultural production and conquer nature, but this point has not seemed to catch the attention of our biologists.”¹¹

The same emphasis on utilitarianism was made by Chen Boda, an influential party theorist who served as one of Mao Zedong’s secretaries and as one of the CAS’s vice presidents, in a major, Mao-cleared speech at the Academy on 18 July 1952 (see Y. Wang 2014: 37). It reflected the new policy of political moderation in Remolding but also firmly came down on the Academy’s applied mission while appealing to the scientists’ Chinese nationalism: “As to the orientation of the work of the Academy, this is now quite obvious. Much of the work of the Academy should be following the needs of the people, the tasks of the nation at the present, and the tasks in the national construction plans. This requires that the scientists be engaged with practice at the most

essential level and to the broadest extent possible To help the nation industrialize is the sacred duty of our scientists” (Chen 1952).¹² However, Chen proposed that research with long-term or indirect applications should not be banned. The point was rather that any personal interests “had to be aligned with that of the entire mass.” “Science for science’s sake,” which carried a particularly individualistic connotation, was out of the question: “one should not conduct research for research’s sake; one should conduct research for the people.” He also allowed research on “important questions in science,” but here the key was who decided what counted as important questions. In his speech, Chen criticized “a few scientists who study the problem of fertilizer without considering soil” as falsely “detaching research subject from its surrounding conditions” (Chen 1952). Yet, five years later, one of the official science popularization journals (by then almost all journals in China were state-owned) published an article translated from a Soviet publication on the merits of “soilless cultivation” (Maertinuofu 1960).

Chen’s articulation of science for serving people and practice also reflected the party-state’s drive for Sovietization in science policy. In his 1952 speech, he cited not only Soviet political leaders Vladimir Lenin and Josef Stalin but also Soviet scientists Ivan Pavlov and Michuarin to justify a moderate but firmly utilitarian science policy. He urged the scientists to “learn from Soviet science.” This did not mean that one could not “consider things produced by British and American scientists,” he conceded. Yet he asserted that “in general all the good things from British and American science have already been distilled by the Soviet Union and therefore the quickest and best way is to learn from the Soviet Union.” Finally, Chen made planning, a key element of Sovietization, the centerpiece of his proposal for the future direction of the Academy and Chinese science in general, to be carried out in consultation with the production sectors. Science planning would ensure that individual interests and interests of individual research units, including the Academy, would be aligned with practical national needs (Chen 1952).

Thus, even though the phrases “basic research” and “applied research” were rarely explicitly invoked in the Chinese discourse on science policy in the early years of the P.R.C., an emphasis on “revolutionary utilitarianism” was clearly at the heart of the party-state’s efforts at ideological transformation of the scientists into party loyalists and at getting them to contribute to economic development, especially industrialization. In fact, it often appeared that political loyalty was more important than practical contributions, and that the emphasis on the latter was to serve the purpose of the former. Part of the reason for this was the party leadership’s political distrust of the scientific elite, and part of it was the widespread belief that China could and should rely on Soviet technical assistance for its critical developmental and defense

objectives. “Rely on the workers for production and on Soviet experts for technology,” as the popular saying went (Zhou [1956] 1984; see also Z. Wang 2015: 183). In 1953, when the nuclear physicist Qian Sanqiang, who was also general secretary of the CAS and director of its Institute of Physics, returned from a visit to the Soviet Union as head of a CAS delegation, he went to talk to a deputy minister of machinery-building about the emphasis on semiconductors in the Soviet Union (“working like crazy”) and about the need to take action in this area in China. The minister, as Qian recalled later, replied, “There is no rush on this subject. We still have not mastered the technology of vacuum tubes. When we do, then they [Soviets] would have turned their semiconductor research into industrial production. Then we can just ‘request’ it from them.”¹³

Consistent with this widespread reliance on Soviet assistance, it was perhaps not surprising that national security was often conspicuously absent or mentioned only in a nominal way in the party-state’s mandates to the Academy and other domestic scientific and technological institutions. The decision in early 1955 to launch China’s own nuclear weapons project, and even more the Sino-Soviet tension in this area in 1959, would, however, force the Chinese party-state to reevaluate its attitudes toward Chinese science, scientists, and the proper balance between basic and applied research.

Theory, Practice, and the Bomb Decision

On 20 August 1954, Qian Sanqiang was invited by Marshal Peng Dehuai, the minister of defense, to give a briefing in Zhongnanhai, seat of the Chinese party-state in Beijing, to a group of high-ranking military leaders on the topic of atomic and hydrogen bombs. Peng was soon to head a Chinese delegation to the Soviet Union to observe a Soviet nuclear test and wanted to explore with the Soviet side the possibility of their providing nuclear assistance to China. “If China wants to build an atomic bomb, how should we go about it? What are the most critical technologies and equipment?” Peng asked. Qian responded that the most important items initially were experimental reactors and cyclotron accelerators, which could be used to train technical personnel, gather talents, and prepare for the construction of both a nuclear industry and nuclear weapons (Ge 2013: 246). This marked one of the earliest direct involvements of Chinese scientists in China’s incipient nuclear weapons program. Such involvement would soon expand and have profound impacts on Chinese science, science policy in general, and the debate over basic and applied research in particular.

The Chinese party-state made its decision to launch the nuclear weapons program in late 1954 and early 1955 against a complex international geopolit-

ical background, including renewed American nuclear threats in the Taiwan Strait crisis in the summer of 1954 and the possibility of the Soviets launching its counterpart to the United States' Atoms for Peace program for nuclear assistance to its allies (Lewis and Xue 1991; Z. Wang 2010). It was during late 1954 that the Science Division of the party's Propaganda Department sent investigators to interview Qian and others about a possible bomb project before drafting a report for the top leadership. Once again Qian suggested that the key was to promote nuclear scientific research, train new talents, and build a nuclear industry as preconditions to the making of the bomb (Ge 2013: 247).

The most pivotal meeting in the atomic decision-making process took place on 15 January 1955 in Zhongnanhai, chaired by Mao Zedong himself and attended by Zhou Enlai and other top party, state, and military leaders. The day before, Zhou Enlai asked Qian and Li Siguang, a geologist who was both minister of geology and a vice president of the CAS, to come to his office for some preparatory mutual briefing. According to a biography of Qian, Zhou told the scientists about the American nuclear threats China had perceived: it started during the Korean War with Harry Truman and then continued with Dwight Eisenhower. The latter's secretary of state, John Foster Dulles, Zhou revealed to the scientists, had tried to pass this message to the Chinese government through Indian Prime Minister Jawaharlal Nehru in 1953: "If a cease fire in the [Korean] War could not be arranged, then the U.S. would no longer be obligated to a commitment of not using nuclear weapons." When Nehru refused to pass the message, Zhou said, the United States tried to spread the message publicly at the negotiation tables in Panmunjom. He also added that the United States made repeated nuclear threats in 1954, from the Dien Bien Phu battle, when the French forces faced defeat by North Vietnamese forces in April/May; to September, when the Chinese People's Liberation Army bombarded Jinmen (Quemoy), an island occupied by the Chinese Nationalist forces; to November, when China sentenced thirteen captured U.S. pilots accused of espionage (Ge 2013: 249).

For his part, Qian briefed Zhou on the status of nuclear science in the West and in the Soviet Union as well as at home, including China's technical training program in this field. He emphasized that all the scientists were full of confidence and wanted to push ahead with the nuclear program. Zhou finally told Qian and Li to come back the next day to give briefings for Mao and others, together with some demonstrations with uranium samples and Geiger counters (Ge 2013: 249).

For our purpose here, what is remarkable about the well-known 15 January 1955 Zhongnanhai meeting is not only the decision on the formal (though still secret) launching of China's atomic bomb project, but also how the deci-

sion helped to elevate the status of Chinese scientists. At the very beginning of the meeting, Mao announced to Qian and Li that “today, we are like elementary school students getting a lesson from you on issues related to atomic energy,” according to an account given by Qian himself some years later. When Li passed around a yellow uranium sample at the meeting, “all the leaders handed it one to another, full of curiosity about its enormous, legendary power.” When Qian, with the uranium sample in his pocket, walked by a Geiger counter he had made and triggered it off with loud noise, “everyone in the room broke into happy laughter” (Ge 2013: 250).

The famous statement by Mao announcing the decision to launch the bomb project, as recalled by Qian Sanqiang, also contained subtle hints about the improved fortune of Chinese science in the eyes of the political leadership:

We now know that our country has uranium mines. After further exploration, we will certainly find even more uranium mines. In addition, we have trained a number of people, laid some foundation in scientific research, and created some favorable conditions [for the nuclear program]. In the past several years, preoccupation with many other things has led to a neglect of this matter. But it has to be taken seriously. Now it's time to go at it. As soon as we put it on our agenda, focusing on it steadily, we will definitely achieve our goal Now with the Soviet assistance, we should make it work. [Even if] we have to do it on our own, we can also definitely make it work. As long as we have the people and the resources we can create miracles at will. (Ge 2013: 250; see also Z. Wang 2010: 259)

Here, when Mao spoke of “scientific research,” its significance clearly went beyond the routine production problems that the CAS was asked to solve earlier; it was now connected with the highest priority of the party-state. Likewise, the criteria of judging the scientific community was no longer primarily its political standing or class identity, but whether it can “make it work.” It is true that, at this stage, Chinese scientists were still expected to play second fiddle to Soviet experts in the bomb project and that Mao’s overall attitude toward scientists and other intellectuals would not always remain so positive. But it was clear that the bomb project brought some protective effects to the scientists in China, as it did elsewhere.

What was implicit in Mao’s statement about the importance of scientists and scientific research in January 1955 was made explicit in Zhou Enlai’s influential address at the Conference on the Issue of Intellectuals a year later. Zhou enumerated the enormous progress China had made in science and education. However, at the same time he stated starkly that “overall the state of our science and technology is still quite backward.” Specifically he pointed to China’s backwardness in “technological sciences,” which he believed was linked to “a weakness in theoretical scientific foundations.” “And it’s precisely

in the area of scientific research that we have invested the least,” said Zhou ([1956] 1984: 166).¹⁴

Without mentioning the Chinese nuclear weapons program then secretly underway, Zhou invoked atomic energy as the “highest peak of new developments in scientific and technological development” and declared that “we must catch up with the advanced scientific state of the art” (Zhou [1956] 1984: 181–182). In order to do so, some corrective actions in regard to scientists and science policy must be undertaken, Zhou ([1956] 1984: 183–184) argued:

In the past few years, various kinds of work have just begun, so it is inevitable and understandable that we have needed to invest more in technological work and paid less attention to long-term needs and theoretical work. But now, if we still do not increase our attention to long-term needs and theoretical work, we would be making a big mistake. Without certain theoretical scientific research as the foundation, it is impossible to make essential technological progress or innovations. But the effects of theoretical work are usually indirect, not easily visible immediately. It is precisely because of this that many comrades tend to be short-sighted at the present, unwilling to spend necessary efforts on scientific research and often requiring scientists to solve relatively simple problems of technical applications and production operations.

Here, in contrast to the rhetoric of “revolutionary utilitarianism” from the 1952 Thought Remolding campaign, including Chen Boda’s speech, Zhou’s address articulated what might be called the Chinese linear model of “theoretical research,” which was very close to “basic research” in the West, leading to technological progress. This formulation was familiar to the Western-trained Chinese scientific elite, and, even further, Zhou pushed for more emphasis on long-term scientific research in comparison to short-term “technological work.” Admittedly, “science for science’s sake” was still not acceptable, but the balance was clearly moved upstream in the linear model in Zhou’s address: “Of course theory should never be detached from practice; we are opposed to any ‘theoretical studies’ detached from practice. But at the present the main tendency has been the neglect of theoretical research. This situation exists not only in the natural sciences, but also in the social sciences” (Zhou [1956] 1984: 184).

To Qian and other leaders of the CAS, what Zhou announced next came as an opportunity to integrate this enlightened view into actual policy. He called for the formulation of a comprehensive long-term national science and technology plan for 1956–1967 as a key step in what he called “A March on Modern Science”:

In making this long-term plan, it is imperative to introduce the most advanced achievements of modern science into our scientific, national defense, produc-

tion, and educational sectors as soon as possible and based on feasibility and needs, and to fill in the gaps in fields where our science is most lacking but where the demands from our national construction are most urgent, so that our scientific and technological levels in these fields would, in twelve years' time, approach those of the Soviet Union and other world powers. (Zhou [1956] 1984: 184)

Among other measures, Zhou specifically called for “greatly strengthening the Chinese Academy of Sciences, making it into the locomotive that would lead the nation in lifting scientific standards and training new talents.” Likewise he called for rapid improvement of scientific research and training in universities and the production ministries, including defense, under the new science plan and in coordination with the CAS (Zhou [1956] 1984: 185).

“Exploratory Research” and the Bomb Project

With this auspicious beginning, the year 1956, which witnessed the making of the science plan, the launch of the March on Science, and Mao's issuing of the liberal double-hundred policy (“let one hundred schools contend and let one hundred flowers bloom”), turned into a golden year of relative political relaxation and professional enhancement for scientists and other intellectuals. Emboldened, some scientific leaders now sought to make the most out of Zhou Enlai's declaration on the importance of basic theoretical science.

Qian Sanqiang, for example, used his election (actually, appointment) as a delegate to the Communist Party's Eighth National Congress in September 1956 to elaborate on the importance of basic research (he called it “exploratory research”), especially for long-term technological innovation, when it was his turn to speak. Perhaps the leading nuclear physicists in China at the time, Qian and He Zehui, a husband and wife team, had worked under Frédéric and Irène Joliot-Curie in France in the 1930s and 1940s and made the discovery that the uranium nucleus could fission into more than two fragments. Recounting the history from scientific studies of radioactivity and the nucleus to nuclear weapons, Qian commented at the party congress that

such exploratory researches were aimed at understanding the internal laws of the structure of matter. There were not many connections with the production practices at the time, neither did they foretell directly such important discoveries [as atomic energy]. But after forty years' exploration following the intrinsic laws of scientific development, the principles governing the applications of atomic energy were finally discovered and the speed of development has quickened greatly thereafter. (Ge 2013: 269)

Here Qian was speaking of the importance of basic or theoretical research not only as a rhetorical exercise, but also as a matter of actual policy debate within his own Institute of Physics. In the early 1950s, Qian had established a “Theoretical Group” in the institute (called the Institute of Modern Physics then) and “it was not without controversy” amid the Thought Remolding campaign, as he later recalled. Qian later felt vindicated when members of the theoretical group all became leaders of the atomic and hydrogen bomb projects.¹⁵

But, perhaps reflecting in part his transnational experiences, broad responsibilities at the Academy, and intimate involvement in the concurrent making of the twelve-year science and technology plan, Qian was aware of the complex and reciprocal relationships between science and technology beyond the common perception that the former would lead to the latter (as articulated, for example, by Zhou Enlai above). As he explained at the party congress,

It should be pointed out here that exploratory research in basic science would be impossible without modern industrial and technological conditions. . . . The example [of particle accelerators] demonstrates that under conditions provided by modern industry, exploratory scientific research has produced new technologies and helped advance industry and technology in general. Science in turn has taken advantage of these new technologies to gain new conditions for rapid development, preparing the stage well for the next phase of exploratory research. Such is the relationship between science and production and between theory and practice. (Ge 2013: 269–270)

Qian further complicated the conventional view with his proposal for “theoretical research in technological sciences,” which addressed common problems in industrial technologies and which “could also lead to leap-like developments” in the latter (Ge 2013: 270). Thus to Qian, there were four elements or stages in scientific and technological development: “basic scientific research [jichu kexue yanjiu], technological scientific research [jishu kexue yanjiu], engineering design [gongcheng sheji], and industrial production [gongye shengchan]” (Ge 2013: 270).

For Qian, the key point of this discourse on science and technology was the idea that if China was to move from dependence on Soviet assistance to “establishing our own independent science and technology,” it must pay more attention to the first three elements. Otherwise, Qian warned, “we would forever lag behind industrially advanced countries and manufacture by copying, producing no new designs, much less radical progress or innovations.” Obviously, he had in mind the vice minister’s comments about asking the Soviets for semiconductor technology. Quoting Zhou’s address, Qian argued further that while it was possible to import technologies within a short period of time,

it was impossible to rush scientific research. Therefore, there was an urgent need to strengthen the first two elements in his formulation: exploratory research in the basic sciences (*jichu kexue zhong de tansuoxing de yanjiu gongzuo*) and theoretical research in the technological sciences (*jishu kexue zhong de lilun gongzuo*) (Ge 2013: 270–271).

How to strike the right balance between basic research and practical applications, as advocated by Qian, became a critical point of contention in the making of the twelve-year science plan, involving tension not only between the scientists and administrators but also between the scientists and the Soviet advisors. On 7 March 1956, at an executive session discussing the making of the plan, several leading Chinese physicists, mostly U.S.-trained, “expressed their dissatisfaction” that the framework of fifty projects to be included in the plan, as proposed by Boris R. Lazarenko, chief Soviet advisor to the president of the Academy, “did not mention basic scientific development,” according to Zhu Kezhen’s diary.¹⁶ Two weeks later, Lazarenko struck back, expressing his own unhappiness with the status of the plan, complaining that it “did not grasp the key problems but only made arrangements for the various disciplines.”¹⁷

Meanwhile, the administrators had come up with a slogan that tended to side with Lazarenko—“tasks leading disciplines” (*renmu dai xueke*)—as the organizing principle of plan-making and came up with fifty-five such applied tasks. They also settled on the slogan “select important developments and catch up from behind” (*zhongdian fazhan, yingtou ganshang*), overruling the alternative, preferred by many of the scientists, of “select important developments, plan comprehensively, lay a solid foundation, and catch up from behind” (*zhongdian fazhan, quanmian jihua, tashi jichu, yingtou ganshang*) as too diffused (Nie 1986: 779; see also Z. Wang 2015).

However, when the administrators briefed Zhou Enlai on “tasks leading disciplines” and the fifty-five actual tasks, Zhou raised objections. According to Wu Heng, a geologist-administrator present at the briefing, “When we got to the slogan of ‘tasks leading disciplines,’ Premier Zhou paused for a moment, and then asked, what happened to those disciplines that could not be led by tasks? Shouldn’t there be a plan for disciplines aiming at scientific development? This was a must for any long-term plan” (Wu 1992: 164).¹⁸ It is not clear whether Zhou’s intervention was connected with the physicists’ own objections described above, but it was evidently consistent with his earlier address on intellectuals and would become legendary among scientists as an indication of Zhou’s concern for basic research. In the end, the compromise provided that the plan would remain dominated by fifty-five practically-oriented tasks, but a fifty-sixth task on “Investigations into Some Basic Theoretical Problems in the Modern Natural Sciences” would be added, which

listed about a dozen specific topics in physics, chemistry, biology, astronomy, mechanics, and mathematics. Literally, “theory” was now “attached to practice.” Later, a fifty-seventh, on scientific and technological information, was also added to the plan.¹⁹ The CAS made its own separate long-term plan for all major scientific fields that was more comprehensive than task no. 56 above (Wu 1992: 164).

The debate over theory and practice or basic and applied research would, of course, not end with the balance reached in the 1956 science and technology plan. During Mao’s 1957 Anti-Rightist campaign against intellectuals, including scientists, who had voiced criticism of the party-state (initially at Mao’s own urging), advocacy for theoretical, basic research once again, as in Thought Remolding, became a political liability. On 5 July 1957, in a highly-publicized speech drafted by the party’s Propaganda Department, CAS president Guo Moruo denounced “some scientists” for believing that “scientific work can be conducted without planning or leadership, [or that] scientific research does not have to be integrated into various forms of national construction work; they want to have absolute personal freedom in scientific research, science for science’s sake” (Guo 1957). As a result of the campaign, about 550 thousand intellectual “rightists” nationwide were purged, often with tragic consequences for themselves and their families. Under its party secretary Zhang Jinfu, the CAS leadership made a bold but ultimately successful appeal to Mao on the utilitarian basis of talent scarcity and protected some of its senior scientists, but that still left 167 people in the Academy’s institutions in Beijing who were persecuted as rightists, including eleven senior researchers at the levels of professor or associate professor. With less protection, scientists in universities fared even worse (Qian and Gu 1994, vol. 1: 86–89).

Mao’s next campaign, the Great Leap Forward movement in 1958–1962, would continue to tighten control and pressure toward the practical, and even ideological correctness in scientific research. Basic research was often denounced as theory detached from practice or even worse—“being expert without being red.” Among the various component campaigns during the Leap, there was one called “Planting Red Flags and Pulling White Flags,” whose main targets were scientists and other intellectuals accused of being “white experts” by pursuing theoretical research detached from practice or without the guidance of Mao and the party.²⁰ Once again, the Academy’s leadership tried its best to protect basic research. With the right combination of factors, including an appeal to national prestige in the Sputnik era, to socialist coordination, and to writings of Friedrich Engels, a co-founder of Marxism, such efforts actually led to the 1958 launch of the basic research project to

artificially synthesize bovine insulin by the Academy and several universities, which remarkably continued into the Cultural Revolution (Xiong and Wang 2005: 14–21). The Soviet decision in 1959 to withdraw its nuclear assistance to China also played a critical role in forcing the Chinese party-state to rely on Chinese scientists and engineers for building the atomic bomb, which in turn improved their professional and political status.²¹

Ultimately, it was the devastating Leap-induced famine that caused the pendulum to swing back to a point of relative political relaxation and a more moderate science policy by the early 1960s. It was in this environment of “adjustment” that Marshal Nie Rongzhen, who was in direct charge of national science and technology policy on both the civilian and defense sides, supervised the making of the famous Fourteen Points liberal science policy directive in 1961. Point no. 3, “Correctly Implement the Principle of Theory Attached to Practice,” for example, stipulated the following:

Socialist construction has many different needs, and the way for theory to be attached to practice is very broad. A comprehensive and long-term point of view should be taken in this regard, and a narrow or short-sighted understanding should be avoided. Besides pushing hard for those kinds of research work that directly serves current economic and defense construction, it must be arranged to carry out those kinds of research work that will only be applicable indirectly or in the long-term. Research topics can be raised from production and construction; they can also be raised from the development of various disciplines. There should not be biased preferences in this regard. Some exploratory topics and some disciplinary branches, even though without foreseeable applied values at the present, should not be neglected if they could help humans gain deeper understanding of the objective world—there must be people to carry out such work.²²

It was concern over the damaging effects of the Leap Forward movement on what was called “advanced technologies”—code words for the nuclear and missile programs—that led Nie to formulate, and the party-state leadership to approve, the policy statement. It was also in this context that the CAS explicitly articulated its positioning, which had started with the 1956 science plan, as the provider of basic, applied basic, and applied research, especially to the nuclear and missile programs as mentioned at the beginning of this chapter. And finally, the liberal political implications of the Fourteen Points were spelled out in February 1962 during what became known as the “Guangzhou Conference” on science and technology when Premier Zhou Enlai and Vice Premier Chen Yi successively pronounced that scientists and other intellectuals were no longer bourgeois but part of the politically reliable laboring and working class (see illustration 8.1).²³



Figure 8.1. *Left to right:* Chinese Premier Zhou Enlai with Chinese physicists Qian Sanqiang and Zhou Peiyuan in February 1962 in Guangzhou at a reception during the famous Guangzhou Conference on National Scientific and Technological Work. Source: Qian Sanqiang, *Qian Sanqiang menxuan* [Selected papers of Qian Sanqiang] (Hangzhou: Zhejiang Science and Technology Press, 1994), xxi.

Conclusion

The successful Chinese atomic bomb test on 16 October 1964 marked a milestone in the history of modern China, whose political, social, and cultural significance still awaits fuller and deeper analysis. For Chinese scientists and science policy participants who were still engaged in ideological battles for the importance of basic scientific research, including those in the CAS, it came as a welcome vindication of their past advocacy and as justification for future requests of support. In a 1965 report to Mao and the party leadership on science and technology policy for the next five years, Nie cited Mao's recently revived Leap-era call for "catching up and surpassing advanced world standards" to justify increased investment in "basic research" (*jichu yanjiu*)—the term that now appeared for the first time in Nie's papers. Without mentioning the bomb directly, Nie claimed that "now the phase of imitation is gradually passing, which requires that we need to create, to carry out independent research." "Therefore," he continued, "the key at the present is to greatly strengthen basic research work."²⁴

Alas, less than two years after the Academy articulated its strategic positions on the upper stream of the linear model and less than one year after Nie made his case for basic research, Mao, whose position at home and internationally was now buoyed by the success of the atomic bomb, launched the Great Proletariat Cultural Revolution in mid-1966, resetting the delicate balance between theory and practice, or basic and applied research, that had been reached during the making of the bomb. Once again, many scientists and intellectuals were attacked as “reactionary bourgeois,” as in the Remolding or Anti-Rightist days, and suffered brutal “labor re-education” or worse. “Theory detached from practice” once again became a label carrying deadly consequences for scientists. Qian Sanqiang, who had always been distrusted by the party leaders in his institute and also in the second ministry of machinery-building, where he served as a vice minister during the bomb project, spent years in labor camps (“cadre schools”); the CAS party secretary Zhang Jinfu was persecuted; and Nie Rongzhen was attacked for putting too much emphasis on modernization and not enough on revolutionization.²⁵ Only the death of Mao in 1976 brought an end to the Cultural Revolution, and the beginning of the reform era that reversed the radical politicization of science. It also introduced a new dynamics of science policy that recognized the value of basic research but still gave more weight to applications and development.

What this survey of the Chinese debates over basic and applied research, or theory and practice, in the early Mao years has demonstrated is that such issues were, compared to developments in the West, but also compared to other socialist countries, political and ideological in a much more radical sense. At the core of the problem lay the political distrust by the Communist party-state, especially Mao himself, of the mostly Western-trained Chinese scientific elite. The issue was thus a matter of party control of science and scientists, of policing the possibility of any individual freedom outside of the authority of the party-state in this period. Thus the fortunes of basic research and its advocates rose and fell with a rhythm that resonated with the general tenor of Chinese politics under Mao, largely confirming Suttmeier’s “regularization/mobilization” model. Only secondarily was the issue of basic research a matter of effective science policy that was amenable to reasoned debates or discussion during times of relative political liberalization. Nevertheless, in this limited sense, it should be noted that the bomb did intervene and provide increased maneuverability by those who carried out basic, applied basic, or applied research. “Science for science’s sake” was never acceptable under Mao, even during periods of moderation, but the relative continuity of the nuclear weapons projects and apparent survival of the artificial insulin project during the Cultural Revolution indicate that there were both change

and continuity in the debates over basic and applied research during the Mao years that deserve further exploration.

Zuoyue Wang is a professor of history at the California State Polytechnic University, Pomona, specializing in the history of science and technology in modern China and the United States. He wrote *In Sputnik's Shadow: The President's Science Advisory Committee and Cold War America* (2008) and published "The Chinese Developmental State during the Cold War: The Making of the 1956 Twelve-Year Science and Technology Plan," in *History and Technology* (2015). Currently, he is working on a transnational history of Chinese American scientists.

Notes

Acknowledgments: I am grateful to David Kaldewey, Désirée Schauz, and John Krige for their insightful feedback; to DING Zhaojun, FU Banghong, GUO Jinhai, Danian HU, LIU Xiao, LIU Xinpei, PAN Tao, Sigrid Schmalzer, SUN Lie, WANG Yangzong, WU Peiyi, XIONG Weimin, ZHANG Jiuchen, ZHANG Li, and ZHANG Zhihui for helpful discussions and assistance with materials.

1. "Zhongguo kexueyuan gongzuo tiaoli (ziran kexue bufen, chugao)" [Chinese Academy of Science Work Regulations (for natural science, draft)], drafted in late 1963 and issued within the Academy on 4 April 1964 (here as quoted in Lou and Zhang 2008: 273).
2. On the change in American rhetoric, see, e.g., Hollinger 1990. On the historical claim that Chinese scientists did bring pure science ideals from the United States to China, see Buck 1980.
3. See Zhu Kezhen diary for 1951–1952 (Zhu 2004–2013, vol. 12). Zhu Kezhen's diaries related to the Thought Remolding have been collected and edited for easy access by Wang Yangzong (Zhu 2013).
4. Zhu Kezhen diary entry for 8 November 1951 (Zhu 2004–2013, vol. 12: 467).
5. Zhu Kezhen diary entry for 10 January 1952 (Zhu 2004–2013, vol. 12: 537).
6. Zhu Kezhen diary entry for 17 February 1952 (Zhu 2004–2013, vol. 12: 561–562).
7. Zhu Kezhen diary entries for 26 February and 10 April 1952 (Zhu 2004–2013, vol. 12: 567, 596).
8. Zhu Kezhen diary entry for 21 May 1952 (Zhu 2004–2013, vol. 12: 622).
9. Le, among other misdeeds, had driven the U.S.-trained prominent geneticist Li Jingjun (Ching Chun Li) to flee China when Le was the dean of the Beijing Agricultural University in 1950 (see Schneider 2003: 123).
10. Zhu Kezhen diary entry for 31 May 1952 (Zhu 2004–2013, vol. 12: 628).
11. "Wei jianchi shengwu kexue de miqulun fangxiang er nuli" [Struggle in defending the Michurinian direction in the biological sciences], *Renmin ribao*, 29 June 1952, 3.

12. On Chen's speech, see also Suttmeier 1974: 36–42.
13. Qian Sanqiang. Talk at the meeting of the Committee on the Collection of Artifacts and Materials Related to the History of the Chinese Academy of Sciences (Qian was chairman), 27 December 1990, as reprinted in Ge Nengquan, *Qian Sanqiang nianpu changbian* [A detailed chronicle of Qian Sanqiang] (Beijing: Science Press, 2013), 729–735, quote 733, see also 220.
14. On Zhou's speech, also see Z. Wang 2015.
15. "Shiwunian de huigu" [A look back at the fifteen years], an interview with Qian Sanqiang by Wang Gantang in May 1989, printed in Ge Nengquan, *Qian Sanqiang nianpu changbian* [A detailed chronicle of Qian Sanqiang] (Beijing: Science Press, 2013), 701–707, quote 704. On the founding of the theoretical group in 1951, see 187; on opposition from a party member in the institute at the height of the Remolding campaign in October 1952, see 197.
16. Zhu Kezhen diary entry for 7 March 1956 (Zhu 2004–2013, vol. 14: 301).
17. Zhu Kezhen diary entry for 23 March 1956 (Zhu 2004–2013, vol. 14: 308).
18. Wu Heng did not give the exact date for this briefing, but in Li and Ma (1997: 556) there is an entry for 12 March 1956, when Zhou met with the science plan organizers.
19. "Yijiuwuliu-yijiuliuqi nian kexue fazhan yuanjing guihua gangyao (xiuzheng caoan)" [The revised draft of the outline of the long-term plan for the development of science and technology for 1956–1967], in *Zhonggong zhongyang wenxian yanjiushi* (1992–1995), vol. 9: 436–540, on 503.
20. See, for example, a remarkable collection of self-criticisms by scientists in Shanghai in this campaign, published by Shanghai People's Press in 1958: *Cha hongqi ba baiqi: Shanghai busen gaoji zhishi fenzi de sixiang jiancha* [Planting red flags, pulling white flags: Ideological confessions by some senior intellectuals in Shanghai].
21. See, for example, an interview with Qian Sanqiang by Wang Gantang in May 1989, printed in Ge Nengquan, *Qian Sanqiang nianpu changbian* [A detailed chronicle of Qian Sanqiang] (Beijing: Science Press, 2013), 701–707, on 703.
22. "Guojia kexue jishu weiyuanhui dangzu, zhongguo kexueyuan dangzu guanyu ziran kexue yanjiu jigou dangqian gongzuo de shisitiao yijian (caoan)" [Fourteen points of suggestions on the current work of natural science research institutions by the State Science and Technology Commission and Chinese Academy of Sciences party groups (draft)], June 1961, in *Zhonggong zhongyang wenxian yanjiushi* (1992–1995), vol. 14: 546–570, on 550–551.
23. On the Guangzhou conference, see Qian and Gu 1994, vol. 1, 109–111.
24. Nie Rongzhen, "Youguan disange wunian jihua jishu zhengce he shixian ganchao mubiao de ruogan jianyi" [Some suggestions related to technology policy during the third five-year plan and to achieving the objectives of catching up and surpassing], a report to Mao Zedong and the party Central Committee, 23 August 1965, in *Nie Rongzhen keji wenxuan* [Selected papers on science and technology by Nie Rongzhen] (Beijing: National Defense Industry Press, 1999), 580–588, on 585–586.

25. On Qian shortly before and during the Cultural Revolution, see Ge 2006: 318–335; on Zhang Jinfu, see Lu 2009. The book was based on oral history interviews with Zhang by Liu Zhenkun. On Nie during the Cultural Revolution, see Wang 2010.

References

- Buck, Peter. 1980. *American Science and Modern China, 1876–1936*. Cambridge: Cambridge University Press.
- Chen, Boda. 1952. “Zai zhongguo kexueyuan yanjiu renyuan xuexihui shang de jianghua” [A speech at the researchers’ study forum at the Chinese Academy of Sciences], delivered on 18 July 1952. *Renmin ribao* [People’s daily], 4 September, 3.
- Ge, Nengquan. 2006. *Qian Sanqiang*. Jinian: Shandong Friendship Press.
- , ed. 2013. *Qian Sanqiang nianpu changbian* [A detailed chronicle of Qian Sanqiang]. Beijing: Science Press.
- Guo, Moruo. 1957. “Bochi yige fan shehui zhuyi de kexue gangling” [Rebuke to an anti-socialist scientific program], *Renmin ribao* [People’s daily], 6 July, 3.
- Hollinger, David. 1990. “Free Enterprise and Free Inquiry: The Emergence of Laissez-Faire Communitarianism in the Ideology of Science in the United States.” *New Literary History* 21 (4): 897–919.
- Lewis, John Wilson, and Xue Litai. 1991. *China Builds the Bomb*. Stanford: Stanford University Press.
- Li, Ping, and Ma Zhisu, eds. 1997. *Zhou Enlai nianpu, 1949–1976* [Chronicle of Zhou Enlai, 1949–1976]. 3 vols. Beijing: Central Documentation Press.
- Lou, Caiyun, and Zhang Li. 2008. “1964 nian de ‘Zhongguo kexueyuan gongzuo tiaoli’ yu ‘lilun lianxi shiji’ wenti” [The 1964 “Chinese Academy of Sciences Work Regulations” and the issue of “attaching theory to practice”]. *Ziran kexue shi yanjiu* [Studies in the history of natural sciences] 27 (3): 265–280.
- Lu, Yongxiang, ed. 2009. *Xiang kexue jinjun: yiduan buneng wanghuai de lishi* [March on science: An unforgettable historical episode]. Beijing: Science Press.
- Maertinuofu. 1960. “Zhiwu de wutu zaifei” [Soilless cultivation of plants]. *Zhishi jishi lilian* [Knowledge is power] 9: 4.
- Mao, Tse-Tung [Mao Zedong]. (1942) 1965. “Talks at the Yenan Forum on Literature and Art,” May 1942, in *Selected Works of Mao Tse-Tung*, vol. 3, 69–98. Beijing: Foreign Languages Press.
- Nie, Rongzhen. 1986. *Nie Rongzhen huiyilu* [Nie Rongzhen’s memoirs]. Beijing: Liberation Army Press.
- . 1999. *Nie Rongzhen keji wenxuan* [Selected papers on science and technology by Nie Rongzhen]. Beijing: National Defense Industry Press.
- Qian, Linzhao, and Gu Yu, eds. 1994. *Zhongguo kexueyuan* [Chinese Academy of Sciences]. 3 vols. Beijing: Contemporary China Press.
- Schneider, Laurence. 2003. *Biology and Revolution in Twentieth-Century China*. Lanham, MD: Rowman & Littlefield.

- Suttmeier, Richard P. 1974. *Research and Revolution: Science Policy and Societal Change in China*. Lexington, MA: Lexington Books.
- Wang, Yangzong. 2014. “Zhongguo kexueyuan de sixiang gaizao yundong (1951–1952)” [The thought remolding movement in the Chinese Academy of Sciences, 1951–1952]. *Yuanshi ziliao yu yanjiu* [Documents and studies on CAS history], whole issue no. 1: 1–82.
- Wang, Zuoyue. 2010. “Physics in China in the Context of the Cold War, 1949–1976.” In *Physics and Politics*, edited by Helmuth Trischler and Mark Walker, 251–276. Berlin: Franz Steiner Verlag.
- . 2015. “Chinese Developmental State during the Cold War: The Making of the 1956 Twelve-Year Science and Technology Plan.” *History and Technology* 31 (3): 180–205.
- Wu, Heng. 1992. *Keji zhanxian mushinian* [Fifty years on the scientific and technological front]. Beijing: Science and Technology Documentation Press.
- Xiong, Weimin, and Wang Kedin. 2005. *Hecheng yide danbaizhi: jiejing niu yidaosu de rengong hecheng* [Synthesizing a protein: The story of the total synthesis of crystalline insulin]. Jinan: Shandong Education Press.
- Yang, Er. 1951. “Luodi de rentou chengzhan ‘haokuaidao’—tan fandui fenqing diwo de yizhong cuowu lundiao” [Head falling to ground but exclaiming “what sharp chopper”—on a mistaken view opposing differentiating between the enemy and ourselves]. *Renmin ribao* [People’s daily], 12 December, 3.
- Zhonggong zhongyang wenxian yanjiushi [Documentation research office of the Chinese Communist Party Central Committee], ed. 1992–1995. *Jianguo yilai zhongyao wenxian xuanbian* [Selected important documents since the founding of the P.R.C.]. 20 vols. Beijing: Central Documentation Press.
- Zhou, Enlai. (1951) 1984. “Guanyu zhishi fenzi de gaizao wenti” [On the issue of the remolding of intellectuals]. Delivered 29 September 1951. First published in *Jiaoshi xuexi* [Learning by teachers]. Reprinted in *Zhou Enlai jiaoyu wenxuan* [Selected papers on education by Zhou Enlai], edited by Zhongyang jiaoyu kexue yanjiusuo [Central educational science research institute], 38–65. Beijing: Education Science Press.
- . (1956) 1984. “Guanyu zhishi fenzi wenti de baogao” [Speech on the issue of the intellectuals]. Delivered 14 January 1956. First published in *Renmin ribao* [People’s daily], 30 January 1956. Reprinted in *Zhou Enlai xuanji* [Selected works of Zhou Enlai], vol. 2, 158–189. Beijing: People’s Press.
- Zhu, Kezhen. 2004–2013. *Zhu Kezhen quanji* [The complete works of Zhu Kezhen]. 24 vols. Shanghai: Shanghai Scientific and Technological Education Press.
- . 2013. “Zhongkeyuan sixiang gaizao he sanfan yundong riji” [Selected diaries during Thought Remolding and Three-Anti movements at the CAS], edited by Wang Yangzong. *Yuanshi ziliao yu yanjiu*, whole issue no. 6: 1–118.