2,4-5-T was safe, citing the argument by the Dow Chemical Company that the 2,4,5-T samples used by Bionetics had contained far more dioxin—nearly 30 ppm—than that of the currently produced commercial grade, and that it was the dioxin which was responsible for the birth defects. This argument was disposed of by the NIEHS repeat of the Bionetics experiment using "pure" 2,4,5-T. On 15 April 1970, nearly 4 years after the first indications of teratogenicity, and after some 20,000 tons of 2,4,5-T had been dropped over Vietnam, the government took its first steps to curtail the use of the herbicide. The Department of Defense announced that the use of 2,4,5-T in Vietnam would be suspended and the Department of Agriculture "canceled" the use of the herbicide on food crops, near water, and around the home.

The history of the 2,4,5-T episode is cogent evidence of the shambles into which the official decision-making machinery has lapsed. At two crucial points—the springing of the suppressed Bionetics report and the exposé of the EPA advisory committee's whitewash—the intervention of outside scientists has been essential in keeping the government machinery on the rails and in motion. And only through by-passing the existing machinery of the advisory committee's report and the review of it by the EPA Office of Pesticides did Ruckelshaus and his aides arrive at the correct decision to maintain the existing restrictions. In short, the established machinery for protecting the public health has failed, and failed ignominiously.—NICHOLAS WADE

Chinese Science: What the China Watchers Watch

An announcement that Mainland China will begin publication of a new monthly magazine, *Scientific Experiment*, appeared on the back pages of the *People's Daily* on 30 April. This announcement is considered *bona fide* by Western observers and is the first indication since 1966 that China intends to publish science news in a systematic way.

The *People's Daily* announcement said that *Scientific Experiment* would be "a monthly comprehensive publication of science and technique addressed to workers-peasants-soldiers. Its main content will be how workers, peasants, and soldiers are engaged in living study and living use of the Thoughts of Mao Tse-Tung and in scientific experiment and technical innovation." The announcement was important because, in the upheavals of the Cultural Revolution which broke out in 1966, China's numerous specialized journals of science and medicine, which had previously been available in the West, were shut down and not resumed. *Scientific Experiment*, then, will be the first break in this 5-year hiatus.

American scientists have become increasingly interested of late in Chinese science and technology—termed by the Chinese "technique"—(see *Science*, 30 April 1971). Their curiosity was whetted this spring when, for the first time in years, two American scientists were admitted to China, M.I.T. microbiologist Ethan Signer and Yale biologist Arthur W. Galston.

Observers say that *Scientific Experiment* will almost surely become available in the West either through regular channels or "as fish wrapping." Either way, interested American scientists will eventually learn of its contents.

In the meantime, however, China specialists have been keeping fairly close track of scientific and technical developments on the mainland. This is the art of China watching, and it has been raised to such heights that one observer, Leo A. Orleans, of the Library of Congress, said that the accounts published so far of the Signer-Galston visit offered little information about Chinese science that was not already known.

Mostly, China watching consists of interpreting Chinese publications or their translations. But China watchers also keep an eye on each other. For there are almost as many interpretations of what is going on as there are analysts. The interpretations are drawn from many bits and pieces of information, and, Orleans says, "You can find quotations to support any opinion, no matter what side you take."

The not-too-surprising result is that there are many different perspectives on what is happening in Chinese science and to Chinese scientists. The Chinese Academy of Sciences, which is the present-day Communist incarnation of the old Academia Sinica, of pre-Mao days, can be interpreted either as a hot center of continuing strife between scientists and the military, or as an arm of the government—no more or no less repressive than any other—carrying out a fairly practical program of applied research suited to China's needs.

A recent article, for example, in *China News Analysis* (CNA), a biweekly journal of interpretation published since 1953 in Hong Kong, gave the recent history of the Academy from the former point of view.* Orleans, on the other hand, disagrees with CNA's "tone" and its implication that, in effect, the army runs science in China.

The Academy itself is the most important single center for scientific research and development. It is divided into five departments that oversee more than 100 research institutes, each specializing in a different discipline. In addition, there are regional branch institutes. Research, particularly the production-oriented type of research that now predominates in China, is probably still carried out by numerous educational and industrial institutions (the universities themselves have been closed down since 1966), and also by the Academy of Medical Sciences, the Academy of Agricultural Sciences, and the Military Science Academy.† The CNA piece dealt only with the Chinese Academy of Sciences.

Perhaps the most important aspect of recent history at the Academy is the changeover in administration since the 1966 Cultural Revolution. During the early 1960's, the Academy en-

* "Life in the Academy of Science," *China News Analysis*, Hong Kong, No. 843, 4 June 1971, pp. 1–7.

† L. A. Orleans, *Science*, 28 July 1967, pp. 392–399.

joyed a position of relative autonomy and was apparently run by scientists, albeit under the control of the Communist Party. Since the Cultural Revolution, however, it has been run by the "triple alliance" of workers, soldiers, and peasants. What is difficult to evaluate is the impact of the administrative change; for example, the pre-1966 president of the Academy, Kuo Mo-Jo, came under attack during the Cultural Revolution. But he underwent "self criticism," declared that all his previous statements should be "buried" and, thus purged, was restored to the Academy presidency. Recently he has been mentioned as a prominent political leader.

Here, as a sample of the problems of interpretation, is the CNA article's view of the Academy today. "What is said about scientific institutes and scientists, what they are doing and how they are being treated, sounds so odd as to be almost unbelievable. The Academy of Science is under the dictation of ignorant soldiers. Specialization and theoretical studies are being discouraged. Some of the reports quoted express what the scientists themselves think about this, how discouraged they are, and how difficult they find it to adjust themselves to this new world."

Orleans, on the other hand, believes, "There is no doubt that there are military representatives in the Academy. CNA would probably say that they exercise day to day control over research, while I would say their role is more in terms of general administrative matters."

Another theme of the CNA analysis was that the individual institutes—now trying to integrate scientists, workers, and peasants—have frequently been scenes of dissent by scientists and of military repression. For 1968, CNA noted incidents of strife in the branch institute in Kansu province, a silkworm research organization in Liaoning province, the mathematics research institute, and the publishing house of the Academy. In 1969, CNA noted problems in the bacteriological institute, the institute for geology, the atmospheric physics institute, and the botany research institute. In 1970, CNA claimed that the botany research institute was still unsettled. And, in 1971, CNA quoted a *People's Daily* account of strife within the chemistry institute. "Evil men had seized power and the section had become a 'hard spot.' . . . the hit-one oppose three campaign revealed the evil men. . . . Some [scientists] go so far as to say, 'In ideology we are ready to receive re-education from workers, peasants, soldiers, but where technique is concerned, we do it better ourselves.' . . ."

The CNA article connected the institute's tensions with the reluctance of scientists to do the more menial chores assigned to them. "One report said that peasants around Peking had applied to them [the botanists] when their cabbage had become affected by some disease. Some members of the research institute thought that this was not their business, but the military representative condemned this as a revisionist attitude and sent a team to the villages. The team prescribed a remedy that the peasants usually employ."

"An even more revealing story," CNA went on, printed on the first page of the *People's Daily*, was that the cook at the institute invented something and was made a member of the institute by the soldiers.

Chou Gives a Nod to Science Swap

Scholarly and scientific exchange between the United States and mainland China is now regarded as a possible means of hastening the current thaw in this country's relations with Communist China (see *Science*, 30 April 1971). Encouraging this view is Chinese Premier Chou En-lai, who, in May, told a representative of the National Academy of Sciences (NAS) that he expects exchange to take place sometime in the near future.

Anne Keatley, a staff member of the Office of the Foreign Secretary of the National Academy of Sciences, met the Chinese leader at a dinner party in the Great Hall of the People in Peking. The dinner was given by Chou for three visiting journalists and their wives. Among the invited journalists was Mrs. Keatley's husband, Robert Keatley, of the *Wall Street Journal*. Several days before the dinner, Mrs. Keatley had delivered a letter from NAS president Philip Handler which described the NAS Committee on Scholarly Communication with Mainland China,* expressed a wish for scholarly exchange, and specifically, invited the Chinese to attend any of five upcoming international meetings.

At dinner, Mrs. Keatley asked Chou whether he knew of the letter. He replied that he had learned of it just that day, and that he had also learned of the NAS Committee. He laughed and called his tardiness a "mistake of bureaucratism." Chou asked her when the Committee had been established, and she replied that it was formed in 1966. He commented that that was a very bad time—an obvious reference to the fact that the Cultural Revolution broke out that year, cutting off all Chinese academic contacts with foreign nations.

Chou asked further whether the Committee was only concerned with exchange pertaining to the physical sciences. Mrs. Keatley replied that it covered other disciplines as well and was co-sponsored by the American Council of Learned Societies and the Social Science Research Council.

At another point in the conversation, Chou said that, starting this year, the Chinese had opened a door. Chinese would go to the United States, he said, but there was a great deal of preparatory work to be done first. Exchanges of all kinds had begun with the visit to Peking of the U.S. table tennis team, he said, and contacts will gradually increase.

NAS officials are delighted with Chou's remarks. "Naturally, we were terribly pleased she had an opportunity to discuss it with him, and are still waiting, hopefully, for a response," says W. Murray Todd, executive secretary of the Office of the Foreign Secretary of NAS.—D.S.

* Current committee members are Harrison Brown, Foreign Secretary of NAS, acting chairman, A. Doak Barnett, Horace R. Byers, James Cahill, Jerome A. Cohen, Paul Doty, Alexander Eckstein, Albert Feuerwuerker, Caryl P. Haskins, Gerald J. Holton, Walsh McDermott, G. William Skinner, Emil Smith, Kenneth V. Thimann, Ezra Vogel, and John A. Wheeler. Ex officio members are Henry W. Riecken, head of the Social Science Research Council, and Frederick Burkhardt, president of the American Council of Learned Societies.

Orleans agrees that some scientists probably dislike being made to work part-time in factories, and doing research only if it applies directly to local, production needs. "It is reasonable to say that the scientist, because he likes to have freedom to do what he wants professionally, may resent the increased external controls. But I would not say that they are all necessarily unhappy or unproductive in their work. It would be a mistake to overestimate the effects of the Cultural Revolution on science."

He believes that the rhetoric which the state-controlled press habitually uses to describe situations of political conflict is often exaggerated for propaganda purposes. In many cases, the rhetorical press descriptions should be read with a grain of salt.

Moreover, the "revealing" stories of elevating cooks to the institute or sending scientists to work on cabbage diseases reflect a broader policy—one which Orleans feels may make sense in the Chinese setting.

"I don't think its ridiculous to have science closely support production. Some of the best research done in our own country is in the factories and in practical situations. But the Chinese seem to go overboard in their policies. There's no doubt that there is some good research going on in certain fields, particularly medicine and agriculture.

"The problem is that they are apparently not training highly qualified people to replace the older scientists. Since they reopened the universities, the curriculum has emphasized practical training and the thoughts of Mao."

Besides determining what is happening to the scientists, how do China watchers—in the absence of any scientific publication—figure out what research is going forward? They read through the propaganda, Orleans says, which is sometimes laced with facts. For example, an article under the title, "Obey Chairman Mao and Resolutely Traverse the Road of Integration with Workers, Peasants, and Soldiers," described how one chemist purged himself of his foreign ideas (called "foreign walking sticks") and reformed his politics in order to do some chemistry.

". . . During an attempt to solve an important problem concerning non-mercury catalyst experiments, and under the leadership of our master workmen, comrades of our scientific experimental team and I resolutely kicked away 'foreign walking sticks,' ignored 'foreign books,' studied and applied Mao Tse-Tung thought creatively, relied on the production experience of workers, and with the help of fraternal units, finally solved, after a short period of efforts, the problem of analyzing 'resin' that was not even recorded in foreign papers. Our accomplishment overcame a difficult experimental problem concerning non-mercury catalysts and was warmly greeted by our master workmen." ‡

Another sample involves the direct application of Mao's teachings to cotton boll research. It was titled, "Chairman Mao's Philosophic Concepts Guide East China Brigade to Get High Cotton Yield."

". . . Chairman Mao teaches: 'In this world things are complicated and are decided by many factors.' We should not pay exclusive attention to manuring in order to get good bolls; other factors must be taken into account. In the past we suffered losses because we failed to do enough pruning. The temperature on the soil surface reached 51 degrees centigrade in the summer of 1964. Shedding off bolls was serious on lightly pruned plants, while it was slight on more heavily pruned ones. Why? We turned to study this teaching of Chairman Mao's: 'In given conditions, each of the two opposing aspects of a contradiction invariably transforms itself into its opposite as a result of the struggle between them. Here the conditions are essential. Without the given conditions, neither of the two contradictory aspects can transform itself into its opposite.' We made an analysis of the growing conditions of cotton and found that each of the two contradictory aspects existing in the plant transforms itself into its opposite under various conditions of light, aeration, irrigation, manuring, and field management during the stages of the growth. . . ." §

A third sample on aviation technology tells little about actual Chinese achievements. It is a typical propagandist diatribe against foreign technology, and against the pre-1966 political figure, Liu Shao-chi, who urged China to emulate the "advanced nations."

"Affected by the renegade, hidden traitor, and scab Liu Shao-chi's counter-revolutionary revisionist line, some comrades in our ranks invariably hold that aviation technology is mysterious and difficult to understand. During the course of the new upsurge in the mass movement to produce technical innovations, they are conservative and remain stagnant. Do they really think that the technology is difficult to understand? No, in their minds they do not believe that all people cannot understand. What they think is that foreigners can understand but Chinese cannot understand, and that the experts can understand but not the masses.

"Mystery and superstition are always related. Those who think that technology is mysterious have blind faith in foreigners. . . .

"Is foreign equipment omnipotent? We do not think so. . . . Some foreign equipment is advanced. We should not reject these advanced products but we should realize also that some people make a perfect fetish of many items of foreign manufacture. . . ."

"Take the development of the techniques of aviation, for example. The world's first airplane was not produced by the so-called 'authority' and expert, but by a craftsman who was engaged in production and ran a bicycle shop. . . . Some experts and 'authorities' often are backward and afraid to do anything, lack creativity, and cannot accept new things because they wish to maintain a good reputation." ¶

—DEBORAH SHAPLEY

‡ *Kuang-ming Jih-pao* [Kuang-ming Daily], 9 October 1970; translated in *U.S. Joint Pub. Res. Serv. Pub.* No. 51724 (1970).

§ New China News Agency, 9 May 1971, translated in *Survey of China Mainland Press*, May 1971.

¶ "Refuting the Theory that Technology is Mysterious," New China News Agency, 20 December 1970. Translated in Foreign Broadcast Information Service, 28 December 1970.

RECENT DEATHS

Emily J. Bell, 44; professor of bacteriology, University of Cincinnati; 21 July.

René H. Bernas, director of research, National Center for Scientific Research, France; 1 July.

Emery J. Coulson, 67; allergens chemist, U.S. Department of Agriculture; 11 July.

George E. Nold, 72; retired assistant professor of physics, State Agriculture and Technical College, Long Island; 21 July.

Vito L. Salerno, 56; retired dean, College of Science and Engineering, Fairleigh Dickinson University; 24 July.