FUTURE OF CHINESE STUDENTS IN US AT ISSUE; CUSPEA PROGRAM NEARS ITS END

Every American academic knows that a great many young people have come from the People's Republic of China to do graduate work in the United States during the last decade, and it is no secret that this development has raised a number of concerns during the past two years within the government of the PRC: Will the students return home, and when? What kinds of jobs will be found for them? What will their impact be on Chinese society and on the Chinese economy and political system?

It also is no secret that American universities—and their science faculties in particular—are equally concerned about whether the PRC will continue to permit Chinese to come to the United States to do graduate and postdoctoral work and about what the impact on graduate departments will be if the flow of Chinese students is drastically curtailed. A variety of recent reports suggest that the number of students coming to the United States each year could be cut by as much as 80 percent or more, but there is considerable disagreement among China experts about the statistics, and even more disagreement about the kinds of concerns motivating the Chinese.

CUSPEA students at Columbia University. Members of the first and second groups that T. D. Lee brought to the United States as part of the China-US Physics Examination and Application program gathered for this photograph several years ago. Jeannette Lee is in the center of the front row, with Lee to the left and Emily Xu to the right. In the back row, left to right, are T. J. Chen, Y. K. Qian, Z. Wu, Z. Qiu, R. J. Tao, C. J. Chen and H. C. Ren. Chen, Qian and Qiu have returned to the People's Republic; Ren returned but currently is back in the US doing a postdoc at Rockefeller University.

According to the general perception in the United States, the general perception in China is that Chinese students in the United States are not returning home. That said, there are no other generally held perceptions. As some see it, Chinese political leaders, science officials and economic development officers are mainly worried about brain drain—the loss of their most highly educated and most promising youth to foreign countries. But of course many Chinese leaders never wanted their most talented youth to leave the country in the first place, and now that these youth have been exposed to foreign influences, the more hard-line Communist leaders undoubtedly have mixed feelings about having them back. Dorothy Shore Zinberg, an authority on the international mobility of scientists at Harvard University's Kennedy School of Government, found during a trip to China last year that even working scientists are somewhat ambivalent about the Chinese students. "Several scientists mentioned that colleagues who had not been abroad often resented the heightened status and advanced knowledge of those who had been abroad and, consequently, were not eager for them to return," she wrote in an article earlier this year.

Why, if they might be resented by colleagues and treated with suspicion by political supervisors, would Chinese studying in the West want to return home? Why—given the political and personal freedoms they have learned to enjoy abroad, the poor job prospects in China and the good prospects in the United States, a low standard of living there and affluence here, insecurity there, safety here—would they not want to stay in the West?

Despite such questions, many of the scholars in the United States who have the most contact with Chinese students firmly believe that most of them would want to return home if only meaningful opportunities could be found for them to contribute to their country's welfare. Chinese students started coming to the United States in large numbers only in the early 1980s, and only a small proportion of them have completed their PhDs; nobody knows what most of the Chinese PhDs will decide to do upon completing their doctoral work.

Between 20 000 and 27 000 Chinese are thought to be studying at undergraduate and graduate institutions as postdocs or as senior scholars in the United States today. Of about 36 000 who have come during the past nine years, fewer than 9000—mostly established scholars who came for short visits, not students—are thought to

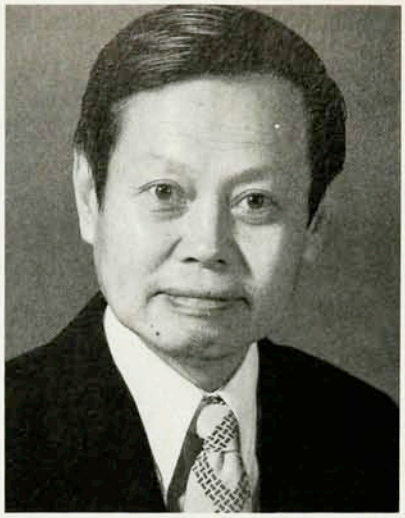
have returned. According to reports that have appeared in *The New York Times* and elsewhere, new policies adopted by the Chinese government would limit the proportion of students coming to the United States to 20 percent of those going abroad, implying that the flow to the US would drop from the current 6000–7000 to 600. The main reason for sharply limiting the flow to the United States is thought to be the relatively liberal US immigration rules, which make it harder for the PRC to assure that its students will return.

But not everybody believes that the new Chinese policies, assuming that they have indeed been adopted, will be implemented. Among the skeptics is C. N. Yang of the State University of New York at Stony Brook. Yang expects the number coming next year to be somewhere between 600 and 7000, the number that reportedly came last year. "I would think that it would be in the thousands, maybe the low thousands, but that's just my guess," he says.

Physics students

About 15 percent of the graduate students in physics currently in the United States are from the People's Republic of China, and in some departments as many as half the students are from the PRC. Of about 50 students from the PRC who earned physics PhDs in 1986 and responded to a survey conducted by the American Institute of Physics, most took five years to complete the degree. The ages at which the students earned their PhDs varied extremely widely—from 27 to 51.

However the general picture changes in the coming years, for at least four reasons it seems certain that fewer Chinese students will be coming to the United States in the next decade to study physics or do basic physics research: The Chinese government has adopted a long-term development plan that emphasizes small-scale enterprise and deemphasizes basic science, especially large-scale physics. Government officials also have made known their view that physicists, and especially physicists sent to the US, have been the main beneficiaries of the more liberal policies in effect in the last decade and that they have now had their turn. The American Physical Society's China Scholars program, which brings established physicists from the People's Republic to American universities for short visits, will end next year (see page 111). Last and far from least, a special program bringing Chinese physicists to the US—the



C.N. Yang

CUSPEA program conceived and managed by T. D. Lee of Columbia University—also comes to an end in 1989.

CUSPEA, the China–US Physics Examination and Application program, was designed to be a six-year program when it was officially launched in 1980–81, following a one-year trial; in 1986 it was decided to extend the program for three years. At the time it was established, neither the Graduate Record Examination nor the Test of English as a Foreign Language was available in China, Lee says, and Americans knew little about the quality of Chinese students or academic standards at Chinese universities. CUSPEA was set up as a temporary measure to remedy this. It was thought that after a few years students from the PRC would be able to apply to US universities the same way other foreign students apply, Lee says.

It seems that Lee, who has put much of his own research on hold during the lifetime of the program, is an "indispensable ingredient" in the program. That is the verdict of Irene Tramm, an administrative assistant to Lee at Columbia, and it is a conclusion that generally goes unchallenged.

Tramm says that CUSPEA is an exchange program "that has consistently worked well"; and that too is a verdict generally accepted. Each summer, two US physicists have gone to China and, together with their wives, have interviewed Chinese applicants to the program, who are selected as finalists on the basis of competitive physics examinations. The candidates are evaluated in terms of their mastery of English, as many are expected to work as TAs immediately upon arrival in the US, and they are asked about their motivation as well as their knowledge of and aptitude for physics.

By the end of next year, CUSPEA will have brought a total of about 1000 outstanding Chinese students to the United States, affording them the opportunity to do graduate work at some of the finest institutions in the world.

Lee points out not only that it takes about six years for a graduate student to finish a PhD, but also that most students would like to have the experience of one or two more years as a postdoc in the US. Therefore, except for the first and second groups of CUSPEA students, the majority still are in graduate school. Four of the eight CUSPEA PhDs at Columbia have returned to China, and Lee believes that about half of all the students may eventually go back.

Yang has argued that the PRC government should not be overly worried about whether students of basic science return in the short run. He thinks that exchanges will still be of benefit to China if some students go back and others visit periodically; he points out that while the first wave of visitors from Taiwan were scientists who tended to stay in the United States, this did not prevent a second wave of engineers and economists from studying here and then returning to Taiwan to build a powerhouse economy.

Yang's views are known to the PRC's leadership, Zinberg found during her visit last year, and she notes that it often is easier for people in the PRC to advance controversial opinions if they can be expressed in the words of a respected Chinese person who is safely outside the country.

Lee has concentrated his efforts in recent years on trying to persuade the PRC's leaders to open up their system so that individual scientists would have the right and ability to entertain competing job offers and settle at institutions of their choice. More particularly, he has raised money from non-Chinese sources to support the establishment of a special scientific institute in Beijing, the China Center of Advanced Science and Technology, and he has persuaded the Chinese government to inaugurate a postdoctoral program for scholars in the basic sciences. The postdoctoral program provides stipends of $3500, plus housing and other benefits, to 250 postdoctoral students per year at institutions all over China. In addition, stipends of $4000 or $6000 are available for "regular" and "special" (more accomplished) members of the the China Center of Advanced Science and Technology. Both CUSPEA and

non-CUSPEA students are eligible for the postdoctoral program and membership in the new science center (the CCAST laboratory). While the stipends may seem relatively paltry by US standards, they are princely in a country where full professors are paid the equivalent of about $700 per year, Lee points out.

Physics priorities

On 3 May, Guang-Zhao Zhou, the president of the Chinese Academy of Sciences, outlined the PRC's approach to science and development to a small audience at the City College of New York. The occasion was the conferral of an honorary doctorate upon Zhou by CCNY, which has a large exchange program with the PRC, directed by CCNY physicist Ngee-Pong Chang. Of the 70 graduate students in physics at CCNY, 30 are from the PRC.

Zhou took pains in his talk to mention the contributions made to Chinese economic and scientific development by individuals who studied abroad. He mentioned Tian-You Zhan, a famous railway engineer who studied at Yale, for example, and he mentioned a group who studied at Cornell around the turn of the century and went on to found the Chinese Science Society and a Chinese journal called *Science*.

Reviewing the history of science organization since the Communist Revolution, Zhou noted that the Soviet model prevailed initially, and that it was well suited to marshalling resources in fields where basic scientific advances already had taken place and what remained was for applications to be worked out. Its weakness, he said, was that individual sectors tended to be rather isolated, each a "closed system," and that in time each tended to be overstaffed with aging and less productive personnel.

Laboratories now are being encouraged to open up—to seek contacts with other labs, to exchange personnel and to subject projects to peer review. By 1987 there were 40 such open labs, Zhou said, but he conceded that it is hard to get scientists to change their ways in a country where people are accustomed to a slow life with a low standard of consumption, high security and little mobility. China is a country where "to move from one side of a city to another is something people would prefer not to have to do," he said.

Last year, Zhou reported, the Chinese government decided to mobilize large numbers of scientists to help solve urgent development needs, such as feeding the growing population. As a result, basic research will be limited to certain areas in which it is essential to keep up with world progress; large and very expensive scientific projects will not be fundable in the next decade, he said. He mentioned solid-state physics, neurobiology and nonlinear dynamics as areas that will be supported. Zhou mentioned China's work in high-T_c superconductivity as an example of research in which world standards have been met or exceeded.

In a short follow-up interview, when asked what kind of work would be supported in physics, Zhou said bluntly: "Solid state." There also will be a little work in high-energy physics, he added.

Zhou himself is a highly regarded theorist who has "published widely and made enormous contributions to the advancement of our knowledge and understanding of the principles that underlie the basic forces of the universe," as the citation from CCNY put it. "Your work on PCAC, and your contributions to the closed-time-path Green's functions have enhanced our understanding of quantum field theories. You have also made major contributions to our knowledge of the role of anomalies in quantum field theories," the citation said.

Educated at Qinghua and Beijing Universities, Zhou did research at the Joint Institute of Nuclear Research in Dubna in the USSR during the 1950s. He also has been a visiting scholar at the Lawrence Berkeley Laboratory and at CERN. He is director of the Academica Sinica's Institute of Theoretical Physics in Beijing and, since the beginning of last year, president of the Chinese Academy. He is a foreign member of the US National Academy of Sciences; CCNY conferred the honorary degree upon him while he was on an official tour of the US sponsored by the National Academy.

Political developments

It was Zhou who announced, at the beginning of 1987, the dismissals of astrophysicist Fang Lizhi as vice president of the University of Science and Technology in Hefei and of physicist Guan Weiyan as president. A member of the Communist Party's Central Committee, Zhou said that the university was being reorganized to "insure the leadership of the party and state." The dismissals were a reaction to student demonstrations in favor of greater democratization that were thought to have been inspired by Fang's speeches. The demotions of Fang and Guan preceded, by two weeks, the dismissal of the president

Guang-Zhao Zhou (center), president of the Chinese Academy of Sciences, receives an honorary doctor of science degree from Bernard W. Harleston (left), president of the City College of New York, in a ceremony at CCNY on 3 May 1988. A. Charlene McDermott, provost of City College, is at the right, and Robert Wilson, chief marshal of CCNY, is at the podium in the background.

and vice president of the Chinese Academy and the elevation of Zhou to the academy's presidency. Soon after that Hu Yaobang, an ally of Deng Ziaoping in China's liberalization drive and Deng's heir apparent, was forced to resign as the PRC's General Secretary, and Fang, the poet Wang Ruowang and Liu Binyan, the country's leading investigative journalist, were forced to give up their party memberships.

The resignation of Hu, seen as a direct result of the student demonstrations and, ultimately, Fang's speeches, prompted Chinese students in the United States to take the extraordinary step of sending a signed petition to the Chinese leadership expressing alarm about the developments.

Endorsed by 1000 Chinese students at 51 colleges and universities, 480 of whom allowed their names to be used, the letter voiced concern over the removal of Hu and the reprisals taken against Fang, Wang and Liu. "We feel that the ultra-leftist practice of labeling people arbitrarily and finding faults with others has redominated the area of communication, culture and ideology," the letter said. "We are concerned about the prospect of economic and political reforms in China. We fear the recurrence of the political situation of the Cultural Revolution, in which 'ruthless struggle and merciless criticism' were rampant."

Fang's views have circulated extremely widely in China, both as underground manuscripts and as official publications sent around by the party to local units for systematic criticism. In the United States they have been excerpted in a wide variety of daily newspapers, science publications and magazines. Fang is the subject of a profile by China hand Orville Schell in the May issue of *The Atlantic*, where he is described as "China's Andrei Sakharov."

Fang is by any standards a remarkably outspoken and fearless individual. "There is a social malaise in our country today, and the primary reason for it is the poor example set by party members," he said in one of the talks that reportedly held Chinese students spellbound. "Creativity has not been encouraged over the past three decades as being in keeping with Chinese tradition. It is a shame that, as a result, China has yet to produce work worthy of consideration for a Nobel Prize.... We should be open to different cultures and willing to adopt the elements of those cultures that are clearly superior. A great diversity of thought should be allowed in colleges and universities.... We must not be afraid to speak openly about these things. In fact, it is our duty. If we remain silent, we will fail to live up to our responsibility."

On another occasion he said: "We are still far behind the rest of the world. And, frankly, I feel we lag behind because the decades of socialist experimentation since Liberation have been—well, a failure.... There is no getting around the fact that no socialist state in the post-Second World War era has been successful, nor has our own 30-odd-year-long socialist experiment.... Clearing our minds of all Marxist dogma is the first step." Fang has not hesitated, in short, to call for an end to one-party rule and a giving up of the Marxist–Leninist–Maoist tradition in Chinese thought. In this sense Fang has gone much further in his public utterances than Sakharov, even though he does not have quite the same stature as a national science hero that Sakharov benefits from.

Political perceptions

It is not easy to guess how greatly Chinese students in the United States will be influenced by perceptions of political developments in the PRC. At the time they published their open letter to the Beijing leadership in January 1987, many denied any intention of not returning as a protest against the more restrictive policies. "If people don't want to go back, they don't care about China," one student told a reporter for *The New York Times*. But another said, "If loyalty is more important than freedom, we would not have written the letter."

Many scholars and China experts in the United States feel that decisions by students will be much more decisively influenced by the professional opportunities and working environment available in the PRC. Merle Goldman of Boston University, an expert on the sociology of Chinese intellectuals, is rather pessimistic. "They've been talking about opening their labs for years," she says, "but nothing ever happens." Lee, on the other hand, declares himself an optimist. "The Academica Sinica has been very forthcoming in setting up open labs, which are rather like our national labs and are available to scholars in all other institutions. This is quite a new departure and rather extraordinary," he says.

Chinese students in the United States currently are very concerned about government policies adopted last November that seem to be intended to reassert central control over the flow of students abroad. The Chinese government denied the existence of the new policy when it first was reported, and so did the US ambassador to China, Winston Lord. It was only after an official document outlining the policies began circulating among Chinese students and was given to the press that the denials stopped.

If the policies outlined in the document are interpreted literally, the effect would be to reduce drastically the number of students able to come to the United States with support from US sources. An appendix to the document says that a majority of Chinese going abroad should go as visiting scholars, not students; undergraduates and graduate students currently in school in China will not be permitted to leave except with state sponsorship; and provincial governments must send the State Education Commission their plans for sending so-called unit-sponsored (as opposed to state-sponsored) students overseas. "No one at work or study is allowed, unless with government authorization, to solicit scholarships, student loans or any other financial support from foreign or domestic institutions," the appendix says.

If taken very literally, these rules would imply that all students going abroad would have to be state sponsored and therefore would be subject to an overall quota that is set in another regulation at 3000; if strictly enforced in conjunction with a regulation that limits students coming to the United States to 20 percent of the total, the rules would indeed restrict the annual flow to the US to 600.

More than 2300 Chinese students at 142 US universities have signed a letter protesting the new policy. "After a long period of closed-doorism," the letter says, "it seems an inevitable but temporary phenomenon that for a time students going abroad outnumber those returning.... Many of our senior experts and scholars were able to make important contributions to the development of China's science, technology and culture only after they had received their degrees and continued doing their research abroad for years."

"Second," the letter continues, "... the reality is that American universities are internationally recognized as best equipped for graduate programs.... Given the fact that a

total of $100 million is donated annually by America through scholarships and financial support, which far exceeds the amount [the] Chinese government spends and is more than the amount all other countries put together [provide to Chinese students], it seems to us that China will suffer irreparably by drastically cutting the number of students sent to the United States."

The letter requests, among other things, that restrictions on seeking foreign financial support for study be lifted, that limits on the time students are permitted to stay abroad be abolished, and that limits on participation in postdoctoral programs be abolished. It has been widely reported that Chinese students going abroad are now being required by the PRC to sign contracts promising to return within specified intervals, and that penalties such as fines will be imposed on the families of those who fail to comply.

The official response to the student petition has been mixed, according to a student who has been following the situation closely and prefers not to be identified. The public reaction has been a hard-line statement to the effect that "Chinese citizens have a sacred duty to the motherland and that the government has the sovereign right to regulate student travel." More quietly and without public announcement, the student says, the PRC is being more liberal with passports, though it is issuing them for shorter intervals.

Leo Orleans, a scholar currently working on a study of Chinese students for the National Academy of Sciences, thinks that the students are grossly overreacting to the new regulations. "There always is a big gap between policies formulated in Beijing and their actual implementation," he says, and "local conditions always are to be used as a guide." Orleans says that more US visas are being issued for Chinese students than ever, and he does not believe there is going to be a drastic drop in the number of students coming to the United States. He does agree, however, that there will be a shift in favor of students working in the more applied sciences.

Love–hate problem

It often is noted that Americans in general and China specialists in particular have had a cyclical love–hate relationship with China that long predates the establishment of the People's Republic. The problem appears in fact not to be limited to the United States. Critical comments in recent months on *The Last Emperor*, the Bernardo Bertolucci film that swept the Academy Awards this year, have complained that Bertolucci tended to follow the Chinese Communist Party's line—that the film soft-pedaled the terror that gripped people during the reeducation campaigns that followed the revolution and, by a curious symmetry, also presented the last emperor as a stronger and less degenerate person than he really was.

Commenting on the attitude of China specialists toward the PRC's recent policies, Fox Butterfield of *The New York Times* told PHYSICS TODAY that we currently are still in the full heat of love and that those who put their responsibility to the immediate truth ahead of their friendship for China can sometimes be given a hard time by colleagues in journalism or academia. Butterfield, a China specialist trained at Harvard, was the first *Times* reporter to be stationed in China following the rapprochement between the US and PRC.

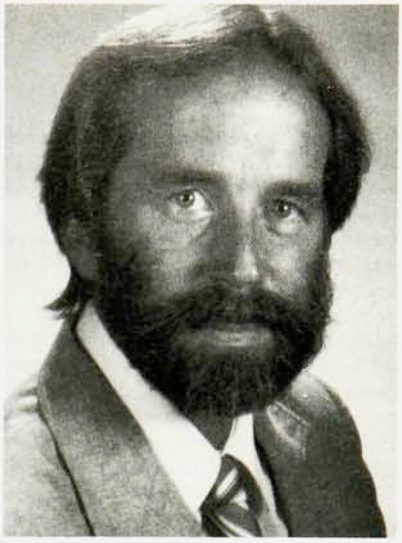
With liberty, personal freedoms and the future of scientific inquiry at stake, nobody wants to risk letting a pessimistic assessment of China's situation turn into a self-confirming and self-fulfilling prophecy. But some realities must be faced, among them the prospect that the golden age of Chinese physicists studying in the United States is coming to an end.

—WILLIAM SWEET

GREENE IS PRESIDENT-ELECT OF AMERICAN VACUUM SOCIETY

Joseph E. Greene, a professor of materials science at the University of Illinois, Urbana–Champaign, is the new president-elect of the American Vacuum Society. Greene will become president in 1989, succeeding John W. Coburn, manager of the plasma– and laser–surface interactions group at the IBM Almaden Research Center in San Jose, California.

Greene earned his bachelor's and master's degrees and his PhD in materials science at the University of Southern California in 1967, 1968 and 1971, respectively. He joined the faculty at the University of Illinois in 1971 and became a full professor in 1979. He is the associate director of



Joseph E. Greene

the NASA Space Vacuum Epitaxy Center in Houston, and he is the editor in chief of *CRC Critical Reviews in Solid State and Materials Sciences*.

Greene's main research interests are crystal growth by sputter deposition and molecular-beam epitaxy, the role of low-energy ion–surface interactions and photoinduced reactions during film growth, metastable semiconducting alloys and transition metal nitrides.

In other AVS election results, William D. Westwood, manager for materials research and gallium arsenide devices at Bell–Northern Research in Ottawa, Canada, was reelected clerk; and N. Rey Whetten, staff physicist in the VLSI Technology Laboratory of the General Electric Research and Development Center in Schenectady, New York, was reelected treasurer.

Three new directors were elected to serve two-year terms: Christopher R. Brundle, a member of the research staff and manager of the micro-, surface and analytical science department at IBM Almaden; Lawrence L. Kazmerski, principal scientist and branch manager for photovoltaics measurements and performance at the Solar Energy Research Institute in Golden, Colorado; and Cedric J. Powell, chief of the surface science division at the National Bureau of Standards in Gaithersburg, Maryland.

The two new trustees are Thomas M. Mayer, an associate professor of chemistry at the University of North Carolina, Chapel Hill; and Russell Messier, an associate professor of engineering science and mechanics and a staff member of the Materials Research Laboratory at Pennsylvania State University.