

How Greatly Do Chinese Students Eclipse Ours?

Julian C. Stanley

In his "Notes from the Editor's Desk" (Fall 1988), Dr. James Gallagher reports impressions he had while on "a short lecture tour of Taiwan and a brief visit to Hong Kong." They accord with my observations while consulting in Taiwan for five days during the fall of 1986. Also, in my extensive work with mathematics educators and mathematically highly talented youths in the People's Republic of China (P.R.C.), including a 35-day visit there in 1986, I have become deeply cognizant of their "impressive commitment to education, a characteristic that we have come to recognize in many Asian families in this country." Truly, "As I looked at these attractive children working with a kind of single-minded determination to learn . . . , it did not escape my attention that these would be the children who would be competing with my grandchildren in the economic battles of the twenty-first century."

Actually, the "competition" has already begun. A large percentage of the ablest graduate students in science and engineering in the United States are foreigners. Increasingly, they are likely to come from Asian countries, especially the P.R.C. Fortunately for our country, we manage to keep about half of them here after they earn the Ph.D. degree, or after they complete medical residencies. For example, a barely 18-year-old woman came to Johns Hopkins University from Shanghai to be a graduate student in mathematics. Five years later she had earned the Ph.D. degree with distinction, married a Harvard-graduate American, and become an assistant professor of mathematics at a state university in our country. Immediately she was followed by an 18-year-old male from Beijing, who has been an outstanding student during his initial semester. (At age 15 he had ranked third in all China in its high-school mathematics competition, so few Americans are of his mathematical caliber.)

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Journal for the Education of the Gifted Vol. 12, No. 4, 1989, pp. 306–309. Copyright ©1989, The Association for the Gifted, Reston, Virginia 22091.

Perhaps results of the most recent annual high-school-level International Mathematical Olympiad (IMO), held in Australia in 1988, constitute a better illustration. The P.R.C. was competing for the third consecutive year, whereas the United States had been in the IMO every year since 1974. China tied Rumania for second place, behind only the Soviet Union, even though no members of its six-person team had competed in a previous IMO. A 15-year-old Chinese made one of the five perfect (42-point) scores earned by the 268 contestants. The China team's other scores were 41 (gold medal), two 30s (silver medal), and two 29s (silver), a total of 201 points. (The Soviet Union scored 217 out of the possible 252.)

By comparison, the United States team won five silver medals (31, 31, 26, 24, and 23 points) and one bronze medal (18 points), a total of 153 points. That ranked our team sixth among the 49 countries competing, the worst showing U.S. teams have ever made. This occurred even though two of the team members had participated in the 1987 IMO and won medals there, one gold and one silver. The ranking was lowered greatly because the two highest scores were 11 points below the possible maximum. Apparently, something went wrong during the U.S.'s brief training session or during the IMO itself, or somehow the competition was stiffer in 1988 than in 1987. Even Vietnam, with a perfect scorer but also one who earned only 12 points, totaled 13 points more than the U.S.!

Perhaps more distressing is that, whereas the United States has *never* had a woman on its IMO team, China has done so each year. In 1986 the young lady won a silver medal. In 1987 a different woman won a gold medal, with a perfect score. In 1988 a third won a silver medal. Each of these is now majoring in mathematics at China's top tertiary institution, the University of Beijing (formerly Peking). China knows something that most other countries don't, because only four of the 130 medals awarded in the 1988 IMO went to women: 1 silver to China, 2 silvers to Bulgaria, and 1 bronze to Austria.

The gender record of the United States in mathematics competitions is even worse than its IMO results. Since 1972, when the top eight scorers on three sequential mathematics examinations for high school students began to be designated each year, only two women have been in this honors group, even though (or because?) the selection procedure is essentially objective. Many young women take the American High School Mathematics Examination (AHSME), a few qualify thereby for the American Invitational Mathematics Examination (AIME), and a very few of those qualify

for the U.S.A. Mathematical Olympiad (USAMO), but in 17 years only two women have ranked in the top eight on the USAMO.

I suspect that much of our weakness in the IMO is attributable to the extremely short training period the U.S. has, only a few weeks for the top 24 contestants, versus the many years in Spare Time Schools that China provides or the equivalent in other (mostly Communist) countries. We choose our team chiefly via rigorous examinations, and this ensures that their mathematics skills are current but seems to discriminate severely against females. If we took the mathematically most talented at age 12 or so and trained them thoroughly for four to six years, we would probably do better in the competition and perhaps also have some females on the team from time to time.

That is what China is doing, whole-heartedly; 188 members of the Study of Mathematically Precocious Youth's "700–800 on SAT-M Before Age 13 Group" reside in the P.R.C. All of these scored in the top 1 in 10,000 of U.S. youths on the mathematical part of the difficult College Board Scholastic Aptitude Test (translated into Chinese), which is designed for college-bound high-school seniors in this country. These mathematically precocious Chinese were found easily via small talent searches in Beijing, Shanghai, and Tianjin.

Recently, SMPY at Johns Hopkins University created SMPY at Tianjin to help the Chinese employ SMPY's principles and practices systematically throughout their country. This might seem likely to jeopardize the U.S. mathematically even more than at present, but the beneficial fall-out of this enhanced identification of mathematically apt youths and supplementation of their education is almost sure to be great. Many of the best students will want to do their graduate work in the United States in fields where the supply of talent is drying up, especially mathematics, computer science, electrical engineering, and physics. A number of them will probably stay here and eventually become American citizens. Those who go back, superbly trained, will tend to be pro-American and collaborate with our scientists and industrialists on projects that benefit themselves, their country, and ours.

This is all highly cost-effective. It costs little, in U.S. dollars, to conduct talent searches in the P.R.C., because the disposable income of Chinese educators is shockingly low by our standards. Also, the graduate students we receive from China cost the U.S. nothing for their education from kindergarten through college. If we can somehow stop the xenophobia that seems to be building up

in our country, it can benefit greatly from the vast pool of great scientific and mathematical talent in the huge population of China, without exploiting the Chinese in the process.

Still, of course, we need to be concerned deeply about the education of our country's youths. How can we inculcate values of hard work, respect or even reverence for education, and obligation to family and society into our culture? Surely, there are important lessons to be learned from Asians. We can no longer get by with rationalizations such as "our students are more creative than theirs," or "our best students achieve as well as their best." At the doctoral level we still seem world-class, but increasingly for non-Americans. Even that edge may disappear during the next century.

Will our educational Neros continue to fiddle while the modern-day analogue of Rome burns? Will the United States still be the world's leading nation industrially in 2047, when my grandson would be the age I am now? What odds would *you* bet on that?