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Scientific Leadership in Malaysia

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At the 2001 International Mathematical Olympiad (IMO) held in early July in Washington, D.C., the team from Singapore finished 30th among the 83 competing teams. The team from Malaysia ranked 59th. The ranking of the Malaysian team was encouraging because it continued their pattern of improving their position every year since Malaysia first sent a team in 1995.

Over this same period, the team from Singapore had rankings that ranged from 24th to 42nd. Part of the difference may well owe to the fact that Singapore, having first sent a team in 1988, has more experience with the competition. But since Singapore was, for a short time, a state within Malaysia and has a history in many respects similar to its larger neighbor to the north, it is reasonable for an observer from as far away as the United States to wonder why there is such a disparity in the performance of the two countries. This question was my entree into understanding what Malaysia is doing to make its educational system supportive of its efforts to continue, even to improve, its ability to compete in the world economy of high technology.

A word about the IMO is in order. It is the most prestigious and difficult secondary school mathematics examination in the world. Held since 1959, it is an annual competition, hosted each year in a different country, that brings together teams of six secondary students from each participating nation. Participants work individually for nine hours on a list of problems that require only pre-college mathematics for their solution, but which are difficult enough to challenge the very best students from around the world.

The performance of six young people on a competitive test does not indicate the general state of mathematical instruction in a country, and we must be careful not to suggest that it does. Tests such as those of

the International Mathematics and Science Study indicate that the United States has a lot of catching up to do, and this continues to be true even as our IMO teams annually give a good account of themselves. At best, the IMO gives some hint at how well a country is doing in developing its very best mathematical (and, by inference, scientific) talent. Therefore, I decided to use IMO results as a way to start the conversation about Malaysia's approach to developing top scientific talent to lead its drive to prominence in the area of technology.

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The natural place to start the inquiry would have been to meet with Malaysia's IMO coaches. Regrettably, scheduling difficulties meant that I missed seeing next year's co-coaches, Professor Abu Osman Mat Tap and Dr. Mat Rofa Ismail. When I visited Universiti Sains Malaysia (USM), however, my host (and former student) was Jamaludin Md. Ali, and he has assisted and continues to assist in coaching the Malaysian team. From him I learned that Malaysia conducts a three-tier (ages 16–18, 14–15, and 13–14) National Mathematical Olympiad in April or May each year. Based on results of this test, about twenty students from the two older groups and another five or six from the junior cohort are invited to a special training camp in December. The group is whittled down as more camps are held, and the final selection of a team is based on student work in the camps and on their performance at the Asian Pacific Olympiad.

Malaysia distinguishes at the secondary level between "smart" schools and "normal" schools. While "smart" is used in the English sense of classy or well appointed, I could not escape the feeling in my visit to Sekalung Penghargaan, a normal school, that expectations of student performance were not high. A group of teachers, having listened to me talk about the use of puzzle problems to teach problem-solving heuristics and to encourage mathematical creativity, explained over lunch that they had no time for anything not directly related to the state-mandated exams. One teacher noted that students at the school were not of the highest ability, and that moving them up one notch in their level of attainment would be seen as a reasonable goal. The Principal, with evident pride in her students, showed me a collection of trophies testifying to the school's reputation as a soccer powerhouse in the area.

More indicative of attitudes than anecdotes is the financial support for secondary education. Smart schools make an effort to introduce technology to their students, but similar training is regarded as out-of-reach for normal schools. Teachers at the secondary level are very poorly paid, and support their families by a combination of tutoring and second jobs.

The acceptance of only modest educational goals was evident in our social contacts. Everyone we spoke to on an informal level seemed to agree that the Chinese schools are much more demanding in their expectations, and that Chinese students are more intense in their desire to excel. This was reinforced when three friends, all females, included me at a dinner party. They got into a lively discussion about which men made the best husbands. Allowing for the exaggerations and generalizations of such conversations, it was nevertheless clear in the midst of the humor that Chinese men were characterized as too focused on work, too intense, and too structured, while Malay men were too relaxed and too content to exert themselves for much of anything.

While such contacts hardly substitute for formal social analysis, when repeated in several contexts they do help the visitor better understand the periodic calls that Prime Minister Dr. Mahathir makes in speeches such as was reported in the September 2, 2001, *Sunday Star*: "What needs to be done is for those concerned to encourage Malay students to change their mindset and attitude because the government can only do so much, as in the adage that there is not much point in bringing the horse to water if it is not interested in it."

There is in the same issue of the *Star* a second article in which Dr. Mahathir questions recent trends in Malaysian education that emphasize Bahasa Malayu as the medium of instruction. Noting that English is the language of science and mathematics, and that the test scores of students were slipping in schools that placed an emphasis on developing a national language, he advocated that, "we need to be able to understand English if we are not to be left behind in this era of information technology." In a country long accustomed to teaching science to its students in English, we have to agree with Dr. Mahathir that the trend toward the teaching of advanced courses in mathematics in Bahasa Malayu seems misdirected.

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There are, fortunately, those who are interested in encouraging a drive for excellence in mathematics among secondary school students and their teachers. Professor Jamaludin, mentioned above, and Professor Howe of USM met with me to discuss my experience in starting a state High School Mathematics League in Minnesota. They reported that there was little enthusiasm among secondary students for mathematical competitions. Professor Howe's frustrations started with the secondary teachers. He had returned to his native Malaysia after teaching for twenty years in Taiwan, and he found a great contrast in the attitude of secondary teachers. In Taiwan, he would announce special sessions for secondary teachers and get large turnouts from the area surrounding the university where he taught, but when he tried the same thing at USM, no one showed up.

It was soon clear in our conversation that most of the things that had worked for me were not options for them. Malaysia has nothing similar to the National Science Foundation to which I had turned to provide seed money for the initial training of teacher/coaches. Neither does there seem to be an alliance of high technology companies that see it as part of their self-interest to support the training of Malaysia's future scientists. These two professors are anxious to get something going, but they do not have a lot of resources upon which to draw. The only applicable advice I had for them was to start small, and since there really is no other way for them to start, the advice probably reduces to "start." We started in Minnesota with four schools.

The lack of a supportive industrial community manifests itself in another way. There is considerable interest among the USM mathematics faculty in getting students involved in undergraduate research. In the talk I was asked to give on this topic, I described a program that I ran in Minnesota that looked to neighboring industries for a source of applied problems on which students could work. The difficulty seems to be that there is little research and development work done in Malaysia, meaning that students have no way of getting practical training in such work. And, of course, this is a vicious cycle. An economist member of our visiting team who is especially interested in start-up companies was told that technical companies in Malaysia typically find that engineers coming out of Malaysian universities need a great deal of additional training before they become productive members of the firm.

With respect to developing programs for students with ability and interest in mathematics, it was encouraging to see that the Malaysian Mathematics Society (MMS) has produced tests that enable it to identify gifted secondary students and bring them together for special training. Once again, the lack of supportive structures from either the government or the high technology industrial sector has meant that the MMS is restricted in how much it can do. Yet what it has done is having an effect. As previously noted, the performance of Malaysian students at the IMO has improved every year since they began to compete in 1995.

During some reflective moments when I visited the beaches of Langkowi, I wondered about the goals of mathematical competitions and other devices that encourage people to develop their skills to heights that they might not otherwise attain. I was reminded of a humorous essay by Mark Twain in which he envisioned the residents of a tropical island, basking in beautiful weather, fishing or shaking down a coconut when hungry, and generally enjoying an idyllic life—until the missionaries arrived to show them the value of work and trading what they had for things they didn't need.

But when I returned from the beach, I realized that people do want more from life than sunny days and readily available food. They also want comfortable shelter, health care, security, quick convenient communication, mobility, entertainment, and a purpose in life. Most developing nations of the world would be envious of the progress Malaysia has made in the competitive world of technology, and the frequent exhortations from Dr. Mahathir in the newspaper leave little doubt about his desire to see Malaysia broaden its capabilities in technology.

These things being so, I have no trouble in advocating that a logical step for the country is to encourage its young people to develop their mathematical talent. Mathematics is the language of science. It is basic to all branches of engineering, and it is increasingly important in biology and the life sciences.

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How is this nurturing to be done? By analogy, if I were trying to popularize soccer in a country where it was played only casually, I would not begin by teaching the game to anyone I could gather round me at the local playground. I would look for a way to interest kids who were healthy, fast, and athletic. I would coach them until they could be com-

petitive, and then draw attention to the game by having them play some good teams. One finds young people enthusiastically playing soccer in playgrounds when there is a very successful team representing their secondary school, town, or city.

In just the same way, when it is an intention to identify and encourage mathematical talent as students rise through an educational system, and to have those with talent ready to profit from advanced instruction, mathematical competitions serve a useful purpose. Everyone's awareness is raised, those with talent are recognized and encouraged, and principals mention their school's reputation in mathematics to visitors.

Some of these things are already in place. We have noted that the Malaysian Mathematics Society has established a series of national tests to identify the mathematically talented students, and they have people who have been working as coaches to develop that talent. The need for a national agency to support education and research in science and mathematics is evident but the funding needed to support excellence in mathematical instruction is minimal. It need not wait on a national effort to support science education and mathematics, though this will surely be imperative sometime in the next few years.

Perhaps the greatest need is a sense on the part of leaders that excellence in mathematics is desirable and achievable. Near the end of our visit, I was seated at a dinner next to a top leader of Malaysia's educational structure. I told him that my interest had been aroused by the contrasting performance of Malaysia and Singapore in the IMO. He knew something about it, and correctly observed that China usually does very well in the IMO. (China was first in the 2001 competition.) When I agreed, he shrugged and explained to me the success of Singapore: "They have a lot more Chinese." ◉