Scientific Growth Faces Fiscal Crisis

Southeast Asia has been pouring money into science to create a talent pool that can compete globally. Can those policies weather the current economic storm?

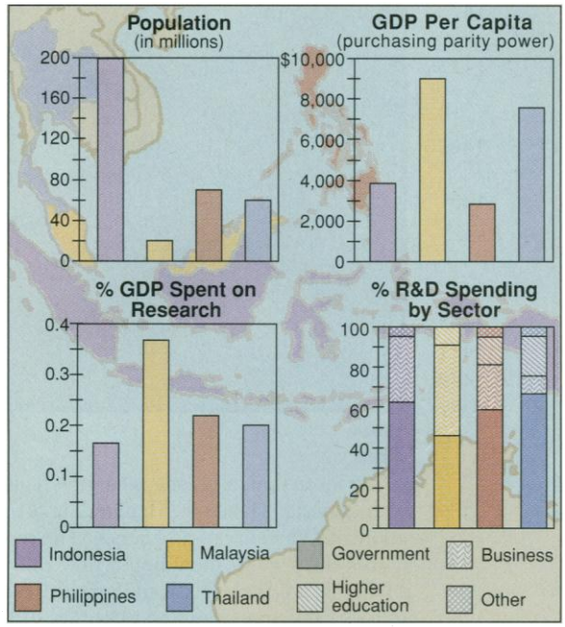
KUALA LUMPUR, MALAYSIA—IMAX films—the large-screen spectaculars so popular around the world—are a great way to draw people into a museum and teach them about science. That's why astrophysicist Mazlan Othman, founding director of Malaysia's National Planetarium, is so eager to use them to lure future scientists and their parents into her 3-year-old museum.

But this year, she can't afford to rent a new film. The economic crisis that has rocked her country and much of Southeast Asia has resulted in a 20% cut in the planetarium's budget, and devaluation of the local currency has doubled the cost of renting a U.S. movie. Mazlan also has delayed plans for a laser show and other new exhibits, and she may not be able to fill staff vacancies. Her personal finances have taken a hit, too: Malaysia has cut the pay of all senior government administrators by 3% and canceled their annual salary increment. "Science usually suffers when there is a recession," she says. "And this year the outlook is bleak."

Mazlan, a professor of astronomy at the National University of Malaysia (UKM), is just one of thousands of scientists in the region who are tightening their belts and hoping that the present crisis doesn't deliver a fatal blow to long-term plans to bolster science and technology. The dark financial clouds that have gathered over Southeast Asia follow more than a decade of bright sunshine for the region's scientific enterprise. As economies surged, government officials invested heavily in all aspects of science, including more and better training for would-be scientists and engineers and greater support for those already doing research. They also adopted new mechanisms for managing science, making it more competitive, more accountable, and more attuned to their country's needs.

There are, however, distinctive differences in the scientific paths followed by Indonesia, Malaysia, Thailand, and the Philippines. Malaysia's outspoken prime minister, Mahathir Mohamad, has placed science and technology at the center of that country's development plans for the last 15 years. He also has played a personal role in promoting them, from the grand vision of the proposed Multimedia Super Corridor—a 50-kilometer strip that he hopes will rival California's Silicon Valley—to the color scheme for Mazlan's planetarium. In Indonesia, a key figure in strengthening science is B. J. Habibie, an aerospace engineer with close ties to longtime President Suharto. Habibie has used his position as Minister of Research and Technology to create and oversee an empire of research agencies and companies; its crown jewel is a heavily subsidized aircraft industry.

Thailand, stung by a cutoff of U.S. support for research in the aftermath of a 1991 military coup, set in place new grant programs that are models of transparency and rigorous peer review. And Philippine President Fidel Ramos, a civil engineer whose 6-year term is now drawing to a close, has refocused the government's attention on research after years of neglect during the country's turbulent transition to a democracy.



At a glance. Indonesia's population is tops, but Malaysia leads in per capita R&D spending.

SOURCE FOR R&D SECTOR SPENDING: ASEAN S&T INDICATORS
SOURCE FOR OTHER DATA: WORLD BANK

Despite the vast differences among the four countries, there is a striking consensus about the need to change one aspect of the scientific landscape. In conversations with hundreds of scientists and government officials, a recurring theme is concern about the existing culture of science. "The real issue is not money," says Triono Soendoro, a reproductive biologist in Indonesia's national development planning agency, BAPPENAS. "The culture has to be changed, but not by the research managers. It has to be done by the researchers themselves."

The present culture manifests itself in various ways, say Triono and others. One feature involves deferring to superiors and avoiding risks in plotting out a course of research. Work ethic is another important element. "When I was working on my Ph.D. in England, I would be in the lab until midnight," says physicist Jazi Istiyanto of the University of Gadjah Mada in Yogyakarta, Indonesia. "Here, at 2 p.m. people are gone; it's unusual to find anyone in the lab in the afternoon."

The right culture also means adopting a broader view of how science should be done. "It's not just developing a critical mass of people. It's training them the right way, to develop the right spirit and attitude," says Jane Cardosa, a virologist at the University of Malaysia, Sarawak, speaking about students and staff in her lab. "I'm here to teach, and to help, and to catch them out if they try to cheat because they want the experiment to work."

The reformers are targeting a relatively small community. In Malaysia, the smallest of the four countries in this special report, officials from the Ministry of Science, Technology, and the Environment estimate that there are only about 2000 researchers qualified to compete for its major grants program, called Intensifying Research in Priority Areas. And a new fellowship program for advanced science and technology training at domestic institutions in those same areas made fewer awards than anticipated—only 156 in the first year. Even in Indonesia, with a population nearly 10 times that of Malaysia, officials peg the number of active researchers at about 4000.

In Thailand, which already leads the region in publications in international journals, so few researchers are chasing the available money that "anyone with a good proposal will get funded," says Vudhipong Techadamrongsin, deputy director of the Thailand Research Fund. That is why all four countries have expanded graduate programs and are sending young scientists overseas for advanced degrees or postdoctoral training. But it's hard to know whether they will continue to do so in the current economic climate.

PROFILE

Tracking a Virus and Making a Point

SARAWAK, BORNEO—An infectious agent that killed more than two dozen young children here last spring, some of them within 24 hours of becoming ill, remains a mystery. But virologist Jane Cardosa and her team at the University of Malaysia at Sarawak (Unimas) are in hot pursuit. If they identify the killer—she's characterizing an adenovirus isolated from a few of the victims, while a team at the U.S. Centers for Disease Control and Prevention (CDC) in Atlanta works on a different virus—she also hopes to strike a blow for the value of local expertise in tracking down global health threats.

By all accounts, the 45-year-old Cardosa is equal to the challenge. "She's a first-rate virologist, and she's developed a first-rate lab in Borneo," says David Warrell, a professor of tropical medicine and infectious diseases at Oxford University, where Cardosa trained. "She was one of the best students there," adds her former adviser, James Porterfield, whose work in Africa in the 1950s taught him "how essential it is to be as independent as possible under adverse conditions."

DAVID PORTNOY

Setting the pace. Jane Cardosa runs a topflight virology lab.

Independence is one of Cardosa's strong suits. Raised in Malaysia and educated in the United States—with an undergraduate biology degree from Princeton University and a year of graduate work at Columbia—she returned in the late 1970s to start a family and continue her education at the country's then-new science university (USM) in Penang. When that training proved insufficient, she decided to "get on with [her] life" and headed for England, with her 3-year-old son, to learn virology.

Her training made Cardosa a good choice in 1995 to establish a research-based Institute for Health and Community Medicine at the new university. "They wanted somebody who had started from scratch," she says about her move to Unimas from USM, where she had returned to teach after obtaining her degree from Oxford. "Lab chiefs have to be very hands-on to do science here. We don't have that middle level of workers to keep the lab running, like in the West."

Despite those limitations, Cardosa is slowly stocking up on young talent. "I came here because it was a chance to solve the pathogenesis of dengue at home, with Jane, in a better environment," says biologist Phaik Hooi Tio, who had worked with her at USM. Last fall, she was joined by chemist Donald Yapp, who completed postdocs at Washington University in St. Louis and McGill University in Montreal. "I was nervous about coming back," says Yapp. "The last time I lived here, in 1979, I was still in primary school. But the equipment here is better than what we had in Montreal."

For her research, Cardosa augments her government grants with income from a company, Venture Technologies, that she started several years ago to sell diagnostic kits for dengue and Japanese encephalitis. The company has annual sales of $150,000. "We charge people and organizations that can pay, and those who get it for free we treat as collaborators, and we ask for access to their data in return," she says.

That expertise put her in a position to help after local pediatricians reported the first cases of an illness, marked by a rash and high fever and often accompanied by damage to the heart and central nervous system, that was killing very young children. A local research team initially pointed the finger at Coxsackie virus, first identified by U.S. scientists in the 1940s. But some of the symptoms were not characteristic of Coxsackie, and the virus was never found in the victims.

A few days later, health officials and the CDC said the culprit was an enterovirus, EV-71. But Cardosa is convinced that it's not the causative agent, and Mark Pallansch, chief of CDC's enterovirus section, agrees. "EV-71 is clearly there, but lots of kids had it and didn't die. So the question is, Are there other factors?" Pallansch's lab is studying a "nonentero-, nonadeno-" virus as another possible candidate, while Cardosa has finished sequencing about half of the virus's genome.

Despite this uncertainty, Cardosa says it was an uphill battle to convince CDC officials that her lab had anything to contribute. Colleagues familiar with the incident agree that hers is a valid criticism. "The questions she was raising were legitimate, and her data were solid," says epidemiologist Joe McCormick, who spent 24 years at CDC and is now heading a new epidemiology program at the Pasteur Institute in Paris. "It was shortsighted of them not to take advantage of her capabilities. And it makes them look arrogant."

Cardosa estimates it will take several more months to sequence the virus, and Pallansch allows that the true killer may never be found. Still, she says her principles leave her no choice but to continue. "I fear that there's no concern for truth, for what really happened. ... I'm a scientist, and I want to know." **–J.D.M.**

A related problem is a lack of public understanding of research—what it is and what it can do. Two years ago, an outcry from a coalition of Philippine citizens groups prompted national legislators to introduce a bill that would have outlawed all research using transgenic organisms. Media reports raised fears of mutant organisms escaping from laboratories. Department of Science and Technology Secretary William Padolina took the lead in educating Congress about both the benefits and risks of such research, and the bill was defeated. But it taught scientists not to ignore public attitudes. "Information dissemination has become an important part of our program," says Mariechel Navarro of the National Institute of Molecular Biology and Biotechnology of the University of the Philippines, Los Baños.

Correcting such misimpressions is also high on the agenda of the cluster of national academies of science that have sprung up in recent years to advise their government and promote science. But their leaders admit that they have a long way to go. "Scientists are not very visible in public dialogue, and we are partially to blame," says A. K. Zakri, deputy vice chancellor of the UKM and a founding member of the 2-year-old Academy of Sciences Malaysia. "We don't have a Carl Sagan or a David Attenborough to promote science or nature."

Mazlan tries to make a case for science with every visitor to the planetarium and with every undergraduate in her classes. "I tell students that they should enjoy what they are doing and not worry about how much money they can make," she says. "And I tell their parents that there are lots of jobs out there for scientists, and their children can make a good living."

–Jeffrey Mervis and Dennis Normile