MANAGING SCIENCE

Agencies Embrace Peer Review To Strengthen Research Base

JAKARTA, INDONESIA—Biochemist Sangkot Marzuki, director of the Eijkman Institute here, still remembers the first meeting to screen proposals for Indonesia's new competitive grants program. It was 1991, and Marzuki was chairing the panel on biotechnology, one of 10 fields that the government had highlighted for increased investment. Drawing on his 17 years at Australia's Monash University, Marzuki began to explain how the process would work: The 10-member panel of senior scientists would eliminate the proposals that were clearly inadequate and send out the rest for peer review. Then the panel would incorporate those comments into a second review and recommend to the government which proposals were worth funding. He didn't get very far. "The panel felt capable of making the decision itself," he recalls. "The resistance was so strong the first year that we used only the panel, no outside peer reviewers."

What Marzuki was proposing ran counter to cultural norms in much of Asia, where criticism is rarely voiced publicly and junior faculty defer to their elders. It would also have meant opening up an activity previously conducted in secret by a handful of insiders. "Their attitude was, 'I know the field and my decision is final,' " he says. "It's hard for people to admit that they may not be an expert in every area." Yet, despite those obstacles, Marzuki's view eventually prevailed: Subsequent rounds of grants have incorporated more peer review.

D. NORMILE

First-class. Prasert Sobhon backs Thai grants system.

Marzuki's efforts to emulate the open, competitive research programs in the world's scientific powerhouses are being repeated across Southeast Asia. In the past decade, governments in the region have established a variety of new science and technology (S&T) programs and agencies, and they are distributing grants according to merit. And government officials insist that these and similar programs will remain in place despite the current economic hard times.

Researchers say these new grant programs and agencies mark a real turning point. There was a sense that the old ways of managing science "would get us nowhere," says Yongyuth Yuthavong, director of Thailand's National Science and Technology Development Agency (NSTDA). That approach, he recalls, included "a committee of very senior people sitting around a table reading [proposals] and saying, 'Shall we fund this?' 'Shall we do that?' "

"Things changed because of the grant sys-

PROFILE

Reviving a Nobel Past in Indonesia

JAKARTA, INDONESIA—It was the fall of 1965—a period of Indonesia's history captured vividly in the Hollywood film *The Year of Living Dangerously*. Sangkot Marzuki remembers joining thousands of other university students in the streets of Jakarta during protests marking the final days of the Sukarno regime. But a less heralded event during those turbulent times would turn out to have a more lasting impact on the 54-year-old biochemist, for 1965 also marked the closing of the Eijkman Institute, named after the Dutch bacteriologist. Eijkman's discovery of the relationship between vitamin B-1 deficiency and beriberi, in the Jakarta lab he founded in 1888, earned him a Nobel Prize. The once-thriving institute was crumbling, however, neglected by a government too poor to support basic research.

Fast-forward 28 years, to 1993. Marzuki is greeting visitors as director of a rebuilt Eijkman Institute, made possible by a $10 million injection of government funds. Marzuki had gone abroad after completing his undergraduate degree and was planning a centennial conference to honor Eijkman's laboratory when he received a faxed message from B. J. Habibie, Indonesia's minister of research and technology, asking him to set up a research institute in molecular biology.

The prodigal son had returned once before, in 1976, but had found the country a scientific backwater. "There wasn't anything going on," he recalls. "The government then wasn't interested in science." But this time he accepted. "I told him it was one of my fondest dreams to reopen the institute, and Habibie said 'OK, do it.' It's modeled after the Institute of Molecular and Cell Biology in Singapore" (*Science*, 15 October 1993, p. 353).

Over the past 4 years, Marzuki has set up a modern laboratory to explore human molecular genetics and the molecular basis of infectious diseases. That approach, he says, allows researchers to follow up on the latest discoveries without worrying about whether the work falls outside the lab's mission. "I don't see any other labs set up like Eijkman—by program activity, not by subject," says Triono, head of health research at BAPPENAS, the country's national planning and development agency. "I hope that it will show the scientific community what needs to be done."

J. MERVIS

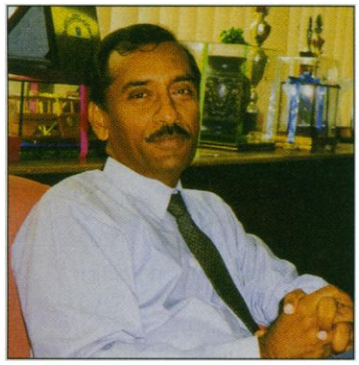
Stepping up. Sangkot Marzuki, from protester to institute chief.

In addition to expanding Marzuki's work on thalassemia, the institute has recently begun a $1.5 million collaboration with Australia's Walter and Eliza Hall Institute (WEHI) to pursue the pathobiology of cerebral malaria, the mechanism of resistance to antimalarial drugs, and the development of new vaccines and diagnostic procedures. "It's an extension of what we are doing here," says microbiologist John Reeder, WEHI's senior research officer. "They have some very bright scientists, trained abroad, and we're trying to bring them up to the point where they can be peer collaborators."

Marzuki hopes WEHI's approach to science will rub off on his young staff. And Triono is confident that Marzuki will succeed. "Sangkot is a great scientist trying to make a difference," he says. "I tell him that he belongs to the nation, not just to the Eijkman Institute." –J.D.M.

tems," says Prasert Sobhon, a professor of cell and human biology at Thailand's Mahidol University. Scientists now not only get support for research, but typically the research grants include a salary component that allows professors to drop outside consulting or teaching in favor of research. "Science is more recognized as a profession," Sobhon adds.

A fresh start in Thailand. Some of these new programs came about as part of broader shifts in managing science. In Thailand, for example, the creation of the Thailand Research Fund (TRF) and the NSTDA in the early 1990s freed R&D funding from the red tape that was strangling the country's existing science agency. NSTDA consolidated separate agencies funding primarily applied research in biotechnology, materials science, and information science. TRF funds research in all disciplines, including the humanities.



J. MERVIS

Help wanted. Malaysia's V. Danabalan tackles administrative needs.

Both agencies have clearly defined procedures to review applications and monitor research progress, an improvement over past practices. A typical 3-year TRF grant, for example, has been reviewed by outsiders, presented at a seminar, and then revised further before the money is awarded. The researcher also submits annual progress reports. Whereas TRF is strictly a funding agency, NSTDA is also building in-house labs in each of its areas of focus. And those projects also undergo external review.

Although Thai officials are proud of the country's new system of funding research, they admit it's not perfect. "We may not be able to find the right [reviewer] every time," says Vudhipong Techadamrongsin, TRF's deputy director. But continued funding, even given the current crisis, is not at the top of the Thai list of worries. NSTDA's funding has grown sixfold in just 6 years, Yuthavong says, adding that even a 20% cut in the upcoming fiscal year "may be a good thing. In the last few years, we've had more money than takers." TRF's budget has also grown rapidly to its present level of $10 million.

The Philippines takes a STAND. That is not the case in the Philippines, however. Universities and research institutes have been starved for money during the long and turbulent transition to a democratic system. "Our budget now is the same as 10 years ago," says Violeta Villegas, a plant breeder and acting director of the Institute of Plant Breeding at the University of the Philippines, Los Baños. And with more than 90% of the base budget devoted to staff salaries, there's little left for other research needs, including upgrades of equipment and building maintenance.

Outgoing President Fidel Ramos, a civil engineer, has promoted S&T to reinvigorate the Philippines' stalled economy. Since taking office in 1992, his administration has nearly quadrupled the budget of the Department of Science and Technology (DOST), to $97 million last year, including $20 million for direct research grants. The department, led by William Padolina, sets spending priorities through its Science and Technology Agenda for National Development (STAND), which has flagged biotechnology, materials science, and marine science as potential sources of higher value-added exports. DOST also reinvigorated five planning councils—industry and energy, agriculture, health, marine resources, and advanced science—that follow a peer-review process used by the U.S. National Science Foundation.

D. NORMILE

Shortfall. The Philippines' William Padolina narrows focus to optimize funding.

Although the extra money is welcome, scientists say it doesn't go far enough. Edgardo Gomez, director of the Marine Science Institute at the University of the Philippines, Diliman, says the institute gets only a third of its budget from government grants, with the rest a hodgepodge of mostly international grants: support from UNESCO to study algal blooms, a collaboration on giant clams with the Manila-based International Center for Living Aquatic Resources Management, and Japan-funded studies of coral reefs.

# OF PAPERS AND RANK		
Indonesia	2775	70
Malaysia	5626	56
Philippines	3871	61
Thailand	7759	52
# CITES/PAPER AND RANK		
Indonesia	4.04	48
Malaysia	3.13	61
Philippines	5.19	32
Thailand	4.66	39

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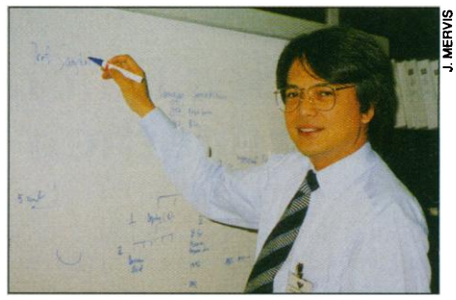
Keeping score. The number of papers and citations is seen as one way to measure quality.



J. MERVIS

Tabula rasa. Indonesia's Triono Soendoro draws up new grants process.

Experts wanted in Indonesia. Although Philippine researchers were generally familiar with outside peer review, the approach was new for most of their colleagues in Indonesia. Much of the responsibility for the new competitive grants program, whose Indonesian acronym is RUT, fell to Triono Soendoro, a reproductive biologist and bureau chief for the national development planning agency, BAPPENAS. (Its U.S. equivalent would be the Office of Management and Budget.) A physician who received his research training at Yale University, Triono joined BAPPENAS at the age of 37 with a mandate to reform the way the country managed its investment in research. "When I arrived, in 1990, we didn't have a system to select research proposals through peer review, which was a new concept in this country," he recalls.

Triono worked with B. J. Habibie, state minister for research and technology and a confidante of President Suharto. He heads the government's technology agency, BPPT, which receives about 30% of the government's overall R&D budget and which oversees funding for several smaller agencies, including space and atomic energy. While Habibie supplied the political clout, Triono enlisted the help of senior research administrators to sell the idea to his bosses at BAPPENAS. He also invited the National Research Council, created several years earlier to advise the government on S&T policies, to oversee the implementation of RUT.

Indonesian researchers who have won RUT grants are enthusiastic. "Our success has come only in the past 5 years, when the government started supporting science through the RUT grants," says physicist M. Barwami of the Institute of Technology in Bandung, whose work in optoelectronics and lasers is ranked by reviewers as on a par with the best foreign labs. "I had been interested in the topic since 1982, but I couldn't start assem-

PROFILE

Setback Spurs a Leap Ahead

BANGKOK, THAILAND—Being on the losing end of a bid to host a major research center is never pleasant. But Yongyuth Yuthavong, an organic chemist and director of Thailand's National Science and Technology Development Agency (NSTDA), says the nation's failure to land the U.N.-sponsored International Center for Genetic Engineering and Biotechnology in 1983 spurred officials to increase their commitment to biomedical research and contributed to wholesale changes in how the country's scientific research is funded and managed. It was a blow, he acknowledges, "but in retrospect it was a good thing," says Yuthavong, 53, who led the scientific committee that lost out to Italy and India.

D. NORMILE

Genetic test. Yongyuth Yuthavong says loss of center was wake-up call.

Stung by that rejection, yet convinced biotechnology was of strategic importance, Thai authorities soon created the National Center for Genetic Engineering and Biotechnology and named Yuthavong as its deputy director. In 1991, when a military coup led the United States to end scientific aid to the country, Yuthavong and colleagues quickly drafted a plan for the Thai government to pick up the slack. Within the year, the government created NSTDA and appointed Yuthavong its director. While the new agency had widespread support from the country's scientists, Yuthavong was "the key implementer," says Pornchai Matangkasombut, dean of the Faculty of Science at Mahidol University in Bangkok.

Yuthavong already had firsthand evidence that Thailand needed its own research funding agency. As an associate professor at Mahidol in the early 1970s, he relied on Britain's Wellcome Trust to fund work he began at Oxford University on how the malaria parasite changes the membrane of the host's red blood cells to facilitate its own growth. "There was almost no local support," he says about his research, which led him to be named Thailand's Scientist of the Year in 1984. Daniel Santi, professor of biochemistry at the University of California, San Francisco, says Yuthavong has been "a major contributor" to an increased understanding of how the malaria parasite develops drug resistance.

NSTDA's budget has grown sixfold since 1992, and its system of managing grant proposals, including competitive peer review, gets a thumbs-up from the community. "It's working quite nicely," says Matangkasombut.

With NSTDA up and running, Yuthavong plans this summer to return to research full-time, but not without some trepidation. The administrative work "has really blunted the research acumen," he says. "Call me next year and ask how it's going." **–D.N.**

bling components until the RUT grant."

Researchers like Barwami may not be so happy when their grants come to an end, however. Early on, Triono decided to bar RUT grantees from a second award so that they would not become dependent on the program and other scientists could have a chance to shine. "After the grant ends, they should be able to go international with their work," he says.

Marzuki, whose institution doesn't compete for RUT grants, doesn't see it that way. "Triono sees RUT as a steppingstone to other competitive awards. But there aren't any that are equivalent to RUT. And 3 years is too soon to compete successfully for overseas grants." The policy actually undermines peer review, he adds, by excluding proposals from the most talented researchers. As a result, he notes, only about 15 of the roughly 100 proposals his biotechnology panel has received in recent years are worth funding, and last year the medical panel endorsed only two of 76 proposals.

Calling the shots in Malaysia. Similar debates followed the 1988 introduction of peer review for Malaysia's Intensifying Research in Priority Areas program, which represented the first significant pot of competitive research funds in the country. Because government officials wanted scientists to take the initiative, they gave researchers great leeway to propose projects. They also rejected very few proposals. "Because we wanted to build an R&D culture, we weren't too strict about quality," says Fatimah Mohdamin, head of the science division for the Ministry of Science, Technology, and the Environment (MOSTE), who is currently studying for a Ph.D. in science policy at George Mason University in northern Virginia. "The acceptance rate was as high as 90% in the first few years."

J. MERVIS

Firsthand look. Indonesian reviewers visit a research center in Bandung.

By 1995, however, the government had changed directions and adopted a top-down approach, selecting 10 specific priority areas and requiring researchers to show how their research would profit the country. The success rate also plummeted and now stands at about 30%. "After a while, we realized that you can't go into new areas without direction from the top," says Tan Sri Omar Adbul Rahman, science adviser to Prime Minister Mahathir Mohamad, who instituted the program. "Otherwise, the research will just move ahead in small increments."

Although the competition has become stiffer, the overall allocation has grown fivefold over the last three 5-year plans to its current RM1 billion (US$250 million) for 1996–2000. A more pressing problem is inadequate administrative support to oversee the grants process. MOSTE's secretary-general, V. Danabalan, acknowledges that a problem exists. "We are looking at ways to improve the process," he says. At the same time, he says, the government's attempt to shrink the civil service precludes beefing up the bureaucracy. "I don't think that more people is the answer. But we are looking at outsourcing or some type of electronic system."

With more money not an option for Indonesia's battered economy, it's no surprise that some new grants schemes have been put on hold, including a plan to fund large collaborations in strategic areas. But Marzuki says he's still optimistic that the path carved out by RUT will become part of the scientific mainstream. "I'm happy with the way it's working," he says. "And I think that we are slowly educating the community."

–Jeffrey Mervis and Dennis Normile