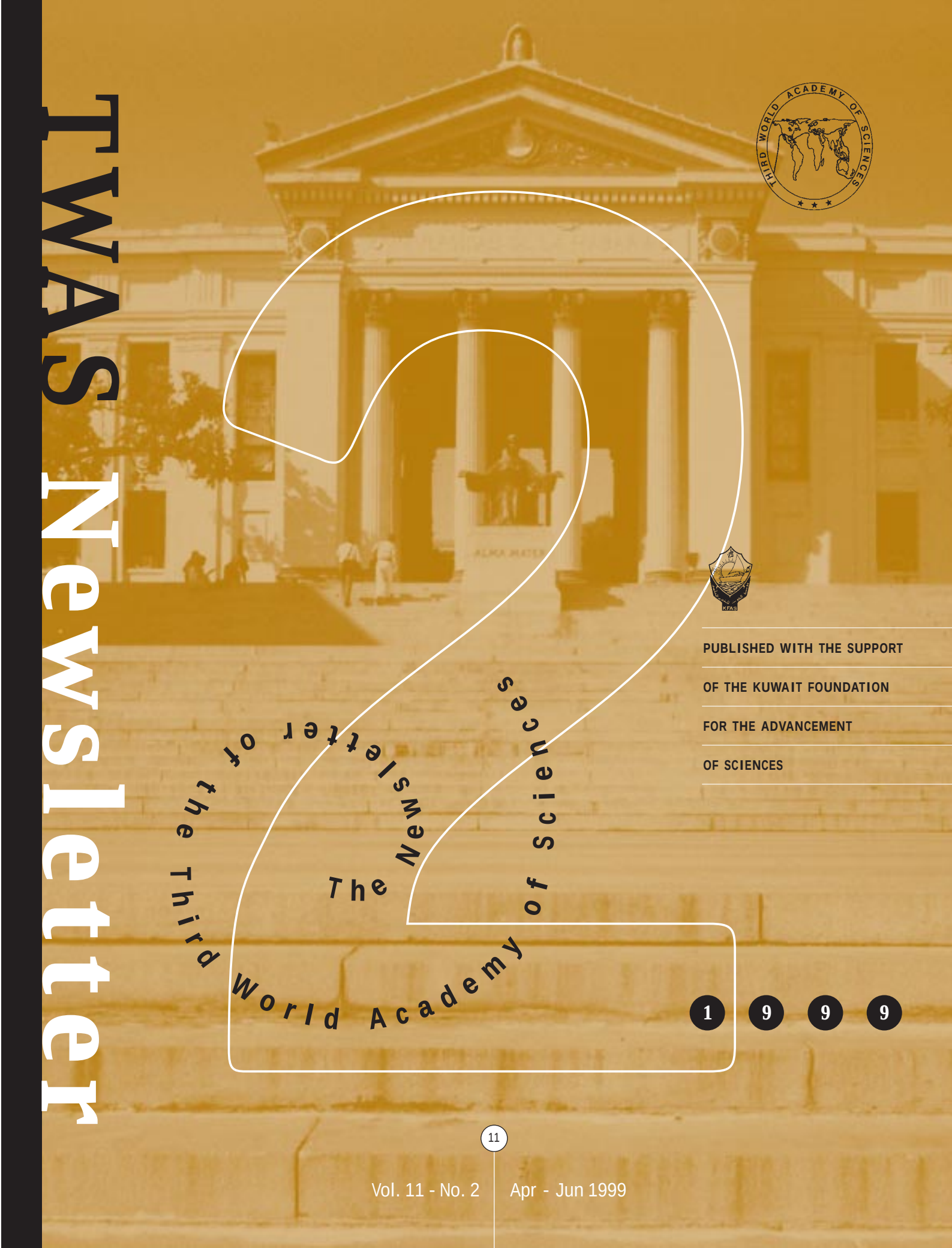
TWAS Newsletter



The Newsletter of the Third World Academy of Sciences

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EDITOR'S NOTE

North/South Gaps

Measured in terms of scientific publications, the North, which comprises 20 per cent of humanity, accounts for more than 90 per cent of the world's production of scientific knowledge. In contrast, countries in the South, where 80 per cent of the world's population live, account for less than 10 per cent. This difference has contributed significantly to current patterns of global economic inequity.

Still more disturbing is that the knowledge gap is constantly widening. Industrialized countries, with their substantial investments in research and development (R&D), continue to advance rapidly along the frontiers of scientific knowledge, making it very difficult for the developing countries, with their relatively small R&D investments, to catch up.

Yet, if modern scientific and technological knowledge has sharply divided our world into two distinct groups, it also has the power to mould it into an equitable and sustainable global village.

The first—and most important—opportunity is created by the modern information technologies, which have revolutionized modes of interaction in research, education and business. Through e-mail and the internet, these technologies offer unprecedented opportunities to transfer instantly to the science-poor countries the latest scientific and technological information.

The second important opportunity is offered by the recent statement by the World Bank that narrowing the knowledge gap between rich and poor nations should be at the centre of development aid strategies. This represents a dramatic shift from previous World Bank strategies that promoted economic development through big infrastructure projects, free trade and adjustment policies.

The third opportunity is created by the growth of science and technology in several 'middle tier' countries, such as Argentina, Brazil, China, India, Mexico, South Africa and South Korea, and their will-

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TWAS NEWSLETTER

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ingness to help others in the South develop their capacities. Regional and inter-regional co-operation in science and technology, based on linking centres of excellence into networks, offers substantial benefits to the developing countries. Many of these countries, although at different stages of development, share similar social, cultural and economic backgrounds.

Disparities between the developed and developing countries in their respective capacities to produce scientific knowledge and use this knowledge for social and economic benefit threaten the stability and future sustainability of our planet. Overcoming these disparities, although not easy, is by no means impossible.

The truth is that if we fail to seize these opportunities, the knowledge gap—and the problems that it creates—will continue to grow. Closing the gap will require sound North-South and South-South partnerships among scientists, institutions and governments. It will also require changes in the policies and strategies of leading international development agencies, giving greater priority to helping poor countries reduce the knowledge gap and generate, manage and use local knowledge for both national and global benefit. These are the issues to which both TWAS and TWNSO have devoted a great deal of resources in the past—and these are the issues that we will continue to address in the future.

Mohamed H.A. Hassan
TWAS Executive Director

For the complete text of this essay, see http://helix.nature.com/wcs/c00.html

EDITOR'S NOTE

NEW ERA FOR TWAS

A new funding mechanism for TWAS presents opportunities and challenges as the Academy enters the next century.

THE ITALIAN GOVERNMENT'S DECISION TO CONVERT THE ANNUAL VOLUNTARY CONTRIBUTION IT HAS MADE TO THE THIRD WORLD ACADEMY OF SCIENCES (TWAS) OVER THE PAST 14 YEARS INTO A LONG-TERM FINANCIAL COMMITMENT PROTECTED BY LAW IS WELCOME NEWS FOR THE ACADEMY.

For the first time in its history, TWAS will have a secure funding base allowing it to fulfil more effectively its mandate for advancing science and technology throughout the South. I don't think it's an exaggeration to say that the Italian government's generosity and commitment have guaranteed the Academy's future—and, in the process, strengthened a key voice for the promotion of science and technology in the developing world.

Such an outcome is important enough in its own right. But I also think that the Italian government's decision could have significant symbolic value, which carries an impact far beyond the site of the TWAS secretariat in Trieste.

As many others have noted, the policy environment surrounding questions of economic development in the developing world has changed dramatically since the collapse of communism a decade ago. In the 1960s and 1970s, keen observers, like TWAS's founding president Abdus Salam, called on industrial countries in the North to invest 1 per cent of their gross domestic product (GDP) on programmes and projects to spur economic development in the South. Salam asserted that it was not only the right thing to do morally, but a smart thing to do diplomatically, as part of a larger effort to build a more stable and secure world. In other words it was in the North's self-interest to be magnanimous in its dealings with the South.

That 1 per cent figure was never reached even during the height of the cold war. Now, with the demise of the Soviet Union and the absence of strategic roles for small, remote Asian and African nations in global diplomacy, the percentage of the world's GDP invested in international aid programmes in the South has fallen to 0.25 per cent—a miserly US$30 billion a year. When you consider that education experts estimate that it would take some $20 billion to eradicate global illiteracy, you realize how wide the "aid" gap is between current investments and needs.

The point is that the Italian government's decision to invest in TWAS's future could re-ignite interest in developmental issues after a decade of neglect. Will other countries in the North be willing to follow Italy's lead and refocus their attention on problems now impeding economic development in the South? Will countries in the South take the steps that are necessary to help advance economic development within their borders in the years ahead?

The Italian government's decision concerning TWAS also comes at a time when international funding agencies are struggling to redefine their missions considering the new world in which they operate. For the past half century, the economic development paradigm that they sought to promote went like this: Take advantage of the cheap, unskilled labour and abundant, unexploited natural resources existing in the developing world, and invest in projects that spur commodity production. Eager to receive outside funding, countries in the developing world responded to the funding priorities of international aid organizations by devising strategies for economic development that drew on their comparative strengths. The strategy's success was secured by creating protective markets within each nation's borders.

Globalization and deregulation have rendered the conventional paradigm for economic development obsolete.

Between the 1950s and 1970s, these interrelated tactics worked to a degree. Indeed some nations in the South made slow but steady progress largely through the extraction of natural resources and the dedication of their unskilled labourers.

But two dramatic forces—globalization and deregulation—have rendered the conventional paradigm for economic development in the South obsolete. With both labour and capital now able to move at rapid speeds across borders, the comparative labour and resource advantages that developing countries once enjoyed have diminished. At the same time, unprecedented advances in new technologies—largely spurred by huge capital investments in the North—have dimmed the prospects for countries that continue to base their economic fortunes on resource extraction and low-tech manufacturing. In effect, the world's commodity economy has been replaced by a knowledge economy. Consequently, factors previously viewed as advantages have become handicaps.

The speed of economic and financial transactions, in fact, has made developing countries more vulnerable than ever.

Over the short term, this vulnerability has been most dramatically revealed in the economic collapse that began in southeast Asia nearly two years ago and has since swept across much of the developing world. Caught in the web of this economic crisis, Brazil's gross domestic product will decline 3 per cent this year. That, in turn, will cause an additional 3 million people to slip into poverty, which in Brazil is defined by family earnings of less than US$1 a day. One doesn't need to be a student of science to understand the impact that such trends will have on investments in research and development.

Over the long term, the vulnerability faced by developing countries surfaces most dramatically in World Bank statistics that indicate that per capita income in such regions as sub-Saharan Africa has substantially declined over the past decade. Thus in an age of unprecedented advances in science and technology, living standards in some nations are becoming worse, not better.

Given these developments, countries in the South find themselves face-to-face with a paradoxical situation. On the one hand, the South enjoys promising opportunities to make great progress in science and technology, particularly if it gains access to the new information technologies. On the other hand, the South runs the risk of falling farther behind if it fails to do so.

That's where the work of TWAS becomes vitally important. Through its research grants programme, the Academy has helped thousands of scientists to continue acquiring the knowledge and skills that they need to be successful in their careers. And through its network of centres of excellence, the Academy has helped scientists in countries throughout the South share facilities and information in ways that have proven mutually beneficial to people and places facing similar problems. The goal is to create a critical mass of skilled scientists and technologists throughout the developing world that can stand at the vanguard of economic and social progress.

Today, vast opportunities exist to expand the Academy's efforts both in the South and North. In a sense, environmental problems are part of our shared heritage—and our shared burden as well. Take the issue of climate change. Most of the world's climate experts agree that the Earth's temperatures are rising. The question is no longer 'when,' but 'how much' and 'where.' As a result, both the North and South share an abiding interest in determining the extent of the problem and uncovering viable solutions that may slow or mitigate the adverse impact carbon dioxide and other emissions are having on the atmosphere.

Researchers estimate that industrialized countries will spend about US$100 billion a year between now and 2010 to meet the emission-reduction targets that participating nations agreed to at

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the 1997 climate change conference in Kyoto, Japan. If a portion of these expenditures were invested in clean-energy projects in the South—for example, on the development of solar and biomass energy facilities or cogeneration and small hydroelectric plants—a wide range of benefits might follow.

In developing countries, emissions would be reduced; the infrastructure for economic development would be strengthened; and the technical skills of the labour force would be enhanced. Meanwhile, developed countries would realize a greater return on their investments. In other words, each dollar of expenditure in the South would remove more pollutants from the atmosphere than the same level of investment in the North.

Other global issues—for instance, reforestation and the use of medicinal plants for pharmaceutical advances—lend themselves to the same dynamic. Small investments by the North in projects in the South could have huge payoffs in addressing these critical global concerns and, at the same time, provide opportunities for strengthening the science and technological base in developing countries.

The world's commodity economy has been replaced by a knowledge economy.

The South also has a responsibility to lay the groundwork for making the best use of investments designed to promote science and technology. One of the best ways for accomplishing this task lies in home-grown efforts to advance the educational system. All levels of education deserve attention but secondary education may prove particularly important because it is the channel for providing the skilled technical personnel necessary for economic development in today's world.

The pace of change in science and technology, which has reached breakneck speed over the past few decades, promises to accelerate even more in the years ahead. The Italian government's decision to fund TWAS on a permanent basis represents a deep expression of hope based on the belief that by working together the North and South will be able to harness the opportunities in science and technology that present themselves in ways that benefit all countries and all people. It conveys a sense of optimism and commitment that I encourage other industrialized nations to emulate. ■

José I. Vargas
TWAS and TWNSO President

S&T IN CUBA

The former president of the Caribbean Academy of Sciences talks about his recent first-hand look at the state of science and technology in Cuba.

SINCE THE REVOLUTION IN 1959, CUBA'S LEADERS HAVE RECOGNIZED THAT SCIENCE AND TECHNOLOGY (S&T) WOULD BE THE KEY TO THEIR NATION'S FUTURE. BIOTECHNOLOGY ULTIMATELY WAS CHOSEN AS A PRIME AREA OF CONCERN, REPORTEDLY BY FIDEL CASTRO HIMSELF.

The rationale for this decision was that given the nation's limited financial and human resources, S&T had to be development-oriented: Biotechnology, a field with great potential, could help improve public health, mainly through the development of new vaccines; advance crop and animal production; and earn hard currency through the marketing of products.

BIOTECHNOLOGY

Founded in 1986, the Centre for Genetic Engineering and Biotechnology (CIGB), one of 13 scientific research institutes created by the Ministry of Health, is Cuba's most renowned research centre. It is a source of pride for all Cubans, and very much the heart of Cuban science.

In 1981, Cuba experienced an epidemic of dengue fever. The National Centre for Scientific Research called a meeting of the directors of the nation's research centres to address the situation. Discussions turned to a suggestion previously made by a U.S. scientist who had met with Fidel Castro concerning the use of interferon in viral infections.

Two major decisions were taken at the meeting: to produce interferon and to build the necessary scientific research capacity for developing the emerging field of biotechnology.

Interferon was effectively used in the treatment of dengue. The success of this effort accelerated Cuban research in molecular biology and genetic engineering. That, in turn, paved the way for the opening of CIGB in 1986.

Located west of Havana, CIGB is a self-contained centre with state-of-the-art equipment and production facilities. Its research and production staff consists of more than 1000 people, including 700 highly skilled researchers who received their training in France, Germany, the United Kingdom and Canada. The centre's main building contains well-maintained air-conditioned laboratories, an auditorium seating 400 people, lecture rooms, language laboratories, a library and a gymnasium. The research area includes five greenhouses and a biotherium equipped for different animal species.

CIGB has fully integrated its research, production and marketing functions and has established several divisions with specific responsibilities—for example, a Vaccine Division, Pharmaceutical Division, Plant Molecular Biology Division and Mammal Cell Genetic Division.

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In addition, in 1991 CIGB launched a separate company, Heber Biotec, to market the centre's 160 products. These products, which are currently available in more than 50 countries, include a hepatitis B vaccine, human alpha interferon, a diagnostic kit for HIV and a cattle tick vaccine. Research and development is now underway on vaccines for HIV, meningitis and hepatitis C.

Like other scientific organizations in Cuba, CIGB does not work in isolation. In fact, it is at the hub of a network of institutions involved in biotechnology research and development that includes:

- *Centre for Molecular Immunology*, focusing on anti-cancer and other pharmaceutical products.
- *National Biopreparations Centre*, focusing on the production of hepatitis B vaccines.
- *Finlay Institute*, focusing on combining existing vaccines, such as vaccines for influenza and cholera, to create new ones. The institute produces meningococcal type B vaccine used to combat meningitis. Exports of this vaccine have generated US$40 million in revenues.
- *National Centre for the Production of Laboratory Animals*, which produces a variety of animals—from mice to monkeys—to meet the growing needs of Cuba's other research centres.

Biotechnology research, in which the government invested US$1 billion from 1990 to 1997, is the strongest link in Cuba's S&T efforts.

PUBLIC HEALTH

In the late 1950s, Cuba's infant mortality rate was one in 10, largely due to diarrhoea and respiratory diseases. Cuba had just one medical school and 6,000 doctors.

Today, Cuba, with a population of 11 million, has 14 medical schools and 60,000 doctors. The latter translates into one doctor for every 200 people. The nation has the lowest mortality rate (8 per 1000) and the highest life expectancy (73) in Latin America. Mass immunization has virtually eradicated several contagious diseases. For example, the Pan American World Health Organization (PAHO) praised Cuba for being the first polio-free country in the Americas. In 1997, no cases of whooping cough, infantile tetanus, poliomyelitis, measles, mumps, rubella or yellow fever were diagnosed. What's behind Cuba's successful public health programme?

- Medical services, including all drugs, are free.
- Pregnant women receive comprehensive health care.
- A free vaccination programme that includes 12 vaccines (PAHO recommends seven) is available to all children.
- Primary care doctors and nurses can be found in every neighbourhood.
- An effective health-care surveillance and prevention programme has been created. For example, Cuban health officials detected the first cases of a December 1996 dengue outbreak within one month, and the number of people afflicted with this illness was restricted to 15—largely because of the effectiveness of the nation's health surveillance system.

Cuba has shown that any developing country can provide education and health care for its people by embracing S&T.

The Pedro Kourí Institute for Tropical Medicine (IPK), established in 1937, seeks excellence in research and development in such areas as tropical medicine, microbiology and communicable diseases. More specifically, it has explored treatments for tuberculosis, AIDS prevention, and dengue immunization. The institute also provides post-graduate training courses for health care professionals, which have been sponsored by UNESCO and PAHO, and offers consultancy services to governments and universities and has an active exchange programme with several countries.

AGRICULTURE AND BASIC SCIENCE

Cuba's S&T efforts are intricately linked to development, and the nation's agricultural sciences are no exception to this rule. Research focuses on crops that generate substantial foreign exchange (for example, sugar and tobacco) and those that help Cuba feed its people and meet the needs of an expanding tourism industry.

At the Institute of Fundamental Research in Tropical Agriculture, a great deal of research has been carried out on neem as a natural pesticide. Neem cultivation began in 1991. Today, there are more than 500,000 neem trees in Cuba.

A joint proposal with the Caribbean Agriculture and Research Development Institute (CARDI) seeks to advance the technologies necessary for the agroindustrial development of neem for use in pesticides and veterinary products. The proposal calls for the creation of a pilot programme for the production and marketing of neem pesticides.

In addition, the institute is involved in projects for pest management that rely on vegetable residues (to date, only tobacco residue has been used as an insecticide) and an integrated resource management plan for the cultivation of papaya that would reduce yield losses.

In Cuba, research in the basic sciences—for example, physics and chemistry—takes place primarily at universities. Because of the fragile state of the economy and Cuba's commitment to

biotechnology, the basic sciences (though not neglected) are not afforded the same level of research support. This does not mean basic scientists are less active or motivated. They attend international conferences and undertake frontier work with researchers abroad. In fact, members of the Institute of Computer Science, Mathematics and Physics will host a major international conference later this year.

Cubans are proud of their nation's achievements in the field of science and technology despite the external pressures that have constrained their ability to purchase technology and market their products. Cuba's investment in biotechnology, apart from being a foreign exchange earner, has benefited the health and agricultural sectors. Emphasis on preventive medicine and community-based public health has built a health-care system second to none in the developing world. Cuba also has made great strides in education overall. In 1958, Cuba had only three universities; today, it has 47. A recent UNESCO study gave Cuba the highest score in elementary education in Latin America.

Cuban scientists are exceptionally competent and display a deep interest in their work. Moreover, unlike their counterparts in many other Third World countries, scientists in Cuba have special status. Science enjoys high social recognition largely because it makes substantial contributions to economic and social development. At the same time, Cuban women are present in large numbers and in high positions throughout the nation's scientific enterprise. Indeed the Minister for Science, Technology and the Environment, Rosa Elena Simeón, is a woman scientist educated at the Pasteur Institute in France.

At a major scientific meeting hosted by the Caribbean Academy of Sciences last September, Simeón stated that Cuba stood ready to share its knowledge of S&T with other Caribbean nations. How may the region benefit from this offer? Cuba is arguably the most scientifically advanced nation in the Caribbean, if not the developing world (it spends 1 percent of its GNP on S&T, compared to an estimated 0.2 percent in most developing countries). Cooperation in the area of biotechnology would be difficult because of disparities in the S&T infrastructure. However, training and joint research initiatives in areas of public health, agriculture and the basic sciences likely would prove more fruitful and, as a result, deserve serious attention.

Quality education and health care for all will serve as the twin pillars of development and progress in the developing world. Cuba has shown that any developing country, given the political will, can provide proper education and health care for its people by embracing science and technology as the centrepiece of its efforts. That's the good news. The bad news is that in the absence of such a strategy, people-oriented development is not possible. ■

Harold Ramkissoon
Immediate Past President and Foreign Secretary
Caribbean Academy of Sciences
Trinidad & Tobago, West Indies

SHARING EXPERIENCES

A new book, assembled with the help of TWAS and TWNSO, highlights successful experiences in science and technology in the South.

THE UNITED NATIONS DEVELOPMENT PROGRAMME SPECIAL UNIT FOR TECHNICAL COOPERATION AMONG DEVELOPING COUNTRIES (UNDP-SU/TCDC) HAS ANNOUNCED THE PUBLICATION OF *SHARING INNOVATIVE EXPERIENCES*. THE VOLUME, WHICH CONSISTS OF 29 CASE STUDIES FROM 15 DIFFERENT NATIONS, EXAMINES "SUCCESSFUL INITIATIVES IN SCIENCE AND TECHNOLOGY IN THE SOUTH." THE PROJECT WAS CO-SPONSORED BY TWAS AND TWNSO.

"Our aim," explains John Ohiorhenuan, Director of TCDC, "is to describe practices and experiences in developing countries that have successfully addressed environmental, social and development problems."

"The South faces a host of challenges," adds R.A. Mashelkar, who served as chairperson of the project's steering committee. "Our intent is not to minimize these challenges," Mashelkar notes, "but to show that successful initiatives may serve as valuable sources of information. The monograph is based on the principle that we have a great deal to learn from one another." Mashelkar is the Director General of the Council of Scientific and Industrial Research (CSIR) in New Delhi, India.

The volume contains a chapter on Brazil's aircraft industry, which has successfully manufactured and exported medium-sized transport jets and military turboprops. Another chapter examines South Korea's construction of a digital telephone exchange and networking system that now reaches 10 million customers within the country and 3 million more abroad.

State-of-the-art, high-tech projects designed to move a country into the global economic market place are not the only projects highlighted in *Sharing Innovative Experiences.* In fact, the majority of projects described in this volume either rely on middle-range technologies to address critical health or environmental problems, or draw on indigenous knowledge and resources to improve the quality of everyday life for local, native-born populations.

For example, the International Centre for Diarrhoeal Diseases Research in Bangladesh (ICDDR-B) helped transfer medical laboratory findings to clinics and homes where cost-effective oral rehydration therapies could be used to fight the ravages of diarrhoea. Meanwhile, the International Rice Research Institute (IRRI) in the Philippines played a major role in advancing our knowledge of plant

genetics, leading to the cultivation of higher yielding plant varieties that proved instrumental in the global campaign against malnutrition and hunger.

Some of the projects in this collection, moreover, describe the use of very modest technologies. For instance, Ethiopia's design and construction of a more efficient, inexpensive plough dramatically raised the productivity of the nation's fertile but crusty soil. Thailand's aquaculture initiatives improved the diet and generated much-needed income for some of the nation's poorest families. Brazil's efforts to develop a low-cost, sugar-based feed supplement for cattle not only enhanced the quality of Brazil's beef but provided another market for the nation's sugar cane farmers.

As Mashelkar observes, "All of these projects—from large government-sponsored efforts to gain a foothold in the global market for jet planes to small locally based projects designed to help farmers make more efficient use of their ox-drawn plough—have two things in common: first, they address real-world problems and, second, project goals never stray far from project resources. Success depends on truly understanding the nature of the challenge and then applying technologies that are not beyond the reach of those who will be asked to use them."

The TWAS/TWNSO volume is the first in a series of monographs on innovative experiences sponsored by TCDC. Other volumes, examining the environment, food security and other critical issues, which are due out this fall, have been assembled with the help of the United Nations Food and Agriculture Organization, Third World Network and Caribbean Centre for Development Administration. In addition, TWAS and TWNSO have received funding from TCDC to produce a follow-up volume on innovative experiences concentrating exclusively on the use of medicinal plants in the developing world. The project is scheduled to begin this fall.

"Our next 'innovative experience' volume," says Mohamed H.A. Hassan, Executive Director of TWAS, "will examine an issue of critical importance to both the North and the South. Issues connected to the harvesting and use of medicinal plants touch on topics ranging from future medical practices to intellectual property rights. For a number of developing countries, particularly those in impoverished regions of equatorial Africa, medicinal plants could be a prime source of improvement in their economic well-being. The monograph, in short, promises to make an important contribution to an important topic of global concern."

In the future, TCDC plans to place the texts of all the case studies examined in its monographs on-line and to create a chat-line where people from around the world—and particularly, the South—can exchange ideas on innovative science-based strategies for sustainable development.

"It's all part of an effort to help policy makers, grassroots activists, entrepreneurs and scientists draw information and inspiration from the success of others," explains Ohiorhenuan. "We think it's one of the best strategies we can pursue for advancing the cause of development in the developing world." ■

For additional information about TCDC information-exchange efforts, including the availability of *Sharing Innovative Experiences,* volume 1, please contact:

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YOU NEVER KNOW...

Is there any way to stem the brain drain—the migration of scientists from the South to the North? Trends over the past half century suggest that it won't be easy. Despite persistent efforts to keep developing world scientists in their countries of birth, where their talents are desperately needed, the prospects of higher pay, better working conditions and more secure employment often prove too alluring for many of the South's best scientists to resist. The worst aspect of the trend is that emigration is strongest among the world's poorest countries. Indeed in the nations of sub-Saharan Africa it has reached epidemic proportions.

We all know the economic and social forces that drive scientists from their home countries. We also have learned over the years that some well-meaning programmes simply do not work. For example, educating and training Third World scientists in the North usually leads to a permanent change of address for them, which only enhances the scientific and technical capabilities of the world's most advanced nations. As Berita Olsson, director of the Swedish Agency for Research Cooperation (SAREC/Sida) recently noted: When developing world researchers receive their advanced degrees in the North, "they never come back."

That's why the Third World Academy of Sciences' (TWAS) Associateship Scheme at Centres of Excellence in the South has proven such a valuable tool in counteracting the brain drain. Currently funded by the United Nations Educational, Scientific and Cultural Organization (UNESCO), the scheme enables scientists from the South to pursue their own research agendas in some of the developing world's best scientific research centres. Such visits, which usually take place twice for two to three months each time, not only allow researchers to remain current in their fields but add to the research capabilities of the hosting institutions. To date, nearly 170 scientists from 40 developing countries have benefited from the initiative, which now draws on more than 60 centres of excellence in the South.

Theo Chidiezie Chineke is one of many scientists who has benefited from the programme. In 1996, Chineke, who had earned a doctorate in physics from the University of Ibadan in Nigeria three years earlier, received an associateship scheme grant to visit the Chinese Academy of Science's Institute of Atmospheric Physics in Beijing. He returned there the following year. Working with Academy's general circulation and ocean models, Chineke was able to sharpen his skills in medium-range weather forecasting and establish a strong foundation for a what has become a promising career. What follows is Chineke's personal account describing what his participation in the TWAS associateship scheme has meant to him.

"You never know, do you?" That well-worn phrase certainly captures the unexpected course of events that have shaped my life over the past several years.

While lecturing at Abia State University in Uturu, Nigeria, several years ago, I stumbled on some material about the Third World Academy of Sciences' (TWAS) in the Office of the Dean of Sciences'. The stack included an application form for the TWAS Associateship Scheme at Centres of Excellence in the South. To this day, I remain grateful both to the person in Trieste who mailed the information and to the university staff member in Uturu who did not throw it out.

Earlier in my career, I was fortunate enough to receive a grant to pursue weather-related research at the International Institute of Tropical Agriculture, one of 16 agricultural centres comprising the Consultative Group on International Agriculture (CGIAR), a global network dedicated to research for improving increased crop yields in the developing world. There, I learned first-hand how excellent equipment can enhance your research. So, when I found out about the TWAS programme, I jumped at the opportunity to return to a state-of-the-art facility.

My first visit to the Chinese Academy of Sciences' Institute of Atmospheric Physics took place between June and September 1996. During this time, I analysed the institute's general circulation model for medium-range forecasting in Africa, which had been developed in the late 1980s, and I compared the results to data from the European Centre for Medium-Range Weather Forecasting assembled for the same period. I concluded that the forecasts generated by the two models were not only similar to one another but, more importantly, attained a level of accuracy that made both models useful tools for weather projections.

For my second visit to the institute, which took place between November 1997 and January 1998, I devised a more ambitious research agenda. During this time, I coupled the general circulation model for medium-range forecasting, the focal point of my previous studies, with the institute's ocean general circulation model to examine how the interplay between these two models might help us better understand weather patterns in Africa. This research earned me several publications in international journals, and a reputation as a skilled meteorologist, which led to expanded responsibilities as a computer consultant at my university in Nigeria.

Poor research facilities compromise the work of scientists throughout sub-Saharan Africa. The problem is persistent and the appeal of better working conditions elsewhere never fades completely into the background. But programmes like the TWAS Associateship Scheme at Centres of Excellence in the South offer scientists hope that they can continue

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their careers without abandoning either their countries of birth or the concerns that often are critical to their communities and regions.

In fact, the TWAS programme has helped me nurture a fruitful area of research that's not only been personally rewarding but has proven valuable for both my university colleagues and students, and, more generally, my fellow Nigerians. After all, like farmers elsewhere, Nigeria's farmers desire accurate information about the weather to help them improve their crop yields.

Over the next 12 months, I hope to build on the skills that I have acquired with the help of TWAS by working at the University of L'Aquila's Atmospheric Physics Laboratory in Italy, where I will serve as an associate of the Trieste-based Abdus Salam International Centre for Theoretical Physics (ICTP) Training and Research in Italian Laboratories (TRIL) programme. During this time, I plan to receive the training I need for real-time forecasting using a worldclass model developed by Pennsylvania State University and the National Centre for Atmospheric Research (NCAR) in the United States. My ultimate goal is to develop a limited area model for weather prediction in Nigeria that would bring my country closer to the rest of the world in its ability to accurately forecast local and regional weather trends.

In the past year or so, I have learned that TWAS and ICTP are located on the same campus and share a common history. Yet, I think it's important to note that I discovered the TRIL programme the same way that I had discovered the TWAS Associateship Scheme—by thumbing through a pile of flyers and brochures sent to the place where I was working (in this instance, the Chinese Academy of Sciences' Atmospheric Physics Institute). Once again, my career path had been set by that well-worn phrase that seems to work for me in wondrous ways: "You never know, do you?" ■

For additional information about the TWAS Associate Scheme at Centres of Excellence in the South, please contact ⋯⁘ **Helen Grant, TWAS**, c/o Abdus Salam International Centre for Theoretical Physics (ICTP), 34014 Trieste, Italy, phone 39 040 2240387, fax 39 040 224559, e-mail: twas@ictp.trieste.it

THE ACADEMY'S NEWEST MEMBERS

LAST DECEMBER IN TRIESTE, 31 FELLOWS AND 8 ASSOCIATED FELLOWS WERE SELECTED TO THE THIRD WORLD ACADEMY OF SCIENCES (TWAS). RECOMMENDED FOR ELECTION BY THE TWAS COUNCIL AND SUBSEQUENTLY ELECTED BY TWAS MEMBERS BY POSTAL BALLOT, THESE DISTINGUISHED SCIENTISTS BRING THE TOTAL NUMBER OF TWAS MEMBERS TO 516. BELOW ARE THE NAMES AND INSTITUTIONAL AFFILIATION OF TWAS'S NEWEST MEMBERS. FOR A DETAILED DESCRIPTION OF THEIR SCIENTIFIC ACCOMPLISHMENTS AND CONTRIBUTIONS, SEE HTTP://WWW.ICTP.TRIESTE.IT/~TWAS/ELECTED98.HTML

TWAS FELLOWS 1998

- **Berhanu M. Abegaz** (Ethiopia), Department of Chemistry, University of Botswana, Gaborone, Botswana.
- **Elias Baydoun** (Lebanon), Department of Biology, American University of Beirut, Beirut, Lebanon.
- **Asis Datta** (India), Jawaharlal Nehru University, New Delhi, India.
- **Luis de la Peña Auerbach** (Mexico), Instituto de Física, Universidad Nacional Autónoma de Mexico, Mexico City, Mexico.
- **Bhola Nath Dhawan** (India), Central Drug Research Institute, Lucknow, India.
- **Fayyazuddin** (Pakistan), National Centre for Physics, Quaid-i-Azam University, Islamabad, Pakistan.
- **Sylvio Ferraz-Mello** (Brazil), Observatório Nacional, Rio de Janeiro, Brazil.
- **Juan A. Garbarino** (Chile), Departamento de Química, Universidad T.F. Santa Maria, Valparaiso, Chile.
- **Ricardo Gattass** (Brazil), Laboratório de Fisiologia da Cognição, Instituto de Biofísica Carlos Chagas Filho, Rio de Janeiro, Brazil.

• **Girjesh Govil** (India), Tata Institute of Fundamental Research, Mumbai, India.

• **C.C. Hang** (Singapore), National University of Singapore, Singapore.

• **Zahurul Karim** (Bangladesh), Bangladesh Agricultural Research Council, Dhaka, Bangladesh.

• **Satinder Vir Kessar** (India), Department of Chemistry, Panjab University, Chandigarh, India.

• **Ho Wang Lee** (Korea Rep.), Asan Institute for Life Sciences, Asan Foundation, Seoul, Republic of Korea.

• **Fang-hua Li** (China), Department of Physics and Materials Science, City University of Hong Kong, Hong Kong, China.

• **Zhi-Ming Ma** (China), Institute of Applied Mathematics, Chinese Academy of Sciences, Beijing, China.

• **Syed Qasim Mehdi** (Pakistan), Biomedical and Genetic Engineering Division, Dr. AQ Khan Research Laboratory, Islamabad, Pakistan.

• **Gloria Montenegro** (Chile), Laboratorio de Botánica Terrestre, Departamento de Ecología, Facultad de Ciencias Biológicas, Pontificia Universidad Católica de Chile, Santiago, Chile.

• **Antonio Divino Moura** (Brazil), International Research Institute for Climate Prediction, Palisades, New York, USA.

• **Narasimhaiengar Mukunda** (India), Centre for Theoretical Studies, Indian Institute of Science, Bangalore, India.

• **David Uke Ukiwe Okali** (Nigeria), Department of Forest Resource Management, University of Ibadan, Ibadan, Nigeria.

• **Sankar K. Pal** (India), Machine Intelligence Unit, Indian Statistical Institute, Calcutta, India.

• **Kalyanapuram Rangachari Parthasarathy** (India), Indian Statistical Institute, Delhi Centre, New Delhi, India.

• **Lalit Mohan Patnaik** (India), Microprocessor Applications Laboratory, Department of Computer Science and Automation, Indian Institute of Science, Bangalore, India.

• **Victor A. Ramos** (Argentina), Depto. de Ciencias Geológicas, Universidad de Buenos Aires, Ciudad Universitaria, Buenos Aires, Argentina.

• **Virendra Singh** (India), Tata Institute of Fundamental Research, Department of Theoretical Physics, Mumbai, India.

• **M.S. Srinivasan** (India), Department of Geology, Banaras Hindu University, Varanasi, India.

• **Jinfa Tang** (China), Department of Optical Engineering, Zhejiang University, Hangzhou, China.

• **Juan Tirao** (Argentina), Institute of Mathematics, Astronomy and Physics, Universidad Nacional de Córdoba, Córdoba, Argentina.

• **Martanda Varma Sankaran Valiathan** (India), Manipal Academy of Higher Education, Manipal, India.

• **Zuoyan Zhu** (China), Institute of Hydrobiology, Chinese Academy of Sciences, Lojiashan, Wuhan, Hubei Province, China.

TWAS ASSOCIATE FELLOWS

• **Nicola Cabibbo** (Italy), Istituto di Fisica, Università "La Sapienza", Rome, Italy

• **Anthony K. Cheetham** (United Kingdom), Materials Research Laboratory, University of California, Santa Barbara, California, USA

• **Saburo Nagakura** (Japan), Kanagwa Academy of Science and Technology, Sakado, Kawasaki, Kanagawa, Japan.

• **Mohamed Najim** (France), Ecole Nationale Supérieure d'Electronique et de Radioélectricité de Bordeaux, Université de Bordeaux I, Talence, France.

• **Yasutomi Nishizuka** (Japan), Kobe University, Kobe, Japan.

• **Un-Chul Paek** (USA), Kwangju Institute of Science and Technology, Kwangju, Republic of Korea.

• **Katepalli R. Sreenivasan** (USA), Mason Laboratory, Yale University, New Haven, Connecticut, USA.

• **Salih J. Wakil** (USA), Department of Biochemistry, Baylor College of Medicine, Houston, Texas, USA.

OBASIS'S VISIT

G.O.P. Obasi (TWAS Fellow 1996), who was recently elected to a fifth term as Secretary-General of the World Meteorological Organization (WMO), met this June with TWAS Executive Director **M.H.A. Hassan** at the Academy's headquarters. Obasi was in Trieste to speak at the opening ceremonies of the Global Change Conference hosted by the Abdus Salam International Centre for Theoretical Physics (ICTP). He took advantage of his visit to discuss potential areas of cooperation between TWAS and his organization. WMO, which now has 185 member nations, promotes the creation of information-gathering weather stations throughout the world; encourages the development of communications systems that facilitate the distribution of that information; and establishes standards to help ensure the quality of the data. During the past several years, the organization also has spearheaded a successful campaign to ensure that climate and weather data remain freely distributed among all nations. These efforts have been mounted to counteract the increasing tendency to privatize such information, which could adversely impact climate and weather research in public institutions throughout the world, especially research efforts in the South. Last year, Obasi was elected Vice President of TWAS for Africa. In this capacity, Obasi will work closely with TWAS in areas in

G.O.B. Obasi

which the information that his organization gathers can make a difference in the economic and social well-being of institutions and people, particularly those in sub-Saharan Africa. Such areas include analyses of the climatic forces driving natural disasters (for example, the increasing incidents of hurricanes, flooding and droughts); the potential threat posed by global warming on natural and social systems, especially those in the South; and issues related to food security in a world that could have 10 billion people by 2050. Addressing these issues, Obasi noted, involves both free access to information and the training of researchers who could effectively use this information. Both of these issues, he concluded, are of vital concern to WMO and TWAS.

WOMEN AND SCIENCE

In the Oct-Dec 1998 issue of the *TWAS Newsletter*, **Lydia Makhubu,** President of the Third World Organization for Women in Science (TWOWS), outlined the progress that her organization had made in the past and the progress it hoped to make in the future in improving the status of women scientists in the developing world (see "Women in Science"). In the following letter, **Veena Ravichandran,** Senior Scientific Officer, Committee on Science and Technology in Developing Countries (COSTED), comments on Makhubu's observations.

"Lydia Makhubu has aptly addressed the key factors that are necessary to make the scientific community more relevant for society and to enhance equitable participation of men and women in the scientific enterprise.

As a women with a doctorate in biophysics, I find that women usually opt for the so-called 'softer' sciences—environmental and public health research. Even among the 'hard sciences,' there is a preference for biological sciences not physical sciences. World over, educationalists have attempted to understand the reasons for this disparity, which clearly calls for counselling, guidance and dispelling of myths and attitudes among the younger generation.

Flexibility in the work environment, without endangering creativity and productivity, is desirable. 'Taking time out' to raise a family is an inescapable reality everywhere. Science is a creative enterprise, the quality of which is bound to be diluted by a stressful environment. The question is one of contributions to science by women in terms of quality and not by sheer numbers of their participation. This cannot happen by relaxation of standards, but by a conducive environment that provides women with the knowledge and skills that they need to succeed in their chosen fields of endeavour."

P. RODGERS-JOHNSON DIES

TWAS Fellow (1991) **Pamela Rodgers-Johnson** died on April 28. Marking the start of a long and distinguished career, in 1948 Rodgers-Johnson was among the first students to enter the University College of West Indies School of Medicine. Upon graduation in 1954, she was awarded the Allenbury Prize for Medicine and Gold Medal for the best clinical student. From there, she began a lifelong career as medical researcher and clinician concentrating on such topics as T-cell lymphotrophic viruses and autoimmune diseases in the central

Pamela Rodgers-Johnson

nervous system; neurodegenerative disorders in Jamaica; the role of viruses in schizophrenia among people of Afro-Caribbean descent; and familial tropic spastic paraparesis. During her tenure at the University of the West Indies, she also served as a visiting scientist at the National Institutes of Health in Bethesda, Maryland, USA, and Janker Clinic in Bonn, Germany. Rodgers-Johnson received numerous honours and awards and was elected a fellow or member of several learned societies, including the Royal Society of Tropical Medicine and Hygiene and the American Neurological Association. In 1991, she became the first woman from the Caribbean to be elected a member of the Third World Academy of Sciences. In 1998, she received the University of West Indies' Vice-Chancellor's Award for Excellence.

TWAS NEW IFS MEMBER

TWAS has been selected a new Member Organization of the International Foundation for Science (IFS), which is headquartered in Stockholm, Sweden. Founded in 1972, IFS is a nongovernmental organization with a membership of 104 scientific academies and research councils in 80 countries. Approximately 75 percent of IFS's membership is from the developing world. The Foundation supports meritorious young scientists, less than 40 years old, from the South focusing on the following research areas: aquatic resources, animal production, crop science, forestry/agroforestry, food science and natural products. IFS's overall goal is to strengthen the capacity of developing countries "to conduct relevant and high quality research on the management, use and conservation of biological resources and the environment." The Foundation's "activities include identifying, through competitive grants and a careful selection process, young promising scientists and science leaders; supporting them in their early careers to enable them to become established and recognized, nationally and internationally; and continuing, once their official association as IFS grantees is completed, the support of these scientists, whenever feasible and relevant." For additional information about the Foundation, contact the IFS Secretariat, Grev Turegatan 19, S-114 38 Stockholm, Sweden; ph: +46 8 54581800; fax: +46 8 54581801; e-mail: info@ ifs.se.

RIAZUDDIN DIRECTOR

Riazuddin (TWAS Fellow, 1993), professor of physics at King Fahd University of Petroleum and Minerals in Dhahran, Saudi Arabia, since 1982, has been appointed director of the new National Centre for Physics at Quaid-i-Azam University, Islamabad, Pakistan. Riazuddin, who was educated in Pakistan and the United Kingdom (he received his Ph.D. from the University of Cambridge), has served as a research associate and visiting professor in universities, laboratories and institutes around the world, including the University of Rochester, University of Pennsylvania and Virginia Polytechnic Institute in the United States; Daresbury Nuclear Physics Laboratory in the United Kingdom; and the International Centre for Theoretical Physics (ICTP) in Italy. Riazuddin is a Fellow of the Pakistan Academy of Sciences and a Member of the New York Academy of Sciences.

WHAT'S TWAS?

THE THIRD WORLD ACADEMY OF SCIENCES (TWAS) WAS FOUNDED IN 1983 BY A GROUP OF EMINENT SCIENTISTS FROM THE SOUTH UNDER THE LEADERSHIP OF THE LATE NOBEL LAUREATE ABDUS SALAM OF PAKISTAN. LAUNCHED OFFICIALLY IN TRIESTE, ITALY, IN 1985 BY THE FORMER SECRETARY GENERAL OF THE UNITED NATIONS, TWAS WAS GRANTED OFFICIAL NON-GOVERNMENTAL STATUS BY THE UNITED NATIONS ECONOMIC AND SOCIAL COUNCIL THE SAME YEAR.

At present, TWAS has 514 members from 76 countries, 62 of which are developing countries. A Council of 14 members is responsible for supervising all Academy affairs. It is assisted in the administration and coordination of programmes by a small secretariat of 10 persons, headed by the Executive Director. The secretariat is located on the premises of the Abdus Salam International Centre for Theoretical Physics (ICTP) in Trieste, Italy, which is administered by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Atomic Energy Agency (IAEA). UNESCO is also responsible for the administration of TWAS funds and staff. A major portion of TWAS funding is provided by the Ministry of Foreign Affairs of Italy.

The main objectives of TWAS are to:

- Recognize, support and promote excellence in scientific research in the South.
- Provide promising scientists in the South with research facilities necessary for the advancement of their work.
- Facilitate contacts between individual scientists and institutions in the South.
- Encourage South-North cooperation between individuals and centres of scholarship.

TWAS was instrumental in the establishment in 1988 of the Third World Network of Scientific Organizations (TWNSO), a non-governmental alliance of 154 scientific organizations from Third World countries, whose goal is to assist in building political and scientific leadership for science-based economic development in the South and to promote sustainable development through broad-based partnerships in science and technology.

TWAS also played a key role in the establishment of the Third World Organization for Women in Science (TWOWS), which was officially launched in Cairo in 1993. TWOWS has a membership of more than 1900 women scientists from 83 Third World countries. Its main objectives are to promote the research efforts and training opportunities of women scientists in the Third World and to strengthen their role in the decision-making and development processes. The secretariat of TWOWS is currently hosted and assisted by TWAS.

WANT TO KNOW MORE?

TWAS offers scientists in the Third World a variety of grants and fellowships. To find out more about these opportunities, check out the TWAS web-pages! Our main page is at:
http://www.ictp.trieste.it/~twas

FELLOWSHIPS

Want to spend some time at a research institution in another developing country? Investigate the South-South Fellowships:
http://www.ictp.trieste.it/~twas/SS-fellowships_form.html

GRANTS

Need funding for your research project? Take a look at the TWAS Research Grants:
http://www.ictp.trieste.it/~twas/RG_form.html
TWNSO runs a similar scheme, for projects carried out in collaboration with institutions in other countries in the South:
http://www.ictp.trieste.it/~twas/TWNSO_RG_form.html

EQUIPMENT

But that's not all TWAS has to offer. For instance, do you need a minor spare part for some of your laboratory equipment, no big deal, really, but you just can't get it anywhere locally? Well, TWAS can help:
http://www.ictp.trieste.it/~twas/SP_form.html

TRAVEL

Would you like to invite an eminent scholar to your institution, but need funding for his/her travel? Examine these pages, then:
http://www.ictp.trieste.it/~twas/Lect_form.html
http://www.ictp.trieste.it/~twas/Prof.html

CONFERENCES

You're organizing a scientific conference and would like to involve young scientists from the region? You may find what you are looking for here:
http://www.ictp.trieste.it/~twas/SM_form.html