1

YEAR 2006
VOL.18 NO.1

TWAS newsletter

NEWSLETTER OF THE ACADEMY OF SCIENCES FOR THE DEVELOPING WORLD

Published with the support of the Kuwait Foundation for the Advancement of Sciences

EDITORIAL

UNLIKE MANY WOMEN IN THE DEVELOPING WORLD, MY MOTHER ENCOURAGED ME TO STUDY SCIENCE. SHE ALSO BELIEVED THAT, ONE DAY, I WOULD BE A SUCCESSFUL LEADER. BEING ELECTED PRESIDENT OF THE THIRD WORLD ORGANIZATION FOR WOMEN IN SCIENCE (TWOWS) HAS THUS FULFILLED BOTH MY MOTHER'S DREAMS AND MY OWN AMBITIONS.

Women Scientists: Dreams And Ambitions

I am proud that members of TWOWS have voted for me and I aim to repay their trust by shouldering my responsibilities as best I can.

I would like to extend my personal thanks to Lydia Makhubu, president of TWOWS since its launch in 1993, for her support and encouragement. Throughout her presidency, Makhubu acted selflessly in presenting TWOWS and its goals to the world. Together with my team of newly elected vice presidents, Xin Fang from China, Ahbor D.A. Ighoroje from Benin, Rokhasana M. Ismail from Yemen and Elsa Quiroga Onostre from Bolivia, I hope that I can be as successful as Makhubu and lead TWOWS forward on the global stage.

To achieve this, we need to use not only our expertise as scientists, but also those qualities that women can bring to the international development arena, including their ability to tackle problems in a holistic way by relying on teamwork and cooperation and by building bridges between different cultures and diverse points of view.

Taking advantage of the momentum set in motion at the TWOWS International Conference and Third General Assembly held in Bangalore, India, last November, 'Women's Impact on Science and Technology in the New Millennium', we now intend to establish national and regional chapters across the developing world similar to those that already operate in such places as Cuba, Nigeria and Swaziland. By networking among ourselves, we hope to expand the sharing of information and knowledge for the betterment of both science and society. These networks will also provide an invaluable framework that will enable TWOWS members to offer their advice to the new executive committee.

CONTENTS

TWAS NEWSLETTER
Published quarterly with the support of the Kuwait Foundation for the Advancement of Sciences (KFAS) by the Academy of Sciences for the Developing World (TWAS)
c/o ICTP, Strada Costiera 11
34014 Trieste, Italy
tel: +39 040 2240327
fax: +39 040 224559
email: info@twas.org
website: www.twas.org

PRINTING
Stella Arti Grafiche, Trieste

As decided during the meeting in Bangalore, among the programmatic activities that TWOWS plans to undertake in the years ahead are those that focus on scientific capacity building and those that examine the role of girls and women in society. Indeed these are two areas that remain central to the aims of TWOWS.

More specifically, programmatic activities proposed at the Bangalore conference with a scientific focus include:

- *improving the infrastructure of both universities and laboratories to strengthen their research and teaching capabilities;*
- *turning to biotechnology to increase food production, including organizing workshops to train farmers in modern crop production techniques;*
- *conducting research on energy conservation and alternative sources of energy; and*
- *analysing sources of environmental pollution and improving remediation practices and access to safe drinking water.*

Proposed programmatic activities with a more societal focus include:

- *enhancing the life of women by promoting education for all girls;*
- *encouraging schools to adopt the latest teaching techniques in their curricula; and*
- *developing business and entrepreneurial skills among talented women.*

TWOWS, simply put, would like to devise effective strategies for helping members build linkages between science and society. The immediate aim will be to develop and implement awareness programmes for various diseases and public health issues, including cancer, the incidence of which is increasing in developing countries, HIV/AIDS and tuberculosis.

In all these activities, it is important that TWOWS retains its historical ties with TWAS – the Academy of Sciences for the Developing World.

We still have a long way to go to realize the vision of TWAS founding president, Abdus Salam, who pictured a world in which women play an equal role – in universities and laboratories as well as in business and government. We have been heartened by the support of such influential figures as C.N.R. Rao, the current president of TWAS, whose efforts proved vital in securing the support of the Indian government for holding the TWOWS meeting in Bangalore, and we are equally thankful for the continuing commitment of TWAS executive director, Mohamed Hassan.

However, to achieve our goals, TWOWS must also learn to stand on its own. To this end, we intend to develop collaborations with other international organizations such as the United Nations Children's Fund (UNICEF) and the World Health Organization (WHO).

Through its fellowship programme for young women scientists in sub-Saharan Africa and the least developed countries (LDCs), generously funded by the Swedish International Devel-

opment Agency (Sida), TWOWS has had a positive impact on the careers of young women scientists. Now we must move forward together to expand on this excellent programme. By the end of my term as TWOWS president in four years' time, I hope that we will be able to stand up and say that our organization's contributions and the individual contributions of our women scientist members have truly made a difference.

TWOWS provides us with a wonderful opportunity to prove ourselves and, equally important, to play a leading role in shaping policies dedicated to advancing science-based sustainable development. As policy makers around the world are learning with increasing regularity, many development projects will fail to achieve their goals without the input and participation of women.

Let us seize the opportunity provided by TWOWS to have our voices heard. Let us devise strategies that help advance science-based sustainable development in our communities, nations and the global society. Let us take the time and make the effort to create a better world for our children – as scientists and women, both individually and collectively. ■

Kaiser Jamil
TWOWS president
Research director
Indo American Cancer Institute and Research Centre
Hyderabad, India
email: kaiser.jamil@gmail.com

SIGNS OF HOPE IN AFRICA?

SCIENCE IN SUB-SAHARAN AFRICA IS SHOWING SIGNS OF LIFE BUT MUCH MORE WILL HAVE TO BE DONE TO TURN AROUND THE (MIS)FORTUNES OF THE WORLD'S POOREST REGION – AND MUCH OF THIS WORK WILL HAVE TO BE DONE BY AFRICANS THEMSELVES. YET, FOR THE FIRST TIME IN DECADES, THERE ARE SOME PROMISING TRENDS. MOHAMED HASSAN, EXECUTIVE DIRECTOR OF TWAS, EXPLAINS WHY.

Is sub-Saharan Africa – a region of 48 nations and home to more than 680 million people – on the mend and is science and technology leading the way? The question, which many may find odd given the dismal state of the region, not only carries importance for Africa but also for the rest of the world.

The surprising answer is that, while a great deal of the recent news has focused on what is wrong with sub-Saharan Africa (and there is a great deal that is wrong), the region may be quietly building a firm foundation for sustained economic growth through efforts that have remained largely hidden from view. Although democracy and capital investment are serving as the cornerstones of this effort in a number of African countries, science and technology are beginning to provide a sturdy framework for long-term success.

Most of the news about sub-Saharan Africa's scientific and technological future has focused on what rich Northern countries can do for their impoverished African brethren. There's the G8 communiqué on sub-Saharan Africa (based on the UK's Commission for Africa report, *Our Common Interest*); the work of the World Bank and its partner organizations, seeking to develop centres of scientific excellence in biotechnology, mathematics and other fields; the US$20 million dollar, 10-year grant from the Bill and Melinda Gates Foundation designed to build

the capacity of science academies in the region (three have been selected: Nigeria, South Africa and Uganda); and many others.

While these outside efforts are welcome (and indeed essential), the best chance for sustained progress is taking place within sub-Saharan Africa itself. It is these internal efforts, more than anything else, that give us hope for the future.

Nigeria, for example, has reformed the nation's science policies to emphasize such 'frontline' scientific ventures as electronic communications, biotechnology and space science. Last year it launched the region's first satellite intended to enhance Africa's remote sensing capabilities. Next year it will launch the region's first communications satellite. Senegal has sponsored research initiatives that have led to higher yielding crops and improved cattle breeds and it is now sharing this information with agricultural researchers and practitioners in other African nations. South Africa has taken advantage of the scientific infrastructure left behind after the collapse of apartheid to create the continent's strongest scientific base, largely by promoting scientific talent from the full spectrum of society. Tanzania has increased its budget for scientific research from US$30,000 to more than US$600,000 over the past decade. Ghana has witnessed an increase in internet users from 10,000 to 500,000 in just the past five years. And Uganda has requested a US$20 million loan from the World Bank to reform the nation's scientific institutes and establish scientific centres of excellence.

These national efforts have been matched by several noteworthy regional efforts.

The New Partnership for Africa's Development (NEPAD) has focused attention on the creation

of centres of excellence in science and technology as a critical element in its overall economic development strategy. The Network of African Science Academies (NASAc) is seeking to build the capacity of the region's science academies and to create science academies in countries where they don't exist (sub-Saharan Africa is comprised of 48 nations but has only 13 merit-based national science academies). The Nigerian government has contributed US$5 million to the African Academy of Sciences (AAS) endowment fund to help the continent's only regional academy develop a series of cross-national projects. Meanwhile, the Kenyan government recently gave AAS status as a full international organization which will help raise the organization's profile and, through special tax privileges, ease budget pressures.

It would be naive to think that this series of activities, however impressive in their scope and breadth, means that sub-Saharan Africa will soon push aside its problems and chart a clear path to peace and prosperity.

The troubles faced by the region are too entrenched and will take years of sustained and focused attention to solve. Nearly half of the population lives in extreme poverty, eking out survival on less than US$1 a day; 40 percent do not have access to safe drinking water and more than 50 percent live without adequate sanitation; more than 15 percent of the children die before their fifth birthday; and HIV/AIDS now afflicts more than 25 million people, reducing the average life expectancy in some countries to below 45 years of age.

Yet through all these dark and dim statistics there is now a glimmer of hope sparked in part by the continent's renewed interest in science and technology. And that's why it is sub-Saharan Africa's rising efforts to extricate itself from extreme poverty – unfolding in ministries of science, science academies, universities, research centres, laboratories and schools – that deserve our utmost attention and support. ■

Mohamed H.A. Hassan
Executive director
TWAS
Trieste, Italy

A similar version of this article appeared in the December 2005/January 2006 issue of SEED magazine.

TWOWS MEETS IN BANGALORE

THE THIRD WORLD ORGANIZATION FOR WOMEN IN SCIENCE (TWOWS) HELD AN INTERNATIONAL CONFERENCE, 'WOMEN'S IMPACT ON SCIENCE AND TECHNOLOGY IN THE NEW MILLENNIUM', AND ITS THIRD GENERAL ASSEMBLY, IN BANGALORE, INDIA, ON 21-25 NOVEMBER 2005. MORE THAN 350 WOMEN SCIENTISTS FROM 120 COUNTRIES ATTENDED THE EVENT. A.P.J. ABDUL KALAM, THE PRESIDENT OF INDIA, WELCOMED THE DELEGATES AND GAVE THE OPENING ADDRESS.

'Women's Impact on Science and Technology in the New Millennium' was the theme of an international conference organized by the Third World Organization for Women in Science (TWOWS). The conference, as well as TWOWS Third General Assembly, took place in late November in Bangalore, the 'Silicon Valley' of India, and a shining example of the nation's growing prowess in science and technology.

The Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), the Department of Science and Technology in the Ministry of Science and Technology, India, and the regional office of the Academy of Sciences for the Developing World (TWAS) in Bangalore co-sponsored the event. Collaborating institutions included the InterAcademy Panel (IAP), the InterAcademy Medical Panel (IAMP) and the Third World Network of Scientific Organizations (TWNSO), organizations affiliated with TWOWS and also based in Trieste, Italy.

Conference sessions were divided into four thematic tracks, each of which was explored from the perspective of the role of women in science. These themes included education, health, environment and new technologies. Participants discussed other critical issues as well – for example, ethics, indigenous knowledge and intellectual property rights.

The paramount concern, not surprisingly, was how to enhance the involvement of women in science and technology, especially in the developing world. All told, more than 350 women scientists from around the world attended the four-day event. Highlights of the conference follow.

- The opening session of the conference featured a speech by A.P.J. Abdul Kalam, President of India, in which he called on women scientists to set a forceful and effective agenda that would enable them to become full partners in science – both nationally and globally. Other dignitaries attending the opening session were Shri Kapil Sibal, India's Minister of Science and Technology; Lydia Makhubu, outgoing president of TWOWS; C.N.R. Rao, president of TWAS; V.S. Ramamurthy, secretary of the Department of Science and Technology in the Ministry of Science and Technology; Mohamed H.A. Hassan, executive director of TWAS; and V. Krishnan, Hindustan Lever research professor, JNCASR, and head of the local organizing committee.

WHAT'S TWOWS

Conceived in 1988 at an international conference held in Trieste, Italy, under the aegis of the Canadian International Development Agency (CIDA) and TWAS (the Academy of Sciences for the Developing World), the Third World Organization for Women in Science (TWOWS) was officially launched at a conference held in Cairo, Egypt, in 1993 – 'Women's Vision of Science and Technology for Development'. Today, TWOWS has more than 2,500 members, making it the largest organization of women scientists in the world. Its primary purposes are to promote the representation and leadership of women in science and technology, and to provide opportunities for women scientists to participate in programmes and policies for sustainable development, especially in the developing world.

For additional information about TWOWS, see www.twows.org.

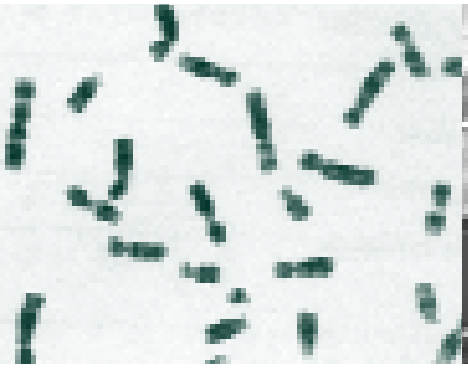
• In a keynote lecture, Her Highness Princess Chulabhorn of Thailand observed that "women scientists often face greater challenges than their male counterparts in gaining recognition for their work." She attributed these difficulties to the traditional role that women play within their families and societies, which limits their time for doing research and directly influences the expectations that society has for their success. To address these circumstances, which remain stubbornly in place despite the progress that has been made in advancing gender equality, Princess Chulabhorn stressed the important role that government research institutions, especially in the developing world, should play in promoting the role of women in science. The major contribution that they could make, she said, is to provide incentives and opportunities that take account of "the family and social responsibilities that women have." The Princess went on to describe the work of the Bangkok-based Chulabhorn Research Institute (CRI), which she founded in 1989. The institute's mandate is to develop research programmes that meet international standards for excellence and that contribute to Thailand's economic growth, especially in the fields of natural products development, environmental toxicology, biomedical research and biotechnology. The Princess highlighted the accomplishments of the CRI-sponsored project, 'Green Health Technology for Women's Empowerment and Sustainable Development', which

SESSION SAMPLES

Women scientists gave more than 200 lectures and displayed nearly 100 posters at the TWOWS Third General Assembly. Beyond the four thematic tracks focusing on education, health, environment and new technologies, the presentations and posters largely fell into three broad categories of interest: research, advocacy – or strategies for advancing the role of women in science – and policy. Here's a sampling of the talks that took place: Ysabel Reyes Ponce, staff meteorologist, National Research Institute of Meteorology, Cuba, spoke about 'The Presence of Cuban Women in Meteorology' and Afsaneh Safavi, Department of Chemistry, Shiraz University, Iran, on 'Chemistry and Women in Iran'. Rina Yanapa Chambi, scientist, Bolivian Organization of Women in Science, assessed 'The Management of the Andean Potato Weevil in Bolivia', and Mercy Bih Achu, Department of Biochemistry, University of Yaoundé, Cameroon, 'The Chemical Characteristics of Cucurbitaceae Oilseeds in Cameroon'. Gloria Luz Nelson, chair, Department of Social Sciences, College of Arts and Sciences, University of Philippines, examined 'Prenatal Care and Maternal Health in Rural Villages in the Philippines', and Sarah O.M. Nusa, professor of zoology, University of Jos, Nigeria, 'Environmentally Sustainable and Profitable Aquaculture in Nigeria'. For a complete listing of the presentations, see Proceedings of the Third General Assembly: Papers and Posters Schedule *and* Book of Abstracts. *Both publications were prepared by the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore. Copies are available from the JNCASR secretariat at* admin@jncasr.ac.in.

is designed to empower Thai women to make even greater contributions to sustainable development, especially in rural areas. Specifically, the project has focused on efforts to grow and market indigenous and medicinal plants. Its success has not only improved economic and environmental sustainability in Thailand but has helped to instil a sense of confidence among the nation's rural women. For more information about the Chulabhorn Research Institute, see *www.cri.or.th/cri*.

- In an invited lecture, Mayana Zatz, professor of genetics and director of the Human Genome Research Centre at the University of São Paulo, Brazil, described her distinguished career as a medical geneticist, which began some three decades ago as a young university



student eager to combine her knowledge of science with her desire to help humanity. "My parents found it a nightmare to explain to their friends the profession I had chosen," explained Zatz. "Human genetics? What kind of science was that? What would she do with her education?" As Zatz noted, no one is questioning the validity of the field today. Few other scientific fields carry the same impact – or hold the same promise – as the study of genetics. Zatz's early research focused on the muscle enzyme responsible for Duchenne muscular dystrophy (DMD). She also provided genetic counselling for those with a family history of the disease. After experiencing first-hand

Conference sessions were divided into four thematic tracks: education, health, environment and new technologies.

the living conditions of children affected with DMD, Zatz founded the Brazilian Muscular Dystrophy Association (ABDIM) in 1981. Today, ABDIM offers a full range of physical and psychological therapies – as well as educational programmes – to help improve the quality of life of those who have been victimized by this debilitating disease. In the late 1980s, she and her colleagues began to research new molecular genetic technologies and, more specifically, to map genes. Such efforts have vastly improved the ability of medical researchers and clinicians to diagnose and identify couples at risk of having children with DMD. She has also become involved in prenatal diagnosis, which has raised even more serious ethical issues than genetic testing for young children and adults because abortion in Brazil is illegal except in the case of rape or to save the mother's life. And most recently, Zatz helped lead a successful campaign that ultimately led the Brazilian government to legalise stem cell research in May 2005. "Direct contact with patients generates tremendous motivation," says Zatz. "It provides a sense of responsibility and a drive to fight for them – not only as a scientist but as a human being determined to diminish their suffering".

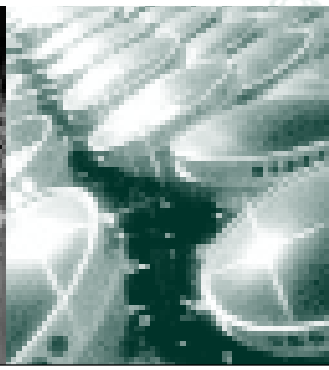
CONFERENCES PAST

'Women's Impact on Science and Technology in the New Millennium' marked the third TWOWS General Assembly. The first General Assembly of TWOWS, 'Women's Vision of Science and Technology for Development', took place in Cairo, Egypt, in 1993 and was supported by the Kuwait Foundation for the Advancement of Science (KFAS) and the Academy of Scientific Research and Technology, Egypt. The second General Assembly, 'Women, Science and Technology for Sustainable Development', was held in Cape Town, South Africa, in 1999 and was hosted by South Africa's Foundation for Research Development (now the National Research Foundation) and the Department of Arts, Culture and Science and Technology (now the Department of Science and Technology). TWOWS' next General Assembly is tentatively scheduled to take place in 2009 at a location still to be determined.

- A science and technology exhibition was sponsored by the Indian Women Scientist's Association, the Research Centre for Women's Studies, Women's University, Mumbai, the Indian Institute of Human Sciences, and the Kannager Society for Developmental Action (SODA), Orissa. The highlight of the exhibition was the display of a series of posters profiling the careers of India's most prominent women scientists. Among them was Rohini Devi, who supervised a government team of scientists responsible for developing a state-of-the-art carbon brake disk for automobiles and aeroplanes that is now marketed globally; and Bharati Bhat, a research scientist with the Indian Institute of Technology (IIT), who played a critical role in the development of 'phase array technology' currently used to track multiple aircraft and to guide missiles. The exhibition also included booths and displays describing the work of India's numerous and highly effective grassroots organizations. Women hold leadership positions in many of these organizations, the majority of which focus on educational, environmental and public health issues.

Women hold leadership positions in many of India's grassroots organizations that focus on educational, environmental and health issues.

- A plenary session focused on women and science in India, highlighting the critical role that women scientists now play in India's burgeoning scientific enterprise. During the session, Anuradha Lohiya, Department of Biochemistry, Bose Institute, Kolkata, spoke about the scourge of infectious diseases in the developing world, focusing specifically on amoebic dysentery (caused by *Entamoeba histolytica*), a common disorder that remains largely hidden from public view despite the fact that it adversely affects the health of more than 500 million people worldwide, mostly in the developing world. While the death rates associated with the disease remain relatively low, amoebic dysentery nonetheless can lead to chronic discomfort, often compromising the quality of a person's family and work life. Lohiya is engaged in the study of biotechnological strategies that can both identify and ultimately block the check points for cell proliferation that are responsible for triggering the disease. Aruna Dhathathreyan, Central Leather Research Institute, Chennai, spoke about another source of tension, this one far more abstract and removed from everyday life than amoebic dysentery but nevertheless carrying potentially important implications for public health. Specifically, Dhathathreyan outlined the current state of scientific knowledge in the field of crystal polymorphism, which analyses the ability of molecules to arrange themselves in different ways depending, for example, on surface tension and temperature. Research in this field could have a dramatic impact on drug development, especially on efforts to create drugs that can pinpoint the molecular source of a malady and



thus combat it at its point of origin. Charusita Chakravarty, Department of Chemistry, IIT, Delhi, highlighted her work on solid-fluid transitions and, more specifically, the development of computer simulations designed to measure the tipping points for crystallization in biological and inorganic materials. These efforts, she said, could ultimately have broad applications in biotechnology and materials science.

Women scientists in the developing world face a double disadvantage due not only to gender but also to geography.

- Shri Kapil Sibal, India's Minister of Science and Technology, announced the creation of a task force to examine the challenges and opportunities faced by women scientists. The group, which will report on their findings within a year, will be headed by Mahtab S. Bamji, a world-class medical researcher who is director emeritus at the National Institute of Nutrition in India. Bamji has been one of India's most outspoken advocates for increasing the presence of women in all fields of science and for providing greater opportunities for women to attain leadership positions in scientific institutions. "Women scientists in the developing world," noted Bamji, "face a double disadvantage due not only to gender but also to geography". Thus the problem of discrimination, common to women scientists worldwide, is compounded by the problem of limited resources. She went on to observe that scientific communities in many developing countries may, in fact, be a step or two ahead of the rest of their societies when it comes to issues related to gender equality. That's because science places a premium on excellence and tends to recognize proven verifiable facts and to reward accomplishment, thus minimizing prejudice and cronyism. But she was quick to add that progress has not come fast enough and that much remains to be done. She cited the case of India where studies have shown a persistently steep drop-off in female enrolment between primary and secondary school and yet, at the same time, an increasing number of Indian women who are earning doctorate degrees in science (35 percent of the total number in recent years). Despite their increasing success in higher education, Bamji noted that women occupy

POSTGRADUATE FELLOWS

The largest programme administered by TWOWS is the Postgraduate Training Fellowship programme, which is funded by the Swedish International Development Agency (Sida). The aim of the programme is to improve educational and training opportunities for young women scientists in sub-Saharan Africa and the least developed countries (LDCs) and to empower a new generation of women to assume leadership roles in science and technology in their countries and regions. Since the programme was launched in 1998, some 200 fellowships have been awarded. Six of the young women who have received grants attended the TWOWS General Assembly in Bangalore.

only 15 percent of high-level management positions in science in India. As a result, Bamji said that she plans to focus the task force's work on two critical 'gender-in-science' issues: the 'leaky educational pipe' that forces too many girls and young women of talent to leave science before they have an opportunity to succeed, and the 'glass ceiling' that prevents women of proven capability from becoming leaders in their fields. She was guardedly optimistic that progress will continue to be made on both fronts – as long as women are persistent in insisting upon reform.

"Some 15 years after its creation, the wisdom and justification for establishing TWOWS," noted TWOWS' outgoing founding president Lydia Makhubu during

STRATEGY AHEAD

Participants at the TWOWS' Third General Assembly approved the organization's first strategic plan, which lays out a broad plan of action for the years 2005-2009. The plan calls on TWOWS to utilize its position in global science to foster the increased involvement of women scientists to promote sustainable economic development in developing countries. The ultimate goal, as outlined in the plan, is to improve the quality of life for people, particularly the poorest. As the strategic plan notes, advances in biotechnology, information technology and, increasingly, nanotechnology make rapid progress possible. At the same time, such advances place an increasing premium on science, which presents both challenges and opportunities for all developing countries generally, and for women scientists working in these countries specifically. To contribute more effectively towards achieving these goals, the strategic plan calls on TWOWS to reform its administration and programmes in ways that increase opportunities for research, training, travel grants and participation in workshops and conferences among its members. It also calls on TWOWS to forge stronger linkages with other international institutions such as the United Nations Educational, Scientific and Cultural Organization (UNESCO), the International Council for Science (ICSU), the International Foundation for Science (IFS) and the Network of Arab Women Scientists and Engineers (NAWSE), and to redesign its website so that it can become a truly global forum for the exchange of information of critical importance to women scientists worldwide. Finally, the strategic plan envisions the creation of national chapters in the 120 countries that are currently home to TWOWS members. All of these initiatives will take money, and the strategic plan lays out a number of long-term, multi-faceted strategies for acquiring the necessary funds to move forward, including seeking additional grants from foundations and governmental aid agencies and launching an endowment fund.

her concluding address to the delegates, "is no longer in doubt. The goals that we have fought for have been worth the fight and, while we have not achieved all that we have hoped for, I think it is fair to say that TWOWS has made a difference. We have helped raise the issues of gender equity in science and brought these issues to the attention of the highest political officials. We have overseen programmes that have trained women scientists who might otherwise have left the profession or never realized their full potential. We have nurtured a camaraderie that has allowed women scientist to know that they are not alone and that their colleagues are able and willing to lend a helping hand. And we have influenced the debate of other international science institutions giving voice to issues that have been ignored for far too long.

TWOWS has helped raise the issues of gender equity in science and brought these issues to the attention of the highest political officials.

"Yet times change and TWOWS, for all of its success, must change as well. We must refine our strategy to focus greater attention on our youngest and most isolated students and colleagues. That means developing programmes that address the needs of school-age girls and women at all levels of education. It means energizing our members, who represent a potential force for global good if they can be brought together to act with purpose and determination. It means strengthening and expanding our research and training programmes and launching an awards programme that recognizes the contributions that women scientists are making, both within their professions and for their societies. And it means securing additional resources that will allow us to successfully meet the challenges that lie ahead.

"TWOWS has been a force for good throughout its history," Makhubu said, "and with a new president and executive board now in place I am confident that the organization will continue to be a leading voice for women in science in the years and decades ahead. The third General Assembly in Bangalore proved that TWOWS has arrived. It also showed that the organization and its members still have a long way to go." ■

NEW TWOWS LEADERS

The TWOWS General Assembly in Bangalore marked a change in leadership for the organization. Lydia Makhubu, TWOWS' founding president who had served in that capacity since the organization's launch in 1993, stepped down. TWOWS members elected Kaiser Jamil to replace her (see 'Dreams and Ambitions', pages 2-4). Jamil currently works as a staff scientist at the Indo American Cancer Institute and Research Centre, Hyderabad, focusing her research on breast cancer, genetic toxicology and leukaemia. She also directs the School of Biotechnology and Bioinformatics at the Mahatma Gandhi National Institute of Research and Social Action, also in Hyderabad, where she oversees postgraduate students seeking doctorate degrees in biotechnology. In a brief statement following the election, Jamil said she intends to "seek additional external funding for TWOWS and to make the organization more visible on the global stage". In addition to the election of Jamil as president, the members also elected a new TWOWS executive board that includes: Rokhasana M. Ismail, director of the Women's Research and Training Centre at Aden University, Yemen, who will serve as vice president for the Arab region; Ahbor D.A. Ighoroje, a scientist at the College of Medical Sciences at the University of Benin, Nigeria, who will serve as vice president for the African region; Elsa Quiroga Onostre, a mathematical modeller with the Bolivian Organization for Women in Science, who will serve as vice president for the Latin America and the Caribbean region; Fabg Xin, a scientist with the Chinese Academy of Sciences, who will serve as vice president for Asia and the Pacific region; Aida El-Azzouny, head of the Pharmaceutical and Drug Industries Division, National Research Centre, Egypt, who will serve as an executive board member for the Arab region; Doreen Semali Kisamo, a research scientist with the Tropical Pesticide Research Institute in Tanzania, who will serve as an executive board member for the African region; Maria Mayra de la Torre, a bioprocessing engineer with the Research Centre for Food and Development Food Sciences, Mexico, who will serve as an executive board member for the Latin American and the Caribbean region; and Farida Habib Shah, chief executive officer of the government-sponsored Melaka Institute of Biotechnology, Malaysia, who will serve as an executive board member for the Asia and Pacific region.

MORE THAN 350 SCIENTISTS ATTENDED THE TWOWS THIRD GENERAL ASSEMBLY AND INTERNATIONAL CONFERENCE, 'WOMEN'S IMPACT ON SCIENCE AND TECHNOLOGY IN THE NEW MILLENNIUM', HELD IN BANGALORE, INDIA, FROM 21-25 NOVEMBER 2005. BELOW IS A SAMPLING OF VIEWS OF THE CURRENT STATE OF WOMEN IN SCIENCE IN THE DEVELOPING WORLD EXCERPTED FROM CONVERSATIONS WITH WOMEN SCIENTISTS THAT TOOK PLACE DURING THE EVENT.

WOMEN SCIENTISTS SPEAK ON SCIENCE

MORE FUNDS A MUST

The TWOWS conference clearly reflects the vitality and diversity of the scientific research that is now being done by women scientists across the world and especially in the developing world. Yet, if Nigeria is an example, and I am sure that it is, then a lack of funding poses a serious constraint to their future participation and growth. While Nigerian women have made significant progress over the past several years, we still face serious funding problems for research and travel. I had to spend more than US$1,300 of my own money to come to this conference because no external funds were available from either my university or government. I felt compelled to do this and I am fortunate enough to have had sufficient savings. But this is not the way it should be; nor is it sustainable over the long term. More funds must be made available for women scientists, especially in the developing world. ■

Christine Emmanuel Ikpeme
Department of Biochemistry
University of Calabar
Calabar, Nigeria
email: christineikpeme@yahoo.com

S. Gopalan

SYMBOLS AND SCIENCE

Science and technology (S&T) have become shrouded in such mystery we now often think that an ability to understand and use S&T are restricted to those who work in universities and government and private-sector laboratories. Yet S&T permeate every aspect of our lives. In rural India, it is sometimes necessary to introduce S&T through cultural and religious channels and to translate S&T issues into a 'language' that can be understood by lay persons. For illiterate rural women this often means relying on symbols not words. It also means training trainers to convey information in ways that can be readily understood by the public. We followed this strategy for improving animal husbandry in India with great success in the early 1990s. Now it's being done in a wide range of fields in agriculture, environment, public health and other areas of critical concern to women in rural areas. The strategy has effectively demystified science and, more importantly, has helped to build skills and confidence among those who have participated. There is a great deal of information and experience on how to do this; a critical issue is making this information available to as many people as possible. ■

Sarala Gopalan
Former secretary to the Government of India
Ministry of Human Resource Development
Department of Women and Children
email: saralagopalan@gmail.com

DOWRY POWER TOO

Vietnam has a long tradition of urging young women to pursue careers in science. Historically, however, women have been most prominent in three major scientific fields: mathematics, medicine and physics. While women today continue to focus on these three areas, they have also begun to move into new fields of study, including biotechnology, chemistry and environmental science. Equally important, they currently enjoy unprecedented opportunities to travel abroad as Vietnam has reopened long-closed lines of communication with both Europe and the United States. Now that Vietnam has become a member of the Association of Southeast Asian Nations (ASEAN), we

S. Nhu-Mai Nguyen Dac

have substantially expanded opportunities for scientific exchange with neighbouring countries as well. All in all, I am very optimistic about the future for young women scientists in Vietnam – funding is rising, exchanges are increasing and opportunities are improving. Traditional values – for example, the need to have a dowry – have encouraged some of the nation's brightest and most capable women to follow more lucrative fields such as economics and law. Nevertheless the future for women scientists in Vietnam remains bright – perhaps brighter than at any time in the nation's history. ■

S. Nhu-Mai Nguyen Dac
Vietnamese Academy of Science and Technology
Institute of Physics and Electronics
Hanoi, Vietnam
email: nd.nhumai@tiscali.fr

GLASS CEILING

F. Saleh Abdilla

I was one of the lucky ones. My father encouraged me to study, not to marry young. Many women in Yemen marry at 16 or younger and find themselves living in male-dominated households where the husband eats first and the wife and children are given what is left over – or where the husband leaves for work in Saudi Arabia or the United Arab Emirates (UAE) and sends money back home. Education is difficult under such circumstances and pursuing a career in science or any other profession virtually impossible. Nevertheless a number of women, including myself, have been appointed to university faculty positions. To achieve this success, I have followed a 'Bedouin-like' career – wandering across the scientific landscape without a permanent home. I received my early education in my home town of Aden. I then went to the University of Alfatel in Tripoli, Libya, where I earned a bachelor's degree in chemistry and zoology. I obtained a master's degree in immunology at the University of Leipzig, Germany, and a PhD in beekeeping at the University of Loovdiv, Bulgaria. In Yemen, women are small in number but not invisible.

But Yemeni women are virtually absent from university leadership positions. The vice president and president of the faculty at the University of Aden, where I teach, are both male. Both are former students of mine. Meanwhile, I have been an assistant professor since 1999. ■

Faiza Saleh Abdilla
Associate professor, Faculty of Agriculture
University of Aden
Aden, Yemen
email: dr_faizasaleh@hotmail.com

WASTE NOT


S.R. Tewfik

I am a chemical engineer by education and training, having received a PhD in my home country Egypt more than 20 years ago. My research has focused on computer simulation and the optimization of complex systems. I develop models that seek to increase the efficiency of resource management in areas of critical importance to my country. I have worked, for instance, on improving the efficiency of urban waste management plants by expanding their capacity through the use of chemicals that do not adversely affect the environment. I have developed integrated solid waste schemes for Cairo, Giza and other major cities in Egypt, and I have designed community-regulated composting plants capable of transforming 100 tons of waste into compost each day – an amount of waste equal to that generated daily by a community of 100,000 people. I cannot speak for other sectors of society and the economy, and I am sure that other women – for example, those working in industry – may have other stories to tell. But in the National Research Centre where I work, there is no overt gender discrimination. The vice-president is a woman, as are 2,000 of the 4,000 research scientists. Women, in fact, are directly involved in the full range of the centre's research, including agriculture, biotechnology, chemistry, nutrition and pharmaceuticals. And now that the government has announced that it will increase spending on research and development to one percent of the gross domestic product, I am more optimistic than ever about the future of science in my country and the part that women will play in its development. ■

Shadia Ragheb Tewfik
Vice head, Engineering Research Division
Chemical Engineering and Pilot Plant Department
National Research Centre
Cairo, Egypt
email: shadiatewfik@yahoo.com

SCIENCE LEADS. WILL SOCIETY FOLLOW?

I am a genetic engineer. My research focuses on developing diagnostic techniques for animal diseases. Specifically, I seek to identify unique segments of DNA that can be used to detect microbes that infect sheep, especially those segments associated with the debilitating disease

brucellosis. The DNA probe we have developed in Kuwait can be applied not only to sheep but to other animals, as well as to humans, who can be affected by brucellosis by drinking contaminated milk. We are now exploring possibilities for marketing the probe, which is faster and more accurate than existing probes. Women are quite visible – indeed prominent – in all fields of science in Kuwait, including biology, medicine, computer science and petroleum engineering. I have never experienced discrimination in my professional life. Pay, promotion and working conditions are gender-blind. The same cannot be said for the larger society. Last year, Kuwaiti women finally received the right to vote after a 40 years of struggle. Following the first election in which they were allowed to vote, a woman was appointed minister of planning — the nation's first female minister. So, even in the world beyond science, women are beginning to find their way. ■

H.P. Khincha
Division of Electronic Sciences
Indian Institute of Science (IISc)
Bangalore, India
email: hpk@ee.iisc.ernet.in



FODDER FOR THOUGHT

I am an animal nutritionist and study the composition and utilization of the indigenous forest plant *Acacia*, which is a major part of the diet of such ruminant animals as cattle, goats and sheep. The goal is to improve animal utilization of fodder, which in the wild contains a high level of tannins, a plant chemical that improves the taste of the fodder, but reduces its digestibility and curbs the protein intake. What we discovered through our research and field demonstrations involving about 100 farmers, is that by drying and wilting the fodder, we can reduce the 'tasteful' effects of tannins (and the levels of tannins present in the plants) while increasing plant consumption, digestibility and protein intake. The strategy has proven particularly effective during droughts. Botswana does not have many women scientists. My department, for example, has only three women among its 30 faculty members. There is no overt discrimination but there is a lack of awareness among young girls about the opportunities that science affords. The government has recently taken steps to increase awareness among girls

about the grants and loans that are available. I am generally optimistic about the future of science for women in Botswana, but the tragic proliferation of HIV/AIDS could rapidly undermine the optimism that I have. ■

Ademiju Aganga
Animal nutritionist
Botswana College of Agriculture
Gaborone, Botswana
email: aaganga@bca.bw

SILENT DISEASE

I am a molecular biologist at the Autonomous University of Mexico (UAM), working with a team of scientists headed by Esther Orozco. Our research focuses on how amoebae, microscopic, single-celled animals, reproduce. These water-borne parasites are also found in fresh foods. Amoebiasis, the disease caused by these organisms, has often been called a 'silent disease' because it has no early symptoms. Yet once a large community of parasites has formed, acute intestinal inflammation and colitis can occur. The disease, moreover, can travel from the intestine to other organs, including the liver and lungs. Today, an estimated one-third of Mexico City's 20 million people have stage 2 amoebiasis, which means they have begun to have mild symptoms. Nearly another 20 percent have stage 3 amoebiasis, which means they have acute symptoms. The disease is treatable but the drugs used for treatment often cause serious side-effects. Our research has shown that the amoeba responsible for the disease is not a single-sex organism that splits into two but is an organism with two sexes. This finding is important because it raises the possibility of developing new therapies that are more effective and less toxic. More than half of our 15-member team are women and more than 70 percent of the students majoring in science at UAM are women. There is no gender discrimination in science in Mexico except perhaps at the very highest levels of administration and management. ■

Sollange Archer
Professor of Molecular Biology and Genomics
Postgraduate School in Genomics
Autonomous University of Mexico (UAM), Mexico City
email: sarcher@prodigy.net.mx

S. Kochen

OVERCOMING EPILEPSY

I am head of the Epilepsy Unit at the National Council of Scientific and Technological Research (CONICET). I am also a professor of neurology at the University of Buenos Aires where I study neurophysiology, helping to shed light on the causes of epilepsy. About 20 to 30 percent of epilepsy patients suffer from refractory epilepsy, which means that they do not respond to pharmaceuticals. These patients can receive surgical treatment but only if you can isolate the part of the brain that is responsible for the disease. My clinical research focuses on electroencephalography (EEG), which helps surgeons locate the section of the brain causing the epilepsy. Such diagnosis was formerly done by observing eye move-

ment – a technique developed through years of study. My basic research focuses on seizure prediction through the use of models that draw on information about brain behaviour immediately prior to an epileptic event. Argentinean women are well represented in the sciences. In fact, in many fields they represent more than half of all researchers. But women are not well represented in high-level positions at universities or research institutes. For example, I am the only full professor in my department, which has 70 positions and CONICET has never had a woman director ■

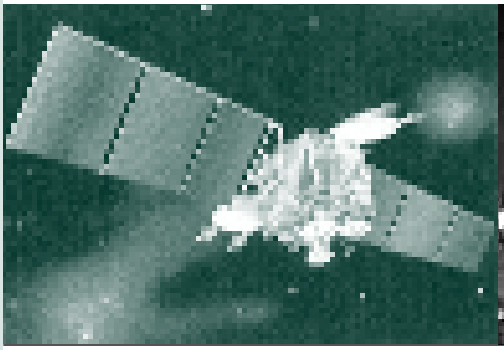
Silvia Kochen
Centre of Epilepsy
University of Buenos Aires
Council for Scientific and Technological Research (CONICET)
Argentina
email: skochen@mail.retina.ar

N. McFarlane-Anderson

MISSING MALES

I am a biochemist. My current research focuses on which types of the human papilloma virus are associated with incidences of cervical cancer in the Caribbean region. During my career I have studied many different medical research topics, including obesity, hypertension and diabetes from a biochemical and molecular biology perspective. Since I am married to a diplomat, I have also worked in many different places around the world – the University of Ottawa in Canada, the Autonomous University of Mexico, Cornell University in the United States and the University of London in the United Kingdom. At the University of the West Indies, in the department of basic medical sciences, where I currently work, only 25 percent of the 80 faculty members are women, but 80 percent of the students are women, strongly indicating that the future will not resemble the present. In fact, the shrinking number of men in the sciences makes women wonder what men are doing? Perhaps, in a bit of role reversal, they have enrolled in such fields as nursing and teaching, which have traditionally employed a large percentage of women. More likely, they are pursuing more entrepreneurial fields such as investment banking or computer sciences. ■

Norma McFarlane-Anderson
Department of Basic Medical Sciences
University of the West Indies, Jamaica
email: norma.mcfarlaneanderson@uwimona.edu.jm



ACCOUNTING FOR INEQUITY

SHOBHANA NARASIMHAN, EXPLORES THE INTRICATE AND CONTENTIOUS RELATIONSHIP BETWEEN SCIENCE, GENDER AND EQUITY.

The average annual income of a person living in Luxembourg is US$58,900; in East Timor it's US$400. There are countries where less than two percent of the population lives in poverty and there are countries where more than two-thirds of the population live in poverty. Residents of Japan have a life expectancy of 81; residents of Botswana 34. Infant mortality ranges from 2.3 per 1,000 births in Singapore (once a developing country) to more than 190 per 1,000 births in Western Sahara.

Statistical indicators of global standards of living showcase one glaring fact: we live in a world of huge and unconscionable inequity.

A critical question is this: does science contribute to equity or inequity? This question is of particular interest to women scientists from the developing world, who by definition belong to two disadvantaged groups – women and developing countries.

Ironically, when it comes to statistics based on gender, the gap between 'developed' and 'developing' countries lessens considerably and, in some instances, it is actually a gap in reverse. In Austria, women earn 68 percent on average of what men earn; in Japan it's just 60 percent. In contrast, women in Sri Lanka earn approximately 80 percent of the salaries provided to men.

Worldwide, women fare worse than men for virtually all statistical indicators related to income and health. The only exception is life expectancy: women live longer than men in almost every country. For example, in India, life expectancy for women is 65 years while for men it's 62. The reasons are not yet clear but researchers have cited a host of potential factors – most notably, differences in biology and psychology. Women, for example, often forge stronger social networks than men and tend to pursue healthier lifestyles (for instance, they smoke and drink less than men).

Scientific progress has contributed positively to the quality of life worldwide. Healthcare provides the most obvious example: nearly everywhere in the world, life expectancy is rising while the number of

Worlwide, women fare far worse than men for virtually all statistical indicators related to income and health.

infant deaths is falling. From the time of the Neanderthals, dating back some 200,000 years, to the middle of the first millennium, average life expectancy ranged between 20 and 25 years. As recently as 1950, it was just 45 worldwide. Today it is 63.

The fact that people are living longer is largely attributable to scientific progress with the prime factors being better hygiene and nutrition and the development of vaccines. Smallpox, for example, has vanished and polio has almost disappeared. There is, of course, the critical exception of HIV/AIDS, which has dramatically lowered life expectancy in sub-Saharan Africa.

The contributions of science to other aspects of life are more difficult to assess. Advances in science and technology make life easier in many ways but also contribute to changes in social structures with implications that are difficult to quantify. For example, is television a boon that entertains a happy populace, or is it a curse that destroys family interaction? Increased life expectancy, moreover, creates its own problems: for example, concern for the quality of life experienced by the elderly.

Scientific progress has impacted gender issues as well. In modern times, the most crucial example has been the development of the birth control pill. While troubling issues remain (for example, there is still a lack of medical research on the pill's potentially adverse health effects and there is an unjustifiable focus on chemical contraception for women as opposed to men), access to birth control pills has had a huge impact on the lifestyle of millions of women worldwide. No longer doomed to seemingly endless cycles of childbirth, women have been freed, both physically and emotionally, and are now able to turn their attention to matters beyond domesticity.

Unfortunately, not everyone has benefited equally from advances in science. The latest developments in medicine and technology tend to be expensive and therefore available only to privileged members of society. Scientific research is also expensive making it difficult for poorer nations to invest in such endeavours. Consequently, advances usually come from developed nations, which then have greater access to (and control over) the fruits of science.

While many indicators of well-being are improving worldwide, trends tend to be uneven and inequitable. Does science contribute to these inequities? On the contrary, I believe that science intrinsically favours equity. However, we need to evaluate and change the way in which science is practised, and the way in which scientific knowledge and technological advances are distributed and utilized.

Scientific progress, especially in communications, has also raised our awareness of the existence of inequities. Access to information and knowledge is generally more equitably disseminated than in the past. Thanks to the ubiquitous presence of cable television, slum-dwellers in Dharavi in Mumbai now know about the lifestyles of the rich and famous in Hollywood. At the same time, the internet allows millionaires in the United States and Europe to read the weblog of a Nairobi taxi driver. In today's world, where we are all con-

nected, it is increasingly difficult to hide injustice, suppress information or pretend that inequities do not exist.

When it comes to gender inequities, while differences in the health, wealth and social status of men and women are decreasing, progress is much slower than it should be. Interestingly, men's life expectancy seems to be increasing at a slightly greater rate than that of women, despite a precipitous drop in the number of women dying in childbirth.

Science is far more egalitarian (at least conceptually) than most other systems or institutions, but there are clearly inequities in the way the scientific establishment functions.

What makes science 'fair' and 'impartial' is that the concept of 'truth' in science is fairly well-defined. Ultimately, truth prevails. This constitutes a great part of the appeal and promise of science. While faulty scientific knowledge may gain ascendancy for a brief time, either due to errors made in good faith by scientists, or for religious or political reasons, the rigorous nature of the scientific method and the universally accepted concept of scientific proof means that 'bad' science is ultimately trumped by 'good' science.

If science is impartial and transparent, it should also be equitable. Indeed it should be one of the primary avenues that the disadvantaged can use to achieve upward mobility and ultimately equity. This is true to some extent.

I was deeply impressed by the television series *Up*, first broadcast in the United Kingdom but ultimately shown worldwide. This series was based on a longitudinal study of a group of British children who were first interviewed about their aspirations and opinions at the age of seven, with follow-up interviews every seven years thereafter. The most striking factor that emerges from these interviews is the determining nature played by class: seven-year-old upper class children expressed confidence and high aspirations, lower class children did not. As the years passed, upper class children became rich and successful adults, often following the career paths they had envisioned as seven-year-olds. Working class children, on the other hand, remained relatively poor and disadvantaged.

One exception to this pattern was a boy who broke away from his humble origins to become a physicist. In my mind, this symbolized the hope offered by science as an equitable pathway to success.

Yet a disproportionate number of successful scientists remain men from affluent countries. It is not just a lack of

access to resources but also discrimination (either conscious or unconscious) that is responsible for the persistence of this trend. Scientists from developing countries work under difficult conditions, but even when they produce good work, it is harder for them to have their work published in prestigious journals. Objective standards of excellence and truth may prevail in the long run, but recognition can be difficult to achieve in the short run.

Women scientists are clearly disadvantaged everywhere in the world. In fact, gender equity is one area where developed nations may not be faring better than the developing nations. In my field of physics, Japan, Germany and the United States have among the lowest percentage of women physicists in the world. Turkey, on the other hand, has the highest percentage of women physicists. In India, about one-third of PhDs in the sciences are awarded to women; however, just 5 to 10 percent of the faculty in Indian universities and research institutes are women.

The debate over why this is so is heating up, and women scientists must prepare for the coming battles. Social and cultural factors clearly play a role. But does biology also matter? How much of the under-representation is due to discrimination? These are thorny issues that people have strong and diverse opinions about. It is indeed unfair that the fight for gender equity in science will have to be fought almost entirely by women. Time and energy devoted to this struggle will mean that women will have less time to devote to scientific research.

Any source of power is subject to abuse. The power that science represents, as a way of affirming truth, is no exception. There are always those who have used and will use science to justify existing inequities, whether based on race, geography, gender or caste. For example, in the 19th century, many scientists claimed to have 'proved' that men of European origin were intellectually superior to males on all other continents, basing their conclusions on cranial size, brain convolutions and other factors. It is now universally acknowledged that these measurements and conclusions were deeply flawed, as brilliantly described in Stephen Jay Gould's book *The Mismeasure of Man*.

Similarly, there are those who now use 'scientific' arguments based on genetics to justify discrimination based on the caste system. Once again, however, scientists find this to be invalid. Genetic comparisons across castes and different regions in India have shown that genetic differences between people of different castes in the same region are much smaller than those between people of the same caste but from different regions.

There are also those, including scientists, who explain why our world is divided into rich and poor countries by attributing greater intelligence, persistence and commitment to those from certain races.

The relationship between innate ability and gender will be one of the hotly debated scientific topics of the next few decades.

Jared Diamond has strongly questioned this argument in his best-selling book *Guns, Germs and Steel*. He contends that much of the existing disparity between races can be explained by factors such as geography and climate. Again, inequities once justified 'scientifically' are now being shown by science to have arisen from other causes.

While there seems to be an increasing acceptance that it is 'politically incorrect' to justify race- or caste-based discrimination by invoking science, this does not yet seem to be true of gender. Last year, Lawrence Summers, the former president of Harvard University, created a furore by suggesting that women may have less innate ability to do science than men. While it is gratifying that his remarks were widely condemned, and that Summers ultimately had to resign in part because of them, it is also true that his remarks were applauded by many.

When I was in graduate school, a fellow female student told me she feared that one day scientists would 'prove' that women were intellectually inferior to men, and that this finding would forever undermine our struggle for greater equality. Many ongoing studies are examining this issue with confusing results. There are studies, for instance, that find women's brains function differently from those of men and that three-day old infant boys relate more to mechanical objects while three-day old girls react more to human faces. Yet many other studies show no gender differences, especially when test subjects are placed in gender-neutral environments. The relationship between innate ability and gender will be one of the most hotly debated scientific topics of the next few decades and women scientists must be at the forefront of the discussions.

However such gender issues are resolved, there are some important factors that need to be kept in mind. First, virtually all studies, even the most 'scientific', find it difficult to separate cultural factors, including conditioning and expectations, from biological factors. Second, scientific excellence is a complex phenomenon that is not determined by a single gene or a particular region of the brain. It requires a combination of mathematical, analytical and conceptual skills. It also requires creativity, determination, access to resources and even good luck. Third, there will always be individual variations. Even if it is ultimately 'proved' that men on average have brains that are better suited to, say, mathematical computation, than women on average, individual scientists are not likely to represent the mean. Instead they are likely to belong to the 'tails' of the distribution scale, where all bets are off.

Science, in short, can serve as a positive force for achieving greater equity, even if, at present, the benefits of science are not as equitably distributed as they should be. ■

Shobhana Narasimhan
Associate professor
Theoretical Sciences Unit
Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR)
Bangalore, India
shobhana@jncasr.ac.in

FIRST FELLOWSHIPS

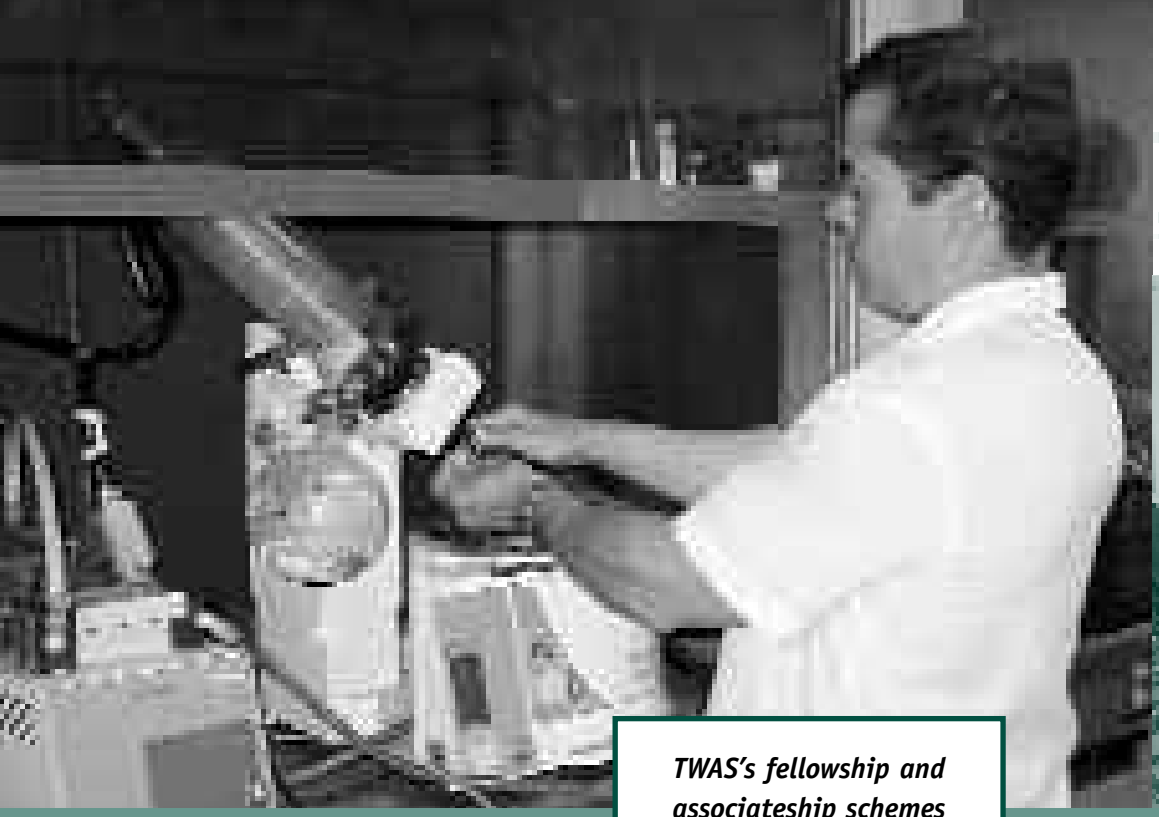
IN 2003, THE GOVERNMENTS OF BRAZIL, CHINA AND INDIA AGREED TO SUPPORT A NUMBER OF SOUTH-SOUTH FELLOWSHIPS AT INSTITUTIONS IN THEIR COUNTRIES. UNDER THESE AGREEMENTS, TWAS NOW OFFERS SOME 250 FELLOWSHIPS A YEAR TO YOUNG SCIENTISTS FROM DEVELOPING COUNTRIES. THE FIRST RESEARCHERS TO HAVE BENEFITED FROM THESE NEW TWAS FELLOWSHIPS ARE NOW RETURNING TO THEIR HOME NATIONS.

Rolando Pérez Piñeiro obtained his PhD in organic chemistry from the University of Havana, Cuba, in 2001. Two years later, he transferred to the department of chemistry of the Instituto Cubano de Derivados de la Caña de Azucar *(ICIDCA, Cuban Institute of Sugar Cane Derivatives). His work there focuses on the synthesis of novel organic entities as potential herbicides and the development of carbohydrate-based biodegradable polymers. However, by maintaining links with his* alma mater*, the University of Havana, Piñeiro continues to follow his interests in other areas of organic chemistry, in particular, medical chemistry.*

Piñeiro was awarded a TWAS-CNPq (National Council for Scientific and Technological Development, Brazil) fellowship in December 2004. In June 2005, he used the opportunity to travel to the faculty of chemistry of the Federal University of Rio de Janeiro (UFRJ), where he worked with Octavio Antunes for six months.

In his earlier work, Piñeiro focused on non-conventional ways of producing new molecules designed to have biological activity. More specifically, he aimed, using rational design methods, to produce new pharmaceutical compounds that would be useful in treating such mosquito-borne diseases as West Nile virus and dengue fever.

"I went to Brazil to gain experience in palladium catalyzed cross coupling reactions," explains Piñeiro. "This methodology is increasingly important in the design of new molecular entities because of its potential to form carbon-to-carbon bonds." He also chose the laboratory of Antunes as several of his colleagues in Cuba had studied there and returned to Cuba full of



TWAS's fellowship and associateship schemes are grouped under the International Programme for Higher Education and Research (IPHER).

enthusiasm for the laboratory and its staff.

"There were two main reasons that persuaded me that I needed to get some experience abroad to develop my career," adds Piñeiro. "First, Cuba lacks scientists with experience and know-how in this area and, second, scientists in Cuba are forced to work in difficult conditions, without access to the latest equipment. Because of the ongoing trade embargo, even obtaining simple reagents from the main suppliers can be problematical."

In Brazil, the most problematical detail that Piñeiro had to deal with was to learn Portugese. "Though I must admit that the language barrier faded away rapidly," he adds.

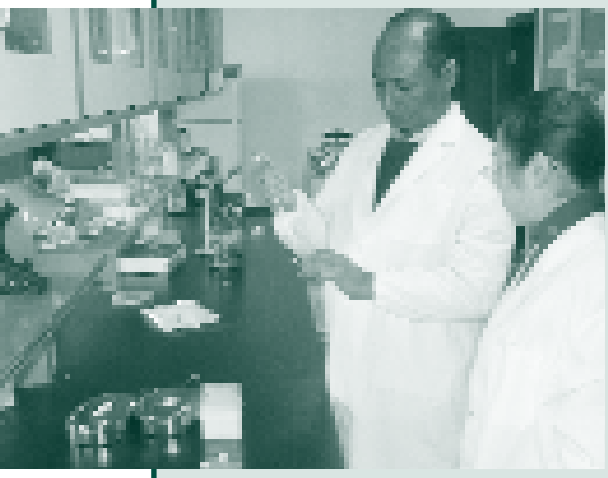
FELLOWSHIP OPPORTUNITIES

TWAS's expanding fellowship and associateship schemes are grouped together as the International Programme for Higher Education and Research (IPHER). IPHER now boasts some 250 fellowships tenable in such developing countries as Brazil, China and India. Government agencies in these countries, in particular Brazil's National Council for Scientific and Technological Development (CNPq), the Chinese Academy of Sciences (CAS) and India's Council of Scientific and Industrial Research (CSIR), Department of Biotechnology (DBT) of the Ministry of Science and Technology and S.N. Bose National Centre for Basic Sciences, have entered into agreements with TWAS. Under these agreements, TWAS manages the programme and covers the travel costs while the national agencies cover local costs such as living expenses and tuition fees. Both postdoctoral and postgraduate fellowships are available, while CAS also allows more experienced scientists to work for brief periods in its laboratories under the TWAS-CAS visiting scholar programme. Additional fellowship programmes with Mexico and India are due to start in the near future. For more information about the various fellowship programmes, visit www.twas.org/Exchange.

FROM ETHIOPIA TO CHINA

Abebe Getahun of the Department of Biology, Addis Ababa University, Ethiopia, first met Liu Huanzhang of the Institute of Hydrology of the Chinese Academy of Sciences (CAS), Hubei, China, in 1998. In those days, Getahun was a young graduate student carrying out his PhD studies on the systematics of cyprinid fish at the American Museum of Natural History, New York City, USA, while Liu Huanzhang was a postgraduate researcher.

Both researchers have since returned to their native countries to continue their scientific careers. However, although they both pursue parallel lines of research, there has been little opportunity for the two colleagues to collaborate on joint projects. A CAS-TWAS Visiting Scientist Fellowship allowed Getahun to visit the CAS Institute of Hydrobiology for one month from November to December 2005.



The Cyprinidae is the largest family of freshwater fishes, with more than 2,000 species identified so far. Indeed, Getahun himself has added to this list, publishing descriptions of six new species found in different Ethiopian rivers and lakes. Until now, however, much of Getahun's taxonomic research has been carried out using the morphological features of the species involved. In China, he expanded his area of expertise to include molecular systematics. More specifically, he carried DNA samples from representative species in the labeine sub-family of the Cyprinidae – a group of fish that are present in east Africa, the Middle East and southeast Asia – to China to compare gene sequences with related species from China.

"My trip to China was essential for this research as many scientists at the Institute of Hydrobiology work on cyprinid fishes and I was provided with access to tissues of the Chinese labeines. On top of that, the molecular laboratory at the institute is well set up for phylogenetic studies," says Getahun.

"Based on the DNA sequences that we obtained," continues Getahun, "we are now working on the phylogenetic and biogeographical relationships of these fish and I am hopeful that we will soon publish a collaborative paper."

Getahun also emphasizes that his newly acquired knowledge of molecular biology will help him to teach a course on systematics to graduate students attending Addis Ababa University. "I also hope to continue this molecular research in Ethiopia, provided that a laboratory can be set up there," adds Getahun.

Getahun's host at the Institute of Hydrology, Liu Huanzhang, is also enthusiastic about the opportunity provided through the CAS-TWAS Visiting Scientist Fellowship Programme. "Our research interests are very similar," he says, "and we have already discussed the possibility of developing a graduate student exchange programme. In addition to systematic studies, future collaborative work will also focus on aquaculture techniques."

Thus, the classical taxonomic studies of Getahun and his colleagues in China may yet lay the groundwork for practical solutions that will help Ethiopia overcome one of its major development issues – feeding its growing population.

Scientists in Cuba are forced to work under difficult conditions without access to the latest equipment.

On arriving in Rio de Janeiro, the first thing Piñeiro did was to sit down with Antunes to develop a detailed plan of action for the duration of his visit.

"We decided to overlap our research interests and I started to develop new synthetic methodologies based on cross-coupling reaction using arenediazonium salts as opposed to conventional aryl halides/triflates," says Piñeiro. "These reactions rely on the use of a palladium catalyst and are being used increasingly to produce bioactive compounds. The popular antidepressant 'rolipram', for example, can be produced efficiently using such techniques.

"The advantages of using arenediazonium salts in cross-coupling reactions include short reaction times, a high catalytic turnover and, most significantly, the use of aqueous reaction conditions," explains Piñeiro.

As a result of the time Piñeiro spent in Brazil under the TWAS-CNPq Fellowship, a paper has been published in the respected international journal, *Tetrahedron Letters*, describing the production of α-benzyl-β-keto esters. Such products, Piñeiro hopes, will prove effective against such protozoal parasites as *Leishmania*, the causative organism of leishmaniasis, one of the so-called 'neglected' or 'orphan' diseases that are prevalent in developing countries but that few researchers in the North are tackling because of limited interest from profit-seeking pharmaceutical companies.

"The chemical structure of the products of these reactions were elucidated using x-ray diffraction, mass spectrometry and nuclear magnetic resonance – techniques that I do not have access to in Cuba," adds Piñeiro. "I must thank TWAS for providing me with the opportunity to travel to Brazil to work on this problem and to learn new techniques.

Now that he is back in his home country, Piñeiro will attempt to take full advantage of his TWAS-CNPq fellowship experience. "While I was in Brazil," he explains, "we agreed to keep our research going and to collaborate on additional research. This will involve receiving critical chemicals, scientific literature and facilities for characterizing synthesized compounds from UFRJ."

"Of course, during my TWAS-CNPq fellowship, I was not confined to the laboratory and had the oppor-

FROM NIGERIA TO INDIA

Dried calyces of the flowers of Hibiscus sabdariffa *are used from the Caribbean to China and from Africa to India as a traditional medicine to treat a number of ailments. As with many traditional medicines, though, the effects – both beneficial and unwanted – of the many chemical components found in extracts of the plant, have yet to be verified scientifically.*

Identifying and monitoring these effects is exactly what Titilayo Fakeye, department of clinical pharmacy and pharmacy administration, University of Ibadan, Nigeria, hoped to achieve during her six-month visit to the Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow, India. Fakaye's visit was made possible by a DBT-TWAS Postdoctoral Fellowship through a programme run by TWAS in collaboration with the Department of Biotechnology (DBT) of the Indian government's Ministry of Science and Technology.

At CIMAP, Fakeye learned how to handle laboratory animals. Different solvents were used to extract the active compounds from the hibiscus calyces and controlled doses were injected into the animal subjects, mostly rats and mice. She then applied a series of blood chemistry methods and immunological analyses, many of them also newly learned at CIMAP, to determine the effects of the chemicals on the physiology of the animals. Once the experiments were completed, tissue samples from key organs were also prepared for histological analyses.

Anirban Pal, Fakeye's supervisor at CIMAP, confirms that the results were interesting. "Fakeye's studies indicate that Hibiscus sabdariffa *extracts could cause toxicological problems when administered at high doses or over a long period of time. In particular, there was a decrease in the number of red blood cells," he says. "However, immunological studies reveal that the plant could have useful anti-inflammatory activity – a type that could be used against the formation of artherosclerotic plaques, for example."*

Although Fakeye's visit to CIMAP lasted just six months, she is now preparing four papers for publication based on the work she carried out in India.

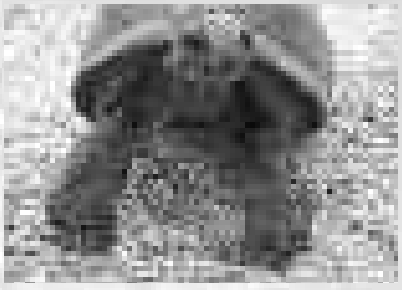
"The knowledge I acquired during my visit to CIMAP will enable me to carry out better pre-clinical research using laboratory animals, especially in the field of drug interactions," adds Fakeye, who now hopes to test the cross compatibilities of hibiscus and other ethnomedicinal extracts with drugs used commonly in Nigeria to treat such widespread problems as malaria and tuberculosis.

tunity to learn about the Brazilian way of life," adds Piñeiro. "I now realize how many things Cuba and Brazil have in common, including a passion for sports, dancing and perhaps the odd *cerveja* (beer) or two."

According to Laura Lami Izquierdo, vice-director of chemistry at Piñeiro's home institution, ICIDCA, Piñeiro has successfully applied for a number of national and international research grants and has played a key role in the development of organic chemistry at the institute. At just 36 years of age, Piñeiro is a young scientist who is increasing his international reputation in the area of the synthesis of bioactive organic molecules. As such, it is likely that he hasn't shared his last *cerveja* – or his last discussion about the finer points of catalytic reactions and carbon-to-carbon bonding – with colleagues in Brazil. Or elsewhere. ■

LIVING ON AN ISLAND

WHAT IS LIFE LIKE ON AN ISLAND MILES FROM ANYWHERE? HOW CAN SUCH A SMALL AND ISOLATED POPULATION DEVELOP ITS ECONOMY IN THIS INCREASINGLY GLOBALIZED WORLD? AND HOW CAN IT PROTECT ITSELF AGAINST NATURAL DISASTERS THAT SEEM TO AFFLICT SUCH ISLAND STATES ALL TOO FREQUENTLY? A RECENT TWNSO WORKSHOP ON NATURAL DISASTER MITIGATION IN SMALL ISLAND DEVELOPING STATES (SIDS) HELD ON MAURITIUS, PROVIDED THE OPPORTUNITY TO FIND OUT MORE.



By their very nature, small island developing states (SIDS) often lack a 'critical mass' of trained personnel in a variety of fields, including both science and technology and disaster preparedness – two issues relevant to a recent meeting of the Third World Network of Scientific Organizations (TWNSO), held in Mauritius and hosted by the University of Mauritius and the country office of the United Nations Development Programme (UNDP).

The meeting – the latest in a series of collaborations between TWNSO, TWAS and the United Nations Development Programme Special Unit for South-South Cooperation (UNDP-SSC) – was held from 26-29 October 2005 and focused on 'Natural Disaster Mitigation for Small Island Developing States'. Twenty participants from 12 developing countries, representing SIDS in the Caribbean, Indian Ocean and Pacific Ocean, attended.

MAURITIUS

Mauritius, a tiny speck in the southwest of the Indian Ocean, lies some 900 kilometres off the coast of Madagascar. Its 1,865 square kilometres make it some five times smaller than Jamaica and more than 50 times smaller than Cuba, two of the world's other 51 Small Island Developing States (SIDS).

Home to 1.3 million people, Mauritius has a chequered history. First settled by the Dutch in 1598, it became a French possession in 1722 and remained in French hands until it was taken over by the British in 1810. Mauritius finally gained independence in 1968.

Since 1639, when the Dutch introduced sugar cane to the island, sugar production has been at the core of the island's economy. Today, Mauritius still produces some 600,000 tonnes a year and sugar remains the nation's most important crop. Indeed, some 49 percent of the island's land area is used to grow sugar cane –

Some 49 percent of the land area of Mauritius is used to grow sugar cane.

some 75,000 hectares – while less than 10 percent of the available agricultural land is set aside for other crops.

Sugar production accounts for some 25 percent of Mauritius' export earnings, but is only part of the dynamo that has seen the Mauritian economy grow by some five percent each year since independence.

Given its tropical location and its sandy beaches protected by an encircling coral reef, it is no surprise that tourism also plays a major role in the local economy, with some 750,000 visitors welcomed each year. In addition, Mauritius has expanded its textile industry, focusing on limited production of top-quality garments rather than mass production. The government of Mauritius is also promoting the island as a financial centre and, to date, more than US$1 billion has been invested in the country's banking sector, mainly from Indian and South African enterprises.

CYBER ISLAND

The so-called 'fifth pillar' of the Mauritian economy is still under construction, yet it promises to put the country in the world spotlight. The ambitious aim is to make Mauritius a 'cyber island' – a nation where everyone has access to the internet. Much of the infrastructure is already in place and it is estimated that by spring 2006 the whole of Mauritius will have access to wireless internet coverage – making Mauritius the first nation able to boast such an accomplishment. An undersea broadband fibre-optic cable, completed three years ago, already provides islanders with fast and reliable telecommunication links with Africa, Europe, India and Malaysia. With nationwide internet access – plus government sponsorship of training and business development in information and communication technologies – Mauritius hopes to become a world leader in the knowledge economy of the 21st century. Indeed, last September, Mauritius' Minister of Information Technology and Telecommunications, Etienne Sinatambou, launched a scheme that provides free broadband internet access to all the nation's secondary schools and public libraries.

The ultimate aim is to use information and communication technologies to generate jobs and create wealth.

"Information and knowledge are the key elements that can empower individuals to progress, to obtain a decent job and to live comfortably," adds Sinatambou.

Among the resources that Mauritius possesses is the bilingual nature of its population. This is seen as a

great benefit to many Indian software companies eager to translate their packages into French for sale to markets not only in France, but also Canada and francophone Africa.

SPREADING ITS WINGS

With its economy now on a firm footing – despite the looming threat of a reduction in earnings from sugar due to new European Union import regulations – Mauritius has managed to reduce poverty among its people to almost zero. In addition, such vital statistics as child mortality and life expectancy have improved year-on-year since independence and the adult literacy rate is approaching 85 percent.

Such figures help to instil confidence, and Mauritius is now spreading its wings on the international stage – and not just in terms of a destination for tourists.

In January 2005, the government of Mauritius hosted the International Meeting to Review the Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States. The five-day conference was attended by 18 presidents, vice-presidents and prime ministers, some 60 ministers, 15 United Nations or multilateral agencies, as well as 2,000 other delegates, many representing nongovernmental organizations, and journalists from 114 countries.

The meeting was declared a success by its United Nations organizers, especially as delegates agreed on the text of two major documents: the Mauritius Declaration, which recognizes the disadvantaged position of SIDS in international trade and calls for international institutions, including financial institutions, to "appropriate attention to these structural disadvantages"; and the Mauritius Strategy, which highlighted the vulnerability of SIDS to natural disasters and calls for small islands to be given special consideration in discussions taking place on the international stage.

TWNSO WORKSHOP

Against this background, TWNSO and the UNDP-SSC organized the seventh in a series of workshops on the theme of 'Sharing Innovative Experiences'. As with other workshops, the aim was to bring together a collection of experts to present their case studies, with ample time being provided for the participants to discuss each presentation in depth.

Unlike previous workshops, which were all held at TWAS headquarters in Trieste, Italy, this time TWNSO and UNDP-SSC brought in two additional partners, the University of Mauritius and the UNDP country office, Mauritius. The University of Mauritius hosted the meeting on its campus, while UNDP-Mauritius assisted with on-the-ground logistics.

Despite difficulties with arranging travel for participants from small islands to attend a meeting on another small island (and the intervention of Hurricane Wilma that delayed the arrival of two participants from Cuba), the meeting was a great success.

The initial session was dedicated to 'the Mauritius experience'. Sok Appadu, Mauritius Meteorological Services, described the cyclone warning system in place on the island (see box – Case Study: Mauritius Meteorological Services), while Soonil Rughooputh, University of Mauritius, outlined the development of an integrated disaster management and information system for the island, taking in not only natural disasters such as cyclones, tsunamis and landslides, but also such events as oil spills. Finally, Mitrasen Bhika-

jee, Mauritius Oceanography Institute, outlined what small islands such as Mauritius could learn following a visit he made to assess the disaster preparedness of Japan. "The total length of Japan's sea wall defences," he informed, "are now longer than the Great wall of China."

Highlights of several of the presentations are outlined on pages 40-42.

The meeting finished with participants agreeing that, among other things, there is a need for more support for scientific research to help understand the processes and mechanisms that lead to natural disasters, and the value that local, indigenous knowledge can play in preparing disaster response plans. The University of Mauritius, through a recently created network of universities located on SIDS, also offered to develop a specific network for research institutions and other agencies involved in natural disaster mitigation research and planning.

There is a need for more support for scientific research to help understand the processes that lead to natural disasters.

Such a network will ensure that the efforts of the participants to share their knowledge and experiences during the workshop will continue. TWNSO will remain involved in these efforts. In addition, as with other TWNSO/UNDP-SSC workshops, the presented case studies will be edited by TWAS staff into more reader-friendly versions. These will be published as volume 12 of the *Sharing Innovative Experiences* series and distributed free of charge throughout the developing world and – in this case – especially to governments and relevant organizations in small island developing states. ■

CASE STUDY: PUBLIC PARTICIPATION IN BARBADOS

The Caribbean Disaster Emergency Response Agency (CDERA) has 16 member nations. Among its current projects is the Caribbean Disaster Management (CADM) project, which is being implemented in collaboration with pilot communities in each of three CDERA member states: Barbados, St. Vincent and the Grenadines, and Trinidad and Tobago.

"Floods have been identified as the most common hazard in CDERA members states, yet only four of the countries have any plans in place to guide disaster management," says Balfour Spence, Department of Geography and Geology, University of West Indies, Mona, Jamaica. "The aim of the project, which began in 2002," says Spence, "is to facilitate the training of professionals in flood hazard mapping and community disaster planning."

In Barbados, the floodplain of Speightstown St. Peter on the west of the island was selected as the site for the project, particularly because it is prone to flooding, having suffered several floods and associated economic losses during the 1980s.

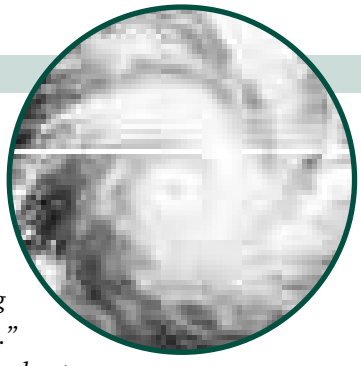
The Japan International Cooperation Agency (JICA) has provided hydrological and meteorological observation equipment valued at US$45,000 to collaborating agencies, including the Barbados Ministry of Public Works and the Caribbean Institute for Hydrology and Meteorology. This equipment, together with geographic information systems (GIS) mapping has been used to create detailed flood hazard maps of the Speightstown pilot area.

Such an academic exercise, however, has little value in disaster mitigation if it does not involve the local community. A major component of the CADM project, therefore, was to consult the local community and help them draw up their own disaster response plans. Because many people in the target area had no experience of map reading, community groups and local leaders were shown satellite images of their neighbourhoods with enough detail to allow them to identify streets and such buildings as churches, schools and hospitals. They were then asked, based on their experience of prior flood events, which areas were most at risk and, more importantly, which streets and potential refuge centres remained out of harm's way.

"Disaster response plans must be based on a combination of scientific data, indigenous knowledge, community coping strategies and resilience," confirms Spence.

Based on these criteria, flood response plans have now been drawn up for Speightstown and community drills and exercises have been carried out.

CASE STUDY: CYCLONE ALERT SYSTEM IN THE SOUTH PACIFIC



Founded in 1968, the Australian Foundation for the Peoples of Asia and the Pacific (AFAP) is a non-profit overseas aid organization based in Sydney. Together with the Foundation for the Peoples of the South Pacific International and with funding from AusAID under its Humanitarian and Emergency Services Cooperation Agreement, AFAP runs the Australian-Pacific Centre for Emergency and Disaster Information (APCEDI) (see www.afap.org/apcedi/*).*

"APCEDI was created in 1994 in response to assisting our field staff during the eruption of the Rabaul Volcano on Papua New Guinea," explains Kevin Vang, executive director and manager of the AFAP Environmental and Natural Disaster Programme and coordinator of APCEDI. "Over the following ten years, the APCEDI system grew, with much of the focus now centred on cyclones, which are the major hazard for the developing island states of the South Pacific."

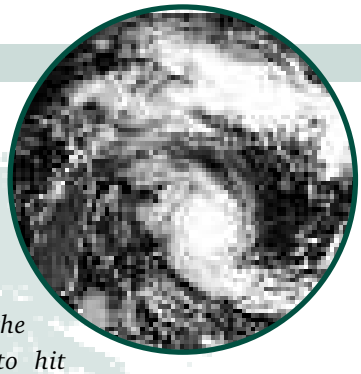
The premise of APCEDI is simple: to make complex meteorological and scientific data, obtained from a variety of sources, easily understood and available to those people most at risk. "Before APCEDI, official alerts were often targeted to islands that had no population while remote populated islands were being overlooked or had no means of receving warnings," says Vang.

"Now, when a cyclone forms and starts to threaten an area," continues Vang, "the APCEDI system combines technical information with local knowledge of populations, demographics and topography. We then issue regular reports, mostly via the internet, and provide communities and officials with easy-to-understand information about the approaching storm."

The APCEDI system covers the whole Pacific region. However, Vang admits that some areas are better served by the internet than others. "During one recent storm, we received some 800 hits a day from the Cook islands, which is well connected," he says. Indeed, APCEDI can receive up to 10,000 hits a day from islands in or close to the path of a cyclone. "For other islands, such as Vanuatu, where few people have internet access, we have to rely more on radio bulletins to disseminate the information," he adds.

Having warned communities of the approaching danger, APCEDI continues to be useful after the event, having been used to locate missing ships and to coordinate and plan post-cyclone operations.

CASE STUDY: MAURITIUS METEOROLOGICAL SERVICES



One hundred years ago, canons were fired to warn ships in the harbour at Port Louis, the capital of Mauritius, to move out to the open sea when a cyclone was imminent. Today, using satellite imagery and data from a suite of meteorological stations, it is the responsibility of the Mauritius Meteorological Services (MMS) to warn the population about impending storms.

"The warning system we have developed is based on a four-tier system," explains Sok Appadu of the MMS.

Before the cyclone season starts in November, the population is reminded about the precautionary measures that they need to take by distributing posters and leaflets in the three main languages in use on the island, English, French and creole.

The most recent cyclone to hit Mauritius was Dina on 20-22 February 2002. In this instance, the Class I warning, aimed at advising people to be alert to following warnings, was given when the storm was 640 kilometres from the island.

The Class II warning was given when Dina was 450 kilomteres from Mauritius – an estimated 30 hours away. This warning let the population know that they had just one day to prepare for the coming storm.

Taking into account that people need daylight to make their final preparations, such as boarding up windows, and that the storm was expected to hit Mauritius during the night, the Class III warning was given at 13:30 on 21 February when the storm was 300 kilometres way.

"The Class IV warning was broadcast when the storm hit, about 21:00 that evening, and the island remained under cyclone conditions for more than 20 hours," says Appadu. "However, because MMS has built up its credibility in Mauritius and people trust us to give them the 'official' warning, they heeded our advice. In fact, only two people died during Dina, but their deaths were not related directly to the cyclone."

"This four-tier system is simple for the public to understand," adds Appadu, "and could easily be replicated for other natural disasters such as tsunamis, storm surges, landslides and torrential rain."

CASE STUDY: EVALUATING HAZARDS AND RISKS IN CUBA

Last October, the most powerful hurricane on record, Wilma, span its way around the Caribbean. Cuba, however, has a long history of preparing for such events, and although Wilma inevitably caused some infrastructural damage, no lives were lost. "Protecting lives is the first and foremost criterion for our natural disaster preparedness plans," confirms Bertha Elena Gonzàlez Raynal, National Centre for Seismological Research, Havana, Cuba.

Raynal's personal input into Cuba's disaster preparations has been a detailed evaluation of the natural hazards and an assessment of the risks to the Municipality of Mariel in the northwest of the country.

Mariel, a semirural area, is home to some 42,000 people, almost half of whom are concentrated in six urban areas. Many of these people work in the local port and other industrial complexes, including a power plant and cement factory. The area also has a high susceptibility to such geological and hydrometeorological hazards as earthquakes, landslides, tropical storms, cyclones and coastal floods. Indeed, based on the number of hurricanes that have hit Marial since 1810, one is expected about every three years.

By analysing the tracks of these hurricanes and superimposing them onto maps with details of the topography of the seabed and coastal zones, Raynal and her team have created storm surge maps that locate accurately those areas – down to the individual street – that are most at risk.

However, landslides are the most common natural hazard in the Marial area. Therefore, Raynal has also investigated the rock formations and soil types in the hills surrounding the municipality. "The whole area exhibits symptoms of slope instability such as the development of cracks and fissures, and the deformation and bulging of the ground," warns Raynal. "There are also many discontinuities in the vegetation coverage and many inclined trees."

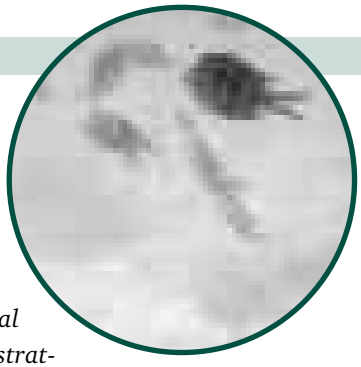
Having fed these data into two landslide probability estimation models, Raynal predicts that there is a 40 percent chance of a major landslide occurring within the next ten years, and a 90 percent chance of one occurring in the next 50 years.

By overlaying such data, a multihazard map has been created for Marial. This has been used to alert decision makers and community leaders of the risks from a variety of natural hazards and to plan appropriate mitigation and response measures.

CASE STUDY: REPAIRING REEFS IN MADAGASCAR

Although not a small island, Madagascar shares many of the challenges faced by SIDS, including the ongoing degradation of its barrier reef. Covering an area of some 2,000 square kilometres, Madagascar's coral reefs play a vital role in supporting livelihoods for numerous coastal communities as well as protecting the coast from storm surges and tsunamis. However, pressure from an increasing population, together with soil erosion from deforested slopes and agricultural run-off, is damaging this fragile marine ecosystem.

Off the coast of Ifaty, southwest Madagascar, it is estimated that some 70 percent of coral colonies are dead. Such devastation requires drastic remedial measures. Eulalie Ranaivoson, Institut Halietique et des Sciences Marines *(IHSM), University of Toliara, therefore, experimented with transplanting corals to three degraded sites. Live pieces of coral, usually about 15 centimetres long, were selected from healthy areas of reef within 300 metres of the degraded reef and carefully transferred to the experimental sites. Fast-acting cement was then used to install the coral pieces in their new locations. By carefully monitoring not only the coral, but also the fish and other marine species in the trial areas, Ranaivoson has demonstrated that more than 50 percent of the transplants survive at least 12 months and that a number of fish species are attracted back to the degraded area by the new coral growth.*



Despite difficult working conditions – her two students were obliged to fund their own studies – Ranaivoson has demonstrated that degraded reefs can be rehabilitated and, in the long-term, recreated, especially if sources of pollution can be controlled and unsustainable fishing practices, such as breaking off chunks of coral to catch octopuses, can be phased out and fishermen can be persuaded that, by protecting areas of coral reef that act as fish nurseries, fish stocks will increase.

IN DECEMBER 2001, HAROLD VARMUS (NOBEL PRIZE LAUREATE IN PHYSIOLOGY AND MEDICINE 1989) INTRODUCED THE CONCEPT OF THE GLOBAL SCIENCE CORPS (GSC) DURING A SPEECH AT THE NOBEL FOUNDATION IN STOCKHOLM, SWEDEN, TO MARK THE CENTENNIAL ANNIVERSARY OF THE NOBEL PRIZE.

GLOBAL SCIENCE CORPS ON THE MARCH

The Global Science Corps (GSC) initiative, as conceived by Harold Varmus, would enable scientists from developed countries to work for extended periods in scientific institutions in developing countries. Since the concept was first presented some four years ago, the Science Initiative Group (SIG), located on the campus of the Institute of Advanced Study in Princeton, New Jersey, USA, and the driving force behind the creation of the Millennium Science Institutes in the developing world, has assumed responsibility for turning the GSC concept into reality.

The GSC is now gaining momentum. Several universities in the United States – including Princeton and Tufts – have agreed to allow their professors to take sabbaticals to participate in the programme. Meanwhile, in January 2006, the United Nations Development Programme Special Unit for South-South Cooperation (UNDP-SSC) sponsored a workshop in Nairobi, Kenya, to examine whether the GSC concept might prove a valuable addition to existing efforts to boost scientific capacity in Africa. The overwhelming response among the African scientists who attended the workshop was 'yes'.

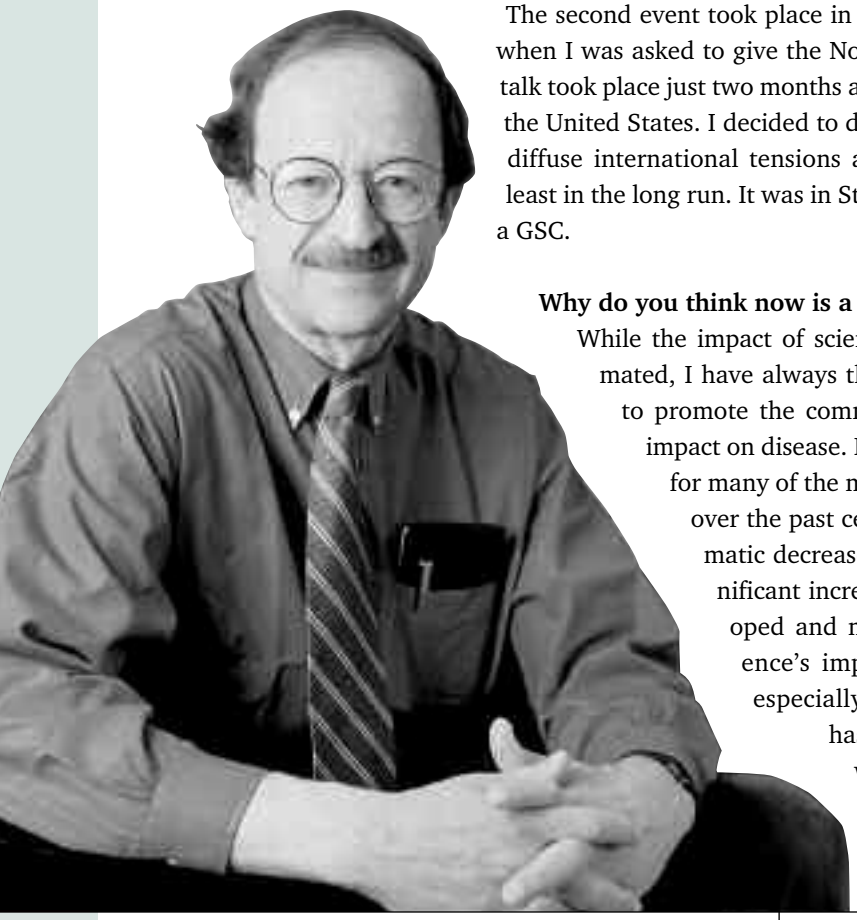
The editor of the TWAS Newsletter *recently conducted a phone interview with Varmus, who spoke from his office in New York City. The conversation focused on the roots of the GSC concept and the initiative's prospects for future success. Varmus has been president and chief executive officer of the Memorial Sloan-Kettering Cancer Center since January 2000, following a seven-year stint as director of the US National Institutes of Health. As a professor of microbiology and immunology at the University of California School of Medicine in San Francisco, he shared the Nobel Prize in physiology and medicine with his colleague J. Michael Bishop, now vice-chancellor at the University of California in San Francisco, "for their discovery of the cellular origin of retroviral oncogenes", which has extensively influenced scientific knowledge about mechanisms for tumour development. Excerpts of the interview follow.*

What gave rise to the concept of the Global Science Corps (GSC)?

The roots of the idea for the GSC reside in two different personal experiences. At first glance, these experiences may seem unrelated. Yet, together they not only helped to crystallise the value of the project in my mind but also made me realise that the aims of the project were eminently achievable.

The first event took place in the mid 1990s. At the time, as director of the US National Institutes of Health, I was invited to travel to western Africa, where I visited the Malaria Research and Training Centre in Bamako, the capital of Mali. The centre's well-trained scientists, who enjoy extensive collaborations with colleagues around the world, use a variety of modern techniques to conduct world-class studies on the malarial parasite and its insect host.

Witnessing the centre's work proved to me that scientists in the North could travel to poor countries in the South and do good challenging science while making important contributions to our global society.



The second event took place in Stockholm, Sweden, in December 2001, when I was asked to give the Nobel Foundation's centennial speech. The talk took place just two months after the 11 September terrorist attacks in the United States. I decided to discuss how science might be able to help diffuse international tensions and promote global understanding – at least in the long run. It was in Stockholm that I first presented the idea of a GSC.

Why do you think now is a good time to push for this idea?

While the impact of science on society should not be underestimated, I have always thought that science could do even more to promote the common good. Take, for example, science's impact on disease. It's true that science has been responsible for many of the most significant advances in public health over the past century – advances that have led to a dramatic decrease in childhood mortality rates and a significant increase in life expectancy both in the developed and much of the developing world. Yet, science's impact on the disease burden of people, especially poor people living in poor countries, has been less than we think. Ronald Ross won the second Nobel Prize for medicine in 1902 for laying "the foundation for successful research and methods" in

combating malaria, and Robert Koch won the Nobel Prize in medicine in 1906 "for his investigations and discoveries in relation to tuberculosis". And, in 1952 Selman Waksman won the Nobel Prize in medicine for devising an effective treatment for tuberculosis with streptomycin. Yet, some 50 years later, malaria infects over three million people worldwide annually, killing one to two million, and tuberculosis is still responsible for some three million deaths each year. In fact, you can argue that both diseases pose a greater threat to public health today than they did a few decades ago.

Yet, such disconnects between scientific research and improvements in public health, especially in developing countries, may finally be narrowing thanks to the efforts of many different organizations – for example, the United Nations with its recent emphasis on the Millennium Development Goals that highlight the importance of public health as a prerequisite for sustainable economic development; the World Health Organization, which has proven instrumental in leading global efforts to detect and curb the spread of infectious disease; the Bill and Melinda Gates Foundation, which has made public health in poor countries the centrepiece of its philanthropy; and the Multi-Laterial Initiative on Malaria, TB Alliance and many other non-profit organizations, which have been uncompromising advocates of increasing global investments in medical research and public health not only as a moral imperative but as a core aspect of sustainable development in developing countries.

I view the GSC as part of these larger trends, which embrace science as a fundamental tool for addressing problems of global poverty and disease. Recent global events, marked by increasing suspicion and distrust among cultures, make it even more imperative that we develop mechanisms like the GSC for promoting exchanges among people who share common interests yet live in distant lands.

How do you envision the GSC will work?

The concept is easy to articulate but not so easy to execute. Simply put, the GSC is designed to provide a framework that enables scientists from the developed world to work for extended periods in scientific institutions in the developing world. For young scientists, it is intended to offer an opportunity for a compelling experience that could possibly shape their entire careers.

For mid-career scientists, it might help re-energize their commitment to science adding a sense of idealism to work that may have become routine with time; and for senior scientists, it may help them continue to contribute to their profession in unexpected but rewarding ways.

But like so many other things in life, the devil – and, consequently, the prospects for success – is found in the details. For the GSC to succeed, there must be a strong administrative structure that can, for example, help identify universities and research centres in the developing world that are capable of receiving scientists from the developed world and putting them to work on projects that are personally challenging and, at the same time, valuable to the nation or region in which the institution is located.

There are also a broad range of logistical challenges that may seem trivial at first but, in reality, are not. The fact is that moving abroad for a year or two, especially to a poor, developing country, is not easy and requires a good deal of assistance. For example, where will the scientists live? What accommodations will be made for family members? Who will cover health insurance costs? What guarantees will there be that a position will be available when the scientist returns home?

All of these details require attention and resources. That's why I was delighted to see SIG assume responsibility for this project. SIG has successfully managed the Millennium Science Initiative (MSI), which has led to the creation of a series of scientific centres of excellence in the developing world, most notably in Latin America.

Partnering with the UN, SIG is now applying its broad-based managerial and networking skills to transforming the GSC from a concept into reality. It is working directly with universities, encouraging administrators to extend sabbaticals to faculty members to allow them to participate in the project; it is partnering the UNDP-SSC, which recently sponsored a conference in Nairobi, Kenya, to gauge interest in the concept in Africa; it is applying for grants from several foundations to secure the necessary resources to succeed; and it is soliciting guidance from such experienced international organizations as TWAS, hoping the Academy can provide assistance, for example, in identifying universities and research centres in the developing world that are willing and able to host scientists from the North.

To succeed, the GSC will not only need funds but also an extensive network of contacts in both the developed and developing world. SIG is clearly well positioned to accomplish both tasks, and its direct involvement in the initiative is one of the reasons that I am guardedly optimistic that we will see progress in the implementation of the programme over the next year.

How will you measure the success of the GSC?

The first measure of success will be to entice scientists in developed countries to take advantage of this opportunity. We hope to have from five to twenty people participating in the project over the next two years. They are likely to receive sabbaticals from their home institutions, which will

continue to pay a large portion of their salaries during their stays abroad. We also hope to convince several foundations that the project is worthy of their support and to garner the backing of international organizations as well.

Once we have people who have spent some time abroad, they will be able to speak from experience. I am convinced that their personal testimonials will encourage others to follow. Everyone involved in the GSC initiative realizes that simple arithmetical indicators will not be a sufficient measure of the programme's success – even if several hundred scientists are involved on an annual basis. It is equally important to have participants involved in worthy projects that contribute directly to both global scientific knowledge and social well-being, especially in poor countries. Again, while recording the number of articles published in peer-reviewed international journals will be a useful indicator, it will not be sufficient. We also want the projects to contribute directly to improving economic and social conditions in the host country and to serve, as well, as a strong foundation for building lasting friendships that extend beyond professional concerns and that help to nurture a greater appreciation and understanding of other cultures.

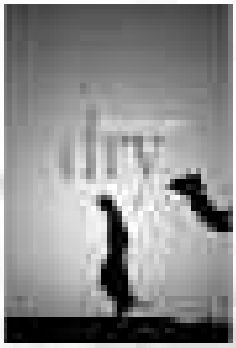
This is undoubtedly a challenging set of goals. But I would argue that we live in challenging times that deserve – and indeed require – bold action. And that is what I hope the GSC is able to deliver on a scale and scope commensurate with the support it receives and the enthusiasm that it generates. I, for one, think that is worth the effort, and I hope that others do too. ■

For additional information about the Global Science Corps, see
www.globalsciencecorps.org

DRY: LIFE WITHOUT WATER

PUBLISHED BY HARVARD UNIVERSITY PRESS IN COLLABORATION WITH TWAS AND TWNSO, 'DRY: LIFE WITHOUT WATER' AIMS TO BRING STORIES ABOUT PEOPLE LIVING IN ARID AND SEMI-ARID REGIONS TO A LARGE GLOBAL AUDIENCE.

Water is in the air we breathe and beneath the ground we walk on. The very substance of life, it comprises more than 60 percent of the human body.

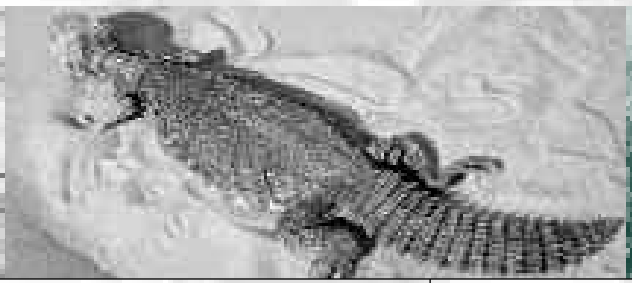


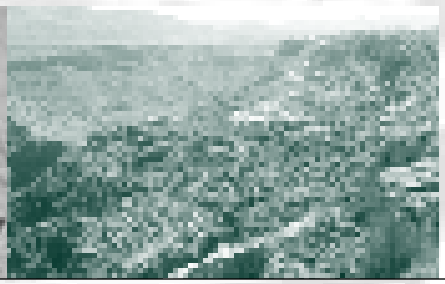
Yet more than one billion people live their lives without reliable and consistent supplies of water.

These are the people that we meet in *Dry*: *Life Without Water,* recently published by Harvard University Press. The book is based in part on research that was overseen by TWAS and the Third World Network of Scientific Organizations (TWNSO) under a project sponsored by the Global Environment Facility (GEF). *Dry* is edited by Daniel Schaffer, TWAS's public information officer, and Ehsan Masood, a freelance writer living in London. It includes 16 stories written by leading science journalists from around the world.

Dry focuses on people living in arid and semi-arid regions of Africa, Asia, the Pacific and the Americas who have developed effective – and, in some instances, ingenious – ways of utilizing the scarce water resources that are available to them. These are stories of people living in very hot, very cold, or very high places who have acquired the knowledge and know-how to collect, pipe and trap the water that they need – and to do it in ways that ensure water will be available for future generations.

The book explores, for example, the ancient communal knowledge that continues to guide the management of grazing lands in Kenya's Maasai. And it





looks at recent efforts by the highland people of Chile's Atacama Desert to install giant mountainside nets to capture water-laden fog that rolls in from the Pacific coast.

Handsomely illustrated and designed to reach a broad non-technical audience, *Dry* is intended to compliment the academic and policy volumes that were previously published as part of the GEF project. It includes a foreword by Adnan Badran (TWAS Fellow 1991), former prime minister of Jordan, and an introduction by C.N.R. Rao, TWAS president, and Mohamed H.A. Hassan, the Academy's executive director.

"Our ultimate goal," says Schaffer, "is to introduce as large a number of people both to dryland environments and the people who live there. Our strategy for achieving this goal is to produce different kinds of publications for people with different interests. We are delighted that Harvard University Press has published such a beautiful book and we are hopeful that readers worldwide will find the stories it conveys to be both informative and engaging." ■

For additional information about the Dry: Life Without Water, see
www.hup.harvard.edu/catalog/MASDRY.html

BLACK BOULDERS

• *The phrase 'lunar landscape' might have been invented for Jordan's arid northern region, the Badia. You could literally fry an egg on one of the black basalt boulders peppering the flats... Reddish dust drifts across a parched ground that receives little more than 200 millimetres of rain in a good year. Yet, a fragile web of life survives here.*

"Reclaiming Jordan's Badia" - Dry: Life Without Water

VALUABLE VICUNAS

• *They call it the camel of the Americas and the queen of the high Andes. In the days of the Inca, the vicuna was a sacred beast. Anyone who killed one of these shy mammals without permission would themselves be slaughtered. Their wool – the finest and warmest in the world – was the preserve of monarchs.*

"Going for Gold in the Andes" - Dry: Life Without Water

DESERT RAINS

• *Like vast seas of sand, the shifting dunes of the world's oldest desert stretch for hundreds of kilometres across one of the driest areas of southern Africa. In good years, annual rainfall in the Namib Desert is measured in millimetres. But the years since the 1990s have been far from 'good' and have spurred many people living on the desert's fringe to change their lifestyles and livelihoods in order to survive.*

"Innovation in Namibia" - Dry: Life Without Water

TREE TREASURES

• *Cakes from the fruit of the zizyphus tree. A savoury sauce made with flowers of the bombax. Sherberty drinks from the plump green fruit of baobab. Oil from the red palm... List the uses of Burkina Faso's trees and the country sounds like a Shangri-La, a plentiful land where nature provides for people's every needs.*

"Burkina Faso's Forest Nurseries" - Dry: Life Without Water

ABDUS SALAM MEDAL

• The TWAS Council has awarded the 2006 Abdus Salam Medal Lecture for Science and Technology to **Lu Yongxiang**, president of the Chinese Academy of Sciences (CAS). The medal was instituted in 1995 to honour TWAS's founder and first president, Abdus Salam, and is given to highly distinguished individuals who have served the cause of science in developing countries. Lu is being honoured for his outstanding contributions to international science and to the development of science in the South. Previous award winners include Federico Mayor (Spain, 1995), M.G.K. Menon (India, 1996), Thomas R. Odhiambo (Kenya, 1998), José I. Vargas (Brazil, 2000) and Paolo Budinich (Italy, 2002). Lu is the first Chinese to be awarded the medal. The Abdus Salam Medal

Lu Yongxiang

will be presented during the opening ceremony of the TWAS 10th General Conference to be held in Angra dos Reis, Brazil, in September 2006.

CRATER DISCOVERY

• Together with his colleague Eman Ghoneim, **Farouk El-Baz** (TWAS Fellow 1985), director, Center for Remote Sensing at Boston University, United States, has announced the discovery of a giant crater in the Saharan Desert. While studying satellite images of Egypt's Western Desert, the team identified the 31-kilometre diameter crater, which they have named 'Kebira', meaning 'large' in Arabic. The largest Saharan crater known to exist before the discovery was just 12 kilometres in diameter. The double-ringed Kebira crater is reminiscent of certain double-ringed craters visible on the surface of the moon. For this reason, El-Baz believes studying the Saharan crater, thought to be the result of a meteorite hitting the Earth tens of millions of years ago, will figure prominently in future research in comparative planetology.

ELECTED TO NAE

• **Man Mohan Sharma** (TWAS Fellow 1990), Mumbai University of Chemical Technology, India, has been elected a Foreign Associate of the US National Academy of Engineering (NAE). Sharma, who has made seminal contributions in multiphase reactions that have led to the rational design of reactive separations, has also been a leader in the development of the Indian chemical industry. Sharma was among nine new Foreign Associates elected by the NAE – and is the only resident Indian to have received such an honour – which now counts 186 Foreign Associates among its 2,200 members.

NEW TECHNOLOGY CENTRE

• A regional science and technology centre, to be named after Prime Minister P.J. Patterson of Jamaica, will be established early next year. "Its main purpose will be to collect ideas from around the world that can be used to help countries use existing science and technology," said **Calestous Juma** (TWAS Fellow 2005), professor, J.F. Kennedy

Calestous Juma

School of Government at Harvard University, United States, who first suggested the idea to Patterson. Among the institute's first activities will be intensive two-week courses on science and innovation policy for leaders in both the public and private sectors.

FELLOWSHIP PUBLICATION

• Thanks to the efforts of two TWAS members, **Atta-ur-Rahman** (TWAS Fellow 1985) and **Muhammad Iqbal Choudhary** (TWAS Fellow 2002), the H.E.J. Research Institute of Chemistry, University of Karachi, Pakistan, has been accepting scientific visitors through various TWAS and affiliated organization programmes for several years. A new research paper from the H.E.J. Research Institute has been co-authored by these two TWAS Fellows along with **Rosa Ranjit**, Natural Products Development Division of the government of Nepal, who is studying at the in-

stitute as part of her TWOWS Postgraduate Fellowship, and **Krishna Prasad Devkota** of the Institute of Forestry, Tribhuvan University, Pokhara, Nepal, who has visited the centre on four occasions between 2003 and 2006 under the TWAS-UNESCO Associateship Scheme. Their joint paper, 'Hydroxylation of the sesterpene leucosceptrine by the fungus *Rhizopus stolonifer*', was published in the journal *Phytochemistry*.

FELLOWSHIP AWARD

• **Adekunle A. Bakare**, Cell Biology and Genetics Unit, Department of Zoology, University of Ibadan, Nigeria, has been awarded a prize for his presentation at the International Symposium on Environmental Mutagenesis and Public Health and the XXXI annual conference of the Environmental Mutagen Society of India, held at the National Institute of Nutrition, Hyderabad, 23-25 February 2006. Bakare is currently visiting the Industrial Toxicology Research Centre (ITRC), Lucknow, India, on a CSIR-TWAS Postdoctoral Fellowship. He has been working with Alok Dhawan of ITRC's Developmental Toxicology Division on 'DNA damage induced by industrial solid waste and municipal sludge leachates in human peripheral blood lymphocytes' – the title of Bakare's co-authored prize-winning paper.

L'OREAL AWARD

• TWOWS member **Esther Orozco**, Centre for Advanced Research, National Polytechnic Institute, Mexico, is the recipient of the L'Oréal-UNESCO prize for

Esther Orozco

Women in Science for the Latin America region. Orozco, who studies the molecular pathology of amoebiasis, a major public health problem in her native country, received the award at a special ceremony at the headquarters of the United Nations Educational, Scientific and Cultural Organization (UNESCO) in Paris, France, on 2 March 2006. The award was presented by Koichiro Maatsura, UNESCO director-general, and L'Oréal chairman, Sir Lindsay Owen-Jones.

INDIAN AWARDS

• Established in 1954 by the President if India, the Padma Vibhushan is the second highest national award given by the government of India. Among the recipients of the 2006 Padma Vibhushan awards are **Prakash Narain Tandon** (TWAS Fellow 2001), dean of research and international relations, University of Delhi, in the field of medicine; **Obaid Siddiqi** (TWAS Fellow 1984), senior associate, Institute of Advanced Studies, Bangalore, in the field of science and technology; and **Norman E. Borlaug** (Nobel Prize for Peace 1970, TWAS Associate Fellow 1985). Borlaug, who is often referred to as the 'Father of the Green Revolution', has also recently been honoured with the Danforth Award for Plant Science in recognition of his life-long commitment to increasing global agricultural production through plant science and the US National Medal of Science, the US government's most prestigious science prize.

NEW PAKISTAN CENTRE

• The Latif Ebrahim Jamal National Science Centre, University of Karachi, has established the Pakistan Biotechnology Information Centre (PABIC) under the patronage of **Anwar Nasim** (TWAS Fellow 1987), chair of the National Commission on Biotechnology. PABIC plans to publish regular newsletters and web-based information bulletins on current activities related to biotechnology research and development Pakistan.

Xuan Wang

IN MEMORIAM

• Among the TWAS members who have recently passed away are: **Shiing-Shen Chern** (TWAS Associate Founding Fellow), **Carlos C. Monge** (TWAS Fellow 1989) and **Xuan Wang** (TWAS Fellow 1993). We will miss their friendship and camaraderie and extend our condolences to their families and friends.

WHAT'S TWAS?

The Academy of Sciences for the Developing World (TWAS) is an autonomous international organization that promotes scientific capacity and excellence in the South. Founded as the Third World Academy of Sciences by a group of eminent scientists under the leadership of the late Nobel Laureate Abdus Salam of Pakistan in 1983, TWAS was officially launched in Trieste, Italy, in 1985, by the Secretary General of the United Nations.

TWAS has more than 800 members from 90 countries, 73 of which are developing countries. A 13-member Council is responsible for supervising all Academy affairs. It is assisted in the administration and coordination of programmes by a small secretariat, 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. The United Nations Educational, Scientific and Cultural Organization (UNESCO) is 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 science and scholarship.

TWAS was instrumental in the establishment in 1988 of the Third World Network of Scientific Organizations (TWNSO), a non-governmental alliance of 160 scientific organizations from developing 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. ⋯⁘ **www.twnso.org**

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 2,500 women scientists from 87 developing countries. Its main objectives are to promote research, provide training, and strengthen the role of women scientists in decision-making and development processes in the South. The secretariat of TWOWS is hosted and assisted by TWAS. ⋯⁘ **www.twows.org**

Since May 2000, TWAS has been providing the secretariat for the InterAcademy Panel on International Issues (IAP), a global network of 90 science academies worldwide established in 1993, whose primary goal is to help member academies work together to inform citizens and advise decision-makers on the scientific aspects of critical global issues. ⋯⁘ **www.interacademies.net/iap**

The secretariat of the InterAcademy Medical Panel (IAMP), an association of 52 academies of science and medicine, relocated to Trieste in May 2004. IAMP and its member academies are committed to improving health worldwide, especially in developing countries. ⋯⁘ **www.iamp-online.org**

WANT TO KNOW MORE?

TWAS and its affiliated organizations offer scientists in the South a variety of grants and fellowships. To find out more about these opportunities, check out the TWAS website:
www.twas.org

FELLOWSHIPS

Want to spend some time at a research institution in another developing country? Investigate the fellowships and associateships programmes:
www.twas.org/Exchange.html
TWOWS offers postgraduate fellowships to women from least developed countries (LDCs) and other countries in sub-Saharan Africa:
www.twows.org/postgrad.html

GRANTS

Are you a scientist seeking funding for your research project? Then take a look at the TWAS Research Grants scheme:
www.twas.org/mtm/RG_form.html
Is your institution seeking funds to collaborate with a research institute in another country in the South? The TWNSO grants programme may be able to provide support:
www.twnso.org/grants.html

EQUIPMENT

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

TRAVEL

Would you like to invite an eminent scholar to your institution, but need funding for his/her travel? Check out the Visiting Scientist Programme:
www.twas.org/hg/vis_sci.html

CONFERENCES

Are you organizing a scientific conference and would like to involve young scientists from the region? You may find the help you need here:
www.twas.org/mtm/SM_form.html