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THE NEWSLETTER OF THE THIRD WORLD ACADEMY OF SCIENCES

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TWAS, TWNSO in Tehran

The 12th General Meeting of the Third World Academy of Sciences (TWAS) and the 14th Meeting of the Executive Board of the Third World Network of Scientific Organizations (TWNSO) was a "coming out party" of sorts — not for TWAS and TWNSO, which conducted their usual business meetings laying the groundwork for their wide-ranging activities in the year ahead, but for Iranian scientific institutions, which used the occasion to announce their intentions to become full partners in the international scientific community as well as leading voices in South-South cooperation in science and technology in the years ahead.

The intentions of Iranian officials were on full display from the moment that participants landed at Tehran's international airport to the time that participants left to return to their home countries a week later: the banners waving along the roadside welcoming us to Tehran, the gracious and efficient manner in which our requests were met at the hotel, the personal involvement of Mostafa Moin, the Minister of Science, Research and Technology, in every detail of the event, the elegant opening address by H.E. Syed Khatami, the President of the Islamic Republic of Iran.

Beyond the warm hospitality and inspiring rhetoric were substantive discussions on Iran's efforts to boost its science and technology enterprise, and to do so within the fabric of the nation's prevailing Islamic beliefs. Sessions on the state of science in Iran revealed the existence of a strong and expanding research base (particularly in the basic sciences), while the science and technology exhibition in the hall outside the lecture rooms successfully showcased an increasing interest in applying the nation's scientific know-how to real-world problems that would boost the national economy and improve living standards.

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As many of our Iranian colleagues pointed out in their lectures, Iran has a long and sacred tradition of learning. It now hopes to build upon that tradition in ways that meet the challenges of the future without undermining the moral and religious principles that guide the society. TWAS and TWNSO, which have enjoyed long and deep relationships with Iran since the organizations were launched more than 15 years ago, welcomed the opportunity to work together with Iranian's scientific community. We hope that the meeting met the expectations of our hosts and we look forward to continuing our dialogue with our Iranian colleagues in the months and years ahead. What we discovered in Iran confirmed what we already knew: There is much that we can learn from one another. ■

C.N.R. Rao
President
Third World Academy of Sciences

SCIENCE, RELIGION AND THE ISLAMIC WORLD

The Holy Quràn reveals that the prophets were designated to help man understand the universe he lives in, purify his inner self, and acquire an endless wisdom from the Holy Scriptures.

Since knowledge illuminates the dark spots in our life and gives us the means of perceiving the truth, the quest for knowledge, considered of prime importance for Muslims, needs to be closely knitted with faith and understanding. Acquisition of knowledge is highly recommended in our religion as it prepares a believer to practice his duties with perfection.

A scholar is the most venerable of all individuals in society and his name, an everlasting fame, is neither confined to time and place nor restricted by his culture and civilization.

In the course of history, the efforts of the human race of different colours and creeds with blends of traits and characteristics from different lands and communities kindled the eternal radiance of knowledge for many a torchbearer to keep this source of light eternally ablaze.

The Islamic world was the cradle of scientific innovation, creativity and advancement at the beginning of the last millennium, and so is the Western world the hub of scientific achievements today. Is it not, therefore, possible to prophesize a new shift to the pole of scientific advancement in the centuries or even decades to come?

The East with its rich flourishing civilization opened up the gates of learning and wisdom for the transfer of science, research and development to quench the thirst of the people across the world for knowledge. It is high time that we regain our lost status, restore our procreative power, and revive the eastern style of life.

Our vision on the full exploitation of the state-of-art science and technology is based upon two inescapable elements of facts and an optimistic approach.

The first fact is the contribution of the scientists and the societies of the Third World towards human knowledge, their share in the advancement of the world civilization, and the influence of profound Islamic thoughts and civilization in facilitating scientific exchanges.

The second irrefutable fact is that there exists an unparalleled distribution of scientific opportunities in today's world, which has widened the gap between the developing and the developed worlds in the process of globalization.

A socially, culturally, economically and politically secure environment, efficient scientific institutions, sound education and research networks are the main prerequisites of the progress of modern sciences and technology. If in the past, the brilliance of scientific discovery emanated from eminent scientists and researchers and the specific relationships among them, today we have to think of prestigious scientific institutions with remarkable records at national and international levels. The recognition of such administrative and social organizations is a must.

In fact, the generative and creative power of sciences comes to the fore wherever universities and research centres and educational and research activities are afforded their due deference and status.

Otherwise, the progress of knowledge is thwarted.

Science and technology can only thrive in a conducive environment. Neither the fascination with the advanced world, nor the sense of nostalgia for the past can open the way for our technological advancement. We ought to think seriously about imparting an ever-greater impetus to the mechanisms for acquiring and internalizing modern science and technology.

This would only be feasible through the establishment and empowering of dynamic and creative scientific and research institutions and networks throughout the South. The societies of the South cannot benefit from the latest achievements in the fields of science and learning unless they have suitable scientific, research and educational centres.

To attain a higher level of science and technology, we need to establish reciprocal inter-communication between educational institutes and research centres. Ensuring the research orientation of our educational sector on the one hand and creating a favourable environment for the application of the achievements of scientific research in the industrial area on the other are among the vital requisites for the progress of research work.

Promotion of cooperation among the centres of science and technology of both South and North and among those in the South is essential. We ought to think about devising an appropriate mechanism for providing support to institutions, networks, funds and foundations that aim at meeting the scientific, intellectual and material needs of scientists at national, regional, and international levels. Strengthening of interrelations between centres of science and learning on the one side and between governmental agencies and organizations on the other — measures that have received little attention until now — should be given top priority. In addition, we need to devise a framework for accommodating dialogue and the spirit of cooperation in all areas of science and technology.

Dialogue is the keystone of promoting understanding, listening actively to criticism, and paving the way for progress and sociocultural fusion. If dialogue is to form the basis of contacts between "self' and "others," no more congenial atmosphere can be induced than that of cooperation in the areas of science and technology.

Our centuries-old civilization provides us with sound experience of such cooperation. The cities of Marv, Balkh (Bactra), Bukhara, Cairo, Baghdad, Neishabur, Rey, Esfahan and tens of others were important centres of science and learning. These ancient cities not only attracted people of different walks of life from various nations and civilizations but they were also actively engaged in the exchange of ideas with other learning centres around the world training students of different fields of sciences.

Today, when we speak of cultural "dialogue," the scope we have in mind as regards scientific and technological exchanges encompasses even those countries with which our relations are not totally amicable. We see science as the common heritage of mankind and consider men of knowledge with unique ideas to be shared assets for

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the entire world. Therefore, we hold all scientists and thinkers in high esteem. We also believe that there should be a continued dialogue among them to strengthen the scientific and cultural exchanges among all learning institutions throughout the world.

We feel that today we are in need of Avicenna's book of Shafa and Mawlana Jalal al-Din Rumi's *Mathnawi-i Manawi* as much as we yearn for Bacon's N*ovum Organum* and Newton's *Principia Mathematica*; and we equally hold high Iqbal's *Asrar-e Khodi* and Tagore's *Sadhanai*.

By no means does the show of respect and upholding the dignity of one civilization and culture mean the denigration of another. We conceive that honouring distinguished men of thinking and learning amounts to upholding the dignity of the entire human civilization and culture. We are determined to encourage such an attitude in the dialogue of civilizations and cultures as a new vista for the promotion of ideas, understanding, morality and learning throughout the world.

We believe that there is an intimate link between religion, sovereignty of the people, human dignity and scientific progress. In support of this idea we have embarked on a new experiment. In this experiment, special prominence has been given to the notions of spirituality, democracy and science.

Our Third 5-Year Development Plan, whose implementation began in early 2000, has special provisions to encourage the transformation of our scientific, research and technological system. The task of drawing up a blueprint with defined academic strategies aims at meeting the objectives of education, research and technology.

The share of the research budget, currently 1 percent of gross domestic product (GDP) of the public sector and 5 percent of the resources of the private and business sector (including state companies and banks), will gradually increase. During this 5-year period the government will be required to facilitate university students and academicians with faster access to domestic and foreign sources of information, national information networks and the internet, and encourage the application of new technologies through the availability of essential funds.

To meet our national requisites, we believe that initially we have to restructure our academic institutes and our centres for research and technology and then embark on safeguarding academic freedom, ensuring the dignity and rights of citizens and preserving our Islamic, Iranian and revolutionary heritage and identity.

Our talented youth are vigorously engaged in activities of cultural, political and scientific nature. More than 5 percent of our people have academic education. And the number of students registered at higher educational centres has reached 20 percent. It is encouraging to note that a fairly large number of female students are taking academic courses.

Adoption and implementation of successful guidelines and mechanisms, and the promotion of science and technology for the welfare of the nations of the South are indispensable. The essential provision for this enterprise is sufficient investment for the expansion of scientific cooperation among different countries, institutions and researchers of the developing world. Such are the goals and strategies that we plan to pursue in the years ahead. ■

Sayed Mohammed Khatami
President
Islamic Republic of Iran

MEETING IN IRAN

TWAS'S 12TH GENERAL MEETING WAS HELD IN IRAN — A NATION THAT CONTINUES TO INCREASE ITS INVESTMENT IN SCIENCE AND TECHNOLOGY WHILE SEEKING TO SERVE AS A MODEL FOR THE REST OF THE ISLAMIC WORLD.

More than 120 scientists from some 35 nations met in Tehran, Iran, from 21-26 October, to examine a broad range of topics related to science-based development in the developing world.

The opening address by the President of the Islamic Republic of Iran, Syed Mohammad Khatami, set the tone for the event by calling on participants to re-examine the critical role that science and technology has played in the Islamic world in the past — and could again play in the future. President Khatami urged developing nations to increase the level of collaboration and exchange among scientific institutions in the South in order to boost national scientific output and the pace of economic development (see "Science, Religion and the Islamic World," p. 3).

The occasion for Khatami's opening address was the 12th General Meeting of TWAS and the 14th Executive Board Meeting of the Third World Network of Scientific Organizations (TWNSO). These biennial meetings usually take place in Trieste, Italy, which serves as the secretariat for both organizations. At the request of the Iranian government, however, this year's meetings were held in Tehran, as part of a larger effort by the Iranian government, and particularly the Iranian Ministry of Science, Research and Technology, to reintroduce the nation's scientific community to the rest of the world and to showcase the progress that Iran has made in scientific training and research over the past 2 decades.

Iran has enjoyed a long and fruitful relationship with Trieste's international scientific institutions, especially with the Abdus Salam International Centre for Theoretical Physics (ICTP), TWAS and TWNSO. The late Abdus Salam, who founded all three institutions, enjoyed a "father/son" relationship with Iran's Minister of Science, Research and Technology, Mostafa Moin, who served as the driving force behind his nation's efforts to host the Academy's 12th General Meeting in Tehran. In fact, Moin recalled that he first broached the idea of having a TWAS general meeting in Iran with Salam in the early 1990s during Moin's first tenure as minister. In addition, in 1992, Moin prodded his government to extend a critical US$3 mil-

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The Iranian Government's partnerships with the Academy, which date back to the days of Abdus Salam, have been re-energized by the TWAS 12th General Meeting.

lion "bridge" loan to help the ICTP survive the most serious financial crisis in its history. Several years later, Iran donated US$150,000 to the TWAS endowment fund and, at the Tehran conference, Iranian officials announced that the government would provide another US$100,000 to the endowment in 2001. Both contributions have come during Moin's tenure as minister.

In light of this history of friendship and support, it should come as no surprise that Moin expressed satisfaction with the staging of the TWAS and TWNSO meetings in Tehran this October. For Moin, it marked the culmination of his unflagging efforts at cooperation dating back more than a decade.

The public event was preceded by a series of TWAS and TWNSO business meetings, held on 21-22 October. At the meetings, the Academy:

• Elected Jacob Palis (Brazil), Director, Institute of Pure and Applied Mathematics, Rio de Janeiro, as TWAS Secretary General. Elected Attia Ashour (Egypt), Professor of Mathematics, Cairo University; Frederick I.B. Kayanja (Uganda), Vice Chancellor, Mbarara University of Science and Technology; Miguel A. Virasoro (Argentina), Director, Abdus Salam ICTP, Trieste; and A. Hamid Zakri (Malaysia), Director, Institute of Advanced Studies, United Nations University, Tokyo, as new members of the TWAS Council. Their 3-years terms will begin in 2001.

• Awarded the 2001 Abdus Salam Medal to TWAS's immediate past president, José I. Vargas.

• Conferred the Academy's 2001 Awards in Basic Science to the following scientists: biology: Alberto Frasch (Argentina); basic medical sciences: Rabia Hussain (Pakistan); chemistry: Gautnam Desiraju (India); mathematics: Weiping Zhang (China); and physics: Ajay Kumar Sood (India). In addition, the Academy awarded the TWAS 2001 Medal Lectures to: medical sciences: Essmat Ezzat (Egypt); chemical sciences: Goverdhan Mehta (India); and biological sciences: Ricardo Miledi (Mexico; United Kingdom).

• Approved several new initiatives as part of a larger strategy to broaden the reach of TWAS and strengthen the Academy's voice in science-related policy discussions in both the developing and developed world. These initiatives, which were outlined in the Tehran Declaration adopted by TWAS members at the General Assembly, called on the Academy to:

• Begin planning an international conference, in partnership with Iran's Ministry of Science, Research and Technology, that would examine the role of science in promoting a "culture of dialogue" among civilizations. The conference is tentatively scheduled to take place in 2001, which the United Nations (following a suggestion made by Iran's President Khatami) has officially designated as the *International Year of Dialogue.*

• Expand the Academy's membership to researchers and scholars working in fields other than the basic sciences. The first step will be to organize a study group/workshop that brings together basic scientists, economists, social scientists and humanists to examine the social and economic implications related to the North-South gap in information technologies, which observers have labelled the "digital divide."

• Launch a network of scientific institutions in the South focusing on issues related to renewable energies. The network will be patterned on previous TWAS/TWNSO networks formed to examine issues related to indigenous plants, water quality and management, and biodiversity in arid and semi-arid lands.

• Provide additional funding for centres of scientific excellence in Africa. TWAS, TWNSO and the participating centres would seek to use this funding as leverage for securing larger grants from international funding and aid organizations.

IRANIAN SCIENCE. *One of the three major symposia at the 12 General Meeting of TWAS focused on "Science and Technology Development in Iran." The other two were devoted to promoting a cultural dialogue through science and biotechnology (see main text). A comprehensive written account of the talks at the Iranian science symposium has been published in* Science and Technology in Iran *(Tehran: Ministry of Science, Research and Technology, Islamic Republic of Iran, 2000). Those interested in obtaining copies of the monograph should contact Davood Rashtchian at the Ministry, rashtchi@che.sharif.ac.ir, rashtchi@mail.com.*

TWO TALKS

Following the opening addresses by Minister M. Moin, Gianfranco Facco Bonetti, Director General for Promotion of Cultural Cooperation, Italian Ministry of Foreign Affairs; newly appointed TWAS President C.N.R. Rao; and the Honorable President of Iran Syed Mohammad Khatami, which took place in the palatial conference hall of the Islamic Summit Building, participants listened to presentations on the SESAME project (a snappy acronym for the rather lengthy project title "Syncrontron Light for Experimental Science and Applications in the Middle East), given by Herwig Shopper, former Director-General of CERN, and on the potential wide-ranging impacts of climate change on developing countries, delivered by G.O.P Obasi, Secretary General of the World Meteorological Organization and Vice President of TWAS.

Schopper noted that a country's "economic and social" well-being no longer depends on "manpower, capital and land," but instead relies on "know-how, information and new technologies." Such trends, Schopper continued, present special challenges for developing countries because they often must attend to basic human needs in the short-term while trying to keep pace with rapid scientific and technological advances over the long term. Nevertheless, current trends strongly suggest that all countries must devise strategies to "develop advanced technologies," which have become the foundation of the new global economy. Developing countries, according to Schopper, must not only invest in national programmes for basic and applied scientific training and research, but must encourage international scientific cooperation to foster the "competence and quality that are essential to compete successfully." In addition, such cooperation will facilitate "technology transfers" that could greatly accelerate future progress in science-based development throughout the developing world. For all of these reasons, Schopper urged global support for the SESAME project, an initiative spearheaded by UNESCO that would provide a synchrotron radiation source (the BESSY 1 facility would be moved from

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TWNSO

Tehran, Iran, 21-26th October 2000

Germany to Jordan) as well as comprehensive training for scientists and technologists from the Middle East. The project, which would give researchers in this region access to X-ray sources with much higher intensities than conventional sources, would create "excellent opportunities for training and research at high levels in interdisciplinary fields" ranging from physics to environmental science. At the same time, the SESAME project could help foster a dialogue among nations, much like CERN (European Organization for Nuclear Research) did in Europe during the post World War II period.

Obasi's presentation, which addressed another critical global science issue, focused not only on human resource development but on the natural environment. Weather and climate, he noted, have played central roles throughout human history. For example, the ascent of *homo sapiens* in northern Europe did not begin until temperatures rose and glaciers receded some 10,000 years ago. Obasi also noted that the atmosphere's inherent heat-capturing characteristics, largely a consequence of such greenhouse gases as carbon dioxide, nitrous oxides, methane and ozone, are essential for life on Earth. Scientists, however, have become increasingly convinced that rising levels of greenhouse gases in the Earth's atmosphere, largely due to such human activities as the increased burning of fossil fuels over the past 150 years, are having a profound impact on global and regional climate and weather. The last two decades, he observed, were the warmest two decades of the 20th century, and the 20th century proved to be the warmest century in the past 1000 years. While climate variations before the industrial era were driven by natural phenomena, "the present concern is that, for the first time in history," human activities are causing "a significant increase in greenhouse gases." Obasi reinforced this point by stating the World Meteorological Organization (WMO)/United Nations Environment Programme (UNEP) Intergovernmental Panel on Climate Change (IPCC) "has concluded that *the balance of evidence* suggests a discernible human influence on global climate." He added that the General Circulation Models used by meteorologists and climatologists, which have become increasingly reliable, project average global temperatures will rise between 3.5 and 10 degrees centigrade by the end of this century and sea-levels will rise between 15 and 95 centimetres. The adverse impact of global warming, he asserted, is likely to be far greater in the developing world than it will be in the developed world, largely because nations in the South will not have the resources to address the "socio-economic difficulties, refugee onslaughts and environmental degradation that is likely to take place."

AWARDS LECTURES. *The meeting in Iran included a series of lectures by recipients of the 1999 TWAS Awards in Basic Science and the TWAS 2000 Medal Lectures. The topics: in biology: Raghavendra Gadagkar (India), "The Evolution of Social Life in Insects;" in basic medical sciences: Esper A. Cavalheiro (Brazil), "The Relevance of Animal Models to Human Epilepsies;" in physics: Nai-ben Ming (China), "Superlatttices and Microstructures of Dielectric Materials;" in chemistry: Darshan Ranganathan (India), "Designer Cyclopeptides for Supramolecular Architecture and Function;" and in mathematics: Servet Martinez-Aguilera (Chile), "Conditionally Invariant Distributions and Ratio Limit Theorems for Killed Processes." The TWAS Medal Lectures included: Frederick I.B. Kayanja (Uganda), "Biodiversity;" Yong Xiang Lu (China), "The Progress and Future of Manufacturing Technology;" and Yousef Sobouti (Iran), "Symmetries of Liouville's and Liouville's-Poisson's Equation."*

As Obasi noted, "weather and weather-related hazards are known to set back the gross domestic product (GDP) of developing countries by several years." To mitigate these problems, he says that developing nations should strengthen the basic infrastructure and capabilities of their national institutions (to improve their ability to monitor, predict and conduct research on climate change), develop effective policies and adaptation strategies, and become more active in such international assemblies as the Conference of the Parties of the UN Framework Convention on Climate Change.

SCIENCE AND CULTURE

Some 100 scientists, nearly all those attending the meeting, engaged in a wide-ranging discussion exploring opportunities "for promoting a science-based culture of dialogue among civilizations." The symposium was framed by presentations from five distinguished speakers: Roshdi Rashed, Director of Research for the National Centre for Scientific Research and Director of the Centre of History of Science and Philosophy for Arab and Medieval Studies, Paris (see "Future Past," p. 25); Hadi Khaniki, Iranian Deputy Minister of Science, Research and Technology for Cultural Affairs; José I. Vargas, Brazil's Ambassador to UNESCO and President of TWNSO; Thomas R. Odhiambo, Honorary President of the African Academy of Sciences; Dun Liu, Director of the Chinese Academy of Sciences' Institute of History of Natural Sciences; and Erling Norrby, Secretary General of the Royal Swedish Academy of Sciences. Despite the diverse perspectives that the speakers brought to the discussion, the symposium evolved around several key topics. All participants agreed that historically science has never been a Eurocentric pursuit but is part of the heritage of all cultures, and, in fact, that 1000 years ago many of the most important advances in the science took place in the Islamic world. Nevertheless, participants also agreed that ever since the industrial revolution, which began in the 18th century, Europe and later the United States have been at the centre of science and technology, and that global imbalances in scientific and technological know-how over the past three centuries have created even more serious imbalances in economic and social well-being. As a recent UNESCO report noted, only 4 percent of new science currently is produced by the developing world, despite the fact that 80 percent of the world's population—more than 4.8 billion people—live in the South. The North/South gap in science and technology is not only morally unacceptable but politically destabilizing. That is why participants agreed that the promotion of a science-based culture of dialogue among civilizations would mark an important step forward in efforts to create a more equitable and harmonious world. Participants acknowledged that such a dialogue would not be easy either to launch or sustain. Not only did nationalism stand in the way of success; many speakers noted that the increasing trend toward proprietary ownership of scientific knowledge was making the sharing of scientific information more and more difficult. Yet, because science is based on a universal understanding of our natural world, discussions concerning science hold the promise of transcending cultural differences. As many participants pointed out, there is no such thing as Christian science or Islamic science: there is only science. In short, because science offers a common frame of reference and a common language, it presents a pathway for promoting a dialogue among nations that reaches beyond the boundaries of the scientific disciplines themselves.

There is no such thing as Christian science or Islamic science: there is only science.

BIOTECHNOLOGY RISING

The meeting's second major symposium was devoted to scientific and policy issues related to rapid advances in biotechnology. Presentations were given by Behzad Ghareyazie, Agricultural Biotechnology Institute of Iran, Tehran, Iran; Yuet Wai Kan, Howard Medical Institute and Department of Laboratory Medicine, University of California, San Francisco, USA; F. Mahboudi and M. Mohammadi, Biotechnology Department, Pasteur Institute of Iran, Tehran; S.Q. Mehdi, Biomedical and Genetic Engineering Laboratory, Pakistan; and A. Hamid Zakri, Director, Institute of Advanced Stuides, U.N. University, Tokyo. All participants agreed that biotechnology has emerged as one of the most critical sciences (if not the most critical science) of the 21st century,

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and that applications of biotechnology would have profound impacts on the global economy in the years ahead. In 1995, for example, transgenic plants had an estimated value of US$75 million; in 2000, the value had skyrocketed to US$2.5 billion; and by 2005, experts forecast the value would take another quantum leap to US$8 billion. Participants also agreed that the developing world should play an important role in the development of biotechnology. Even more importantly, participants concluded that the developing world should benefit immensely from applications of biotechnology in areas ranging from the development of more disease-resistant crops, to improvements in animal nutrition and health, to the creation of more effective drugs. Because much of the world's biodiversity, which will provide the resource material for improving our understanding and development of biotechnology, resides in the developing world, the South could indeed play a central role in this field. Yet, the developing world's ability to tap the potential of biotechnology has been compromised by several factors that could ultimately restrain its participation. Obstacles to success include such long-standing factors as limited financial resources and inadequate numbers of well-trained scientists. But obstacles also encompass issues that have emerged more recently and relate to the unique characteristics of biotechnology. These issues include insufficient safeguards for the protection of intellectual property rights and inadequate legal and regulatory frameworks to ensure biosafety. Despite these problems, participants agreed that developing nations were making substantial progress in advancing biotechnology and they expected these advances to accelerate in the future due to growing government support and the increased involvement of the private sector. As one participant concluded, it is not a question of whether biotechnology will become more prominent in the developing world (that's certain). Rather, the critical question is whether developing nations will enjoy the full economic benefits likely to be generated by the growing presence of biotechnology in the fields agriculture, husbandry, pharmaceuticals and biodiversity, or whether these economic benefits will largely accrue to multinational corporations headquartered in the North.

INDIA NEXT. *TWAS's 8th General Conference, to be hosted by the government of India, will take place 27-31 October 2001 in New Delhi. For additional information, please contact Sandra Ravalico, TWAS Secretariat, c/o ICTP, Strada Costiera 11, 34014 Trieste, Italy, phone + 39 040 2240 327, fax + 39 040 224 559, e-mail info@twas-online.org.*

TOMORROW'S SCIENCE TODAY

Mostafa Moin, Iran's Minister of Science, Research and Technology closed the meeting by not only thanking the participants for making the gathering a success but for helping to raise the profile of science and technology in Tehran and throughout Iran. He noted that 2000 marked the first year of a multi-year government plan to promote and transform the state of science and technology in his country. The effort has focused on strategies to make Iranian science more responsive to social needs; to transform universities and scientific research centres into institutions that concentrate increasingly on everyday issues; and to nurture an environment that encourages greater contact and interaction with the global scientific community. All these goals, Moin noted, are well served by joint activities with other institutions such as TWAS and TWNSO. Such partnerships, he added, date back to the days of Abdus Salam and now have been re-energized as a result of the discussions that took place at the meeting. Moin concluded by noting that Tehran Declaration, with its specific recommendations for the organization of an international conference "to examine the role that science can play in promoting a culture of dialogue and understanding among nations" would ensure that the critical issues raised in this meeting would continue to be aired and discussed in the years ahead. ■

SCORES OF IRANIAN SCIENTISTS AND STUDENTS FROM MANY DIFFERENT REGIONS OF THE NATION ATTENDED THE 12TH GENERAL MEETING OF TWAS. HERE'S WHAT A FEW OF THEM HAD TO SAY WHEN ASKED ABOUT THE CURRENT STATE OF SCIENCE AND MATHEMATICS IN THEIR COUNTRY.

IRAN'S SCIENCE COMMUNITY

REAL WEALTH

• The real wealth of countries resides today in their scientific and technological capacities. Scientific change now takes place so rapidly that any delay in catching up with achievements made elsewhere can be irretrievable. The countries of the South, with so many shortcomings and bottlenecks, have no other choice but to overcome the scientific gap between the first and third worlds. My ministry hopes that educational and research institutions in developing countries will pursue more effective and fruitful cooperation, particularly in scientific fields. That is a major reason why we are hosting the 12th General Meeting of TWAS and 14th Executive Board Meeting of TWNSO. ■

Mostafa Moin
Minister of Science, Research and Technology, Islamic Republic of Iran, Tehran

COOPERATIVE SPIRIT

• Knowledge is teamwork. Since Third World countries have similar problems as well as similar capabilities and opportunities, it is obvious that networks will lead the way for more fruitful collaboration. Such a strategy can help countries in the South offset each other's weak points, strengthen their respective strong points, and consequently assume a more effective role in the international scientific arena. ■

Seyyed Javad Azhari
Chancellor, Iran University of Science and Industry, Tehran

TAPPING TALENT

• Scientists in Iran have sustained a positive rate of growth in terms of the number of articles published in professional international journals over the past several years. This trend is very promising. Meanwhile, students in Iran's secondary schools have scored very high in international mathematics and science Olympiad competitions during the 1990s, which bodes well for the future of science and math in Iran. Our best students have great talent and we need to put that talent to use, both for the sake of our students and for the sake of our society. ■

Habib Firouzabadi
Professor of Chemistry, Shiraz University, Shiraz

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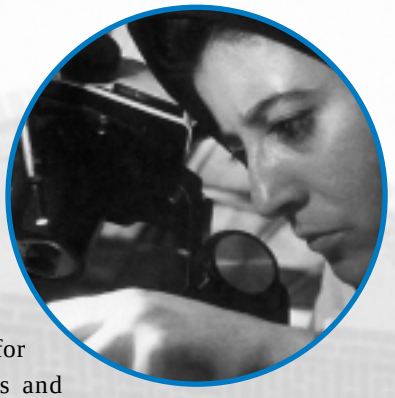


PHYSICAL DIMENSIONS

• The Islamic revolution in 1979, the cultural revolution in 1980-1984, and the Iran-Iraq war in 1980-1988 caused stagnation, if not reversal, in the research output of Iranian scientists. After the war, however, key indicators in scientific output, including the number of researchers with advanced degrees, publications and university students, displayed marked and sustained increases. These trends were evident in all scientific disciplines, including physics. Centres of excellence — for example, the Institute for Advanced Studies in Basic Science in Zanjan and the Institute for Physics and Mathematics in Tehran have played major roles in increasing the number of Iranian research papers in theoretical physics and mathematics published in international journals. Such positive developments are expected to continue, indeed accelerate, in the future. ■

Reza Mansouri
Professor of Theoretical Physics, Sharif Technical University, Tehran

REACHING HIGHER

• Both the number of students enrolled in my department and the amount of research conducted by department faculty members has been increasing in recent years. Indeed, we now have about 25 Ph.D. students. The fact is that science is becoming more important in Iran and our scientists are anxious to cooperatate with our counterparts elsewhere in the world. ■

Ahad Kiasatpour
Professor of Astrophysics, University of Isfahan, Isfahan

WOMEN'S ROLES

• The role and responsibilities of women in Iranian science are clearly on the rise. I expect to see an increasing number of women in all areas of science and technology, at all levels, continuing into the future. If Iranian women work hard and display talent in their areas of study, they have ample opportunity to move ahead. In my department, for example, half of the 12 Ph.D. students are women. ■

Nahid Pourreza
Professor of Chemistry, Chamran University, Ahvaz

EARTHLY MATTERS

• The study of geology has made great strides in Iran since the first university department of geology was established in Iran in 1961. Foreign geologists used to conduct all of the oil surveys here, but that has changed. Today, Iranian geologists are responsible for those surveys. In 1978, Iran's geologists published only 22 research papers and sponsored just one symposium. Since then, Iranian geologists have published more than 450 research papers and have sponsored dozens of symposia on geology, geophysics and earthquake-related research. ■

Mohammad Hassan Karimpour
Professor of Geology, Ferdowski University, Mashad

FAULTY MANAGEMENT

• Third World countries, especially Iran, are not underprivileged either in terms of human or natural resources. When Iranians go abroad, they excel in all endeavours. But the same people

do not flourish in Iran. The greatest problems facing Third World countries are poor management and faulty planning schemes. We are only underprivledged in these regards. In and of itself, the TWAS meeting in Iran doesn't hold much significance. What is important is what we do after the meeting. We must devise effective post-meeting plans to move ahead. ■

Dariush Farhoud
Faculty of Medical Sciences, University of Tehran, Tehran

PERSIAN MATH

• Persian mathematicians made great contributions to such fields as algebra and trigonometry more than 1000 years ago. Today Iranian mathematicians continue to do excellent research often without being noticed by the rest of the global scientific community. But that is changing. I would like to see the Iranian Mathematical Society spearhead a drive, with the cooperation of the International Mathematical Union, to establish a Third World Mathematical Society that is modelled after TWAS. The Iranian Mathematical Society is ready and willing to cooperate and to exchange experiences with their colleagues across the globe. ■

Mehdi Behzad
President, Iranian Mathematical Society, Tehran

KNOWLEDGE DISPERSION

• Our library — a brainchild of Abdus Salam, the founding father of TWAS — is now 8 years old. We serve a broad regional area encompassing researchers and institutions not only in Iran but in North Africa, the Middle East, Central and Southeast Asia — some 55 countries in all. The library belongs to the scientists in our members states, and the information we gather is made available to them free of charge. In addition to our books and journals (we acquire about 2000 scientific publications a year), we have access to electronic information worldwide, including information from the United States. Only about 7 countries — Iran, Jordan, Kazakhstan, Pakistan, Syria, Turkey, and Yemen — currently make extensive use of our facility. One of our major goals is to increase usage among all our member countries. ■

Jafar Mehrad
Director, Shiraz Regional Library of Science and Technology, Shiraz

FUTURE HOPES

• I am a student in mathematics planning to graduate in two years. I am interested in the field of "fuzzy math" and its applications in boosting the "artificial intelligence" of computerized robots, particularly robots that are designed to work in hostile environments where human labour would pose a danger to worker health and safety. As a woman, I am convinced that I will be rewarded for my abilities and not be discriminated against. I am hopeful that I will travel abroad to learn about the most recent developments in my field. I believe my expectations are shared by many other students in science and mathematics in Iran." ■

Maryam Sami
Undergraduate Student, Khageh Nasir E.D. Din Toosi
K.N.T. University of Technology, Tehran

PHYSICS IN IRAN

LIKE RESEARCH AND TRAINING TRENDS IN THE OTHER FIELDS OF BASIC SCIENCE, PHYSICS IN IRAN IS EXPERIENCING A DRAMATIC UPSWING IN FORTUNES.

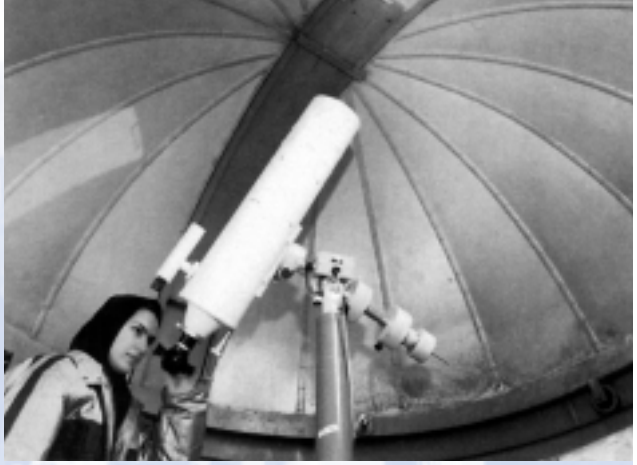
The teaching of modern physics in Iran, especially at the university level, has a brief history, dating back to the creation in 1928 of Dar-Ol-Moallemin-e-Ali, an institution devoted in part to the training of high school physics teachers.

When it comes to research in physics in Iran, the history is even shorter. In fact, the number of articles published in international journals by Iranian scientists before the Islamic Revolution in 1979 was negligible. The Cultural Revolution (1980-1984) and the Iran-Iraq war (1980-1988) further eroded Iran's weak foundation in physics leaving the field in a state of decline.

The end of the Iran-Iraq war, however, rekindled hope, and the creation of the National Research Council of the Islamic Republic of Iran, the Institute of Theoretical Physics and Mathematics (IPM), and the Institute for Advanced Studies in Basic (ISBSc), in the early 1990s, all sparked the beginning of a new, more promising, era for physics and all the basic sciences.

In 1979, Iran had only 11 physics departments; today there are 80, and while no university in Iran offered a doctorate degree in physics before the revolution, now eight departments do. Although the number of faculty teaching physics has nearly tripled since the Revolution (from 230 to 650), this welcomed ascent obscures two other factors of equal significance: First, the number of students enrolled in physics courses and, more specifically, majoring in physics, has climbed even more sharply; second, less than half of the university teachers — 270 of 690 — have doctorates. The rest either hold master's or bachelor's degrees. Add to this fact that the number of physics professors from foreign countries visiting Iran at any one time has never exceeded 10, and you are left with a portrait of a profession that has made important progress over the past three decades but still has a long way to go to reach international standards.

The state of physics libraries in Iran is another area requiring immediate attention and additional resources. Only five physics departments (out of total of 80) have more than 10,000 bound monographs on their libraries shelves, and half have less than 100. A shortage of hard currency and unfavourable international exchange rates have made it difficult even for the most prestigious physics department to subscribe to more than 10 international journals; some 20 physics departments do not even subscribe to a single international journal.



While we continue to keep our eyes on the ultimate goal of becoming full partners in the international physics community and while we recognize the obstacles that stand in our path, we are nevertheless encouraged by several trends.

For example, young Iranian students who have participated in the international physics olympiads have placed no lower than fourth since 1995 (from a pool of more than 70 countries). Such a consistently high ranking indicates that Iran has a wealth of talent in physics comparable to the talent found anywhere in the world. A major challenge facing Iranian society in the years ahead, then, will be to ensure that there are sufficient job opportunities (and state-of-the-art research facilities) capable of satisfying the career ambitions of some of the nation's brightest young citizens. Failure to meet the post-graduate expectations of an increasingly well-educated and well-trained work force will only exacerbate the brain drain problem.

In 1979, Iran had only 11 physics departments; today there are 80.

While young Iranian scientists continue to excel in the classroom, their older colleagues continue to increase the number of publications that they publish in international journals. In fact, there has been an annual 25 percent increase in publications bylined by Iranian scientists during the past 5 years. More than 10 percent of those papers — some 100 in total — have been in physics.

What is interesting to note is that the breakdown of published papers in theoretical and experimental physics has been completely reversed over the past decade: Today twice as many papers are published in theoretical physics than in experimental physics. This turnabout in fortunes reflects in part the growing vitality of theoretical physics departments in Iranian universities (that's the good news) and reflects in part the lack of investment in physics laboratories and equipment that are essential for conducting experimental physics at an international level (that's the bad news).

The Physical Society of Iran, relaunched in 1982, enjoys both an active and growing membership and an expanding agenda of activities. Today, nearly 5000 individuals belong to the society, representing a threefold increase over the past decade. In addition to its awards scheme and publications programme, the society holds conferences in several different fields each year, including optics and condensed matter physics. Moreover, its annual general conference, usually attended by more than 600 people, serves as the touchstone of its yearly calendar of events. Through its recognition of achievement, programmes for exchange and collaboration, and influence among policy makers, the society has proved instrumental in improving the state of training and research in physics throughout the nation.

The most important factor shaping the state of physics and, more generally, the basic sciences throughout Iran is government support for research and development (R&D). In Iran, progress on the funding front has not always been steady. In fact, R&D budget markers show many twists and turns from one year to the next — and not all of them have been positive.

For example, Iran devoted less than 0.2 percent of its gross domestic product (GDP) to R&D in the decade following the Revolution. In the 5-year economic plan for 1989-1994, officials envisioned that R&D expenditures would rise to 0.6 percent of GDP when the plan was fully implemented, but the goal was never reached. A second 5-year plan called for investing 1.5 percent of GDP in R&D, but that goal fell by the wayside as well — and, in 1999, the percentage actually slipped to between 0.28 and 0.33 percent of GDP.

Now a third 5-year plan again proposes that 1.5 percent of GDP be targeted for R&D (two-thirds from government and one-third from the private sector), and for the first time states that 15 percent of all R&D expenditures be invested in basic research. The enthu-

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siastic support and institutional commitment of the Ministry of Science, Research and Technology offers some hope that these funding targets will be met, but whether the figures become reality remains to be seen. One reasonable estimate, based on existing figures and extrapolations, placed R&D expenditures at 0.35 percent of GDP in 1999. Depending on the exchange rate, the budget could be as low as US$250 million or as high as US$1 billion.

A nationwide government-sponsored programme, launched in 1997, offers research support to all areas of science and technology in Iran, although budget uncertainties have hampered the effectiveness of the initiative. A new effort in 1999, the Special National Projects, has made even more research funds available. For the physics community, these funds have made it possible to launch major projects in optics, superconductivity, spectroscopy, polymers and plasma. In addition, the money has allowed the design and construction of a new refractometre, the development of an augur spectroscopy, and a comprehensive feasibility study for the design and operation a national astronomical observatory.

Moreover, Iran is one of 11 nations to lend its commitment and support to the Synchrotron-Light for Experimental Science and Applications in the Middle East (SESAME) project, whose goal is to move the BESSY-1 synchrotron light facility from Germany to Jordan. If this effort comes to pass, many Iranian scientists, including physicists, biologists and chemists, will benefit enormously from having such a facility located within the Arab world. In addition, Iran's anticipated collaboration with CERN (European Organization for Nuclear Research) for assisting in the construction of equipment parts for the Large Hadron Collider (LHC) should prove a boon to physicists, especially experimental physicists whose efforts have been handicapped by poor laboratory equipment and limited international collaboration.

As the foundation of physics in Iran continues to be strengthened, researchers have begun to set their sites on future developments. The "Sharif Report," published in summer 1999, helped lay the groundwork for the nation's involvement with CERN by examining the potential for Iranian scientists to become involved in megaprojects that are interdisciplinary in nature and international in scope. Meanwhile, the National Research Council of Iran has proposed the creation of a national network of laboratories that would include facilities in material science, optics and thin films.

In Iran, progress on the funding front has not always been steady.

While the history of modern physics in Iran dates back to the late 1920s and the field has only begun

to build a strong presence during the past two or three decades, the nation enjoys a long and proud history of commitment to learning in all fields of human endeavour, including science. It is my firm hope that my country can build upon these sacred traditions in ways that enable physicists and scientists in all fields to participate fully in the international dialogue and collaboration that make the pursuit of science and technology a truly global adventure. ■

Reza Mansouri
Professor of Physics
Sharif University of Technology
Tehran, Iran

IRANIAN-CANADIAN CONNECTIONS

THE TWAS-ICSU-UNESCO LECTURESHIP PROGRAMME HAS HELPED BUILD BRIDGES BETWEEN IRANIAN SCIENTISTS WHO HAVE LEFT THEIR HOMELAND AND THOSE WHO HAVE NOT. THE INITIATIVE IS LIKELY TO HAVE A LASTING IMPACT ON PUBLIC HEALTH AND THE ENVIRONMENT IN IRAN AS WELL.

Like many of his Iranian colleagues, biologist Hamid R. Habibi has built a successful career beyond the borders of his home country. Born in Tehran in 1955, Habibi received his primary and secondary school education in the nation of his birth, graduating from high school in Iran's capital city with a diploma in the natural sciences in 1973.

At the age of 18, Habibi's life and career began to unfold in faraway lands: First in the United Kingdom, where he earned his bachelor of sciences degree in 1979 and his doctorate degree in comparative endocrinology in 1983 at the University of Aston in Birmingham, and then in Canada, where he has served as a distinguished member of the faculty at the University of Calgary's Department of Biological Sciences for more than a decade.

Mohammad H. Sanati, President of the Iranian National Research Centre for Genetic Engineering and Biotechnology, in Tehran, has also taken a lengthy and intriguing international journey to reach his current position. Like Habibi, the 42-year-old Sanati was initially educated in his home country. In fact, he not only graduated from high school in Iran but also received his first two university degrees there — his bachelor of science degree in chemistry from Ferdousi University in Mashhad (where he was born), and his master's degree in biochemistry from Tarbiat Modarres University in Tehran.

Sanati, like Habibi, also travelled abroad to receive his doctorate degree, which he earned in molecular biology from the University of Perth in Western Australia in 1996. However, unlike Habibi, Sanati decided to return home soon after receiving his Ph.D. to assume his current position. His decision, in many ways, symbolizes the ways in which the domestic environment for teaching and research has improved for Iranian scientists in recent years.

The truth is that the careers of these two Iranian-born scientists may have never crossed paths if it had not been for two factors: First, the Iranian government's slow but rising interest in promoting interaction between their own scientists and scientists from other parts of the world, and second, the existence of the

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Habibi's visits have taken place within the last 18 months following a 20-year absence from his home country.

TWAS-ICSU-UNESCO Lectureship Programme, which offers travel grants for professors to visit research institutions in the South for the exchange of information and ideas with colleagues who share similar interests.

Habibi's visits have taken place within the last 18 months following a 20-year absence from his home country. "I had not been back to Iran since 1979, the year of the Islamic Revolution," explains Habibi, "when Mohammad Sanati invited me in March 1999 to give a series of lectures at his National Research Centre for Genetic Engineering and Biotechnology. What I discovered there was an excellent nucleus of scientists and technicians eager to do first-class research and use advanced technology."

Habibi also observes that "a new generation of younger scientists, many recent graduates from universities from around the world, are assuming leadership positions in Iran's scientific institutions. While they are well-versed in the scientific issues that are paramount within their fields of study," he notes, "they often need additional experience and maturity to become better managers. They also must develop a compelling vision of the future to emerge as more effective leaders in their fields."

Partly in response to such challenges, Iran's National Research Centre for Genetic Engineering and Biotechnology, which has been in existence for more than a decade, only adopted an active research agenda 3 years ago. "We devised and subsequently instituted a very deliberate plan for our development," explains Sanati. "As a result, I think we have laid a solid foundation upon which to build a true centre of excellence in biotechnology in the developing world."

The centre, in fact, existed largely in name only during the first decade of its existence as resources were invested in the education and training of young scientists who were sent abroad for their master's and doctorate degrees. "They enrolled in reputable universities throughout Europe, Canada, South America and Australia — virtually everywhere except the United States, which placed insurmountable obstacles in the path of Iranian students who requested visas," explains Sanati.

Today, the careful planning of the early years is paying big dividends. Only 3 years after the launch of its research programme, there are 25 Ph.D. students and 70 additional researchers with bachelors and master's degrees, mostly in biochemistry and microbiology, at work on research projects at the centre.

"The centre focuses on a wide range of issues and processes related to biotechnology and genetic engineering," says Sanati. "For example, we are investigating both the science and technology driving the development of transgenic plants for use as pharmaceuticals, particularly in the treatment of human genetic and reproductive disorders. We are also examining recombinant proteins for similar diagnoses and treatments."

And that's where Habibi's work has come into play. For much of his career, Habibi's research has focused on the endocrine control of human and animal reproduction and growth. Specifically, his investigations

have uncovered new information on the gonadotropin-releasing hormone (GnRH) in mammals and fish, which has proven useful in addressing a host of public health and environmental concerns, ranging from treatments of cancer-related diseases and reproductive disorders in humans to the need to increase fish stocks in aquaculture facilities, which are more commonly referred to as fish farms. For his efforts, in May 2001, the International Federation of Comparative Endocrinological Societies will award Habibi the Grace Pickford Medal at the federation's 14th congress in Sorrento, Italy.

"Prostate and breast cancers are among the most prevalent malignancies in Iran, especially for people over 55. Using GnRH hormones to treat these diseases is commonplace in the developed world but remains rare in developing countries." For this reason, Habibi's interactions with Iranian scientists are not only helpful to the scientific community but also could prove beneficial to the general population. "My objective," he explains, "is to help coordinate, with the cooperation of Iranian pharmaceutical companies, the training of Iranian physicians and oncologists in an effort to improve therapeutic treatments of hormone-dependent cancers in Iran."

The technology that Habibi is assisting in transferring to his colleagues in Iran does not require costly mega-sequencing machines often necessary for the development and production of other genetically engineered hormones. If that was the case, these efforts would be beyond the budget of Sanati's research centre. "As with our other projects," Sanati notes, "the sequencing of the GnRH hormone can be done by hand in simple inexpensive incubators that are easily built in Iran and operated by our well-trained technicians. Its application is appropriate to our circumstances," he observes. "That's why it's been so successful."

M.H. Sanati

H.R. Habibi

Those applications extend to critical uses of the hormone in treating not just cancer but human reproductive problems. "There are many human reproductive disorders that can be treated with GnRH, says Habibi, "including precocious and delayed puberty, hypogonadism, anovulation, pre-menstrual syndrome and inadequate luteal function. It's another medical use of GnRH that is commonplace in the developed world but rare in the developing world."

Effective applications of this hormone, moreover, are not confined to human health issues. "With one or two different sequences," explains Habibi, "the GnRH hormone can be used to help improve the production of sturgeon fry through artificial breeding." The issue is critical to Iran because sturgeon, which together with Persian rugs, pistachios and, of course, oil, are among the nation's most noteworthy and valuable exports, have been plagued by dramatic declines in population. Indeed some experts believe that the sturgeon population may soon face extinction in the wild and can only be preserved through aggressive conservation measures and a reliance on aquaculture.

Mohammad Pourkazemi, Director of Iran's International Sturgeon Research Institute in Rasht, along the southern edge of the Caspian Sea, notes that the "development of aquaculture ponds will not only help raise sturgeon population in the short term but could help relieve fishing pressures on sturgeon in the Caspian Sea and thus ensure their long-term survival in natural environments."

That's why Habibi spent a portion of his time during his TWAS-ICSU-UNESCO-sponsored visit to Iran at Sanati's research centre in Tehran explaining both the science and sequencing technology that drives the creation of the GnRH reproductive-enhancing hormone, and a portion of his time at Pourkazemi's institute in Rasht, instructing fish culturalists how to efficiently apply this hormone as part of a larger management

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strategy to increase the sturgeon production and conserve the marine environment. "The lectures addressed the scientific issues related to the artificial breeding of sturgeon as well as the initial costs and potential returns that would be incurred in pursuing this technology," explains Pourkazemi. "Financial considerations are especially important to fish breeders who must pay particular attention to the bottom line if they hope to remain in business."

"The stunning decline in sturgeon population presents the most immediate challenge for those interested and involved in the production of GnRH hormones in Iran," says Habibi. "But the technique has potential applications for enhancing the reproduction both of cultured fish and farmed animals." In fact, over the next few years, the Iranian government hopes to use aquatic biotechnology, including the use of GnRH hormones, to increase the nation's production of cultured fish from 60,000 tons to 350,000 tons. That could prove a real boom to the economy and employment in remote areas that are desperately in need of promising strategies for economic growth.

When interviewed, Habibi sheepishly admitted that he didn't even know about TWAS's existence until Sanati told him about the Academy and the funding opportunities it presented for lecturing abroad. "I searched for TWAS on the internet and was delighted to see the range of activities that the Academy pursued for the advancement of science and technology in the developing world."

With the final report of his lectureship to Iran now complete, Habibi says that he would like to see TWAS expand the programme to allow lecturers to return to the country that they have visited several additional times.

Habibi's suggestions, which had been voiced by other participants in the Lectureship Programme, led to the creation of TWAS-ICSU-UNESCO Visiting Professorship Programme in 1994. The initiative has recently been restructured to fit into the "framework of follow-up activities" related to the UNESCO/ICSU World Conference on Science, held in Budapest, Hungary, in 1999. Under the 5-year programme, internationally recognized experts are offered visiting professorships to scientific institutions in the developing world. To foster long-term collaboration, researchers are urged to visit the host institution at least three times during the course of their professorship and stay at least one month during each visit.

"Additional visits," as Habibi notes, "provide lecturers with the opportunity to see how their efforts are evolving over time." Such an expansion of activities, he adds, "also allow lecturers who have established strong ties with colleagues in the host nation to pursue other research topics."

"For example, environmental contamination and the associated human health risks due to endocrine disrupting chemicals has emerged as a research priority in developed countries, especially the United States. Some researchers, in fact, have concluded that these chemicals may be responsible for promoting cancer and autoimmune disorders across the globe. Yet, the heated discussions that have taken place in the North have yet to find their way south.

"It would be useful to begin these discussions in earnest in developing countries like Iran, which have the scientific talent and capacity to be directly involved in the issue. Much like our collective efforts in the examination and production of the GnRH hormone, this initiative would benefit both Iran's scientific community and larger society as well." ■

For additional information about the TWAS-ICSU-UNESCO Lectureship/Professorship Programme, please contact ***Helen Grant****, TWAS, c/o ICTP, strada Costiera 11, 34014 Trieste, Italy; phone: + 39 040 2240387; fax: + 39 040 224559; e-mail: info@twas-online.org; or see the TWAS website at www.twas-online.org.*

FUTURE PAST

A RENOWNED SCHOLAR OF THE HISTORY OF SCIENCE DISCUSSES HOW THE ISLAMIC WORLD WAS THE FIRST TO PRACTICE "SCIENCE ON A GLOBAL SCALE."

In today's world, it has become vitally important to promote a culture of dialogue among nations based on science. Such an initiative would constitute a sure path to authentic dialogue: that is, an exchange between equal partners that both informs and transforms.

True dialogue demands recognition of oneself and of others. With regard to a science-based culture, each civilization would have to reflect upon itself, and ask itself about its relations with science both past and present. In other words, the question of a culture of dialogue based on science is not susceptible to a general response but must isolate the features relevant for each civilization.

In the science of Islamic civilization, beginning at the end of the 8th century, the global potential of Greek science was brought to fruition: that is, the tendency, in embryonic form among the scholars of Hellenistic antiquity, to transcend regional borders and break through the limits of a culture and its traditions to assume the dimensions of a world. In the science of Islamic civilization, we see for the first time an urge to transcend what is being realized locally.

Within this new framework, the transmission of results mattered less than the possibility to combine scientifically diverse traditions that were now united within the broad parameters of Islamic civilization. Yet the novelty of this phenomenon was not the result of chance encounters, or of the passage, whether regular or unexpected, of caravans and navigators. On the contrary, it was the result of a massive enterprise of translation of scientific and philosophical texts, undertaken by professionals who were organized into schools and sometimes were rivals — a movement supported by ruling powers and brought into existence by research.

In this way, there was born a library suitable to the world at the time. Traditions of different languages and origins emerged as elements of a single civilization whose scientific language was Arabic. In the 9th century, one could read Ptolemy as well as Brahmagupta, and the new astronomical research of Habash al-Hasib, all in Arabic.

Indeed, during this period of Islamic civilization, one could read in one and the same language both the scientific productions of the ancients and the advanced research of the moderns. The latter was carried out essentially in Arabic, at Samarkand, Tus, and Granada, by way of Baghdad, Cairo, and Palermo.

In Islamic civilization, science became "science on a global scale." Its language was Arabic, which was no

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longer the language of a nation, but that of several nations, and no longer the language of a few disciplines, but that of all branches of knowledge. New paths were opened to facilitate communication between scientific centers scattered from north India and central Asia to Andalusia.

This "global science" was a component of the Islamic state from its origins. If we take away this dimension from Islamic civilization, full comprehension of the civilization eludes us. Science was at the heart of the state: in mosques (to determine the hours of the day), hospitals, observatories, and schools. What is more, it is vain to try to understand much of the writings in the human and social sciences (linguistics, lexicography, jurisprudence and philosophy), if one is not familiar with the mathematical sciences of the time.

If we take away the scientific dimension, full comprehension of the Islamic civilization eludes us.

Let us return to our initial question concerning the promotion of a scientific culture that may serve as a basis for dialogue. Whether in the case of an Islamic country, or any other country, such a project cannot be realized on the basis of the learning and diffusion of scientific results alone. For science to become culture, the scientific spirit — that is, scientific rationality and its norms — must be embraced. Among the most favorable means for this "return" to the scientific spirit and its appropriation is the history of science, when properly understood.

If the history of science is conceived not as a historical novel in which the heroes are scholars whose deeds are scientific conquests, but as the building of scientific institutions and ways of thinking, the history of science can accomplish several goals.

In the first place, it will allow contemporary Islamic societies to find the scientific dimension of their own civilization buried beneath several centuries of neglect. To acquire such a new awareness is to have travelled half the road towards the promotion of scientific culture. It will strike a blow to such pernicious theses as the Occidental nature of science and notions that suggest the existence of an Islamic science and non-Islamic science. Moreover, an awareness of history will help to diffuse scientific culture to wider sectors of the public through infusions of the true story of science into popular publications, museums, television programmes and films. Better yet, an awareness of history will assist the reconstitution of a transcendent scientific language.

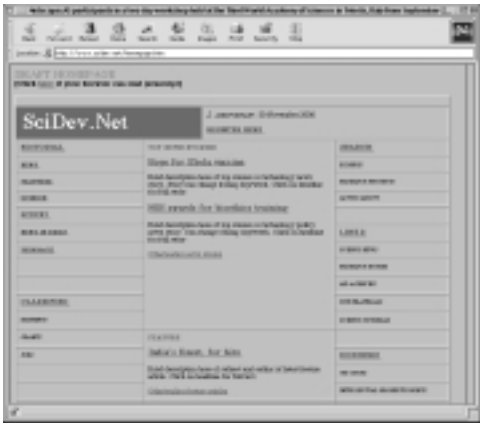
In short, an appeal to history will place the scientific achievements of Islamic civilization within the fabric of the culture as a whole, equal in importance to its other prominent threads. Within such a framework, it will become apparent that Islamic civilization today is what it has never ceased to be: a manifestation of humankind's rational conquest of nature. ■

Roshdi Rashed *(TWAS Fellow 1991)*
Director of Research, National Centre for Scientific Research, and Director, Centre of History of Science and Philosophy for Arabic and Medieval Studies, Paris, France.

A GATEWAY TO INFORMATION ON SCIENCE AND DEVELOPMENT

STAFF ON NATURE MAGAZINE AND TWAS HAVE JOINED FORCES WITH SEVERAL OTHER INSTITUTIONS TO PLAN AN ELECTRONIC GATEWAY FOR PROVIDING ACCESS TO INFORMATION ABOUT THE INTRICATE RELATIONSHIP BETWEEN SCIENCE AND DEVELOPMENT.

On 29 September - 1 October 2000, the Third World Academy of Sciences (TWAS) hosted a two-day 'scoping' meeting organized by *Nature* magazine. The purpose of the meeting was to discuss the prospects for launching an electronic portal that would meld news about science and development with broad-ranging information on institutions that are intimately involved in science-based development efforts. Those present included individuals from the United Nations Educational, Scientific and Cultural Organization (UNESCO), World Bank, Rockefeller Foundation, Caribbean Academy of Sciences, Centre for Science and Environment in Delhi, South Africa's National Research Foundation, and Scientists and Health Researchers for Development (SHARED).



A statement prepared and endorsed unanimously by participants at the conclusion of the meeting expressed "enthusiastic support" for "an internet-based information network devoted to reporting on and exploring linkages between science and development." The statement outlined a set of principles for the operation of the website, a possible editorial structure, and a development strategy.

Those present at the Trieste meeting also agreed that the next step in this strategy should be a six-month planning phase to allow the key aspects of such a network to be investigated and developed further.

Several key issues are now being addressed with a view to devising a detailed plan of how such a network could be created, maintained and financed. High priority is being given to:

- Additional validation of the initiative's principles and objectives through consultation with the intended audiences of such a network, as well as potential partners and sponsors.
- Clarification of the governing structures, including the possibility of establishing an international advisory board and an overseeing charitable foundation, as well as the optimal relationships between potential sponsors.
- Examination of the best operational arrangements, including staffing levels, administrative responsibilities and access to technical resources.

Following the Trieste meeting, the UK Department for International Development (DFID) agreed to finance a six-month contract with *Nature* to carry out the preparatory work necessary to develop and launch

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a website. Under this contract, David Dickson, *Nature*'s news editor, has been given the task of pursuing the goals and objectives agreed to in Trieste.

This work is being carried out under the guidance of a steering group co-ordinated by *Nature* and TWAS. The planning stage is being designed to develop:

- A working prototype of the proposed website.
- An identification of potential additional partners and collaborators.
- A proposed business model, including suggested staffing levels.
- A draft business plan addressing issues of long-term sustainability.

The results of this planning process will be presented at a subsequent meeting of potential partners, collaborators and sponsors. The meeting is planned to include representation from a range of potentially interested groups, particularly from the South.

What follows is a general statement concerning the purpose and goals of the scidev.net initiative written by David Dickson. ■

We live in a world where economic and social development are increasingly dependent on access to knowledge in general — and scientific knowledge in particular. Yet in today's global knowledge economy, a significant gap exists between the levels of access to scientific knowledge enjoyed by rich and poor countries — and the gap is growing. The result is that those who stand to benefit most from modern science are also those who have least access to information about it.

To address this problem, plans are being developed, under the guidance of *Nature* and with the collaboration of TWAS, for a free-access internet-based information network devoted to exploring the linkages between science and development.

The goal of this network will be to provide a key point of access to information about science for all those concerned about such linkages and their social and economic implications. By creating an intelligent gateway to the world's scientific events, literature and debates, the aim is to empower both individuals and communities in ways that will increase the impact of science and technology on sustainable development and the reduction of poverty.

The core of the network will be a regularly updated website, operating essentially as an electronic news magazine. The site will include news reports and feature articles prepared by science journalists, a dedicated search engine providing access to information and contacts on particular scientific and science-related topics, links to relevant sites, listing of meetings, research grants, job opportunities, and other elements considered relevant to the network's overall goals.

The audience will not be limited to research scientists in developing countries, but will reach out to all those interested in the role of science in development. Such groups include government decisionmakers, non-governmental organizations (NGOs), research administrators, science journalists, science teachers and officials in professional scientific organizations and multilateral and bilateral aid agencies — indeed all those in

a position to make use of the information that it will provide.

A key role of the website, as reflected in this intended readership, will be to work with communities engaged in various aspects of sustainable development, scientific capacity building and poverty alleviation, to help meet their needs for scientific information and improve the effectiveness of their efforts.

To achieve this goal, close links will be established with science journalists and their organizations, as well as nongovernmental organizations keen to promote knowledge-based strategies for development. Underlying such a network will be commitments to:

- Editorial independence and integrity.
- Free and open access for end-users.
- Efficient use of available data and information.
- Perspectives and information of particular relevance to the South.
- Access to information about scientific activity in the South to a global readership.
- Scientific information available from more than one source.

To put the above principles into practice, the website will include at its core:

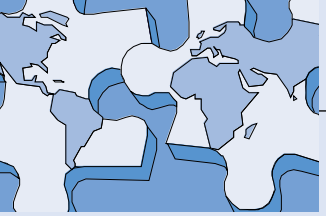
- Up-to-date coverage of development-related scientific discoveries and science-related policy developments, including significant announcements, events, reports and debates.
- Staff-written and contributed features and opinion articles discussing such discoveries, announcements, events and debates.
- Sophisticated search capability designed to allow end-users to locate individuals, institutions, research publications, reports and other resources relevant to science-based development needs.
- Updated links to organisations, projects and communities providing potentially useful and relevant information.
- National and regional 'gateways' tailored to the needs of local scientific communities.
- 'Dossiers' on key issues, such as global warming, AIDS, and the role of women in science. Each dossier will include news and feature items, background scientific analysis, authoritative opinion articles, links to key official and unofficial reports, and user-feedback through discussion forums.
- Notices of relevant meetings, conferences, job opportunities, and research grants.

Financial sponsorship for scidev.net will be sought from a variety of sources and editorial support from various partners and collaborators. Individual sponsors will be asked either to support particular aspects of the website — for example, the preparation of dossiers — or to contribute to the core funding of the network to cover such items as editorial and technical staffing costs.

The goal of this electronic portal, in short, is to provide a freely accessible, one-stop information centre for individuals and institutions involved in issues related to science-based development, particularly individuals and institutions in the developing world. We welcome your input and participation in this potentially important initiative. ■

David Dickson *is the news editor of Nature. For additional information about SciDev.Net, please contact ddickson@nature.com.*

To examine an outline of the proposed website, see http://www.scidev.net.



ANCIENT PLANTS FOR MODERN NEEDS

TWNSO WORKSHOP EXAMINES POTENTIAL USES OF INDIGENOUS MEDICINAL AND FOOD PLANTS TO MEET CONTEMPORARY HEALTH AND NUTRITIONAL NEEDS. PARTICIPANTS AGREE TO FORM NETWORK TO KEEP LINES OF COMMUNICATION OPEN AND TO LEARN FROM EACH OTHER'S EXPERIENCES.

"It's so old, it's new." The adage has never been more appropriate than for discussions concerning the rapidly rising interest that the modern world has shown for potential applications of indigenous medicinal and food plants. Such plants, which have played central roles in the health and nutrition of traditional societies for thousands of years, have been "embraced" by the public and "rediscovered" by today's medical research institutions and pharmaceutical firms as possible agents for improved public health and personal well-being in the 21st century.

The converging — some would say colliding — interests of traditional and modern medicine were prime topics of discussion at the International Workshop for the Sustainable Use of Medicinal and Food Plants held in Karachi, Pakistan, between 15-17 September 2000. The workshop, part of a wide-ranging initiative led by the Third World Network of Scientific Organizations (TWNSO) to network centres of excellence in the South in many different fields of science and technology, was funded by the United Nations Development Programme (UNDP) Special Unit for Technical Cooperation among Developing Countries (SU/TCDC). The Third World Academy of Sciences (TWAS), the University of Karachi's H.E.J. Research Institute of Chemistry, the Commission on Science and Technology for Sustainable Development in the South (COMSATS), and the Organization of Islamic Conference (OIC) Standing Committee on Scientific and Technological Cooperation (COMSTECH) joined TWNSO in cosponsoring the event.

With some 50 participants from 20 countries, discussions evolved around 11 presentations exploring successful experiences in the sustainable use of medicinal and food plants in the developing world. Topics ranged from research efforts to expand the marketability of southeast Asia's indigenous mungbean to cultural and scientific investigations into the use of medicinal plants in southern Africa. Other presentations examined the use of traditional plants in Bangladesh to combat diabetes, the cultivation of wild edible leafy plants in Nigeria, the successful re-emergence of maize among remote Indian tribes in Brazil, and the integration of traditional knowledge with computer-driven technology for the extraction of potentially effective drug compounds from Borneo's richly diverse flora.

Despite their differences in opinion on the various strategies required to ensure the sustainable use of medicinal and food plants, workshop participants agreed on these points:

• Interest in the use and application of medicinal and indigenous plants is increasing at an ever-accelerating rate. Agricultural economists estimate that market demand for these plants, which experts project total 2000 species worldwide, is currently growing at roughly 15 percent per year.

• The majority of these plants grow in fragile ecosystems often located in developing countries. Similarly, much of the knowledge about their use and effectiveness is found among traditional community healers and herbalists who possess information and skills that have been passed "word-of-mouth" from one generation to another. Yet the scientific knowledge necessary to confirm (or disprove) the health and nutritional value of these medicinal and food plants — as well as the technology needed to meet the potential demand — is in the hands of university-trained scientists and technologists in the developed world.

• Environmental assaults and developmental pressures have placed the ecosystems in which these plants have flourished under increasing stress. If measures are not soon taken to protect both the plants and their surroundings, the total number of medicinal and indigenous food plants is likely to diminish rapidly over the next few decades. Once lost, these resources can never be recovered.

• Rising global demand for medicinal and indigenous food plants could generate much needed income for the people living in the traditional communities where these plants are found. But as demand rises, so does pressure for intensive unsustainable harvesting. That, in turn, could undermine long-term efforts to make effective use of nature's treasure trove of plants.

• Increasing interest in medicinal and indigenous food plants is matched by increasing suspicions over the motivations of the various groups or "stakeholders" involved in this diverse enterprise. Traditional healers and herbalists distrust university-trained doctors and pharmacists. Both groups are wary of industrialists. Meanwhile, governmental officials seeking to balance these competing interests are rarely held in high regard by any of the parties.

In such an atmosphere, dialogue becomes essential. And that's exactly what the participants of the workshops hope to foster through the creation of an institutional network for the sustainable use of medicinal and indigenous food plants. The network, organized under the administrative umbrella of TWNSO, will be housed at the University of Karachi's H.E.J. Institute of Chemistry, which has agreed to provide the office space and staffing necessary to get the initiative off the ground and then sustain it over time.

Like the workshop, the network will welcome into its fold the full range of stakeholders involved in this issue: traditional medical healers and herbalists, modern medical researchers and practitioners, representatives from pharmaceutical companies, grassroots orga-

[CONTINUED PAGE 32]

nizers and governmental officials. And like the workshop, the network will encourage the stakeholders to talk about issues of common concern in an open forum — hoping that effective solutions lie in frank discussions.

Tentative plans call for the creation of a website that will provide the latest information on developments in the field, offer a comprehensive list of individuals and institutions engaged in the issue (including information on how they can be reached), and provide on-line entry to chat rooms where ideas can be aired and opinions expressed and exchanged.

In addition, the network may eventually offer a host of services to its members, including electronic access to the texts of national laws and regulations dealing with the protection and use of indigenous and medicinal plants, as well as up-to-date "drug pharmacopoeias" that would help certify the medicinal value and safety of "investigated" chemical compounds.

Devising effective strategies for the sustainable use of indigenous medicinal and food plants is a high priority among many developing countries. In fact, the area is one where developing countries believe that they can operate on level playing field with developed countries when it comes to modern-day science and technology. After all, most traditional plant species are located in developed countries, as is the indigenous knowledge required for their successful use. The technology, moreover, is basic and relatively inexpensive. Finally, growing global demand for these plants and the chemical compounds that may be derived from them translate into expanding market opportunities for people and communities where market opportunities are often hard to come by.

The soon-to-be-created forum, launched under a TWNSO network initiative and with the support of the University of Karachi's H.E.J. Institute of Chemistry, is designed to help the developing world take advantage of its bounty of indigenous medicinal and food plants — and, in the process, show that valuable knowledge is a timeless commodity where progress may depend as much on the past as it does on the future. ■

For additional information about the TWNSO network initiative, contact

***Helen Martin**, TWNSO Secretariat, c/o ICTP, Strada Costiera 11, 34014 Trieste, Italy; phone: + 39 040 2240 386; fax: + 39 040 224559; e-mail: info@twnso.org.*

For additional information about the indigenous medicinal and food network, contact

***Muhammad Iqbal Choudhary**, H.E.J. Research Institute of Chemistry, University of Karachi, Karachi 75270, Pakistan; phone: +92 21 499 0007; fax: +92 21 496 3373; e-mail: zainraa@digicom.net.pk.*

FROM WORKSHOP TO NETWORK

The following individuals and institutions participated in the Workshop on Sustainable Use of Medicinal and Food Plants, held in Karachi, Pakistan, 15-17 September 2000. They will serve as the founding group of the proposed network designed for the exchange of information and viewpoints surrounding issues related to the sustainable use of medicinal and indigenous plants. Redrafted texts of the presentations that they gave in Karachi will be published as a monograph in 2001:

- ***Odunayo C. Adebooye***
Obafemi Awolowo University, Nigeria

- ***Fasihuddin B. Ahmad***
University of Malaysia, Malaysia

- ***Mubarik Ali***
Asian Vegetable Research and Development Center (AVRDC), Taiwan, China

- ***Yasmin Baksh-Comeau***
University of the West Indies, Republic of Trinidad and Tobago

- ***M. Iqbal Choudhary***
University of Karachi H.E.J. Institute of Chemistry, Pakistan

- ***Cobus Coetzee***
ARC-Elsenburg, Republic of South Africa

- ***Renee H. Fortunato***
Institute of Biological Resources, CRN-INTA, Argentina

- ***Antonio Carlos Guedes***
National Center of Biological and Genetic Resources (CENARGEN), Brazil

- ***Hui Lv***
Institute of Medical Plant Development, Chinese Academy of Sciences, China

- ***Madhav Karki***
Medicinal and Aromatic Plants Program in Asia, India

- ***A.K. Azad Khan/Liaquat Ali***
Research Division, BIRDEM, Bangladesh

- ***Lydia Makhubu***
University of Swaziland, Swaziland

- ***Suzanne Urverg-Ratsimamanga***
Malagasy Institute of Applied Research, Madagascar

- ***Daniel Schaffer***
Third World Academy of Sciences, Third World Network of Scientific Organizations, Italy

- ***Abbas Shafiee***
Tehran University of Medical Sciences, Iran

KHUSH RECEIVES WOLF PRIZE

• **Gurdev S. Khush** (TWAS Fellow 1989), a principal plant breeder and head of Plant Breeding, Genetics and Biochemistry Division at the International Rice Research Institute (IRRI), Makati City, Philippines, has won the 2000 Wolf Prize for Agriculture. He was honoured for his "extraordinary contribution to theoretical research in plant genetics, evolution, and breeding, especially of rice, with

Gurdev S. Khush

regard to food production and alleviation of hunger." Specifically, the Wolf jury highlighted Khush's achievements in devising new techniques for breeding better rice varieties. It also cited his leadership in the development of genetic maps, which initially pinpointed molecular and traditional markers in rice, but are now widely used in studying the origin and evolution of such grain crops as wheat, maize and barley. The Wolf prize, which is granted by the Israeli-based Wolf Foundation, carries a US$100,000 cash award. Since 1978, the prize has honoured outstanding scientists and artists for their achievements in advancing the interests of humankind and fostering friendly relations among people. Khush has been the recipient of many awards. His most recent honours include India's Padma Shri Award, the Indian Science Congress Association's B.P. Pal Memorial Award, and a honorary doctorate degree from Assam University, India. Each of these awards was given to Khush for his contributions in combating issues related to food insecurity among the world's poorest nations.

TWAS MEMBERS ELECTED TO US NATIONAL ACADEMY

• Two TWAS Fellows and one TWAS Associate Fellow are among the newest members of the U.S. National Academy of Sciences. **Roddam Narasimha** (TWAS Fellow 1988), ISRO K.R. Ramanthan distinguished professor and chairperson of the Fluid Dynamics Division Unit at the Jawarharlal Nehru Centre for Advanced Scientific Research and director of the Indian Institute of Science's National Institute of Advanced Studies, Bangalore, India; and **Armando J. Parodi** (TWAS Fellow 1997), professor of biochemistry at the Institute of Biological Research at the University of Buenos Aires and investigator at the National Research Council, Argentina, were among the 15 scientists elected foreign associates. **Thomas Kailath** (TWAS Associate Fellow 1991), who was born in India, was one of 60 new members elected to the NAS. Kailath is a Hitachi America professor of engineering at Stanford University, Stanford, California, USA.

CONFERENCE FOR CHERN

• The Mathematical Sciences Research Institute, the University of California, Berkeley, hosted a conference, "The Panorama of Mathematics," from 14-16 September to honour its founding director and TWAS Associate Founding Fellow **Shing Shen Chern**. Colleagues and friends examined some of Chern's broad accomplishments in the field of mathematics in the United States, China and elsewhere. Participants also stressed the relationship between mathematics, science, education, industry and society. Among those in attendance were Robert Bryant, Duke University; S.Y. Cheng, Hong Kong University of Science and Technology; Brian Greene, Columbia University; John Gage, Sun Microsystems; Phillip A, Griffiths, Institute of Advanced Studies; and S.T. Yau, Harvard University. Born in China and educated in his home country and Germany, Chern is professor emeritus of mathematics and director emeritus of the Mathematical Research Institute at the University of California, Berkeley, and director of the Nankai Institute of Mathematics, Tianjin, China. He has received many awards, including

Shing Shen Chern

the Wolf Foundation Prize, and a host of honorary degrees, including one from Nankai University in China and another from the University of Notre Dame in the United States. Chern is a member of the Chinese Academy of Sciences, U.S. National Academy of

Sciences, a foreign member of The Royal Society, and a corresponding member of the Brazilian Academy of Sciences.

INTERNATIONAL SCIENCE AWARD FOR WOMEN

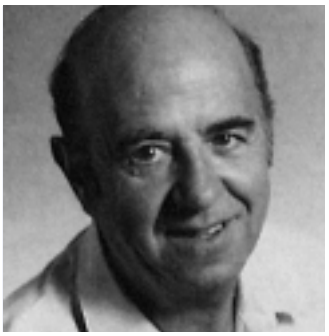
• **Daniella Buna**, professor of physics at Ramapo University, New Jersey, USA, received the second Fatima El-Fehria International Award for Women in Science. The award, established by the Women in Science International League, was presented at a ceremony held at the United Nations headquarters in New York City 26 September 2000. TWAS Fellow (1985) and Council Member Farouk El-Baz represented TWAS at the meeting and spoke on the Academy's behalf. Buna, who was educated at the University of Bucharest in Romania and George Washington University in the United States, was honoured for her contributions to the study and applications of magnetic resonance imaging (MRI). The award is named for Fatima El-Fehria, an Arab women who used her inheritance to establish Karaouiyne University in Fez, Morocco, some 1200 years ago.

NEW FELLOWSHIP SCHEME

• The South African Medical Research Council (MRC) and the South African AIDS Vaccine Initiative (SAAVI) invite applications for one-year travelling research fellowships in health research. The purpose of the fellowship is to build research capacity and strengthen research collaboration within Africa and among African scientists. Fellowships may be awarded in South Africa for non-South African applicants, or in any other African country for South African applicants. The award, to begin in April 2001, will cover the fellow's travel to and from the host country, his or her salary (calculated on South African scales, in US$) in the host country, and reasonable research costs in the host country. Five such fellowships may be awarded. MRC'S major programme areas include molecules to disease, health systems and policy, women and child health, infection and immunity, non-communicable diseases, environment and development. For additional information, please contact: Medical Research Council, P.O. Box 19070, 7505 Tygerberg, South Africa; attention: Carole Robert; e-mail: carole.roberts @mrc.ac.za; phone: +27-21-938 0359; fax: +27-21-938 0368.

MILEDI RECEIVES HONORARY DEGREE

• Ricardo Miledi (TWAS Associate Founding Fellow) received an honorary degree from the University of Trieste in Italy, this October. The rare honour was bestowed on Miledi for his contributions to the field of neuroscience and to the study of the human nervous system and brain. Born in a small village in Mexico, Miledi both received his undergraduate degree (1945) and medical degree (1955) from Universidad Nacional Autonoma de Mexico in Mexico City. He began his long and distinguished career in the mid 1950s at the Instituto Nacional de Cardiologia in Mexico City. As a Rockefeller Foundation fellow in 1956, he studied under the great neurophysicist and Nobel Prize winner Sir John Eccles at the John Curtin School of Medical Research in Australia. For nearly three decades, beginning in the late 1950s, Miledi conducted research in the



Ricardo Miledi

Department of Biophysics at University College in London, working closely with Bernard Katz. During his long tenure there, he rose from reader to department head. For the past 20 years, he has been a distinguished professor and director of the Laboratory of Cellular and Molecular Neurobiology at the University of California at Irvine. Miledi, whose studies of synapses has earned him an international reputation and many honours, is a member of The Royal Society, US National Academy of Sciences, Hungarian Academy of Sciences, Mexican Academy of Sciences and Academy of Medicine, European Academy of Arts, Sciences, and Humanities, and American Association for the Advancement of Science.

Correction: Although we still hold fast to our conclusion that the Academy of France is "an exclusive organization," it may not be as exclusive as we suggested in the July-August 2000 TWAS Newsletter. The total number of scientists in the Academy stands at 400, not 65, as we had reported. C.N.R. Rao remains a proud and well-deserving member, but we apologize for the error.

WHAT'S TWAS?

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

At present, TWAS has 543 members from 75 countries, 61 of which are developing countries. A Council of 13 members is responsible for supervising all Academy affairs. It is assisted in the administration and coordination of programmes by a small secretariat of 9 persons, headed by the Executive Director. The secretariat is located on the premises of the Abdus Salam International Centre for Theoretical Physics (ICTP) in Trieste, Italy. 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 scholarship.

TWAS was instrumental in the establishment in 1988 of the Third World Network of Scientific Organizations (TWNSO), a non-governmental alliance of 155 scientific organizations from Third World countries, whose goal is to assist in building political and scientific leadership for science-based economic development in the South and to promote sustainable development through broad-based partnerships in science and technology.

TWAS also played a key role in the establishment of the Third World Organization for Women in Science (TWOWS), which was officially launched in Cairo in 1993. TWOWS has a membership of more than 2000 women scientists from 87 Third World countries. Its main objectives are to promote the research efforts and training opportunities of women scientists in the Third World and to strengthen their role in the decision-making and development processes. The secretariat of TWOWS is currently hosted and assisted by TWAS.

WANT TO KNOW MORE?

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

FELLOWSHIPS

Want to spend some time at a research institution in another developing country? Investigate the South-South Fellowships: .../SS-fellowships_form.html

GRANTS

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

EQUIPMENT

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

TRAVEL

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

CONFERENCES

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