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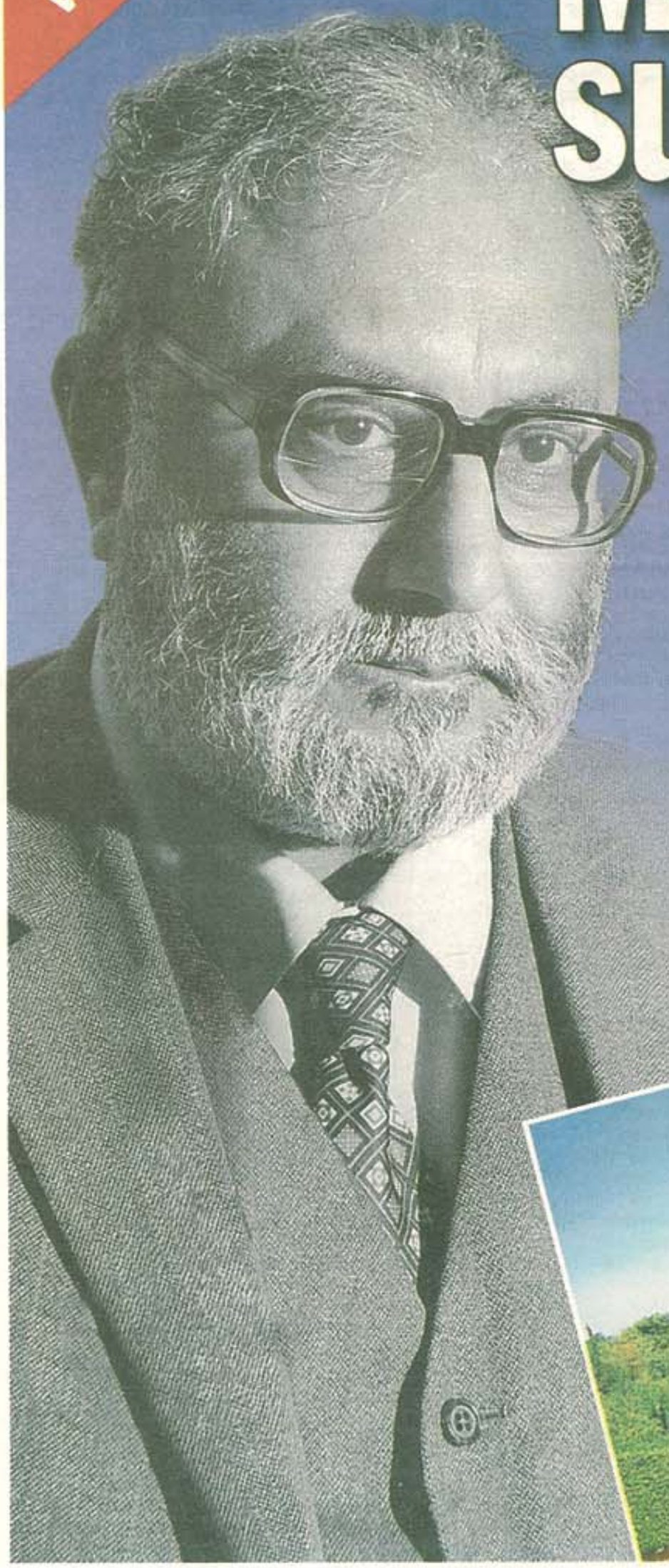
JOINT VENTURE

Mission successful



Nobel laureate Abdus Salam's dream comes true. Pathik Guha reports from Trieste, Italy

It's a cloudy October morning at the Milan airport. The bus to ferry passengers to the aircraft for Alitalia's flight 1339 to Trieste is slowly getting filled up. "It seems everybody is going to the ICTP," says Panamalai Ramrao Parthasarathy, mathematics professor at the IIT-Madras, looking at the lot that's boarding the bus. "Maybe you're right," comments the gentleman sitting next to him. "I'm also going there. Let me introduce myself. I'm Ghulam Murtaza from the Government College, Lahore."

Prof. Murtaza is an authority on the life and works of Abdus Salam, the Pakistani scientist who shared the 1979 Nobel prize in physics along with Sheldon Glashow and Steven Weinberg. As the bus trundles towards the aircraft, the two professors from India and Pakistan engage themselves in a

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The ICTP campus

R&D

No ghosts

Andrei Frolov of the Stanford University has ruled out the possibility of some ghostly particles pervading all space. Such particles were postulated last year to account for the more-than-expected rates of the expansion of the Universe. But Frolov says if such particles did exist, they would have been gobbled up by the black holes at the centres of galaxies, including our own Milky Way. Since that's not happening, those particles don't exist.

Gender-bender

Scientists have found fish with both male and female sex tissues at the Colorado wastewater treatment plant in the US. University of Colorado biologists believe that chemicals — used in birth-control hormones, female hormones and detergents excreted or flushed down the toilets and drains by humans — can disrupt female hormones in fishes, causing this gender-riddle.

New ape

A group of giant apes, reportedly ferocious and even capable of killing lions, having characteristics of both gorillas and chimpanzees, have been seen in Congo, reports *New Scientist*. Like gorillas, they stand up to two metres tall and nest on the ground, but their diet is closer to that of chimpanzees. Behaving like gorillas, they could be hybrids of gorillas and chimpanzees.

Rare stink

A plant whose bloom produces a smell variously compared to rotting flesh or smelly socks, has flowered in the Sydney Botanic Gardens. After more than a decade of coaxing, *Amorphophallus titanum* burst into bloom last week. The flower, which originates from western Sumatra, has been known to grow up to 2.9m tall.

A second home

Continued from Page 1

discussion on Salam's early life. "Do you know that Salam's first published paper was on a problem set by your Srinivasa Ramanujan?" Prof. Murtaza asks. "Prof. Sarvadaman Chowla, Salam's teacher at the Lahore College, once described the problem, daring his students to solve it. A few days later Salam came back with a solution, and later he wrote a paper on that."

Prof. Murtaza then concentrates on the life of the teacher who honed Salam's mathematical skills. "After Independence, Chowla went to the Institute for Advanced Study in Princeton, US," he tells Prof. Parthasarathy. "And it was there that Chowla did that now-famous research with physicist Freeman Dyson," comments the latter. "They detected an uncanny link between the properties of prime numbers and atoms."

The discussion continues even on board the flight to Trieste. Hardly surprising, for the stories of Ramanujan, Salam or Chowla are essentially the same: about genius from the East making a mark in the West. Like many other passengers in the aircraft, Prof. Parthasarathy and Prof. Murtaza are going to Trieste to attend the 40th anniversary celebrations of the International Centre for Theoretical Physics (ICTP). It was established at the initiative of Salam (which is why, after his demise in 1996, it's been renamed as Abdus Salam ICTP) so that "young physicists from the Third World countries can find a second home where they are treated with dignity and respect" *(see story on Page 3)*. "The centre's inception marks it as a new type of venture — an assay in collaboration for pure science organised under the aegis of the United Nations," wrote Salam in *Physics Today* in 1965. "The idea is the embodiment of the international ideal; it must succeed." That prophecy has come true and the ICTP authorities have organised a two-day celebration, beginning October 4, inviting more than 150 scientists (as many as eight Nobel laureates among them) and statesmen from across the globe.

The programme, appropriately titled 'Legacy for the Future', begins at the spacious lecture hall of the ICTP in the presence of ministers from the Italian government, dignitaries from the UNESCO, International Atomic Energy Agency (IAEA), mayor of Trieste and the Chairman of the Group of 77. At the outset, the ICTP director, Prof. Katepalli R. Sreenivasan, reads out messages from Pakistan's President, Gen. Pervez Musharraf (a message from India's Prime Minister, Dr Manmohan Singh, reaches late and is also read out by him during another session), and the director-general of UNESCO. He then briefly describes ICTP's role in promoting R&D in the developing countries. To mark the 40th year of ICTP, he announces the institution of a couple of new prizes, including one in mathematics, to be called the 'Ramanujan Prize'. The funds for it, he says, have come from the Abel Foundation in Norway where Niels Henrik Abel, a genius mathematician, was born in the 18th century. Abel's life bears close resemblance to that of Ramanujan in that he too was ignored in his own country and died young in utter poverty.

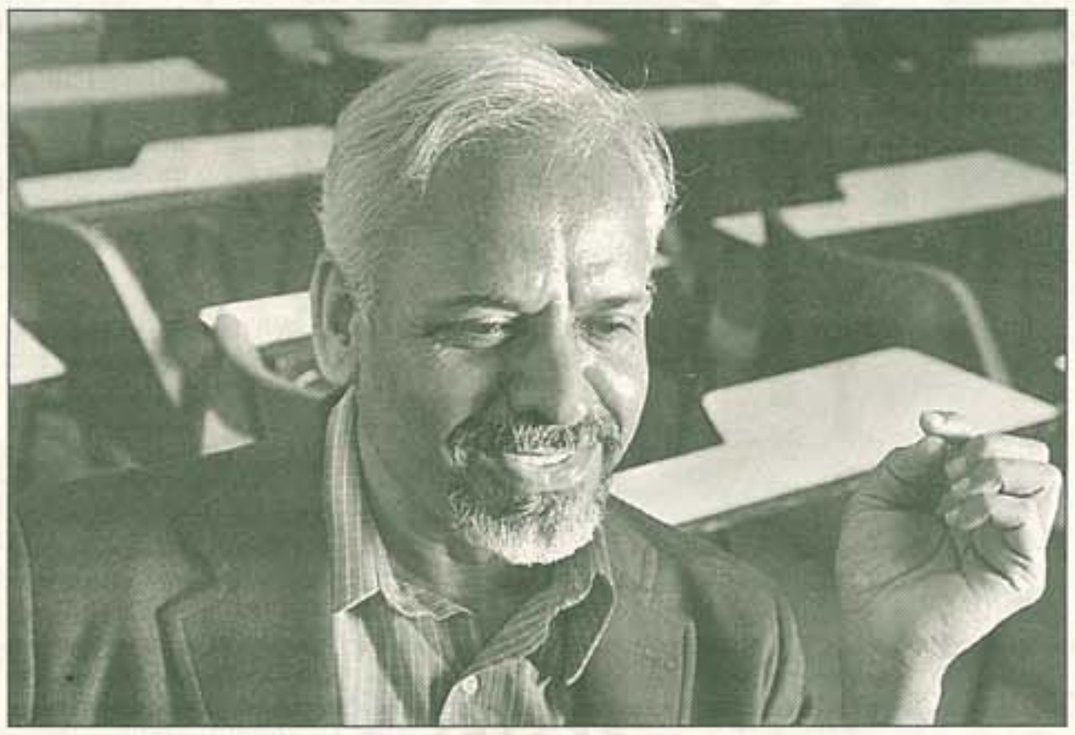
The plight of the developing countries figure prominently in the discussions at the 'Legacy for the Future'. Speaking on 'Rural Poverty in Poor Countries and the Local Environment', Cambridge University economist Sir Partha Dasgupta shows why common indicators of the wealth of a nation, like the GDP or per-capita income, don't necessarily reflect the well-being of its citizens.

In the panel discussion on 'International Cooperation and the Promotion of Science', Prof. Chintamani N.R. Rao, from the Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, laments that many developing countries don't even spend 0.1 per cent of their GDP for R&D. "How will science flourish there?" he asks, pointing out that although India, China and Brazil harbour more than one-third of the world's population, their scientists publish only 7-8 per cent of the papers in journals. "Only 3-4 per cent of those papers are cited by others," Prof. Rao comments. "Let's set a target for ourselves: 15 per cent citations within the next 10 years."

Discovery of a final theory will lead to boredom

Speaking on 'Science in the Developing World', Prof. Ahmed Zewail, Nobel Prize-winning professor at the California Institute of Technology, says, "We must get our house in order before blaming others for ignoring us. Political will is lacking in the Third World for progress in science." He describes an incident in which a researcher in Egypt could get customs clearance for an imported instrument only after its warranty expired.

'Legacy for the Future' includes sessions that go beyond soul-searching. For example, in his lecture on 'Challenges for High Energy Physics', Dr Luis Alvarez-Gaume, from the Counceil Europeen de Recherches Nucleaires (CERN), the particle accelerator near Geneva, discusses some of the conundrums of theoretical physics. One of them is the varying strengths of the different forces that operate in nature. For example, two electrons, being of the same negative charge, repel each other with a force. However, being particles with some mass (however small that may be), they also attract each other. Now, the repulsive force is 100,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000 times bigger than the attractive force. Why? Physicists have no clue to that puzzle yet. Similarly, physicists aren't quite sure yet why particles have mass. A theory to explain this riddle assumes the existence of a class of particles, called 'Higgs' (after Dr Peter Higgs, the Scottish expert who put forward that theory), but no one has "seen" a Higgs yet. Which is why CERN is preparing in a big way to catch one in 2008.



BIG RESPONSIBILITY: ICTP director, Prof. Katepalli R. Sreenivasan

The audience bursts into laughter as Prof. Alvarez-Gaume, while discussing the string theory (experts' concept of a single idea to explain all physical phenomena), flashes a surrealist painting on the screen. It shows a castle on top of a huge piece of rock hanging in thin air! "I want to convey the idea that the string theory has a rock-solid base," he comments, highlighting critics' arguments that the theory is merely a mathematical artifact and has not been corroborated by experiments yet.

"Is there really such a final theory?" asks Dr Tuillo E. Regge, from the Institute for Scientific Interchange Foundation, Torino, Italy, in his lecture on 'The Very Small and the Very Large Structure of the Universe.' "How boring it will be for scientists to discover such a theory. There will be no work left for us after that. I don't think a single theory can ever explain all physical phenomena. I think our efforts to understand the complexities of nature will have no end. The show must go on." Fielding a question from the audience as to whether the laws of nature are suited to the emergence of life in this Universe, Dr Regge comments, "I don't think so. I know some physicists are of that view. But that sounds like religious faith, not science. Not to be able to explain why the laws of nature are what they are is a failure of physics."

The last scientific presentation is by Prof. John Forbes Nash who bagged the Nobel prize in economics in 1994. He's probably the most famous of all Nobel-winners in the recent times, thanks to the gripping saga of his life. Having done his pioneering work — the so-called 'Nash Equilibrium', which is a kind of optimal strategy for games involving two or more players — he fell prey to schizophrenia while still at the famed Institute for Advanced Study in Princeton, US. For several years he spent his days in and out of mental asylums and his wife, Alicia, stood by him during those hard times. Eventually, Nash came round and was awarded the Nobel. Their story was poignantly captured by the former *New York Times* economics correspondent Sylvia Nasar in *A Beautiful Mind*, the celluloid version of which — directed by Ronald Howard, who cast Russell Crowe in the lead role — won several Oscars.

By a strange coincidence, the film is shown on a movie channel the night before Nash is supposed to present his paper. And the scientists celebrating the 40th year of ICTP realise that Hollywood is a better ticket to fame than a call from Stockholm. The students from local schools and colleges swarm the auditorium — many of them sit on the stairs of the aisle — much before the appointed hour. And Nash gets an unprecedented ovation, a big hand as soon as he is called to the podium.

His paper, titled 'An Interesting Equation', however, doesn't match the overblown expectations, especially of the youngsters. For half an hour Nash discusses the so-called tensor geometry, the concept that Einstein employed to arrive at his celebrated General Theory of Relativity. Local press photographers have a field day with Nash beside a blackboard full of unintelligible squiggles, but the faces of the experts in the hall simply tell a different tale — they can't really fathom Nash's brainwave.

Why? Nash claims to show that his "interesting equation" makes quantum mechanics redundant as a description of nature. Relativity, he asserts, can explain all phenomena. "I don't understand quantum mechanics," he comments with a touch of sarcasm, "especially that bit of 'unknowable' attached to it. We all know that Einstein too didn't like the concept."

Relativity describes the behaviour of stars, planets or falling apples, but it fails in the realm of the ultra-small — subatomic particles. Although quantum mechanics reigns supreme in that world, many of its counterintuitive diktats baffle scientists, like the one that Nash finds so repugnant — the idea that it's impossible to know the exact position and velocity of any particle at a given instant. Physicists have lived with irritants of this kind for too many years now to fret about them, more so because experiments confirm the bizarre implications of the concept. Which is why hardly any serious question is hurled at Nash by the experts after his talk is over. They simply ignore his claim.

But that doesn't minimise the applause as Nash comes down from the podium. And the audience starts dispersing, as if the hall were to empty. "Ladies and gentlemen, the session isn't over, we've to move on to the concluding part of our programme," says Prof. Sreenivasan over the microphone.

His repeated pleadings finally work, and the closing session gets under way. A number of delegates, including Jafar Towfighi Darian, Iran's minister for science, research and technology, are called to make brief remarks. All the speakers pay rich tributes to the ICTP for promoting R&D in the developing countries. Dr Spenta Wadia, from the Tata Institute of Fundamental Research (TIFR), Mumbai, who is currently working at CERN, expresses his gratitude to the ICTP for providing financial support for organising the world conference of the experts on the string theory at TIFR in January 2001. On a personal note, too, he says he is indebted to the ICTP. "It was during my stint here that I first met my wife," he comments amidst uproarious laughter.

Hollywood is a better ticket to fame than a call from Stockholm

In his remarks, Mohammed Shamsher Ali, president, Bangladesh Academy of Sciences, recounts his days at the ICTP immediately after it was set up. "Salam was a fatherly figure to all of us youngsters here in those days," he says. "He could be autocratic at times when it came to choosing research topics. We used to argue with him, but he would cut us short, often having the last word. However, he would soon appreciate our point and not hesitate to even apologise a moment later." Salam, Ali claims, foresaw a big role for the ICTP in promoting R&D in Bangladesh. "He visited our labs even in the last year of his life, although he was not keeping well then, and we looked to him for guidance and inspiration," says Ali. "Let the ICTP carry forward Salam's dream."

Responding to the shower of praise, Prof. Sreenivasan exudes modesty as well as confidence, saying, "I'm a trifle scared when I think whether the Abdus Salam ICTP will live up to the huge expectations of the researchers from the developing countries. One thing that I can assure you is that there will be no dearth of efforts towards that end on our part."

As the celebrations draw to a close, participants leave the premises praying for the greater glory for Salam's brainchild. The mood is aptly captured by Umberto Vattani, secretary-general in the Italian ministry of foreign affairs, who in his speech at the inaugural session has adduced an anecdote from the life of Winston Churchill. A young photographer, having shot a couple of pictures of the former British Prime Minister on his 80th birthday, asked him if thought he could come again to do the same on his 90th birthday. "Why not, young man?" shot back Churchill. "You seem to be in such good health."

JOYCEAN CONNECTION

A lot of lobbying has gone into building a now-famous institute, writes **Pathik Guha**

SCIENCE MEETS ART: Cover of the book on James Joyce and (bottom) a group photo of the high energy conference where Prof. Abdus Salam mooted the idea of ICTP

During the 1960s, science enjoyed very good patronage in the industrialised world. World War II had shown that it worked wonders and the statesmen of those nations were convinced of the usefulness and importance of fundamental studies. The atmosphere, however, was different in poorer countries, many of which had just extricated themselves from the clutches of foreign rule. Scientists from these countries were emigrating to the developed nations, leaving their own countries in the lurch, just when they needed them most.

What could be the solution to such a serious problem? Dr Abdus Salam, a science prodigy born in Jhang, Pakistan, who was back in his native country after a stint as a professor at the Imperial College in London, realised that improving science locally would not be enough to stem the flight of budding talents from the East. Arrangements were needed to allow researchers, especially those returning home after a training abroad, to stay in touch with the leaders in any field. In the words of Juan G. Roederer, emeritus professor of physics at the Geophysics Institute, University of Alaska-Fairbanks, "The time was right for the conception of an international centre for theoretical physics."

According to Andre-Marie Hamende, ICTP's in-house historian, in the autumn of 1960, Salam, then just 34 years old, outlined a proposal first at the 10th International Conference on High Energy Physics in Rochester, US, and then before the delegates attending the general conference of the International Atomic Energy Agency (IAEA) in Vienna. He sought their help to create an international centre dedicated to theoretical physics that would pay special attention to the needs of scientists from poor countries. Salam's proposal was cosponsored by the governments of Afghanistan, West Germany, Iran, Iraq, Japan, Portugal, Thailand, Turkey and the Philippines. The IAEA general assembly agreed to conduct a feasibility study of the proposed centre.

Although Salam's brainchild met with enthusiastic support from eminent physicists like Neils Bohr and later his son Age Bohr, both of them Nobel laureates, it encountered opposition from the IAEA's Scientific Advisory Committee (SAC) comprising Nobel laureate Isidor I. Rabi and the father of nuclear energy in India, Homi Jahangir Bhaba. They argued that rather than creating a whole new centre, launching fellowship programmes at the existing renowned centres of theoretical physics (like the Institute for Advanced Study in Princeton, US) could be a "more cost-effective and easier-to-implement response" to the problem that Salam was trying to address. "Committee members are also concerned that a centre for theoretical physics would have no practical applications for the developing countries struggling to improve their living standards," says Hamende.

Salam's idea, however, triumphed when Sigvard Eklund was appointed as the director-general of IAEA in 1961. He forcefully recommended its implementation. As the IAEA Board of Governors felt that the centre could not be created solely with their funds, offers of financial assistance came from the governments of Italy, for the new centre to be located at Trieste; from Denmark for Copenhagen; from Pakistan for Lahore; and from Turkey for Ankara. The most generous was the Italian offer ($275,000) and the man behind this was Prof. Paolo Budinich, a famous theoretical physicist in Italy.

According to Hamende, Prof. Budinich sought the backing of Italian authorities, convincing the president of Cass di Risparmio di Trieste, a local bank, to provide 100 million lire (then about $160,000) to fund a campaign for having Trieste serve as the site for the proposed centre. Budinich argued that the centre would help ease East-West tensions chilled to the bone by the Cold War. The money given by Cassa di Risparmio di Trieste led to the creation of a local committee, chaired by the city's mayor Mr Mario Franzil, that proved instrumental in the IAEA's decision to choose Trieste as the site for the proposed centre.

On October 5, 1964, a group of high officials, mostly from Italy, joined eminent physicists from around the world at the Jolly Hotel in downtown Trieste for the inaugural meeting of the newly-created International Centre for Theoretical Physics (ICTP).

"A seminar on plasma physics served as a platform from which to officially launch the ICTP," says Hamende. "IAEA director-general Eklund was there. So, too, was Guido Gerin, the Italian government's representative to IAEA, as was Begum Liaquat Ali Khan, Pakistan's ambassador to Italy. Science luminaries included one future Nobel laureate — Prof. Abdus Salam — and Dr Marshall N. Rosenbluth, a professor of physics at the University of California, San Diego, and a former student of Edward Teller [the father of the hydrogen bomb]. In all, 73 participants attended the seminar, representing 14 countries in the West, five in the East, and 12 in the South."

Today, ICTP (renamed 'Abdus Salam International Centre for Theoretical Physics' after the demise of its founder in 1996) maintains links with scientific communities in about 170 countries and hosts up to 4,000 scientists each year as short-term or long-term visitors. Since its creation, the centre has built a worldwide family of alumni — tens of thousands of former associates, lecturers, and students, many of whom are now internationally recognised scientists or university leaders.

ICTP pursues scientific excellence in research and training for research in a variety of fields, including condensed matter physics, high-energy physics, pure and applied mathematics, nuclear physics, statistical physics, physics of the earth, weather studies, living matter and applied physics.

Since its birth four decades ago, ICTP has spawned local scientific bodies like the International School of Advanced Studies (SISSA, funded by the Italian Ministry of Education and located on the ICTP campus) and several other wings, collectively known as the 'Trieste Science System'. The centre is also host to headquarters for several organisations, most notably the Third World Academy of Sciences (TWAS).

Not everyone in the IAEA supported Salam's brainchild in the beginning

Trieste, it seems, is specially suited to host all such bodies: it's located in the West, but at the doorstep to the Eastern Bloc. The city is linked to the physics lore in another subtle way. It was here that the Irish author James Joyce came exactly 100 years ago as an English teacher. Also, it was here that he wrote the poem *Finnegans Wake* which had the famous line "Three quarks for the Muster Mark ..."

Inspired by Joyce's poem, Nobel laureate physicist Murray Gell-Mann immortalised 'quarks' when he called the main building blocks of all matter by that name in 1964 — the same year that the ICTP was founded.

As part of the ICTP's 40th anniversary celebrations, its director, Prof. Katepalli R. Sreenivasan, has released a book (*A Rose for Joyce*) discussing Joyce's stay in the city on the coast of the Adriatic Sea. "The young Irishman who arrived in Trieste a century ago became a great author; the young Pakistani who arrived here forty years ago became a world-famous scientist by founding ICTP and by winning the Nobel Prize in physics," says Prof. Sreenivasan. "Who knows: some among today's visitors to Trieste, from similarly unusual places, might soon become equally famous."

THIRD LAW

Quantum leaps

With reference to *Bricks of nature* (October 11), the recognition of the three physicists by the Swedish academy once again proves the importance of quantum mechanics (QM). It's time people stop considering the subdiscipline as bizarre or paradoxical. Just because it's exhaustively mathematical and apparently abstract, you can't ignore QM. Finally, Prof. Wilczek's remark on the superiority of public education in the US should serve as an eye-opener to Indian education administrators. No wonder the country churns out Nobel laureates in dozens.

Pramit Mukherjee
Serampore

Soy benefits

The cancer-fighting activity of soya products (*Vegetable dose*, October 4) has been reported long back by researchers from the Hershey Medical Center, Pennsylvania State University, US. However, scientists have yet to identify the constituent (either protease inhibitor or flavone or both of the chemicals) which plays the central role. Not only soyabean but other types of beans can also fight cancer. For instance, recently a study at the Cancer Research Institute, Mumbai, has claimed that the common field bean can be effective against stomach tumours in model rats. Since soya is a very rich source of trypsin (a protein-breaking enzyme) inhibitor, taking unlimited amounts of soya powder should be avoided. It is better to have soya in its cooked form.

Samir Datta
Scientist, IICB

Foreign interest

I wonder why foreign aid agencies are so very interested in highlighting the so-called AIDS epidemic in India (*Poor surveillance*, October 4). Agencies like CIA have also made similar remarks about HIV/AIDS in India. Is it because foreigners want to make India a testing ground for vaccines and drugs for the disease?

Anirban Ghosh
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