

tion, are a matter of concern. This is mainly due to contamination during the bioprospecting or manufacturing processes. The herbal material might contain heavy metals when grown on polluted soil. Such incidences certainly reflect failure of good agricultural and manufacturing practices and quality assurance, but not necessarily a failure of the regulatory system, particularly the Indian, that is unable to evolve and enforce effective quality control norms for herbal medicines.

Presence of spurious substances in market samples is not new. However, it does not reflect adversely on the importance of modern medicine. For instance, cyanide-tainted Tylenol⁵. Therefore, conclusion of

Saper *et al.* that 'users of Ayurvedic medicine may be at risk for heavy metal toxicity' is certainly not justified. It only relates to certain samples of Ayurvedic medicines from certain companies in certain locations. It is high time now that India should take a formal position on such issues by integrating views from scientific and regulatory agencies such as ICMR, AYUSH, CSIR, FDA and DCGI. While it will take a substantial effort to redress the damage to the Ayurvedic system due to such publications in international journals, we need to learn more from such lessons.

1. Daniel, M., *Curr. Sci.*, 2004, **87**, 275–276.
2. Schmidt, M., Betti, G. and Thomsen, M., *Curr. Sci.*, 2005, **88**, 336.

3. Saper, R. B., Kales, S. N., Paquin, J., Burns, M. J., Eisenberg, D. M., David, R. B. and Phillips, R. S., *JAMA*, 2004, **292**, 2867–2873.
4. *Charak Samhita* (eds Bhagavan Dash and Sharma, B. K.), Chaukhamba Sanskrit Series Office, Varanasi, 2001, 7th edn.
5. Infante, F., Dominguez, E., Trujillo, D. and Luna, A., *J. Forensic Sci.*, 1999, **44**, 110–113.

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NEWS

92nd Indian Science Congress*

The focal theme of the 92nd Indian Science Congress was 'Health technology as a fulcrum for development of the nation'. About 6000 delegates attended the Congress, including about 400 from abroad.

The Congress was inaugurated by the Honourable Prime Minister of India, Manmohan Singh on 3 January 2005. After releasing a souvenir, he addressed the gathering of scientists from all over the world and urged them to work for the upliftment of the society and mankind at large. According to Singh, apart from being an instrument of economic and social progress, science is also a means to acquire a more rational approach to life. Science and technology (S&T) must pervade our psyche, our way of thinking and our way of working. He referred to a vision of science that included:

- Devoting equal attention to the development of basic and applied sciences, both in teaching and research.
- Rebuilding the science base in the universities, including creation of synergy between new initiatives in S&T and the university system.

- Promoting public-private partnerships to increase funding for frontier areas of scientific research.
- Ensuring de-bureaucratization of S&T institutions and assuring their academic autonomy.
- Restructuring of S&T support systems.
- Creating career opportunities for scientists for retaining talent within the country and building more centres of excellence in science, like the Indian Institute of Science, Bangalore.

Manmohan Singh said that S&T must play a greater role in our strategy to address problems of mitigation and management of impact of natural disasters. Pre-disaster preparedness is also important and the Indian S&T community should rise to this challenge.

He expressed concern on the fact that our best minds are not turning to science and those who do so, do not remain in science. We have to improve the quality of teaching and increase the enrolment of students in science and mathematics at the school level. Secondly, the tyranny of bureaucracy and the quality of output in many of our scientific research establishments need attention. Questions like whether or not we are creating the required incentive mechanisms to reward creativity, are arising in the minds of Indians. He also

added that apart from keeping our international commitments, an important objective of our Government is to bring in a balanced intellectual property regime, which on the one hand will give a full expression to the creative ability of India's intellectual prowess and on the other hand, protect interests of the society at large. Agriculture and energy are the two areas of great importance to our economic development where the nation can benefit from more research and innovation. A new technological revolution in the energy sector is required that would meet the growing demand for energy in more economical and sustainable ways.

Focusing on the theme of the Congress, the Prime Minister added that biotechnology, pharmaceuticals and health technology are priority areas for public policy. Alternative pathways for drug discovery, where India has a distinct comparative advantage and a chance to win, must be created. Singh informed the audience that his government is presently formulating programmes to launch a National Rural Healthcare Mission. Singh announced the constitution of a Scientific Advisory Council to Prime Minister with C. N. R. Rao as its chairman. The Council would guide in addressing the challenges facing Indian science that may be identified in the Congress.

*A report on the 92nd Indian Science Congress held during 3–7 January 2005 at Nirma University, Ahmedabad.

In his speech, the Honourable Minister for Science and Technology, Government of India, Kapil Sibal, referred to a quote from Jawaharlal Nehru 'The future belongs to those who make friends with science', delivered on 26 December 1937, while addressing the Indian Science Congress. He stated that we need gene revolution, without any environmental hazard or tinker in any fundamental manner with the ways of nature, to make India self-sufficient with regard to food. In order to address some of these issues the Government of India has evolved many models at the national level through programmes and initiatives such as Technology Development Board, Programme Aimed at Technological Self-Reliance, New Millennium Indian Technology Leadership Initiative, and Drugs and Pharma Programme of Ministry of Science and Technology. On the international front, the Government has signed Intellectual Property Rights (IPR) agreement in the field of S&T with the European Union and Russian Federation. There are IPR norms already operative in the Indo-French Centre. India does have an edge in the S&T areas, which may be converted into profitable ventures. This needs a reasonably high level of funding, including contract research in India and abroad. Sibal announced that the Department of Science and Technology is going to formulate an innovative scheme, that would soon be implemented to offer continuous research support to 'performing scientists', irrespective of their employment status, affiliation and age, with the idea of guaranteed working-level support to them in an uninterrupted fashion based only on their track record in the preceding project. For major grants, they would, of course, go through the usual thorough peer-review mechanisms. This nurture scheme has been named as 'Ramanna Fellowships', in the memory of the noted scientist, Raja Ramanna.

Narendra Modi, Chief Minister of Gujarat, narrated some of the scientific achievements of his state. He stated that the Gujarat government has created an independent Department of Science and Technology in April 2003, in order to ensure a unified effort for development. Besides the Physical Research Laboratory, Gujarat hosts the Bhaskaracharya Institute for Space Applications and Geoinformatics, which is entrusted with pioneering work in areas like remote sensing applications for inventory, mapping and monitoring of natural resources to enable effective deve-

lopmental planning, facilities for digitization and optical enlargement for preparation of thematic maps and photo interpretation of satellite images. Modi also stated that Gujarat has the largest operational optical fibre cable network of more than 35,000 km, the highest number of internet service providers, more than 60 MB of bandwidth through five internal gateways and a growing culture of computer usage. The Gujarat State Wide Area Network, connects all the 25 districts and the 225 talukas. With 12,000 nodes, it is the largest wide area network in the Asia Pacific. Focusing on the theme of the Congress, Modi said that advice on health care can now be taken to the doorsteps of the common man at very little cost, due to advances in communication.

N. K. Ganguly, President of ISCA, in his address, laid stress on the theme of the Congress. He stated that with 16% of the world's population, India accounts for over 20% of the world's maternal deaths. Maternal mortality ratio is still incredibly high at 408 per 100,000 live births in the country. Poor maternal health results in low birth weight and premature babies. Ganguly also stated that we have a module for home care in the case of pneumonia in children, providing antibiotics at home and referral guidelines; a module on reduction of mortalities due to septicaemia through administration using robotics; the indigenously produced Hib vaccine to reduce Hib pneumonia, and the low osmolarity oral rehydration fluid with zinc. These interventions will reduce the number of under-six-months deaths and enhance the growth and development of children.

Ganguly stated that a major proportion of genetic disorders can be prevented by public health measures and approaches in primary public health care. Prenatal genetic diagnostic facilities identifying mutations specific to Indian population are now available in the country and will help in reducing childhood disabilities. Similarly, for women, an effective injectible, long-acting contraceptive, a drug for safe medical abortion, non-injectible local drug for reduction of postpartum bleeding and a technology for effective management of anaemia are available. World-class recombinant hepatitis B vaccine is being produced in the country by several industrial houses in ample amounts and at affordable costs. A self-destructing syringe goes with this vaccine. Despite this, it has not been possible to use the vaccine due to two reasons. First, the data on

transmission of hepatitis B from mother to child are scanty. Secondly, the logistics for delivering three injections of this vaccine has not been worked out in major parts of our country where 70% of the births occur at home.

India is fast developing into a vaccine-manufacturing hub. Some of the vaccines identified for development on priority include those for cholera, diarrhoea, malaria, rabies, meningitis, HIV, tuberculosis, combination vaccines, and a vaccine against cervical cancer. Two HIV vaccines were subjected to clinical trials in January 2005 as a part of international AIDS vaccine initiative.

Ganguly pointed out that in the drug front also, India has made advancement. We have reached the stage for developing a new drug for the treatment of tuberculosis, a new anti-diabetic, topically deliverable insulin, anti-retro-viral drug, a novel drug for psoriasis and anti-malarials. A huge battery of drugs for allergy, asthma and ulcers is being subjected to phase-I clinical trials. In India, we have good examples of community participation. One such example is that of 'Apni Yojna', in which a community from Churu district, Rajasthan participated in distribution, planning and management of water. It is an excellent case where government, community, consumers particularly women, and CSOs in almost 60 villages of Churu district participated. In disease control, we have achieved leprosy control, where development of new diagnostics, new treatment regimes for persistors and new mapping techniques in India have brought us closer to the elimination stage of this disease. Similarly, in a complex situation of migrating population and street children, the polio control programme has incorporated state-of-the-art technology of genotyping. For the first time, India could produce a global drug, 'Miltefosin'. This along with a companion drug, aramycin is orally administered for treatment of kala azar and is effective against drug-resistant strains. Two new anti-malarial drugs, artemisinin derivatives – artemether and artesunate, have been marketed in the country and one more – endoperoxide, has been cleared for phase-I clinical trial. Space satellite technology is being used for mosquito control through tracking of vectors using Geographic Information Systems. In the area of textile and medicine, we have acquired the capability of making textile-based urinary bladder, and self-degrading devices, which could be used

in surgery. Another achievement is the launching of the integrated disease surveillance system. Pinpointing of Chandipura virus as an emerging pathogen, by defining its role in the outbreak of acute encephalitis of unknown origin, with high fatality in children from Andhra Pradesh during 2003, underlines our capabilities.

Ganguly said that we are in the middle of a demographic transition. The life expectancy in our country has increased from 41.2 years in 1951–61 to 62 years. This is a remarkable achievement in itself. However, this has also brought a large section of the population to an age, where life-style diseases begin to manifest themselves. Unfortunately, cardiovascular diseases are affecting our people at a much younger age. In the field of the cancer, we have a cancer mapping system which uses recent advances in computer and information technology. A peptide-based anti-cancer drug for the treatment of colorectal cancer has been synthesized indigenously and is ready for human trials. A 'pro-drug activation' strategy for gene therapy of oral cancer is also being developed. A vaccine against human papilloma virus, implicated in cervical cancer, may also be introduced. After signing the Framework Convention on Tobacco Control, we will be able to circumscribe the spread of tobacco and tobacco products. Genetically modified food may likely be the answer to our problems of nutrition and micronutrient deficiencies. An area which demands immediate attention, is manufacture of medical and scientific instruments. Ganguly noted that our medical graduates have reasonably good knowledge of medical science but are often found deficient in clinical research. There is a need for critically reviewing the teaching methods in medical courses. Other aspects covered in Ganguly's presidential address included medical insurance, funding for S&T sector and scientific autonomy.

The technical sessions of the Congress started with a special opening lecture by C. N. R. Rao on 'Reflections of science in India'. He described briefly his personal experiences of doing science in India for the past 54 years. He said that though S&T are mentioned together, science existed far earlier than technology. He stressed that only with good working conditions, can good research result from laboratories.

The other special lectures included those by M. S. Swaminathan (MSSRF, Chairman), Gerald T. Keusch (Boston

University Medical Campus and School of Public Health), Richard Klausner, ex-Senior Fellow at the National Academies of Science, USA, and Advisor to the Presidents of Academies for counter-terrorism and liaison to the White House Office of Science and Technology Policy.

In his special lecture, 'Mission 2007: A hunger-free India and every village a knowledge centre', Swaminathan pointed out that the two biggest achievements of India during the past 50 years are that (i) India has remained a strongly democratic country despite all adversities and (ii) India has managed to progress significantly with regard to agricultural production. He said that our focus has to shift to food security, where every man, woman and child in India has access to a balanced diet and safe drinking water, an India where no one goes hungry. He also spoke about research being carried out across India related to inter-cropping, crop system design, community-managed farming systems and organic farming supplemented with good features of genetic engineering, etc. Swaminathan stressed on the need for interconnection of villages through the use of IT, so that villages could share information and knowledge. He gave an example of a fishing village in Pondicherry, where the use of IT helped prevent loss of human life during the recent tsunami.

Keusch spoke about the disparity that existed between developed and developing nations. He was speaking on 'Bridging science and society: Virtual networking and people'. He noted that the health sector is critical for development of the nation and poor health directly relates to reduced productivity in society. The theme and the essence of his talk, however, revolved around the application of scientific knowledge, responsibility of the scientific community and ways to promote global science to address local problems. Keusch suggested a global forum for scientists across the world on the internet, where they could coordinate, train, collaborate, manage, interact, etc. He summarized the solutions to the current problems by mentioning the four paradigm shifts that are necessary: a new research paradigm, a new academic paradigm, a new cooperative paradigm and a new R&D paradigm.

Klausner spoke on Global health – The 21st century challenges for science, technology and society. He emphasized on the importance of the design of technology and hinted at the enormous potential

in our science and its application to decrease the mortality rate, improve health and the environment. S&T, according to him, was measured by the capacity to provide practical solutions to human problems. He also touched upon the need for application of innovative methods for creation of vaccines for HIV and other dreadful diseases.

Speaking in the plenary session, 'Could India be a global pharmaceutical giant?', Bansi Lal (Nicholas Piramal Research Centre) expressed his opinion that R&D has a key role in making India a global pharma giant, as R&D is the backbone of the pharmaceutical industry. According to him, manufacturing and contract research can give us revenues, but will not make us a global pharma giant. To control major share in the market, we have to develop new molecules and have top infrastructure.

Bernard Pecoul (Executive Director, Drugs for Neglected Diseases initiative (DNDi), Geneva), another speaker of this session, pointed out that India is a strong contender for the position of a pharmaceutical giant. But to go global, it cannot forget to prioritize the needs of the poor and neglected people suffering from diseases that have failed to find a place on national health agendas across the world. The country also needs to consolidate engineering and research to develop new drugs and delivery systems, he stated. The world pharma market is estimated at around \$406 billion, and India accounts for only 1.8% of it, at \$7.3 billion. Only 1% of the new drugs developed globally is for neglected diseases and Indian companies should focus on R&D in these areas as well. DNDi is working on over 14 different projects in different countries and has partnered with ICMR. In India, DNDi aims at doing collaborative projects for neglected diseases to reduce the cost of research and development, with the help of public and private sector participation.

India must jump onto the hydrogen energy bandwagon, according to S. K. Chopra (Senior Adviser to the Ministry of Non-conventional Energy Sources, Government of India). While speaking in the plenary session on 'Environment and health', Chopra said that it was necessary to systematically replace fossil fuels with environmentally benign renewable energy for protecting the environment and human health. However, while carrying out this transition, sustainable energy security has to be ensured. He discussed the broad

features of the energy situation in India and proposed a pathway for achieving the goal of sustainable energy security and health for all in India in the next two decades. The Indian Hydrogen Energy Programme, according to him, was a cheaper, pollution and emission-free, solar hydrogen energy system compared to the existing coal, oil and gas resources, the costs of which are stifling the country's economy.

In the session on 'Using space technology for societal needs' the speaker was Lee Morin (Deputy Assistant Secretary for Health, Space and Science, US Department of State's Bureau of Oceans and International Environmental and Scientific Affairs). Being a NASA astronaut, Morin discussed in detail the history of aviation medicine. He spoke on the activities of the flight surgeon under environmentally unfriendly conditions of oxygen requirements as well as fluctuation of pressure. Under conditions of zero gravity, space motion sickness occurred that caused cardiovascular, neurovestibular, musculoskeletal as well as psychiatric problems. Aerospace medicine, according to him, dealing with all these problems, must be developed properly for a country to be successful in space missions.

In the session on 'Innovative water technology for the poor', Saul Arlosoroff (Director and Chairman, National Water Corporation, Mekorot, Israel) spoke on environmental and socio-economic risks that are strongly linked to water scarcity, especially in semi-arid regions like parts of India and the Middle East. He cited examples from the water resources management strategy of Israel as a case study of adequate water demand and supply management in a highly water-scarce condition.

Rajaraman (President of Complete Environmental Solutions Pvt Ltd, IL, USA), stressed on the fact that clean water should be a basic requirement and there is a need to use technology to assure clean water. He focussed on health and sanitation problems, policy-making, health effects of impure water, water conservation technology, deep pond system, use of low-cost biological treatment to purify water, etc.

In the session on 'Frontiers in stem cell research and biotherapy', Alok Srivastava (CMC Vellore) spoke on bone marrow and blood stem cells and their novel applications. The two most significant applications of bone marrow and blood stem cells are in curing chronic leukaemia and

thalassaemia major, where conventional treatment is prolonged and expensive. For Indian conditions, he was of the opinion that a group of such immuno-competent cells could be developed, but the major problem often faced is that of getting suitable donors. Srivastava also threw light on the isolation and culture of mesenchymal stem cells, where the possible applications included cases of renal failure, cardiac failure, traumatic brain injury, Chron's disease and their use as a vehicle for gene therapy.

Virender S. Sangwan (L.V. Prasad Eye Institute, Hyderabad) spoke on restoring vision using limbal stem cell technology. He gave an introduction to the basic concepts of limbal stem cells and their impact with respect to tissue transfer and harvesting in the case of eye diseases. This technology was mostly useful in chemical injury cases most prevalent in India, that include accidents, acid and alkali injury as well as allergic eye diseases.

Vinton Cerf (Senior Vice-President of Technology Strategy for MCI) spoke on the 'Use of IT in science in developing countries'. He stated that the science and engineering communities have the ability to accelerate products of research through the use of the World Wide Web. Search engine tools not only allow researchers to quickly find current and historical research results, but also foster contributions to major scientific databases such as the human genome and astrophysical databases.

In the session on 'Bio-engineering – current challenges and expanding opportunities', Sitarama S. Iyengar (Louisiana State University) spoke on new applications of distributed sensor network as an emerging technology. He gave a brief introduction to the evolution of sensing and added that the industry is aggressively pursuing application and development of sensor netting and that wireless sensor network is one of the emerging types of sensor networks. He mentioned the major applications of sensor networks in harbour monitoring, urban surveillance, medical monitoring, military and in the detection of catastrophic events.

G. S. Bhuvaneshwar (Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram) said that in spite of having considerable potential in emerging areas like tissue engineering, targeted and controlled drug delivery and nano-particle ceramics, India imported 80% of its medical devices. He

shared his vision for 2020 through which he hoped that at least 50% of bio-medical devices would be produced indigenously.

The honourable President of India, A. P. J. Abdul Kalam addressed the 92nd Indian Science Congress in a separate session. Kalam shared his thoughts on expected important achievements in S&T in 2005 in the fields of stem cell research, interactive tele-education delivery system, biofuels–Jatropha, Brahmos–supersonic cruise missile, treatment of Parkinson's disease, different aspects of solar energy, prediction of shock embedded tidal waves (tsunami), mission of providing urban amenities in rural areas and so on.

Kalam also shared his vision of a developed India in 2020 and the mission of scientific community. According to him, developed India in 2020 would be a nation where:

- The rural and urban divide would be reduced to a thin line.
- There would be an equitable distribution of energy, water and access to quality electric power.
- Agriculture, industry and service sector would work together in symphony, absorbing technology, thereby resulting in sustained wealth generation leading to higher employment potential.
- Education will not be denied to meritorious candidates because of societal or economic discrimination.
- The country would be the best destination for the most talented scholars and scientists from all over the world.
- The best of health care will be available to all and communicable diseases like AIDS/TB, water and vector-borne diseases, cardiac diseases and cancer would be eradicated.
- The governance will use the best of the technologies to be responsive, transparent, easily accessible and simple in rules, thereby being corruption-free.
- Poverty will be totally alleviated, illiteracy and crime against women eradicated and society unalienated.
- There will be a prosperous, healthy, secure, peaceful and happy society.
- India will be one of the best places to live in on the Earth and bring smiles on a billion plus faces.

There were two public lectures in the Congress. The first one was by R. A. Mashelkar (CSIR) and the second by Sam Pitroda. In the public lecture 'Resurgence of innovative India', Mashelkar compared India

and Japan based on industrial R&D trends, public/private company contribution percentages and showed that they had almost opposite traits. Apart from fostering indigenous technological capabilities in industrial enterprises, he said, we should be open for international technology transfer, and also highlighted that entrepreneurs should contribute more towards S&T improvements. Emphasizing the role of grassroots innovations, Mashelkar lauded the efforts of the National Innovation Foundation that registers grassroots innovations across India, helps convert innovations to enterprises with suitable IPR protection, mobilizing micro venture financing. For resurgence of India, the main challenges are, according to Mashelkar, making technologies work for the poor, converting brain-drain to brain-gain, creating new Indian footprints rather than following beaten tracks and fostering innovative culture.

In the public lecture 'Indian science in the 21st century', Pitroda, started out by saying that the current period was a crucial time in the history of India. He reflected on the challenges ahead of the nation and the steps that need to be taken to fulfil the collective dreams and aspirations, lamenting on the state of science in the broader context of the country. Pitroda said that institutions have been built, but they do not have the requisite systems in them: surplus food is there but people starve in some parts of the country. According to him, bold initiatives in S&T have to be taken up so that 500 million individuals below the age group of 25 years will be a great potential for India in the near future, as opposed to a shrinking and ageing population in most other parts of the world. His suggestions included bringing in reforms in the scientific policy as well as institutions like the CSIR that needed breaking up into smaller organizations so that there could be better focus, management as well as better opportunities for several young scientists. Pitroda also added that the era of intellectual property (IP) will stay, whether it is liked or not, and India must respond to the WTO compulsions not by opposing them but by responding to them, in its own terms, i.e. build a pool of IP. He felt that one possible mechanism to support scientists is to create a funding model as followed by the US like that of the National Science Foundation, funded and managed solely by scientists.

Apart from the plenaries and special lectures, research papers were presented in oral as well as poster sessions in 14 subject-wise sections at the Congress. In the following, the presidential addresses of these sections are summarized.

K. K. Agarwal (G.G.S. Indraprastha University, Delhi), representing the information and communication science and technology (including computer sciences), spoke on 'Information technology and society'. His talk gave a detailed picture of synthesis of knowledge areas, diffusion of boundaries, efficiency improvement, e-governance and its impact on health, increased productivity, impact on education, DNA computing, adult literacy and so on.

Shelly Bhattacharyya (Viswa Bharati University, Santiniketan) spoke on 'Survival strategies in a compromised environment: Molecular rescue pathways', in the environmental sciences section. She stated that although sufficient reports are available on the xenobiotic response in animals, the basic understanding of the mechanism of signal transduction is still hazy. She also added that the biology of stress response to xenobiotics can be addressed in piscine cellular models, which may unravel many of the unknown pathways of stress in a dependable manner, since fish cells can reproducibly demonstrate the adaptive responses to the xenobiotics and also have the potential to be used successfully as biomarkers of immunotoxicants.

T. S. Kamal (Guru Tegh Bahadur Khalsa Institute of Technology, Punjab), in the engineering science section, spoke on 'Tele-medical information system; the mantra of health care'. He covered the wide scope of the telemedical information system (TIS) and gave examples of the different types. According to Kamal, though TIS plays a central role in the wide range of telemedicine, there is a lack of interoperability between dedicated stand-alone telemedical applications like teleconsultation and the large local information system like HIS/EPR. A major challenge for the next few years will be to provide high quality content and sophisticated retrieval and information mining techniques behind simple-to-use, intuitive man-machine interfaces for all people.

B. Satyanarayana (Osmania University, Hyderabad), in the earth system sciences section, gave a review of geo-hazards pertinent to India like floods, droughts, desertification, cyclones, seismicity, land-

slides, avalanches, sea water inland encroachment, gully erosion, etc. He was talking on 'Geo-hazards: Indian scenario'. Natural hazards cannot be controlled, but the damage they cause can be minimized by certain measures. He gave some suggestions like connection of river basins for transfer of water to minimize the effect of flood disaster, building of storage tanks at higher altitudes to restrict flow of water by gravity, etc. which, if followed, may minimize the possibility of erosion and landslides.

P. K. Banerjee (Defence Institute of Physiology and Allied Sciences, New Delhi), in the Medical sciences (including physiology) section, presented a general perspective of the subject of physiology of human work potential and a brief account of the S&T efforts in India to understand the subject with the objective of mobilizing the best of performances from our resources. The title of his talk was 'Physical fitness and physiology of human performance'.

V. K. Saxena (Dr Hari Singh Gour University, MP), in the chemical sciences section spoke on the studies of 'Some indigenous medicinal plants – the reservoir of potential therapeutic agents'. He discussed in detail the isolation and characterization of potential therapeutic agents from several indigenous medicinal plants and also the structure of the active compounds. He laid stress on research and development as an integral part of herbal drug analysis.

'Relevance of fish haematology in monitoring their health and the aquatic environment' was the topic of discussion of B. D. Joshi (Gurukul Kangri University, Haridwar) in the animal veterinary and fishery sciences section. According to him, the fish has been the most original and innovative in the animal world, to give us the red blood corpuscles laden with haemoglobin – the respiratory red pigment. He called on the Indian scientists working in this field to make use of fish haematology for monitoring fish health and its ambient environment. The subject should acquire further importance because of the continuously increasing menaces of aqua-pollution all around.

Neeraj Khare (NPL, New Delhi) spoke on 'Novel electronic materials' in the materials sciences section. His talk included high-temperature superconductors, their differences from the low-temperature superconductors, description of the area of microwave electronics, CMR materials,

etc. As an alternative path for the future, Khare described the developments in the areas of spintronics and orbitronics.

M. A. Pathan (Aligarh Muslim University) in the mathematical sciences section spoke on 'A new perspective on lie theory and special functions'. He threw light on differential equations and special functions via Lie algebra, representations of Lie groups, Lie derivatives, and so on. He also included the details of Rogers-Ramanujan identities, Hurwitz zeta function, Selberg function and multi-variate differential equations in his talk.

The new biology section (including biochemistry, biophysics, molecular biology and biotechnology) had R. V. Hosur (TIFR, Mumbai) speaking on 'NMR in structural biology'. He reviewed recent advances in concepts and techniques that have led to newer applications in spectrometer designs and technologies. His talk also included NMR determination of macromolecular structures, structural propensities in unfolded and partly folded proteins, secondary chemical shifts, nuclear Overhauser effect, residual dipolar couplings, dynamics in proteins, etc.

R. S. Sirohi (IIT, New Delhi), in the chemical sciences section, spoke on 'Speckle interferometry and some of its biomedical applications'. He gave a detailed description of superposition of speckle patterns, uses of speckle interferometry

for electronic recording of flight fields as well as biomedicine ranging from deformation studies to imaging.

R. C. Rajak (Bundelkhand University, Jhansi), in the plant sciences section, covered 'Fungal diversity: Perspectives, issues and opportunities'. He described how relevant fungi are in the present scenario of global biodiversity programme. Inadequacies in resources have posed some critical problems for proper development of mycology in India. However, the launch of the BIO-NET International in 1993, marked an important step forward in relieving the taxonomic impediments, thus providing a mechanism to maximize the use of available resources.

Saroj Kr Sanyal (Bidhan Chandra Krishi Vishwavidyalaya, West Bengal), in the agriculture and forestry sciences section, spoke on 'Arsenic contamination in agriculture: A threat to water-soil-crop-animal-human continuum'. His presentation overviewed the complex problem of arsenic toxicity in agroecosystems receiving contaminated groundwater for irrigation purpose with emphasis on soil as an efficient sink and entry of arsenic in the food chain. He explained how accumulation of arsenic in soil, plants, plant organs, live-stock, and livestock products is a combined function of arsenic input to the time period of arsenic loading in as well as arsenic retention capacity of the system.

Mahesh Bhargava (Haraprasad Institute of Behavioural Studies, Agra), in the anthropological and behavioural sciences section (including archaeology, psychology and educational sciences), spoke on 'Positive psychology and holistic health'. His lecture covered life problems and challenges, positive concepts of holistic health, behavioural manifestation indices and also Bharatiya concept of health and happiness.

A new chapter of cooperation opened up in Indo-Pak relations by the visit of Anwar Nasim, Chairman of Pakistan's National Commission on Biotechnology during the Science Congress. Nasim said that Pakistan was keen to cooperate with the Indian scientific community and discuss solutions to common problems in agriculture, and the eradication of poverty. He also felt that there is a wide scope for Pakistan to seek India's expertise in the field of cultivation of bio-saline land. He announced that a formal meeting of scientists of both the nations would be held in Lahore to solve some of the problems facing South East Asia.

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The Berlin-3 meeting*

The Berlin-3 Meeting (Progress in Implementing the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities) was hosted by the School of Electronics and Computer Science, University of Southampton, with financial support from UK Joint Information Systems Committee and the Network of Excellence in Digital Libraries.

Incidentally, this School is headed by Wendy Hall, who was the President of the British Computer Society last year. Also, Tim Berners Lee, the inventor of the World Wide Web is on the faculty here. More importantly, it is here that the

Eprints software, used by many institutional archives around the world, was created and perfected.

The meeting was to monitor the momentum and increase implementation of the Berlin Declaration on Open Access. It was attended by some 70 participants, including those from major European Union research organizations such as CNRS and INSERM (France), Max Planck (Germany), CERN (Switzerland) and many universities from UK, Portugal and Italy. There were also advocates of Open access (OA) such as Jean-Claude Guedon, and representatives of SPARC, PLoS, BioMed Central and the Electronic Publishing Trust. I was the only participant from the developing world.

The most important outcome of the meeting was the agreement on recommendations for a concrete practical policy

that institutions can now adopt in order to implement the Berlin Declaration and provide open access. Until now, all we had was an abstract expression of principle and assurances of support.

The provisional recommendation agreed on is as follows: In order to implement the Berlin Declaration, institutions should (i) implement a policy to require their researchers to deposit a copy of all their published articles in an open access repository, and (ii) encourage their researchers to publish their research articles in open access journals where a suitable one exists and provide the support to enable that to happen.

Significantly, the recommendation places the need for depositing papers in an OA archive ahead of publishing the paper in an OA journal. Also, this recom-

*A report on the Berlin-3 Meeting held at Chilworth Manor, at the Research Park for the University of Southampton during 28 February-1 March 2005.