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From the Editor's Desk

Our understanding of the material nature of the world is dependent on our knowledge of chemistry and the year 2011 has been declared as the International Year of Chemistry by the UN General Assembly. The year also coincides with the 100th anniversary of Madam Curie winning the Nobel Prize for Chemistry, besides being the 100th Anniversary of founding of the International Association of Chemical Societies in Paris. During the year, different activities to increase the public appreciation of chemistry for sustaining natural resource base for life and creating opportunities to discover exciting new principles and applications in chemistry are planned by different organizations. A greater understanding of chemistry will help in developing novel materials and new technologies in the field of medicine, health and environment and contribute to solutions to global warming. An article entitled "Role of Chemistry in Development of Technology for Hydrogen as Future Energy Carrier" by Dr. Shyamala Bhardwaj is included in this issue of newsletter.

The year 2011 has also been declared as the International Year of Forests by United Nations in order to increase awareness and help in conserving the forests for the benefit of current and future generations. Forests form an integral part of global environment and deforestation accounts for up to 20% percent of the global green house gas emissions, which contribute to global warming. The forests support habitats for about two thirds of the species on earth and the forest soil store more than one trillion tons of carbon, which is almost twice the amount found in atmosphere. In this issue of the newsletter we have an article by Dr. V. Abraham on "The endangered nature of Flora and Fauna in forest year 2011".

On March 11, the world witnessed one of the greatest earthquakes in Japan of about 9.0 magnitude followed by a tsunami, which rattled the shores of Sendai destroying thousands of lives and rendering millions homeless. The high sea walls built along the coast of Sendai could not stop the 13- 15 meter tall giant tsunami waves, which battered the coast line, causing great damage and it finally led to a nuclear crisis at Fukushima Daiichi Nuclear Plant exposing millions to radiation. Three units operating at the time of the quake suffered a partial melt down and some spent fuel stored at the plant was exposed. It is the worst nuclear accident after Chernobyl in 1986. The issue also has an article by Dr. Bhupesh Kumar Gangrade on "Earthquakes and Tsunamies".

We have completed a decade after sequencing of the human genome. In February 2011, papers were published in Nature and Science, reporting glimpses of the subject. One of the important applications of Human Genome Project is in

medicine for identification of genes associated with diseases. It is high time to step back and evaluate the fruits of this project from a scientific point of view.

India, well known for its rich spiritual and ethical values has of late become one of the most corrupt countries in the world and science and scientific research is no exception. Indian Women Scientists' Association meanwhile conducted a conference on "Science and Technology: Ethical Issues" at IWSA Complex, Vashi, Navi Mumbai, where more than 350 delegates participated and shared their ideas. A report on the conference is included in this issue of newsletter.

Profile of Dr. Smitha Lele appears in the Women Achiever's column. The L'Oreal women awardees 2011 have been announced and the details are included in this issue. Women scientists who are recipients of prestigious awards are also included in this issue. News from Headquarters and different branches are also reported. This is the last issue of the present editorial team and we thank all contributors, advertisers, trustees, executive committee members and head quarter staff for their valuable assistance for bringing out this issue in time.

Dr. Susan Eapen
Editor

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ORBITURY



We report the demise of IWSA President Dr. Uma Rao under sad circumstances on April 29, 2011. She had been the driving force of IWSA during the period 2009 -11 and the organization had made rapid strides during her tenure. We wish her eternal peace.

Announcement

The Indian Science Congress Association

Symposium Announcement

The 99th session of the Indian Science Congress Association will be held at Bhubaneswar under the auspices of KIIT University, Bhubaneswar from January 3 to 7, 2012. The focal theme of the Congress is "Science and Technology for Inclusive Innovation: Role of Women". Hon'ble Prime Minister of India is proposed to inaugurate the Science Congress. For further details, please see the website as under.

<http://sciencecongress.nic.in>

Nature news

Antimatter detector ready for launch

A heavy weight, and controversial, cosmic-ray detector is set to head for the International Space Station. The Alpha Magnetic Spectrometer (AMS) is a cylindrical magnet, which has already flown on a 1998 shuttle flight, surrounded by a suite of new instruments for detecting cosmic rays. It is the result of former NASA administrator Dan Goldin's quest to find meaningful sincere projects for the ISS, and of Nobel-prize-winning physicist Samuel Ting's unorthodox ideas about antimatter.

The USD 2-billion experiments have been sold partly as a search for regions of the Universe containing gas, stars and planets made exclusively of antimatter. This has raised eyebrows among those high-energy and particle physicists who doubt that such regions exist.

Alongside detecting any heavy antimatter nuclei which would be a smoke gun for regions of antimatter in the Universe the AMS will produce definitive data on the energy, charge and composition of cosmic rays from the sun and from astrophysical sources such as supernovae and gamma-ray bursts.

AMS will be a big advance over previous space-based cosmic-ray detectors, such as the Russian-Italian Payload for Antimatter Matter Exploration and Light-nuclei Astrophysics (PAMELA), launched in 2006. PAMELA detected positrons from the halo of the Milky Way that may have been a signal of dark-matter particle annihilating there. With 200 times the collecting area of PAMELA, the AMS should be vastly more sensitive to the same signal.

News from Head Quarters

Brief report on XI All India Meeting of Women In Science Science and Technology: Ethical Issues

IWSA's XI All India Meeting of Women in Science with the theme "Science and Technology: Ethical Issues" was held at IWSA's "ICICI" Multipurpose Hall, at Sector 10 A, Vashi, Navi Mumbai, from 28-30 January. Three hundred and forty three delegates from all parts of India participated in the three-day deliberations. There was a good representation from major institutions, viz. the DAE members from BARC, Mumbai, Rare materials Dept., Mysore, IGCAR, Kalpakkam, CIMAP-Lucknow, Shivaji University, Homi Bhabha Center for Science Education, Mumbai, University of Mumbai, MGM University, Navi Mumbai, Delhi University, Bharati Vidyapeeth Medical College, Sangli, Indian Institute of Science, Bangalore, Bose Institute, Kolkata, National Institute of Immunology, N. Delhi, colleges of Navi Mumbai, Mumbai, Amravati and Kolhapur, TISS, Mumbai, eminent doctors from Mumbai and Navi Mumbai hospitals.

The conference was inaugurated on 28th January 2011 by Dr. R.K.Sinha, Director, BARC, Mumbai and he also released the abstract book. Dr. Mahtab Bamji, Hon. INSA scientist presided over the inaugural function and Prof. P. Balaram, Director I.I.S.C., Bangalore delivered the keynote address. Dr. Uma Rao, President, IWSA welcomed the guests and delegates and gave a brief summary of IWSA's history and activities. Prof. B.S. Mahajan, Convenor of the conference, stressed on the importance and relevance of ethics to maintain scientific credibility. Dr. Sinha talked about ethical codes adopted by DAE personnel. The idea, method and practices in ethics have been part of the curriculum in BARC training school. Dr. Bamji stressed on the necessity for rational judgement with open mind, while applying ethical codes, especially in bio-chemical tests and clinical trials. Dr. P. Balaram, in his key note address opined that the pursuit of pure science requires no justification outside itself. However, applications and technologies evolving from science must have a strong basis of ethics as they are linked with humanity and nature. The inaugural function was concluded with a vote of thanks by Dr. Susan Eapen, Co-convenor of the conference.

The conference was categorized into three sub-divisions:- The first day, 28th January 2011 focused on Ethics of doing Science. The second day 29th January dwelt on Ethics in Scientific Applications (Technologies) and the third day 30th January concentrated on Ethical issues in medical practices.

On the first day, eminent speakers included Dr. M. Vijayalakshmi, Dr. Kalavathi, T. Jayanti and Vaidehi Ganesan (IGCAR, Kalpakkam), Prof. N. Raghuram (School of Biotech, N. Delhi), Prof. C. Dutta Gupta (I.I.T, W. Bengal), Dr. Neelu Srivastav (N.I.S.C & I.R.N. Delhi), Dr. Gaurangi

Maitra (Tezpur, Univ., Assam), Dr. Nutan Khalap, Dr. Neelima Prasad, Dr. G.A. Ramarao and Tessie George (BARC, Mumbai), Dr. Joy Odimegwun (Varsity Of Logos) and Dr. H. K. Anasuya Devi (IISc. Bangalore). In all, the speakers covered issues in publication, plagiarism, fabrication of data, responsibilities of whistle-blowers, learning standards and professional ethical practices. The talks were lively and aroused a lot of interest from the audience.

On the second day, there were 8 speakers:- Dr. Chitra Natarajan (HBSCE, Mumbai) Shri. H.K. Kaura (Father Agnel Engg. College, Mumbai), Dr. Sunita Mahajan (ex-BARC), Ms. Almitra Patel (Supreme Court Committee Member, Solid Waste Management, Bangalore), Ms. Grace Sirju Charran (Varsity of W. Indies, Trinidad), Dr. S. V. Chawan (University of Mumbai), Dr. Rashmi Tyagi, Dr. Karuna Ramesh Kumar (St. John's Medical College, Bangalore) and Dr. Lalita Dhreshwar, Dr. Meera Venkatesh (BARC). Together they covered the reach and range of different technologies and their ethical dilemmas: Technologies in Engineering, Lasers, Computer Hardware and Software, Waste management issues, problems in genomics and neurobiology, information technology and remote sensing, pros and cons of robotics, balancing of risks and benefits from technology, professional career responsibilities v/s institutional policies etc. At the end of the day, there was one interactive session conducted by Prof. Shubha Tole (TIFR) on mentoring issues. The entire audience participated forming groups and deliberating on conflicting situations and viable codes of conduct. Finally, the leader of each group gave presentation of their solution in practical and ethical terms and defending their view point. This was a very dynamic and active session. The winners of the essays and posters, submitted for competition were announced. The three prize winning essays were presented by the authors.

The day ended with an entertainment programme, a dance drama by Takshashila Dance Academy, Vashi, depicting excerpts from the Epic Ramayana, illustrating the high ethical codes adopted in the lifestyles of that era.

The third day concentrated on Medical Ethics. Dr. Sunil Pandhya (Jaslok Hospital, Mumbai) delivered the plenary lecture "Medical Ethics In India". Emphasizing on high standard of ethics in medicine, he concluded with 'we should do unto others what we would like others to do unto ourselves'. The eminent doctors who spoke in the following sessions were Dr. Vasantha Muthuswamy (ex-ICMR, N. Delhi), Dr. P. Vineeta (IGCAR, Kalpakkam), Dr. P. Gandhi (Sri Satya Sai Seva Organization, Mumbai), Dr. Meena Kumar (Prof. & HOD Surgery LTMMC & LTMGH, Mumbai), Dr. Neeta Dhar (Bharati Vidyapeeth Hospital, Sangli), Dr. Chitra Pai (MGM Hospital, Navi Mumbai), Dr. Sanjay Gupte (President FOGSI-2010, Pune), Dr. Malini Desai (Homeo Med. College, Goa), Dr. V. Bal (Natl. Inst. of Immunology, N. Delhi) and Dr. Avinash Supe (KEM Hospital, Mumbai). They discussed the various conflicting medical issues in Genomics, Assisted Reproductive Technology, DNA diagnosis, stem-cell therapy, embryo manipulation, organ transplantation, infective cell phone usage in hospitals and ICU's, surrogacy and euthanasia. The valedictory session

was chaired by Dr. Sudha Rao, organizing Secretary of the conference. Dr. Ravi Bapat (Vice-Chancellor, MGM University, Navi Mumbai) spoke on changing nature of medical practice and the importance of patient-doctor interaction in treatment procedures.

Dr. Sudha Rao summarized all topics of the third day and Dr. Ravi Bapat distributed prizes for best essay and posters. Dr. Bakhtaver Mahajan summed up the entire conference proceedings. She assured that a few resolutions received by IWSA organizing committee would be carefully deliberated and some effective operatives could be initiated to serve as guidelines for the presentation of ethical conduct in Science & Technology programme. Dr. Devaki Ramanathan, Jt. Secretary of the conference, gave the concluding vote of thanks.

Dr. Devaki Ramanathan

Clean and Green Cities: Initiative in solid waste monitoring & upgradation of science laboratory skills

In 2009-2010, Indian Women Scientists' Association (IWSA) launched the second phase of the "Clean and green cities" programme. The first phase (2008-2009) was aptly named as "Clean and green cities: Students' initiative in environment monitoring; this is an action-based environment education programme. In the first phase, twenty one schools from Navi Mumbai participated. Ten students from each school guided by two teachers, selected and studied specific environment problems in their schools/areas, using the methods of science, for one academic year. IWSA's core resource persons interacted and guided the teachers in the scientific approach and studied these problems. Hence as part of their project work, students studied the quality of water, air, soil in their surroundings; others looked at the wet waste generated at their school; others studied noise pollution around their schools. Prizes and certificates were given out at the end of the year in a valedictory function; Dr. JJ Irani, Director, Tata Sons, Dr. S.K. Banerjee, Director, Bhabha Atomic Research Centre, and Dr. Surekha Zindge, Deputy Director, ACTREC, Mumbai, were the guests of honour at this grand function. This phase of the programme was generously funded by Sir Ratan Tata Trust.

The second phase of this programme launched in October 2009, concentrated only on one specific aspect of environment management, i.e., **solid waste management**. This programme also included a laboratory training session along with a field visit for school teachers to sharpen their basic scientific skills, including observations and analysis. To start, twenty two schools of Navi Mumbai participated in this years' programme. School teachers had to choose a specific item, which is normally considered as waste: (1) biodegradable material: paper, cardboard, or vegetable matter; (2) building materials; (3) medical waste; (4) thermocole and (5) electronic waste. The idea of this action-based programme is to sensitise students and teachers about the large volumes of waste generated by us due to our lifestyles. In the process, teachers/students had to track these

different items right from their sources to the final end point.

Solid waste generation has recently multiplied enormously in India due to socio-economic changes and changing lifestyles, food habits and rising economic standards. Due to improper public consciousness, awareness and general apathy, and limited state enforcement of safety rules, the solid waste management has become a huge problem/issue today. Hence, it was decided to train these teachers/children as "tomorrows' citizens" to understand and appreciate the problems involved in managing different solid waste accumulation patterns.

Environmentally viable waste-management practices must go beyond its safe disposal /recovery. It must go to the root of the problems and change the unsustainable patterns of their production, consumption and final disposal. Important aspects to consider are: (1) reducing the waste, (2) adopting environmentally safe "reuse & recycle" processes, and (3) operating environmentally safe waste treatment and disposal techniques.

Again the two-tier system of guidance was adopted. Two teachers from each school attended IWSA's guidance sessions, often with 10 participating students from their school to study the specific project. Specific project was assigned to different schools by a lottery system. As solid waste management is a difficult problem to tackle, the resource persons gave detailed guidance to pursue the individual projects in different ways, collection of data, scientific analysis, projections, conclusions, etc. These sessions continued throughout the year with about one session per month.

Laboratory session: The laboratory session held for these teachers evoked great interest and enthusiasm: different scientific concepts were brought out by resource persons, assisted by teachers, in different science subjects. The subjects included microbiology, environmental science, bio-chemistry and optics (physics). Teachers were elated at the end of the session and were seen keenly observing and performing different experiments.

Another important session for this batch of teachers was the field visit arranged to NMMC's solid waste management sites at Turbhe and Koparkhairne, both in Navi Mumbai, and the "Nisargagun" plant in BARC that converts the bio degradable kitchen waste to biogas used in cooking. More than thirty teachers (from different schools) and eight IWSA resource persons attended the field visit. At Turbhe, Mr. Mule, Dy. Engineer-in-charge, NMMC, first showed a video of the details of the scientific preparation of a dumping ground at Turbhe. A leachate treatment plant has been developed at the site along with planting of trees to sustain environmental balance and also a technique to capture and contain land-fill gas methane which contributes to the green house effect. Methane gas given out by garbage could be salvaged to generate electricity. This part has been contracted to a UK firm. Mr. Mule also took the group to Koparkhairne dumping site which was used for 18 years and abandoned as it started leaching out gases (not prepared

scientifically). However, this closed dump-ground has been developed by NMMC into an attractive *Nisarg Udyan* (Nature park) with a grass meadow and a walking trail. The methane gas emitted in this area is also continuously monitored and burnt off (significantly, the levels of methane have reduced with time). The group also visited BARC training school hostel at Anushakti Nagar, to see the *Nisaraguna* bio-gas plant set up by Dr. Sharad Kale, a senior Scientist of BARC and his colleagues. The kitchen waste generated from the hostel and the neighborhood area is collected and processed for this purpose (5 tonnes per day).

Four steps were involved in this project:

1. Waste is sorted by unskilled ladies from Stree Mukti Sanghatana
2. It is processed in a mixer
3. It is predigested using special strains of microbes
4. Biogas evolved is collected and sent to the Training school hostel kitchen by a pipe. An equivalent of three gas cylinders/day is produced from five tones of wet vegetable matter.

The residual waste is dumped in manure pits and converted to manure for beautifying the garden in the neighboring areas. Dr. Kale stated that some 100 similar plants were being developed and installed in different places across the country.

The visiting group was generously hosted lunch at Anushaktinagar Training school hostel with sumptuous food prepared using the *Nisarganaruna* gas. Dr. Kale also gave a simple, illustrative and impressive talk on waste management to the teachers which was highly educative and motivating.

On 7th August, 2010, the schools concluded their individual projects with the students orally presenting their work and action plans to tackle their individual waste problems. Finally, only 14 schools presented their work: 9 English schools, 1 Hindi school and 4 Marathi schools. A panel of judges drawn from eminent scientists and a social worker evaluated and graded their performance on the basis of scientific content, originality, data collection, analysis, presentation, and conclusion. The judges were Mr. Dhananjay (Modern College), Ms. Gargi Lagu (freelancer) and Ms. Namarata Ranadive from TERI. The results were declared as follows:

English

- I Prize Fr. Agnel High School, Vashi
II Prize St Augustin School, Nerul

Marathi & Hindi

- I Prize Vidya Prasarak High School, Vashi
II Prize Dyan Vikas High School

Consolation prize

Sainath English High School, Vashi.

All the schools had taken a lot of efforts and presented their work quite well. We at IWSA were taken aback with the presentations and felt highly gratified that our efforts were not wasted. Special mention should be made of Dyan Vikas High School, who in a very innovative way presented the medical waste problem in a Marathi skit a street play like skit that would be a very powerful medium to drive the issue to the common man.

St. Augustine school had demonstrated a model to burn and dispose of the plastic waste in an innovative manner. These showed how the students, "the soldiers of the Earth" could apply their mind to solve the problem which the elders, in their irresponsible way-of-life have imposed on today's environment. Fr. Agnel school emphatically said "No to plastics" and had even stitched and distributed cloth bags (from discarded dresses, jeans etc) as substitute for (plastic) shopping bags. In fact, no student now brings any plastic in the school.

Sainath English School had done a massive survey of 15 families over 7 days to collect information on bio degradable (domestic) waste produced and collected and presented the data well. The second phase of this programme was funded by Maharashtra Pollution Control Board.

Resource persons of IWSA, the pillars on which this project solely depended were: Dr. Sudha Rao, Dr. Shubadha Nayak, Dr. Srirupa Mukherjee, Prof. Bakhtaver Mahajan, Dr. Rita Mukhopadhyaya, Dr. Devaki Ramanathan, Mrs. Meena Sharma, Dr. Sita Venkateshwarlu, and Dr. Sandra D'souza. These resource persons put in a lot of voluntary service, efforts and time to make this project a success. Our two ever smiling volunteers, Mallika and Radha, were also always there with there with a helping hand. The program will be taken forward in June 2011 and suggestions regarding its format et al are welcome.

(Program co-ordinator: Prof. Bakhtaver S. Mahajan Co-ordinators: Dr. Sudha Rao and Dr. Devaki Ramanathan)

Report on Teachers Training Inauguration 14th June, 2010 (New Batch)

The teacher's Training Course at I.W.S.A. is being conducted for the last 15 years. This one year diploma course is affiliated to the S.N.D.T Women's University at Mumbai.

This years batch was inaugurated by Mr. Madhav Shirvalkar C.E.O. Pujasoft Technology Pvt. Ltd. Airoli, Navi Mumbai, on 14th June, 2010. He highlighted the importance of computers in our day to day life. He also spoke on the various sites good for teachers and children. The use of computer as a teacher also helps them in promoting IT skills, which acts as a better method for teaching today's generation. Mr. Madhav Shirvalkar is the author of several books and is a regular writer in Loksatta. The Guest of Honour Ms. Gaurita Manjerekar, a freelancer spoke on the importance of e-

learning. The overall presentation clearly gave an idea to help oneself recognize their potential. Dr. Uma Rao, I.W.S.A. President, Dr. V. Sudha Rao, Vice President and the course co-ordinator Dr. Usha Thakare, convenor of Nursery Education Committee were also present during the function.

Science Day 2011

Science day was celebrated by IWSA on 1st March 2011, from 3.00 to 5.00 p.m., in V.G. Kulkarni auditorium, Homi Bhabha Centre for Science Education, Mankhurd, Mumbai. Dr. Uma Rao, President IWSA, welcomed the audience and introduced the speakers.

The first lecture was delivered by Dr. Brenda P. Winnewisser, Adjunct Professor of Physics, Ohio State University, U.S.A. She spoke about: A lady physicist a century ago: Hedwig Kohn (1887-1964). She outlined how Dr. Kohn was one of the only three women, who achieved the qualification for university teaching, in physics in Germany up to World War II. She was a student of Otto Lummer, expert in the measurement of intensities in atomic spectroscopy. Forced like many other scholars to leave Nazi Germany, she came to the US in 1940 and made a new life. She traced her story with the challenges Dr. Kohn faced in the realities of the era, her responses to them (she was an optimist), and illuminated the response of various institutions, German and American, to her ambitions and later her desperation. She also spoke about the situation of women in science in general and in physics in particular in Europe and North America.

Dr. Rukmini Krishnamurthy Technical Advisor, Institute of Forensic Science, Ex Director Forensic Science Laboratory, Govt of India was the next speaker. She gave a very illuminating and interesting talk on how Hi-Tech crime is being investigated with Hi-Tech methods in forensic science. How DNA technology, Narco analysis, Nuclear forensic techniques etc. are being used to provide unbiased scientific evidence to investigating agencies and in turn the judiciary system. With examples of some of the latest crimes such as the 9/11 Mumbai blasts etc. she talked about how difficult scenes of crime have to be probed to give accurate results.

She also emphasized the need to cater to the need for skilled forensic scientists and the need of disciplined educational curriculum with a dedicated Research and Development Institute. These factors are now being recognized by the governments and academic Institutes and a number of courses in forensic science are being offered in the country. She concluded that in today's age, forensic science has no longer been just a science related to law and criminals; it has moved far above the realm and has entered into the day to day life of common man.

Dr. Susan Eapen, Executive Committee member, IWSA, proposed the vote of thanks and the programme was anchored by Dr. Anjali Bhagwat life member, IWSA. High tea followed the event.

International Women's Day Celebration, IWSA

International Women's Day was celebrated on 12th March 2011 in IWSA's ICICI Multipurpose Hall at 7.30 p.m.. This year it was decided to have the young hostelites of our Vashi Hostel to speak about their experiences in their lives as many were stepping outside their homes for the first time. The response was very good and six of them participated.

Dr. Uma Rao, President, IWSA welcomed the audience and initiated the program by describing how women are playing myriad roles and taking on many responsibilities with amazing ease. She gave a short description of her life and how her mother who was widowed at 34, bravely brought up five daughters and one son supported by her grand parents and educated all of them. The role models in her life were her mother, a liberated grand mother and her sisters. Her husband and her in-laws played a very supportive role for her to pursue her Ph.D. while working in BARC and with the up bringing of her two sons. At a stage in her career, after working for 28 years she decided to spread the message of science through IWSA and took voluntary retirement.

Participants in the panel discussion expressed their journey through professional life and how they have proved themselves successful in different sectors. They expressed their thoughts and feelings of their tough and strenuous, but satisfying lives.

Nitya Ramanan from St. Stephen's College, Delhi, M. Sc. Physics (Bangalore), pursuing Ph.D. (BARC), talked about how she diversified into physics as she could not pursue MBBS. She realized and was astonished to know that she was the only girl amongst men in her section and her guide who is one of the first 20 women in the world, pursuing research in the field of developing beam lines in the country. In Nithya's words, "the world has moved from women being house wives alone to almost every field: medicine, science, sports, entrepreneurship, journalist, entertainment industry etc. The status of women in society is improving exponentially and it is up to us to keep this attitude alive", she said.

Shree Saujanya from Hyderabad, an Electrical Engineer, is in her first job and thanked her parents for supporting her career in a city like Mumbai, though there was a lot of opposition from others. She is facing the challenges of her job well.

Rashmi Goswami is a Software Engineer from far off Guwhati, Assam. She expressed how she could succeed in her journey of educational life and is proud of her occupation as a software engineer. She promised to prove herself that women can also walk shoulder to shoulder with men and is by no means behind men in any aspect of life.

It was an eye opener for many in the audience to hear Pratiksha Patade who comes from village Bori near Pune, from an agricultural background She is a software engineer specializing in Java. She focused her speech on the problems faced by under privileged section of women of

society in rural areas. She stated many valid points about preference of villagers for having boy child over girls. She expressed her concern about the obstacles faced by women in pursuing higher education in rural areas.

She herself has passed through such difficult phases, where many people were not motivating her in her pursuit of her dreams of becoming an engineer. It was her mother and sisters in the family who supported her dreams to come true. Pratiksha explained how every single penny used for her education fees was either contributed by her mother's hard work in farms, her sister's job after 12th std. and loans taken by her father. At present Pratiksha is satisfied with her career, but is dissatisfied with the pessimistic perception of villagers about women. She expressed her valuable thoughts about the contribution of every lady to address this pessimistic view of society towards women.

Salma Nadaf is a B.Sc. Biotechnology and MBA from Pune University, hailing from Solapur. She is working for Apollo Pharmacy Ltd. as a Supervisor (Operations Dept.). She explained how she is successful in her career, life and profession. She gave credit to her parents specially her mother and sisters. Traveling is part of her daily job and she is satisfied with her profession. She feels proud for proving the untrue belief of society about the education and contribution of Muslim women in society. Her main concern is about the need of social awareness, which women must have in today's era. Her main concern is to make ladies more aware about the present legal aides provided by government. She is pursuing the Civil Services exam. She concluded by requesting all ladies to bring the unprivileged society along with them and to prove that women lag nowhere behind men.

Dr. Uma Rao summarized that the program had achieved its goal to increase the awareness of women of IWSA, the need of their stand in the Indian society as well as to share their opinions and problems with other ladies present. It was a good interaction between the senior IWSA members and the young IWSA hostelites.

Ms. Chhaya Kelkar, Member, Hostel Committee thanked all the participants and all the other ladies. Snacks were served to all at the end of program.

Uma N. Rao and Salma Nadaf (Hostelite).

Report on Story Telling

The Human Development Department of College of Home Science, Nirmala Niketan, Mumbai organized a story telling competition "Tell a Tale".

Indian Women Scientists' Association, Vashi, conducting the Teachers Training Course affiliated to the S.N.D.T. University, had their teacher trainees participate in the story telling competition. Six trainees as a group dramatized the story "The Cap seller and the Money" and was awarded the first prize for "Group story telling" and "Best Co-ordinated group".

Paired story was dramatized by two trainees "Do good and good will come back to you", was awarded the best value imparting story. Individual story was presented in Hindi, using a flannel board "Apni Apni Visheshta" based on different animals in the jungle, was awarded the story with the most effective body language.

This competition gave a very good experience to all participants. There were over 20 institutes which participated and some were a part of the audience. Renowned speakers and personalities conducted workshops on topics related to story telling.

Rainbow 2011 - A colourful event

Another exciting event of IWSA was Teaching Aid Exhibition - Rainbow 2011

A three day exhibition, from 24th February, 2011 was inaugurated by Chief Guest, Mr. Nilesh Nimkar, Director, Quest India. He threw light on the educational system especially at the pre-primary level that has been harming young minds.

Rainbow A Teaching Aid Exhibition conducted by IWSA trainee teachers, is an opportunity for them to exhibit their skills, creativity and let their imagination go wild. A theme based exhibition was conducted and this year it included all things learnt from the workshops conducted and the different field trips. Two counters Origami making and puppet making attracted both young and old, where they were taught to make different origami folds and various types of puppets.

Five game stalls were put up such as, feeding the rabbit, shapes, magnetic games, games on seasons and shape it up to develop the child's skills and enhance their cognitive skills. A colourful display of their aids and journals proved their creative development.

The highlight of the exhibition as always was the puppet show. This year the name of the puppet show was "Hoshiyar Chuha Tinku" A dramatization on "Taklu the Cap seller" was shown, that won the first prize at the Inter College Competition, Nirmala Niketan, Mumbai.

The first day attracted a crowd of above 450 students and over 100 adults, who came from schools like Gold Crest, Fr. Agnels, Kidos, Sunny Smiles, Kidzee, Modern School etc.. Many other stalls such as Navneet Books, Anandita Toys, Grammangal and Warli Painting were put up.

This was a great start for IWSA which would want to go ahead.

DELHI BRANCH NEWS

1. Lectures

A lecture was arranged on 29th November, 2010 by Dr. Manju Sharma, Former Secretary to the Govt. of India, Department of Biotechnology, whose contributions have been

instrumental in shaping biotechnology research and application in the country. Presently, she is the founder President and Executive Director of Indian Institute of Advanced Research in Gandhinagar, Gujarat, Principal Advisor to the Dept. Science and Technology, Gujarat and Board member UNU-IAS Institute of Advanced Studies, Japan. Dr Sharma spoke on "Biotechnology Excitement & Relevance".

2. Member participation in other activities

Some of our members participated in the conference organized by IWSA HQ, in Mumbai, viz. XI All India Meeting of Women in Science on *Science and Technology: Ethical Issues*, held at Vashi, Navi Mumbai, on Jan 28-30, 2011.

3. Teaching aid in science

A few members provided teaching aid in science to underprivileged students of Std VII to IX by holding classes for them on various topics they found tough and giving them an insight into the subjects, thereby generating interest in science among them.

KALPAKKAM BRANCH NEWS

1. IGCAR Women Scientists including IWSA Kalpakkam members participated in the XI All India Meeting of Women in Science, *Science and technology: Ethical issues*, organized by IWSA Mumbai on 28-30 January, 2011

Following six papers were presented by IWSA Kalpakkam branch members.

1. Women in Science a compelling essentiality for a robust sustainable society Dr B. Raj and presented by Dr. Vijayalakshmi.
2. S. Kalavathi - Role and Responsibilities of Whistle Blowers.
3. Vani Shankar and R. Sandhya Ethics in Science Why is it Important?
4. T. Jayanthi and S. Usha Professional Ethics in the Pursuit of Excellence in Engineering and Technology.
5. P. Vineetha and Rani P. George Ethics in Medicine.
6. Vaidehi Ganesan - "Science and Technology: Some Ethical Issues and Solutions".

On behalf of the organizing committee Dr. Bakhtaver S. Mahajan, Convener welcomed all to the conference. This conference was aimed to strengthen science in India by creating awareness about ethical issues in science and technology. Dr. R.K. Sinha, Director, BARC inaugurated the conference and wished that the deliberations of this conference will greatly increase awareness about the many

ethical issues in S&T. The conference sensitized scientists and students about the basic tenets of ethics in science and their importance at all levels individual, institutional and societal. It was felt by all that there is an urgent need to develop formal education courses of ethics at pre/post graduate levels. Then it was also felt that there is need for good mechanisms to carry out honest assessments and good capability to address unethical behaviour at institutions. Conference was planning to come out with a formulation or code of conduct for people in S&T.

2. SPECIAL WOMEN'S DAY CELEBRATIONS ON MARCH 16TH 2011

A talk on "Being a Woman in Today's World" by Dr. Gita Arjun, Director, E V Kalyani Medical Centre, Chennai was the highlight of this event, followed by the felicitation function of Dr. A. Vijaya, Medical Supdt., DAE Hospital and a senior member of IWSA, who has taken voluntary retirement on March 15th, 2011. Dr. Rani George, Convener, IWSA welcomed all to this function and introduced Dr Gita Arjun to the audience. In addition to successfully running the Kalyani Medical Centre, she has started several preventive health programmes, "Passport to Health", "Passport to Fitness" and "Passport to Healthy eating" to help women take charge of their own health. Her talk clearly brought out the need for every woman to take good care of one's own health while doing the balancing act of family and work. She stressed the importance of giving iron supplements for 3 months of every year to every girl who attains puberty. This goes a long way for the healthy women of future. She mentioned that obesity is a common problem among women and is the root cause to most of the problems faced by women. She warned that estrogen protects us until menopause after which ladies are equally susceptible to heart attacks as men. She suggested all women to adopt an active life style with random acts of kindness that reach out to others and not overdo things trying to become best mothers, wives or career women, but to do things the way you enjoy. As parents we should learn acceptance and set limits and not boundaries to children. We should inculcate values in children more than making them achievers. 150 women scientists including IWSA members participated and also felicitated Dr. Vijaya who served our township for more than 32 long years as an excellent and empathic doctor. This programme was well attended by many of our lady colleagues as well the ladies of both the townships.

3. A Talk on "Ethical Issues Related to Advances in Science and Technology" on March 28th, 2011 by Dr. Vasantha Muthuswamy, Retd. Senior Deputy Director General, ICMR.

The members of IWSA Kalpakkam Branch who participated in the All India Womens' Conference on Ethics in Mumbai invited Dr. Vasantha Muthuswamy, retired Senior Deputy Director, ICMR, and a participant of the conference to come over to Kalpakkam and to speak to the audience there.

Dr Vasantha spoke to us on "Ethical Issues Related to Advances in Science and Technology" This talk was arranged in the Sarabhai Auditorium, on March 28th, and

around 120 participants attended. Dr. Vasantha, a WHO fellow at the Kennedy Institute for Ethics at Georgetown University, Washington DC, is well recognized nationally and internationally for bringing out the ICMR's "Ethical guidelines for biomedical research on human subjects" in the year 2000 and its revised version in 2006. This has become a landmark document in the country. She shared with us as to how the guidelines for Animal Experimentation, Stem Cell research and therapy, Safety evaluation of food derived from GE plants, etc were prepared and documented. She described the sad story of how the technology of pre natal diagnostics led to an increase female foeticides and ultimately a dramatic decline in the female/male child ratio.

She stressed the importance of including Bioethics in the syllabus of all medical colleges. By being part of the National Ethics Committee she spoke on the efforts to make these guidelines into laws. This is essential for the right use of technology.

KOLHAPUR BRANCH NEWS

1) General Body Meeting:

Convener Mrs. Dhanashri Patil arranged general body meeting at GRASP, Kolhapur dated 25/07/2010. Agenda was planning of future activities and for increasing new membership.

2) Meeting about National Meet at Mumbai:

Convener Mrs. Kalpana Savant arranged meeting for discussion of national meet at Mumbai 28th to 30th Jan. 2011.

3) Lecture on Waste Management:

On 17/01/2011, Mrs Todkar Jayshree delivered a very useful lecture on "Waste management and Composting by using Bacterial Culture". She included different aspects on waste management. Preparation of pots and beds and our duties towards society. Mrs. Todkar showed her terrace garden and explained the procedure of composting waste and raising plants. The activity in charge was Mrs. Padmshree Awate. Twenty five ladies from Budhawar Peth, Kolhapur and 10 IWSA members were involved in the activity. Mrs. Kalpana Savant, Mrs. Tejshree Patil and Mrs. Dhanashree Patil assisted.

4) Wetland Day:

International Wetland Day was celebrated on 2nd Feb, 2011, near 'KHIDRAPUR'. Khidrapur is historical place, where Wetland is of a large size. Variety of flora and fauna are present there. A number of phytoplanktons and Zooplanktons are present there. Samples were collected in bottles and polythene bags for further study. Number of trees was listed, many birds were observed and their names were also listed. *Typha* and *Cyprus* are the most dominating species in wetland, while *Hydra* is over-populated. Dr. Mrs. Niranjana Chavan and Dr. Sajid Shaikh guided students regarding Wetland activity. Along with IWSA

member, about 40 students of B.Sc I, the KIT engineering students and Shivaji University research students participated in Wetland day celebration / activity. The activity in-charge was Mrs. Tejashree Patil. Mrs. Kalpana Savant, Mrs. Padmshree Awate, Mrs. Dhanashree Patil and Spurti Bidri assisted the programme.

5) Science Day:

To get awareness about 'Nano Technology' for new generation, on Science Day 28th Feb. 2011 eminent personality Prof. Dr. P.S. Patil Dept. of Physics, Shivaji University was invited for the lecture at GRASP. He has given a lot of information on nano technology and related it with research, medicine, industries, food, cosmetics etc. Forty five students of XIth and XIIth Science classes, from Vivekanand College, Kolhapur have taken the advantage of this activity with proper interaction. The activity incharge was Mrs. Kalpana Savant. Mrs. Tejashree Patil, Mrs. Padmshree Awate. Mrs. Dhanashree Patil and Mrs. Deepa Taywade Patil assisted the programme.

6) International Women's Day Celebration:

Indian Women Scientists' Association celebrated **International Women's Day on 8th March 2011, by felicitation of women Entrepreneurs in Scientific, Agribased Business.** On this occasion, the visits to their sites were organized as follows-

*Mrs. Jayashree Todkar - Organic Waste management.

*Mrs. Sunita Patil - Green House Development, Kaneri.

*Mrs. Vijayanti Kale - Neena Foods, MIDC Gokul Shirgaon.

*Mrs. Vijaya Patil - Sajiv Nursery Kolhapur

This activity was organized for encouraging and motivating women to develop their capabilities through proper direction through eco-friendly Scientific approaches. Thirty ladies from different areas have taken the guidance and enjoyed Women's Day with a very different approach. The activity in-charge was Mrs. Dhanashree Patil. Mrs. Kalpana Savant Mrs. Padmshree Awate, Mrs. Neeta Shinde and Mrs. Deepa Taywade Patil assisted the programme.

LUCKNOW BRANCH NEWS

1st May 2010: Annual Get Together and May Day were celebrated with cheers at Gomti Nagar, Lucknow. The program was mainly organized for working women. Number of participants were about 25.

17th Sep. 2010: Engineers Day was celebrated. Er. Kshamta Sinha, Secretary talked on 'General Power Scenario of Uttar Pradesh' at Electricity Training Institute Seminar Hall, Sarojini Nagar Lucknow followed by an interactive discussion on the subject. Number of participants was about 40.

14th Dec. 2010: A powerful discussion was held at Gomti Nagar, Lucknow on "General Awareness on Energy Conservation in Domestic Sector" on the occasion of

Energy Conservation Day. The program was organized for housewives and students also. It was also decided that at least 2 members of Lucknow Branch should attend the National Conference to be held at IWSA Headquarters, Navi Mumbai from 28-30 Jan. 2011 on "Science and Technology: Ethical Issues". Er. Usha Birjee (Convener) and Er. Kshamta Sinha (Secretary) were requested to attend the same. Consequently Er. Usha Birjee and Er. Kshamta Sinha attended the Conference, which was a great success and in brief, the various ethical issues of major important sectors of S & T which have now become the need of the recent time were discussed and the various measures were suggested to manage these to sustain and enjoy a respectful life.

NAGPUR BRANCH NEWS

30th July 2010: After the very scorching summer of Nagpur, we started the activities for the year with the Annual General Body Meeting. Various programmes to be carried out during the year were chalked out. A Talk by Dr. Farhat Daud, Department of Cosmetic Technology was organized on "Protection of the skin from the sun". Dr. Daud is one of the founders and Directors of "Revayur" cosmetic products. Her speech was very interesting and evoked a good response.

04th September 2010: Every year, Nagpur Branch celebrates Teachers' Day to express gratitude and respect towards teachers felicitating its own teacher members with a small memento. The celebration was in collaboration with Somalwar Nikhalas Mahila Maha Vidyalaya (SNMMV) and an open discussion on "Teachers Yesterday, Today and Tomorrow" was held. Five teachers representing these different times led the discussion. Dr. Pradnya Bhalerao, Principal, SNMMV was the Chief Guest.

17th Sept 2010: A function was organized to celebrate Nutrition Week at Nagpur University Women's Hostel. An exhibition on "Nutrition" was put up by Apang Mahila and Bal Vikas Sanstha and was viewed by 250 inmates of the hostel. A Talk on "Your Nutrition is your concern" was also delivered by Dr. Pratibha Shastri, Head (Retd.), Food Technology Department, Nagpur University. The other speaker was Mrs. Pradyna Pande, Dietitian, NKP Salve Medical College, Nagpur.

24th October 2010: World Food Day was celebrated in collaboration with Nutrition Society of India (NSI), Nagpur and Kalakunj. Dr. Rekha Sharma, our Life Member and President, NSI, Nagpur conducted a Quiz for college students and housewives. A talk and slide presentation by Dr. Mrunalini Phadnavis, Principal, Mahila Mahavidyalaya, Nagpur was very much enjoyed by all present.

19th November 2010: IWSA, Nagpur Branch celebrated Children's Day at "Tender Buds", a school for toddlers. Dr. Jayashree Pendharkar, our Life Member and Dietitian at Central India Institute of Medical Sciences (CIIMS), Nagpur gave a talk on "How to take care of the food and food habits of the kids" for the parents of the children studying in the school. Children were given appropriate sweets.

23rd January 2011: Our regular annual "Inter Collegiate Event" was organized at the Nagpur University Women's Hostel in collaboration with Bureau of Indian Standards (BIS), Nagpur. Dr. N P Kawale, Director, BIS and Dr. Jambulkar Asst Director, elaborated on working of BIS and Consumer's awareness in details. A Poster competition on the topics, (1) Products' Advertisements and (2) Consumers and Products. was organized. Girls were very enthusiastic and 35 posters were presented. The prizes were awarded to winners.

28th February 2011: Shankarrao Dhawad Polytechnic, Nagpur, invited IWSA, Nagpur Branch, to organize Science Day Programme for their students. Essay, Poster, Project preparation competition on "Science in every day Life" was organized and best entries were given prizes. Dr. Ramkrishna Pujari spoke on "Birth of Water"

26th March 2011: Workshop on "Status of Women in India" was organized. Today women have come a long way with growing literacy and economic independence. They aspire to lead a life of dignity and self respect. To acknowledge their achievements in various fields "The Indian Women Scientists' Association, Nagpur Branch planned an innovative workshop with a scientific angle on "Status of Women in India". This was in collaboration with "The Institution of Engineers India, (IEI) Nagpur Centre" and the "Women Development Cell (WDC), Dr. Ambedkar College, Diksha Bhoomi Nagpur.

The Chief Guest to grace the function was Dr. Pallavi Darde, Additional Commissioner, Income Tax Department, Nagpur. She quoted Einstein "It's the Character which makes the Scientist and not mere intelligence" and informed the gathering citing the exact dates about the various incidents faced by the fearless women in safeguarding women's interest since 1857. Her concern was, while working for others a woman should not forget herself.

The Presentations were on the topics as below:

- 1) Save the Girl Child : Dr. Seema Ubale
- 2) Disparity with other halves : Dr. Seema Somalwar
- 3) Role of Women in bringing desirable social changes:
Dr. Bharti Ganu
- 4) Science & Technology & Women's Development :
Dr. Deepa Panekar
- 5) Role of Women in Politics: Ms. Shipra Katakwar
- 6) Role of Women in Media : Dr. Manali Kshirsagar
- 7) SWOT Analysis of Womanhood: Dr. Kalpana Date.

The presentations were followed by open discussions. Er Varghese and Er. Mrs. Vidya Sirsakar from IEI and Dr. Shobha Naranje from Dr. Ambedkar College, Nagpur were very helpful in organizing the Workshop. Members with outstanding achievements were felicitated.

News about Members:

Er. Kalpana Bhole: President of India's Award for outstanding work in Water Supply.

Dr. Preeti Katakwar: For being conferred with Degree In Naturopathy

Dr. Sumeeta Mukherjee: Visit to Vietnam representing WCL, Nagpur.

Dr. Mrs. Surekha Kalkar: Elected on Nagpur University Post Graduate Constituency as Senate Member

Dr Lalata Sangolkar: Visit to China as the only Indian Delegate to present a paper in the International Conference on Cyanobacterial Toxins

HYDERABAD BRANCH NEWS

Press Release:

Jana Vignana Vedica (Member, NCSTC-Network & AIPSN) and Indian Women Scientists Association, Hyderabad Chapter, jointly organised a one day panel discussion on "Genetically Modified (GM) Crops: How Safe, How Necessary for India's Future" on March 31, 2011 at the National Institute of Nutrition. Eminent scientists, representatives of NGOs, industries and others participated. (Programme attached). Prof. D Balasubramanian, Director Research, LV Prasad eye institute and former director CCMB, moderated the discussion. According to Dr. Mahtab S. Bamji, an eminent nutrition scientist and convener of the programme, the subject of GM crops has become a controversial issue. Such discussions are necessary to educate the public regarding the science of GM technology, and scientific evidence behind GM crops- their advantages and limitations. Recent press reports seeking 50 years ban on GM Crops, according to her are unscientific.

While most eminent scientists, (panelists) like Prof. G. Padmanaban (Hon. Professor and Former director, Indian Institute of Science, Bangalore) Prof. AR Reddy (Co-chairman, Genetic engineering advisory committee) Dr. Shantu Shantharam (ABLE-AG), Dr. B Sesikeran (Director, NIN)), Dr. J. Gowrishankar, (Director CDFD) Dr. Kiran Sharma (ICRISAT) and others, provided evidence in support of health and environmental safety and desirability of GM Crops, including Bt cotton and its widespread application in many countries including India, Dr. PM Bhargava, (Representative of Supreme Court to GEAC), presented some reports questioning its safety to health and environment and demanded more stringent experimentation to prove its environmental and health safety. Few agriculture scientists like Prof. KR Chowdry, Prof. A. Prasad Rao, Prof. N. Venugopal Rao and NGOs from Andhra Pradesh presented observations, which question the safety and sustainability of Bt cotton. Crop-improvement in terms of disease or pest-resistance through other than endotoxin gene insertion should be prioritised before opting for toxin gene process. According to Dr. Ramesh Sonti, Member, GEAC, Marker assisted selection supported by molecular breeding was less controversial, and should be the method of choice where varietal diversity permits identification of advantageous genes. This however is not feasible for all crops like egg groundnut. Foreign gene if

derived from a food crop may get better acceptance. Dr. Sagari Ramdas a veterinary scientist shared her frustration in collecting data to correlate levels of Bt to sheep that died on grazing Bt cotton leaves. While Prof. Padmanaban and several scientists advocated limited trials on Bt brinjal, there was no consensus on the issue. It was also pointed out that GM technology could help combat dietary micronutrient deficiencies and other biotic and abiotic stress in this era of global warming. There is too much pre-occupation with Bt to the exclusion of investigating GM applications in other areas. It was generally felt that GM technology is useful and several useful GM medical and health products are in market. There is need to have a re-look at the performance of Bt cotton, to find out if the adverse association is causal or non-causal. Prof. AR Reddy, Co-chairman, GEAC informed that this is being planned. Strengthening and rationalisation of the regulatory, monitoring and analytical procedures, transparency and greater empowerment of the farmers is needed. Industries have a role, but multinationals or nationals should not be allowed to become activists to push their products. There should be a dispassionate assessment of which crops and for what purpose (biotic and abiotic stress, nutrition security) is needed. Adverse farm-level observations should be objectively investigated to identify the causal factors like use of spurious seeds, selection of inappropriate soil and water conditions etc instead of throwing away the baby with the bath water.

Besides, 100 delegates representing researchers, science teachers, agriculture scientists, representatives of farmers and NGOs, activists of JVV, members of IWSA, eminent citizens like Sri K.R. Venugopal, former Secretary to the Prime Minister of India, Dr. D. Raja Reddy, Former Director, Nizam Institute of Medical Sciences, Dr. G. Ramanjaneyulu, Director, Centre for Sustainable Agriculture, Dr. Ch. Mohan Rao, Director, CCMB, and Dr. C. Mohanram, former director of National Institute of Nutrition participated in the Panel discussion.

PUNE BRANCH NEWS

Convener: Dr. (Mrs.) N.S. Rajurkar

Secretary: Dr. Madhurima Dikshit

Joint Secretary: Dr. (Mrs.) Ranjana Bhadane

Treasurer: Dr. (Mrs.) Sudha Bhoraskar

Life members: 93

1. A Lecture competition on the topic "Towards better environment" 19th Feb. 11

Indian Women Scientists' Association, Pune branch in association with Department of Environmental Science, University of Pune and The Institution of Engineers (India), Pune local centre had organized a lecture competition for M.Sc. (Environmental Science) students on Saturday 19th February 2011 at Institute of Engineers. The theme of the competition was "Towards better Environment". There was enthusiastic response from a large number of students. The students selected the various topics such as car pooling, green buildings, climate change, sustainable development,

global warming, population bomb, sacred groves, and carbon foot print and suggested various strategies to achieve the better environment.

In the beginning Prof (Mrs.) N. S. Rajurkar welcomed the chief guest and described the role of Department of Environmental science and Indian Women Scientists' Association in Environmental Awareness and mentioned this type of competition was arranged for the first time to give a platform for the students to discuss the environmental related problems and the solutions for them. Prof. R.V. Saraf expressed his views on the theme of lecture competition. The competition was inaugurated by Prof. S.F. Patil, Executive Director, International relations, Bharati Vidyapeeth and Former Vice chancellor of North Maharashtra University and Bharati Vidyapeeth. In his address he took a review of how the total environment is getting degraded day by day and also suggested the means to proceed towards better environment with explanatory examples in day to day life.

Prof. Madhurima Dikshit, Dr Ranjana Badve and Dr. Ranjana Bhadane acted as judges for this competition. The prizes were distributed at the hands of Engineer Bora, Chairman of Institute of Engineers (India), Pune local centre. Secretary Engineer Pandarkar was also present on the dias. The following were the prize winners.

First Prize: Vaibhavi Athavale, Bharati Vidyapeeth.

Second Prize: Anjali Kshirsagar, Department of Environmental Science, University of Pune.

Third Prize: Shital Bacchav, KTHM College, Nasik.

Consolation Prize: Yogesh Patil, Vasantdada Sugar Institute, Pune.

2. Celebration of Women's Day 8th Mar. 11

Department of Environmental science, University of Pune and Indian Women Scientists', Association, Pune branch celebrated International Women's Day and International Year of chemistry by arranging a seminar on the theme "Chemistry: Our Future , Our Life" on 8th March 2011. Prof. N.S.Rajurkar, convener of the seminar welcomed the guest and participants and told about the theme of seminar. The seminar was inaugurated at the hands of Prof. S.F.Patil, Executive Director, International relations and Former Vice Chancellor, NMU and Bharati Vidyapeeth. In his key note address he took a review of Role of Women scientists and progress of Chemistry. Following speakers acted as resource persons.

Dr. D.G.Naik, (ARI): **Standardization of herbal drugs.**

Dr. Smita Nilegaonkar and Dr. Vaishali Agte (ARI) : **Probiotics.**

Prof. N.S.Rajurkar, (UoP) : **Role of Nuclear and Radiation chemistry in human health.**

Dr. G.Ambika (IISER) : **Madam Curie : An icon for women scientists.**

Following women scientists were felicitated for their achievements during 2010-11.

Prof. Nilima Rajurkar
Dr. Smita Nilegaonkar
Dr. Vaishali Agate

Prof. Sudha Bhoraskar chaired the concluding session. Prof. Madhurima Dikshit compered the whole day programmes. Prof. Rajurkar proposed the vote of thanks.

The endangered nature of Flora and Fauna in Forest Year 2011

Dr. V. Abraham - Former Scientist, BARC, Mumbai

Human beings are directly or indirectly guests of green plants. Besides being the primary producers of carbohydrates and oxygen, they are also repositories of a variety of substances of medicinal, aromatic, textile and industrial value. If green plants become extinct, so would humans and all forms of flora and fauna. It is therefore important that humans view their inevitable dependence on green plants more seriously than so far. The first step is to commit ourselves to preserve what are still left intact and then to recreate as early as possible, what ever would have been the scenario, if man had not exploited nature for more than his needs.

The year 2011 has been declared as the Forest Year. On 26th January 2011, there was a conference at Kathmandu and on 4th February another meeting was held in New York in order to emphasize the value of Forests in the current situation. On 31st July 2011, there is to be another conference held at Oregon, USA to discuss about diseases and insect resistance in forest trees. Genetic resistance is the key element to maintain forest health. Genetic resistance is one of the few management options available to combat the impact on forest ecosystems and plantations worldwide.

From this point of view, the areas which require urgent attention are dealt with here.

Extinction of species in the world

Ten per cent of the tree species in the world face extinction through felling, forest fires and poor forest management according to conservationists. Dr. Steve Howard, the Head of worldwide Fund for Nature, said that already 77 species are extinct and the report has now confirmed our worst nightmare. The world has approximately 80,000 to 100,000 tree species of which 8753 species are in the danger of extinction.

Extinction or near extinction of trees in India

Even though the north east of India and the Andaman Pristine look lush green, which are the biodiversity hotspots, all is not hunky dory. Habitat loss due to deforestation and

human encroachments is quietly pushing hundreds of trees and plant species to the brink. The world conservation Union (IUCN) has put 45 tree species of India on its "red list" of threatened plant species as being critically endangered. Overall, ICUN has flagged 247 species from the country as threatened. For example, *Ilex khasiana*, a typical high altitude tree found only in Meghalaya has run into its last generation. There are just four trees left in a small area confined to Shillong peak. The ICUN's critically endangered category is for species facing high risk of extinction in the immediate future. It's strict assessment says trees like *Ilex khasiana* vanish because of low regeneration and habitat decline. 247 tree species face grave threat because of overuse for medicinal or religious purposes without adequate conservation. The red list states that there is only one *Actinodaphne lanata* tree left in the shola forest at an altitude of 1500-1800 meters in the Nilagiri hills. Similarly *Syzygium manii* is found only in middle Andamans. *Veteria indica* which is a slow growing tree found in Karnataka and Kerala is being over exploited for timber. Similar is the fate of *Ficus angladii*, a tree known from Palani hills of Tamil Nadu.

Tree species already extinct due to habitat loss which means human encroachment and deforestation, are *Ilex gardneriana*, *Sterculia khasiana*, *Syzygium gamgleanum* and *Wendlendia angustifolia*.

Can we prevent logging of wood?

A coconut tree takes 30 - 32 years to grow to a height of 40 feet whereas trees like teakwood (*Tectona grandis*), rosewood (*Dalbergia latifolia*), jackfruit (*Artocarpus intgra*) and *A.hirsuta* require much longer time to acquire a girth of about four feet. At the same time, these trees are vigorously cut down for making new houses and for furniture. Soon these trees also will reach their last generation. Another threat in the near future is for soft wood trees which are used for making plywood boxes, matchsticks and match boxes. In remote villages, people come demanding *Alstonia scholaris* and *Ailanthus altissima* trees for any price for these industries. The problem can be solved if soft wood trees are also grown in large plantations as being done for teakwood and rosewood.

Nilgiri Bio-reserve is centre of flourishing wildlife trade

This bio-reserve spreads over borders of Karnataka, Tamilnadu and Kerala which constitutes 15% of India's total protected area. This area shelters 100 mammalian species, 550 bird species and 30 reptile species, thus acquiring the unparalleled biological status. It is sad to state that live specimens and their body parts are available at over 30 spots. For about Rs.5000, one can buy an elephant tusk and Rs.100, an elephant tail hair to decorate gold rings. A pair of tiger nails costs Rs.500 and a tiger tooth Rs.300.

People can pick pets of their choice, be it an otter, barking deer, spotted deer, wild boar, jackal or jungle cat, at a bargain price from Rs.100 to 300. 15 million hectares of forest disappear from the world every year, Brazil leading with 3.7 million hectares, India with 1.5 million and Indonesia with 920,000.

Pollution threat for Kashmir fish species

Unchecked use of herbicides, pesticides and fertilizers of substandard quality dumped into Kashmir waters is the main threat of the survival of the fish species in Kashmir valley.

Sunderbans warms up

It is the largest tiger reserve in the world which had 500 tigers in the late 1960s but now between 270-350 only. But the Indian Statistical Institute (ISI) report says the number may be even lower. It is the largest mangrove reserve in the world and one of the most unique ecosystems in South Asia, recognized as the UNESCO world heritage site. The rising sea levels and coastal erosions caused by global warming are steadily shrinking the mangroves of Sunderbans, thus threatening the survival of endangered tiger population.

Chasing the Great Indian Bustard

They may not make it much longer into the 21st century given the ongoing assault on their habitat. They are heading for the iconic "Sainthood" of stuffed specimens with glass eyes and no shred of life. Among the four members of the bustard family, the great Indian Bustard is in the greatest peril. The Indian Bustard is nearing extinction with an estimated population of 500 birds and it disappeared from two sanctuaries created to protect them.

But the only good news is that the great Indian Bustard is set to return to its old stomping ground in the open grasslands of Stonehenge, in southern England. 20 chicks will form the nucleus of what conservationists hope will become UK's first breeding colony for over 150 years.

Green in Trees

Several USA companies began planting forests to capture CO₂ in the mid 1990's. They did the bulk of planting in areas such as Brazil, where land is cheap and growing season is long. So far 17 million dollars is spent to reforest about 52000 acres, which is considered as enough to absorb 11 million tons of CO₂ released during several decades. Quantifying how much CO₂ a forest absorbs is an inexact science. But the academics put the figure at about 600 tons of CO₂ per acre. Companies have planted monocultures of fast growing trees like Eucalyptus, but they do little for the wildlife.

Global warming and El Nino

The wind patterns linked to global warming over the past 50 years suggest they are slowing the planet's daily spin by about half a millisecond every century. Ocean current associated with El Nino are already known to make equatorial winds blow faster. Satellite observations showed that El Nino made days drag on by an extra 0.4 milliseconds.

Kyoto Protocol

The Rio summit of 1992 adopted the framework convention

on climate change (FCCC). It took five years for this convention to be in operation. Meanwhile there are disturbing signs of a fading resolve on the part of countries that need to cut down on the emission of green house gases (GHGS). The largest and most important GHG is CO₂ which is formed by burning of all forms of fuels. In North America, the per capita consumption of commercial energy is 40 - 50 times that of developing countries like India and Bangladesh.

Global Forest strategy must shed old leaves

The world is facing a forest crisis and global management needs new strategies, if the devastation is to be stopped. "Our forest, our future" - this was the conclusion of the world commission of forests and sustainable development. The commission found from forest dwellers and forest departments on five continents from Siberia to Haiti, forests are being destroyed far beyond their ability to reproduce. Since 1950 nearly 75% of West Africa's tropical forests have been lost. In the Indian subcontinent, 40% of the landmass was forest at the turn of the century, but now forest mass is just 7 %. In 1980, Thailand lost a third of its forest in just 10 years. Global population is expected to grow 50 % in the next fifty years. The loss of millions of hectares of forest cover is very serious because the forest provides hydrological aid for soil conservation, biodiversity and control of weather cycle. Dr. M.S. Swaminathan, a commission member and one of the architects of the 'Green Revolution' of the 1960's says, "Now the world should merge with new ideas for an Evergreen Revolution". Dr. George Woodwell of Woods Hole Research Centre, USA states "Forest has a role in supplying the world with timber and fibre".

The value of mangroves

As the value of land increases, there is a hunt to find out new areas for encroachment and this is where the mangroves are in danger. It is coming as a daily feature in our newspaper these days. Dr. M.S. Swaminathan has formed an International Team of researchers to breed, protect and multiply the mangroves. In Bombay the credit goes to Godrej group which maintains more than 1750 acres of mangroves on the western bank of Thane creek, to bridge the gap between the sea and the land. This will facilitate also for the breeding of fishes, birds and other vertebrates and invertebrates. This is the home for about 206 species of birds, 33 types of reptiles, 30 species of spiders, 20 species of fish, seven types of prawns 13 types of crabs, and 12 species of mammals. In the same way BARC also has mangroves on the eastern boundary. Even though there is no attempt to reclaim the land as a continuous process, the people staying nearby cut the mangroves to use it as firewood. This is the second hazard to this group of plants. In Bombay the NGOs and Environmentalists took up the matter in Dahisar, Mira Road and Vasai on the western Suburbs. Reclamation is going on and slow action is also coming up. The area left of Vashi Bridge is vigorously being reclaimed and so far nobody has brought it to the notice of the authorities. The main mangrove being lost is *Avicenia marina* var. *acutisima*. More interesting is the news of "Love nests" in mangrove forest at Mini Chowpathy in Navi Mumbai. This is a

new innovation of using the vast unutilized landscape to make illegal money. In this process, the perpetrators are making a 10 ft x 10 ft area of mangroves chopped at ten spots or so. The next hazard is from oil slick. Mangroves cannot survive nor propagate in such situations. Near the refinery jetty mangroves cannot survive.

Endangered vulture hatched in captivity

Now, vulture is one of the most endangered species, especially the oriental white black vulture. For the first time, the chick was hatched at Pinjore in Haryana. This is the first vulture being born in captivity in India with the support of the Bombay Natural History Society (BNHS). Vultures are nature's most efficient scavengers. Nine species of vultures are reported from India. The use of Diclofenac by human causes vultures to gradually die of kidney failure. The world alliance of Parsi - Irani Zarthoshtis has appealed to the members of the community to ask doctors to prescribe alternate drugs. The Tower of Silence at Malabar Hill needs more vultures for their religious needs and they are not turning up.

Export of medicinal plants

India is a veritable emporium for medicinal plants. A favorable policy frame work is required to promote commercial cultivation, research and development to increase the export potential. The trade in medicinal plants in India is estimated to the tune of Rs.550 crores up to 1997 and now it will be much more. The cosmetic industry and the aroma therapy are the two important areas where Indian medicinal plants or their value added extracts can contribute a lot globally. The most important item is isabgol husk and seeds, the global demand for which doubled to 16,000 tons between 1985 to 1995. The study adds that it is imperative to evolve a national policy for medicinal plant conservation.

Botanical gardens and zoos

Former prime minister of India Mr. I. K. Gujral (from April 1997 - March 1998) was keen to ensure that each state in India sets up at least one botanical garden for the conservation of our biodiversity. Letters were sent to all the then chief ministers of all states from the PMO's office. But it needs an ownership rights to avoid the widespread piracy of bioresources. The important botanical gardens in the country are Lucknow Botanical Garden, Forest Research Institute, Dehradun, Indian Botanical Garden, Sibpur, Howrah, Tropical Botanical Garden, Trivandrum, Government Botanical Garden, Ooty, Regional plant Resources Centre, Bhuvanashwar, Lloyd Botanical Garden, Darjeeling, Botanical Survey of India, Pune and Victoria Gardens, Byculla, Mumbai.

At the same time there are 107 zoos in the country. There are 50 deer parks, 16 safari parks, 6 snake parks and 24 Nature Education Breeding Centres. The central zoo authority has got the powers to wind up any zoo within six months, if it fails to come to its expectations. Needless to say, unless it enforces standards, the functioning of zoos will not improve. There is a systematic effort to breed captive

animals, and the endangered species are given top priority. Here comes the case of vulture breeding also.

The near extinct animals are given a lot of importance for protection by inbreeding whereas for plants, it is not known how many are aware of the endangered species and their usefulness. Animals are kept as a source of entertainment and show pieces in zoos whereas valuable plants are neglected. Thus hundreds of plants are vanishing without anybody's notice and that is where we should have a balanced approach towards Fauna and Flora.

Coconuts may soon be a thing of the past

Experts from The University of Agricultural Sciences (UAS), Bangalore pointed out that a mite (*Aceria gurerronis*) had been creating havoc on the coconut plantations on the outskirts of Bangalore. This mite has already done enormous damage in Kerala. The mite can attack all the nuts of a tree and almost all the trees in a plantation. The mite is carried away by wind from tree to tree. The use of chemicals has only limited scope and natural enemies such as fungal pathogens could be the long term answer.

Sacred groves

In India the only forest cover unexploited are the sacred groves, which are common in Rajasthan, Madhya Pradesh, Maharashtra, Andhra Pradesh and Kerala. They are protected shelters of rare flora and fauna and even new species are reported from such groves in Kerala. Andamans comprising of 572 small islands with an area of 8293 sq.km has one of the richest flora and fauna because of the least disturbances from biotic factors. A thirteen year old boy from Germany has motivated thousands of children around the world to take part in global initiatives against deforestation.

Mahatma Gandhi had once remarked "The earth has got enough for the man's need although not for his greed".

References

1. Abraham V. (1997). The Flora of Trombay: pp, 1-137.
2. Abraham V. (1998). Biodiversity at BARC, Trombay: pp, 1-162.
3. Houghton R. A. (1995). Deforestation, Encyclopedia of environmental biology: 449-461.
4. Mahlman J. D. (1997). Uncertainties in projections of human-caused climate warming. Science: 278:1416-1417.
5. Skole D. and Tucker C. (1993). Tropical deforestation and habitat fragmentation in the Amazon. Science: 260: 1905-1910.
6. Webster et. al. (1997). The past and the future of El Nino. Nature: 390: 562-564.
7. Times of India Daily and Hindustan Times Daily Newspapers.

Meet an eminent woman scientist



Prof. (Dr.) Smita Lele, a Life member of IWSA was awarded the Fellowship of Biotech Research Society of India (BRSI), in November 2010 during the national convention at Madurai. In January 2011, she also received the Dr. Bains Life Time Achievement Award for a Woman Scientist, given by the AFST (I), at Mysore.

Dr. Lele is recipient of several other awards e.g.: Hari Om Ashram Prerit Shri. S. S. Bhatnagar Research Award 2001 on Prevention of Water Pollution, Fellow of the Maharashtra Academy of Sciences. She is a topper throughout the academic career, was the first women engineer selected in Hindustan Lever Limited way back in 1977. After working in industry, she joined as a lecturer in chemical engineering at UDCT, Mumbai and is now the Head and Professor of Biochemical Engineering, at UDCT - now Institute of Chemical Technology.

Dr. Smita Lele has over 100 publications, of which 50 are research papers in refereed international journals, 3 books, supervised 10 Doctorates, 54 Masters and sponsored projects worth few crores. She has conducted research in the field of biological treatment of industrial effluents over last three decades and worked on problems faced by Indian industry. Food product and process development; Photo-bioreactors, microalgal metabolites and heavy metal adsorption are some other areas where Dr. Lele has made significant contribution.

In 1990 she developed a novel award winning process of simultaneous coal recovery with biogas production from distillery spent wash that is commercialized. The most recent work was on developing continuous biological treatment of concentrated, radioactive nitrate waste generated by nuclear plants. This technology has solved an important national problem that was pending for several years.

In the area of Food Technology, she has developed vegetable and fruit based products and processes, filed 4 patents and taken 2 trade marks. She was instrumental in setting up a demo plant for small scale processing of fruits/vegetables to reduce post harvest losses. This project was supported by the Rajiv Gandhi S and T Commission of the Govt. of Maharashtra.

She is also known for her contribution in popularizing science in the society and a popular figure amongst students as a mentor career counsellor. She has represented her Institute in many international visits, is expert member on several government / University Committees and active in many professional bodies. At present she is a member of the Management Council, BRSI and Vice President, AFST (I), Mumbai Chapter.

Contact: dr.smita.lele@gmail.com

DAE Scientific and Excellence Awards- 2009-10

Every year, DAE honours the scientists who have made excellent contribution towards its program in the form of awards. The awards presented for the year 2009-10, presented on October 31st 2010, reflect the significant contribution of Women Scientists as listed below.

Homi Bhabha Science & Technology Award



Dr Sadhana Mohan, who is the Head of Heavy Water Division of Chemical Engineering Group, BARC, received the prestigious Homi Bhabha Science & Technology Award for her excellent contributions from 'Concept' to 'Commissioning' in the indigenous detector grade silicon technology development programme. Detector grade single crystal

production technology is a highly challenging and demanding technology due to its stringent requirements of purity. She has been instrumental in achieving this task and it has made India to become one of the few countries in the world in successfully pulling single crystal of silicon by Float Zone method.

Scientific & Technical Excellence Awards



Dr. Sharmila Banerjee, Radio Pharmaceuticals Division, BARC for her significant contribution to the development of novel Radiopharmaceuticals. She has played a key role in setting up a laboratory facility for radiopharmaceutical research and has contributed immensely towards standardization of the challenging synthetic protocols for cost-effective sourcing of potential ligands. Dr. Banerjee

is leading the group which has achieved indigenous production of Lutetium- 177 of high specific activity, a promising therapeutic radionuclide, and has developed Lu-177 based radiopharmaceuticals for targeted radiotherapy in human patients.

Smt. Smitha Manohar, Product Development Division, BARC for her excellent contribution towards development of processes and their adoption in radiochemical plants. She has been responsible for development, design, setting up and operation of the Spent Solvent Management Facility at Trombay and she is presently engaged in setting up a similar facility at Tarapur. She has also been

involved in the development of process for actinide partitioning of high level waste wherein she has successfully demonstrated the actinide partitioning process on engineering scale using inactive surrogates. Based on this work, the setting up of an active facility at Tarapur is nearing completion.



Smt. Padmini Sridharan, Electronics division, BARC, is awarded for her excellent contribution in the development of software for systems used in reactor instrumentation and in nuclear physics experiments. Her major contribution has been in the design and development of "Real Time Data Acquisition Framework", a reusable, semi-complete application which leverages

proven software designs (patterns) and implementations. Using this approach Flux mapping system for TAPP-3&4, Digital recording system for AHWR Critical Facility, Radiation data acquisition system, Fire alarm system and RRS data acquisition system for Dhruva have been developed successfully.



Smt. R. Vijayashree, REG/NEG/CHMD, IGCAR, is awarded for her excellent contributions for the design and development of Diverse Safety Rod and its Drive Mechanism for the secondary shutdown system of PFBR ahead of schedule. The completion of its endurance testing was one of the vital steps for getting construction clearance for PFBR. She has made noteworthy contribution for

engineering development of eddy current position sensing system for drop time measurement of DSR (Diverse Safety Rods). The integration of the sensing system with prototype mechanism is currently being done. Her focus presently is on enhancing the reliability of shutdown system by one order of magnitude for future Fast Breeder Reactors.

Young Scientist Award



Dr. (Mrs.) Vinita Grover Gupta, Chemistry Division, BARC, was awarded for her excellent research contributions in the field of solid state chemistry and towards development of rare earth based novel compositions which have potential to evolve as efficient white light solid state phosphors for U-V based lighting devices. Her work has significance in various areas

such as exploring potential inert matrices for plutonium utilization, waste immobilization, establishing phase relations in some of the nuclear materials, thus providing useful database, synthesizing novel multifunctional pyrochlores with good ionic conductivity and photocatalytic properties etc.

Young Engineer Award



Ms. Menka Sukhwani, Electronics Division, BARC was awarded for her excellent contributions in the design and development of mixed CMOS-ASICs (Application Specific ICs) and for her pivotal role in setting up VLSI CAD, computational infrastructure and wafer level IC tester setup at CMEMS (Centre for

Micro-Electronics and Electro-Mechanical Systems) Center, Prabhadevi, Mumbai). She was also involved in the development of ASICs chipset for portable spectrometer and nuclear physics experiments. As a part of the chipset she successfully developed "Anushikhar" and "Anuroop" ASICs which are designed in 0.7 μm CMOS technology. Another significant and notable achievement of hers is the development of Anusmiriti ASIC and "Anusparsh" ASIC using CMOS technology.

Special Contributions Award



Dr. (Smt.) K. Jayanthi, Product Development Division, BARC, has been honoured with in recognition of his valuable contributions in the field of Nuclear Science & Technology and to the programme of the Department of Atomic Energy.

13th Annual L'Oréal-UNESCO 2011 Women in Science Awards

"The women scientists from all over the world who are receiving the L'Oréal-UNESCO Awards make it possible for us to hope for a better future."

(AFRICA and ARAB STATES)



Professor Faiza AL-KHARAFI
Professor of Chemistry, Kuwait University, Safat, KUWAIT

For her work on corrosion, a problem of fundamental importance to water treatment and the oil industry.

Born in Kuwait, Faiza Al-Kharafi earned a BSc degree from Am Shams University in Egypt before returning to Kuwait to pursue her MSc and PhD degrees from Kuwait University. She has filled in a number of teaching and research positions at the Kuwait University, including serving as the first female president of the university from 1993 to 2002. The first Kuwait-France Chemistry Symposium was held under her patronage in 2009, and she is currently Vice-President of the Academy of Sciences for the Developing World.

(ASIA / PACIFIC)



Professor Vivian Wing-Wah YAM
Professor of Chemistry and Energy, The University of Hong Kong, CHINA

For her work on light-emitting materials and innovative ways of capturing solar energy. Vivian Wing-Wah Yam was born in Hong Kong, where she pursued her university studies, obtaining her PhD at the University

of Hong Kong. After two years at the City Polytechnic of Hong

Kong, she moved to the University of Hong Kong in 1990 where she became Professor in 1997 and Chair Professor in 1999. She was Head of Chemistry for 6 years from 2000 to 2005, and became the Philip Wong Wilson Wong Professor in Chemistry and Energy in 2009 at the University of Hong Kong. She is an Academician of the Chinese Academy of Sciences, a Fellow of the Academy of Sciences for the Developing World, and has been awarded a Royal Society of Chemistry (UK) Centenary lectureship and medal.

(EUROPE)

Professor Anne L'HUILLIER

Professor of Atomic Physics, Lund University, SWEDEN



For her work on the development of the fastest camera for recording events in attoseconds (a billionth of a billionth of a second).

Anne L'Huillier obtained her PhD in Physical Sciences in France, the country of her birth, at the Université de Paris VI. After postdoctoral research in Sweden and the United States, she spent the years 1986-1995 as a researcher at the French Atomic Energy Commission. She then transferred to Lund University, where she has been Professor Atomic Physics since 1997. She has received numerous awards, is a Fellow of the American Physical Society and a member of the Swedish Academy of Sciences.

(LATIN AMERICA)



Professor Silvia TORRES-PEIMBERT
Professor Emeritus, Institute of Astronomy, Mexico City University (UNAM), Mexico City, MEXICO

For her work on the chemical composition of nebulae which is fundamental to our understanding of the origin of the universe.

A native of Mexico, Silvia Torres-Peimbert obtained her PhD at the University of California Berkeley, USA. She then became Professor in the Faculty of Sciences and the Institute of Astronomy at UNAM. Today she is Emeritus Professor and since 2009 has been Coordinator of Physical, Mathematical and Engineering Sciences at the university. She is a member of the American Astronomical Society, the Academy of Sciences of the Developing World, and is a past Vice-President of the International Astronomical Union.

(NORTH AMERICA)

Professor Jillian BANFIELD

Professor of Earth and Planetary Science, of Environmental Science, Policy and Management, and of Materials Science and Engineering, University of California, Berkeley, UNITED STATES

For her work on bacterial and material behaviour under extreme conditions relevant to the environment and the Earth.

Originally from Australia, Jillian Banfield received her bachelor's and master's degrees in Geology from the Australian National University. She subsequently completed a PhD in Earth and Planetary Science at Johns Hopkins University, USA. From 1990-2001 she was a professor at the University of Wisconsin-Madison. Since then she has been a professor at the University of California-Berkeley and an affiliate scientist at the Lawrence Berkeley National Laboratory. She has been honored with numerous prestigious awards, including a MacArthur Fellowship, The Dana Medal of the Mineralogical Society of America, and a John Simon Guggenheim Foundation Fellowship. She was elected to the U.S. National Academy of Sciences in 2006.

Earthquakes and Tsunamis

Dr. Bhupesh Kumar Gangrade

Seismology Division, Bhabha Atomic Research Center, Mumbai 400 085

Introduction

A 9 magnitude earthquake in Japan resulted in Tsunami on March 11, 2011 causing catastrophic damage to the property and environment in the country in addition to tens of thousands of people who lost their lives. Such calamities or natural disasters are not so frequent on planet earth but if they happen, the effect on civilization is devastating. Earthquakes per se do not kill people. It is the effect of an earthquake in the form of building collapse, fire, tsunami etc. which is responsible for the loss of lives. Salient features about earthquakes and tsunamis will be discussed in this article.

Internal structure of the earth and plate tectonics

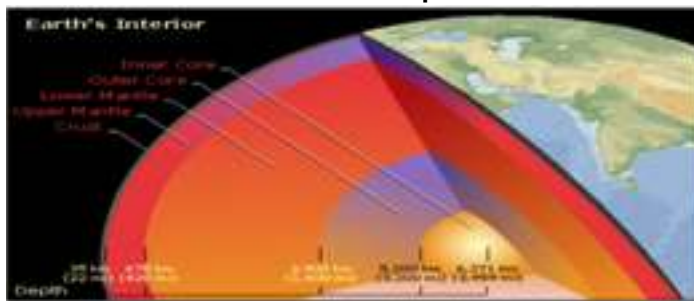


Figure 1. Cross section of the interior of the earth

Our earth is almost spherical in shape with a radius of 6370 km. The internal structure of the earth reveals that it is made up of crust, mantle and core (figure 1). The top layer of the earth up to about 50 km deep from the surface is called crust. The mantle depth goes to about 2900 km from the surface. From 2900 km depth to the center of the earth is core which is also divided into the outer core and the inner core. Outer core is liquid whereas inner core is solid. The earth's crust along with some part of upper mantle is called **lithosphere** which is a high viscosity region. The portion of mantle below lithosphere is called **asthenosphere**, a region of relatively low strength which behaves like a viscous fluid. Lithosphere can be thought of as made up of about a dozen rigid tectonic plates (figure 2) which are kind of floating on the asthenosphere. These tectonic lithospheric plates are in



Figure 2. Different plates identified on the basis of Plate tectonics

relative motion for hundreds of millions of years. The essence of lithospheric motions is large horizontal transport, from creation to destruction of plate.

Few hundred million years back all continents were joined together called **Pangaea** and all the seas were only one sea called **Tethys** sea. Then the breakup of Pangaea into two parts, namely Laurasia in the north and Gondwanaland in the south, took place. This relative movement of plates continued over millions of years and is still continuing today which has resulted in so many continents and oceans existing in the present form. Millions of years back there was sea where today our Indian subcontinent is located. About 50 million years ago oceanic lithosphere north of the Indian shield was subducting beneath Eurasia. By 40 million years ago, the oceanic material had been completely consumed, and the Indian plate started colliding with the Eurasian continental mass resulting in the formation of Himalayas and the Tibetan plateau. Mount Everest, the highest mountain in the world, is a striking example of the result of collision of plates. India continues to move northward relative to Eurasia at a rate of about 4-5 cm/year, making the India-Eurasia collision zone one of the most seismically active regions in the world.

Earthquakes

The convection current in the earth's mantle is the driving force which pushes the tectonic plates in different directions at an average rate of 3-5 cm/year. Since the rocks in the earth's crust are elastic in nature, they can store strain energy in them. Seismologist H.F. Reid proposed the elastic rebound theory of earthquakes. This states that crustal stresses, generally resulting from large-scale regional crustal shearing motions, cause strain to accumulate in the immediate vicinity of **Faults**. Faults are quasiplanar breaks or fractures in the rock across which some previous displacement has occurred and which are hence relatively weak. When the strain accumulation reaches a threshold imposed by the material properties of the rock and the fault surface, abrupt frictional sliding occurs, releasing the accumulated strain energy. This is what is called an **earthquake**. Much of the energy is consumed in heating and fracturing of the rocks, but a portion of energy is

converted into seismic waves which travel all over the earth. The point (or area) from where the energy is released is called the **Hypocenter or focus**. The point on the surface of the earth vertically above the hypocenter is called **epicenter** of the earthquake.

The two sides of the fault can slide past each other either horizontally (called strike slip fault) or vertically (normal fault or thrust fault) or the motion can be at an angle (oblique fault). Since the generation of earthquakes involves shear stress (shear faulting), they can occur in rigid materials only. 90% of the earthquakes originate from the crustal part of the earth and only 10% earthquakes originate up to a maximum depth of about 600-700 km from the surface up to which the rigidity in the material exists. Beyond 700 km. depth earthquakes can not occur. Earthquakes do not occur randomly anywhere. They occur either on plate boundaries (inter-plate earthquakes) or inside a plate (intra-plate earthquakes). Generally, inter plate earthquakes are of much larger magnitudes than intra-plate earthquakes. There are few thousand earthquakes taking place on earth everyday. However, majority of them are so small and in the sea that they go undetected.

Above processes are natural phenomena for generation of seismic vibrations. Even volcanoes and rock bursts in mines, which are natural processes also cause earthquakes. In addition, there are seismic vibrations which are artificial or man-made. For example, earth vibrations due to underground nuclear explosion, chemical explosion, reservoir (dam) induced seismicity, removal of oil from oil wells etc. are all man-made events.

Earthquake waves (or Seismic waves)

When an earthquake occurs, different types of waves are emanated from the source. There are basically four types of seismic waves: **P-waves, S-waves, Love waves and Rayleigh waves**. Love waves were discovered in 1911 by the mathematician A.E.H.Love and Rayleigh waves were discovered in 1887 by scientist Lord Rayleigh. P and S waves are called body waves because they travel throughout the interior of the earth (note that S-waves do not travel through the earth's liquid outer core). P-waves are longitudinal waves whereas S-waves are transverse waves. Love and Rayleigh waves are called Surface waves because they travel only along the earth's surface and they decay very fast with depth. All these waves travel with different velocities ranging from 3 km/sec to 14 km/sec. In general, P-waves travel fastest, S-waves travel with a velocity 1.732 times less than that of P-waves and Love and Rayleigh waves travel with velocities about 0.9 times the velocity of S-waves.

Seismic waves also undergo reflection, refraction, diffraction, polarization, dispersion, attenuation etc. like electromagnetic waves. Much of our knowledge of the interior of the earth, right from surface to its center (6370 km deep), has come from the study of earthquake waves only. These waves act as a probe of the earth's deep interior.

Earthquake measuring instruments

As discussed above seismic waves of different kinds take different paths to travel all over the globe and are detected by the instruments called **seismometers**. These instruments convert ground motion into some form of signal (e.g., voltage, counts etc.). The amplitude vs. time trace of a seismic wave recorded by the seismometer is called a **seismogram**. Seismometers are of different types which record earth displacement, velocity or acceleration. **Accelerometers** are the instruments which are designed to record strong ground accelerations at frequencies of 5-10 Hz or more. These types of instruments have very high natural frequencies compared to the ground vibration frequencies needed to be recorded. The amplitudes on seismogram are directly proportional to the ground acceleration. **Displacement meters** are the instruments which directly record ground displacements. In such instruments, ground vibration frequencies are much higher than the natural frequency of the instrument. The instruments which directly measure the ground velocity are called **velocity transducers**. That means the seismogram amplitude is directly proportional to the ground vibration velocity. In these instruments which are most commonly used, ground vibration frequency to be recorded and natural frequency of the seismometer are almost same.

In general, seismometers are of two types: vertical and horizontal. As the name suggests, a vertical seismometer detects earth vibrations which are in the vertical direction whereas a horizontal seismometer detects horizontal earth vibrations. Whenever any earthquake takes place, the waves reach recording stations at various angles with respect to vertical (called the angle of emergence). The amplitude of the wave arriving at a recording station is a vector sum of its amplitudes in horizontal and vertical directions. Therefore, depending on the angle of emergence of the wave, horizontal seismometer and vertical seismometer will accordingly record wave amplitudes. These days there are compact instruments which are 3-component recorders which record one vertical and two

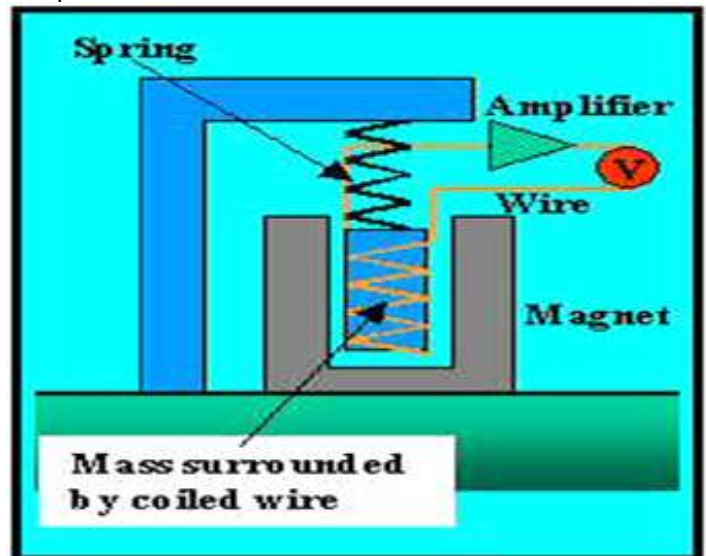


Figure 3. Principle of seismometry

horizontal (North-South and East-West) components of earth vibrations. These instruments are highly sensitive and they can record earth vibrations of the order of nanometers.

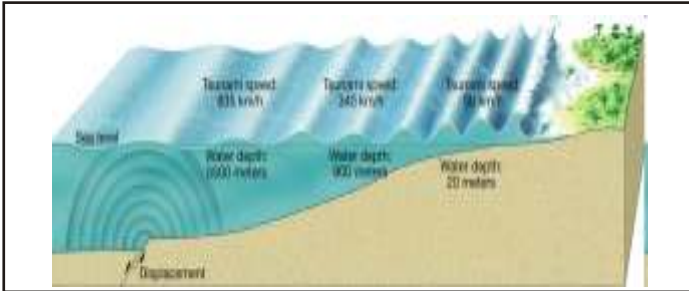


Figure 4. Undersea earthquake results in Tsunami formation

The basic principle of working of a seismometer is based on the Faraday's law of magnetic induction (figure 3). The instrument consists of a freely suspended magnet and electrical coil surrounding it. There is a relative motion between the coil and the magnet due to an earthquake because the coil (attached to the frame of the instrument) follows earth movement whereas heavy magnet stays put. This relative movement between a coil and a magnet generates an electromotive force (e.m.f.) which is amplified and recorded. The earthquake wave amplitude gets modified during propagation due to geometrical spreading, inelastic attenuation and reflection/refraction at boundaries.

Earthquake Magnitude

The size of an earthquake in terms of its magnitude was given for the first time by U.S. seismologist Charles F. Richter in 1930s. He had developed the magnitude scale to quantify local earthquakes in and around California region. It is on his name that the magnitudes of earthquakes are generally reported in Richter scale. For smaller magnitude earthquakes which occur close to the recording stations, Richter magnitude scale gives correct values. But for longer distance and larger magnitude earthquakes, this scale is not suitable. A word of caution is required at this stage because it is a misnomer to quantify earthquakes taking place anywhere in the world on Richter magnitude. However, even today television and print media still call an earthquake magnitude on Richter scale which is wrong.

There are many magnitude scales which have been developed over the past few decades. They are body wave magnitude M_b , Surface wave magnitude M_s , local magnitude M_l , Moment magnitude M_w , Lg wave magnitude $M_b(Lg)$, Duration magnitude M_d etc. All these magnitude scales have been empirically obtained to quantify an earthquake. Every scale has certain restrictions. However, the most accurate scale so far is seismic moment magnitude, M_w , which is based on the logarithmic scaling of seismic moments (M_0) to give numerical magnitudes that are roughly comparable to older magnitude scales. This scale gives an idea of the total energy released in an earthquake. The general form of all magnitude scales is given by $M = \log_{10} (A/T) + f(h) + C_s + C_r$, where A is the ground displacement of the phase on which the amplitude scale is based, T is the time period, f is a correction factor for epicentral distance (θ)

and focal depth (h), C_s is the correction for the siting of the station (e.g., variability in amplification due to rock type) and C_r is a source region correction. Logarithmic scale is used because the seismic-wave amplitudes of earthquakes vary enormously. A unit increase in magnitude corresponds to a 10-fold increase in amplitude of ground displacement. For example, the relative ground displacement for 8 magnitude earthquake would be 10 times more than 7 magnitude earthquake whereas the displacement for a 9 magnitude earthquake would be 100 times more than a 7 magnitude earthquake.

The seismometer recordings at different distances will show different amplitudes and frequencies of the waves recorded. However, each one will estimate almost similar values of earthquake magnitude because of the compensating factors (or correction factors) as mentioned above.

Tsunami

Tsunami is a Japanese word which means "harbour wave". It is long-period gravity wave in the ocean. Tsunamis are excited by large-scale displacements of water due to earthquakes, landslides in the sea, volcanic eruptions or most importantly sea-bottom displacements caused by fault motions in the earth under the sea. Even the impact of cosmic bodies, such as meteorites, can generate tsunamis. Water pressure sensors in the deep ocean can record passage of tsunamis larger than a few millimeters, but most tsunami records are from tide gauges in harbors. The periods of Tsunami waves may range from 200 sec. to 2000 sec. and wavelengths of tens of kilometers. The speed at which tsunamis travel varies as the square root of the water depth. Generally, the velocity of Tsunami wave in deep sea is 700-900 km/hr i.e., about the speed of a jet airliner. Its speed goes on reducing as it approaches the shore (figure 4).

Whenever the water in the sea is displaced from its equilibrium position due to any of the above mentioned phenomena, waves are formed as the displaced water mass, which acts under the influence of gravity, attempts to regain its equilibrium. The wave so formed may or may not become a devastating tsunami depending on the volume of water displaced. As a tsunami leaves the deep water of the Open Ocean and travels into the shallower water near the coast, it transforms. The tsunami's energy flux, which is dependent on both its wave speed and wave height, remains nearly constant. The shallowing of the water in the harbor, along with geometric effects, influences the peak amplitude of the tsunami wave. This run-up effect is due to the decrease in velocity as the depth shoals; the kinetic energy of the wave is transformed into gravitational energy by increasing the wave height. Tsunami wave amplitudes in the deeper part of the ocean may range from few centimeters to a few meters in height, but run up of these long period waves on shore may reach the heights of few tens of meters as it happened in Japan earthquake recently.

It should be clearly remembered that only when there is lateral variation in ocean depth, tsunami can be generated. Horizontal motion of the fault can never generate tsunami

even if it is a very large magnitude earthquake. Tsunami warnings are issued in the areas where a potential tsunami can strike so that people can evacuate coastal areas and save their lives. This is possible in such places where there is enough time for seismologists to analyze the earthquake parameters and issue warning to the people so that they are able to go inland well in time before the tsunami strikes.

Role of Chemistry in Development of Technology for Hydrogen as Future Energy Carrier

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An increase in the energy consumption of a country provides a positive impact on the economic as well as social development of the country. The energy requirement of the world has been increasing due to increasing world population, technological development and increased living standards. The world currently uses about 12 terawatts (TW, 10^{12} watts) of power, about 85% of which is generated by burning of fossil fuels. The fossil fuels such as petroleum and natural gas are non renewable and are expected to last for another 40 to 60 years based on the current energy consumptions. The global warming, mainly caused by CO_2 emissions generated from the combustion of fossil fuels is another critical energy issue. As a consequence, investigations of alternative energy strategies have become important. The most important property of alternative energy source is their environmental compatibility. In line with this characteristic, hydrogen is one of the most attractive energy carriers in the near future. Much research, including experimental and theoretical studies, has recently been carried out on hydrogen energy. These studies indicate that the role of hydrogen energy will become increasingly important, and the world energy systems may undergo a transition to an era in which the main energy carriers are hydrogen and electricity. In this article, the role of chemistry for the development of hydrogen energy based technologies are discussed, whose aim is to achieve a more environment friendly and a more sustainable society.

Although it is the most common element in the universe, hydrogen is not found in pure form on our planet. It is present in very large amounts combined with oxygen as water and with carbon and other elements in fossil fuels. The idea of using hydrogen as a fuel is very old and dates from its isolation by Henry Cavendish in 1766, to the beginnings of fuel-cell developments by W.R. Grove in 1839, to current times. Serious experimental and theoretical studies on hydrogen-production technologies began during the early 1970s and the main focus has been on water splitting using nuclear heat, direct water splitting on semiconductors using solar insolation (water photolysis or photocatalytic water splitting). The ultimate hydrogen economy is expected to have the following features (i) low-cost production of hydrogen using either renewable or inexhaustible primary energy sources, and (ii) oxidation of hydrogen in fuel cells in fuel cell hybrid vehicles with very high conversion efficiencies [1].

Our current industrial system relies on the use of fossil fuels as primary energy source. The largely fossil-fuel based economy is currently undergoing rapid changes because of the need to minimize air pollution in our urban centres. It is desired to replace gasoline and diesel powered vehicles by fuel-cell hybrids with on-board reforming of fossil fuels. This conversion proves to be economically viable compared to production of electricity from renewables (e.g. biomass, wind energy, photo voltaics etc.). Thus production of hydrogen from fossil fuels continues to add carbondioxide to the atmosphere as hydrogen from electrolysis of water works out to be high - cost hydrogen.

A new avenue for arriving at the hydrogen economy involves the use of nuclear energy as the primary energy supply source. Both conventional fission and breeder reactors require cooling loops with peak temperatures around 1000-1200 K in the normal cooling cycles. A large number of low temperature thermal cycles have been designed for water splitting using sun or nuclear reactor as primary energy input. None of these has as yet entered the competitive market place. The most promising methodologies are those that couple heat energy provided from nuclear fission reactors to the water splitting cycle, but even these are not likely to compete with direct fossil fuel utilization unless projected environmental changes are levied for carbon-dioxide additions to the atmosphere.

In the following sections, the research efforts aimed at hydrogen production from water splitting cycles will be discussed along with brief accounts of research efforts on hydrogen storage and utilization in fuel cells. So far, none of these efforts has progressed to the point of possible near future commercial viability, and therefore, plenty of research is going on that leads us to hope for the progress in this direction.

Hydrogen Production Using Nuclear Technologies

Hydrogen can be produced by thermo chemical and/or electrochemical processes using nuclear energy as the primary thermal energy source. Nuclear energy can be used in hydrogen production mainly in three ways: [2].

- (1) By using the electricity from the nuclear plant for conventional liquid water electrolysis.
- (2) By using the heat and electricity from the nuclear plant for high temperature steam electrolysis or the hybrid processes.
- (3) By using the heat from the nuclear plant for thermo chemical processes.

Electro chemical Processes

Electrolysis of water or steam at different temperatures can lead to the decomposition of water. High temperature steam electrolysis (HTSE) is the electrolysis of steam at high temperature. The total energy required, H , is composed of the required thermal energy, Q , and the Gibbs free energy (electrical energy demand) G . The total energy increases

slightly with temperature. The electrical energy demand, G , decreases with increasing temperature leading to increased direct heat requirement. The decrease in electrical energy demand drives the thermal to hydrogen energy conversion efficiency to higher values. This is one of the primary advantages of HTSE. The higher temperature also favours the electrode activity and helps lower the cathode and anode over voltages. Therefore, it is possible to increase the electric current density at higher temperatures and consequently lower the polarization losses, which yields an increase in the process efficiency.

High temperature steam electrolysis using ceramic electrolytic cells is representative of the new advanced technologies, which avoid corrosion problems. The reaction scheme in the HTSE process is the reverse of that in a solid oxide fuel cell (SOFC), which is being developed for application in the power industry. The HTSE process is particularly advantageous when coupled to high efficiency power cycles. The steam electrolysis concept can be coupled to a range of nuclear technologies, such as gas-cooled reactors, lead-bismuth-cooled reactors and molten salt cooled reactors, all of which can deliver relatively high temperatures and high net power cycle efficiencies.

In the development of HTSE, chemists will play the important role in development of materials for the various cell components such as electrolytes, electrodes, interconnects etc.

Thermo chemical Processes

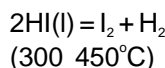
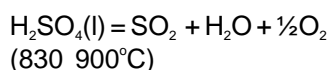
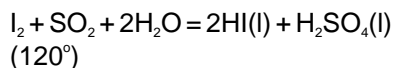
Thermo chemical processes for hydrogen production involve thermally assisted chemical reactions that release hydrogen from hydrocarbons or water. The most wide spread thermo chemical process for hydrogen production is the steam methane reforming (SMR) process. While this technology is the most economic today, it yields considerable carbon-di-oxide emissions. Therefore, SMR is not favoured for a long term hydrogen economy. Alternative thermo chemical processes are those which do not have hydrocarbon feedstock but which split water into hydrogen and oxygen through a series of thermally driven chemical reactions. The purpose is to generate hydrogen at lower temperature than that for pyrolysis of water, which takes place at temperatures greater than 4000°C. In the long term, the low cost of water itself and avoiding CO₂ emissions totally are the main benefits of water splitting approach. A recent study [3] has identified two thermo chemical water splitting cycles which have the highest commercialization potential, and practical applicability to nuclear heat sources. These are the sulfur-iodine (S-I) and calcium-bromine-iron (UT3) cycles. The S-I cycle is being investigated by General Atomics (USA) and Japanese Atomic Energy Research Institute (JAERI). The UT3 cycle which is so called in recognition of its origin at the University of Tokyo, is being investigated by JAERI.

In Chemistry Division, BARC we have recently taken up studies on the S-I Cycle, with a view to demonstrate a lab-scale experiment on hydrogen production by this

thermochemical cycle. Efforts are on at the Bhabha Atomic Research Centre to develop the S-I thermo chemical process so that a hydrogen production plant can be set up by utilizing the heat from the proposed Compact high Temperature Reactor at Vishakhapatnam.

The Sulfur-Iodine (S - I) Thermochemical Cycle

The sulfur-iodine (SI) cycle was proposed by General Atomics in the mid 1970s. It consists of the following three chemical reactions which yield the dissociation of water.



The whole process takes in water and heat, from high temperature nuclear reactor and releases hydrogen and oxygen. All other reagents are recycled and there are no effluents. Decomposition of sulfuric acid and hydrogen iodide involve aggressive chemical environments. Hence, the material candidates for the S-I cycle hydrogen plant should be chosen carefully to accommodate corrosion problems. The sulfuric acid decomposition reaction requires a catalyst to generate sulfur di oxide in good yield. Thus, development of catalysts, and materials for handling the aggressive chemical environments are the major challenges for this process, which are being addressed by researchers working in the field of physical chemistry and materials chemistry.

Hydrogen from Biomass

Biomass is a widely available renewable resource. Thermo chemical conversion processes produce hydrogen from hydrocarbon and biomass derived gases. Hydrogen can be produced by pyrolysis or gasification of biomass resources such as agricultural residues, for example, peanut shells or crops specifically grown for energy uses. Biomass pyrolysis produces a liquid product (bio-oil) that contains a wide spectrum of components that can be separated into valuable chemicals and fuels including hydrogen. Advanced separation technologies are being researched to reduce cost and to increase efficiency. In particular, research is needed for better heat integration, durable and active reforming catalysts, efficient purification technologies etc.

Hydrogen from Photoelectrochemical Water Splitting

Photo chemical hydrogen production systems integrate a semi-conducting material and a water electrolyser into a single monolithic device to obtain hydrogen directly from water, using light as the only energy input. Current research is focused on the materials science and engineering of a light harvesting system with suitable energetics to device the

electrolysis reaction that is also stable and durable in an aqueous /electrolyte environment. This research, building on the multijunction technology developed by the photovoltaic industry over the last 25 years, is exploring a variety of surface treatments to address energetics requirements and corrosion and designing new catalysts for water splitting reactions. Research is also underway to identify efficient, low cost materials and systems for scale-up from the laboratory phototype production facilities.

Hydrogen Storage

Hydrogen is the lightest element and has the highest gravimetric energy content of any known fuel. Its low volumetric energy density, however, makes it challenging to store. Hydrogen storage is a key technology for the advancement of fuel cell power systems in transportation applications. Low cost, energy efficient storage of hydrogen will be needed for stationary and portable applications and throughout the hydrogen delivery system infrastructure.

For hydrogen to be a competitive fuel for vehicles, the hydrogen vehicle must be able to travel a comparable distance to conventional hydrocarbon fueled vehicles. Hence storage and transport of hydrogen is necessary. Today's state-of-art for on-board hydrogen storage is 5000- and 10,000 psi compressed gas tanks and cryogenic liquid-hydrogen cylinders. Storage of gaseous hydrogen is very risky and this is another challenge taken up by chemists. Hydrogen can also be stored in advanced solid state materials via reversible sorption process or chemical reactions in conventional metal hydrides, complex metal hydrides and in carbon materials.

Deriving Energy from Hydrogen

Hydrogen can be converted into electrical and thermal energy through thermo chemical (combustion engines and turbines) or electrochemical (fuel cells) processes. The main by-product of both processes is water. Hydrogen can be used in combustion engines in the same manner as natural gas, while fuel cells use the chemical energies of hydrogen directly to produce electricity and thermal energy. Since electrochemical reactions do not require combustion to generate energy, fuel cells are more efficient, quieter and cleaner than combustion engines [4].

The use of hydrogen in engines is a fairly well developed technology. Other combustion applications are under development, including new combustion equipment designed specifically for hydrogen in turbines and engines. Vehicles with internal combustion engines fueled by hydrogen and hydrogen-natural gas blends are now in demonstration phase.

Fuel cells are an important technology for the hydrogen economy and have the potential to revolutionize the way we power our nation by linking efficient, clean and fuel flexible energy conversion to locally available renewable energy resources. Today, fuel cells are being developed to power passenger vehicles, commercial buildings, homes

and small devices such as lap-top computers. Fuel cells are classified primarily by the kind of electrolyte they use. They also differ by the kind of chemical reactions that take place in the cell, the kind of catalyst required, the temperature required and other factors. These characteristics in turn affect the application for which these cells are most suitable. There are several types of fuel cells currently under development, each with its own advantages, limitation and potential applications as shown in Tables 1 and 2.

Table 1. Different Types of Fuel Cells

| Fuel Cell Type | Mobile Ion | Operating Temperature | Applications and Note |
|----------------------------------|-------------------------------|-----------------------|--|
| Alkaline (AFC) | OH ⁻ | 50-200°C | Used in Space Vehicles e.g. Apollo, Shuttle |
| Proton Exchange Membrane (PEMFC) | H ⁺ | 30-100°C | Vehicles and Mobile Applications and in Low Power CHP Systems |
| Direct Methanol (DMFC) | H ⁺ | 20-90°C | Suitable for Portable Electronic Systems of Low Power |
| Phosphoric Acid (PAFC) | H ⁺ | ~220°C | Large Number of 200 kW CHP Systems in Use |
| Molten Carbonate (MCFC) | CO ₃ ²⁻ | ~650°C | Suitable for medium to large scale CHP Systems, upto MW Capacity |
| Solid Oxide (SOFC) | O ²⁻ | 500-1000°C | Suitable for all sizes of CHP Systems, 2 kW to multi-MW |

Table 2. Range of Applications of Different Types of Fuel Cells

| Typical Applications | Portable Electronic Equipment | | | Cars, Boats and Domestic CHP | | Distributed Power Generation CHP, also buses | | |
|---|---|----|-----|---|-----|--|------|-----|
| Power In Watts | 1 | 10 | 100 | 1k | 10k | 100k | 1M | 10M |
| Main Advantages | Higher Energy Density than batteries Faster recharging | | | Potential for Zero Emissions Higher Efficiency | | Higher Efficiency Less Pollution Quiet | | |
| Range of Application of the different Types of Fuel Cells | DMFC | | | AFC | | MCFC | | |
| | PEMFC | | | | | SOFC | | |
| | | | | | | | PAFC | |

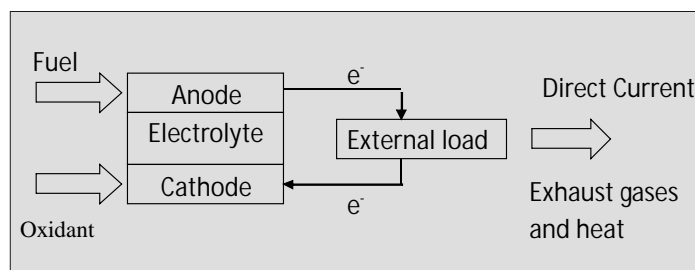


Fig. 1. Schematic diagram of fuel cell operation

A typical fuel cell consists of two electrodes (the anode and the cathode) separated by an electrolyte. (Fig. 1) Fuel (e.g. hydrogen) is fed to the anode where it is oxidized and electrons are released to the external circuit. Oxidant (e.g. oxygen) is fed to the cathode where it is reduced and electrons are accepted from the external circuit. The electron flow from anode to cathode through the external circuit produces direct current electricity. The electrolyte conducts mobile ions between the two electrodes. Practical fuel cells are not operated as single units; rather they are connected in series to build up the desired voltage. A series of cells is called a stack. An inter-connect connects the anode of one cell to the cathode of the next cell in a stack. The role of chemists in fuel cells research is to develop suitable cell components that are chemically compatible with each other at high temperature operations and have the desired electronic and thermal properties.

Concluding Remarks

Development and utilization of more efficient energy conversion devices are necessary for sustainable and environmentally friendly development in the 21st century. For achieving this, electricity and hydrogen are expected to become the two major energy carriers. Hydrogen, as well as electricity, could be produced by many kinds of primary energy, namely fossil fuels, renewable energy sources and nuclear energy. Hydrogen is superior even to electricity in some ways, since its transmission by pipelines over long distances consumes less energy than the transmission through wires of the same amount of energy as electricity. But one of the practical difficulties in using hydrogen as a fuel is its tendency to react over time with the metal in pipelines or storage containers in which it is used. This difficulty may be overcome by developing composite materials rather than single metals as the structural materials for storage and transport facilities. The problem of devising a practical, economical and safe way of storing hydrogen has to be achieved.

Fuel cells are fundamentally more energy efficient and can achieve as high as 70-80% system efficiency in integrated units including heat utilization, because fuel cells are not limited by the maximum efficiency of heat engines or IC engines dictated by the Carnot cycle. Further research and development are necessary in the areas of hydrogen production, storage and utilization in fuel cells for achieving sustainable and environmentally friendly energy security for the future, where the role of researchers in the field of materials chemistry will be very important.

References

1. S.S. Penner, Energy 31 (2006) 33-44.
2. B. Yildiz and M.S. Kazimi, Internatinal J. Hydrogen Energy 31 (2006) 77-92.
3. G.R. Besenbruch, L.C. Brown, J.F. Funk, S.K. Showalter, The First Information Exchange Meeting on Nuclear Production of Hydrogen, Paris, France, October 2000.
4. J. Larmine and A. Dicks, Fuel Cell Systems Explained, Wiley, London, (2003)

Worth a read!!

Mr Zaidi a senior citizen has compiled various Schemes, Concessions and Benefits for the Senior Citizens of India, which they can avail of. Many senior citizens do not know these facilities and face unnecessary hardships.

The first step is to get a valid card of proof of being a senior citizen. Mr. Zaidi can be contacted on 022-23718132.

Here is a brief compilation of same for your ready reference

- (1) Court cases involving senior citizens
- (2) RTI Act (Right to Information Act)
- (3) Health Care
- (4) Finance & Taxation
- (5) Banking
- (6) Telecommunications
- (7) Travel by Indian Railways
- (8) Travel by Airlines
- (9) Travel by Roadways (state transport)
- (10) Law (Legislations)
- (11) Old Age Homes and Recreation Centres for Senior Citizens

For details of the above schemes one can visit the site.
[Http://www.voice4india.org/2008/04/08/benefits-concessions-schemes-senior-citizens-india/](http://www.voice4india.org/2008/04/08/benefits-concessions-schemes-senior-citizens-india/)

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