IWSA NEWSLETTER

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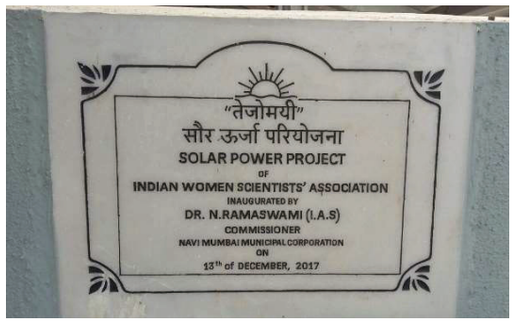
Bioinformatics Workshop -RNA seq data Analysis, December 1-4, 2017



Inauguration of "Tejomayee" IWSA's Roof Top Solar Power Project on December 13, 2017

Inauguration of the Science Academies' Refresher Course on "Foundations of Physical Chemistry and its Applications" on 15th December, 2017

BRANCHES

Roorkee 1979 . Hyderabad 1979 . Pune 1980 . Nagpur 1982 . Kolhapur 1982
Delhi 1987. Kalpakkam 1987. Baroda 1988 . Amravati 2010

Workshop on "Stress Management, Personality development and Goal orientation" by Institute of Psychological Health (IPH) on 9th November 2017 at IWSA Campus

BRNS Popular Science Talk on "Secondary Metabolites and Metabolic Engineering of Medicinal Plants" by Dr. Sudhir Singh at VES College, Chembur, 2nd December, 2017

BRNS Popular Science Talk by Dr. Shyamala Bharadwaj on "Is Water the Coal for Future?" at Sophia College on 8th December, 2017

BRNS Popular Science Talk on "Cancer Prevention using Dietary Phytochemicals"by Dr. G.B. Maru at D.Y. Patil University, Belapur on 12th December, 2017

BRNS Popular Science Talk on "Human genome project" by Dr. Rita Mulherkar at Ramnarain Ruia College, on 13th December, 2017

Participants of the Refresher Course in Chemistry with Prof. Vasudeva Rao, Vice Chancellor, HBNI on 28th December, 2017

From the Editor's Desk

Dear IWSA Members,

In this issue of Newsletter, besides our regular features of reports regarding Popular Science Lectures, Workshops, Science Nurture Programs etc., we bring you the detailed report of some of the important activities conducted at IWSA headquarters and some of the branches.

A detailed report on the fifteen - day Refresher Course in "Foundations of Physical Chemistry and its Applications" sponsored and supported by three National Science Academies - Indian Academy of Sciences (Bengaluru), Indian National Science Academy (New Delhi) and The National Academy of Sciences, India (Allahabad) held during 15-30 December, 2017 at IWSA Campus at Vashi, Navi Mumbai is included in this issue. A three day exhibition on "DAE Technologies in the Service of the Nation" which was held during the Refresher Course was attended by more than 800 visitors consisting of school children, college students and many others. A glimpse of the exhibition is brought to you in this issue.

Installation of a 20.4KWp roof top Solar PV Electricity generating system at IWSA Headquarters was another feather in the cap of IWSA' Green initiatives. We report some of the salient features of this event. Highlights of important activities at the Headquarters like, Workshop on Stress Management for School Children, Workshop on Food garden, Cancer Detection Camp, Workshop on Bioinformatics etc are presented.

You can also read about the interesting activities held at IWSA Branches at Amravati and Nagpur. In the previous issue we reported about the achievements of Dr. Mahtab Bamji, an eminent nutrition specialist. In this issue, we bring you a very informative and useful article by her on nutrition. Finally, a short note about the Nobel Prizes 2017 awarded for contributions in Chemistry, Physics and Medicine is included in this issue.

I hope that all of you will enjoy reading about these reports and the scientific information content of this Newsletter.

With best wishes

Shyamala Bharadwaj
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Editorial Board

President's Message

Dear Members of IWSA,

This News Letter is the last issue for the year 2017. It covers the last quarter of the year. September to December bring information about the Nobel prizes along with the beginning of the holiday season which starts with Dassera, Diwali and Christmas and the anticipation of the New Year to follow.

The Nobel prizes this year have recognized scientists for their work on Gravitational waves (Physics prize), Cryo electron microscopy (Chemistry prize) and Circadian Rhythms (Physiology and Medicine). You will note that the early observations in the laboratory have taken decades to develop to their present status wherein they are able to explain astronomical/morphological/ biological observations in great depth. Nobel Prizes are truly the scientific community's recognition of the most important discoveries of the time.

Dr. Mahtab Bamji, one of IWSA's very senior members is a very well acknowledged scientist in the field of Nutrition. In this issue she tells us about her entry into the field of Nutrition and her passion for the science and the efforts required to take the results at the bench in the laboratory for the benefit of Society at large. She was acknowledged for her work with the recognition of the Living legend award of the International Union of Nutritional Sciences in Oct 2017. Dr. Bamji, we have a lot to learn from you.

Our Amravati and Nagpur branches have been active with several programs. It is encouraging to see that both branches could organize the program with CDAC to inform schools in the area about OLABS, which are the virtual on line laboratory experiments for the CBSE syllabus. Amravati branch has made tremendous efforts to conduct programs for society. We look forward to our other branches coming forward with activities which ensures that science is made available for societal benefit.

This year at headquarters we have conducted a Refresher Course in Chemistry for College teachers. The detailed write up in this issue gives you the intense efforts put in by the coordinator of the course, Dr. Shyamala Bharadwaj who is also the Editor of our Newsletter, for this program. A small workshop on RNASeq analysis for students and researchers and several lectures on contemporary topics conducted in different colleges has ensured that we keep college students and teachers informed about the latest in different areas in science. In parallel we have given school children the attention they need. A program to guide students to address stress and define their goals was conducted in November. The children in our Science nurture program have learnt the connection between the food they eat and the science they learn in their schools. A major addition to our green initiatives at the headquarters is the solar electricity generating system. We are happy that our electricity needs are now supported through solar energy. All these activities and more which are in the newsletter have kept the members at headquarters extremely busy and we must admit it has been an educative and wonderful experience for us too.

With Best Wishes for the New Year

Dr. Surekha Zingde
surekha.zingde@gmail.com

Reports from Head Quarters

IWSA Popular Science Lectures

1. BRNS Popular Science Lecture at VES College, Chembur on 2nd December, 2017

A popular science lecture titled "Secondary Metabolites and Metabolic Engineering of Medicinal Plants" by Dr. Sudhir Singh, NABTD, BARC was conducted at VES College, Chembur, Mumbai on 2nd December, 2017 at 11.30 a.m.

Secondary metabolites are compounds with a restricted occurrence in taxonomic groups and play an important role in the interaction of the cell (organism) with its environment. In plant kingdom, >100000 secondary metabolites have been discovered. Due to large biological activities, plant secondary metabolites have been used for centuries in traditional medicine. Now a days, they correspond to valuable compounds such as pharmaceutics, cosmetics, fine chemicals, or more recently nutraceutics. The production of these compounds is often low (<1% dry weight) and depends greatly on the physiological and developmental stage of the plant. Many plants containing such high-value compounds are difficult to cultivate or are becoming endangered because of over-harvesting. The biotechnological production of valuable secondary metabolites in plant cell or organ cultures is an attractive alternative, but has had only limited commercial success. This is due to enormous chemical diversity in their structure and limited information about their biosynthesis in the plant. In recent years with the advent of various 'omics' technologies, it is relatively easy to decipher whole biosynthetic pathway of a compound in the plant. Detailed understanding of such pathway can help us to engineer plant cell and organ cultures for improved levels of product of interest. Camptothecin is an important anti-cancer compound for treatment Colon Cancer. He spoke on his attempts to clone genes of Camptothecin pathway in *Nothapodytes foetida* and expression in *Ophirrhiza rugosa.*

Dr. Susan Eapen Member, Board of Trustees, IWSA spoke about the various activities of IWSA and the efforts to popularize science among students. The lecture was attended by 170 students and teachers. Students and teachers from Somaiya College and KBP College also attended. There was an active discussion after the lecture.

2. BRNS Popular Science Lecture at Sophia College for Women, Bhulabhai Desai Road, Mumbai on 8th December, 2017

A popular science lecture was delivered by Dr. Shyamala Bharadwaj, former senior scientist BARC and currently, Secretary, IWSA, on "Is Water the Coal for the Future?" at Sophia College for Women, Bhulabhai Desai Road, Mumbai on 8th December, 2017 at 11:30 am.

Increase in global energy demand during the 21st century, combined with the necessity to reduce the green house gas emission, has lead to the introduction of a new and universal energy carrier, viz., hydrogen. Today, most of the hydrogen production comes from hydrocarbons: oil (18 %), coal (30 %) and natural gas (48 %). Only about 4 % of H_2 comes from water through electrolysis. Water and biomass are viable long term candidate raw materials for hydrogen production, as the fossil resources are dwindling and there are limitations on the release of green house gases. Two processes that have greatest likelihood of successful massive hydrogen production from water are electrolysis and thermochemical

cycles. The thermochemical cycles are processes where water is decomposed into hydrogen and oxygen via chemical reactions using intermediate species which are recycled. The required energy can be provided by nuclear energy or by solar energy.

Hydrogen can be produced by thermochemical 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: (i) by using the electricity from the nuclear plant for conventional liquid water electrolysis, (ii) by using the high temperature heat and electricity from the nuclear plant for high temperature steam electrolysis or the hybrid processes and (iii) by using the heat from the nuclear plant for thermochemical processes.

In this talk, Dr. Shyamala Bharadwaj explained how future energy demands will be met by hydrogen and thus water will be the coal for the future. Ms. Madhu Pahwa, Joint Secretary, IWSA and Dr. Shyamala Bharadwaj gave a brief account of activities of IWSA to the audience. About 75 students and several teachers from Sophia College attended the lecture. The students actively participated in discussion after the lecture. Dr. Shyamala Bharadwaj distributed certificates and trophies to the best students with excellent academic performance.

3. **BRNS Popular Science Lecture at D.Y. Patil University, C.B.D. Belapur on 12th December, 2017**

Dr. Girish B. Maru, Honorary Consultant, ACTREC delivered a lecture at D.Y. Patil University, Department of Biotechnology and Bioinformatics, C.B.D. Belapur on 12th December, 2017 at 2.30 p.m. The topic of the lecture was “Understanding the Molecular Mechanism of Cancer Prevention using Dietary Phytochemicals: Experimental Models to Clinical Trials”. Chemoprevention is one of the cancer prevention approaches wherein natural /synthetic agent(s) are prescribed with the aim to delay or disrupt multiple pathways and processes involved at multiple steps i.e. initiation, promotion, and progression of cancer. Amongst environmental chemopreventive compounds, diet/beverage-derived agents are receiving increasing attention, due to their long history of exposure to humans, high tolerability, low toxicity, and reported biological activities. The presentation compared the available evidence on chemopreventive efficacy and probable mechanism of chemoprevention by selected dietary phytochemicals (capsaicin, curcumin, diallyl sulphide, genistein, green / black tea polyphenols, indoles, lycopene, phenethyl isocyanate, resveratrol, retinoids and tocopherols) in experimental systems and clinical trials. Most of the dietary phytochemicals referred above have demonstrated chemopreventive efficacy against spontaneous or carcinogen-induced experimental tumors and/or associated biomarkers and processes in rodents at several organ sites. The observed anti-initiating, anti-promoting and anti-progression activity of dietary phytochemicals in carcinogen-induced experimental models involve phytochemical-mediated redox changes, modulation of enzymes and signaling kinases ultimately leading to effects on genes and cell signaling at multiple levels. Results from clinical trials using these compounds have not shown them to be chemopreventive. This is probably due to lack of our (a) ability to replicate the conditions of exposure levels, complexity, and other host and lifestyle factors, and (b) knowledge about the mechanisms of action and toxicity of the agent on normal physiological processes in different organ systems. Current research efforts in addressing the issues of exposure conditions, bioavailability, and the mechanism of action and toxicity of dietary phytochemicals may help address the reason for observed mismatch that may ultimately lead to identification of new chemopreventive agents for protection against broad spectrum of environmental exposures, he said.

Dr. Surekha Zingde, President, IWSA spoke about the various activities of IWSA. There was an active discussion after the lecture. About 65 participants attended the programme.

4. BRNS Popular Science Lecture at Ramnarain Ruia College, Mumbai on 13th December, 2017

Dr. Rita Mulherkar, former Senior Scientist, ACTREC spoke on "Human genome project and its applications in medicine" at Ramnarain Ruia College, Mumbai on 13th December, 2017 at 10.00 am.

More than a century after Gregor Mendel propounded the theory of heredity, scientists discovered that DNA was the source of genetic information. Soon after that the three dimensional structure of DNA, with the iconic image of double helix was solved. Also the three letter genetic code was deciphered. Scientists discovered enzymes that could cut and paste DNA. In the 1970's two technologies transformed the field of genetics – sequencing and cloning of genes. Simultaneously, Sanger devised methods to sequence DNA using copying reactions of polymerases. In the 1980's these techniques were used to map and identify genes linked to diseases such as Huntington's disease and Cystic Fibrosis. This opened up a new era of patient management using DNA. The technology led to the most ambitious project termed Human Genome Project (HGP).

HGP was an international project to sequence the complete human genome – all our genes together, the first draft of which was published before time in 2001. One of the objectives of HGP was to generate comprehensive sets of reagents and data that would create kits for genomics-based research. DNA sequencing technology and the machines for sequencing evolved. Whole genomes could now be sequenced in much shorter time and at an affordable cost. Genomic maps and sequences including databases of sequence variation, clone libraries and cell lines were generated. Genomes of disease causing microorganisms could be sequenced. The science of genomics showed a tremendous potential for improving health.

All individuals have genome sequences which are about 99.9% identical. The remaining 0.1% is responsible for the genetic variation. Based on the genetic variation in humans the concept of precision medicine has evolved. Genetic variants which contribute to human conditions were discovered. The field of medicine is changing with the field of genomics. Diagnostic and prognostic kits have been developed based on genomic data. Genomics has become a central discipline of biomedical research. Her lecture was received with great interest by participants. There was an active question–answer session and students wanted IWSA to conduct more such programmes. Dr. Susan Eapen, Trustee, IWSA spoke on various activities of IWSA and its efforts to popularize science among students and teachers. About 200 students participated in the program.

Science Nurture Program

1. Workshop on "Stress Management, Personality Development and Goal Orientation" by Institute of Psychological Health (IPH), Thane on 9th November, 2017

A one day workshop on "Stress management, personality development and goal orientation" was organized by IWSA for 104 students of X std from Sainath English High School on 9th Novemeber 2017 at IWSA campus. This workshop was conducted by Institute of Psychological Health (IPH), Thane from 8 am to 2 pm.

The workshop was conducted by 4 volunteers from IPH. The students were divided into two equal groups and each group was handled by two volunteers. The volunteers were Mr. Surabhi Naik (Psychotherapist), Mr. Swapnil Pange, Ms. Aishwarya Natekar and Ms. Iravati Josekar, (all clinical psychologists) from IPH. The topics covered in this workshop were-

1. Stress / distress/tension/nervousness - behavioural problems /family constraints – and how to conquer them. Sources of stress are generally- biological /emotional and mental short coming- manifestation in the student's life. Identify how the stress affects the individual – biologically emotionally or mentally the physical symptoms that can be detected.
   Optimal stress or healthy stress is essential and unhealthy stress will blow the situation out of proportion. The volunteers conducted interesting and interactive demos through acting by students for identification of the different stress conditions and manifestation.
2. Learning disabilities and understanding them – whether difficulty is in studying or in writing – finding out where one's weakness lies and how to tackle it.
3. Study skills and techniques for preparing for exams – disciplinary techniques for learning hard concepts / subjects: employing physical movement exercise/ rhetoric/even punishment.
4. Memory technique through an activity called VAK: Visual Auditory / Kinesthetic – helps to know which style of learning is more effective for the individual. It was presented as to what are Visual or Auditory techniques. Visual aids like flashcards improve learning efficiency.
5. How to set goals and train to focus your most effective time for study / your own style and speed of learning, judgment of available time and degree of difficulty of the task / subject and reduction of other distractive factors.
6. A technique- Fitting an imaginary device in your head – TENSOMETER – to identify whether one is suffering from mild tension / full tension or healthy tension (HT). Its range is to be assigned so that it helps in problem solving, enhances capability to do hard work and solution finding techniques.
7. Relaxation techniques using square breathing and muscular relaxation were also taught.

A parents' session was also conducted for two hours and about 100 parents attended the session. This session was taken up by Dr. Shubha Thatte, Founder Trustee and Clinical Supervisor, IPH, Thane.

2. Workshop on Food Gardens on 11th September, 2017

A workshop on Food Gardens (Batata-Wada, Idli-Dosa and Puri-Bhaji) was conducted at Science nurture class on 11th September, 2017. Besides learning about propagation, transplanting, potting and other horticultural practices, the children were exposed to various culinary techniques like fermentation, steaming, boiling, frying etc. The nutritional and medicinal value of the ingredients was also discussed. The children were divided into three teams and they worked in groups. This was an attempt to teach science along with life and social skills through the medium of a garden.

Nursery School and Education Committee

As part of child welfare learning, the trainees visited education and training centre for differently abled children on 22nd September, 2017. They interacted with the students and enacted a Pratham story. The trainees visited ARWA and Kilbil Day care at BARC on 6th October, 2017 to observe the working of ideal day care centre. Trainees also visited Muktangan a new model of education for underprivileged children in Mumbai on 24th November, 2017. The students of Training of Teachers program learnt innovative things about preschool and pre-schoolers.

IWSA Nursery school children celebrated 18th to 22nd September, 2017 as pet week. Cat, dog, parrot and turtle were brought to the class and the children enjoyed playing with them. For Diwali, children did wet painting and decorated class with their wet paintings. They made chakly and laddu in the class. The Nursery kids celebrated Children's day in the IWSA garden. They also celebrated community helper's day with our gardener Krishna bhai. On 21st and 22nd December, 2017, the kids went to a picnic at Mina Tai Thakre Garden, Sector 10, Vashi and then had a Christmas party in the IWSA garden respectively.

Picnic and Christmas Party by Nursery Kids

IWSA's Murli Laj Chugani Health Care Centre

IWSA conducted a Cancer Detection Camp in collaboration with Samata Mahila Mandal, Nerul, Navi Mumbai in the S.S. High School, Nerul on 19th November, 2017. The team from Indian Cancer Society, Parel, carried out the various checks for oral, breast and cervix cancer. They also provided counselling to the 99 women who attended the camp. The camp was sponsored by Mrs Vinita Mantri and Ms. Jyoti Nadkarni in memory of their parents Drs. Jayshree Nadkarni and Jagdish Nadkarni.

IWSA's Satish Haware Computer Education Centre

A workshop on Bioinformatics was organized by IWSA from 1st to 4th December, 2017. This workshop was on high throughput sequencing data analysis, for post graduate students of Biotechnology, life sciences and computer science. Unix commands to basic script writing in shell was practiced by all the 15 participants using the computers available at the computer centre. Students learnt to execute the READemption analysis pipeline. Lectures on NGS platform, databases, metagenomics and future job opportunities were conducted by Dr. Rita Mukhopadhyaya, Mr. Nikhil Gadewal and Dr.Suresh Shettigar.

Special Reports

1. **Installation of a 20.4KWp roof top Solar PV Electricity generating system at Indian Women Scientists' Association, Vashi, Navi Mumbai**

Indian Women Scientists' Association established in 1973, has always been a champion of sustainable green initiatives. It has always upheld the values of 'Excel, Inspire and Empower' for women and children through its multitude of community welfare and science education activities. Great pains were taken by our founder members to maintain an environment free from plastics and other hazardous elements. Four decades ago, it started with retention of ground water by the use of minimum cementing of the one acre ground of IWSA.

Currently, the IWSA Complex houses : (i) a 160 capacity working women's hostel, (ii) Day care Center for children, (iii) Nursery school and Nursery teachers' training course affiliated to SNDT, (iv) Science Laboratory to teach science to underprivileged students, (v) Library, (vi) Computer Center and (vii) a Health Care Centre. We continue to build a sustainable environment around us.

As part of its green initiatives, IWSA has implemented various projects related to environmental sustainability with effective solid waste management systems. These include a biogas plant, rainwater harvesting, incinerators for sanitary napkins, grey water harvesting and

a solar water heating system. These have successfully resulted in an effective management of our resources.

We have moved a step further now, in our green energy initiatives, by installing a Solar PV electrical generating system of 20.4KWp with a Net Meter system. This solar system is expected to lower IWSA's electrical consumption from MSEDCL by about 30%, thus enabling us to save considerable amount of money, which could be used for other important projects of IWSA.

On 13th Dec 2017, Dr. N. Ramaswami, Commissioner, Navi Mumbai Municipal Corporation (NMMC), inaugurated the 20.4KWp roof top Solar PV electricity generating system,"Tejomayee" at IWSA's headquarters in Vashi, Navi Mumbai. Dr. Sudha Padhye, Founder member of IWSA, Dr. Sudha Rao, Trustee, IWSA, members of IWSA and its Executive committee and well-wishers were present on the occasion. In his address to the audience, Dr. Ramaswami appreciated IWSA's efforts towards Women Empowerment and popularization along with awareness of science to the masses to ensure that laboratory science reaches the society at large. He offered support from NMMC where ever possible. He also informed that he would consider IWSA's support for the proposed Science Park of the NMMC.

2. Science Academies' Sponsored Refresher Course on "Foundations of Physical Chemistry and its Applications"

The Science Academies' Sponsored Refresher Course on "Foundations of Physical Chemistry and its Applications" was held at Indian Women Scientists' Association Head Quarters at ICICI Multipurpose Hall, Sector 10-A, Dr. Mar Theophilus Marg, Vashi, Navi Mumbai 400703 during 15-30 December, 2017. The fifteen day course covered various topics in physical chemistry such as, quantum chemistry and molecular structure, chemical thermodynamics and applications, electrochemistry and applications, physical chemistry principles involved in analytical chemistry, physical organic chemistry, catalysis, interfacial chemistry and chemical kinetics. The course comprised of lectures, tutorials and experiments.

The advertisement for the Refresher Course appeared in the July 2017 issue of Current Science and August 2017 issue of Resonance. Thirty eight post graduate teachers and six students from all over India had applied. After screening, selection letters were sent to 26 participants (22 outstation and 4 local participants) and they were requested to confirm their participation by 15th November 2017. Others were kept in the wait-list. As only about 50 % of the selected participants confirmed their participation, selection letters were sent to the wait-listed participants. Many of them accepted the offer. As on 11th December, 2017, the confirmed list of participants was 26 (22 outstation and 4 local). Just two days before the start of the course, emails were received from several confirmed participants about their inability to attend the course. The main reason for their inability to attend was that they did not get leave from their college. Finally, 18 participants attended the course on all the fifteen days (10 outstation and 8 local participants). Four local participants were contacted and requested to participate in the course on 14th December, 2017. Out of the 10 outstation participants, six were men and were accommodated in BARC Guest House at Anushaktinagar, Mumbai. The four outstation women participants were accommodated in IWSA's Working Women Hostel at the venue of the Refresher Course.

The course was inaugurated by Dr. J.P. Mittal, former Director of Chemistry Group, BARC and INSA Senior Scientist. Dr. Indira Priyadarsini, Director of the Course welcomed the participants and guests and explained the genesis of the course. Dr. Surekha Zingde, President, IWSA made a presentation about the various activities of IWSA and highlighted the efforts of IWSA in regularly organising the Science Academies' Refresher Courses in various disciplines. Dr. Shyamala Bharadwaj, Coordinator of the refresher course presented the overview of the lectures and various activities planned for the next fifteen days. Dr. J. P.Mittal spoke about the various educational programs of the Science Academies and motivated the participants to actively involve themselves in the activities of the Science academies. Vote of thanks was given by Dr. Lalitha Dhareshwar, Vice President of IWSA.

Several evening lectures were arranged during the course. Some of the eminent speakers of the evening lectures were: Padma Shri. Dr. J.P. Mittal, who is a fellow of all the three science academies and a distinguished INSA Senior Scientist, Prof. Lakshmi Kantham, Fellow of NASI and INSA and the first woman director of a CSIR Institute, Dr. Swapan Ghosh, fellow of all the three science academies and a well known theoretical chemist, Prof. Vasudeva Rao, Vice Chancellor of HBNI and Prof. Shridhar Gadre, Shanti Swaroop Bhatnagar Awardee, Fellow of IAS and INSA. The talks by these distinguished speakers were highly motivating for the participants. All the lectures were very well received by the participants and there were intense discussions with the speakers.

One of the main highlights of the Refresher Course was the one-day workshop on Physical Chemistry Experiments conducted by scientists from Homi Bhabha Centre for Science Education (HBCSE) on 18-12-2017. The participants were given certain experimental problems and there were discussions on how to interact with students and make them interpret the observations from these experiments. The participants interacted with the scientists of HBCSE and there were lively discussions about conducting experiments in physical chemistry and interpreting the results.

Two visits to the R&D centre of ONGC at Panvel, Navi Mumbai were arranged on 20-12-2017 and 21-12-2017. The scientists of the centre enthusiastically explained to the participants of the course about how these R&D centres find instant solutions to the various problems faced by the Oil and Natural Gas industry. Various aspects of corrosion problems, including those due to microbial attacks on the oil pipe lines, effects of parameters such as viscosity etc on the flow rates of oil and gas, and several day to day problems faced by the industry and how the R&D centre addresses these problems were explained to the participants. The participants also had an exposure to experimental aspects of scanning electron microscope and microstructural analysis of structural materials used in the industry. Overall it was a rich experience for the participants of how the knowledge gained in class rooms can be applied to solve problems of industry that serves the nation.

The participants learned about several analytical techniques such as ICP-MS, ICP-OES, gas chromatography, XRD, photo luminescence, thermal analysis etc during their visit to Bhabha Atomic Research Centre on 22nd December, 2017. The participants were highly motivated by the scientists who explained to them the intricacies of doing experiments with sophisticated equipment and interpreting the results with careful observations.

As part of the Refresher Course, an exhibition cum poster display of various technologies developed by Department of Atomic Energy (DAE) for the societal applications was organized

during 18-20 December, 2017. The participants learnt about the mandate of DAE to harness atomic energy for generation of a clean, green and benign source of electricity and how the activities of DAE are also for other societal applications in a variety of areas like health-care, agriculture & food, water resource management, industry, environment, research and education.

There was a one - day workshop on Mass Spectrometry and its applications on 29th December, 2017. There were lectures on various types of mass spectrometers, mass analysers, detectors etc,, followed by demonstration of a proto type quadrupole mass spectrometer which has been designed and fabricated at Technical Physics Division of Bhabha Atomic Research Centre. This motivated the participants about indigenous development of instruments. They also had hands on experience in observing and interpreting mass spectra.

On the concluding day of the Refresher Course (30-12-2017), an additional lecture on "Chemical Ecology" was delivered by Dr. Meena Haribal, who has conducted research in chemical ecology for almost 25 years at Cornell University and Boyce Thompson Institute in Ithaca, NY, USA. This lecture was not in the original schedule of the program, but was included so as to provide a completely different aspect of chemistry i.e. chemistry and biology to understand our environment. We were fortunate that Dr. Haribal agreed to speak during her visit to IWSA on 30th December, 2017. This was followed by Prof. Gadre's lecture on "Electrostatics Landscapes of Molecules". All the participants actively interacted with the speakers during both these lectures.

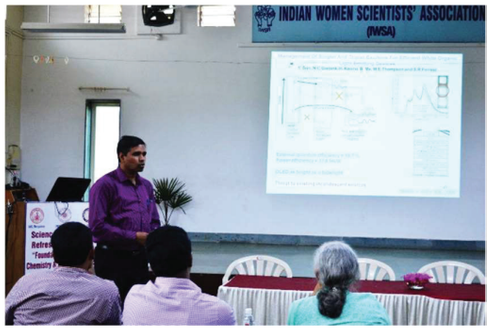
The participants then had a very interesting interactive session with a panel of distinguished scientists, who are also well known for their contributions towards chemistry education. The panellists were: Prof. Shridhar Gadre of Pune University, Prof. V.K. Jain, Director, Centre of Excellence in Basic Science, Mumbai University and Prof. S.D. Samant, a renowned scientist from Institute of Chemical Technology, Mumbai and Former President of Association of Chemistry Teachers. Initially, the panellists spoke about their views on chemistry education and research. The participants then expressed their difficulties in teaching some of the topics in chemistry to undergraduate students and the panellists advised them on how these difficulties can be overcome. There were also lively discussions between the participants and panellists about interdisciplinary research and how there are no boundaries such as physical chemistry, organic chemistry etc. and for that matter even among various disciplines of science like, chemistry, biology, physics etc. Ideas on how the teachers can motivate their students to consider and address research queries were also discussed. Dr. Indira Priyadarsini, Dr. Shyamala Bharadwaj, Dr. Leela Jain and Dr. Surekha Zingde also expressed their views and gave suggestions during the discussion.

The panellists presented the participation certificates and books on chemistry to all the participants at the Valedictory Function. The course was well appreciated by all the participants, speakers and guest participants and all of them expressed their view that this course will go a long way in enhancing the teaching capabilities of the post graduate teachers.

Dr. Shyamala Bharadwaj
Course Coordinator

Participants listening to lectures with keen interest and carrying out some experiments

Visit to ONGC R&D Centre,21st December, 2017



Participants sharing their experiences with others

Participants of the Refresher Course with some of the faculty

3. DAE Exhibition held at the Indian Women scientists' Association (IWSA), Vashi, Navi Mumbai during December 18-20, 2017

An exhibition of posters explaining the DAE activities that are contributing to the progress of our nation was organised by IWSA at its headquarters during December 18-20, 2017. The exhibition was visited by the participants of the refresher course as well as students from nearby schools and colleges according to the following schedule:

18th December, 2017 – Students from Sainath English Medium School, Vashi, the students of Teachers' Training program of IWSA, Science Nurture Students of IWSA. IWSA Members, Office and other administrative staff of IWSA, IWSA Library users and IWSA Hostel girls. Total Visitors : 80.

19th December, 2017 – Participants of the Refresher Course, Students from KBP College, Vashi and other senior citizens visitors. Total Visitors : 102

20th December, 2017 – Students from KBP College, Sainath English Medium High School, St. Mary's School, ICL School and Modern School – all from Navi Mumbai. Total Visitors : 600

The students visited all the posters and they were given explanation by the scientists from BARC about the significance of the technologies developed by DAE for societal benefits and for the progress of the nation. The students enthusiastically participated in discussions with the scientists. It was evident from the enthusiasm shown by the students that this exhibition will go a long way in motivating them to take up science as their career and contribute to the society.

Participants of the Refresher course at the Exhibition

Benefits of Radioisotopes for management of Cancer are explained to the students

Use of Radiation in Food Technology

Tele-ECG Machine developed by BARC

Reports from Branches

Amravati Branch

1. CDAC Teachers Training Workshop

A workshop for school and junior college teachers was organized by IWSA Amravati branch in collaboration with CDAC, Navi Mumbai and Bhartiya Mahavidyalaya, Amravati. On 11th July, 2017, Mr. Samadhan Manore, Senior Technical Officer CDAC trained the trainee teachers for using O Lab developed by CDAC. The teachers were given hands on training of web based access, experiments and evaluation components aligned to CBSC curriculum and interactive simulation.

IWSA, Amravati Branch members contacted all the CBSE, ICSE schools for active participation of the teachers. The response was overwhelming. Fifty six participants from 30 schools enthusiastically participated in the workshop. The success of the workshop was due to the untiring hard work by the Amravati Branch members Dr. Ingole, Dr. Maggirwar, Dr. Rathor, Dr. Parhate, Dr. Kulkarni, Dr. Pande, Ms. Patharkar, Mrs. Sirsat, Dr. Kadu, Dr. Dawande and Dr. Wasnik.

2. Yog Samellan

A social program of "Yog Samellan" was jointly arranged by Mahila Patanjali Yog Sameeti (MPYS) and IWSA, Amravati Branch specially for women and children of Khatakali village, Chikhaldara, Dist. Amravati on 24th October, 2017. Scientific information about Yoga and their benefits were explained to the people with demonstrations. On this occasion, sarees, education material, charts and healthy snacks were distributed amongst women and children. The success of the program was due to the efforts by Amravati Branch members, Dr. Mithilesh Rathor and Dr. Vandana Parthate.

2. Awala Processing Karyashala

Awala Prakriya Prashikshan Karyashala was arranged in collaboration by Vidya Bharati GEMS, Mahila Patanjali Yog (MPY) Sameeti and IWSA, Amravati Branch. Dr. Archana Kakade, subject expert, Krishi Vidhnyan Kendra described how Awala processing can be done and how this would prove to be a source of additional income to farmers and house wives. Mrs. Sandhya Wankhade, district coordinator MPY Sameeti, demonstrated some of the recipes like awala candy, pickle, chyawanprash, murrabba, etc. She also distributed the recipe books to the participants. About 75 IWSA, Amravati Branch members, staff and MPY Sameeti members attended the workshop.

Dr. F.C. Raghuwanshi, Dr. Archana Kakade, Mrs. Sandhya Wankhade and Dr. Deeplaxmi Kulkarni were present on the dias. Dr. Mithelesh Rathor conducted the programme and Dr. Vandana Parthate presented vote of thanks.

4. Vaidhnyanik Swayampakghar

Bharatiya Mahavidyalaya, Amravati, IWSA, Amaravti Branch and Sakal "Madhurangan" arranged a lecture on science in kitchen for beauty and health for women. The increasing expenditure on health medicines and cosmetics is a matter of concern for every woman. Mrs Chaya Deshmukh described that the traditional recipes and home- made beauty products like turmeric water, amla- alovera juice, lemon - vegetable crush are safe and cost effective. She emphasized the need to do Yoga for better health and to utilize lots of fruits and vegetables for better health of women and her family. About 50 IWSA members of Amravati Branch and Sakal Madhurangan members were present for the lecture.

Nagpur Branch

Training Workshop for Teachers on-"Using and Managing O Lab Resources"

Indian Women Scientist Association (IWSA), Nagpur branch celebrated teacher's day on 9th September, 2017. As a part of teacher's day celebration, a training workshop on **"On Line Labs "(**O Labs) for school environment developed by Centre for Development for Advanced Computing (C-DAC) Navi Mumbai, was organized by (IWSA) in association with Bhartiya Vidya Bhavan,Shri Krishna Nagar, Nagpur. Forty two teachers from 20 different schools participated in the workshop. The teachers were taught the skill and authoring tools of simulating experiments in a virtual medium to make learning more interactive for the students. The teachers thus could recreate a real lab environment with the able guidance of the training resource team from C-DAC, Navi Mumbai. Mr Vaibhav Singh and Mr Pratik Shah, both project engineers at C-DAC helped the teachers to get acquainted with the tools. Participants were also introduced to **e-basta** and **Assessment and Monitoring Framework for CEE**. The participants were given a certificate of participation and a CD from C-DAC and a kit comprising of a folder, letter pad and a pen was given by IWSA. Present on the occasion were Dr. Anuradha Gadkari, Founder Member, IWSA, Dr. Seema Somalwar, Convener, Dr. Bharati Ganu, Secretary, Dr. Seema Ubale, Treasurer and other executive members of IWSA, Smt. P. Nirupama Shankar, Principal, and other Teacher members of Bhavan's B. P. Vidya Mandir, Shri Krishna Nagar, Nagpur.

ARTICLE

LEAP FROM SCIENCE OF BIOCHEMISTRY AND NUTRITION TO SOCIETAL SCIENCE

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Several years before my retirement from the National Institute of Nutrition (NIN), Hyderabad in October 1994, I had opportunity to visit the Comprehensive Rural Health Project of Raj and Mabel Arole in Jamkhed, Maharashtra, with members of the Medico Friends Circle. Aroles have pioneered the training of even illiterate rural women as effective grass-root health workers. This was a turning point in my life when I took the decision to move from laboratory science to the rough and tumble of rural development as soon as possible. This turned out to be only after my retirement in 1994. Though at NIN my work was mainly in the area of nutritional biochemistry, I did get some opportunity to be associated with clinical and field research since nutrition research has to be multidisciplinary. Explanations for aetio-pathogenesis of nutritional and health problems observed in clinic or field, have to come from basic research in biochemistry, and cellular and molecular biology.

Enter the Fascinating World of Biochemistry

The choice to study Biology/chemistry/ biochemistry instead of medicine (a career chosen by my twin sister) was a deliberate one since I loved science, particularly physics and biology from school days in Mumbai. After graduating with BSc degree in chemistry and Botany from Bombay University, I joined the fledgling MSc, biochemistry by papers programme. While chemistry was not my passion or forte; the very first class in Biochemistry opened a fascinating world. Even in those days there were women students for MSc biochemistry.

For some reason, women have always opted for biological sciences. Well planned studies have however shown that the notion that women do not have aptitude for mathematical, physical and engineering sciences is incorrect. Indian high school girls have interest, aptitude for mathematical and physical sciences, and are not intimidated by these subjects as often thought. Their preference for biological sciences and medicine later is due to societal mind set rather than gender difference in aptitude.

Yet another turning point in my life came when Professor V. Giri, Head of the Department of Biochemistry, Indian Institute of Science, Bangalore, who was the examiner for MSc the year I qualified in 1957, invited me to come to the Indian Institute of Science (IISc) in Bangalore for doing PhD. I was naturally delighted and excited. My mother and an old aunt were apprehensive but finally it was decided that I could go, but my father would accompany me to Bangalore. To me that seemed reasonable and assuring since in those days young girls were not as bold as they are today. Professor Giri, assigned me to Professor Homi Cama, a well-known scientist and a good man who created a very happy working environment. He

suggested that I work on the problem of vitamin A2, chemistry and metabolism along with Dr. PR Sundaresan (Sundar). My friendship with Sundar and his family in the US has lasted over the years. Purifying and crystallising vitamin A2 was a challenging task since vitamin A2 is a very unstable compound, and there were moments of great frustration and anxiety. Long hours of work had to be put in. But finally things worked out and classical papers emerged. In those days there was no shortage of power and water, but scarcity of equipment. There was only one Beckman DU spectrophotometer- life line for biochemistry research, between the departments of biochemistry and pharmacology and it had to be booked ahead of time. Sometime bookings were available in the night.

After Professor Giri passed away, Professor PS Sharma from Madras (now Chennai) became the head of the department. The system of weekly Journal Clubs was introduced. All graduate students had to come prepared with a recent paper and any one would be called to present using a black board and chalk. It was an interesting experience in which at the first call, I discovered my ability to speak. Prof. Sharma's compliment with a flicker of smile on his otherwise stern demeanour made my day. Ability to articulate is very important in science. Unfortunately many timid, inexperienced Indian students lack this ability and get missed out.

In early 60s, Professor CV Raman developed fascination for studying role of carotenoid pigments in vision. This provided me an opportunity to interact with this great man. Though the theory that he proposed could not be proved, discussing science with a man like him was a wonderful experience.

Unlike other departments at IISc, biology departments which included biochemistry, pharmacology and fermentation technology (today there are many) had a few women students. However, I do not find my former colleagues (except one or two) in good academic positions or as fellows of science academies. Reasons are not far to see. Some have moved to other countries, and some have got married and science career has become secondary. A few have built professional careers, but are not as visible as their male counterparts. The situation persists, but remedial measures for women to return to career in science after break are being tried by the Departments of Science and Technology and Department of Biotechnology. Re-entry fellowships have been introduced. There is demand for these fellowships, but after availing of this opportunity for a few years, there are placement problems. Readers may find two reports- 1) "Science career for Indian women: an examination of Indian women's access to and retention in scientific careers", by the Indian National Science Academy (INSA) (2004) and 2) "Evaluating and enhancing women's participation in scientific and technological research: the Indian initiatives" by the National Task force for Women in Science, Government of India, Department of Science and Technology (DST) (2010) informative. These reports are on the websites of INSA (www.insa.ac.in) and www.indianwomenscientists.in respectively. I chaired both the committees.

The obvious course for me after PhD in 1962 was to go to the US for Post doctoral experience. I did the obvious and had great opportunity to work with Norman Krinsky, an authority on carotenoids at the Tufts University School of Medicine, Boston and with Andre Jagendorf,- a name in the field of photosynthesis, at Johns Hopkins University, Baltimore. Three and half years in the US were enjoyable and rewarding. In 1962, at Tufts University School of Medicine I was the only woman post doc between departments of biochemistry, pharmacology and physiology.. Edith Wilson (later Miles) came the following year, and my friendship with her and her husband Todd Miles has also lasted over the years. In those days, women in `saree' were a rare species, and when I was asked to take lectures for medical students, I was confident,

but the students were a worried lot. Can she speak English that we can follow was their main concern? Indian accent in English tends to be varied and unfamiliar to American students. This apprehension was dispelled after my first lecture, and I became good friends with some medical students. Unlike today there were hardly any girls studying medicine then, even in the US.

Challenge of Nutrition Research

In 1965, on Professor Sharma's suggestion, I wrote to Dr. C. Gopalan, then Director of the National Institute of Nutrition (NIN), Hyderabad for job. Gopalan responded promptly and positively and asked me to appear for an interview. I could not, but was selected in absentia and thus started my long innings of 29 years at NIN. This was yet another watershed in time and a turning point. NIN was then and continues to be a very well –run institution. It has three working ends. The main laboratory, the clinical units in two local hospitals and field unit devoted to community nutrition work in villages. Varied scientific expertise and access to instruments for biochemical work, clinical material, pathological laboratory, animal facility, and opportunities for field/community studies, at NIN, offers unique opportunity to do human nutrition research.

Though nutrition is an old science and the science of biochemistry began as nutritional biochemistry, vast gaps exist in our understanding of : mechanism of absorption and action of micronutrients at biochemical, cellular and molecular level; tests for early detection of deficiency; biochemical and molecular basis of the pathology of nutrient deficiencies; nutrient requirements for preventing deficiency disease Vs positive health; functional consequences of marginal malnutrition; interaction within nutrients and between nutrients and other chemical and biological agents; and many others. Discovery of health promoting phytochemicals (nutraceuticals) other than established nutrients has opened a vast field of functional foods. Impact of nutrition on foetal programming, and long term health consequences is yet another fertile area for research. To solve these problems at basic level, concerted effort of medical professionals, biochemists, physiologists, cellular and molecular biologists and agriculture scientists is required.

At NIN I had the right atmosphere and colleagues to foray into some of these problems. Few areas where my students, colleagues and I could contribute are: 1) Biochemical tests for early detection of B-vitamins deficiency and using them for deriving vitamin requirement of Indians. The glutathione reductase test developed by us is internationally used. 2) Biochemical/molecular basis of the skin pathology in B-vitamins deficiency, 3) Biochemical basis of some of the clinical side effects of contraceptive steroids, particularly increased vitamin requirement, and altered glucose tolerance, 4) biochemical basis of altered vitamin B-2 metabolism in respiratory infections, 5) demonstration of vitamin like properties of carnitine, synthesised from the essential amino acid lysine among others. A team work between biochemists, clinicians and laboratory animal specialists was needed to address these problems. **Some of the vitamins depletion repletion experiments that I did on human volunteers including myself, to derive minimum requirement of vitamins for humans, may not pass the ethics committees of today. But then safety was ensured and none of us suffered**.

Dr. Gopalan (President, Nutrition Foundation of India, now 99 years old) is a brilliant man, who gave full freedom to work, once he was convinced about the problem. He was generous with ideas, but never put his name on a publication unless he had initiated it. An example that many seniors need to emulate.

Women- Friendly Infrastructure in Institutions

In those days, NIN did not have a ladies hostel, and many of my students used to stay with me. People used to tease me that I run a `gurukul'. This shortcoming has been rectified and now NIN does have a good hostel for women. However, the problem of housing for female students and faculty is a serious one even today. Research in science is not 9 am-5 pm affair. Some experiments continue till late in the evening or even night and safety of women researchers is an issue that needs to be addressed if more women have to be motivated to take up career in science. Many institutions don't have proper toilets and restrooms for women. Lack of such basic facilities in colleges and institutions keeps many girls from coming to towns and cities for education. Availability of a good crèche, and even day care centre for the elderly, in universities and institutions will help and encourage women (who have to bear the double burden of home and professional work), to take up professional careers. In recent years, situation has changed and at least in some universities and government institutions, women- friendly infrastructure has been mandated and funds provided for their creation.

Study and Practice of Nutrition- women have a presence

Nutrition research is an area where there is concentration of women. Thus at NIN there were many women in faculty positions, and I did not get any feeling of gender discrimination. However, an institution of over 90 years standing (since 1918) has had only two women directors. Over 80% of membership of the Nutrition Society of India is women, mostly from Home Science fraternity, but there have been only 2 women presidents of NSI in over 4 decades of its existence. Yet I cannot attribute this to deliberate gender bias. There is paucity of nutrition scientists in general and women in particular who have attained positions of eminence.

From Lab to Land

As mentioned earlier, on retirement from NIN, instead of continuing with lab work, I decided to join my friend Dr. Devyani Dangoria and her establishment, Dangoria Charitable Trust (DCT), as ICMR emeritus scientist. Devyani is a gynaecologist with deep societal commitment. The Trust runs a hospital for women and children, and a home for the aged in village Narsapur in Medak district of AP. Nutrition is not a stand- alone subject. For nutrition security, there has to be convergence between Awareness, and Access at Affordable cost to age-appropriate balanced diet (food security), healthy environment including clean drinking water, and access to health care. My right- hand man- PVVS Murty (a social scientist) and I have tried to evolve models for each of these, while working in some villages of Medak district, Andhra Pradesh (Now Telangana) . Funding for our work has primarily come from the Department of Science and Technology (DST) and Department of Biotechnology (DBT), Government of India through their societal programmes.

Our model of Health and Nutrition Entrepreneur and Mobiliser has had marked positive impact on perinatal, neonatal and infant mortality, and some impact on child nutrition and birth weight. For improving food security our effort has been to promote diversification from mono cropping with paddy and sugar cane to horticulture, legumes and millets, and crop livestock mixed farming using green methods. This model enhances household access to micronutrients (vitamins and minerals)- rich foods; (Indian diets being qualitatively deficient in micronutrients); reduces demand for precious water, and organic fertilisers and pesticides help to protect the

environment. Yet we have not ventured in to totally organic farming and advice on use of chemical fertilisers after soil testing.

Our focus has been women and adolescent girls, though a family approach is used for creating awareness. In the villages of Medak district where we work, school attendance of girls has improved remarkably in recent years and there are not many school drop-out girls. Adolescent girls are enthusiastic learners and good agents of change. In an initial Knowledge Attitude Practice survey on issues of health, nutrition, environment, gender etc. done before chalking out science and skill- based interventions (a NIPCCID supported project), we found that there was universal resentment to dowry system, but helplessness to stop it. Gender roles have been internalised and accepted, till specifically pointed out. If India has to develop, it needs to do much more for health, nutrition, education and empowerment of women, starting with girl child and adolescent girls.

An award winning rural Food processing cum Training Centre has been established, with financial support from the Ministry of food processing industries (besides DST and DBT) in collaboration with CFTRI, Mysore. The objectives of this centre are: 1) generate skill-based employment for women, 2) prevent wastage of farm produce during glut season, through value addition, and 3) enhance nutrition security by developing low-cost nutritious foods. Setting up such a facility in a rural area is not without difficulties. Frequent power failure; paucity of trained artisans to ensure maintenance of equipment and infrastructure; access to ingredients other than farm produce needed for processing; inadequate work culture (poor time discipline, absenteeism) and spirit of entrepreneurship among rural women; and transportation and marketing are problems. Yet it is a useful exercise.

Dr. Bamji receiving the national award 2012, from DST, on behalf of Dangoria Charitable Trust, for development of women through application of science and technology, on March 8, 2013

Women's Nutrition for National Development: the Asian Enigma

South Asia, particularly India has the dubious distinction of having highest incidence of under-nutrition in the world; higher than the Sub-Saharan Africa which in many ways is poorer and less developed than India. In an analysis done by Ramalingaswamy, Johnson and Rhodes way back in 1996, the authors compared the two regions to find out why S. Asia fares badly. (The Progress of Nations, Commentary, UNICEF, 1996, 11-17). The finger rested on women's health and well being. Africa is no haven for women, but India's neglect of women is more. Every third child in India even today is born with low birth weight (LBW), compared to half that number in Africa. Malnourished women give birth to low birth weight (LBW) babies who grow up as weaker individuals, susceptible to morbidity and mortality. Studies have now shown that individuals who have suffered from malnutrition in womb and are born with LBW, have more body fat than muscle and have greater susceptibility to chronic diseases like hypertension, cardiovascular diseases (CVD), diabetes, etc in later life; particularly if there is change towards more risky lifestyles due to affluence. The theory of foetal origins of adult diseases is gaining acceptance and can to some extent explain the growing incidence of chronic diseases like diabetes and CVD in India. Malnutrition and neglect of women not only increases susceptibility to infections due to compromised immunity, but also to adult-onset, chronic diseases. Malnutrition is the worst form of non-communicable disease. While both men and women suffer; the incidence of micronutrient deficiencies like iron-deficiency anaemia and vitamin deficiencies is much higher in women, particularly during pregnancy. Anaemia is a silent crippler and killer. The adverse effects of maternal under nutrition are multigenerational. Nutrition has to be high on the agenda of national development. Till that happens, India is building castles on foundation of straw, and all this hype about economic growth is helping only few. If a beginning has to be made, it should be with female health, nutrition, education, and empowerment. This requires committed leadership and action. Not just lip-service.

Whatever little I have achieved in life is a great measure due to the love and encouragement from my late parents, my large and highly supportive family, particularly my twin sister, Dr. Mahrukh Joshi and colleagues. These are essential if women have to succeed in the rough and tumble of life.

About the Author

A former Director-grade scientist of the Hyderabad-based, National Institute of Nutrition, the 82-year old Bamji is associated with the Dangoriya Charitable Trust. She contributes to the efforts of the trust to help improve the nutrition and health status of poor farmers and villagers in Narsapuram on the outskirts of Hyderabad.

Recently, she has received the Living Legend Award from the International Union of Nutritional Sciences (IUNS) in recognition of her significant contribution to the advancement of nutrition at national, regional and global level through professional activities such as research, teaching, services. Dr. Bamji is an active IWSA Member from Hyderabad.

Nobel Prizes 2017

(abridged from https://www.nobelprize.org/nobel_prizes)

The Nobel Prize in Chemistry 2017

The Nobel Prize in Chemistry 2017 was awarded to Jacques Dubochet, Joachim Frank and Richard Henderson *"for developing cryo-electron microscopy for the high-resolution structure determination of biomolecules in solution"*.

Prof. Dubochet, born in 1942 in Switzerland, is Honorary Professor of Biophysics, in University of Lausanne, Switzerland. **Prof. Frank**, born in 1940 in Germany, is Professor of Biochemistry and Molecular Biophysics and of Biological Sciences in Columbia University, New York, USA. **Prof. Henderson**, born in 1945 in Scotland is Programme Leader, MRC Laboratory of Molecular Biology, Cambridge.

Although NMR and X-ray crystallography has contributed a lot for studying biomolecules and protein structures, the former works for relatively small proteins and the latter requires the molecules to form well-organised crystals, limiting their use. Electron microscopy (EM) had very good resolution but was not applicable for these studies because the powerful electron beam destroys the biomaterials and the biomolecules deteriorate and collapse under the high vacuum due to the loss of surrounding water molecules. Prof. Henderson overcame these difficulties with suitable methods for cooling and adding images from low energy beams, and he could obtain the structure of bacterio-rhodopsin, a membrane protein, at atomic resolution using cryo-EM in 1990. Prof. Frank developed an image processing method to merge the apparently minimal information found in the electron microscope's two-dimensional images to generate a sharp, three-dimensional high resolution structure. Prof. Dubochet solved the problem of evaporation of liquid water in the electron microscope's vacuum. In the early 1980s, he succeeded in vitrifying water – he cooled water so rapidly that it solidified in its liquid form (glass) around a biological sample, allowing the biomolecules to retain their natural shape even in a vacuum. Combining all these efforts, cryo-EM became more generally applicable and the desired atomic resolution was reached in 2013. Researchers can now freeze biomolecules mid-movement and visualise processes they have never previously seen, which is decisive for both the basic understanding of life's chemistry and for the development of pharmaceuticals. Eg: When researchers began to suspect that the Zika virus was causing the epidemic of brain-damaged newborns in Brazil, they turned to cryo-EM to visualise the virus. Over a few months, three-dimensional (3D) images of the virus at atomic resolution were generated and researchers could start searching for potential targets for pharmaceuticals.

The Nobel Prize in Physics 2017

The Nobel Prize in Physics 2017 was divided, one half awarded to Rainer Weiss, the other half jointly to Barry C. Barish and Kip S. Thorne *"for decisive contributions to the LIGO detector and the observation of gravitational waves"*.

Rainer Weiss was born on 29 September 1932, Berlin, Germany. **Barry C. Barish** was born on 27 January 1936, Omaha, NE, USA. **Kip S. Thorne** was born on 1 June 1940, Logan, UT, USA. All are affiliated to LIGO/VIRGO Collaboration at the time of the award, Weiss at Massachusetts Institute of Technology (MIT), Cambridge, MA and both Barish and Thorne at California Institute of Technology (Caltech), Pasadena, CA, USA.

On 14 September 2015, the LIGO detectors in the USA saw space vibrate with gravitational waves for the very first time. Although the signal was extremely weak when it reached Earth, it is already promising a revolution in astrophysics. Gravitational waves are an entirely new way of following the most violent events in space and testing the limits of our knowledge. The gravitational waves that have now been observed were created in a ferocious collision between two black holes, more than a thousand million years ago. Albert Einstein was right again. A century had passed since gravitational waves were predicted by his general theory of relativity, but he had always been doubtful whether they could ever be captured. LIGO, the Laser Interferometer Gravitational-Wave Observatory, is a collaborative project with over one thousand researchers from more than twenty countries. Together, they have realised a vision that is almost fifty years old. The 2017 Nobel Laureates have, with their enthusiasm and determination, each been invaluable to the success of LIGO. Pioneers Rainer Weiss and Kip S. Thorne, together with Barry C. Barish, the scientist and leader who brought the project to completion, have ensured that more than four decades of effort led to gravitational waves finally being observed.

The Nobel Prize in Physiology or Medicine 2017

The Nobel Prize in Physiology or Medicine 2017 was awarded jointly to Jeffrey C. Hall, Michael Rosbash and Michael W. Young *"for their discoveries of molecular mechanisms controlling the circadian rhythm"*.

Jeffery Hall was born in 1945, New York, NY,USA and is currently Honorary Professor at University of Maine, Maine, ME, USA. **Michael Rosbash born in** 1944, Kansas City, MO, USA and is currently **Honorary Professor at** Brandeis University, Waltham, MA, USA and Howard Hughes Medical Institute. **Michael W. Young** was **born in** 1949, Miami, FL, USA and is currently Honorary Professor at Rockefeller University, New York, NY, USA.

Life on Earth is adapted to the rotation of our planet. For many years we have known that living organisms, including humans, have an internal, biological clock that helps them anticipate and adapt to the regular rhythm of the day. But how does this clock actually work? Jeffrey C. Hall, Michael Rosbash and Michael W. Young were able to peek inside our

biological clock and elucidate its inner workings. Their discoveries explain how plants, animals and humans adapt their biological rhythm so that it is synchronized with the Earth's revolutions.

Using fruit flies as a model organism, this year's Nobel laureates isolated a gene that controls the normal daily biological rhythm. They showed that this gene encodes a protein that accumulates in the cell during the night, and is then degraded during the day. Subsequently, they identified additional protein components of this machinery, exposing the mechanism governing the self-sustaining clockwork inside the cell. We now recognize that biological clocks function by the same principles in cells of other multicellular organisms, including humans.

With exquisite precision, our inner clock adapts our physiology to the dramatically different phases of the day. The clock regulates critical functions such as behavior, hormone levels, sleep, body temperature and metabolism. Our wellbeing is affected when there is a temporary mismatch between our external environment and this internal biological clock, for example when we travel across several time zones and experience "jet lag". There are also indications that chronic misalignment between our lifestyle and the rhythm dictated by our inner timekeeper is associated with increased risk for various diseases.

The three women pictured in this incredible photograph from 1885, Anandibai Joshi of India, Keiko okami of Japan, and Sabat islambouli of Syria. Each became the first licensed female doctors in their respective countries.

The three were students at the women's medical college of Pennsylvania, one of the only places in the world at that time where women could study medicine.

Cancer Detection Camp at the S.S. High School, Nerul on 19th November, 2017

Community Helper's Day Celebration by Nursery Kids

CDAC Teachers Training Workshop
Amravati Branch, 11th July, 2017

Yog samellan, Amravati Branch,
24th October, 2017

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CDAC Workshop in progress, Nagpur Branch 9th September, 2017

To

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