Message

प्रधान मंत्री कार्यालय
नई दिल्ली - 110011
PRIME MINISTER'S OFFICE
New Delhi - 110011

MESSAGE

The Prime Minister is happy to learn that Centre for Research Technology Developments, Sinhgad Institutes, Solapur is organising an event on 'Innovative Technologies for Rural Development Their Commercialisation (ITRDC 2017)' from 18th- 20th February, 2017 and publishing a souvenir to mark the occasion.

On this occasion, best wishes to the organisers and participants.

(Chandresh Sona)
Deputy Secretary

New Delhi
February 06, 2017

Message

Devendra Fadnavis
Chief Minister
Maharashtra

Mantralaya
Mumbai-400 032

13th February 2017

MESSAGE

It gives me immense pleasure that Centre for Research & Technology Developments of Sinhgad Institute, Solapur in collaboration with the Media Relations and Public Awareness Section of BARC, Mumbai is organizing a mega event with the theme of Innovative Technologies for Rural Development & Their Commercialisation.

The last century has witnessed a sea change in life standards as well as in the field of business and economics. Presently, we need some innovative solutions to make our life easy by bringing enhancement in productivity and broadening our ability to communicate and connect on a global level.

I congratulate the institute for creating a platform for young and promising students to discussing the issues related to community development, especially in rural areas.

I hope that this mega event will provide a springboard to the upcoming experts and give a chance to know about the latest developments in the field of research and knowledge.

I extend my best wishes to all those involved in the effort.

(Devendra Fadnavis)

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Message

At the outset I feel proud to announce that N B Navale Sinhgad College of Engineering, Solapur has successfully established the "Centre for Research & Technology Development".

Primarily the centre is to carry out frontier level research related to energy crisis in the rural district of Solapur. Besides, the centre will concentrate to harness solar energy in tune with the mission of NITI ayog Vision 2047 of Independent Energy India.

In the direction the centre has organized multi-mega event on "Innovative Technologies for Rural Development and their Commercialization" ITRDC-2017 from 18th to 20th February 2017 in collaboration with Bhabha Atomic Research Centre (BARC), Mumbai.

I congratulate the team of scientists & faculty of College for venturing this mega event and wish them all the success in their endeavor.

Prof. M. N. Navale

INNOVATIVE TECHNOLOGIES FOR RURAL DEVELOPMENT AND THEIR COMMERCIALISATION

ITRDC-2017

A MULTI-MEGA EVENT

(With emphasis on Renewable Energy and DAE Technologies)

Rural development is the process of improving the quality of life and economic well being of people living relatively isolated and sparsely populated areas. The need for rural communities to approach development from a wider perspective has created more focus on a broad range of development goals rather than merely creating incentive for agriculture or resources based businesses. Education, entrepreneurship, physical infrastructure and social infrastructure all play an important role in developing rural regions.

With a vision of "Development of human being through research" the Savitribai Phule Shikshan Prasarak Mandal, Kamlapur has established the "Centre for Research & Technology Developments", Sinhgad Institute, Solapur (India) in N.B.Navale Sinhgad college of Engineering Solapur. This centre mainly focuses on top ten problems of next fifty years .To begin with Energy, Environment and Health Science are attempted.

The centre has ventured in a big way to undertake rural development program with innovative technologies.

Events Under ITRDC-2017 at a Glance :

1. National Conference on Engineering the materials for technology application with special reference to renewable and nuclear energy
2. Exhibition & Trade Show of renewable and nuclear energy technologies
3. Skill Development Programs for DAE technologies
4. Launching of national project on ''First Cloud Physics Experiment' in collaboration with IITM Pune sanctioned by DST Delhi.
5. Science Exhibition for Students
6. Talent Search (Quiz Competition)
7. 'DISTA' National Level Tech Festival for Engineering Students
8. Robotics Workshop
9. Interaction with Scientists



PREFACE

Prof. Dr. S. H. Pawar

Emeritus Scientist (CSIR), & Distinguished Professor,
Director, Centre for Research & Technology Developments,
Sinhgad Institutes, Solapur (India) & Convenor - ITRDC-2017

Friends!

I have a great pleasure to introduce our multi mega event on 'Innovative Technologies for Rural Development and their commercialization' ITRDC-2017 organized by Centre for Research and Technology Developments, Sinhgad Institutes, Solapur in collaboration with Media Relations and Public Awareness Section, Bhabha Atomic Research Centre (BARC) Mumbai, from 18th to 20th February 2017. This event is in tune with the development of our country and for make in India. We have celebrated recently 68th independence day on 26th January 2017. The question is that are we really enjoining the independence totally? The answer is negative. If we look at the top ten problems globally for next 50 years, the first with top priority is the energy crisis. As we know that "यत्र शक्ति तत्र जीवनम्" where ever there is energy, there is life. No energy, no life. Keeping this in focus, the main agenda of our event is the emphasis on Renewable energy and atomic energy.

India's growth story is now the subject of global interest. India wanted to be transformed from group of developing countries to the group of developed countries like U.S., Canada, Australia and many other countries in Europe. To support this growth, energy will play a key role in multiple ways - to meet the rising fuel demand, to spur growth through investment and raise the standard of living of our citizens. A directional pathway to active such ambitious goals of meeting the energy needs of 1.32 billion people of India, NITI Aayog, as the think tank of Government of India, proposed a comprehensive National Energy policy draft-India Energy security Scenarios- 2047. As we all know that the India's most of the population, more than 70% is spread along in rural are and hence, in a true sense for make in India, our main focus is on Rural development with innovative technologies.

Sinhgad Institutes is one of the largest providers of quality education in India. Prof. M. N. Navale, Founder President of Sinhgad Institutes established these centers of excellence with the vision of bringing technical education to the masses. Today, Sinhgad Institutes provide education from KG to PG and also runs doctoral programs. Starting with sou. Venutai Chavan Polytechnic in 1993, today we have nearly 85 education institutes located at 12 campuses, nurturing the dreams of over 86,000 students in various disciplines every year. The location of these campuses is pollution-free, lush green and picturesque conducive to learning.

We always endeavor to meet the growing needs of higher technical and management education by adopting new technologies, methodologies, disciplines, and even attitudes.

We always welcome and quickly respond to new suggestion and innovative ideas to upgrade the quality of education at Sinhgad Institutes. Considering the need of nation Sinhgad Institutes Solapur meet the global needs. The centre has planned the Multi Mega Event on 'Innovative Technologies for Rural Development & Their Commercialization (ITRDC-2017)', in collaboration with BARC, Mumbai, to showcase the significance and promote the usage of innovative technologies for rural development that dreams come true of Mahatma Gandhi.

I am glad that the chief guest of the inaugural function Padmavibhushan Dr. Anil Kakodkar is the driving force to bring together the scientists and technologists of Singhad Institutes and BARC Mumbai for good cause & development of rural areas with a thrust on renewable energy and atomic energy. It is an honur that the Maharashtra Energy Developments Agency, महाऊर्जा has also joined this multi mega event. The board of research in Nuclear Sciences, Mumbai and Department of science and technology New Delhi have extended their generous financial support.

It is a matter of pride to all Sinhgadian that this event has become not as national event but converted into international event by virtue of the participation of the resource persons from abroad. Hope that you will enjoy the event and get benefitted.

Jay Hind ! Jay Maharashtra !

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Board of Research in Nuclear Sciences (BRNS), Mumbai

Department of Atomic Energy

Govt. of India

Science & Engineering Research Board (SERB)

Department of Science & Technology (DSTE)

Govt. of India

Sinhgad Institutes

Savitribai Phule Shikshan Prasarak Mandal (SPSPM)

Kamalapur, Tal. Sangola, Dist. Solapur

INNOVATIVE TECHNOLOGIES FOR RURAL DEVELOPMENT AND THEIR COMMERCIALISATION

A MULTI-MEGA EVENT (ITRDC-2017)

(With emphasis on Renewable Energy and DAE Technologies)

18th to 20th February 2017

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Prof. Dr. S. H. Pawar	Research Director, Sinhgad Institute, Solapur

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Organizing Chair

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Convener, ITRDC-2017,Director, CRTD
Sinhgad Institutes, Solapur

Dr. S. D. Nawale
Principal, NBNSCOE, Secretary ITRDC-2017

Shri. R. K. Singh
Co-Convener,
ITRDC-2017, BARC, Mumbai

Prof. B. G. Holey
Principal, SPS, Soalpur

Chief Co-ordinators

Prof. S. T. Jagtap
ITRDC-2017

Prof. R. B. Gharase
BARC Stalls at ITRDC-2017

Dean, Administration
Prof. J. G. Kulkarni

Dean, Academic
Prof. A. M. Kalaje

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INNOVATIVE TECHNOLOGIES FOR RURAL DEVELOPMENT AND THEIR COMMERCIALISATION

A MULTI-MEGA EVENT

(With emphasis on Renewable Energy and DAE Technologies)

18th to 20th February 2017

PROGRAMME

Saturday, 18th February 2017

Time	Particular
9:00 am to 10:00 am	Registration of the delegates **Venue: Ground floor, E&TC Dept., NBNSCOE**
9:30 am to 10:00 am	The procession of students Rally for Urja Jyoti with Chief Guest
10:00 am to 11:30 am	**Inaugural Function** **Chief Guest : Padmavibhushan Dr. Anil Kakodkar, BARC, Mumbai** **Venue: Dr. A.P.J. Abdul Kalam Open Auditorium**
11:30 am to 12:00 noon	Tea Break
Conference Technical Session - I **Venue: Sir M. Visvesvaraya Hall, Conference Hall, E&TC Dept., NBNSCOE**	
Chairman	Dr. A. H. Manikshete, Principal, Walchand college of Arts & Science, Solapur
12:00 am to 12:45 pm	**IT-1:** Dr. S. T. Mehetre, BARC, Mumbai **Topic: BARC technologies for benefit of farming community**
12:45 pm to 1:30 pm	**IT-2:** Dr. Hemraj M. Yadav, Department of Energy & Materials Engineering, Dongguk University, Seoul, South Korea **Topic: TiO2: One nanomaterial many applications**
1:30 pm to 2:30 pm	Lunch Break
Conference Technical Session - II **Venue: Sir M. Visvesvaraya Hall, Conference Hall, E&TC Dept., NBNSCOE**	
Chairman	Dr. G.S. Shahane, HOD, Physics Dept, Dayanand Arts & Science College, Solapur
2:30 pm To 3:15 pm	**IT-3:** Dr. Saly T. Panicker, BARC, Mumbai **Topic: Innovative Water Purification Technologies for Rural Development**
3:15 pm To 4:00 pm	**IT-4:** Dr. Rajeev Joshi, Department of Physics, Central University of Karnataka, Kalaburagi **Topic: Fuel Cell - A technology of hope in the midst of Energy Crisis**
4:00 pm to 4:15 pm	Tea Break
Chairman	Dr. T. V. Kolekar, RIT, Sakharale, Islampur
4:15 pm To 6.30 pm	Oral presentation (01 to 09)

Sunday, 19th February 2017

(A Workshop on Nuclear Energy & Healthcare - NEHCA-2017)

Time	Particular
9:00 am to 10:30 am	Poster presentation Venue: Hall No. 1 & 2, E&TC Dept., NBNSCOE
10:30 am to 11:00 am	**Inaugural Function: NEHCA-2017** **Chief Guest: Prof. Dr. Prakash B. Behere, Vice Chancellor,** D Y Patil University Kolhapur **Venue: Sir M. Visvesvaraya Hall, E&TC Dept., NBNSCOE**
Technical Session-III **Venue: Sir M. Visvesvaraya Hall, E&TC Dept., NBNSCOE, Solapur**	
Chairman	Prof. A. A. Phatak, HOD, CSE, NBNSCOE, Solapur
11:00 am to 11:45 am	**IT-5:** Prof. Dr. Prakash B. Behere, Vice Chancellor, D Y Patil University Kolhapur **Topic: Psychological Impact of Nuclear Disasters**
11:45 am to 12:30 pm	**IT-6:** Dr. Basant L. Malpani, Radiation Medicine Centre, BARC, Mumbai **Topic: Nuclear Medicine Imaging Technology : An Introduction**
12:30 pm to 1:15 pm	**IT-7:** Dr. Sunita Sonavane, Radiation Medicine Centre, BARC, Mumbai **Topic: Nuclear Medicine in Disease Detection & Treatment**
1:15 pm to 2:15 pm	Lunch Break
Technical Session-IV **Venue: Sir M. Visvesvaraya Hall, E&TC Dept., NBNSCOE**	
Chairman	Prof. S.S. Shirgan, HOD, E&TC, NBNSCOE
2:15 pm To 3:00 pm	**IT-8:** Dr. S. D. Sharma, Radiological Physics and Advisory Division, BARC, Mumbai **Topic: Advances in Radiation Theraphy for Cancer Treatment**
3:00 pm To 3:45 pm	**IT-9:** Dr. D. K. Dalal, Board of Research in Nuclear Sciences, Mumbai **Topic: Research Proposals: Financial support by BRNS, Mumbai**
3:45 pm To 4:00 pm	Tea Break
Chairman	Dr. Mrs. Pushpanjali, Sangmeswar College, Solapur
4:45 pm To 5:30 pm	Oral presentation (010 to 018)

Monday, 20th February 2017

Time	Particular
Conference Technical Session-V **Venue: Sir M. Visvesvaraya Hall, E&TC Dept., NBNSCOE**	
Chairman	Prof. A. M. Kalje, Dean Academic, NBNSCOE, Soalpur
9:30 am to 10:15 am	**IT-10:** Prof. (Dr) S. H. Pawar, Director, Centre for Research & Technology Developments, Solapur and Distinguished Professor, Centre for Interdisciplinary Research, D. Y. Patil University, Kolhapur **Topic: Role of Nanotechnology in Health Care**
10:15 am to 11:00 am	**IT-11:** Prin. Dr. S. D. Nawale, Principal, NBNSCOE, Solapur **Topic: UHF RFID Passive Tag for Humidity Sensing and Electromagnetic Energy Harvesting**
11:00 am to 11:15 am	Tea Break
Chairman	Prof. (Dr) L. P. Deshmukh, HOD, Physics, Solapur University, Solapur
11:15 am to 12:00 noon	**IT-12:** Shri. R. K. Singh, BARC, Mumbai **Topic: Exhibition on BRNS Technologies**
12:00 noon to 12:45 pm	**IT-13:** Dr. P. S. Patil, Founder Co-ordinator, School of nanoscience and Technology, Shivaji University, Kolhapur **Topic: Deployment of Nanotechnology for Energy Harvesting Solar cells**
12:45 pm to 1:15 pm	**IT-14:** Dr. Jitendra Kumar, BARC, Mumbai **Topic: Hand held Biosensor for detecting Methyl Parathion pesticide**
1:15 pm to 2: 00 pm	Lunch Break
Conference Technical Session-VI **Venue: Dr. Sir M. Visvesvaraya Hall, E&TC, Dept., NBNSCOE**	
Chairman	Prof. P. P. Tapkire, HOD, Civil, NBNSCOE
2:00 pm To 2:45 pm	**IT-15:** Dr. C. H. Bhosale, Department of Physics, Shivaji University, Kolhapur **Topic: Solar Energy Assisted Purification of Water using Nanocrystalline Transition Stratified Metal Oxide Semiconductor Thin Films**
2:45 pm To 3:30 pm	**IT-16:** Dr. Noble Jacob, Isotope and Radiation Application Division, BARC, Mumbai **Topic: Environmental isotope and geophysical techniques to identify groundwater potential zones.**
3:30 pm To 4:15 pm	**IT-17:** Dr. Thara, IITM, Pune **Topic: Advances in Cloud physics Research**
4:15 pm To 4:30 pm	Tea Break
4:30 pm To 5:30 pm	Prize Distribution & Valedictory Function

Workshop on Robotics

Sunday, 19th February 2017

Venue: Dr. A.P.J. Abdul Kalam Open Auditorium

PROGRAMME

Time	Details
11:00 am to 11:30 am	Registration of the delegates
11:30 am to 12:00 noon	Inaugural Function
12:00 noon to 2:00 pm	**IT-18** Robotics Session by **Dr. D. N. Badodkar,** (Associate Director) Division of Remote Handling & Robotics, BARC, Mumbai
2:00 pm to 2:30 pm	Break
2:30 pm to 3:30 pm	Training programmes in BARC and Educational opportunites in Homi Bhabha Nuclear Institute (HBNI) by Mr. S. K. Singh, BARC, Mumbai
3:30 pm to 4:00 pm	Panel Discussion on Career Opportunity in Robotics
4:00 pm to 4:30 pm	Valedictory function

Talent Search - Quiz Competition

Monday, 20th February 2017

Venue: Sir Ramanujan Hall, CSE Dept, NBNSCOE

ABOUT QUIZ

This quiz is organised by CRTD, Sinhgad Institutes, Solapur and Media Relations and Public Awareness Section, BARC, Mumbai. The students of Engineering, Degree, and Science stream can take part in this quiz in the group of four students from same institute/college.

The main objective of organising the quiz is to search the Talent amongst the graduate students of Science and Engineering. Quiz is based on the same theme of the National level conference "Innovative Technologies for Rural Development and their Commercialization" (ITRDC), organized in this institute from 18th Feb. to 20th Feb. 2017 viz Renewable Energy, Engineering the materials for the technological applications, Nuclear Science and Cloud physics.

The special feature of this quiz is that students taking part in the quiz have to atend all the sessions of the conference on 18th Feb. to 19th Feb. 2017. One round of the quiz is based on the invited talks given by the Eminent Scientists on these two days. This wills inclucate the habit of listening to the scientist with great concentration and taking their notes. This will enhance the awareness amongst the young students about the recent trands in Science and Technology. Talented students will get inspired to do their carries in the well-known National level organisations like BARC, IUCAA, TIFR, DAE etc.

Participating students will get certificate from BARC. This wil be the prestigious certificate to the participating students. It will be helpful in future for the talented student to open the doors of any National level organistion woring in research and development.

Attractive feature of the quiz is that, there will be a special interactive session with the Eminent Scientists about "Awareness of the national and global fellowships for Science and Engineering aspirants", only for the quiz participants after the prize distribution.

PROGRAMME

Time	Particulars
1:30 pm to 3:30 pm	First Round
3:30 pm to 4:30 pm	Second Round
4:30 pm	Prize Distribution

Date	Time	Event	Venue
18th to 20th Feb. 2017	10:00 am to 5:00 pm	BARC Technologies Exhibition	Dr. Homi Bhabha Technology Exhibition Hall, 2nd Floor, Library Building, NBNSCOE
18th to 19th Feb. 2017	10:00 am to 5:00 pm	Science Exhibition	Dr. C. V. Raman Science Exhibition Hall, Ground Floor, MBA-MCA Building, Sinhgad Institutes
18th to 20th Feb. 2017	10:00 am to 5:00 pm	Technical Trade Fair	Trade Fair Exhibition Pendol

शेतकऱ्यांची कार्यशाळा

कार्यक्रमाची रुपरेषा

वेळ	कार्यक्रमाचा तपशील
सकाळी १०.०० ते १०.३०	शेतकऱ्याची नांव नोंदणी
१०.३० ते ११.००	स्वागत व प्रदर्शनाची तोंडओळख
११.०० ते ११.३०	कार्यक्रमाचे उद्घाटन व शेती क्षेत्रात उत्कृष्ठ कामगिरी केलेल्या शेतकऱ्यांचा सत्कार
११.३० ते १२.१५	भाभा अणुसंशोधन केंद्रातील शेती करण्यासाठी उपयुक्तता या विषयावरील संशोधन १) विविध पिकांच्या सुधारीत बी-बियाणांचे प्रदर्शन व माहिती २) सुधारीत बायोगॅस प्लांटबद्दल पाहिती ३) माती परीक्षण संच ४) पिकांवरील विविध रोग व त्यावरील नियंत्रण या विषयांवर शेतकऱ्यांना मार्गदर्शनपर भाषण **वक्ते : डॉ. एस. टी. म्हेत्रे**
१२.०० ते १२.३०	डॉ. भाभा अणुसंशोधन केंद्राने तयार केलेले सामाजिक व ग्रामीण उपक्रम (आकृती व गाव) - डॉ. स्मिता मुळे
१२.३० ते १२.४५	चहा
१२.४५ ते ०१.१५	अन्न टिकविण्यासाठी व ते आरोग्यवर्धक असावे यासाठी किरणोत्सारी पद्धतीचे तंत्रज्ञान याविषयांवरील माहिती **वक्ते : डॉ. सचिन हजारे**
०१.१५ ते ०१.४५	शेतीतील माल जनत करण्यासाठी किरणोत्सारी पद्धतीचा अवलंब (कांदा, लसूण, आंबा व इतर पिके) या विषयांवर माहिती. **वक्ते : डॉ. एच. डी. खाडे**
०१.४५ ते ०२.००	शेतकरी व वक्ते यांचे चर्चासत्र तदनंतर कार्यक्रमाचा समारोप

ही कार्यशाळा शेतकऱ्यांसाठी विनामूल्य आहे. आपली माती आणि बळीराजासाठी डॉ. भाभा अधुसंशोधन केंद्र, मुंबई व सिंहगड इन्स्टिट्यूटस्, सोलापूर यांच्या संयुक्त विद्यमाने हे उचललेले पाऊल आहे.

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POSTER PRESENTATIONS :

EXHIBITION ON BARC TECHNOLOGIES

Media Relations & Public Awareness Section, Bhabha Atomic Research Centre, Mumbai and Centre for Research & Technology Developments, Sinhgad, Institutes, Solapur have planned Multi mega event on the theme "Innovative Technologies for Rural Development & their Commercialisation (ITRDC-2017) during February 18-21, 2017 at Centre for Research & Technology Developments, Sinhgad, Institutes, Solapur

Shri R.K. Singh, Head, Media Relations and Public Awareness Section, BARC will be coming with a team of scientists from BARC, Mumbai. Exhibition on BARC Technologies will be organised. Exhibition will be open for all. All are invited to visit exhibition which is being organised first time in this part.

Exhibition on BARC Technologies will include-

'Exhibition on BARC Technologies' will include Poster Gallery, Interactive models, LCD displays, information kiosks and AV presentations depicting applications of atomic energy.

Gallery of Posters:

The poster gallery will covered a variety of domains like Agriculture, Food Preservation, and Land Utilization; Health and Bio-medical Instrumentation, Desalination, Drinking Water, Rural Empowerment, Industrial Application and Electricity Generation; and National Security.

Interactive Models/Exhibits:

Exhibition will showcase various interactive models and exhibits to let the students and visitors have a first hand experience of technologies to cover a spectrum of BARC projects in the areas of science, technology, and societal initiatives.

KRUSHAK: KRUSHAK is the acronym for **'Krushi Utpadan Sanrakshan Kendra'**, literally translated in English as 'agricultural produce conservation centre'. The facility is located at Lasalgaon in Nashik District, 250 km east of Mumbai and is operational since 2003. Radiation processing brings benefits to consumers in terms of availability, storage life, distribution, and improved hygiene of food. Radiation processing can have a stabilizing effect on market price of commodities by reducing storage losses resulting in increased availability of produce. The KRUSHAK irradiator is a specially designed technology demonstration unit, primarily for controlling sprouting in stored onions.

Nuclear Desalination: Desalination is removal of salt and other minerals from saline water to produce drinking water. BARC has established the largest nuclear desalination plant in the world

Shri R.K. Singh, an Electrical Engineer, joined Bhabha Atomic Research Centre in 1986 after graduating from 29th batch of BARC training School. He has worked for Design, development, installation, commissioning & maintenance of control instrumentation of 100 MWth Research Reactor, DHRUVA. Shri Singh was on deputation to Narora Atomic Power Station (NAPS) for rehabilitation and commissioning of control instrumentation after fire incident. He has worked for design, installation & commissioning of Physical Protection Systems. He has developed Advanced Instrumentation for flow visualization and Vector field mapping of Advanced Heavy Water Reactor (AHWR) components and Pressurised Heavy Water Reactor (PHWR) components. Presently, he is Secretary, Indian Nuclear Society. He has coordinated International Conferences and organised hundred National seminars all over India. He has organised/planned- theme meetings, position papers, International conferences, National Seminars, Seminars with other nuclear societies of the world. Presently he is Head, Media Relations and Public Awareness Section, Bhabha Atomic Research Centre and working in the area of development of advanced instrumentation for flow visualization and multiphase flow. He is leading BARC Outreach Programme with an holistic approach & leading a team of 120 young BARC scientists. Shri Singh has published 60 research papers in national and international conferences. He has delivered 350 invited talks in outreach programmes. Shri R.K. Singh was awarded prestigious Indian Nuclear Society Award; Outstanding Service Award in the area of Science Communication. Shri Singh has been conferred BHARAT JYOTI AWARD by India International Friendship Society.

based on hybrid technology-Multi Stage Flash Reverse Osmosis technology. The plant built at Kalpakkam is integrated with existing Madras Atomic Power Station. It produces distilled water of 4.5 Million Litres per day.

Bhabhatron: Bhabhatron delivers radiation therapy for the treatment of cancer patients. It is a teletherapy machine indigenously developed by BARC. This low-cost machine makes the treatment affordable and accessible to the patients, particularly from rural areas.

Hydrogel: Dressing for wounds caused by fire and wound using the radiation processing technology. Hydrogel is ready to use, sterile, cooling, transparent, mechanically strong, cushioning, flexible, non adherent, contour forming, water absorbing hydrogel dressing. The hydrogel reduces depth of burning by cooling the wound when applied immediately after the burn. It provides humid environment to the desiccated wound, form layer of growth promoting biochemicals (exudates), keeps new skin intact (non adherent) and provides sterile cover resulting in early and clean healing. The application and removal of dressing is painless.

It hydrates sloughy wounds by first softening and then sucking out the slough and making them clean. These dressings have also been observed to reduce pain and is effective in difficult to heal wounds like leprosy, diabetic foot ulcers, pressure ulcers etc. Further, it prevents scar formation and is very useful on donor areas in plastic surgery. Recently, it has been observed to be useful in treating animal bites. Burn injuries from firework, chemical, petrol, electrical appliances, road accidents can be treated using hydrogel. The hydrogel contains about 90% water, yet has capacity to absorb more water, almost equal to its weight. It is not medicated and does not contain any extraneous, synthetic chemicals which could leach out into the wound and interfere with natural wound healing process.

Crop seed varieties: Sample seeds of crop varieties developed by Nuclear Agriculture and Biotechnology Division, BARC using radiation induced mutation and cross-breeding. Over 41 varieties of crops have been developed by the Bhabha Atomic Research Center (BARC) under its nuclear agriculture programme. The BARC had developed 15 varieties of groundnut, eight of mung bean (greengram), five of urad bean (blackgram), four of tur (pigeonpea), three of mustard, two of soybean and one each of chavali (cowpea), sunflower, rice and jute. These 41 varieties of different crops developed by BARC's Nuclear Agriculture and Biotechnology Division at Trombay, in collaboration with some of the agriculture universities in different states, have been gazette-notified by the Union Ministry of Agriculture for commercial cultivation by farmers in different states. These varities are endowed with improved characters such as higher yields, earliness, large seed size along with resistance to biotic and abiotic stresses.

Irradiated samples of vegetables, food grains, spices and other: Samples of radiation processed vegetables, cereals, spices. . Radiation processing is a physical process in which food and agricultural commodities are exposed to controlled doses of radiant energy to achieve desirable effects such as inhibition of sprouting and ripening, and destroying insect pests, parasites, pathogenic and spoilage bacteria. The technology is very effective for elimination of pests, parasites and pathogens. It can be applied to pre-packaged commodities even under frozen conditions. Radiation brings its effects through direct deposition of energy on the large biomolecules and indirectly through radiolysis of water when free radicals so produced interact with other molecules. Gamma rays from radioisotope cobalt-60 and electron beams or X-rays from machine based radiation sources can be used for processing food commodities. Food security is essential for enhancing economic well being and security of a nation.

A significant amount of agricultural produce is lost due to insect infestation, microbial attack and other biological and physical damages during postharvest handling and storage. Prevention of postharvest losses using appropriate technologies can plug the widening gap between food production and demand. The chemical fumigants used for the control of insect pests, and microbial decontamination of food commodities are being phased out on account of their harmful effects on human health and environment. Radiation processing provides an effective alternative.

Nuclear Medicines: Nuclear medicines make use of radiation emitted by radioisotopes. Detecting these emisssions and transforming them into images is the basis of nuclear medicines. Scientists have identified a number of chemicals that are absorbed by specific organs. With this knowledge, several radiopharmaceuticals have been developed. These are compunds that are tagged with radioisotopes for diagnostic or therapeutic purposes which are injected into the patient's body.
Radiopharmaceuticals injected into a patient produce a signal which can be seen using a gamma camera- a device that detects gamma radiation. It is possible to show both organ function and possible to show both organ function and the development of the disease within it.
Nuclear medicine is used for controlling or eliminating cancerous growths formed by rapidly dividing cells.

Domestic Purification (Drinking water technologies) developed by BARC: Availability of safe drinking water is a major concern for the people as well as the government. BARC has contributed towards this goal, by developing and transferring to industry, water purification technologies. BARC has developed and demonstrated several types of thermal and membrane based desalination and water purification technologies. Few sets of water purifiers developed by BARC are kept in the exhibition.

Master-Slave Manipulator (Robotic Arm): Master-Slave Manipulators (MSMs) are the most widely used general-purpose remote handling tools in nuclear industry. An MSM consist of two arms: the master arm and the slave arm. The slave arm is usually placed in the hostile area (hotcell) and the master arm in a safe area (operating area). The arms, which are placed on either side of a thick concrete wall, are connected at the top through a through-tube. From the operating area, when the operator moves the handgrip of the master arm, the motion gets reproduced on the tong of the slave arm in the remote area. For the operator to view the hotcell from outside, lead glass shielding window is used. BARC has developed many models of MSMs with different payloads and ranges. They are used in various hot cells in BARC and other DAE units. Extended Reach Master Slave Manipulator and Sealed Type Three-Piece Master Slave Manipulator are the recent addition to this list. ERM has 6 independently controlled joints (6 DOF) for arbitrary positioning and orienting the object. Power is transmitted from the master to the slave through stainless steel wire ropes, stainless steel tapes and a parallelogram mechanism. To reduce the operator's effort, the manipulator joints are mechanically balanced in all configurations. The first 3 axes of the manipulator are provided with electrical indexing motions. It increases the range of slave arm, improves operator ergonomics, provides better viewing, and helps to orient the slave for insertion of the manipulator into the hot cell. It is used in Remote handling of radioactive materials in hot cells

Indian Radiation monitoring Network: Countrywide environmental radiation/radioactivity monitoring network for the assessment of natural and fallout radioactivity has been established through a network called IERMON (Indian Environmental Radiation Monitoring Network). It is a solar powered system for online monitoring of environmental radiation with multiple detectors which uses Multiple GM tube detectors. Online data communication using GSM based and direct LAN based communication has been incorporated. Options for use of power supply from mains powered and battery powered have been enabled. Care has been taken to make it weather-proof, compact, elegant and reliable. It is a part of the ongoing program of country-wide deployment of radiation monitors under "Indian Environmental Radiation Monitoring Network (IERMON).

Radiation Protection Gear for workers working in radiation: Personal Protective Equipment (PPE) used by personnel working in a Radiation environment. The clothing and/or equipment worn by workers to prevent or mitigate serious job-related illness or injury.

Dummy Fuel Assemblies:
The Nuclear Fuel Complex (NFC), established in the year 1971 is responsible for the supply of nuclear fuel bundles and reactor core components for all the nuclear power reactors operating in India. It is a unique facility where natural and enriched uranium fuel, zirconium alloy cladding and reactor core

components are manufactured under one roof starting from the raw materials. The zircaloy clad enriched uranium oxide fuel elements and assemblies for these reactors are fabricated at NFC starting from imported enriched uranium hexafluoride. Dummy nuclear fuel assemblies and components and other products being manufactured by Nuclear Fuels Complex, Hyderabad are displayed in the exhibition.

Dip N Drink membrane pouch: The membrane pouch is based on Osmosis process to get sterile drinkable solution from biologically contaminated water, especially during disaster conditions like flood, cyclones, tsunami, earthquakes and the useful concentration of high value low volume product in food, pharmaceutical, chemical industries. It can also be used in Oral Rehydration Therapy in remote areas and villages.

Glass to metal seals: Glass to metal seals are vacuum tight assemblies, in which metallic wires, tubes, eyelets or flanges are firmly bound in a glass material. These are normally used as insulated feed-through for electrical connections in hermetically sealed devices and UHV systems as well as mounts for electrodes, filaments etc. The materials chosen have the properties of wettability by glass, matched temperature coefficients of expansion and low out gassing rates even at elevated temperatures making them suitable for application in ultra-high vacuum systems. This technology has been developed for various types of glass to metal seals-like flat bead seals, circular based seals, eyelet type seals, tubular seals, wafer base seals and glass to metal feed throughs for high pressure applications.

Information KIOSK and AV Presentations:
Various Audio-visual presentations were made as the part of Exhibition on BARC Technologies. The students and visitors showed keen interest in browsing the contents rolled out on touch-screen information KIOSK. Interested visitors made themselves aware of BARC's scientific and societal deliveries to the nation by the presentations played on large LCD screens.

Radiation Sterilized medical products: The gamma radiation sterilization plant for medical products is situated at Trombay, Mumbai. Sterilization of medical and healthcare products using gamma radiation is now a well-established and efficient technology. ISOMED - was set up in 1974 by the Department of Atomic Energy to provide gamma sterilization services to the manufacturers of healthcare products in the country. The advantages of radiation sterilization over conventional methods have prompted a large number of manufacturers to use this technology. A wide range of healthcare products sterilized at ISOMED are displayed.

- **Panasonic 42"LEDTV-TH-L42E5DM with remote**
- **65"VU TV with built in computer with vertical stand**
- **Cycle mounted water purifier**
- **Advanced Heavy Water Reactor model**
- **KAMINI REACTOR**
- **Dosimeter,radiation meter,TLD, Radiation Protection Plastic suit**
- **Scintillator crystal tubes (CSI, BGO,LGBO,CAF2, LMO)**
- **SOIL TESTING KIT**
- **Glass model to depict Radioactive Waste**
- **Glass to metal & glass to ceramicsseal**
- **Touch screen interactive information Kiosk**
- **LCD TV**
- **Dummy Fuel rods of Pressurised Heavy Water Reactor (PHWR)**
- **Dummy Fuel rods of Boiling Water Reactor (BWR)**
- **Scrolling display systems**
- **Many Other R&D Products**

CENTRE FOR RESEARCH & TECHNOLOGY DEVELOPMENTS (CRTD)

SINHGAD INSTITUTES, SOLAPUR - 413 255 (INDIA)

1. Preamble

Rural development is the process of improving the quality of life and economic well-being of people living relatively isolated and sparsely populated areas. The need for rural communities to approach development from a wider perspective has created more focus on a broad range of development goals rather than merely creating incentive for agriculture or resources based businesses, education, entrepreneurship, physical infrastructure, and social infrastructure all play an important role in developing rural regions.

With a vision of "Development of human being through research" the Savitribai Phule Shikshan Prasarak Mandal (SPSPM), Kamalapur, Sangola has established the "Centre for Research & Technology Developments", Sinhgad Institutes, Solapur (India) in N. B. Navale Sinhgad college of Engineering, Solapur. This centre mainly focuses on top ten problems of next fifty years. To begin with, Energy, Environment, and Health Science are attempted.

The centre has ventured in a big way to undertake rural development program with innovative technologies

2. Vision, Mission, and Objectives

a) Vision

"To make the Sinhgad Institutes a World Class Centre of Excellence in Research and Technology"

b) Mission

"Develop outstanding research talent capable of undertaking and exploring the Development of Innovative Technologies"

c) Objectives

1. To provide platform to Scientists, Engineers, Students and Partner Organizations for working together to find solutions of societal most challenging problems

2. To establish specialised research laboratories for carrying out frontier level needbased regional and global problems.

3. To develop a full-fledged infrastructure for undertaking R & D programmes of nano technology for applications in variety of fields.

4. To develop new and renewable energy technology for clean environment and protect the planet.

3. Research Council:

SPSPM has established CRTD to cater the needs of research and technologycal developments" of all institutions under the umbrella of SPSPM. In order to plan, guide, monitor, and advise to the researchers for the research activities under CRTD the Research Council has been formulated. It consists of Founder Chairman and Campus Director as Patrons, Director of Chairman, one of the Principals of colleges as Secretary, and Deans and HODs of the Departments as Members. The meeting of Research Council will be scheduled at least four times in a year to review and monitor the progress trimonthly. The duration of Research Council is of two years. The patrons & Research Council will formulate new Research Council by nominations.

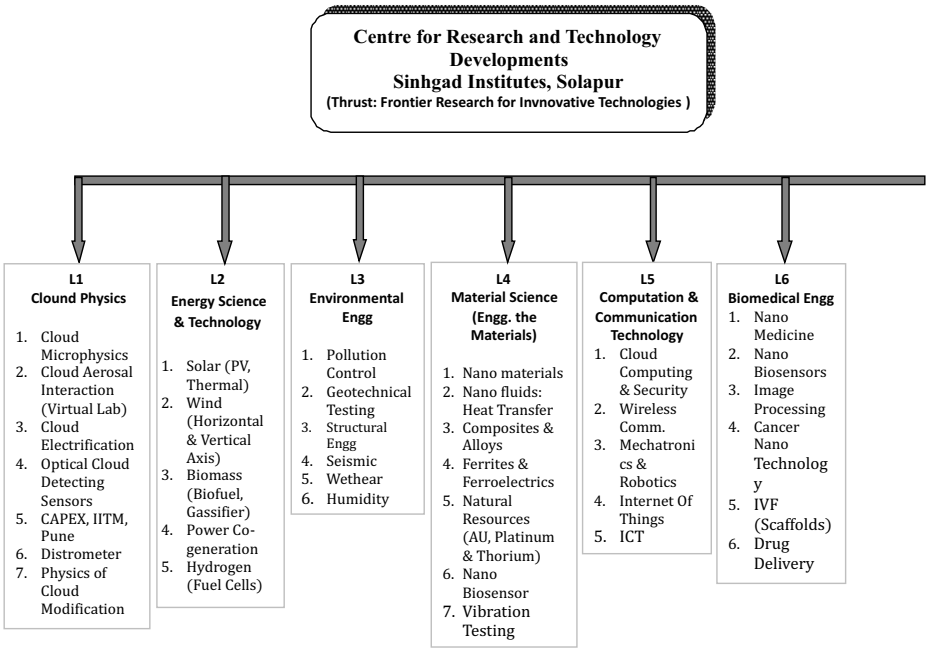
RESEARCH COUNCIL

Prof. M. N. Navale Chairman, SPSPM, Kamalapur, Sangola	Patron		**Mr. Sanjay S. Navale** Campus Director, Sinhgad Institutes, Solapur	Patron	
Prof. (Dr.) S. H. Pawar **(Emeritus Scientist)** Director, CRTD, Solapur	Chairman		**Prof. Dr. S. D. Nawale** Principal, NBNSCOE, Solapur	Secretary	
Prof. B. G. Holey Principal, SPS Solapur	Member		**Prof. J.G. Kulkarni** Dean (Administration) NBNSCOE, Solapur	Member	
Prof. A. M. Kalje Dean (Academics) NBNSCOE, Solapur	Member		**Prof. A. K. Shaikh** HOD, Mech. Dept. NBNSCOE, Solapur	Member	
Prof. P.P. Tapkire HOD, Civil Dept. NBNSCOE, Solapur	Member		**Prof. R. B. Gharase** HOD, Electrical Dept. NBNSCOE, Solapur	Member	
Prof. A.A. Phatak HOD, CSE Dept. NBNSCOE, Solapur	Member		**Prof. S.S. Shirgan** HOD, E & TC Dept. NBNSCOE, Solapur	Member	
Prof. V. S. Biradar HOD, General Science. NBNSCOE, Solapur	Member		**Mr. S. V. Joshi** Registrar, NBNSCOE, Solapur	Member	

4. Research Activities of CRTD

Sr. No.	Committe	Chairman
1	Establishment of sophisticated research labs	Prof. R. B. Gharase
2	Energy self sufficient SMART Campus	Prof. P. P. Tapkire
3	Skill development programs (Rural & Urban)	Prof. S. S. Shirgan
4	Institutional-Industrial Interactions	Prof. A. K. Shaikh
5	Linkages at National/International Institutions	Prof. A. M. Kalje
6	Incubation Center Development	Prof. I. I. Kazi
7	P.G. & Ph.D. Programs	Prof. J. G. Kulkarni
8	Seminars/Workshops/Conferences-	Dr. I. M. Chandarki
9	Students Awareness & Motivation Programs	Prof. V. S. Biradar
10	Projects, Proposals, Schemes	Prof. A. A. Phatak
11	Kishor Vaidnyanik	Prof. B. G. Holey
12	Book, Patents & Publication	Dr. S. S. Kulkarni

5. Research Laboratories



For further details contact to Prof. Dr. S. H. Pawar,
Director, CRTD, Sinhgad Institutes, Solapur
Mb. 8380035623, E-mail: researchtechnology2016@gmail.com

IT - 1

BARC TECHNOLOGIES FOR BENEFIT OF FARMING COMMUNITY

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ABSTRACT :

Bhabha Atomic Research Centre (BARC), a premier research institute in India, is engaged in multidisciplinary research activities. BARC has developed several technologies for the benefit of farming community, many of which have become very popular amongst farmers in India.

Nisargruna biogas plant has been developed at BARC for processing different types of biodegradable wastes, including agriculture waste generated in farmers' fields. This technology has been widely adopted across various sectors of society. Recently, it has been adapted for the slaughterhouse waste also.

Soil organic carbon is an indicator of soil health. A field test kit called Soil Organic Carbon Detection Kit has been developed at BARC. This is a very quick, accurate and easy to perform test, using which a farmer can know the organic carbon levels of his soil within a short time. This technology has been transferred to six companies and products based on the technology are available in the market. Demonstration of this kit can be arranged, where soil samples from farmers' field can be analysed and measures suggested for soil improvement.

Biological control of insect and disease has gained significance during recent times, particularly due to ill effects of pesticide chemicals. Different technologies developed at BARC in this area include Trichoderma mass multiplication medium, Trichoderma virens mutant strain for better disease control and neem based microfine formulation for enhanced insect control. All these technologies have tremendous application in agriculture. Products based on these technologies are available in the market and display of these products can be arranged at the venue.

Using radiation induced mutations, BARC has developed 42 crop varieties; these have been notified and released for commercial cultivation in different agro-climatic zones in the country. Some of the varieties are very popular and grown extensively. The improved characters include higher yield, earliness, large seed size, resistance to biotic and abiotic stresses. Display of these seeds will be done during the outreach programme.

Dr. S. T. Mehetre : Working as a Scientist at Nuclear Agriculture and Biotechnology Division, Bhabha Atomic Research Center (BARC), Mumbai since 1999.
Education qualification : PhD (Microbiology) from Mumbai University in 2008, M. Sc (Agriculture) from Mahatma Phule Agriculture University, Rahuri in 1996, B. Sc (Agriculture) from College of Agriculture, Pune in 1994.
Was a visiting Scientist at Northern Illinois University, USA during year 2011- 2012. Has published 20 research papers in national and international journals and writing popular articles in national newspapers. Also working as an editorial board member and reviewer of many scientific Journals.Got a patent for development of a novel biopesticide and developed 03 technologies which are widely used by industries and farmers across the country. Received awards like Government of India DBT-CREST Award (2011), Department of Atomic Energy (DAE) Group achievement Award (2010 & 2015) and Dr. E. J. Wevai Memorial Award (1995) as a university topper.

IT - 2

TIO2: ONE NANOMATERIAL MANY APPLICATIONS

Hemraj M. Yadav

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ABSTRACT :

The titanium dioxide photocatalytic process is a conceptually simple and promising technology. Due to its high chemical stability, non-toxicity and good heat resistance, it is highly promising to be used in electronic, photocatalysis, air-water purification, drug delivery, antibacterial and self-cleaning materials. However, it can only work under ultraviolet (UV) Light (wavelength < 388nm) due to its wide band gap of 3.2eV. Different preparation strategies have been adopted to enhance photocatalytic performance of titanium dioxide nanostructures. Detailed structural, optoelectronicproperties have been investigated from sophisticated techniques. The photocatalytic properties of modified titanium dioxide nanostructures have also been investigated.In this talk I will briefly introduce about the properties of multifunctional titanium dioxide and then explain its applications in air-water purification and biomedical systems.

Dr. Hemraj M. Yadav, Research Professor, Department of Energy & Materials Engineering, Dongguk University, Seoul, South Korea.
Has received his Master degree in Chemistry from Shivaji University Kolhapur, India in 2009, and his PhD in Chemistry in 2014 from D.Y. Patil University Kolhapur, India. He had his post-doctoral training at Department of Materials Science and Engineering, University of Seoul, South Korea. He is presently affiliated with Department of Energy and Materials Engineering, Dongguk University, South Korea as a Research Professor. He has been involved in a broad range of research projects including the synthesis and characterizations of modified titania nanoparticles for photochemical transformations, heterojunction nanocomposites of titaniafor solar energy harvesting, development of self-cleaning and antifogging materials for building applications and fabrication of MEMS based hydrogen gas sensors. As an author or co-author, he has contributed more than 30 international journal publications. Current research interests include heterogeneous photocatalysis, nanomaterials, MEMS gas sensors, solar and environmental chemistry.

IT - 3

INNOVATIVE WATER PURIFICATION TECHNOLOGIES FOR RURAL DEVELOPMENT

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ABSTRACT :

Drinking water with physical, chemical or biological contamination has harmful effects on human health. In general, surface water is affected with disease-causing micro-organisms and ground water at certain locations contain high loads of dissolved salts, including toxic elements. Though rain water harvesting could help in enhancing the quality & quantity of drinking water, it is feasible only if it rains and also has got limitations as far as storage is concerned. Membrane based technologies provide a one-step solution in making contaminated water safe for drinking. While Ultra-filtration (UF) based systems are very effective in removing biological and other colloidal species, Reverse Osmosis (RO) is capable of bringing the concentration of dissolved salts down to potable limits. In India, many of the remote & rural areas do not have good quality drinking water. As most of the illnesses in such areas are water borne, supply of safe drinking water itself would be a preventive measure in the health improvement program. UF and RO are pressure driven processes and hence require energy in the form of electricity. Nearly 67% of the country's population lives in rural areas. Reports also say that, only 55% of rural households have access to grid electricity. Even in areas where power is available, the voltage is not stable to operate any systems. This prevents the rural sector from getting the benefit of the available water purification technologies. Stand-alone water treatment systems which can work on renewable energy or human power are the only viable solution to deal with such situations. The most useful renewable energy source is the sun. Solar power in India is a fast-growing industry and the country's solar grid has reached a cumulative capacity of around 9000 MW. In addition to the large-scale grid connected solar PV initiative, India is continuing to develop off-grid solar power for localized energy needs. With about 300 clear, sunny days in a year, the theoretically calculated solar energy incidence in India is about 5000 trillion kilowatt-hours (kWh) per year, which exceeds the possible energy output of all fossil fuel energy reserves in the country.

Dr. Smt. Saly T. Panicker : B.E. (Chemical Engg) from Cochin University is a senior scientific officer in Bhabha Atomic Research Centre (BARC), Mumbai and is presently heading the process development & utility section of Desalination Division. She is a member of the public awareness committee of BARC. She has nearly 30 years of research & development experience in the field of water treatment, starting from laboratory scale units to industrial level plants capable of handling low salinity water up to seawater. Her experience spans over, process development, design, setting up and operation & maintenance of systems and plants. By providing a water treatment plant in pharare village near Chiplun in Maharastra , she could win the hearts of the needy community. With this experience, she expanded her research field to the development of renewable energy based water treatment systems, keeping rural & remote areas in mind. Her work on development of solar energy driven water treatment systems received a lot of national & international acclaim. Her further research led to the development of manually operated systems. The bicycle mounted pedal driven water treatment unit got special attention from the Honorable Prime Minister of India, Shri. Narendra Modi, during his visit to BARC. Smt. Panicker has authored a number of publications in national and international journals and conferences. She is also the recipient of a few awards for her contributions in the field of water treatment system development and its rural implementation.

As a part of the societal commitment of BARC, Desalination Division (DD) has been developing rural - friendly water treatment systems, supported by solar energy and human power. In order to increase the utility of solar energy based small water treatment units, they are integrated with a foot-driven facility and is mounted on a bicycle. This offers the added advantages of anytime water irrespective of, if the sun is shining or not, along with mobility for the unit to be moved from place to place. Similarly, a community level plant, which is on wheels has been set up to have the advantage of mobility, so that it could of help also in the event of disaster management.

The talk will be covering the drinking water quality issues, details of membrane based water treatment technologies, a case study of technology deployment by BARC in rural Maharashtra, experience/lessons learnt from that, implementation of the experience in adapting the systems to make them more rural-friendly, details of the developed stand-alone systems and their commercialization through technology transfer route.

IT - 4

FUEL CELL - A TECHNOLOGY OF HOPE IN THE MIDST OF ENERGY CRISIS

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ABSTRACT :

'Energy crises' and 'Energy solutions' are the two antagonistic phrases which guide the economy, life style and the overall development of the country today[1]. Researchers and technologists have tried to address the crises mentioned above with all innovative and inventive methods. Starting from wind, solar to geothermal are few of the realms in which the development is taking pace. Fuel cell is one leading approach which is seen as one of the most promising solutions of future [2]. Conventionally, it is a battery which uses hydrogen and oxygen to produce electricity. Different combinations of electrodes, electrolytes and connectors attempted in fuel cells, decide the set of advantages over other technologies.

The talk would throw some light on the science of Fuel Cells, working principle, scope and advantages. It will also include a few new set of approaches adapted by our group to make fuel cell a viable technology. Further, the different types of Fuel Cells and their limitations from the point of view of materials [2] will also be discussed with special stress on the 'Single Chamber Fuel Cell Technology' and its advantages [3], which is one of the latest innovations making fuel cell the leader in energy harvesting. At the end, the paper would present some part of the authors work in the development of low temperature (significantly!) single chamber Solid Oxide Fuel Cell [4] and its impact on growth of the field.

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Rajeev Joshi : An Assistant Professor of Physics at Central University of Karnataka

He has completed his masters degree from Karnatak University, Dharwad in 2004 and Ph. D from Shivaji University, Kolhapur, in the area of Condensed Matter Physics, in 2010. He was a post doctoral fellow at Department of Physics, Indian Institute of Science Bangalore, from 2010-2013 and at Cambridge University, United Kindom in 2014.

His current areas of interest in research are magnetotransport in complex magnetic oxides and their multilayers, magnetoelectric coupling in solids, micromagnetic simulation of nanostructures, ion transport and energy technology. His other areas of interest are Indian Classical Music, literature and theater.

IT - 5

PSYCHOLOGICAL IMPACT OF NUCLEAR DISASTERS

Behere Prakash B. Vice-Chancellor & Professor of Psychiatry, D. Y. Patil University,KasabaBawada Kolhapur-416006, Maharashtra, India

Chougule Kaveri N. Dept. of Psychiatry, D. Y. Patil Hospital, Kadamwadi, Kolhapur-416003 Maharashtra, India

Syyed S.

ABSTRACT :

There are major Nuclear Power plant disasters in world, one was Chernobyl, Ukraine 1986, and other was Fukushima, Japan 2011. There are many studies, which are evidence based to demonstrate short and long terms consequences of nuclear plant disasters.

The psychological consequences of nuclear power plant disasters include depression, anxiety, posttraumatic stress disorder, and medically unexplained somatic symptoms. These effects are often long term and associated with fears about developing serious illness like cancer. Research on disasters involving radiation, particularly evidence from Chernobyl, indicates that mothers of young children and safai workers are the highest risk groups.

The psychological consequences occur independently of the actual exposure received. In contrast, studies of children raised in the shadows of the Three Mile Island (TMI) and Chernobyl accidents suggest that although their self-rated health is less satisfactory than their peers, their emotional, academic, and psychosocial development is comparable. The importance of the psychological impact is underscored by its chronicity and by studies showing that poor mental health is associated with physical health conditions, early mortality, disability, and over-utilization of medical services.

Given the established increase in mental health problems following TMI and Chernobyl, it is likely that the same pattern will occur in residents and evacuees affected by the Fukushima meltdowns. Preliminary data from Fukushima indeed suggest that workers and mothers of young children are at risk of depression, anxiety, psychosomatic, and post-traumatic symptoms both as a direct result of their fears about radiation exposure and an indirect result of societal stigma.

Thus, it is important that non-mental health providers learn to recognize and manage psychological symptoms and that medical programs be designed to reduce stigma and alleviate psychological suffering by integrating psychiatric and medical treatment.

Dr. Prakash.B. Behere :

Recepient Dr B C Roy National Award, Vice Chancellor, D Y Patil University Kolhapur wef 9th June, 2016, MD (Psychiatry)- Postgraduate Institute Of Medical Education & Research, Chandigarh (PGI) -1978, Fellowship of National Academy of Medical Sciences (FNAMS) -2014, Director Research & Development Datta Meghe Institute of Medical Sciences (Deemed University) and Professor & Head Dept of Psychiatry - Oct 2011 - May 2016, Director Professor & Head, Dept. Of Psychiatry, Mahatma Gandhi Institute of Medical Sciences; Sewagram 1996 - 2011, Lecturer & then Reader in Psychiatry in 1979 - 1995 Institute of Medical Sciences, Banaras Hindu University,BHU, Varanasi (U.P.),

Award : Dr B C Roy National Award - 2006 for Socio medicl Relief, Dr D L N Murthy Rao Oration Award delivered at ANCIPS Raipur, 6th January 2017, Dr V N Bagadia Life Time achievement Award on 20th April,2014, Marfatia Award 1981, WHO Fellowship in Community Psychiatry - 1986, Merck Lipha Travelling Fellowship UK -1995 for USA, Member of Research Board of Advisers of American Biographical Institute Inc. North Carolina USA,

Visiting Professor : Visiting Professor to University of Chester UK, Adjunct Faculty Georgia Southern University, US, Research Current Project: Prevalence, determinants and awareness regarding child sexual abuse in school going children of Wardha Dist." Funded By ICMR, Investigator for WHO ICD- 10 F & DCR SCAN field trials, Completed W.H.O. funded projects in community psychiatry in Dementia and Alcohol related problems in Rural areas,

PhD : Supervisor for 4 Ph.D. candidates who had been awarded the degrees

Published books : Mental Health Training For Health Professionals : Global Mental Health Assessment Tool (GMHAT), IPS Publication 2017, Child Sexual Abuse : India Scenerio , IPS Publication 2016, Hand Book of Clinical Psychopharmacology. Paras Med Pub, Hyderabad, 2010, Psychometrics for Post Graduates in Psychiatry -2017,

Associate Editor : Text Book of Family Medicine. Paras Publication, Hyderabad, 2008

IT -6

NUCLEAR MEDICINE IMAGING TECHNOLOGY : AN INTRODUCTION

Dr.Basant L Malpani

Radiation Medicine Centre, Bhabha Atomic Research Centre, Mumbai - 12

ABSTRACT :

Nuclear Medicine encompasses the science of studying invivo metabolic activity of our living body using extremely low potency doses of radioactivity. In 1896, when Henri Becquerel accidentally discovered "Radioactivity" it was hardly imagined that it would find such tremendous application for diagnosing and treating diseases. By demonstrating the principles of tracer Kinetics in 1913, Radiochemist George De Hevesey set forth the evolution of the subject and field of Nuclear Medicine. The progress as we see today has been contributed by continuous developments in Isotope production, Radiochemistry, Instrumentation, Better understanding of the underlying fundamental biological processes in various diseases, concepts of Molecular Biology, Pharmacology, Digital Signal Processing methods, Computers and Mathematics.

Nuclear Medicine, as the name suggests is a product of extending application of physical sciences in the medical field. To describe the field and subject of nuclear medicine it is essential to relate to the developments in the various fields that are integral to its nature.

Nuclear Medicine derives its strength from the ability to locate and measure gamma radiation from a shortlived radioisotope that is tagged to a molecule that is internally administered to a patient. This ability allows targeting and studying organ function for diagnosing and treating diseases. The modern day Gamma Cameras permit better images of the disease process thereby aiding the physician in selection of better treatment methods. Further advances in Tomographic capabilities by way of SPECT scan and PET scan have improved the quality of information. The modern day TOF-PET Scanner boast resolution close to 3.5mm and the ability to perform imaging in short span of time, (typically 8-10mins). Combination of dual modality scanners like SPECT-CT, PET-CT, PET-MRI further enhance the imaging capability and disease delineation.

Dr. B. L. Malpani, RMC, BARC

Dr. Malpani obtained his Post Graduate Diploma in Medical Radioisotope Techniques (DMRIT) from the Bhabha Atomic Research Centre in 1986. He worked as a JRF for a joint research program funded by the IAEA and World Health Organisation for developing Immunodiagnostic Methods in Tuberculosis. For this work he was awarded M.Sc.by Research by Mumbai university in 1991. Further while working in the field of Nuclear Medicine at the Radiation Medicine Centre, he obtained Ph.D. on Developing Computational methods for performing Parametric Analysis in Nuclear Medicine with focus of Evaluating Liver Diseases. He has received very short term training/exposure on Positron Emission Computed Tomography at Biomolecular Imaging Research Centre (BIRC), University of Fukui, Fukui, Japan and also at Keck School of Medicine, University of Southern California, Los Angeles. He has published several papers on measurement of Salivary Function and also on measurement of GFR and renal function reserve. He is guide for Ph.D. at HBNI. Served as Examiner for M.Sc. (NMT), Radiation Safety Officer (NM) etc. He also serves as a peer reviewer for prestigious journals like Medicine and IJNM. He has about 12 International Publications to his credit and several invited talks in various conferences and seminars.

He is presently serving in Scintigraphy Section as Scientific Officer (G), and Associate Professor (Health Sciences) at Homi Bhabha National Institute, Course. Serving as the course Cordinator for DMRIT Program & Member, Standing Committee on Training Courses and Radiation Professionals, (SCTC&RP) RPAD, BARC. Ex.Member, Safety Committee for Nuclear Medicine (SACNUM) of the Atomic Energy Regulatory Board. Ex.Secretary (HQ), Society of Nuclear Medicine India.

Availability of a "Radionuclide Generator" within a Hospital Campus combined with easy methods for producing the radiopharmaceuticals of choice from "Kit form" chemicals allows its penetration in to far reaches. The availibilty of Medical Cyclotron (fondly called Baby Cyclotrom) allows production of short lived isotopes like 18F and 15O with half lives of nearly 2hrs and 2 mins respectively, allow metabolic studies with more physiological tracers. For e.g. 18F-FDG, a glucose analogue is used for studying density&function of glucose transporters while 18F-FLT, a Thymidine analogue is used to study mitotic cell divisions.

Computer based modelling and quantification methods have enhanced the ability to measure very pertinent physiological indicators like the Glomerular Filteration Rate, Tubular Secretion Rate, Hepatic Extraction Fraction, Cerebrovascular Reserve Function etc. These can be used not only to study diseases but as early markers of disease or for determination of better strategies to combat diseases. Even simple indicators like SUV (Standardised Uptake Value) for FDG-PET allows measurement of aggressiveness of a tumour.

Capabilities of a Nuclear Medicine Imaging investigation are further enhanced by inclusion of pharmacological intervention to appropriately decipher metabolic changes. For eg. Myocardial Perfusion Imaging following "Adenosine" infusion permit distinction of Ischeamic tissue from infarcted one.

Nuclear Medicine investigations are now at the inflection point of a explosive growth in our country given the advances in detector instrumentation and easy availibility of radiopharmaecuticals. The importance of studying "Function" in a disease process as against employing "Anatomical" methods like CT Scan or MRI scan alone is better appreciated. With about 15 medical cyclotrons installed in the country and about 65 PET scanners, the questions of commercial viability and radiation safety of patients (and the public) are no longer in the minds of medical proffession.

IT - 7

NUCLEAR MEDICINE IN DISEASE DETECTION & TREATMENT

Dr. Sunita Nitin Sonavane

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ABSTRACT :

Nuclear medicine is a boon of technological advancement which uses radioactive materials safely, painlessly, and cost-effectively in very tiny amount into human body by injection, ingestion, or inhalation to provide diagnostic information about the functioning of a person's specific organs, or to treat multiple types of cancer as well as conditions such as Graves' disease.

Nuclear Medicine's advanced imaging capabilities can identify changes in organ function. Imaging techniques are various from simple planar static, planar wholebody imaging, 3D SPECT imaging. The thyroid, bones, heart, liver, kidneys, brain, lungs, and many other organs can be easily imaged, and disorders in their function are revealed.

Latest technology is combining information about the body's anatomy and physiologic/ metabolic function. SPECT/CT and PET/CT fusion imaging are performed on specialized scanners that directly map the abnormal tissue physiology depicted on the nuclear images to the affected anatomic area displayed on the high-resolution CT images. PET/CT scan provides a more detailed picture of cancerous tissues than either test does alone. The images are captured in a single scan which provides a high level of accuracy. PET/CT is a very powerful and significant tool which provides unique information on a wide variety of diseases from dementia to cardiovascular disease and cancer (oncology). PET/CT studies are performed and interpreted together by a team of cross-trained specialists, resulting in one integrated report for the referring physician that contains a cohesive assessment of the patient's overall condition. PET/CT scans in present era not only indicated for staging, response assessment, restaging, but also assist radiation oncologists in planning treatment with external sources of radiation (external radiotherapy).

Rapidly dividing cells are particularly sensitive to damage by radiation. For this reason, some cancerous growths can be controlled or eliminated by irradiating the area containing the growth. Patient therapy is a significant component of Nuclear Medicine. Nuclear medicine therapy aids effectively to treat some medical conditions, especially cancer, using radiation to weaken or destroy

Dr. Sunita Nitin Sonavane :

Training : MBBS - Grant Medical College & Sir J. J. Group of hospitals, Aug 1995 till Jan 2001. DRM - Radiation Medicine Centre, Bhabha Atomic Research Centre, Mumbai - January 2005, DNB (NM) - National Board of Examinations, New Delhi, India- Dec 2010, RSO-Level-II (NM) (Radiation Safety Officer) Radiological Physics and Advisory Division, Atomic Energy Regulatory Board-Mumbai -August 2006, **Present position :** CONSULTANT: Radiation Medicine Centre, Department of Nuclear Medicine & PET/CT, Parel, Mumbai-22nd March 2013 -till date.

Past Positions : Senior Registrar at TATA Memorial Hospital, Department of Nuclear Medicine & PET/CT, Parel, Mumbai, August 2012 - 21st March 2013. Clinical Associate at Bombay Hospital, Department of Nuclear Medicine & PET. August 2010- Feb 2012.

Publications : Number of Research publications in Journals during the last 3 (Three) academic years: National Journals: 7 PAPERS, 1 interesting image, 5 abstracts (Indian Journal Of Nuclear Medicine). State/Other Journals: 2 chapters (PET & INCAS bulletin), 14 case reports; 4 review, 2 original paper, 3 abstracts; 7 general practitioner section articles.

particular targeted cells. In some cases radiation can be used to treat diseased organs, or tumours. With any therapeutic procedure the aim is to confine the radiation to well-defined target volumes of the patient. Nuclear medicine was developed in the 1950s by physicians with an endocrine emphasis, initially using iodine-131 to diagnose and then treat thyroid disease. Radionuclide therapy has progressively become successful in treating persistent disease and doing so with low toxic side-effects. Treatments, and sometimes pain relief, are offered for conditions such as Graves' disease, thyroid cancer, liver cancer, neuroblastoma, paraganglioma, pheochromocytoma, neuroendocrine tumors, cancer that has spread to the bone and refractory lymphomas.

To summarise, Unique expertise and unsurpassed technology empowers the optimum use of nuclear medicine to help care for patients, from offering the earliest possible diagnosis to helping assess and manage treatment plans.

IT - 8

RECENT ADVANCES IN RADIATION THERAPY

Dr. Sunil Dutt Sharma

Scientific Officer (G) & Head, Medical Physics Section (MPS), RPAD, BARC, Mumbai
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Radiation therapy is one of the principal modalities for the treatment of cancer by the use of ionizing radiation. The inception of radiation therapy goes back to the discovery of X-rays by Roentgen in 1895 and it has the history of continuous development of new skills and new approaches. The aim of radiotherapy is to deliver as high and homogenous dose as possible to diseased tissue without causing unwanted and unnecessary side effects for the patient. This aim recognizes that is not enough to destroy tumor cells & prolong the life of a patient, but the life must be of high quality. Achievement of higher tumor control probability with reduced treatment morbidity is the ultimate goal of radiotherapy.

There are two principal modes for the administration of radiation therapy, namely, beam therapy (also called external beam therapy or teletherapy) and brachytherapy. Beam therapy is most common form of radiotherapy where radiation source is kept at a certain distance from the patient body. It is generally performed with highly penetrating gamma rays and X-rays, however, electrons, protons and other charged and neutral particle beams are also used. Brach therapy is a treatment where sealed radioactive sources are placed within or in the vicinity of the tumour volume to deliver a localized dose to the tumor. It plays an important role in the management of cancers of several sites, including the brain, head and neck, uterine cervix, endometrium, oesophagus, nasophrynx , bronchus and prostate. Compared to conventional beam therapy, physical advantages of brachytherapy result from a superior localization of dose to the tumor volume. On the other hand, the dose gradients around an implant and dose heterogeneity within an implant are much higher than those in external beam therapy.

Standard telecobalt machine is commonly used as the beam delivery device for masses of the cancer patients in the country. About 245 standard telecobalt machines are routinely used of for such purposes in India. Specialized telecobalt machine (such as gamma Knife) is also used for treatment of some of the cancer cases nu the method of stereotactic radio surgery (SRS). Medical electron accelerators with the option of shaping either square or rectangular beams are in use at some of the radiotherapy centres in the country for treatment of cancer by conventional approaches. Now-a-days, advanced medical electron accelerators along with sophisticated beam

Dr. Sunil Dutt Sharma : Design and development of radiotherapy equipments (telecobalt, Linac, RAL HDR Brachytherapy unit) and accessories (MLC, SRS cone); Development of dosimeters & phantoms for radiotherapy; Development of quality control instruments and tools for radiotherapy; Development and standardization of comprehensive dosimetry quality audit method and programme for beam and brachytherapy; Establishment of advanced radiological laboratory for education, standardization and research; QA and dosimetry in diagnostic radiology; Medical advisory related to radiology and radiotherapy. Type approval, performance and safety evaluations of radiation generating medical equipment as technical support to regulatory body. Coordinator of DipRP course (BARC/HBNI)

Honours & Awards : Gold Medal in M. Sc. (Phys) - 1991, ICTP TRIL Fellowship (2003-04), AMPI-TNP Dr. C. A. Jayachandran Oration Award-2007, DAE Scientific and Technical Excellence Award-2013, IARP Dr. A. K. Ganguly Felicitation Prize - 2014

shaping, monitoring and imaging devices becoming very popular for treatment of cancer utilizing the approaches of three dimensional conformal radiotherapy (3D-CRT), intensity modulated radiotherapy (IMRT), image guided radiotherapy (IGRT), volumetrically modulated are therapy (VMAT) and helical tomotherapy. Both standard and specialized medical electron accelerators (such as advanced standard accelerator, tom therapy and cyber knife) are used for such purposes. About 200 medical electron linear accelerators are currently available in the country for the treatment of cancer patients.

Brach therapy uses a variety of gamma emitting sources which can either be implanted manually or by remote controlled source driving devices. High dose rate (HDR) brachytherapy which uses a 10 Ci Ir-192 source and a remote after loading device (RALD) is becoming very popular. Some of the brachytherapy HDR RALD is also uses a dedicated C-arm type X-ray imaging system and an interconnected radiotherapy treatment planning system (RTPS) to make the system as an integrated brachtherapy unit (IBU).

Accurate dose calculation and precise dose delivery to the intended region of a cancer patient is one of the important part of radiation therapy. For this purpose, number of dose calculation algorithms have been prescribed and are the part of commercial RTP. In addition, routine verification of the planned treatment and the radiation dose by the methods of pretreatment and post-treatment are the important elements of successful radiation therapy. This requires the development of specialized measuring medium (i.e. phantoms), dosimeters and methods to implement this requirement. A review of dose calculation algorithms and dose verification methods, indicates that some of the dose calculation formalism dose not account for the realistic radiation transport environment and gives erroneous dose values. Similarly, some of the existing dose verification methods provide limited information regarding the dose delivery accuracy.

In summary, this presentation provides detailed technical aspects of radiotherapy equipments and sources and dosimetric formalisms and methods used for dose calculation and verification.

IT - 9

Research Proposals : Financial support by BRNS

Shri. D. K. Dalal

Nuclear Engineer in Reactor Group of Bhabha Atomic Research Centre (BARC).

Board of Research in Nuclear Sciences (BRNS) is a Board constituted by Secretary, Department of Atomic Energy (DAE) for promotion of R&D programmes in the areas of interest to DAE in India.

The main objectives of BRNS are

* To supports extramural and/or collaborative research and development activities in nuclear and allied sciences, engineering and technology
* to encourage, enthuse and support scientists and engineers in pursuing excellence in R & D programmes of interest and relevance to DAE.

The Mandate of BRNS is

* Management and Financial assistance to Collaborative Research Programme in Science and Technology,
* Promotion of Interactions (Symposia, Theme Meetings, Visits by Academicians/Non-DAE Scientists, etc) amongst the Scientific Community
* Promotion of Excellence in Science (DAE-SRC Award, Young Scientists Award, etc),
* Honour to Excellent Performers (Homi Bhabha Chair, Raja Ramanna Fellowship, etc),
* Sponsoring of Conferences
* Conducting national and international conferences, seminars, and workshops facilitates researchers to exchange ideas on their research findings and to chalk out further research programmes to fill up the gaps or to take up newer thrust activities. BRNS has been providing grants for organizing such events in the country.
* Besides fully funded DAE conferences, BRNS has been providing partial support to several other conferences hosted by non-DAE organizations, provided the topic has relevance to the DAE's programme or it is important in the national / international context.

Scientific Advisory Committees under BRNS :

These Committees assist the Board in the discharge of its assignments related to Regular Research Projects :

* Advanced Technology Committee (ATC)
* Basic Sciences Committee (BSC)
* Nuclear Reactor and Fuel Cycle Committee (NRFCC)
* Radioisotopes, Radiation Technology and Application Committee (RTAC)
* Plasma & Fusion Research Committee (PFRC)

Selection and Award of Research Projects :

Research projects are submitted by the Researchers working in universities, education institutes, research laboratories etc. The submitted research project proposal is reviewed / scrutinized at various levels before it qualifies for financial support by BRNS :

* Assessment of the submitted project proposal by referees. Based on the review report of the referees, the proposals are selected for next stage review.
* The qualified proposals are presented before Scientific Advisory Committees & experts in Technical Programme Discussion Meeting (TPDM)
* Discussions by the Advisory Committee after presentation and approval / recommendations to the Board.
* Approval of the Board for the proposals recommended by the Advisory Committee
* Issue of Financial Sanction by BRNS Secretariat, DAE.

Shri. D. K Dalal joined BARC in 1983 after completing Bachelor of Engineering degree in Mechanical Engineering from Govt. Engineering College, Jabalpur (M P). He successfully completed one year DAE training school (27th Batch of training School) and joined as Nuclear Engineer in Reactor Group of Bhabha Atomic Research Centre (BARC). He worked as Operation & Maintenance engineer for Research Reactors CIRUS & Dhruva. In 2013 he moved to Board of Research in Nuclear Sciences (BRNS) and looking after responsibilities as programme officer for Advanced Technology Committee (ATC) and Pasma & Fusion Research Committee (PFRC).

IT - 10

ROLE OF NANOTECHNOLOGY IN HEALTH CARE

Prof. Dr. S. H. Pawar

Director, Centre for Research and Technology Developments, Sinhgad Institutes, Solapur &
Distinguished Professor & Vice-Chancellor Emeritus, D. Y. Patil University, Kolhapur (India)

shpawar1946@gmail.com, researchtechnology2016@gmail.com

ABSTRACT :

Health care is prime importance to every human being. It is well known that healthy mind lies in healthy body. Hence, every nation provides great importance for the provision of sufficient funds in its annual budget. The world health organization (WHO) keeps an eye on health care globally. It conducts the survey of diseases. Recent survey reveals that out of every 10 deaths in India, 8 are caused by non communicable diseases (NCDs) which include cardio vascular diseases, cancers, chronic respiratory diseases and diabetes. In light of these facts, our research group has focused the major thrust on the applications of nanotechnology in health care, specifically on atherosclerosis and nanotechnology, cancer nanotechnology, stem cells and regenerative medicine, wound healing and nanotechnology, and invitro fertilization. Our group has published considerable amount of research papers in highly reputed international research journals and reality available on website www.shpawar.com . In the present talk, attempts have been focused on right form synthesis and characterization of variety of nano materials, as per the requirements of diseases. Specifically , magnetic nanoparticles (MNPs) are of great interest for use in medicine for example, for targeted drug delivery, for enhancing the contrast of magnetic resonance images and in magnetic hyperthermia treatment. The role of magnetic NPs will be discussed at length in cancer nanotechnology, as it is a painless curing of cancer.

Prof. Dr. S. H. Pawar is presently working as the Director, Centre for Research and Technology Developments, Sinhgad Institutes, Solapur and Distinguished Professor of the D. Y. Patil University, Kolhapur. Prior to this position, he has worked as "Vice-Chancellor", D. Y. Patil University, Kolhapur for two successive terms and also held various important responsibilities like "Emeritus Scientist" CSIR, Delhi, Director, Research & Technology Development, T.K.I.E.T. Warananagar; Coordinator, School of Energy Studies; Professor & Head, University Department of Physics; Acting Registrar and Director, BCUD of Shivaji University, Kolhapur. Prof. Pawar has successfully guided 67 Ph. D, 10 M. Phil and 1 M. Tech. students and presently guiding 10 Ph.D. students in the frontier areas of research in NanoBio Materials science, Nanobiotechnology, Medical Physics, Renewable Energy, Thin films and Solid State Physics, Material Science and High Tc Superconductors Fuel Cells.

He has edited 10 books, written 35 review articles and published more than 800 research papers in National & International Journals and Proceedings of the Conferences. He has 8 patents to his credit. He is an academician with distinguished record and scholastic recognition in the national and international circle of Physicists.

Due to his high quality research, he has bagged number of awards like :

Materials Research Society of India's Medal-Bangalore (2002), Indian Cryogenics Council's Prof. M. C. Joshi Award, Kolkata (1993), Dr. Vikram Sarabhai Award, DST, Delhi (1996), Royal Society's Indo-UK young scientist exchange award (1975), U.G.C. National Associate, Delhi (1978), Shivaji University First Best Teacher Award (1994), Marathi Vidnayan Parishad Award, Mumbai (1993), Best Research Paper Awards(Nine) at National and International Conferences, Vice-Chancellor's Life Time Achievement Award by World Management Congress and Commonwealth of Distance Education Summit, Delhi (2010), Vasantdada Kale Pratisthan Purskar for Excellence in Education Achievements (2013), Dr. R. B. Devsthali Memorial Purskar for Excellence in Medical research, Karad (2013), International Prize for Best Manager of the year in Science & Education by EBA, Oxford, U.K. (December 2013), 3rd CMAI CCI Technical Education Excellence Award 17th July 2015 at Gujarat Technological University, Ahmedabad, "100 Most Influential Vice-Chancellors" Global Ranking Awarded by World Education Congress at Mumbai , 23rd June 2016

UHF RFID PASSIVE TAG FOR HUMIDITY SENSING AND ELECTROMAGNETIC ENERGY HARVESTING

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ABSTRACT :

Keywords: Conductive polymer, EEH, Sensor, UHF RFID

Radio Frequency IDentification (RFID)is one of the rapidly growing near field communication technology (NFC) due to its vast number of day to day applications. Being used in unlicensed frequency bands, most of the researchers have paid their attention for designing and development of the RFID based systems. Also passive RFID tags have numerous advantages over active tags; therefore it is more worth to work in the area of the passive tags. As RFID tag consists of an antenna properly matched in terms of impedance with the microchip,to enhance its communication read range, design parameters becomes more crucial. Also,out of different frequency ranges, Ultra High Frequency (UHF) based passive RFID tags are more preferred, due to its design feasibility and commercial aspects.

In this research UHF RFID passive tag based applications are studied, for its use in the environmental applications. The first part of the research deals with the sensing of the humidity, where chemically sensitive species of the conductive polymer PEDOT:PSS, is doped with the passive RFID tags. In this case, the Planer Inverted Folded Antenna (PIFA), type structure of the micro-strip antenna is used with the slots at the conducting surface. Changing conductivity of the polymer has helped to convert the identification tag as a sensor. Both the communication and the sensing scenarios are being verified with the experimental results in the real time environment.

In the second part of the research, RFID tag as the Electromagnetic Energy Harvesting (EEH) device has been studied. The non-linear performance of the rectifying element of the microchip has been utilized to increase the DC output voltage, by proper feedback process. Two types of the harvesters are being designed such as; Self and External Harvester. For Self harvesting device, single band tag working at 868 MHz is used as the communication device and harvesting mechanism is designed at its 3rd harmonic (i.e. 2.604 GHz). Whereas, for External harvesting device, RFID communication is happening at the same UHF (i.e. 868 MHz) and the harvesting part is designed at UMTS 2.17 GHz. The performance of both the harvesters' is being verified and compared, in terms of DC output voltage and improved read range.

Dr. Shankar Nawale, is basically an Electronics & Telecommunication Engineer. He has done his Diploma from Government Polytechnic, Pune and B. E. from Dr. Babasaheb Ambedkar Marathwada Uuniversity. He has completed his M. Tech. and Ph. D. from Veermata Jijabai Technological Institute (VJTI), Mumbai. Dr. Nawale has also completed his Post-Doctoral Research, from Grenoble Institute of Technology, France. His areas of interest are Electromagnetics, Antenna Wave Propogation and Microwave Engineering.

His research lies in passive RFID Tag and its applications for Environmental Sensing, as well as Energy Harvesting in RFID tags. He has carried out his part of Ph. D. research at University of Rome, Italy, under the Erasmus Mundus Scholarship. He is also recipient of European Comission Fellowship for his Post-Doctoral Research. Dr. Nawale has total fifteen years of Teaching Experience and five years of Administrative Experience, as Head of the Department.

Pivotal Contributions of Dr. Nawale are: Represented his research lab at ¡¥COST Research Forum¡¦ in France, Received Research grant from BCUD, University of Pune and DST, Govt. of India, Published 18 Research Papers at International Conferences and Peer reviewed Journals, He has also published Two Books on RFID Security Algorithms, Visited almost 20 Countries for Research, Conference or Symposium Purpose, Had been Resource Person at more than 30 Workshops or Conferences of National Level, Had been a Consultant for IGNOU, New Delhi for Syllabus Setting of E&TC Engg., Actively involved for incorporating ¡¥Project Based Learning¡¦ model in Engg. Education, Convenor for Workshop on ¡¥Opportunities in Electronic Sector of Design and Manufacturing¡¦ in Collaboration with DIET, Govt. of India, Coordinated the Satellite Image Processing Projects for ISRO, Bangalore, Coordinated National Level Technical Festival, Coordinated the the activities under Indo-US Colaboration for Engineering Education, Handeled the responsibilities like Exam Cell Incharge, Student Council Incharge, He is also has the membership of ISTE, IETE and IEEE,

His major Achievements are : He is one of the four Researchers from all over India, who have been invited under European Union Fellowship, His one of the paper was awarded with the price of 400 Euro in Germany, Awarded with Best Participant Award at IIT, Kharaghpur, Appointed as a Principal of Sinhgad College of Engineering, Solapur, at very early age.

IT - 12 (Article No.1)

EXHIBITION ON BARC TECHNOLOGIES

Shri R. K. Singh, BARC, Mumbai

Deployment of Nanotechnology for Energy Harvesting Solar cells

Prof. (Dr.) Pramod S. Patil

Founder Co-ordinator, School of nanoscience and Technology
Department of Physics, Shivaji University, Kolhapur -416 004, India

ABSTRACT :

The photovoltaic solar cells are attracting great deal of interest from across the globe due to their potential of producing electrical energy by harvesting photon energy, available on the earth, which is abundant and available free of cost. However, the cost of electricity production and the efficiency with which it is produced are important attributes. Subsequently, several solar cell generations have been emerged in order to chase the low cost-high efficiency race. The initial solar cells, first generation, based on crystalline silicon exhibited high efficiency but it became practically impossible to bring down their cost, hence their utilization was limited to the extra-terrestrial applications. Afterwards, several other interesting inorganic materials in the form of thin films, second generation, were investigated for the fabrication of low cost-high efficiency solar cell devices that includes CuInS2, CuInSe2, CIGS, amorphous Si and CdTe. The market penetration of these devices were marginal due to the limited resources and cost of the elements like indium, gallium and toxicity of Cd. Further research is focused on low cost nanomaterials including configuration like dye sensitized solar cells, quantum dot sensitized solar cells and organic solar cells. However their performance is yet to be explored fully before arriving at any conclusion. Much efforts are still required in this direction to exploit their full potential.

Organometaltrihalide organic-inorganic hybrid perovskites with general formula ABX3, where the "A" site is an organic-molecule cation, were ?rst discovered in 1978. The structural understanding, solution-processing, and properties of this remarkable family of materials were further developed in the 1990s, but their use in solar cells in 2009 has sparked tremendous interest in these hybrid organic-inorganic materials for photovoltaics and also other applications In this talk, a systematic approach of development in third generation solar cells will be highlighted. Further, a novel in-situ processed gold nanoparticle-embedded TiO2 nano?bers, enabling plasmonic perovskite solar cells with power conversion e?ciency exceeding 14%, will also be discussed.

Prof. (Dr.) Pramod S. Patil : M.Sc. from Shivaji University in 1986, Ph.D. from Shivaji University in 1990. Working as Professor in Department of Physics in Shivaji University, Kolhapur, since 1990. Ex-Coordinator, Dept of Energy Technology, Coordinator, School of Nanoscience and Technology, Best Teacher Award of Shivaji University-2014, Dean of Science Faculty- 2015 onwards, Produced 37 Ph.D. and 4 M .Phil. students, Ph.D. and 4 M. Phil. students are currently working. Published 390 research papers in the International and National journals of well repute and 348 papers in the National and International conferences. Total citations for the papers: 8550, h-index = 48, i10-index= 217., Research Gate Score: 48.46, Paper views: 38000, Paper Downloads: 17,400, Written 4 books, 2 book chapters and 4 Indian patents, 1 Korean Patent. Bagged 19 best paper presentation awards at the National and International conferences. Recipient of prestigious German Academic Exchange Service (DAAD) fellowship award, 1996-1998 at Hahn-Meitner Institute, Berlin, Germany. Recipient of prestigious Brain Pool fellowship award of South Korea, 2005-2006, Seoul National University, S. Korea. Fellow member, Institute of Physics, London, UK, Fellow of Maharashtra Academy of Sciences, November 2013. Life member of The National Academy of Sciences, India. Recipient of prestigious Brain Pool fellowship award of South Korea, 2012-2013, Chonnam National University, S. Korea. "Best microscopy image in the world" award-2010; Nano Today, Elsevier Publishers, Feb 2010, 2011and 2013; Impact Factor-17.68, Best cover image award, "Materials Today", (2011, 2012, 2012) Impact Factor- 11.45, Invited talks > 70 Life member of several academic bodies in India and Abroad.

Coordinator : MoU between Shivaji University and Universities of Ontario, Canada and MoU between Shivaji University and National Dong Hua University, Taiwan, Participant in Indo-Japanese joint project- 2013. Referee for many SCI International journals including American Chemical Society. Research interests: Smart window coatings, Energy harvesting nanomaterials, quantum dots, solar cells, supercapacitors. Established strong International and National scientific collaborations, Editor, International Journal of Materials Science, Hidawi Publishers. Review Editor, Frontiers in Materials , May 2014, Visiting Professor, Chonnam National University, Gwangju, South Korea. Individual projects worth Rs. 2.35 Crores, Instrumental in common projects worth Rs. 7.3 Crores, One of his Ph.D. students received best Ph.D. thesis in the world-award-2014

HANDHELD BIOSENSOR FOR DETECTING METHYL PARATHION PESTICIDES

Jitendra Kumar and Jose Savio Melo

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ABSTRACT :

Methyl parathion (MP) is an organophosphate (OP) pesticide, which is being used as non-systemic insecticide in agriculture to protect the crops from insects. In India, Central Insecticide Board and Registration Committee (CIBRC) has recommended MP in two different concentrations either in 2% DP or 50% EC for controlling the pests from the cotton, paddy, wheat, pulses such as green gram and black gram and oilseeds such as ground nut and mustard crops. As per statistical reports by Directorate of PPQS, India and Centre of Science and Environment (CSE), consumption of MP in India during 2005 - 2010 was 8408 tons. MP can cause many health problems in humans related to acetylcholinesterase inhibition such as impaired memory and concentration, disorientation, severe depression etc. Although banned in developed countries like USA and Japan it is still being used in developing countries like India as a restricted insecticide. Presence of this insecticide is thus expected in the soil samples, water resources and even in food materials across countries still using this pesticide. Therefore, economically feasible, rapid, sensitive, selective and reliable methods for detection of MP are necessary. Thus there has been an intense effort to develop biosensors for the detection of methyl parathion. We have designed a prototype of colorimetric handheld biosensor for detecting methyl parathion pesticide. Biosensor has shown a linear detection range between 1-10ppm.

Dr. Jitendra Kumar, Scientific Officer F from **NABTD, Bhabha Atomic Research Centre**, Mumbai. His major finding in field of **immobilization of microbial cells, enzyme and DNA based probes for development of biosensors**. Major emphasis has been given for the detection of organophosphorus and carbamate pesticide. He has **developed handheld colorimetric biosensor for detection of methyl parathion** pesticide. He has published many papers, majority in **Biosensors Bioelectronics** journals which has high **impact factor 7.47**.

Received Ph.D. in Biochemistry from University of Mumbai in October 2011. For outstanding research and publications from Ph.D. research, received **Best Thesis Award** at the 3rd International Conference on Sediment Management (I2SM-2012).

Received **DAE-Young Scientist Award 2011** for contributions in the field of immobilization of microbial cells and enzymes for application in biosensors for detection of methyl parathion and glucose. Received **Fellow Award from Society of Applied Biotechnology (FSAB)** for outstanding achievements and contributions to the field of microbial biotechnology. Received **Best Poster Award** in 3rd International Symposium on Material Chemistry (ISMC2010) and **ISEAC Journals Publication Award 2011** by Indian Society for Electro Analytical Chemistry (ISEAC).

SOLAR ENERGY ASSISTED PURIFICATION OF WATER USING NANOCRYSTALLINE TRANSITION STRATIFIED METAL OXIDE SEMICONDUCTOR THIN FILMS"

C.H. Bhosale

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ABSTRACT :

Radiant energy from the sun is vital for life on our planet. It determines the surface temperature of the earth as well as supplying virtually all the energy for natural processes both on the earth and in the atmosphere. One of the most important problems affecting people throughout the world is inadequate access to potable water. Over one billion people are exposed to unsafe drinking water due to poor source water quality and lack of adequate water treatment, a problem expected to grow worse in the coming decades, with water scarcity occurring globally, even in regions currently considered water rich. The problem is particularly significant in developing countries and in arid areas where water sources are scarce. This is a continually growing problem due to rising population and increasing demands for source waters. Moreover, with rapid industrialization, many pollutants such as various dyes, sulphates and toxic compounds are dumped into the water. Waste water from textile processing plants, is highly colored and difficult to decolorize. Azo- dyes form the argest group among the synthetic colorants (60-70%). Their chromophoric system consists of azo groups (-N N-) in association with aromatic systems and auxochromes (-OH, -NH2, etc.). It was estimated that more than 50,000 tons of dyes are discharged from dyeing and coloration industries every year. Since azo dyes are intentionally designed to resist degradation, it is very difficult to degrade them by conventional wastewater treatment methods. In addition, the toxicity, mutagen city and carcinogenicity of azo-dye degradation byproducts are of great environmental concern. Chemical disinfection options such as chlorine and iodine treatment, ozonization, flocculation and filtering require additives and are also not cost-effective. Physical treatment such as boiling, distillation, reverse osmosis and UV irradiation require considerable energy input. One alternative for drinking water treatment method that has been proposed is solar photocatalytic purification, a process that could be utilized in countries that receive abundant sunlight. Wide band gap semiconducting transition metal oxide photocatalysts have been shown to decompose organic compounds, bacteria and other impurities present in water. The most prominent, widely studied photocatalyst is TiO_2. Upon irradiation of a semiconductor with photons of energy higher than the band gap, charge carriers are generated. Those which are not lost by recombination can carry out electron transfer reactions at the interface between the semiconductor and a liquid containing an oxidizable or a reducible species. In the case of an n-type oxide semiconductor, valence band holes (h+) lead either

Dr. Bhosale Chandrakant Hari : M.Sc., Ph.D. Completed Post Graduate Studies (M. Sc.) under Earn and Learn Scheme (1974-76), Publications: 201, (i) Citations: 40174 (ii) h index: 39 (iii) i-10 index: 113, Invited talks delivered : National and International:73, Distinction Academic, Ex HOD Department of Physics, Shivaji University, Kolhapur (2010-13), BOS committee member at Shivaji, Aurangabad, Goa, Pune, Dharwad, Bangalore, Life member of Maharashtra Academy of Sciences Dec. 2012, Executive Council (EC) member of Maharashtra Academy of Sciences 5 Dec. 2013, Shivaji University Best teacher Award 2013, UGC BSR Faculty Fellow since 2014, **Membership:** Many academic bodies, Research Schemes handled: 7 **Collaborations:** Florida Solar Energy Center (FSEC) USA (1993 to 1998) for five years, Indian Institute of Technology (I. I. T.) Powai, Mumbai-76 (2000-05), National Centre for Scientific Research (CNRS) France (2000-2014). M.Phil. Degree Awarded: 5 Working: 2, Ph.D. Degree Awarded: 24 Working: 2, Physics Books Published: 04, Visits Abroad: USA (1990), Czech Republic (2007), China (2014), Egypt (2015),Canada (2015) Awards: 07

directly, or via OH_ radicals, to the oxidation of the solute (D), while conduction band electrons (e-) lead to reduction of dissolved oxygen, if present, forming superoxide radical anions, _O2 - and OH radicals, if not participating in the degradation process, finally lead to the formation of water and oxygen, respectively. Recombination of photo generated positive holes and electrons inside the semiconductor are responsible for a rather low quantum yield of the photocatalytic degradation. A way of increasing electron- hole separation and consequently enhancing quantum yield is the use of transition stratified metal oxide semiconductor thin films and an application of electrical bias, which is possible when the photocatalyst is deposited on an electrically conducting substrate. Here, the working point of the photoelectrochemical reaction can be shifted to the potential range where photon flux limited (plateau) currents flow. Due to backside illumination through the transparent conducting substrate, direct photolysis is avoided and even strongly colored solutions can be treated, as actinic light is encountering the semiconducting layer first. Electrons are drawn away from the interface, and reduction reaction occurs at the counter electrode. Oxygen is available in sufficient quantity as a depolarizer for the counter electrode, firstly due to rapid recirculation of the solution through a reservoir in contact with air and, secondly, due to water oxidation by reaction steps initiated by valence band holes. As to the organic molecules which can be oxidized in this way, azo-dyes are of special interest, as mentioned above. Different methods have been explored for the removal of azo-dyes from solution. Bourikas et al. investigated the adsorption of a textile azodye, acid orange 7 (AO7), on the surface of TiO2 in aqueous suspensions in the range of 0.1-1 mM at pH values between 2 and 10. Liu et al. studied degradation of AO7 quite differently, using a Fe/granular activated carbon system in the presence of ultrasound. Singh et al. reported more than 90% dye decolourization of two onoazo dyes and their partial degradation in a sequential fixed-film anaerobic batch reactor (SFABR) using bacteria. Fernandes et al. studied the electrochemical degradation of AO7 on a boron doped diamond electrode (BDD) and obtained 98% and 77% color and chemical oxygen demand (COD) removal, respectively. AO7 photofading by a photocatalytic method using TiO2 nanotubes was also reported. Here photoelectrochemical degradation of organic compounds by TiO2, taking AO7 as a model compound. The main aspects studied are (i) the use of electrical bias, (ii) the use of large catalyst surfaces, and (iii) the possibility of using solar light that be used efficiently concentration of the contaminant down to small concentration.

ENVIRONMENTAL ISOTOPE AND GEOPHYSICAL TECHNIQUES TO IDENTIFY GROUNDWATER POTENTIAL ZONES IN DROUGHT PRONE AREAS OF AMRAVATI DISTRICT, MAHARASHTRA, INDIA

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ABSTRACT :

The groundwater potential of Anjangaon village in Amaravati district of Maharashtra is generally poor and the water quality is saline in most of the places. Farmers dig open wells (up to 30 m depth) and drill bore wells (100-150 m depth) for domestic and irrigation purposes. Most of the wells failed and farmers are struggling for fresh water in this region.

However, the foothills of Chinchona Hills (about 10 Km north of Anjangaon), are potential areas for groundwater development. Because of this, farmers are buying small areas of lands, construct bore wells (about 70 m deep) and pump water to their agricultural fields located 4-5 km downstream through pipelines. These well fields also serve as the main water supply sources for the rural community. Due to large scale exploitation, the groundwater levels are drastically declining. In order to rejuvenate the groundwater potential, various rainwater harvesting practices are being implemented. Several detention tanks are constructed along the natural drainage to impound the rainwater runoff so as to enhance the groundwater recharge.

To evaluate the groundwater recharge and to identify the groundwater potential zones an environmental isotope and geophysical study was carried out. Water samples were collected from rain, springs, open wells, bore wells and detention tanks and measured for environmental isotopes such as 18O, 2H and 3H. Isotope results indicate that the groundwater is getting modern component of recharge from the rain as well as from the detention tanks. The percentage contributions from the detention tanks were estimated to be about 40 to 90 %. In the southern part of the Anjagaon village, an electrical resistivity survey of the geological formation was carried out and a groundwater potential zone was delineated at 45m depth. The farmers were asked to drill bore wells at the identified depth. The drilled five bore wells yielded perennial source of good quality water.

Dr. Noble Jacob : is presently working as Scientific Officer 'F' in Isotope and Radiation Application Division, Bhabha Atomic Research Centre (BARC), Mumbai. He obtained his Ph. D in Water Resources Engg. from Indian Institute of Technology, Mumbai. He has 20 years of research experience on the application of isotopes for water resources assessment, development and management. He is a recipient of British Council's Commonwealth Professional Fellowship during the year 2006-07. He has more than 60 publications in various journals and conference proceedings.

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REMOTE HANDLING AND ROBOTIC ACTIVITIES IN BARC : AN OVERVIEW

D. N. Badodkar

Distinguished Scientist, Associate Director, Design, Manufacturing and Automation Group
Sr. Professor, Homi Bhabha National Institute, BARC, Trombay, Mumbai (India)

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ABSTRACT :

Division of Remote Handling and Robotics, BARC has been working on design and development of various remote handling tools & robotic systems and application system automation systems for nuclear installations in the country. Division is also engaged in pre-service and in-service inspection of coolant channels for Pressurized Heavy Water Reactors in India. Design and development of safety critical Reactor Control Mechanisms for Nuclear Research and Power Reactors is another important activity carried out in this division.

The talk brings out challenges in the design of remote handling tools, automation systems and robotic systems for nuclear installations. It is stated that in case of conventional industries, such automation systems are primarily aimed at reducing product cost and with the objective of improving product quality, however, in case of nuclear installations, it is stated that such remotely operated tools and systems are the necessity.

Above talk is presented on behalf of all the officers and staff of DRHR. An overview of some of the divisional ongoing activities in the field of remote handling tools, robotic systems and automation are presented.

Dr. D. N. Badodkar : postgraduate in Electrical Engg., joined BARC Training School in the year 1980. After successful completion of one year orientation training in Nuclear Science and Technology, he joined Reactor Control Division, BARC, Mumbai in 1981 as 'Scientific Officer/C'. Subsequently, he obtained Ph.D. degree from Mumbai University. Presently, he is 'Distinguished Scientist' and holding post of Associate Director, Design, Manufacturing and Automation Group and also as Head, Division of Remote Handling and Robotics. His expertise includes: Special purpose electrical drives, Electromagnetic actuators, Reactor control mechanisms and Application specific automation systems. He is also serving as Faculty at Homi Bhabha National Institute (HBNI) as 'Senior Professor (Adj)' in Engg. Sciences and serving as Member of Board of Studies and Standing Committee of HBNI. He is serving as Chairman of Doctoral Committee of HBNI at BARC and RRCAT and also Chairman of M.Tech. Monitoring Committee in Electrical Engg. He is recipient of DAE's Technical Excellence Award-2000 and Group Achievement Award-2008, 2014 and 2015.

TRAINING PROGRAMMES IN BARC AND EDUCATIONAL OPPORTUNITIES IN HBNI

Shri Shiv Kumar Singh

Scientific Officer, Reactor physics and Nuclear Engineering Section, BARC, Mumbai

ABSTRACT :

Part A Training Programme leading to Employment as Scientific Officer

(Gazetted Officer Post in the Government of India) for B.E./B.Tech./M.Sc. candidates through two flagship programmes-

1. **OCES Programme :**

   * Selection is by way of screening through GATE Score/ BARC Online Test followed by Technical Interview
   * Brief Advertisement end of December/beginning of January for all disciplines
   * Detailed Advertisement in January. Online Test in 45 cities across India
   * Interviews in May-June for screened in candidates
   * One Year Training in any of the Training Schools in Mumbai, Indore, Kalpakkam (near Chennai), Hyderabad
   * Placement in any DAE Units all over India on successful completion of training.
   * Emoluments - Stipend of Rs. 35000/- p.m. during training (One Year)

     About Rs. 75000+/pm depending on place of posting on successful completion of training (during 6th CPC PB III: Rs 15600/- to 39100/- with a GP of Rs 5400/- Now in 7th CPC Level Pay 56000/ +DA+TA+HRA+CEA+LTC+CHSS etc. + a few advanced increments on initial appointment.

Shri Shiv Kumar Singh : on completion of his post-graduation in Physics from University of Delhi, joined BARC, Mumbai through 31st Batch of BARC Training School. After successful completion of the 1-year OCES training course, he was appointed as a Scientific Officer in the Reactor physics and Nuclear Engineering Section in BARC. He initially worked in the field of core physics aspects of research reactors at Trombay, namely Apsara, Cirus and Dhruva reactors. This included providing reactor physics guidance to operating staff of the reactors.

With his keen interest in imparting training to young graduates and post graduates, he moved to his present Division ie Human Resource Development Division in 2009. He is actively involved with the organization of BARC Online Test and interviews for selection to OCES/DGFS Programmes of Department of Atomic Energy (DAE). He is presently designated as Trainees Warden.

He teaches Reactor Physics and Nuclear Engineering course to post graduates in BARC Training School, Mumbai and Hyderabad. He has been visiting faculty in Jadavpur University, Kolkata for 4 years and he has been teaching at DAE-Mumbai University's Centre for Excellence in Basic Sciences (CBS), Mumbai. He provides his services to other units of the Department of Atomic Energy including IGCAR Kalpakkam and Nuclear Power Corporation of India Ltd (NPCIL).

In addition, he is associated with Homi Bhabha National Institute (HBNI), a deemed to be university.

In connection with his work, Shri Singh has presented a few papers in symposia and conferences. He underwent 2-week training programme on research reactors at KERI, South Korea, and also visited Pohang University. He represented India in a week-long meeting at IAEA, Vienna.

2. DGFS Programme :

Two-Year DAE Graduate Fellowship Scheme for Engineering Graduates and Physics Post Graduates

* As Scientific Officer (Gazetted Officer Post in the Government of India)
* For those who are selected for BARC Training School's OCES programme and also secure admission for M.TECH. /MChem in IITS-B, D, K, KGP, M, R, G, BHU-V, ICT, Mumbai, NIT- Rourkela
* Stipend (Rs. 35000/-pm) and reimbursement of tuition fee during M.Tech.
* Absorption after completion of M.Tech./MChem into one of the following DAE Units-BARC, Mumbai, RRCAT, Indore, IGCAR, Kalpakkam
* Emoluments - Same as under OCES Programme.
* Employment through DGFS comes 1 year after their OCES counterparts.

Non employment Programme :

Summer Training and Academic Projects for Students: BARC provides summer training (1 to 2 months) and academic projects (2 to 12 months) to BE/B.Tech/M.Tech/ ME/Engg Diploma/MSc/MCA students from all over the country. Annual intake about 1600 students.

Part B : Educational Opportunities under HBNI

* Ph.D. in varied disciplines is offered at all CIs. HRI and IMSc also offer an integrated Ph.D. programme where students study for M.Sc. as well as Ph.D.
* M.Tech. in engineering sciences, and M.Phil. in physical sciences, chemical sciences and life sciences. These programmes consist of one year of course work and one year of project work The course work is offered at all campuses of BARC Training School and project work is offered at BARC, IGCAR, RRCAT VECC and some other units of DAE. Those not interested in project work get a diploma in lieu of a M.Tech. or a M.Phil.
* M.Sc. (Engg): Here research content is more than that in an M.Tech. programme. The duration of the project work under this programme is 18 months, while the duration of the course work is up to one year. This programme offered at BARC, IGCAR, VECC and RRCAT is tailored for the employees of the Department.
* Integrated M.Sc. of five-year duration at NISER.
* DRM: Diploma in Radiation Medicine at BARC. Diploma in Radiation Medicine (DRM) - To equip medical doctors in use of Nuclear Medicine- MBBS + 1 yr. as House Surgeon-10 nos.
* Dip.R.P.: Diploma in Radiological Physics at BARC. Diploma in Radiological Physics (DipRP): For Medical Physicists or Radiological Safety Officers in Hospitals and Industries using radiation sources - for PGs in Physics- 25 nos.
* DMRIT:Diploma in Medical Radioisotope Techniques- Technicians in Nuclear Medicine Departments of Hospitals - Graduates in Science-10 nos.

  Professional Short Courses in Radio Immuno Assay, NDT using Nuclear Techniques, Radiopharmaceuticals etc.

DM Post Graduate Courses at TMC :

Super Specialty Courses at TMC (4 DM and 3 MCh Courses)

Post Graduate Courses at TMC (8 MD Course in different areas)

In addition, the TMC also offers a two-year Certified Fellowship programme in 23 different disciplines related to Oncology.

The Institute offers a unique Ph.D. programme where students are manadated to work at the interface of basic research and technology development. Under this programme, they work under the guidance of two supervisors, one having strength in basic research and the other in technology development.

M.Sc. (Nursing) at TMC

Part C

Employment through KSKRA (Dr. K.S. KRISHNAN RESEARCH ASSOCIATESHIP)

* For a challenging career in pursuit of front ranking R&D programmes in Atomic Energy
* 10 KSKRAS can be selected every year and paid a stipend of Rs.40,000/- per month + HRA + other benefits for a maximum period of 2 years.
* At the end of 1 year of Associateship, KSKRAS will be considered for absorption as Scientific Officer/Engineer-D subject to satisfactory performance
* Qualification- For Engineers: Ph.D. Degree in Engineering or Master's Degree in Engineering (M.Tech./ M.E.) with a minimum of 2-year R&D experience after obtaining M.Tech./M.E.
* For Scientists: Ph.D. Degree in Science

RADIATION TECHNOLOGY FOR PRESERVATION ANDHYGIENIZATION OF FOOD AND AGRICULTURAL COMMODITIES

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ABSTRACT :

Growing population demands more food for consumption. Given that the agricultural land is shrinking day by day in urban as well as rural areas, we are left with no choice but to preserve the produce in whatever way we can. In this scenario, gamma irradiation or exposure of foods or food products to high energy rays is a very effective technology in long term preservation of these products.Food Irradiation is an established and effective processing methodology that involves controlled application of energy from ionizing radiations in an irradiation chamber shielded by thick concrete walls using radioisotopes (Cobalt-60 and Caesium-137), electron beam (up to 10 MeV) and X-rays (up to 5 MeV). Presently it is being practiced in more than 60 countries for various applications. Radiation processing can achieve insect disinfestation of stored products, inhibition of sprouting in tubers, bulbs and rhizomes, delay in fruit ripening, destruction of microbes responsible for food spoilage and elimination of pathogens and parasites of public health importance. Moreover, it can be used as a phytosanitary treatment for international trade. Radiation processing is an environmentally safe preservation process with no harmful byproducts or increase in temperature of the product.The process has been approved by various International and National organizations including Food and Agricultural Organization (FAO), World Health Organization (WHO), International Atomic Energy Agency (IAEA), and Food Safety and Standards Authority of India (FSSAI). Presently, about 15 such irradiation facilities are functional in India and few more are coming up. India is exporting irradiated mangoes to USA since year 2007 and last year about 750 tonnes of mangoes of different varieties have been irradiated and exported. In today's scenario, food irradiation is a boon of technology for ensuring food safety, food securityand facilitating international trade.

Dr. Sachin N. Hajare did his Masters in Zoology from Pune University and then joined Food Technology Division, Bhabha Atomic Research Centre, in 1998 after completing one-year Orientation Course (OCES- 41st Batch) in Radiobiology discipline. His early work involved control of mycotoxin producing fungi in foods and feeds, for which he was awarded a Ph.D. degree of University of Mumbai in 2014. During his work he has isolated a novel strain of Bacillus amyloliquefaciens which produces an antifungal lipopeptide bacillomycin D. This lipopeptide was shown to inhibit mycotoxigenic fungi on food grains. He is working in the Food Science and Safety section of FTD and currently working on preservation of foods and food products using gamma radiation technology. His other area of research includes radiation processing and shelf life extension of minimally processed foods, and development of ready to eat foods for special target groups using radiation processing. He has more than 23 publications in national and international journals and three book chapters to his credit. He was a part of two IAEA-CRP projects and has represented India in the co-coordinated research programs internationally. Dr. Sachin was a member of a team which developed a novel dip technology for retaining pericarp colour and extending shelf life of litchi fruit for which an Indian patent has been filed. The technology has been transferred to seven entrepreneurs including one international entrepreneur. He has also been awarded DAE Group Achievement Award for this technology in 2011.

RADIATION PROCESSING OF AGRI-PRODUCE (ONION, POTATO, GARLIC, MANGO AND OTHERS)

Dr. H. D. Khade

Scientific Officer / E, Food Technology Division.

ABSTRACT :

Radiation processing of food involves the controlled application of energy from ionizing radiations such as gamma rays, electrons and X-rays for food preservation. Gamma rays and X-rays are short wavelength radiations of the electromagnetic spectrum which includes radiowaves, microwaves, infrared, visible and ultra violet light. Gamma rays are emitted by radioisotopes such as Cobalt-60 and Caesium-137 while electrons and X-rays are generated by machines using electricity.

Radiation processing of food is carried out inside an irradiation chamber shielded by 1.5 - 1.8 m thick concrete walls. Food either pre-packed or in-bulk placed in suitable containers is sent into the irradiation chamber with the help of an automatic conveyor. The conveyor goes through a concrete wall labyrinth, which prevents radiation from reaching the work area and operator room. When the facility is not in use the radiation source is stored under 6 m deep water. The water shield does not allow radiation to escape in to the irradiation chamber, thus permitting free access to personnel to carry out plant maintenance. For treating food, the source is brought to the irradiation position above the water level after activation of all safety devices. The goods in aluminium carriers or tote boxes are mechanically positioned around the source rack and are turned round their own axis, so that contents are irradiated on both the sides. The absorbed dose is determined by the residence time of the carrier or tote box in irradiation position. Absorbed dose is checked by placing dosimeters at various positions in a tote box or carrier. It is efficient and can be used to treat prepacked commodities.

Laws and regulations enacted by Atomic Energy Regulatory Board govern operations of irradiators used to process non-food products, such as medical supplies. Three such irradiators are operating in India and about 160 around the world. The plants which must be approved by the Government before construction are subject to regular inspection, safety audits, and other reviews to ensure that they are safely and properly operated. Similar controls would be applicable for radiation processing facilities. At the international level, the Codex Alimentarius Commission, of the United Nations Food and Agriculture Organization (FAO) and the World Health Organization (WHO) have laid down standards for good manufacturing practices (GMP) and good irradiation practices (GIP)

Dr. H.D. Khade : is currently the Scientific Officer / E, Food Technology Division. He Joined BARC in year 2001 as "Quality Control Officer", at KRUSHAK (A commercial Radiation Processing facility). Located at Lasalgaon, Nashik rom last 15 years he is working in Food Irradiation Programs of BARC. Major achievements of Shri. Khade as follows

* Commercial Radiation Processing of 4000 Metric Tons of Food and Agri-Produce. * USDA-APHIS Approval to KRUSHAK * Radiation processing of mangoes 2700 Metric Tons for export to USA. * Installation, commissioning and dosimetry trilas at KRUSHAK.* Formulation of protocol, collaborative trials and Public Awareness.

Work was recognized and his team was awarded with DAE- Group Achievement Award. Currently, Shri. Khade is actively engaged in Basic and applied research, Application of Graphene Oxide as preservative mainly on Onion and other fresh Agri-produce, Collaborative Trials and Public Awareness. Pursuing Ph.D. degree from Homi Bhabha National Institute, Mumbai.

for a number of foods. They cover all aspects of treatment, handling, storage and distribution of food. The guidelines emphasize that, as with all food preservation techniques, effective quality control systems need to be installed and adequately monitored at critical control points at the irradiation facility.

Krushak (Krushi Utpadan Sanrakshan Kendra) the technology demonstration plant set up by BARC at Lasalgaon, district Nashik, Maharashtra, for demonstration of low dose applications of radiation for preservation of agricultural commodities. The plant was dedicated to the nation by the Prime Minister Atal Bihari Vajpayee on October 31, 2002. For radiation processing KRUSHAK uses gamma radiation. The plant is designed to process 10 tonnes of onion/hour. It is a forerunner for more such facilities. KRUSHAK a multitasking facility used for radiation processing of onions, potato and mango as well as other fresh Agri-produce and processed foods.

KRUSHAK is the facility that recognized by USDA-APHIS, that could be for quarantine treatment of mango. Important aspects of the operational work plan to export mango to USA, was the Facility Compliance. Agreement was signed between the USDA-APHIS and Department of Agriculture and Co-operation, Government of India. KRUSHAK meet all the requirements of the USDA-APHIS for quarantine treatment (400Gy). On 26th April 2007 after satisfying USDA issued a certificate of approval for commercial processing of mango and export to USA. Till date 2700 MT mango exported to USA, varieties include alphonso,kesar, langada, chousa dasehari, banganpalli.

Onion (Allium cepa) is one of the important commercial cash crops grown in India. It is widely grown in different parts of the country. Has very good medicinal and nutritive value. Nutritive value of onion varies from variety to variety. Onions within the country and for the export has made it essential to supply onions round the year either from fresh harvest or from stocks. Annual production of onion is estimated to be about 168.13 Lakh tones. It is also necessary to have proper planning for production, post-harvest handling and storage. However, necessary to make efforts for minimizing post- harvest losses for meeting increasing demand. Post harvest losses could be prevented by such as cold storage, fumigation, and drying. Radiation technology provides effective alternative to fumigants that are being phased out due to their adverse effects on environment and human health.