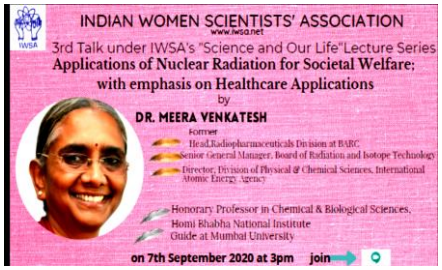
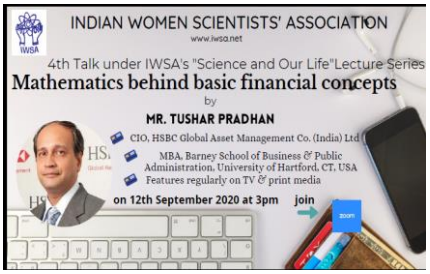
IWSA NEWSLETTER

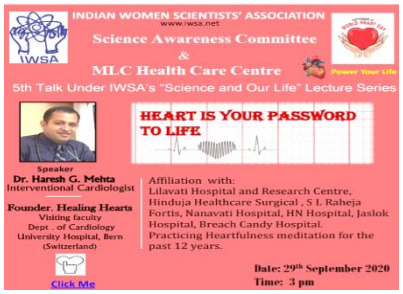
The Official Publication of the Indian Women Scientists' Association

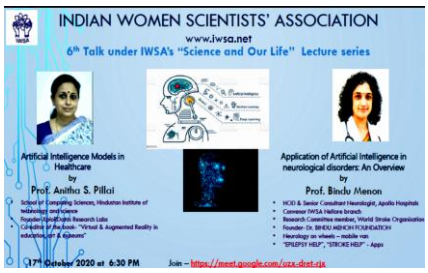
Volume 47 | Issue No. 3 | ISSN 0972-6195 | September – December 2020

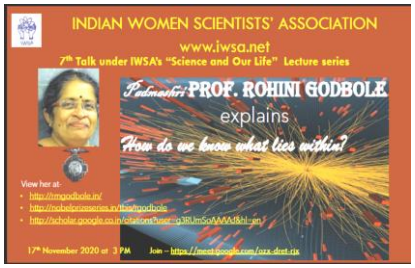
Webinars under the "Science and Our Life" Series

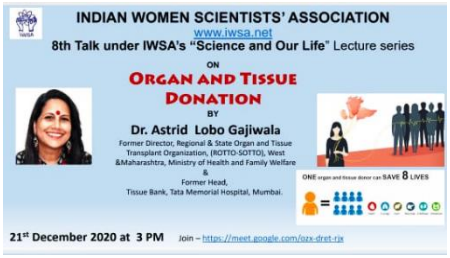




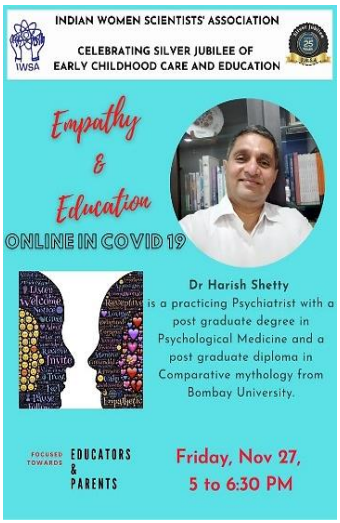








Webinars Celebrating the Silver Jubilee of Early Childhood Teaching in IWSA



BRANCHES

Roorkee 1979, Hyderabad 1979, Pune 1980, Nagpur 1982, Kolhapur 1982 Delhi 1987, Kalpakkam 1987, Baroda 1988, Amravati 2010, Bengaluru 2018, Nellore 2018

BRNS Popular Science Lectures held during September to December 2020

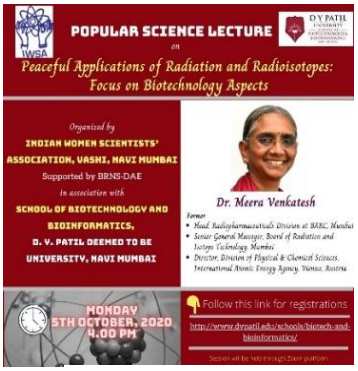
5th September 2020

10th September 2020

12th September 2020

24th September 2020

29th September 2020



5th October 2020

23rd October 2020

26th November 2020

Dr. Subi George delivering lecture on "Life beyond Molecules : A Dynamic world of Supramolecular Polymers" on 28th November 2020

From the Editor's Desk

Dear IWSA Members,

In this issue of Newsletter, you will find our regular features of reports regarding Popular Science Lectures, Science Awareness Activiities, Activities regarding Early Childhood Education, Activities of various Branches etc. All the activities reported in this Newsletter have been conducted online due to COVID Pandemic. IWSA has conducted thirteen BRNS Popular Science Lectures during September to December 2020 in various colleges of Mumbai, Navi Mumbai and Kochi. In addition to this, IWSA Bengaluru Branch also conducted a BRNS Popular Science Lecture. In our "Science and our Life" Lecture Series, six interesting lectures were held during the period of September to December 2020. This is our new endeavour, among the various other Science Education Programs which we have initiated earlier, to take Science to the society. Another new activity was a series of lectures organised by IWSA's Learning Garden Members through Google Meet platform which was named as as "Member Enrichment Program". Under this activity, 18 lectures were held during this period and brief reports of the lectures are given in this Newsletter. We consider it an honour that IWSA participated in the 6th India International Science Festival in December 2020. Science Nurture activities were resumed and the 25 years of Celebration of ECCE course were continued and we are glad to report of such activities in this Newsletter.

This issue also brings the interesting online activities held at IWSA Branches at Bengaluru, Hyderabad, Kalpakkam, Kolhapur, Nagpur, Nellore and Roorkee. Prof. Vandana Patravale and her colleagues from Institute of Chemical Technology, Mumbai have written a detailed article about COVID 19 Vaccine Development, which is of current interest to all of us. In another article, the achievements of Nobel Prize Awardees of 2020 have been highlighted. We have reported about some of the women and girl achievers and also about some of the IWSA members who have appeared in Stanford University list of top 2% scientists in the world in their respective fields. I hope that all of you will enjoy reading about these reports and the scientific information content of this Newsletter.

With best wishes

Shyamala Bharadwaj
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President's Message

Dear Members of IWSA,
It is indeed heartening to see that the activities at IWSA have increased considerably in these four months in spite of the pandemic. The online platform has brought the members closer and the branches have also contributed immensely to the various activities. The 6 lectures under the series "Science and our Life" and the 18 lectures under the series of "Member Enrichment Programme" have expanded our horizons in terms of outreach. The 13 numbers of "Popular Science Lecture Series" supported by the Board of Research in Nuclear Sciences (BRNS) have helped us to reach out to many more colleges. Details of these programs are mentioned by the Editor and also covered in this issue. The total outreach through our science education initiative activities in this period has been more than 3000.

It was my privilege that I was invited to represent IWSA as a panelist in the the Panel discussion-" School and the Science Practical" on 23rd December, 2020, during the 6th India International Science Festival (IISF2020) from 22nd to 25th December 2020 in New Delhi, which took place entirely on a virtual mode. The inputs by IWSA which I presented, are given in detail on page 19 of this issue. On the 22nd Dec 2020, Prime Minister Shri. Narendra Modi, in his inaugural address to the participants of the India International Science Festival 2020, stressed on creation of a scientific temper from the very childhood in our younger generation. IWSA has been engaged in this very endeavour for the past several decades. Setting up of the Atal tinkering labs and Atal incubation centres are the result of a shift in orientation from purely text book knowledge to a research environment. He talked about several reforms introduced in our education system through the National Education Policy 2020. His speech was very inspiring and has given a positive direction to science education in India. Thus, IWSA as an active organization engaged in Science Education initiatives has a very important role to play in the future and we hope that we would be able to contribute significantly in many of the new programmes taken up by the government.

In this period a very important collaboration between IWSA and Vigyan Prasar (an autonomous organization under the Department of Science and Technology, Government of India) was initiated. Under this, science education and community welfare activities have been highlighted, the details of which would be shared with the readers in the next issue of the Newsletter.

It is a dream close to all our hearts, that, in 2021, we would be able to reach out to many more beneficiaries in rural India. We therefore request all members of IWSA and the readers of the Newsletter, please do revert back to us with your suggestions and any innovative ideas aligned with our mandates, so that we can all, together, soar higher!

With Best Wishes
Lalitha Dhareshwar
lj_dhareshwar@yahoo.com

Reports from Head Quarters

Science Awareness Programs

A. IWSA – BRNS Popular Science Lectures

1. Online BRNS Popular Science Lecture at the Pillai HOC College of Engineering & Technology, Rasayani on 5th September, 2020

Indian Women Scientists' Association, (IWSA) in association with Pillai HOC College of Engineering & Technology, Rasayani, organized a webinar on ***"Diverse Applications of AI in Core Engineering"*** on 5th September 2020 at 5:00 pm. This webinar conducted through Google Meet. **Mr. Makarand Apte,** Director, Solidworks AI Development, commenced his lecture with an introduction to Artificial Intelligence and gave real life examples of generative design generated by using artificial intelligence. He further discussed about the prominent areas in Machine Learning and showed how AI can be used for predictive maintenance and industrial quality inspection. Some of the interesting examples in his lecture were: AI powered robots working in various fields like walking robots, manhole cleaning robot and AI with prosthetics. At the end of his lecture, he gave tips for students on how to participate in various AI projects.

Welcome address for the webinar was given by Dr. Sunil Singh Rajput, Department of Mechanical Department, Pliiai HOC College of Engineering and Technology. Dr. Lalitha Dhareshwar, President of IWSA spoke about the various activities of IWSA. Dr. Sunil Singh Rajput conducted the question & answer session and gave the vote of thanks. About 70 students and faculty members participated in this lecture.

2. Online BRNS Popular Science Lecture at the K.J. Somaiya Institute of Engineering and Information Technology, Sion, Mumbai on 10th September, 2020

Indian Women Scientists' Association, (IWSA) in association with the COEPS CELL (Career Opportunity for Engineering Students in Public Sector) of K.J. Somaiya Institute of Engineering and Information Technology (KJSIEIT), organized a webinar on **"Importance of quality of service in networking**" on 10th September, 2020 at 4.00 pm. This webinar was conducted through Zoom platform. **Mr. Alhad Apte**, Ex-Chairman, NTRO, Gov. of India, began his lecture with an introduction to the topic on how our daily lives depends on the accuracy of internet. He explained how the Internet has become all pervasive today and its use for a range of applications has grown enormously, especially so, during the current lock-down period. Internet, that was originally conceptualised and

designed to provide only 'Best Effort Service", is now being used for applications ranging from those demanding high throughput, low latency in multimedia communication to financial transactions, to Computing Clouds offering daily life services to masses, to mission critical remote control. Mr. Apte discussed about these applications and the knowledge in terms of packet networks, bandwidth, and other important concepts related to this topic.

The welcome address was given by Dr. Sandhya Deshpande of KJSIEIT. Dr Sunita Mahajan, Chairperson, Board of Trustees, IWSA gave a glimpse of IWSA and spoke about its foundation, development and activities. Dr. Deshpande introduced the speaker and the KJSIEIT team conducted a very interesting interactive question and answer session. About 42 participants attended the webinar and were benefitted by the discussion with the expert in the field of networking.

3. Online BRNS Popular Science Lecture at Ramnarain Ruia Autonomous College, Matunga, Mumbai on 12th September 2020

An IWSA-BRNS lecture was held in association with Ramnarain Ruia Autonomous College, Matunga, Mumbai on 12th September 2020 at 10.00 am. **Dr. Anuj Tripathi**, Senior Scientist, NABTD, Bhabha Atomic Research Centre, Mumbai spoke on "**Porous Biomaterials for Bioengineering Applications".**

Porous materials with unique features are the requirement of next generation bioengineering and biotechnological advancements. The efficacy and multi-functionality of polymeric biomaterials are keeping them at the forefront of advanced interdisciplinary research and applications since many decades in a wide range of fields like agriculture, biomedical, bio-separation, biosensing and environmental science. Diminutive and constrained mobility due the small pores and poor pore-interconnectivity delimits the applications of classical hydrogels. In contrast, smart porous hydrogels are considered as an indispensable carrier for delivery, separation, production of clinically and industrially important biomolecules and regeneration therapy. Dr Tripathi's talk focused on one of the special class of porous biomaterials developed at cryo-conditions which are classified as 'Cryogel'. The talk included the fundamental understanding to develop these porous biomaterials, and their wide area of bioengineering and biotechnological applications.

Dr. Jessy Pius, HOD, Department of Botany, Ruia College welcomed the speaker and the participants. Dr. Lalitha Dhareshwar, President, IWSA spoke about the various activities of IWSA. Dr. Susan Eapen, former Trustee of IWSA, introduced the speaker and Dr. Bhavna Narula of Ruia College proposed the vote of thanks. About 121 participants attended the program. According to the summary of the responses, 60% of the participants stated that the presentation, content and ability to stimulate were excellent, while 40% rated the talk as good. According to majority of participants, the content of the talk was very informative and interesting, presentation was comprehensive and easy to understand. The participants stated that the resource parson shared valuable research data and answered all the queries.

4.Online BRNS Popular Science Lecture at St. Xavier's College, Mumbai on 24th September, 2020

Dr. Neelam Shirsat, former Senior Scientist, Cancer Research Institute, ACTREC, Tata Memorial Centre, Kharghar, Navi Mumbai delivered an online lecture on "**Cancer Genomics Translates Basic Reearch into Clinical Practice**: via the zoom platform.

The pioneering discovery of the Philadelphia chromosome in the cells of chronic myeloid leukemia first indicated genomic alterations as a likely cause of cancer in the year 1960. It took 30 years to identify the BCR-ABL fusion gene as a cause of CML. In 2001, Gleevec, a BCR-ABL inhibitor, showed dramatic improvement in the survival rate of these patients. Translation of basic research into clinical practice thus took enormous efforts and time. The miracle drug Gleevec demonstrated that by understanding the biology of a disease, one can develop effective treatment strategies.

Human genome sequencing completed in 2003 paved the way for identifying genome-wide alterations in cancer cells. The next-generation deep sequencing technologies made it possible to sequence the entire human genome in a couple of days and also considerably reduced the cost of sequencing. Cancer genomic analysis showed that most cancers are driven by 2 to 8 driver genetic alterations, which impart the characteristic hallmarks like unlimited proliferation, resistance to cell death, the invasive capacity.

Conventional diagnosis of cancer is based upon microscopic observation of the tumor tissues. Several cancers were found to consist of multiple subtypes based upon the underlying genetic alterations, which also correlated with their clinical behavior, indicating the inadequacy of histopathological diagnosis. Cancer genetic testing is now being increasingly used for accurate diagnosis and thereby for appropriate treatment design. For decades scientists have been looking for a blood biomarker-based diagnosis for early detection of cancers. Analysis of circulating DNA, micro RNAs is being developed as a non-invasive strategy for early detection of various cancers. Targeted therapy based upon the underlying genetic alterations is often a treatment option for some cancers like Herceptin for HER2-positive breast cancer. Cancer genomics has opened the doors to novel strategies for early detection, prognostication, and treatment design. In-depth basic and clinical research is necessary for exploring the full potential of the knowledge gained from the cancer genomics data. In her lecture Dr. Shirsat explained about the diagnosis of different subtypes of brain cancers based on the molecular information available.

At the beginning of the lecture Dr. Priya Sunderajan, Director, Caius Laboratory, St. Xaviers College, welcomed the audience and speakers. Dr. Surekha Zingde, Trustee, IWSA, informed the participants about IWSA and its activities. The lecture was attended by 86 students including staff. Dr. Sunderajan encouraged students to raise questions during the lecture and this was well appreciated. She finally thanked the speaker and the audience for attending the webinar.

5.Online BRNS Popular Science Lecture at St. Xavier's College, Mumbai on 29th September, 2020

Ms. Vijaya Chakravarty, a well acknowledged ecologist and landscaper, who is the Co-ordinator of the IWSA's Learning Garden initiative and Managing Committee member of the National Society of Friends of Trees delivered a lecture on **"Nutrition in the Garden"** at St. Xaviers College, Mumbai. The lecture was conducted on the Google meet platform.

The Millennium Development Goals have been successful in reducing global poverty but have failed to stem malnutrition. Sustainable Development Goal [SDGs] no.2 specifically addresses Nutrition, yet the success of all the 17 SDGs depends upon ensuring adequate nutrition in the population, especially among women and children.

Ms. Chakravarty showed the various ways of achieving 'ZeroHunger' and combating Hidden Hunger [Micronutrient deficiency] in India through the consumption of wild edible plants, forgotten foods, tree crops, traditional Indian foods and local vegetables. She highlighted many of the foods traditionally cooked on special occasions like Choddoshak in Bengal, Rishi Panchami Bhaji in Maharashtra and PathilaThoran in Kerala and indigenous cooking with edible flowers and leaves of large trees.. The importance of the use of every part of the vegetable—peel,leaves, stem, fruit and seeds—so as to reduce waste and aid nutrition was emphasized

.

The last part of the talk was devoted to explaining how 'Nutrition Gardens' in urban areas based on 'Zero Acreage Farming' can be developed utilising balconies, grills and terraces to grow food. The importance of sustainable horticultural practices like soil conservation, species diversity, natural pesticides/fertilisers, mixed cropping, cover crops, crop rotation, companion and trap plants was explained lucidly. The 200 participants enjoyed the lecture as evident from the numerous questions that were addressed to the speaker, who answered them patiently. The students found the lecture useful, meaningful and inspiring with the message of eating healthy, seasonal, local and vast repository of our traditional food wisdom and knowledge about wild edibles.

At the beginning of the lecture, Dr. Maya Murdeshwar, Asst Prof, Dept of Life Sciences and Biochemistry initiated the program and briefed the audience about the department and college. Thereafter Dr, Surekha Zingde, Trustee, IWSA spoke about the activities of IWSA.

Ms. Vijaya Chakravarty was introduced to the audience by a student representative. The webinar is available on: the link to the Youtube video recording: https://youtu.be/jNCBq4nkpo4

6.Online BRNS Popular Science Lecture at D.Y. Patil School of Biotechnology and Bioinformatics, Navi Mumbai on 5th October, 2020

A webinar on "**Peaceful Applications of Radiation and Radioisotopes: Focus on Biotechnology Aspects**" was organised by Indian Women Scientists Association supported by BRNS-DAE and hosted by School of Biotechnology and Bioinformatics, D.Y.

Patil Deemed to be University, Navi Mumbai, (DYPUNM - SBB) on Monday, 5th October, 2020 at 4:00 p.m. through Zoom platform. The resource person was **Dr. Meera Venkatesh**, Former Head, Radiopharmaceutical Division, BARC, Mumbai and Former Director, Division of Physical & Chemical Sciences, IAEA, Austria. Dr. Meera initially explained how radioactive nuclides or radioisotopes are unstable and undergo nuclear transformation by emitting energetic radiations (α, β or γ or any combination of these). She further explained about the energy that these radiations carry and their unique interaction with matter are the basis for their numerous applications in varied fields such as medicine, agriculture, industries, hydrology, research and a few unique areas such as drug development. Dr. Meera focused her lecture on nuclear medicine which is growing steadily with availability of a variety of radionuclides, targeting bio-molecules and the strategy of personalized treatment through a holistic combination of diagnosis and therapy, coined as 'Theranostics'. While radiopharmaceuticals are administered into the patient, 'Teletherapy' and in 'Brachytherapy' are two therapy modes in which the radiation source is external or in close proximity to the cancerous tissue/organ. She also discussed about other medical applications in radiometric assays that employ radiolabelled molecules as tracers, sterilization of medical products, blood irradiation, and in production of high-performance products such as hydrogels used in wound dressing. She then gave examples of applications of radiation and radionuclides in the food and agriculture area, radiation induced mutation, irradiation of food for food safety and security, radiotracers in agricultural research and use of radiation in sterile insect technique. In several of the above applications, especially those which cause biological changes, biotechnology plays a role. In nuclear medicine, advances in biotechnology have had significant impact on new developments and large-scale use of the nuclear medicine procedures, emphasizing the need for synergistic developments in these two fields for maximum benefits.

Dr. Debjani Dasgupta, Director, DYPUNM – SBB welcomed the participants and stressed the importance of holding such webinars during the pandemic. Dr. Shyamala Bharadwaj, Executive Committee Member, IWSA spoke about the various activities of IWSA. Dr. Naveen Padmadas, Associate Professor, DYPUNM - SBB introduced the speaker and conducted the question - answer session at the end of the lecture. Vote of thanks was given by Dr. Thankamani Marar, Professor, DYPUNM – SBB at the end of the webinar. Dr. Meera Venkatesh answered the several questions that were posted in the chat box. She also made a word document of the questions and answers and sent it to Dr. Naveen Padmadas, who could share it with all the students.

There were 540 registrations comprising - 131 faculty, 331 UG/PG students from the school, and other colleges across India, and 78 other category. About 100 Participants attended the webinar on the Zoom Platform and others were asked to attend through the DYPUNM-SBB Official Facebook Live link. Of the total registered participants, 147 People have submitted the feedback form and have been issued certificates.
The full video is available in the
following link: https://www.facebook.com/watch/?v=3376315972483291
As of 05th October 2020, 21:40 Hrs, the video was viewed by 2127 people.

7.Online BRNS Popular Science lecture at Vivekanand Education Society's College of Arts, Science and Commerce, Chembur, Mumbai on 23rd October, 2020

An IWSA BRNS Lecture by **Dr. Annamma Odaneth**, Associate Professor, DBT-ICT Centre for Energy Biosciences, Institute of Chemical Technology, Matunga, Mumbai on "**Biorefinery of seaweed: A sustainable approach**" was hosted by Microbiology Department of Vivekananda Education Society's College of Arts, Science and Commerce College, Chembur, Mumbai on 23rd October, 2020 at 4.00 pm. The webinar was relayed live on the VESASC Webinars Channel on YouTube.

Seaweed, also called as marine macroalgae, has the potential to be a valuable feedstock for biorefinery, Dr. Odaneth said. Seaweed biorefinery is an efficient process to convert renewable energy biomass to value added products and has a positive effect on ecosystem. It offers a wide range of interesting bioactives like nutraceuticals, cosmetics, food and health products etc. Seaweed derived polysaccharides include alginate, fucoidan, ulvan, carrageenan etc which have anti-oxidant, anti-tumour, anti-coagulant, anti-lipemic, anti-bacterial and osteo-protective properties. With over 10,000 species globally, it is of great interest to be able to extract these compounds. This biorefinery processing approach should be adapted to local conditions to maximize the biomass utilization and to lower the waste fractions or preventing any waste materials re-enforcing the circular economy. Depending on seaweed type and species, it is possible to extract different fatty acids, oils, natural pigments, antioxidants, high-value biological components, and other substances that can be potentially used in an industrial production system.

The webinar was attended by 208 participants which included students and staff from across India and members of IWSA. The webinar was relayed live on the VESASC Webinars Channel on YouTube. Dr. Santhini Nair, Vice-Principal, VESASC, Head of Microbiology Department and Convener of the Webinar welcomed all the online attendees. Dr. Anita Kanwar, Principal, VESASC gave a brief introduction about VESASC College and its achievements. Dr. Lalitha Dhareshwar, President, IWSA next provided a presentation on IWSA and elaborated on the activities that the organisation has been conducting round the year with programs that included among others- kindling scientific curiosity among students through various sessions including online webinars and providing community services for the welfare of larger sections of society. Dr. Susan Eapen, Former President, IWSA introduced the speaker of the day. A lively question answer session followed the webinar, wherein the speaker provided her expertise in the subject and simplified concepts for the participants.

The webinar evoked a positive response from the participants as was revealed from the feedback collected. Certificate of participation was mailed to all the attendees. The event was compered by Dr. Shweta Patil, while Dr. Dona Joseph and Dr. Malay Shah coordinated the Question-and-answer session. Mr. Suman Ganger, Coordinator of the webinar proposed the vote of thanks to all the participants on behalf of the department and VESASC College.

8.Online IWSA-BRNS Popular Science Lecture held at Institute of Chemical Technology, Mumbai on 21st November 2020

An IWSA -BRNS lecture by Dr. Devashish Rath, CRISPR biology group, Molecular Biology Division, Bhabha Atomic Research Centre, Mumbai on "CRISPRs: Ushering a Revolution in Genome and Metabolic Engineering" was hosted by the Institute of Chemical Technology &Teqip3, Matunga, Mumbai on Saturday, the 21st November 2020 at 10.00 am.

CRISPR (Clustered Regularly Interspersed Short Palindromic Repeats)-Cas (CRISPR-associated) systems are defense systems of bacteria that provide immunity against foreign invading nucleic acids such as viruses and plasmids. Since their discovery these systems have been adapted for various applications like gene editing and gene silencing. This has ushered in a revolution of sorts in genome engineering and synthetic biology. The versatility of the system has ensured that it has found further applications in gene regulation and metabolic engineering. Innovative applications of this technology are continuously emerging. CRISPR-Cas tools are now being channeled into food, medical and plant biotechnology approaches. Exciting applications like gene therapy, development of new age anti-microbials, diagnostics and vaccine development are now being explored with modern CRISPR-Cas tools.

Dr. Annamma Odaneth, Coordinator, DBT ICT CEB delivered the welcome address. Prof. Padma Devarajan, Coordinator, Teqip III spoke about TEQIP. Dr. Rita Mukhopadhyaya, Vice President, IWSA spoke about the various activities of IWSA. Dr. Susan Eapen introduced Dr. Rath. Mr. Custan Fernandes, Ph.D. scholar, ICT proposed the vote of thanks. There was an active question and answer session after the lecture and about 218 persons participated in the program.

9.Online BRNS Popular Science Lecture at K.C. College, Churchgate, Mumbai on 21st November, 2020

An IWSA BRNS Lecture by **Dr. Pillarasetty Ratnakar**, Director, Pharmaceutical Sciences, Merck & Co., New Jersey, USA on "Role of Microbiology in Pharma Sterile Manufacturing" was hosted by Krishichand Chellaram College, Chuchgate, Mumbai on Saturday the 21st November, 2020 at 6.30 pm. The webinar was conducted through Zoom Meeting. During the presentation, Dr. Ratnakar spoke about the "**Role of microbiology in pharmaceutical sterile manufacturing"** . He stressed about the various regulations, the different microbe recovery and their habitats, aseptic technics, environmental sampling, engineering, sanitisers and precautions to combat microbes etc. He also spoke on lab testing, manufacturing operations, quality assurance, pharma auditors, record reviewers and regulatory personnel. The presentation also dealt with various pharma careers for students.

Dr. Rajita Satish, Assistant Professor (Microbiology) gave an introductory talk. Dr. Hemlatha Bagla, Principal of KC College delivered an address and welcomed the guest speaker and the participants. Dr. Rita Mukhopadhyaya, Vice President, IWSA spoke on the different activities of IWSA. Dr. Sejal Rathod, Head of Microbiology, KC College proposed the vote of thanks.

About 157 persons participated in the program and also took part in the question-and-answer session.

10.Online BRNS Popular Science Lecture at M.D. College of Arts, Science and Commerce, Parel, Mumbai on 26th November, 2020

Dr. Deepa Khushalani, Professor, Materials Chemistry Group, Tata Institute of Fundamental Research, Mumbai, delivered a IWSA-BRNS lecture on **Nanomaterials for Harnessing Solar Energy** It is well accepted now that concurrent to the increase in population, India's rapid economic growth has forced us to recognize the challenge of energy supply as nation's top priority. Over last two centuries, most of our energy needs have been fulfilled by fossil fuel sources such as coal, natural gas and petroleum. However, the adverse environmental effects arising from carbon dioxide and other pollutants that are released due to fossil fuel combustion necessitates the search for environmentally clean, renewable energy fuel sources. Several alternate sources of energy such as wind, solar, hydro and biomass have been explored over the last several decades. Among all these unconventional energy sources, solar energy has emerged as one of the most practical alternatives to conventional fossil-fuel based sources. This is mainly due to the fact that solar energy reaching the earth from sun is massive, i.e. 3 × 1024 J per year or ca. 104 times more than what the entire human population currently consumes annually. Hence the potential of this resource is enormous; however, the use of this large energy reservoir still remains a major technological challenge despite the fact that the first solar cells were invented ca. 70 years ago. Most of the challenges associated with harnessing this energy effectively involve the total cost of device fabrication, effective cell efficiency that has long term temporal stability and ability to manipulate the cell for various high-end applications. As such, till date harnessing solar energy on a large scale has still not happened and it is still not able to compete fully with the conventional fossil based energy sources.

Keeping the aforementioned issues in mind, Dr. Khushalani explained that the work in the Materials Chemistry Group at TIFR entails the selective processing of inorganic structures with features on the nanometer scale. Formation of such materials has seen a great surge in interest over the last few decades. These materials are known to possess interesting and useful optical, electronic and/or magnetic properties that can subsequently be exploited in a wide variety of applications ranging from novel forms of catalysis to solar energy conversion. The choice of application is contingent on not only the chemical composition of the material but also on the overall morphology, and even more precisely on the accessible surface area. DR. Khushalani gave an overall perspective of the work being performed in her laboratory where new synthetic routes are being developed to form a variety of functional materials such as large band gap semiconductors that serve as photo catalysts (conversion of solar energy into chemical energy) and also light absorbing structures that form viable photo anodes in third generation photovoltaic devices (solar cells). The lecture was attended by 92 students and faculty and some IWSA members. Dr. Khushalani addressed the questions that were raised by the participants.

The lecture was coordinated by Dr. Rupesh Gaikwad, Asst Prof of M. D. College, Dr. Chhaya Panse, Principal, M. D. College, welcomed the participants and informed about the college.

Dr. Surekha Zingde, Trustee, IWSA spoke about IWSA. Dr. Gaekwad thanked the audience at the end of the lecture.

11.Online BRNS Popular Science Lecture at Guru Nanak Khalsa College of Arts, Science and Commerce, Matunga, Mumbai, on 28th November, 2020

A webinar on "**Life beyond Molecules: A Dynamic World of Supramolecular Polymers**" was organised by Indian Women Scientists Association supported by BRNS-DAE and hosted by, Guru Nanak Khalsa College of Arts, Science and Commerce, Matunga, Mumbai, on 28th November, 2020 at 3:00 p.m. through Google Meet platform. The resource person was **Dr. Subi George**, Professor, New Chemistry Unit, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru and Shanti Swarup Bhatnagar Awardee 2020. Dr. Subi George initially explained how molecular self-assembly has always been a promising route to achieve novel soft, dynamic and adaptive materials. He showed that this has been possible by decades of research and laying down of principles governing the phenomenon. In biological systems, which have always served as an omnipresent inspiration for self-assembly, they control their assemblies and function temporally with unparalleled deft. Considering the conventional self-assembly one wonders if the complexity and dexterity of biological systems is ever to be matched and perhaps one might tread on diverse scientific routes for kinetically controlled self-assembly. After explaining these concepts, he showed results from his laboratory driven by this philosophy and how the scientists are currently trying to understand various aspects of self-assembly. Dr. George described the efforts in understanding a very key concept of biological self-assembly which is temporal control over aggregates via a chemical fuel as this approach can singlehandedly cater to various existing challenges of synthetic self-assembled materials. He shared his views on this frontier area of research by taking supramolecular polymers as model system. In the end, Dr. George also provided the information about various research opportunities available to the students.

Dr. Meeta Rakesh, Head and Associate Professor, Department of Chemistry, G N Khalsa College (Autonomous), Matunga, Mumbai welcomed the participants and expressed her pleasure to have a distinguished speaker for this webinar. She urged the students to take advantage of such an opportunity to interact with a frontline scientist. Dr. Lalitha Dhareshwar, President, IWSA spoke about the various activities of IWSA. Dr. Shyamala Bharadwaj, Executive Committee Member, IWSA introduced the speaker and listed his achievements in the field of supramolecules that led to his winning the prestigious Shanti Swaroop Bhatnagar Award for the year 2020. Dr. Praful Tekale, Associate Professor, G N Khalsa College (Autonomous), Matunga, Mumbai conducted the question - answer session and gave the vote of thanks at the end of the lecture. About 120 students from the college attended the webinar and posted some interesting questions in the chat box. Dr. George was pleased to see the kind of questions raised by the students and answered all the questions very patiently.

12.Online BRNS Popular Science Lecture at SIES College of Arts, Science and Commerce, (Autonomous), Sion (W), Mumbai on 5th December, 2020

Dr. Sanjeev Shukla, Associate Professor, IISER, Bhopal delivered an IWSA-BRNS **lecture** on **" Cellular response to hypoxia: In Development and Disease"** at the SIES College via the Microsoft team platform

Earth's atmosphere had no oxygen before the evolution of photosynthesis but as the oxygen levels in the atmosphere went up, the organisms that can survive the oxygen stress evolved. In due course of time, oxygen became critical to life and acted as a driving force for the embryonic development and various cellular functions and metabolism. At the same time, modulation of oxygen in the microenvironment facilitates early development and tissue growth during later development. The oxygen levels differ in various tissues, and the function of hypoxia-inducible factors maintains oxygen homeostasis. Dr. Shukla explained that, Hypoxia is a condition wherein cells or tissues fail to receive adequate oxygen. It may be local or may affect the whole body. In response to cellular hypoxia, all organisms respond by activating an evolutionarily conserved pathway mediated by the master regulators called hypoxia-inducible factors or HIFs. In the normoxic condition, the prolyl hydroxylases (PHDs) hydroxylate the HIFa proteins, which is recognized by the von Hippel-Lindau (VHL) proteins followed by ubiquitin-mediated degradation of HIFa. However, in the hypoxic condition, PHDs are not able to hydroxylate the HIFa, thereby rendering VHL unable to cause degradation of HIFa. The hypoxiainduced stabilization of HIFa then leads to an activation of an elaborate transcription program which includes over 4000 genes. Aberrant or inappropriate activation of the HIF pathway leads to developmental defects and several diseases, including cancer. In this talk, Dr. Shukla discuss various aspects of hypoxia and its association with development and disorders. He explained the complex pathways with cartoon representations for the benefit of the students for whom the area was new. This was followed by a question and answer session. There were 64 student and faculty participants.

Dr. Tara Menon, Coordinator, Biotechnology Dept of the college welcomed the participants and spoke briefly about the college and department. Dr. Surekha Zingde informed about the activities of IWSA and

13.Online BRNS Popular Science Lecture at UC College, Aluva, Kochi on 12th December, 2020

An IWSA - BRNS lecture was held in collaboration with the Departments of Zoology and Bioscience, UC College, Aluva, Kochi on Saturday, the 12th December, 2020 at 10.30 am. **Ms. Ankita Susan Mathew**, Senior Associate TeckIP Knowledge Consulting Pvt. Ltd., Bengaluru spoke on "**Types of IP and Brief Introduction to Patenting Process in India**". The webinar was conducted through Google Meet.

Intellectual property is a property that arises from human intellect. It is a product of human creation. Intellectual property comprises of two distinct forms – Literary and Artistic works and Industrial property which includes patents, trademarks, designs, trade secrets, lay out designs and geographical indications. Ms Ankita informed that intellectual property is important against infringement of your work by others and you can file a suite against the

person or company, can stop others from using, making, selling etc. Literary and artistic work are protected by copyright act of 1957 and is valid for 60 years. Industrial design act is valid for 10 years and can be extended for another 5 years. According to patent act 1970, patent validity is for 20 years. Patents are given for a new product or process. Novelty of the product is very important. However, plants, animals, computer algorithms, inventions related to Atomic energy etc. can not be patented. One can apply for a provisional patent, which gives 12 months to develop an invention and is given priority. She spoke on different steps in filing and getting the patent granted.

Dr. Shirley Thomas, HOD, Zoology Department welcomed the guest speaker and participants. Dr. Surekha Zingde, Member, Board of Trustees, IWSA elaborated the various IWSA activities. Dr. Susan Eapen introduced the speaker and Dr. Elizabeth Mathew proposed the vote of thanks. An interesting Question and Answer session followed the lecture. About 173 people participated.

B. "Science and Our Life" Series of Webinars

The following webinars were conducted through Google Meet platform during September to December 2020 under "Science and Our Life" Series.

1. "Nuclear Radiation for Societal Welfare with Emphasis on Healthcare Applications" by Dr. Meera Venkatesh on 7th September, 2020

The third lecture of the series on "Science and Our Life" was held on 7th September, 2020 at 3 pm as an ON-LINE webinar, through Google Meet platform. Dr. Meera Venkatesh, Former Head, Radiopharmaceutical Division, BARC, Mumbai and Former Director, Division of Physical & Chemical Sciences, IAEA, Austria, spoke on "Nuclear Radiation for Societal Welfare with Emphasis on Healthcare Applications". Nuclear radiation, denoting the energetic emissions from the nucleus of an atom, have been put to various uses since more than a century ago, when the pioneering works by Madame Curie, and Henri Becquerel laid foundation to a new specialty in the world of science, followed by several major inventions through the decades that followed. The energy that these radiations carry and their unique interaction with matter are the basis for the numerous applications they have been put to. Dr. Meera Venkatesh, in her talk explained in brief about applications of radioisotopes and radiations in the fields of medicine, agriculture, industries, hydrology and in research giving suitable examples with pictures that conveyed clearly the great impact they make in our life. She then explained in detail the impact of radiation and radioisotopes in healthcare. Nuclear medicine is a speciality wherein radiolabelled molecules or radiopharmaceuticals are used for diagnosis as well as therapy, especially in cancer patients. She showed with suitable examples how nuclear medicine is growing steadily with availability of a variety of radionuclides, targeting bio-molecules and the strategy of personalized treatment through a holistic combination of diagnosis and therapy, coined as 'Theranostics'. She explained the two therapy modes called 'Teletherapy' and in 'Brachytherapy' in which the radiation source is external or in close proximity to the cancerous tissue/organ repectively. A few other medical applications such

as radiometric assays that employ radiolabelled molecules as tracers, sterilization of medical products, blood irradiation, and in production of high-performance products such as hydrogels used in wound dressing were highlighted. She spoke about another interesting application called Boron Neutron Capture Therapy, where radiation is generated at the tumour site, through a reaction of neutrons on boron compound. This mode although a challenging one, has been shown to be successful in treating a few types of well localized cancers, such as brain cancers. Thus, covering the entire spectrum of applications of nuclear radiations for societal benefit and explaining the application in the field of medicine in detail, Dr. Meera Venkatesh convinced the participants that nuclear radiations are not harmful as is usually thought by general public, but beneficial to the society, when used judiciously and under strict regulatory practices. About 62 participants attended the webinar and registered several queries in the chat box. Dr. Meera answered all the questions patiently.

Before Dr. Meera Venkatesh's lecture, the participants were welcomed by IWSA President, Dr. Lalitha Dhareshwar. She gave a brief introduction to IWSA and its objectives. Dr. Rita Mukhopadhyay, Vice president, IWSA, explained the objective behind the series (Science and Our Life) of lectures and the relevance of this special lecture. Dr. Shyamala Bharadwaj, Editor, IWSA Newsletter introduced the speaker and talked about the importance of the topic and the expertise of the speaker in the field of nuclear medicine, radiopharmaceuticals and peaceful uses of nuclear radiation. Dr. Suparna Kamath compered the program. She along with Ms. Sukhvinder Sandhu conducted the question – answer session. Ms. Deepti Yadav summarised the talk and Dr. Suparna Kamath proposed the vote of thanks.

https://youtu.be/rF1YU4VlaFI You tube link to the Above Lecture

2. "Mathematics Behind Basic Financial Concepts" by Mr. Tushar Pradhan on 12th September, 2020

Mr. Tushar Pradhan, Chief Investment Officer, HSBC Global Asset Management Co (India) Ltd gave a lecture on **"Mathematics Behind Basic Financial Concepts"** on 12th September, 2020**.** This was the fourth talk under INDIAN WOMEN SCIENTISTS' ASSOCIATION's "Science and Our Life" Lecture Series.

We, the scientists, generally are not enthusiastic to put our minds in money making. Mr. Pradhan explained how important it is to be moneywise and while earning money, how and why we should exploit different avenues to increase the value of our savings. In very simple terms he explained in what way Gross domestic product (GDP) is calculated and what increase and decrease in GDP means to financial health of a country. GDP is the total monetary value of all the finished goods and services produced within a country in a specific time period. It is a score card of the country's economic health. While continuing to explain the above points he elaborated the concept of inflation and how increase in inflation reduces the real value of money over a period. He also emphasized the need for saving and investing in schemes which will compound the interest thus avoiding erosion

of the value of our savings due to impending inflation. He also explained the mathematics behind these calculations in layman's terms. The session highlighted the macro elements of economy linking them to personal savings, interest calculations and returns. He also emphasized the need to start exploiting different avenues of investments very early in life to make the future, financially secure for us and our families. In the end he explained rule of 72 which is simple way to determine the time needed to double the investment.
About 28 participants attended the webinar and learnt about basic financial concepts, financial security and several investment avenues.

3. "Heart is Your Password to Your Life" by Dr. Haresh Mehta on 29th September, 2020

The eminent Interventional Cardiologist, Dr. Haresh Mehta spoke on "Heart is Your Password to Your Life" on 29th September, 2020 at the Indian Women Scientists' Association's, Science and Our Life series of talks. This was the fifth talk under the Lecture Series.
The President, Dr. Lalitha Dhareshwar gave the welcome address and introduced the speaker. He commenced the lecture by explaining the difference between a Cardiologist and an Interventional cardiologist. He then explained simple heart diseases that are seen by an Interventional Cardiologist. These included Ischaemic heart disease, Congenital heart disease, Myocarditis, Cardiomyopathy, Valvular heart disease, Rheumatic heart disease, Arrhythmia and Weak heart where the ejection fraction was low. This was followed by a series of videos demonstrating some procedures that an Interventional Cardiologist employs to treat in these clinical conditions. The videos showed how Angioplasty was done, how to deal with a patient who collapses, management of closure of arterial / ventricular septal defect, trans catheter Aortic valve replacement, implantation of defibrillator into a patient, working of an artificial heart, repair of leaky valves, left atrial appendage closure device and dealing with atrial fibrillation clots. Finally, he graciously answered all the questions in a simple and clear way to the satisfaction of the audience of about 60 participants who attended the webinar. The program was compered by the Co-convenor of the Science Awareness committee, Ms. Tripta Tewari.

4. "Artificial Intelligence Models in Health Care" by Prof. Anitha S. Pillai and "Application of Artificial Intelligence in Neurological Disorders – An Overview" by Dr. Bindu Menon on 17th October, 2020

Prof. Anitha S. Pillai, School of Computing Sciences, Hindustan Institute of Technology and Science delivered a lecture on "Artificial Intelligence Models in Health Care". She explained how Artificial intelligence(AI), Machine Learning(ML) and Deep Learning (DL) models are used to support Neurologist in treating Neurological disorders. She also discussed about how these models are trained using a dataset and the model learns to perform tasks like detection of a disorder, predict the likelihood of a disease or propose rehabilitation measures. All these jobs are possible as AI can learn features from large volume of healthcare data and then use these insights to assist Neurologist in treatment

design or in assessing the risk. AI can be used to do jobs, such as analyzing tests, X-Rays, CT scans or data entry and they can also help in reducing diagnostic and therapeutic errors.

Dr. Bindu Menon, HOD & Senior Consultant Neurologist, Apollo Hospitals and Convenor IWSA Nellore branch delivered a lecture on "Application of Artificial Intelligence in Neurological Disorders – An Overview". Dr. Bindu menon explained about the great impact of Artificial intelligence (AI) in detection and prediction of diseases in the healthcare sector. She emphasized on the growing trend of AI in neurology and listed the several benefits that AI can offer to the Neurologist , both in neurological research, as well as in diagnosis and therapeutic interventions. She also discussed about how a Neurologist make use of AI and which are the neurological disorders which can be detected and predicted using AI. AI-based algorithms and models that help neurologists and their patients and the various areas of neurology where AI is currently playing a role in improving healthcare were highlighted in this lecture.

The webinar was compered by Dr. Suparna Kamath, Joint Secretary of IWSA. Welcome address was given by Dr. Rita Mukhopadhyay, Vice President of IWSA and she also introduced the speakers. The webinar was attended by 54 participants. You tube links for these two talks are:

Dr. Bindu Menon's Lecture: https://youtu.be/FRFlH4n_OaI

Prof. Anita Pillai's Lecture: https://youtu.be/-1vKOUqwahA

5. "How do we know what lies within?" by Padmashri. Prof. Rohini Godbole on 17th November, 2020

Padmashri Prof. Rohini Godbole, Centre for High Energy Physiscs, Indian Institute of Science, Bengaluru spoke on "How do we know what lies within? "on 17th November, 2020. In this lecture, she described the journey as to how we (the human beings) arrived at today's understanding of the elementary constituents of nature and interactions among them. Even though in this journey, the development of mathematical description of these interactions are important, she did not go into the details of the mathematical description, as this lecture was intended for scientists from various disciplines. She outlined its importance and how it has provided us insights into basic principles of the laws of nature. She started her lecture by explaining about our understanding of what lies within the matter we see around us in our daily life, that is we know that all matter that we see comprises of molecules, which in turn comprises of chemical elements, atoms, nuclei, quarks, leptons and so on. Therefore, the ultimate building blocks of matter are the elementary particles. The laws of physics that governs the behaviour of these elementary particles, allows us to predict about what lies within everything that we see. Prof. Godbole has created her own niche in particle physics studying high energy physics and the Standard Model of particle physics, according to which, everything around us is made up of fundamental particles, like leptons, bosons and quarks. She has contributed immensely towards the design and implementation of two particle colliders, the Large Hadron Collider (LHC) and the Next

Linear Collider, at CERN, the European Organization for Nuclear Research. Prof. Godbole explained how the experiments at LHC led to the exciting discovery of the Higgs boson, "the God Particle". She concluded her lecture by describing the ongoing experiments at LHC and INO (Indian Neutrino Observatory) and how these experiments will further help us to understand more about the laws of particle physics. All these studies ultimately lead us to address the happenings in the cosmological time scales.

Dr. Rita Mukhopadhyay, Vice President, IWSA was the compere for the webinar. Dr. Devaki Ramanathan, Trustee, IWSA talked about the Science and Our Life series of webinars which is a new initiative of IWSA started after lockdown was imposed due to COVID pandemic. The lecture by Prof. Rohini Godbole is the seventh webinar in this series. Dr. Lalitha Dhareshwar, President, IWSA introduced the speaker and about 55 participants attended the webinar.

The you tube link for Prof. Godbole's Lecture: https://youtu.be/OsqOiTNsbv0

6. "Organ and Tissue Donation" by Dr. Astrid Gajiwala on 21st December, 2020

Dr. Astrid Gajiwala, Former Director, Regional & State Organ and Tissue Transplant Organization, (ROTTO-SOTTO), West & Maharashtra, Ministry of Health and Family Welfare & Former Head, Tissue Bank,Tata Memorial Hospital, Mumbai delivered a lecture on "Organ and Tissue Donation". Dr. Gajiwala initially explained about organ and tissue donation which is the process of permitting one's organ(s) or tissue(s) to be retrieved for transplantation in another person, either by written consent while the donor is alive, or subsequent to the donor's death after written consent of the next-of-kin. She then described about the living donors who can donate a kidney or sections of the liver, and surgical residues like bone removed during hip or knee replacement surgeries. She also discussed about the process of organ and tissue donation and how it is governed by the Transplantation of Human Organs and Tissues Act, 1994. Other highlights in her lecture were the discussions on how in persons suffering from end stage organ failure, organ transplantation is life saving and how the donated tissues on the other hand, improve the quality of life of patients suffering from debilitating medical conditions. She also pointed out that unfortunately, there is a huge gap between the requirement for organs and tissues and their availability. Therefore, there is need for public awareness about the donation process and the law that governs it which will be an important step in closing this gap, as it motivates people to give their consent when approached by medical personnel for organ and/or tissue donation.

The webinar was compered by Ms. Sukhvinder Sandu, Member, IWSA. Dr. Surekha Zingde, Trustee, IWSA welcomed the participants, spoke about the significance of Science and Our Life Series of webinars and introduced the speaker. About 32 participants attended the webinar.

C. Participation of IWSA at the 6th India International Science Festival (IISF 2020) from 22nd to 25th December 2020

The Ministry of Science and technology, Ministry of Earth Sciences & Vijnana Bharati (VIBHA) organized the 6th India International Science Festival (IISF2020) from 22nd to 25th December 2020 in New Delhi through virtual mode. This festival was organized to celebrate the various Indian achievements in the field of Science and technology. It provided a platform for young scientists, students, technocrats to exchange ideas and knowledge. The theme of the IISF2020 was -"Science for self -reliant India and Global welfare" to support India's initiative to make it - 'Atma Nirbhar Bharat'.

During IISF, a two day forum –"Science Education in India" was organized on 23rd and 24th December, 2020. In this, policy makers, curriculum developers, academicians and institutional representatives were invited to place their ideas for the implementation of the new education policy NEP2020. Dr. Lalitha Dhareshwar, President, IWSA was invited to represent IWSA on this forum as a panelist in the the Panel discussion-" School and the Science Practical on 23rd December, 2020.

In the panel discussion, Dr. Dhareshwar presented the several education initiatives by IWSA to achieve its mandates of taking Science to the masses and creating a scientific temper in society. She discussed on- our sustained efforts to bring scientific temper from ***Pre-primary (ECCE) to Research level by Scientific enquiry from early childhood, from evolving out of the Text book to research methods.***

She said that India's higher education system is the third largest in the world (>1000 Universities) next to the United States and China. Also Higher education contributes to sustainable livelihoods and economic development of the nation.

Key reforms envisaged in NEP2020-

- Rote learning to research focus
- Skill and value based learning
- Focus on teacher training
- Multiple entry-exit options in higher education
- Intellectual curiosity, scientific temper, creativity, spirit of service

The most important question addressed was- Is the practical training in Science and Technology given to students at the University level adequate? Does it make them job ready? Does it make them ready for research and industry?

Solution to the problem: Solution lies in **preparing students for 21st century skills. We have to enhance student participation in the industry and academic research to trigger critical thinking and problem solving.**

This can be achieved by-

- Interaction with scientists and technology experts by visits to industry and research institutes to observe the working instruments and systems. In this direction, IWSA has been arranging "Popular Science Lecture Series" (supported by BRNS), for the last ten years, for college students, faculty- taking the experts from research institutes and industry to colleges.

- Thematic Workshops and Refresher courses for students and faculty is an excellent way to make students and faculty understand about the latest developments in the area and demonstration sessions leads to hands on experience. IWSA has played a major role in this direction by conducting such workshops and refresher courses for the past several years, which have been supported by Science Academies.

- Summer Research Fellowships of Science Academies at research institutes and industry is another way to impart hands on working experience. Working with specialized instruments, experimental installations- scanning electron microscopes, Laser systems, X- ray diffraction studies, Neutron scattering experiments at Research reactors, synchrotron machines etc.gives the students and faculty enhanced experience of current scenario in research.

- Internships after the course completion would be an ideal way to integrate the students in the working environment of industry and institutions. This is also of great value for the industry, as, a trained manpower is made available at minimum cost to them. For this, MoU could be made by the universities with institutes and industry.

Dr. Dhareshwar also discussed about some new concepts which are being planned at IWSA, as given below-

"Nurturing Scientific Talent" by using the methodology of "Each one Teach one", an approach by bringing together a college student mentor with a school student. This leads to an approach to **EXPAND EDUCATION from "I" to "WE"**

Through this we will motivate an educated student to understand their moral and social responsibility of educating the less privileged students. The idea here is to encourage college students to learn teaching methodology, learning the value of inclusiveness, improve their communication skills in turn understand the basics of various scientific concepts.

VIRTUAL Tours of Labs at Institutes/ Industry are a novel means to attract students to industry and Research labs after completing their courses. This concept is being tried at **IWSA Learning Garden- as an open air laboratory.**

In conclusion, she stressed that Participation of Research institutes, Industries in "Educate India" movement has to be followed much more intensely. Every industrial or research set up must have an education hub to cater to summer projects, trainings, visits etc for the students. Also, it is most important that NGOs engaged in Science Education initiatives must strive to act as a bridge between educational institutions and industry/ research organizations.

D. Online Science Nurture Classes

IWSA has been running a Science Nurture (SN) program, since last 8 years, for school children in the 7th and 8th grade from under privileged section of society. About 15 children are taught science, Mathematics, English and computer skills, every day for 2-3 hours, four days a week. Science is taught through hands on experiments. In the English class, we try to establish conversation and improve their vocabulary and communication skills. In the computer class, they are taught to use MS-Office. They are taught to do research on a topic from their book and make a power point presentation to the class. This program has helped in realizing IWSA's mandate of taking science to the masses and inculcating a scientific temper in the citizens of tomorrow.

IWSA has started the Science Nurture classes for 8th standard online on google meet platform. There are 5 students attending the program.

Methodology used for teaching during the COVID situation:

- Google Meet platform has been used for the online classes.
- A WhatsApp group of students is formed where the lesson to be covered next day is mentioned. Students are asked to collect and keep ready the components/ingredients needed for experiments to be conducted the next day.
- Many of our students cannot afford mobile data, hence IWSA pays for their data on their phones.
- During the class, the teacher asks the students certain questions related to the topic and asks them to demonstrate experiments in front of their camera. Teacher can do it after everyone has completed. The teacher then gives reasons if students are not successful.
- Class room is made interesting and participative using the Google App to show 3 D models.
- In between, few questions are posted on chat box, which the students have to answer. This keeps the students alert throughout the class.
- At the end of the class, the teacher posts some video links of youtube videos relevant to the topic.
- For making simple projects and active participation in the classroom the children are rewarded with data points in their mobiles.

Some of the experiments performed in the online science classes are given below:

- **Demonstration of osmosis and diffusion-** The children learnt osmosis and diffusion using simple do it yourself experiments. They were told to fetch a glass of water and add a crystal of potassium permanganate into water and observe diffusion. Then they were told to soak raisins overnight in two jars containing plain water and sugar solution each. The results seen next day were noted and pictures were taken and posted on the WhatsApp group. The teachers demonstrated how soaking an egg in vinegar for two days makes it lose its shell and become translucent. This translucent egg when soaked

in plain water swells up since its membrane is permeable to water and it shrinks in sugar solution as it tends to lose water. The concepts of hypertonic, hypotonic solutions were easily explained with the above examples.

- **Demonstration on properties of light conducted in the IWSA lab**- Heating objects exposed to lightshows that light is also a form of energy. Other properties such as; Light propagates in a straight line; Light bending in a stream of water; Composition of white light-Newton's wheel, Optical illusion were also shown.

- **Metals and non-metals:** Students were asked to collect simple metallic and non-metallic objects from their house and the names of the metals were made clear to them like aluminum, silver, copper, iron and gold.

The difference between iron and steel led to the idea of alloys with brass and bronze were introduced and discussed. They were made to listen to the sounds of different metal bells and plates. Wires, coins and vessels of copper were shown to demonstrate ductility and malleability. Thermometers were examined to observe liquid metals like mercury. Difference in properties of mercury and gallium were shown with YouTube videos.

- **Acids and Bases:** Acids and bases were taught by making indicator solutions and papers by using turmeric solution, juice from hibiscus flowers and purple cabbage. We make indicators which show discernible colour change in lemon juice and soap solution. These strategies have helped to stimulate curiosity and imagination thus enhancing scientific temper. The children are thus kept entertained and alert.

- **Use of Google apps to show 3D models:** The children were told to check out the 3D models of bacteria, animal cell and plant cell using Google app. The excited children vied with one another to present these 3D models on their mobiles to the teacher rather than vice-versa. It was a very pleasant experience to be taught by the children rather than the other way round. The alertness and involvement in the subject was so much that a child who was normally not very responsive in online classes (irrespective of the subject) was very eager to present all these 3D models! The 3D models were systematically labelled and the names popped up as the presenter clicked on the label numbers. so the children learnt the location and structure of each organelle in the cell. The high quality of visuals in these models has had a great impact on their minds. Instead of the teacher being eager to teach the children and complete the stipulated portion, the children were eager to continue the class well beyond the slated time period!

- **Virtual tour using Google's virtual reality tour:** The children were shown a virtual tour inside the respiratory system complete with travelling through the bronchioles, inside the lungs, gliding over alveoli and seeing the fine capillaries surrounding and comparison of a healthy lung with a smoker's lung. These tours have a narrative as well, for certain sections, which work well for English medium students. But we preferred keep the audio off and give a personalized tour with our own commentary whilst showing the 360 degree angles of the various parts of the respiratory system as well as the heart! Mathematics is

also taught in a fun way focusing on the underlying concepts in order to overcome Mathematics-Phobia.

Thus, Covid -19 pandemic has changed our education systems immensely and IWSA Science Nurture teachers have also shifted to virtual platforms to conduct their classes online. But there are some challenges both for teachers as well as students in this new methodology. Due to lack of devices and inconsistent access to the internet, online classes may be difficult. It is challenging for teachers to make the session interactive. Innovative ideas along with Visual Aids relevant to the subjects are available for online teaching. Performing experiments on line is being enjoyed by the students and we are able to keep them engaged using the 3D animations and virtual reality software. We therefore observe that if digital technology is used in an innovative way, online teaching can become more enjoyable and at the same time enhance their scientific temper as much as in an actual laboratory.

All these experiences were written as an essay "Nurturing the Scientific Temper through Online Classes" submitted for the "Teacher's Conference" organized by Navi Mumbai Science Foundation on 6th February 2021. The essay was authored by *Devaki Ramanathan, Lalitha Dhareshwar, Madhu Pahwa, Manashi Chakraborty, Rama Prasad, Smita Kekatpure, Srirupa Mukherjee, Sukhvinder Sandhu, Suparna Kamath, Tripta Tewari, Vijayalakshmi Tilak*

D. IWSA's Learning Garden

IWSA's Learning Garden Members continued the organisation of lecture series on every Wednesday during the period from September to December 2020, under the aegis of "Member Enrichment Program". A brief report of the lectures under this program is given below. All webinars were conducted through Google Meet platform. Most of these lectures can be viewed in "Indian Women Scientists' Association You Tube Channel"

1. On **2nd September, 2020**, **Dr. Devaki Ramanathan**, Convenor of IWSA's Science Awareness Committee and **Ms Divyanka Reddy**, our Science Nurture student spoke on "The Science of Cooking" and ''Gourds of India'' respectively. This webinar was attended by 61 participants. Science in Cooking mainly involves Chemistry Laboratory practices, carried out in the kitchen, with the interplay of different ingredients, making the final edible products. The speaker discussed many of the properties of these ingredients & their reactions at the molecular levels. This knowledge helped in better understanding the cooking processes besides aiding the selection of proper ingredients and the optimal conditions for the best results. She also presented a brief recommendation on the best cookwares to use in the kitchen and the ones to avoid. She introduced Maillard reaction, a very important flavour-inducing reaction in food chemistry. Two widely used tools in the kitchen –the pressure cooker & the microwave oven were discussed with their principle of operation, the physics involved & the advantages of these in preparing nutritive food products. In a lighter vein, the science involved in the making of puries/ chapatis were highlighted, step-by step. In conclusion, a mouth-watering fruit tart was displayed to exemplify the culinary art in cooking. The

program was compered by Manashi, with welcome address by Dr Susan Eapen, summarisation of talks by Dr Maitrayi Paul and Ambika, lyrical couplets by Madhu Pawha and Snehalata and announcement of prize winners of 'fermented food' recipes by Tripta Tewari. Ms Zharna Parikh bagged the first prize for Nachni Dosa, while the second prize was shared by Ms. Chhaya Kelkar and Dr.Srirupa Mukherjee for their entries on Handvo and multicolour Idli respectively and the third prize was also shared by Vijaya Chakravarty, Madhu Pahwa and Sangeeta for Beet root kanji soup, Kaanji /black carrots/vada and khameer roti respectively. In the sweets category, Dr Rita Mukhopadhyay won the first prize for Rasobada with urad dal while Dr Bakhtavar Mahajan procured the second for Banana cake without maida and sugar.

2. On **9th September, 2020**, **Dr. Smita Kekatpure** and **Ms. Pari Kulkarni**, our Day Care student spoke on "Algae- Pollution Indicators'' and ''Science and Spirituality Plants in Hindu Mythology and Modern Science'' respectively. This webinar was attended by 64 participants. The former talk highlighted the fact that pollution of surface water is currently one of the most important environmental hazards, leading to deterioration of water quality, affecting the aquatic ecosystem and restricting the use of the water body for many other purposes. Algae are the primary producers in this ecosystem and the presence of certain species in a water body is correlated with particular type of organic pollution. Algae are considered to be good indicators of pollution because of their wide temporal and spatial distribution, perennial presence, quick response to environmental pollutionand ease of sampling & identification. Many desmids are known to be present in oligotrophic waters while few species are found in eutrophic water bodies. Similarly, presence of many blue green algae like *Nodularia sp*, dinoflagellates like *Alexandria tamarense*, *Noctiluca scintillans* and Diatoms like *Pseudo- nitzschia sp* indicate "algal blooms". These are steadily increasing in Indian waters and are lethal for human beings and marine ecosystems. Upwelling, formation of mud banks, nutrient discharge from estuaries, effluent discharge from chemical plants and surface runoff during monsoon are some of the major causative factors for water pollution which is clearly indicated by algal blooms.

   Our young speaker Pari narrated the importance of plants as illustrated in Indian culture. They play an important place in Hindu Religion and Ayurveda. Leaves and flowers, are an integral part of worship rituals. The medicinal properties of plants have been utilized in Ayurveda. Science and philosophy are two sides of the same coin. Science is experimental while philosophy and spirituality are experiential. Both are entwined with each other. The medicinal plants exemplified included Sandal wood - used while worshipping Lord Shankar; Tulsi - used for thousands of years for its healing properties and known to be beneficial in respiratory, digestive ailments and kidney stone. Tulsi leaves are also offered in the worship of Lord Krishna; Bael Leaves - always found in a cluster of three leaves, used for improving digestion and curing ulcers due to their effective antifungal and antibacterial properties; Durva - used as a good source of fibre, calcium and potassium and known to reduce body heat; Banyan tree components used to cure Diarrhea and dental ailments; Neem – used as an effective air purifier, a disinfectant and for dental cure and in treating Leprosy; Gandh (Sandalwood paste) - known to improve concentration, conserve energy, maintain positivity and facilitate blood

circulation.; Ghanta - sound helps in brain balance and activation seven Chakras; Namaskar - pose is said to activate all chakras.

3. On **16 th September, 2020**, 2020, **Mrs Anita Dash** and **Dr Jyotsna Singh** spoke on "Community Gardening'' and ''Mental Health Care'' respectively. This webinar was attended by 36 participants. The talk by Anita Dash was aimed to generate public awareness in Community Gardening and it's benefits to Individuals, Communities and Environment. The presentation provided examples of Community Gardening from the Second World War era and included illustrations from the White House, Gangsta Garden, how Offices are using space to develop Community Gardens in Tokyo and ideas for developing this in India and finally showcasing prevalent activities at IWSA garden in execution of this awareness.
   Mental or emotional health refers to the overall psychological well-being of a person. It can include the way one feels about self, the quality of relationships and ability to manage one's feelings and deal with difficulties.
   Dr Jyotsna Singh's talk highlighted that Mental health and physical health are very closely connected. Mental health plays a major role in the ability to maintain good physical health. Mental illnesses, such as depression and anxiety, affect the ability to participate in healthy behaviors. This can result in problems with physical health, such as chronic diseases, and can also decrease a person's ability to participate in treatment and recovery. Issues with mental health can have many different symptoms, just as with physical health. However, most people avoid going to a mental health professional or for a mental health examination. In many cases, people only seek out a mental health professional after a crisis has occurred. Poor mental health is a risk factor for chronic physical conditions, while people with serious mental health conditions are at high risk of experiencing chronic physical conditions. People with chronic physical conditions are likewise at risk of developing poor mental health. The social determinants of health impact both chronic physical conditions and mental health. Key aspects of prevention include increasing physical activity, access to nutritious foods, ensuring adequate income and fostering social inclusion and social support. This creates opportunities to enhance protective factors and reduce risk factors related to aspects of mental and physical health. The talk is aimed at creating an awareness of mental health issues in the prevalent time with focus of some preventive and remedial solutions to the same. Practices and therapies including recreation, ecogardening, music, yoga, meditation, useful mobile apps, etc were explained in the presentation.

4. On **23rd September, 2020**, **Dr. Varsha Singh**, Assnt Prof, Dept of MRDG, Indian Institute of Science, Bengaluru, presented a talk on "Murmuration, schooling and swarming- Lessons from population behaviours". The session was compered by Dr Smita Kekatpure with introduction of the speaker by Dr Rita Mukhopadhyay. The lecture wassummarised by Dr Susan Eapen. This webinar was attended by 54 participants.'No man is an island' is a 16 th century poem by Jon Donne. This is not only true for humans, but there is increasing evidence now that other animals, plants and bacteria are not islands either. Social interactions in most population is crucial for their survival, migration and reproduction. Bacteria are unicellular organisms, but they show collective behavior called biofilm formation and collective motility called swarming. Dr Varsha Singh lucidly explained how swarming and biofilm formation in bacteria can be studied.

Using modern biology tools, it is now possible to understand how and why bacteria engage in social behaviors. The eminent speaker described interdisciplinary approaches to understand and manipulate these behaviours. Understanding biofilm formation and antibiotic resistance has direct impact on human and animal health. The lesson from social behaviour of bacteria also has implications for defense and surveillance and for medicine such as treatment of hospital acquired pneumonia.

5. On **30th September, 2020**, a talk on ''Home remedies from kitchen garden for common ailments'' was presented by **Dr Saisha Vinjamuri** and **Dr Savithri Bhat**, faculty from Dept of Biotechnology, B.M.S. College of Engineering, Bengaluru. The session was compered by Dr Srirupa Mukherjee and Tripta Tewari with introduction of IWSA by Dr Sudha Rao and a summary of the talkwas given by Dr Shyamala Bharadwaj. This webinar was attended by 45 participants. The speakers highlighted that India is one of the 17 mega biodiversity countries and well known for its traditional medicinal systems—Ayurveda, Siddha, and Unani. These three medicinal systems have about 90% formulations which are plant based. Amongst these, Ayurveda is more than 3000 years old system of medicine ans has wider acceptance. Ayurveda is also called the "science of longevity" as it offers a complete system to live a disease free life. Through inclusion of herbs in regular diet and nutrition, one can rejuvenate the body and live longer and healthier through all the ages. The presentation offered few simple recipes which can be prepared from herbs grown in the home garden. The herbs such as Ginger, Methi, Lemon, Basil , Bone plant, Brahmakamalam, Henna, Ashwagandha, garlic, mint etc were selected. These are grown either in pots or land in their own garden. The faculty made an attempt to select these herbs in combinations to prepare home recipes for the prevention or treatment of common ailments such as Cold & cough ,Fever , body pains & aches, diabetes, Joint & abdominal pains etc

6. On **7th October, 2020**, the lecture on "How to grow Veggies Permaculture Style" was given by **Ms. Laura Khanna**. Growing your own herbs and vegetables is a true act of sovereignty and resilience! This short talk covered how we grow food the permaculture way. Useful topics including soil health, do it yourself fertilizers, composting , innovative container gardening and starting and saving your own heirloom seed were discussed. Permaculture is a design-based approach to land management, rooted in the three core ethics of Care of the Earth, Care of people and Fairshare. There is no better time than now to start your own garden to get kickstarted. The session was compered by Ms. Sukhvinder Sandhu with welcome address by Ms.Tripta Tewari. 46 participants attended the lecture.

7. On **10th October, 2020**, a talk on ''Basics of Growing your own food'' was presented by **Mr. Julius Rego**, an urban farmer who has conducted workshops in over 200 educational institutions. He shared his experiencial knowledge and skills in Soil Basics, Composting, Weed control, Circular Beds With Mulching, Erosion Control & Rain Water Harvesting, Versatile Planters from Waste like cardboard boxes, Discarded Wooden Crates, ideal Grow Bags for gardens, Paint Bins Mulched With Leaves, Leaf Grow Bags: Nature's Bounty, Veggies on the Terrace, Companion Plants: Basil & Tomatoes, Bountiful Harvest, Trellis: Keeps Pests & Dirt Away, A Galaxy of Gourds: Gandhiji's

Favourite Foods, Trellis: Space savers like tunnel and web, Polyculture, Vertical Landscape With Pipes and Community Gardening. Members were indeed enriched and motivated with several novel ideas to grow their own food. Twenty participants attended the talk.

8. On **14th October, 2020**, a talk on ''Forest and Folklores'' was presented by **Sharanya Chattopadhyay**. As multidisciplinarity is the key to explore eco-regions, through photographs, historical accounts, and excerpts from fieldwork diaries, the speaker explored the universe of Sundarbans- its history, geography, ecology and people.
Disconnected from the hinterland, crisscrossed by a complex network of rivulets and creeks,and an abode of wildlife, Indian Sundarban Delta has its very own uniqueness, which led to a romanticized picturesque image of this region. Both the fury and beauty of this terrain have caught the attention of tourists, ecologists and zoologists. As a tourist destination and for academicians of different streams, Sundarban is indeed intriguing. For masses, Sundarban is synonymous to the mighty Royal Bengal Tigers; the 9630 square km area of Sundarban is an abode of wildlife; it is world's largest mangrove delta where Royal Bengal Tigers are found. It was declared as a World Heritage Site (1987) by International Union for Conservation of
Nature and Natural Resources (IUCN), Biosphere Reserve (1989) by The United Nations Educational, Scientific and Cultural Organization (UNESCO), and Ramsar Site (2019). Now,for obvious reasons the attention is always fixed on the ecology, geography and wildlife of Sundarban. But it also sets a perfect stage for a never-ending saga of anxiety and vulnerability for the settlers. The speaker attempted to shed light on the changing waterscape of Sundarbans and how the ecology and society converge together in the terrain. In the era of climate change, biodiversity conservation, adaptation and resilience building have become a major issue. A critical understanding of the livelihood choices of local people with respect to the natural resources available and their faith system, and perception aboutrisk play a major role in the said interaction. This session was compered by Sweedle Shivkar with welcome address by Dr. Sunita Mahajan and had an impact outreach of 44 participants.

9. On **16th October, 2020**, a session on ''Learning Garden Living Museum Vegetable Section at IWSA'' was conducted to brief the members with recent updates of this newly introduced section in the learning garden.While **Madhu Pawha's** talk focused on the possible methodologies to realize IWSA's vision for the Living Museum, Dr. Sangeeta's talk appraised the members about the experiments under way for the Living Museum. This session was compered by Ms Vijaya Chakravarty with introductory remarks by Dr. Rita Mukhopadhyay and had a member outreach of 28 attendees.

10. On **21st October, 2020**, a talk on ''The Healing Wonder Flowers: Lavender and Roman Chamomile'' was presented by **Dr Jyoti Marwah**, Aromatherapist, Mussoorie, Uttarakhand. Aromatic plants, their extracts and oils have been used for thousands of years as incense, perfume and cosmetics. They have also been used for food preservation and culinary delights as flavour enhancers. Our ancients knew by instinct the effect of aroma ingredients of plants on the mind and the body. The speaker

highlighted the applications of two exotic plants from high- altitude regions and also touched on Rose hip oil or Rose haw to introduce the audience to a very exotic and highly beneficial but lesser known essential oil from the wild Himalayas with tremendous benefits in skin care. Lavender – Has about 350 chemical compounds of which the major ones are Linalyl acetate and linalool. Lavender oil has clinical benefits on the central nervous system, antimicrobial activity; spasmolytic activity (soothes the muscles). It is anticarcinogenic and an antioxidant. They have sedative and local anesthetic effect. Linalool is also antibacterial, antifungal and insecticidal. Topical application of lavender oil can be detected by the presence of linalyl acetate and linalool in the bloodstream. On the other hand German Chamomile contains the major compounds Chamazulene and Bisabolol. It has a sedative effect due to a flavoid Apigenin that binds to Benzodiazepine receptors in the brain. Hence it is the best treatment for Insomnia. Roman Chamomile has relaxation and calming properties on the digestive system. Terpenoids impart a unique smell and flavonoids are strong antioxidants that boost the immune system and are anti-inflammatory. It is best known for hypnotic effects. This session was compered by Ms. Madhu Pahwa and moderated by Ms. Vijaya Chakravarthy and had an outreach impact of 93 participants.

11. On **28th October, 2020,** a talk on '' Hydroponic Farming at home'' was presented by **Dr Sheela Donde**, Former Vice-Principal, St. Xavier's College, Mumbai. Hydroponics, also called soilless gardening, is simply, growing plants in nutrient water without any soil. Ideal for urban living, it is space saving, economical, labor efficient and amazingly rewarding! Having experimented growing a variety of vegetables like greens (spinach, methi, salad), herbs (tulsi, oregano), and vegetables (tomatoes – both regular and cherry, capsicum, green chilly, peas, broccoli) in her balcony, the speaker enthusiastically shared her experiences with potential enthusiasts, so that they could develop Hydroponics as a hobby, and enjoy the thrill and satisfaction of growing their own pesticide free vegetables in their homes! This session was compered by Dr. Suparna Kamath with welcome address by Dr. Maitrayee Paul and had an impact outreach of 50 participants.

12. On **4th November, 2020**, a talk on ''Butchart Gardens: A floral extravaganza carved out of an unused quarry'' was presented by **Shobha R. Pakala**. The transformation of an unused limestone quarry into a fascinating display of exotic blooms is the story of the Butchart Gardens located in Victoria, British Columbia, Canada. The vivid imagination, aesthetic brilliance, and ceaseless toil of Mrs Jennie Butchart culminated in a visual masterpiece of floral displays which are unmatched in their beauty. The masses of glorious blossoms; stately trees; colourful shrubs and elegant artefacts are both alluring and awe inspiring. The speaker brilliantly enthralled the audience with a virtual feel of these gardens to walk away with the experience of a lifetime. This session was compered by Dr. Suparna Kamath and moderated by Vijaya Chakravarthy with welcome address by Dr. Paramjit Anthappan and was attended by 47 participants.

13. On **11th November, 2020**, a talk on ''Novel strategies for protection and cleaning up of soil and water bodies using plants and bio-materials'' was presented by **Prof. Susan Eapen**. She is currently the Adjunct Professor, Biosciences Group, UC College, Aluva,

Kerala. The speaker highlighted that plants and bio-materials can be used for cleaning up of water bodies, lakes and canals, prevention of soil erosion, waste dump land restoration, river embankment solutions and sustainable green belt development. Live plants and bio-materials can be used to rebuild the ecosystem. Detailed studies have been conducted in various parts of India to clean up water bodies. The backwaters of Kerala are invaded by noxious weeds like *Eichornia crassipes* which can be turned to develop women hygiene products and fertilizers. Biotechnological approaches can be used to develop novel plants to remove pollutants, heavy metals and radionuclides. This session was compered by Dr. Sweedle Shivkar with welcome address by Dr. Shyamala Bharadwaj and was attended by 37 members.

14. On **18th November, 2020**, a talk on ''Ikebana art of flower arrangement: recreating nature in a container'' was delivered by **Ms. Zarna Parikh**. Ikebana is the traditional art of flower arrangement. It is an artistic endeavour to recreate nature in a container. An ikebana artist analyses nature, shape, texture and colour of the plants, leaves, branches, roots, flowers and then combines them to create an arrangement which reflects Nature. This type of flower arrangement is also used as offering in Buddhist temples. There are different styles of this art form as well. Each has its own guidelines with regard to the length, angle, number etc. for the placement of every element. In this talk thee styles, viz. Rising, inclining and single row were explained and demonstrated by the speaker. This session was compered by Tripta Tewari with welcome address by Dr Srirupa Mukherjee and had an impact outreach of 43 participants.

15. On **25th November 2020**, a session on ''Team building and Communication'' was presented by **Dr. Paramjit D. Anthappan** for in house IWSA members with the following learning objectives: [1] to gain a greater understanding of how effective teams develop, behave and perform and [2] to utilise this knowledge to develop high performing teams at IWSA and it's programs. The speaker highlighted the required effective skills for team building including Active listening and care for others; collaborative skills; creativity wrt creative thinking and idea exchange; problem solving skills; others ie positive attitude, relationship building, responsibility, understanding feelings, honesty, influencing; supportive skills; patience; building confidence; communication skills like verbal and non verbal, confidence, empathy, open mindedness and feedback reception. The importance of abiding to group agreements, Stages of team building, stages of team development behaviors, characteristics of effective and ineffective teams, Aspects of Conflict [destructive and constructive] and resolutions and Team roles and responsibilities were also discussed with real life examples. The session was attended by 21 members.

16. On **2nd December, 2020**, a talk on ''Algal polysaccharides as potential plastic alternatives for packaging and biomedical applications'' was delivered by **Ms. Rubie M. Sam**. In today's world, especially with the outbreak and spreading of COVID-19, where the major cause of environmental pollution is non-recyclable plastics, development of sustainable replacements such as bioplastics plays a vital role. Bioplastics are naturally degraded by microbial action to produce natural end products like water and carbon dioxide in a reasonable period of time, and have been introduced

to substitute 'traditional', non-biodegradable, petro-based materials. Packaging materials are the foremost contributors to plastic wastes, particularly polymers such as polyethylene (PE), polypropylene (PP), polyethylene terephthalate (PET), etc. Even though many of these plastics claim to be recyclable, most of them are non-reusable, and only around 9% of the packaging materials are recycled. This is where biodegradable resources need to come into play for the production of environmental-friendly materials. Marine macroalgae, or sometimes referred to as seaweeds, are known for their richness in bioactive substances like polysaccharides, pigments, polyphenols, peptides, minerals and certain vitamins. Algal polysaccharides such as alginate, carrageenan, agar, etc. possess immense potential as substitutes for conventional synthetic plastics, both in the field of packaging and biomedicine. In a nutshell, the talk addressed the present-day scenario of plastic pollution, with the intention of suggesting some practical steps as to how we can do our bit as individuals in reducing our carbon and plastic footprints for a healthier tomorrow and for a more sustainable generation to come. This session was compered by Dr. Smita Kekatpure with welcome address by Dr. Devaki Ramanathan and had an impact outreach of 41 participants.

17. On **16th December, 2020**, a talk on Sindhudurg Wetlands was given by **Dr. Dhanashree Patil**. The speaker got an opportunity to study and understand wetlands through orders and under the supervision of District Collector of SIndhudurg. She visited, supervised and studied 10 wetlands in Vengurla Tehsil with a team of students. The flora and fauna along the wetlands were studied and geographical details along with threats and prospects were recorded. Vengurla wetlands: Nishant talav, Huda, Mharatale, Mauli mandir, Adeli, Bombadojichiwadi, Shiroda creek and Redi Lake were the site sampling locales for the study of their specialities. It was observed that coastal wetlands were very rich in biodiversity. Birds, butterflies, adonates, reptiles, and medicinal plants were in plenty in a healthy atmosphere. Aquatic flora and palms like *Caryota urens* were the best flora for birds and other faunal species. This session was compered by Sukhvinder Sandhu with welcome address by Dr. Devaki Ramanathan and had an impact outreach of 36 participants.

18. On **30th December, 2020**, a talk on ''Uncommon and Rare Fruits of India'' was presented by **Mrs Chhaya Kelkar**. Fruits are an integral part of human diet as they are rich source of nutrition, vitamins, fiber and water. India, with its very diverse climatic conditions ranging from cold Himalyas to hot humid Tropical Southern India, holds the distinction of being the world's second largest producer of fruits. Now our supermarkets are full of colorful fruits imported from across the world, but our local fruits are rarely to be seen. In this talk the speaker introduced the members to the local Indian fruits which have very high nutritional value, and are available only in villages and towns. They are sometimes seen in our markets briefly during summer or cold winters. This session was compered by Madhu Pahwa and moderated by Sukhvinder Sandhu with welcome address by Srirupa Mukherjee. It was attended by 30 members. Also a contest on Fruit preservation was held wherein the 8 participants

were adjudged by Veena Khera & Suparna Kamath. Priya Jacob, Tripta Tewari, Madhu Pahwa and Vijaya Chakravarty bagged the first, second, third and consolation prizes.

Nursery School and Education Committee

1. Teacher's day was celebrated virtually by students, teachers and committee members on 5th September 2020. Students recited poems in Hindi and English, performed on a song and played games. About 100 participants attended the webinar.

2. IWSA introduced ECCE course in 1995 and this year, the 25th year celebrations were started with a WEBINAR on "The New Normal in Teaching for Early Years". The WEBINAR was organized on 12th Sept 2020. The Speakers were Mrs. Poornima Contractor, President, AECED, Mumbai; Mrs. Sandra Pudubidri, Para Educator in Special Education; Mrs. Rutika Sankhe, Extention Officer, Navi Mumbai Municipal Corporation and Mrs. Archana Premkumar, PrePrimary Parent. Around 100 participants attended the WEBINAR.

3. As part of celebration of 25 years of ECCE course, a webinar on "Role and Need of Shadow Teachers and Understanding ADHD and LD" by Dr. Smita Desai, PhD and Educational psychologist, Founder Director of Drishti was organised on Thursday 15th October 2020. About 167 participants attended the webinar.

4. A webinar by Dr. H.C. Pradhan, Former Director of Homi Bhabha Centre for Science Education on "NCERT- its Objectives and Functions" was organised on 6th November 2020 for the students and teachers of ECCE course.

5. As a part of the syllabus for the ECCE Course, an online Puppet Workshop was held by Mr. Katta Babu on 23rd and 24th November 2020. Mr. Katta Babu is from a NGO in Mumbai and woks for children of migrant construction workers. He is an expert in making puppets.

6. Dr. Harish Shetty, a practising Psychiatrist, gave a webinar on "Empathy and Education online in COVID-19" on 27 November 2020. About 100 participants attended this webinar.

7. The five day INSPIRE program on Value Based Education, was conducted online by Heartfulness Education Trust as a part of IWSA ECCE 25 year's celebration from 7th to 11th December, 2020. It was a good step in imparting practical ways and means to impart Value Based Education to young school students and also developing Heartful teachers. There were 159 registrations and the average number of participants over the five day workshop was about 80. The program in general not only benefitted teachers but also participants who were parents. It aimed at developing a sense of awareness in the group about themselves so as to create an environment of love and nurturance. The modules covered in this program were- Heartful teacher / Facilitation skills/ Heartful communication /Heterogeneous learners/ Inspired Living was really helpful and will help

them in better classroom management and understanding the child. In addition, three important tools of the Heartfulness Practices were taught, namely- Relaxation & The meditation/ cleaning and rejuvenation/ Reconnection through Prayer. These tools imparted have equipped them with better self- awareness and ability to face challenges in life. Since the workshop was conducted online, activities such as – group discussions and making creative aids for teaching value based education which are normally conducted during offline workshop, could not be done. HET has developed syllabus and teachers manuals as well as curriculum on Value Based Education for standards 1 to 9. Normally in offline workshops, the curriculum is discussed in detail and practiced in group sessions. During this, lessons are practiced and some guide lines with hands on training is imparted to implement the curriculum in the classroom keeping the young learners in mind. It has been suggested by the ECCE teachers that a simple three step lesson plan which should be part of ECCE teacher development would go a long way in inculcating these core life values in children. This part would be taken up for the ECCE trainee teachers in the near future. Overall Heartfulness INSPIRE is a program in a way of living rather than a theoretical approach to impart Value based Education.

IWSA's Satish Haware Computer Education Centre

The Computer Education Centre (CEC) was closed during the period from September to December 2020 due to the prevalent COVID-19 pandemic lockdown.

However the computer committee members met online to conduct meetings to plan and explore alternate activities of the centre in accordance with IWSA objectives. The class 10 ICSE board students of 2019-20 batch, trained for Java course at our computer centre scored proficiently at their examinations with the following marks: : Soumurup, Hriday, Tanvi and Akshara procured 100; Smit 99; Sara and Himisha 98; Atul and Krishnan 97; Aish 96; Riya 95 and Amal 89. Currently 7 students for Java, Grade 10 curriculum and 1 student for C++Grade 12 curriculum have enrolled at our centre.

The computer committee has conducted **an application based online 'Microsoft Power Point' course** for empowerment of IWSA members from all branches from 8th to 24th October 2020, over four - lecture cum demonstration sessions. The relevant theoretical knowledge and required practical skills for the same was imparted and shared with the member participants, by Ms. Vini Sandhu and Ms. Akhila Mahesh of CEC respectively. This was initiated as Member empowerment Program (MEP) of CEC. The importance of any presentation, it's aesthetics assisted with animations, insertion of audio/video links, manoeuvring the process of slide making using short cut keys were explained thoroughly. Interface windows were introduced and step by step demonstration of creating slides with tools from smart art, background coloration, etc were carried out. Twenty four members attended and submitted their homework sheets for evaluation. The online valedictory session of the course was held on 4th November 2020. The first course was applauded by all.

Reports from Branches

Bengaluru Branch

1. International Webinar Series on ““Recent Advances in Drug Discovery and Pharmaceutical Sciences” on 7th to 10th October 2020

Dept of Biochemistry, IADC-A and Department of Biotechnology, B.M.S College of Engineering in collaboration with Indian Women Scientist Association, Bengaluru branch organized an International Webinar Series on ““Recent Advances in Drug Discovery and Pharmaceutical Sciences” on 7th – 10th October 2020. The total number of registered participants were 106 for the Webinar sessions and 5 eminent speakers from reputed National and International Research Institutes delivered the talks. The webinar was organized on the GMeet platform. Dr Prashanti, currently Professor in MSR University of Applied Science and Research and Dr Rashmi Shenoy coordinated the entire webinar series. The webinar series started with welcome address delivered by Dr. Savithri Bhat, Convener, Bengaluru branch.. The speakers were introduced by Dr Rashmi Shenoy and Prof Prathibha from the Department of Biotechnology, BMSCE. The first speaker was Dr. Priyanka Baloni, Research Scientist, Institute for Systems Biology, Seattle, USA. She spoke on: “Metabolic Markers in Diseases” on 7th October 2020 at 11:00 am. She discussed about metabolic markers in Alzhemer’s disease and role of diet on metabolism. She further explained about how expression data is incorporated into genome wide metabolic models to understand and predict metabolic markers in disease. The second speaker was Dr. Upasana Ray, Senior Scientist, Infectious Disease and Immunology, CSIR-IICB Translational Research Unit of Excellence, Kolkata. She spoke on: “Vaccine strategies: A COVID-19 perspective” on 7th October 2020 at 4:00 pm.. She first discussed about the different types of COVID-19 vaccines and their stages of development. The third speaker was Dr. Pavitra Viswanath, Associate Professor, Department of Radiology and Biomedical imaging, University of California, San Francisco, USA. She spoke on the topic “Exploiting Metabolism for Imaging and Therapy for Brain Tumors” on 8th October 2020 at 11:00 am. She started her talk with a brief description of the cancer as a hetrogenous and genetic disease. She, then, discussed about the how metabolic imaging of C14 labeled glucose and pyruvate in glioma and glioblastoma can be used for analyzing disease progression and treatment outcomes. The fourth speaker was Dr Kavyashree Manjunath, Former Scientist, Instem, Bangalore. She spoke on “Structural Biology in Drug Discovery and Vaccine Development” on 9th October 2020 at 4:00 pm. She started her talk by giving brief introduction on structural biology and its importance to study various drug targets. She then discussed various techniques like X-ray crystallography, NMR etc. used to study the structural details of complex biomolecules. The fifth speaker was Dr Anjali Pai, Scientist and Integrator, from University College, Cork, UK. She spoke on “Cancer Biology and drug targets” on 10th October 2020 at 11:00 am. She started her talk by giving an outline on CRISPR tool and its importance in gene editing. She then discussed about cancer and different markers and

associated target drugs. She also spoke about application of CRISPR tool in cancer biology. The webinar series ended with a vote of thanks from Dr Savithri Bhat.

2. BRNS Popular Science Lecture on "Strengthening the Collaborative and Multidisciplinary Approach to Implement the National Vector Borne Disease Control Program" on 28th November 2020

Indian Women Scientist Association, Bengaluru branch in collaboration with the Department of Biotechnology, Faculty of Life and Allied Health Sciences, Ramaiah University of Applied Sciences organized a Popular Lecture supported by BRNS-DAE on "Strengthening the Collaborative and Multidisciplinary Approach to Implement the National Vector Borne Disease Control Program" on 28th November 2020 at 11 am. There were 150 registered student and faculty participants from different colleges all over India. Of these 80 attended the lecture. Prof. Sunitha C. Srinivas, Visiting Professor @ Rhodes University delivered the talk. The popular lecture was organized live on the MSTeams platform. Dr. Soma Chaki, HoD, Dept. Biotechnology, RUAS and Dr. K. Prashanthi, Assistant Professor, Dept. Biotechnology, RUAS organized the Lecture. The lecture started with welcome address and introduction of the speaker by Dr. Ekta Tripathi, Assistant Professor, Dept. Biotechnology, RUAS. Prof. Sunitha Srinivas then started her talk by discussing the various aspects of the vector borne disease Malaria. The disease was prevalent globally but was controlled in majority of the countries in the world by proper vector control and treatment options available. However, India is still facing problems from malaria with small children and pregnant women being affected the most. India carries 4% of the global malaria burden and contributes 87% of the total malaria cases in South-East Asia. India is in malaria elimination mode, and has set targets for malaria-free status by 2030. Diagnosis and treatment of asymptomatic falciparum malaria cases continues to be a challenge for health care providers. The speaker spoke about how to overcome these hurdles through innovative solutions along with the existing tools and strategies involving vector control, mass drug administration, disease surveillance, which hold the key to solve this gigantic health problem. Case studies about how the use of insecticide treated bednets drastically reduced mortality by 44% due to malaria in Kenya. The speaker emphasized the necessity for Science Communication that includes public engagement, outreach and research communication are very important for solving public health problems. Multidisciplinary teams need to be at the fore for designing solutions for various public health problems. The lecture was very well received and there were many questions from the life science students. The popular lecture ended with a vote of thanks by Dr. K. Prashanthi, Department of Biotechnology, RUAS.

3. National e-workshop on Lasers and Optics on 14th December 2020

The National e-Workshop on Lasers and Optics was organized by Department of Physics, Indian Academy Degree College-Autonomous, Bengaluru in collaboration with Indian Women Scientists' Association (IWSA), Bengaluru online on 14th December 2020 via Zoom platform. The event commenced with the traditional lamp lighting ceremony digitally. Dr. E Jerome Xavier, Principal, Indian Academy Degree College-Autonomous, Bengaluru welcomed the guests in the inaugural address.

Dr. Lalitha Dhareshwar, President, Indian Women Scientists' Association (IWSA) was the Chief Guest. She addressed the participants about the significance and various applications of Lasers and fibre optics. She mentioned how this field has gained the importance throughout the world in various applications like Laser radars, terrain mapping, space technology, laser guided missiles, almost all fields are using Lasers. She gave an example of surgery in retinopathy for detached retina and also many other applications in the medical field. She also mentioned about Nobel Prizes in the field of Laserresearch. The 3rd woman who received the Nobel Prize in Physics in the year 2018 is Donna Strickland after more than 50 years, after Maria Goeppert in 1963, for Nuclear shell structure.

She advised that the students and researchers must visit the prestigious laboratories to gain interest in the Laser field. She said that it is very necessary to dream big tor achieve everything in a scientist life. She spoke about logic, mathematics, creativity and scepticism which are also very important quanlities to become a scientist.

Dr. Devaki Ramanathan, Guest of Honour of the e-Workshop presented a glimpse of various activities, goals and achievements of IWSA and IWSA branches. She mentioned that IWSA is now a 47 years old organization having 11 branches with a total of about 2300 IWSA members across the country. She also mentioned that IWSA Bengaluru branch is new having 37 members and it is growing. She informed about the various community welfare services rendered from IWSA HQ and requested participants to visit IWSA website (www.iwsa.net) to get more information on IWSA activities.

Dr. Devaki made a special mention about the one-year diploma course which has been running successfully for the last 25 years by IWSA in affiliation with S.N.D.T Women's University of Mumbai. This program has recently introduced short-term courses for handling special children such as those with ADHD and LD. She also mentioned about Science education initiatives such as learning garden and green initiatives for school and college students.

Dr. Srinidhi K Parthasarathi, Chief Operating Officer, Indian Academy Group of Institutions, Bengaluru delivered Presidential remarks. He mentioned that he has seen reference of lasers in the Rigveda and Vedic times. He also mentioned that when we talk about Tripura shrungara and we talk about the Indragni Missile (The Narayan Astra), reference to modern days Lasers have been given there. He said workshops such as the present one are extremely necessary for the students of today.

After the formal inaugural session, the 1st session was delivered by Resource person, Dr. Padma Nilaya, Head – Infrared Laser Section, Laser & Plasma Technology Division, Bhabha Atomic Research Centre (BARC), Mumbai on "Laser Fundamentals and Applications". She presented an insight into the Physics of Laser and explained the basic concepts of absorption, emission, amplification processes, cavity, cavity modes and gain. She explained about 2,3,4 level laser systems and coherent sources

by nonlinear processes. She also spoke on applications of Lasers in various fields such as medical, defence, cosmetics, fashion technology etc.

The 2nd session was delivered by Resource person, Shri Aseem Singh Rawat, Scientific Officer (H), Laser & Plasma Technology Division, BARC on the topic "Laser based instrumentation". He mentioned in his talk that Laser based instrumentation is one of the important applications of laser. He said that Laser based instrumentation is a field in which an instrument has laser as integral part of the sensor. This makes an instrument non-contact, non-destructive and fast in nature. It is useful for remote measurement in toxic and hazardous environment and where on-line process monitoring is required. He spoke about important properties of Lasers. He discussed about various optical techniques such as shadow pulse, optical triangulation, time of flight etc.

After lunch break, the 3rd session was the demonstration session on Lascan Dia-Gauge instrument, shadow pulse and few other instruments such as vibration measuring instrument, Projectile speed monitor using fibre optic cable etc. All those instruments were demonstrated by the Resource person, Shri Aseem Singh Rawat directly from BARC Lab.

Last session (4th session) was also demonstration session on how to determine the numerical aperture of the optical fibres, coefficient of thermal expansion of metals using lasers and verification of Malus' law. These were demonstrated by the Resource person, Dr. Banita Behera, HOD, Department of Physics, Indian Academy Degree College – Autonomous, Bengaluru.

In the valedictory session, Dr. Lalitha Dhareshwar, Chief Guest of the e-workshop expressed her satisfaction to see active participation by the students from across the country. She suggested that we can have a virtual tour to the prestigious laboratories. Finally, vote of thanks was proposed by Dr. Banita Behera, Coordinator of e-workshop. More than 120 participants including eminent educationists, faculty members and students from various institutions joined the e-workshop on virtual platform.

Hyderabad Branch

National Webinar on "Healthy Diet: Immunity (Right Food – Bright Life)" on 11th September 2020

IWSA-Hyderabad Branch, in collaboration with Department of Microbiology, St. Pious X Degree and PG College for Women organized a national level webinar on Healthy Diet: Immunity (Right food-Bright Life) on 11th September 2020 as part of national nutrition month, with the theme Eat right, Bite by Bite. Principal of St. Pious College, Rev. Sr. Velangini Kumari delivered a message on the importance of making informed food choices. Convener IWSA-Hyderabad branch Dr. K. Ratna addressed the audience and spoke how to practice healthy eating habits.

The speaker for the day was Prof. C. Anjali Devi, Former Head, Department of Food & Nutrition, Osmania University. The session was highly informative and eye opening with respect to healthy eating. Prof. Anjali focused on various aspects on healthy diet, intake of salt, immune boosting foods and emphasized that Food is the only medicine and only proper Food can improve immunity.

Response for the webinar was overwhelming with around 230 attendees from various college faculty and students, and other participants. The webinar was scheduled online, on "Google meet" platform. The webinar session was followed by queries where the speaker interacted with the participants and answered their questions.

The session was an eye opener and apt according to the current scenario where people during COVID-19 pandemic need to remain safe at home. At the same time right bite can indeed help boost our immunity and make a stronger individual. The attendees were presented with E-certificates.

Kalpakkam Branch

1. **Webinar on "Medicinal Plants" on 10th October 2020**

IWSA, Kalpakkam branch conducted a Doctor's Talk on 10th October, 2020. Dr. K.R. Ambika B.A.M.S.; M.P.H. delivered a lecture on "Medicinal Plants" with an elaborate presentation about various plants and their medicinal values. The lecture was arranged through Google.meet. About 90 people attended the talk. Dr. Ambika patiently answered all the queries by the participants. After this meet IWSA committee decided to distribute medicinal plants to members.

2. **Webinar on "Crosslinked poly(ionic liquid) for the removal of antimony ions" on 21st November 2020**

A technical talk was arranged on 21st November 2020 by IWSA Kalpakkam through Google meet. Ms. T. Vijayalakshmi, SRF, WSCD, BARC Facilities presented her research work on Crosslinked Poly(ionic liquid). The title of the presentation was "Crosslinked poly(ionic liquid) for the removal of antimony ions". The presentation was attended by about 50 people and was well received by the members. IWSA senior member Dr. S. Vijayalakshmi, SO/H, Radiochemistry Division, IGCAR presented a memento to the speaker.

3. **Distribution of Medicinal plants in December 2020**

IWSA, Kalpakkam branch planned distribution of medicinal plants to members and township women as a small initiative to encourage people to grow medicinal plants, practice using them and improve immunity and health. In the first lot, 60 grow bags with 1 Kg mud and medicinal plant were prepared. Six types of medicinal plants were grown. The first plant was received by Dr. P. Vineetha, DAE Hospital at Kalpakkam and Dr. K.R. Ambika at Anupuram township on 20th December 2020. Several other IWSA Members collected the

remaining medicinal plants. Next lot of plants are being prepared. IWSA has a plan to distribute about 300 plants as well as grow some of them in office premises.

Kolhapur Branch

1. Webinar on "Nutritious food" during the Rashtriya Poshan Maah, 1st to 30th September 2020

Ministry of Women and Child development has decided month of September as a Nutrition month. A webinar was organized by N.S.S., Women development group of Br. Khardekar College, Vengurla, Indian Women Scientist Association, Kolhapur, Gardens Club, Kolhapur and Science College, Sangola University. There were seven sessions under the celebration of Nutrition month (Raashtriya Poshan Maah (1st -30th September 2020). Dr. Manjusha Deshpande, Director of Lokvikas Kendra, Shivaji University, Kolhapur delivered a talk on Nutraceuticals in kitchen garden. She give information related to nutritious vegetables useful for health and highlighted the tradition food wisdom along with delicious recipes of wild vegetables. Second session was on Potential health benefits from cucurbits. It was delivered by (Prof.) Dr. Niranjana Chavan, Department of Botany, Shivaji University, Kolhapur. She highlighted the role of various cucurbits in diet. Cucurbits increases the immunity and blood circulation. Cucurbits are useful for eyes and skin. They contain vitamins, iron, potassium and antioxidant. Some cucurbits which are rich in flavanoids,, lignans, terpenoids are also useful medicinally. In third session Mrs. Tanuja Rane-Sawant, Government Officer, Accounts and Finance Department, Maharashtra delivered a talk on Backyards and Nutri garden. She gave a demonstration on circular model which is an experiment under Umed in association with Bachat gat, Pen. Cultivation of vegetables and planning for composting were main aspects of kitchen gardening. Fourth session was conducted by Dr. Vasudha More, B.H.M.S Yoga Teacher on Yoga and Diet. The session was proceeded with colored slides regarding nutrition and demonstration of yoga. Diversity in nutrition, proteinaceous food and dietary tips were given by her. Session five was conducted by Dr. Pramila Battase, Ph.D. in Chemistry, Gardens Club, Kolhapur on Toxin free vegetables from Kitchen garden. She highlighted composting, preparation of enzymes and cultivation of toxin free vegetables in zero budget. In the Sixth session Prof. (Dr). Varsha Jadhav, Head of Botany Department, Shivaji University, Kolhapur delivered a talk on Nutraceuticals in wild vegetables. Emphasis was given on wild vegetables, flowers and fruits of various wild varieties which are useful as health tonic and rich in vitamins and minerals. Rhizomatous and bulbous wild vegetables were shown using power point presentation. Session seven was dealt by Dr. Vijaya Chakravarty, IWSA, HQ ,Vashi, Navi Mumabi on Landscaping related to nutrition. She gave an account on Indian historical nutria gardens like Nakshatravan, Navgraha van, Rashivan, Vrushivan, Tulasivan, and highlighted protein rich fruits and their medicinal uses. The sessions were informative with respect to diet and immunity. Scientific information was immensely useful for local participants and other delegates too. There was wide coverage of "Poshna Maah webinar" through media and newspaper. In the concluding

session, Ms. Madhu Pahwa, EC Member of IWSA, Headquarters, presided over the function. (Prof.) Dr. C. Anjali Devi, Food Nutrition Department, Osmania University, Hyderabad graced the function by highlighting about nutritious food and immunity. Dr. Rita Mukhopadhyaya, Vice President, IWSA, highlighted practical approach of nutritious food and encouraged students and delegates to propose the projects related to different aspects of nutrition. About 225 participants attended these webinars.

2. Workshop on "Bonsai Making" on 18th October 2020

Kolhapur Bonasai Club had organized Workshop on "Bonsai Making". Br. Balasaheb Khardekar College, Vengurla, Indian Women Scientist Association, Kolhapur and Gardens Club Kolhapur supported this webinar. Ms. Suniti Deshmukh, President of Kolhapur Bonsai club gave an informative power point presentation on Basics of Bonsai. She described the different techniques, tools and styles of Bonsai. Mr. Arora, President of Lucknow Bonsai Club presided over the workshop. Mr. Vivek Chavan, and Ms. Vedashree Chavan handled the technical responsibility. Ms. Kalpana Sawant, President of Gardens Club Kolhapur and Prof. (Dr.) Niranjana Chavan, Convener, IWSA Kolhapur Branch supported and encouraged this webinar. This workshop was held on 18th October 2020 and attended by 65 participants.

3. Celebration of "World Child Right's Day" on 12th December 2020

World Children's Day (WCD) is a global day of action for children. Each year more than 1.7 million children under the age of five lose their lives as a result of avoidable environmental degradation, while millions more suffer disease, disability, and an array of other forms of harm, some of which can result in lifelong effects. nChildren's rights are under threat due to insufficient government measures to address the climate crisis, unprecedented levels of biodiversity loss, exploitation of natural resources, exposure to toxic substances and waste, and widespread pollution of the air, water and soil. In view of this, millions of children and youth across the world are calling for more urgent and ambitious action to tackle the root causes and impacts of the global environmental crisis.

On the occasion of "World Child Right's Day", a webinar on, "Environment, Climate Change and Future of Youth" was organized by N.S.S. Unit, Vidnyan Mahavidyalaya, Sangola in collaboration with Indian Women Scientist's Association (IWSA), Kolhapur Branch on 12th December 2020.

Dr. Kakasaheb Ghadage, N.S.S Programme Officer talked about the purpose of webinar. N.S.S. member and Co-convener, IWSA- Kolhapur branch, Dr. Seema Gaikwad, introduced the guests. Prof. (Dr.) Niranjana Chavan, Convener, IWSA Kolhapur Branch presided over the session and briefed the need of conservation of nature. After that, Mr. Nitin Doifode delivered a talk on, "Environmental crisis, Climate change and Future of Youth" The presidential speech was given by Dr. Sahebrao Jundale, Principal, Vidnyan Mahavidyalaya, Sangola. The programme was anchored by Dr. Seema Gaikwad and Prof. N.P. Aadlinge concluded the programme by giving vote of thanks. About 37 participants attended the webinar.

Nagpur Branch

1. Webinar on Breast Cancer Awareness on 16th October 2020

We all are aware that October 2020 is a National breast cancer awareness month. IWSA Nagpur had invited Dr Rakhi Gajbhiye, senior consultant gynecologist at Mauli Hospital, Nagpur to deliver a talk on Breast Cancer Awareness on 16th October 2020. The program was held on a Google meet platform. Dr Rakhi emphasized on self-breast examination. She explained causes and prevention for breast cancer. The talk was highly informative and received well by all. About 40 participants attended the webinar.

2. Teacher's Day Celebration on 26th October 2020.

Teacher's Day was celebrated by IWSA Nagpur branch on 26th October 2020. The program was organized on Google meet. The topic chosen for the Teacher's Day Celebration was Journey of educators on the path of education in Independent India. At the outset Dr. Pradnya Bhalerao welcomed all speakers and members. She greeted them on the occasion of teacher's day. She briefly introduced the idea behind the topic for deliberation. The speakers included teaching faculty from colleges and schools with rich experience of teaching and representing urban, rural segments as well as CBSE, NMC and ZP school. Mrs. Pratibha Lokhande, Assistant Teacher, Late Sakhale Guruji Uccha Prathamik Shala, and member of महाराष्ट्र राज्य पाठ्यपुस्तक निर्मिती व अभ्यासक्रम मंडळ पुणे spoke about innovative practices in education. She shared her experiences of developing newer methods of teaching based on student's learning ability. Mrs. Anju Bhutani, Principal, Bhartiya Vidya Bhavan, Civil Lines Nagpur deliberated upon how education policies have undergone changes from 1947. Dr. Anagha Nasery a retired Professor of Statistics from Dharampeth Science College Nagpur shared her experiences as a teacher. She explained how initially just a few students chose statistics as one of their subjects and how a lot of efforts from teachers was required to increase the number of students for this subject. From learning computers to the latest mobile technology, she elaborated how important it is for a teacher to upgrade and continuously learn. Dr. Karuna Raut, Head Mistress from Milind School run by Nagpur Municipality, shared her journey of teaching – learning and the challenges of dealing with children from lower economic background, where parents are unable to provide even basic facilities of learning. Computers are a distant dream for these children and therefore, schools are trying to provide computer facilities to them. Dr. Jayashree Thaware from Porwal College Kamptee shared her observations on how education has progressed in rural sectors in India. She further stated that there is overall rise in enrolment in higher education and notably a rise in number of girl students. Parental expectations in rural segments are concerning jobs after degree education. Mrs Madhu Parad teacher from Sanjay Nagar Uccha Madyamik Shala of Nagpur Municipal Corporation spoke about "Teacher yesterday, today and tomorrow". She explained how important it is for a teacher to teach with dedication. She also emphasized that one should select teaching as a career only if there is true liking for it. They should be sincere and passionate about their work. Dr. Seema Somalwar, program co-ordinator, summarized by saying that national aspirations are linked to education and

there is a sense that education is a strong tool to bring about social, political and economic change. Therefore, education must continually evolve to orient itself to the needs of time. Dr. Anuradha Gadkari appreciated all the speakers and their efforts in teaching-learning process. She also remarked that teachers' professions should be selected only if the person has a strong ability and aptitude to do so. It involves not just following the syllabus, teaching methodology but also affection and care of students. About 32 participants attended the webinar.

3. Celebration of World Food Day on 30th October 2020

IWSA Nagpur celebrated "World Food Day" (VIRTUAL) on 30th October 2020. The theme for the World Food Day 2020 was "Grow, nourish, sustain together. Our actions are our future". At the outset Dr. Pradnya Bhalerao Convenor welcomed all members and participants.

The participants displayed and presented their recipes online. Recipes were prepared by the participants using 7-8 constituents like Multigrain, Flours, Vegetables and Fruits, Spices and Condiments, Sweetening agents, Vegetable oils etc with a write up detailing the time required, calories etc and presented in the form of Pictures, Videos or write ups. Six recipes were presented by participants. An invited recipe from Nutritionist, Dr Asmita Thaokar was presented and she discussed the nutritional importance of her recipe. Dr Pratima Shastri IWSA member and retired Professor Food Technology presented a short video. Dr Dipti Andhare, IWSA member made a presentation about the use of Palm oil. Dr Anuradha Gadkari in her remarks highlighted importance of various ingredients in cooking and appreciated video recipes presented by the participants. About 21 participants attended this online program.

4. Celebration of Children's Day on 28th November 2020

A program for Creative Kids to celebrate Children's Day was arranged on 28th November 2020 (Virtually). The Creativity of Kids in the form of a story/ Painting/ Portrait/ Poetry/ Acting/ Dancing/ Yoga or Diwali Fort were invited in the form of 02 minute Videos showcasing how best they have spent their Lockdown months. The response received was enormous and about 100 entries from Schools of Nagpur including the NMC School were received. The 20 Best Entries were selected and presented during the Program, some of them being the Live Presentations by the students themselves. Dr Mrs Shanoor Mirza, Principal, J N Tata Parsi Girls' High School, Nagpur and Dr Dipti Bisht- Science Teacher from Surendragadh Hindi High School, NMC, Nagpur were the Guests of Honour and addressed the students during the Program. Dr Deepti Andhare and Dr Rita Israni were the Program - Coordinators. At the outset, Dr Pradnya Bhalerao, Convener, IWSA, Nagpur welcomed the guests and addressed the students and delivered her introductory address. Dr Anuradha Gadkari, the past Convener, IWSA, Nagpur summed up the

Program and gave the concluding remarks. Participation Certificates were given to all the participants. The program ended with a vote of thanks proposed by Dr Bharati Ganu.

Nellore Branch

Virtual Stroke Quiz conducted on 31st October, 2020

Dr. Bindu Menon from IWSA, Nellore Branch in collaboration with Apollo Hospitals and Dr. Bindu Menon Foundation conducted a quiz competition on " Virtual Stroke Quiz" on 31st October 2020. Flyer announcing the Quiz Competition was circulated through Whatsapp and social media. An overwhelming response was received from nursing professionals and other interested participants. The participants were divided into four teams and grouped two in each team, named as Frontal, Temporal, Parietal and Occipital. More than 120 participants joined as audience. Dr. Bindu Menon was the Moderator and asked five questions to each group with a time limit of one minute to answer. There was interesting interaction and a knowledge sharing among participants. Out of the four teams, Team Occipital won first place and Team Temporal was placed second. Members of the other two teams received participation certificates.

Roorkee Branch

1. Webinar on "Maa" on 4th October 2020

IWSA, Roorkee Branch, organized a unique and unusual lecture/talk on 'Maa' through the digital zoom platform on 4 th October, 2020. The lecture was delivered by Dr. S.C.Handa, Professor (retd.), I.I.T. Roorkee. The unconditional love and affection of a mother (Maa) for her children is an eternal truth. There is nothing new about it. The presentation by Dr. Handa through beautiful visuals and poetic language penetrated deep into the heart of the audience. Dr. Handa emphatically conveyed various sensitive aspects of the role of 'Maa'. The participants were spellbound. Dr. Handa brought out deeper meaning to what is generally taken for granted for 'Maa'. The Zoom Platform of hundred capacity was full. Many more could not get entry.

The chatbox was full of positive reviews, and a common request to organizing more such presentations by Prof. Handa, the speaker of the day. Dr. Handa has delivered a good number of talks on various topics within India and abroad.

2. Webinar on "Health is Precious – Enrich it" on 1st November 2020

Everyone is aware of the fact that health is precious and we have to enrich it. IWSA, Roorkee organized a webinar on "Health is Precious – Enrich it" on 1st November 2020 through zoom plarform. The speaker was Dr. Ajay Bhargava, Senior Consultant Physician,Bhargava Nursing Home, Roorkee Dr. Bhargava's first statement was 'how to ensure that we are healthy'? 'What is health' was the next question. According to WHO health is "a state of complete physical, mental and social wellbeing and not merely the

absence of disease or infirmity". Dr. Bhargava in a lucid manner gave the holistic approach towards health. God has bestowed us our body in the form of a machine whose proper care is of our utmost importance. Maintaining good health depends upon many parameters. The seven components of health are Physical, Intellectual, Social, Occupational, Mental, Spiritual, and Environmental. He provided a glimpse of the above issues and their consequences. He highlighted that to maintain good health, we need to understand anger management, lifestyle management, etc. Personnel from different walks of life attended and appreciated the excellent presentation made by Dr. Bhargava. IWSA Roorkee is indebted to Dr. Ajay Bhargava for an excellent and meaningful presentation as well as to our esteemed audience for their gracious presence. About seventy participants attended the webinar.

Articles

COVID-19 Vaccine Landscape and Insights on Intranasal Vaccination

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Introduction

Coronavirus disease 2019 (COVID-19) has posed unprecedented challenges to public health, research, medical fraternity, economy and governments worldwide. The first cases of COVID-19 with symptoms of a severe form of influenza, leading to pneumonia were reported in Wuhan, China in December 2019 [1]. The disease was observed to be highly contagious and by 30th January, 2020, it was flagged as a global health emergency as hundreds of cases were reported in multiple countries within no time. On 11th March, 2020, World Health Organization declared it as a pandemic. As of February 2021, the number of cases have crossed a hundred million worldwide with more than 2.3 million deaths.

Although the prognosis for most of the patients affected with COVID-19 is mild to medium with symptoms like fever, headache, dizziness, sore throat, loss of taste and smell and weakness, it was seen to be serious in people of higher age group, children and patients with predisposed illnesses and comorbidities like diabetes, heart diseases, pulmonary diseases, cancer, weak immunity, etc. In such patients, development of Severe Acquired Respiratory Syndrome (SARS) is observed, which in many cases leads to respiratory failure and death. These extreme reactions are

observed due to severe cytokine storm in lungs leading to heavy mucous influx and alveolar puncture [2]. Apart from lungs, SARS-CoV-2 also attacks the heart, intestinal linings, arteries and all the surfaces which contain angiotensin converting enzyme 2 (ACE2) receptors, leading to thrombosis and in many cases multi organ failures.

The SARS-CoV-2, belongs to β-coronavirus family along with SARS-CoV (2002) and MERS (2012). It is a zoonotic infection and contains several surface proteins responsible for infiltrating the human body [3]. The genome of SARS-CoV-2 is a positive sense RNA, coding around 3000 genes and the induction sites are the nasal and oral opening, where they attach their spike proteins S1 to ACE2 receptors present on epithelial cells of oral and respiratory tract surfaces and enter the cell using the spike protein S2 receptor [4]. The spike proteins activate T cell and antibody responses and thus, are the epitopes of primary interest [5]. Apart from this, the virus encodes three more proteins, nucleocapsid (N), membrane protein (M) and envelop protein (E). These proteins are considered major candidates in preparation of vaccines against coronavirus, since they are capable of inducing immunity [4].

COVID-19 Vaccine candidates

Right from re-purposing of existing therapeutics to use of traditional medicines, anything and everything is being tested for its potential to fight this global pandemic. However, the fact remains that a prophylactic vaccine is one of the best alternatives to cater a pandemic of this stature and severity via mass immunization. Major research is being carried out throughout the world to make vaccines against SARS-CoV-2 as it seems the ultimate measure to bring the pandemic under control. Developing a vaccine is a critical and time consuming process which is the main challenge in development of vaccine for COVID-19 wherein a huge number of vaccines are to be provided to population in a small time. The vaccines are expected to be efficient in protecting individuals from COVID infection without causing any adverse reaction, safe for administration and in bringing herd immunity against it, which is formed if 75-90% of population carries antibodies against the pathogen thus preventing its person to person transfer [6]

Different types of vaccines against SARS-CoV-2 are being created in which whole cells, subunits like spike proteins of the virus, recombinant proteins, viral vectors, and nucleic acids are being used to generate immunity against the virus. Let us have a look at the different strategies for developing COVID-19 vaccines, which are approved for emergency use around the world and those in development.

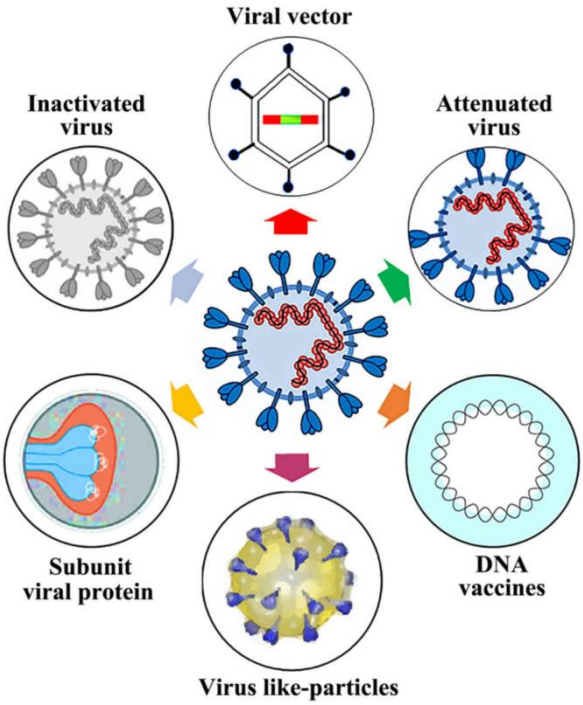

Figure 1: Types of COVID-19 vaccine being developed (Reproduced under Creative Common Attribution License (CC BY-NC-ND 4.0) from [7]

- **Live attenuated viral vaccine:**

These vaccines contain live pathogens but lacking their pathogenicity. The condition is achieved by growing the micro-organisms in extreme conditions and passaging them for months to years. In the process, they lose their virulence and are incapable of infecting the host, but at the same time, due to presence of surface epitopes generate antibodies and memory cells in the host body and avert any future infections [1,8]. These vaccines induce both cellular and humoral responses upon administration and provide a strong and long immune response without the need of a booster dose [9]. One concern regarding live attenuated vaccines is that the pathogens can replicate inside the body and in the process, can regain their virulence thus causing infection. People with immunodeficiency are at a greater risk of bearing this side effect [8,10,11]

COVI-VAC from Codagenix and the Serum Institute of India is a live attenuated vaccine currently under phase 1 trials. The traditional BCG vaccine is also evaluated for protection against COVID-19 in phase 2/3 trials as it is proved to be helpful in combating respiratory tract infections other than providing immunity against TB. No live-attenuated vaccine has been authorized yet for use against COVID-19.

- **Inactivated vaccines:**

Inactivated vaccines utilize pathogens that are heat killed or inactivated to prevent regaining pathogenicity. These vaccines generate a better immune response as compared to subunit vaccines since whole viral particles are present, providing proper size and a good range of epitopes, but due to lack of reproducibility they are removed from the system rather quickly and thus may fail to elicit enough immune response to protect from further infection. Due to this, booster doses of this type of vaccination are needed [8, 12].

The three vaccines developed in China and authorized for emergency use are using inactivated virus. The inactivated Sinopharm vaccine has been approved for emergency use by healthcare workers and essential personnel in China and UAE. Another one named BBIBP-CorV, also developed by Sinopharm in collaboration with several other institutes has been approved for emergency use in 13 countries so far. The third vaccine, developed by Sinovac and Pontificia Universidad Catolica de Chile, is approved in 7 countries so far. Covaxin (BBV152) developed by Bharat Biotech and Indian Council of Medical Research is also an inactivated vaccine that has been recently approved for emergency use in India. Other than these, five such vaccine candidates are in Phase 1-2 and pre-clinical trials.

- **Protein subunit vaccines:**

Our immune system recognizes specific parts of the virus and generates antibodies against them. These specific parts could be surface proteins, carbohydrates etc. These parts are isolated from the virus and are used to make vaccines which are referred to as Subunit vaccines. [11]. These are safe compared to live attenuated vaccines with respect to the risk of pathogenicity and unwanted host response to certain epitopes [8]

Since subunit vaccines are produced by purification of epitopes from actual pathogens, they require culture of organisms in large quantities which increase significant risks and cost. EpiVacCorona is a peptide vaccine developed in Russia which has gained approval for use. Majority of the vaccine candidates which are in different phases of clinical trials belong to the category of protein subunit vaccines.

Another category of subunit vaccines are made by using Recombinant DNA Technology (RDT). Only a few surface epitopes are required to induce immunity in the host body. This method gives us the advantage of introducing genes encoding those specific epitopes in a non-infectious vector system. Either the whole cell expressing these epitopes or purified epitopes can be used as vaccines. Sometimes the epitopes can be weakly immunogenic due to their size, thus adjuvants are needed to elicit the required immune response [6,11,13]. A couple of recombinant subunit vaccines are in Phase 2 clinical trials while many others including PittCoVacc, a recombinant protein vaccine developed by University of Pittsburgh designed to be delivered using a microneedle array, are in pre-clinical stages.

- **Viral Vector vaccine (replicating and non-replicating)**

These vaccines are produced by insertion and expression of gene of interest encoding required epitopes in non-pathogenic viral vectors. These types of vaccines induce strong humoral and cellular immune response and can be classified as replicating and non-replicating viral vectors, based on their ability to replicate in the host cells [9]. The replicating viral vectors have the advantage of inducing strong and long-lasting immunity, whereas non-replicating viral vectors are deficit in this aspect but are much safer [1].

Different types of viruses such as, retroviruses, adenoviruses, HSV, poxviruses etc. are used as vectors, the most common being adenoviruses [6,9]. Viral vectors have become so popular in vaccine preparations that the probability of a possible immunity already present in host body against the virus introduced in form of vaccine for some other pathogens cannot be ruled out. In order to avoid this, recently chimpanzee associated Adenoviruses (ChAd) are being used [14].

Covishield, the Oxford/AstraZeneca: AZD1222, CanSino: Ad5-nCoV vaccine, and Sputnik V, the Russian vaccine are non-replicating viral vector vaccines which have gained authorization for use while 17 other replicating and non-replicating viral vector vaccine candidates are under different stages of clinical trial.

- **Nucleic acid vaccine (DNA and RNA):**

These types of vaccines use DNA based or RNA based antigenic agents. In this approach, DNA / mRNA of desired surface protein required to induce immune response is introduced in host cells. The cells uptake the nucleic acids and translate them to form the epitopes. Immune response is created against these non-self particles. These types of vaccines are cheaper and have higher stability, thus producing long term immune response. Although stable, the DNA based vaccines are unable to induce strong immunity as they are easily degraded. This drawback is overcome by mRNA based vaccines.

Tozinameran, Comirnaty (or BNT162b2), the mRNA based vaccine developed by Pfizer and BioNTech and Moderna: mRNA-1273 are nucleic acid vaccines among the first widely approved vaccines. Ten other mRNA vaccines and nine DNA based vaccine candidates including ZyCoV-D from Zydus Cadila, an Indian origin vaccine are in clinical trials.

- **Virus-like particles (VLPs):**

VLPs are nanostructures containing one or more epitopes of the virus that aggregate together to mimic structure of actual virus, but cannot replicate or show virulence since they do not contain genetic material [9]. They elicit high humoral and cell mediated responses [15]. VIR-7831 vaccine developed by Medicago, GSK and Dynavax, a plant based adjuvant vaccine using quadravalent VLP are in phase 2/3 trials.

Intranasal vaccination – a game changer?

Administration of vaccines via injectable route (muscular, subcutaneous, etc.) is the traditional and widely used method of vaccination. However, this route of vaccination also

holds various drawbacks such as low patient compliance, post application soreness, needle-stick injury, requirement for skilled personnel, risk of syringe reuse and blood transmittable diseases, etc [16]. With development in technology, efforts are being made to device alternative route of vaccination which will help avoiding these problems. One such way is mucosal vaccination. It can be administered non-invasively, comfortably and overrides all the issues with injections mentioned above.

Mucosal vaccination is not emphasized enough with its numerous benefits. The traditional injectable route of vaccination elicits systemic immune response producing Immunoglobulin G (IgG), but it fails to trigger mucosal response. Most of the pathogens enter body via nasal and oral route and thus strong barriers are present in this route. Abundance of immunity inducing Mucosal Associated Lymphoid tissues (MALT) is seen in the upper respiratory tract and a strong adaptive immune response is observed in this site. The predominant antibody of mucosal surface is immunoglobulin A (IgA) which is the only secretory antibody (SIgA). Antigen specific SIgA is not formed when vaccine is administered through injectable route [17]. Apart from the site of administration, mucosal vaccine generates antibody response in other mucosal surfaces like intestinal, ocular, vaginal, and rectal [18]. Thus mucosal vaccines are beneficial in providing prophylaxis against respiratory tract infections.

Our research group has in the past successfully developed a mucosal nanovaccine against brucellosis and observed prolonged humoral and cell-mediated immunity in intranasally administered mice confirming the thought process that vaccines delivered via homologous nasal route can prime the immune system via the mucosal and systemic pathways [19]. The first site of SARS-CoV-2 infection involves mucosal surfaces like nose, mouth and conjunctiva. Evidences of high ACE2 receptor expression and SARS-CoV-2 infectivity in the nose compared to the peripheral lung could prove to be valuable reference data emphasizing the need for exploring the nasal pathway for the administration of COVID-19 vaccine candidates [20]. An intranasal vaccine against COVID-19 is expected to induce formation of IgA specific to the coronavirus and may help in prevention of infection at the primary site itself as IgA will recognize and neutralize it at the site of entry. In addition to IgA, the B cells also induce production of antigen specific IgG, which contributes to systemic immunity [21]. Currently, there is one intranasal replicating viral vector based vaccine (Wantai: DelNS1-2019-nCoV-RBD-OPT) being evaluated in Phase 1-2 clinical trial. Recently, Phase 1 clinical trial of COVI-VAC, a single-dose, intranasal, live attenuated vaccine against SARS-CoV-2 developed by Codagenix and manufactured at Serum Institute of India, has been initiated. The Phase 1 trial of BBV154 - an adenovirus vectored, intranasal vaccine for COVID-19 developed by Bharat Biotech and Washington University School of Medicine in St Louis has also been approved. In addition, 7 other intranasal vaccine candidates against COVID-19 are under preclinical evaluation. Considering the fact that these intranasal vaccines are easy to manufacture at large scale at most global manufacturing facilities, require minimal training to administer without a needle and syringe, and do not demand ultra-low temperature freezers, they could well prove to be a crucial and easy tool to prevent this highly infectious, debilitating disease.

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Dr. Vandana B. Patravale is currently a Professor of Pharmaceutics at the Institute of Chemical Technology, Mumbai, India. She has over 200 refereed publications(H index 44, i10 105), 13 granted patents , 22 patents in pipeline and 2 trademark registries. She has published 2 books and 25 book chapters with international publishers. Dr. Patravale has been active in teaching, research and service throughout her career. Her areas of research include development of nanocarriers with major emphasis on infectious diseases, cancer and neurodegenerative disorders; medical device development, nanodiagnostics and nanovaccines.

Nobel Prizes 2020

The 2020 Nobel Prize in Physics awarded for discoveries on the formation of black holes.

This year's Nobel Prize in Physics focuses on black holes, which are among the most enigmatic objects in the Universe. **The Royal Swedish Academy of Sciences** has awarded the Nobel Prize in Physics 2020 with one half to **Roger Penrose** [University of Oxford, UK] for the discovery that *''black hole formation is a robust prediction of the general theory of relativity"* and the other half jointly to **Reinhard Genzel** [Max Planck Institute for Extraterrestrial Physics, Garching, Germany and University of California, Berkeley, USA] and **Andrea Ghez** [University of California, Los Angeles, USA] for the discovery of a *''supermassive compact object at the centre of our galaxy"* .

Black holes and the Milky Way's darkest secret

Roger Penrose used ingenious mathematical methods in his proof that black holes are a direct consequence of Albert Einstein's general theory of relativity. Einstein did not himself believe that black holes really exist, these super-heavyweight monsters that capture everything that enters them. Nothing can escape, not even light. In January 1965, ten years after Einstein's death, Roger Penrose proved that black holes really can form and described them in detail; at their heart, black holes hide a singularity in which all the known laws of nature cease. His ground breaking article is still regarded as the most important contribution to the general theory of relativity since Einstein.

Reinhard Genzel and **Andrea Ghez** each lead a group of astronomers that, since the early 1990s, has focused on a region called Sagittarius A* at the centre of our galaxy. The orbits of the brightest stars closest to the middle of the Milky Way have been mapped with increasing precision. The measurements of these two groups agree, with both finding an

extremely heavy, invisible object that pulls on the jumble of stars, causing them to rush around at dizzying speeds. Around four million solar masses are packed together in a region no larger than our solar system. Using the world's largest telescopes, Genzel and Ghez developed methods to see through the huge clouds of interstellar gas and dust to the centre of the Milky Way. Stretching the limits of technology, they refined new techniques to compensate for distortions caused by the Earth's atmosphere, building unique instruments and committing themselves to long-term research. Their pioneering work has given us the most convincing evidence yet of a supermassive black hole at the centre of the Milky Way. "The discoveries of this year's Laureates have broken new ground in the study of compact and supermassive objects. But these exotic objects still pose many questions that beg for answers and motivate future research. Not only questions about their inner structure, but also questions about how to test our theory of gravity under the extreme conditions in the immediate vicinity of a black hole", says David Haviland, chair of the Nobel Committee for Physics.

The 2020 Nobel Prize in Chemistry awarded for the development of a method for genome editing.

The Royal Swedish Academy of Sciences has awarded the Nobel Prize in Chemistry 2020 to **Emmanuelle Charpentier** [Max Planck Unit for the Science of Pathogens, Berlin, Germany] and **Jennifer A. Doudna** [University of California, Berkeley, USA] *"for the development of a method for genome editing"*

Genetic scissors: a tool for rewriting the code of life

Emmanuelle Charpentier and Jennifer A. Doudna have discovered one of gene technology's sharpest tools: the **CRISPR/Cas9** genetic scissors. Using these, researchers can change the DNA of animals, plants and microorganisms with extremely high precision. This technology has had a revolutionary impact on the life sciences, is contributing to new cancer therapies and may make the dream of curing inherited diseases come true.

Researchers need to modify genes in cells if they are to find out about life's inner workings. This used to be time-consuming, difficult and sometimes impossible work. Using the CRISPR/Cas9 genetic scissors, it is now possible to change the code of life over the course of a few weeks.

"There is enormous power in this genetic tool, which affects us all. It has not only revolutionised basic science, but also resulted in innovative crops and will lead to ground-breaking new medical treatments," says Claes Gustafsson, chair of the Nobel Committee for Chemistry.

As so often in science, the discovery of these genetic scissors was unexpected. During **Emmanuelle Charpentier's** studies of *Streptococcus pyogenes*, one of the bacteria that cause the most harm to humanity, she discovered a previously unknown molecule, *tracrRNA*. Her work showed that tracrRNA is part of bacteria's ancient immune system, *CRISPR/Cas*, that disarms viruses by cleaving their DNA. Charpentier published her discovery in 2011. The same year, she initiated a collaboration with **Jennifer Doudna**, an experienced biochemist with vast knowledge of RNA. Together, they succeeded in recreating the bacteria's genetic scissors in a test tube and simplifying the scissors' molecular components so they were easier to use.

In an epoch-making experiment, they then reprogrammed the genetic scissors. In their natural form, the scissors recognise DNA from viruses, but Charpentier and Doudna proved that they could be controlled so that they can cut any DNA molecule at a predetermined site. Where the DNA is cut it is then easy to rewrite the code of life.

Since Charpentier and Doudna discovered the CRISPR/Cas9 genetic scissors in 2012 their use has exploded. This tool has contributed to many important discoveries in basic research, and plant researchers have been able to develop crops that withstand mould, pests and drought. In medicine, clinical trials of new cancer therapies are underway, and the dream of being able to cure inherited diseases is about to come true. These genetic scissors have taken the life sciences into a new epoch and, in many ways, are bringing the greatest benefit to humankind.

The 2020 Nobel prize in Medicine awarded for the discovery of Hepatitis C virus

The Nobel Assembly at Karolinska Institute has awarded the 2020 Nobel Prize in Physiology or Medicine jointly to **Harvey J. Alter** [National Institutes of Health, Department of Transfusion Medicine], **Michael Houghton** [Canada Excellence Research Chair in Virology and the Li Ka Shing Applied Virology Institute , University of Alberta] and **Charles M. Rice** [Rockefeller University, New York] "for the discovery of Hepatitis C virus." These three scientists have made a decisive contribution to the fight against blood-borne hepatitis, a major global health problem that causes cirrhosis and liver cancer in people around the world. Harvey J. Alter, Michael Houghton and Charles M. Rice made seminal discoveries that led to the identification of a novel virus, Hepatitis C virus. Prior to their work, the discovery of the Hepatitis A and B viruses had been critical steps forward, but the majority of blood-borne hepatitis cases remained unexplained. The discovery of Hepatitis C virus revealed the cause of the remaining cases of chronic hepatitis and made possible blood tests and new medicines that have saved millions of lives.

Significance of this Nobel Prize-awarded discovery

The Nobel Laureates' discovery of Hepatitis C virus is a landmark achievement in the ongoing battle against viral diseases . Thanks to their discovery, highly sensitive blood tests for the virus are now available and these have essentially eliminated post-transfusion hepatitis in many parts of the world, greatly improving global health. Their discovery also allowed the rapid development of antiviral drugs directed at hepatitis C. For the first time in history, the disease can now be cured, raising hopes of eradicating Hepatitis C virus from the world population. To achieve this goal, international efforts facilitating blood testing and making antiviral drugs available across the globe will be required.

Compiled by Dr Paramjit D. Anthappan using the following links:

https://www.nobelprize.org/alfred-nobel/
https://www.nobelprize.org/prizes/physics/2020/press-release/
https://www.nobelprize.org/prizes/chemistry/2020/press-release/
https://www.nobelprize.org/prizes/medicine/2020/press-release/

We Salute these Women/Girls Achievers

1. School Girls from Mumbai win World Robot Olympiad 2020

As climate change rattles the world, technology has come to the fore to help the environment. Over the years, youngsters around the world have come up with different innovations to do their small bit for the environment. Two such young minds are Prisha Patel (12) and Antara Patel (11) from Mumbai, India. The students of Jamnabai Narsee School, Mumbai, won the recently concluded World Robot Olympiad held in Canada. Antara and Prisha formed Team Technonerds under the tutelage of On My Own Technology (OMOTEC), Mumbai, and the team was placed first in the Open Category of the olympiad. Climate Squad, which was the theme for this year's competition, required the two to innovate and design a solution to a climate problem. "We are proud to have represented India in the competition especially because our solution helps the environment," says Prisha, one half of Team Technonerds.

With the theme in mind, the girls started to look for a solution that can help the environment. And what better way than starting with appliances in one's own home? The girls looked at appliances used daily by people and thought of a way to improve the efficiency of a device and reduce electricity consumption. They zeroed in on the air conditioner as it consumes electricity the most, while also letting out hot air from the outdoor unit. The girls started devising a solution to cool this hot air and reduce the impact of air conditioners on the climate. After much research they finalised on using clay cones to cool down the air.

The girls devised a system called Aqua Clay Atmosphere Cooler or AC square, which uses a natural filtering screen made using clay cones arranged in an aluminium frame. The cones on the screen are kept moist with recycled water, and as hot air passes through these moist cones, it significantly cools down. The girls used the concepts of Boyle's Law & Venturi Effect to select the shape and size of the cones. Temperature and humidity sensors connected with an Arduino circuit (robotic circuit) were used to keep track of the performance of the AC and the filter. With help from OMOTEC, the two developed an app with MIT App Inventor, using which one can get full information on all the testing parameters directly on the phone. The app gives data which allows the user to set the correct temperature for optimum cooling and energy.

According to Prisha, the girls were very happy to come up with a solution to help the environment using clay, which is a traditional material used in India for hundreds of years. This also made their solution more eco-friendly and sustainable. The two now look forward to developing a career in STEM and competing in more competitions. Moving ahead, Antara and Prisha would love to solve problems of a much larger scale than the ones they are working on currently.

https://www.thehindu.com/sci-tech/meet-antara-and-prisha-winners-of-the-world-robot-olympiad-2020/article33342759.ece

2. School Girl Vinisha Umashankar has designed an award-winning solar ironing cart to reduce the use of charcoal.

Thinking of ways to reduce the impact of pollution is on everyone's minds. Some are working on methods to reduce air pollution by introducing or adopting electric vehicles and some are trying to reduce the impact on water bodies by reducing the use of plastic. What about ironing? This is how 14-year-old Vinisha Umashankar, a student of SKP Vanitha International School in Tiruvannamalai, Tamil Nadu, is also doing her part to save the planet.

In 2018, she designed a solar ironing cart so that the use of charcoal can be reduced. A year later, in November 2019, her idea was brought to life by a group of engineers at the National Innovation Foundation, Ahmedabad. While the 14-year-old knew that solar energy can be harnessed to generate power, she did not know how to harness it. To learn about that, she referred to college-level Physics books and also took help from her parents to understand the concepts. Vinisha says, "To make 1 kg of charcoal 12 fully-grown trees are cut down and it is estimated that there are 10 million ironing carts in India and each burns at least 5 kgs of charcoal every day. This simple design can address the serious problem of air and water pollution."Her idea won the Dr A.P.J. Abdul Kalam IGNITE award and an international award called the Children's Climate Prize, one of the world's largest international climate awards for young innovators. Along with the award, she also received a cash prize of Rs 8 lakhs.
(HTTPS://WWW.THEBETTERINDIA.COM/AUTHOR/ROSHINIMUTHUKUMAR/) DECEMBER 2, 2020

3. The Story of Kamlesh Kumari, the First Policewoman to Be Awarded Ashok Chakra

Kamlesh Kumari Yadav was deployed at the Parliament House on 13th December 2001. She was a constable with the CRPF and posted at Iron gate number 1, her job being to assist the watch and ward staff in checking visitors and frisking them. This was the same gate that Union Ministers, Member of Parliament and other VVIPs used to enter the premises. A white ambassador passed through the gates, complete with a red *batti* and tagged 'Parliament' and 'Home Ministry'. On any other day, these marks would assure the guards that the car belonged to one of the VVIPs and there was nothing to be suspicious about. But that day, Kamlesh Kumari felt that something was amiss. Just as the car passed through the gates, instead of maintaining its speed or even slowing down, the car started speeding. Now, we should note that Kamlesh Kumari was equipped with nothing but a walkie-talkie. Even as the CRPF is the country's first Para-Military force to have Ladies Battalions, the women constables deployed in the Parliament House were not given weapons at the time. Without prioritizing her own safety, Kamlesh Kumari started following the ambassador when she saw five men, all armed with heavy weapons get out of the car and head towards the building. Perhaps the most important thing she did as soon as she noticed the terrorists was to raise an alarm. Alerting other CRPF officials on the walkie-talkie as

well as by shouting, the Braveheart took the very first steps in countering the terrorist attack. Kamlesh Kumari ran towards constable Sukhwinder Singh, who was posted on Gate no 11. Her alarm had alerted the CRPF agent, but unfortunately, it alerted the terrorists too. They fired indiscriminately at the lady constable, who without any weapons on her person, was left unshielded. 11 bullets pierced through the brave heart, making her the first victim of the Parliament attacks in 2001. But her martyrdom was not without cause, Singh who was alerted about the attack and pursued the terrorists, shot one wearing a suicide vest. Other CRPF officials too grew vigilant at once, one of them being Santosh Kumar, who gunned down three of the five terrorists. A story of true heroism in the face of grave danger, you can read more about it here. (https://www.thebetterindia.com/166751/hero-parliament-attackterrorists-crpf-delhi-india/)

If not for the quick and courageous actions of the Mahila constable, who can guess how many lives the terrorists would have taken that day. She was instrumental in limiting the attack outside the building, indirectly protecting our former Home Minister and Foreign Minister, among others. Even as she was martyred in the attack, Kamlesh Kumari's sacrifice did not go unnoticed. In 2002, she was posthumously awarded the Ashoka Chakra, India's highest peacetime award by then President K R Narayanan. She became the first policewoman to receive the award posthumously. Kamlesh Kumari is survived by her husband, Avdhesh Yadav, and two daughters, Jyoti and Shweta. We are sure both her daughters grew up listening to their mother's bravery and knowing that she died a hero, one who would inspire hundreds of girls joining the para-military forces to serve their country just as bravely as she did. (http://theincredibleindia.in/story-brave-heart-ashoka-chakra-awardee-kamlesh-kumari/)

Antara Patel and Prisha Patel, School Girls from Mumbai who won World Robot Olympiad

Vinisha Umashankar with her innovative solar power driven ironing cart

Kamalesh Kumari Yadav, the First Policewomen to be Awarded Ashok Chakra

Women Achievers from IWSA

1. Top 2% Indian scientists in the world published by Stanford University

Stanford University has recently published the list of the two per cent top-ranking Indian scientists in the world in various disciplines of science. Five IWSA members are appearing in this list. We are proud to give an account of their achievements, which has been responsible for their receiving this recognition in their respective areas of research.

(i) Dr Susan Eapen – Plant Biology and Botany

Considered to be one of the pioneers in transgenic plant research, Dr. Susan Eapen, is a special BSc (Botany) graduate from Maharaja's College, Ernakulam, and holds a post-graduate degree in 'Genetics and Plant Breeding' with a gold medal from the University Centre, University of Kerala, Kariavattom. She is from the 15th batch of BARC Training School scientists in 'Biology and Radiobiology' and retired in 2011, from Bhabha Atomic Research Centre, Mumbai. She obtained her PhD in Applied Botany from Mysore University in 1982. At present though she is not involved in any research work, she recently published a paper on absorption of uranium from soil using vetiver plants. The research work for the paper was done about a few years back. At present, she is involved in triggering scientific temper among the faculty and students at Union Christian College, Aluva, as an adjunct professor in Biosciences Group. Dr. Susan's interests vary from plant biotechnology, production of secondary metabolites from in vitro cultures and phytoremediation. She was invited by the Chinese Academy of Sciences in 2007 to chair a session and give a plenary talk on Symposium in "Pollution Ecology". Immediately after the Fukushima nuclear plant disaster, she was approached to find solutions to contain low-level radioactive contamination at the site using plants. She has published 93 research papers of relevance and has review papers with the highest impact factor reaching up to 12.831. Her papers are still quoted in international journals. She was also involved in the 'Cotton Mini Mission' project of Government of India. IWSA is proud of her achievements. She is a past President and member of the Board of Trustees of Indian Women Scientists' Association (IWSA).

(ii) Dr. Indira Priyadarsini – Chemical Physics

Dr. K. Indira Priyadarsini, joined Chemistry Division, BARC after completing 26th batch of BARC training school in chemistry and continued there till her superannuation in July 2019 as Head of the Chemistry Division. She is also a senior professor of Homi Bhabha National Institute. She received her MSc from Andhra University with first rank and PhD from Mumbai University in 1990 and did her post-doctoral fellowship as European Communities Marie Curie Fellow at Gray Laboratory Cancer Research Centre, UK. She has worked in the multidisciplinary research areas of chemistry and biology on development of antioxidants and radioprotectors from natural products and organoselenium compounds

She completed many national and international projects in these research areas. She holds two patents and transferred technologies to Indian industries to prepare turmeric based nutraceutical products. She has published more than 250 research papers in peer reviewed journals. She is a recipient of young investigator award in International congress on radiation research in 1991, Homi Bhabha Science & Technology Award, 2003 and is an elected Fellow of National Academy of Sciences, India and Royal Society of Chemistry, UK. In 2015, she received Indian Nuclear Society's Outstanding Service award in the field of Radiation and Radioisotopes Technologies. In 2018, she received DAE group achievement award. Currently she is working as DAE Raja Ramanna Fellow at DAE-University of Mumbai Centre for Excellence in Basic Sciences in University of Mumbai.

(iii) Dr. M.A. Vijayalakshmi – Analytical Chemistry

Prof. M.A. Vijayalakshmi with her basic training in chemistry, from All India Institute of Chemistry, Calcutta in 1966, obtained a PhD from University de Bourgogne, Dijon, France in 1974 and then her D.Sc. from University de Technologie de Compiegne, France in 1980 combined with UNIVERSITY OF UPPSALA, SWEDEN. She worked as a Research Engineer at CNRS, National Research Council Group, UTC, France from 1979 to 1990. She became a Full Professor in UTC in 1990, and in 2001 she became a Distinguished Professor in UTC (called Professor "Class Exceptional" in French) which is the highest level in the academic career in France.

The Center for Bioseparation Technology (CBST) was created at VIT University by Prof. M.A. Vijayalakshmi under the "High priority Research Area" funded by Department of Science and Technology (DST), Government of India. The Centre is projected by the DST as a 'National Facility' for R&D and training and it caters to postgraduate, doctoral and post-doctoral researchers.

In 2005, she was awarded "CHEVALLIER de PALMES ACADEMIQUES" by President of France For more details read:
http://www.info.vit.ac.in/cbst/vijayalakshmi_profile.asp

(iv) Dr. Suhasini Agnihotry – Energy

Dr. Suhasini Agnihotry did her M.Sc. in Physics and Ph.D. in Molecular Spectroscopy from Mumbai University. She was engaged in Research and Developmental work in National Physical Laboratory (NPL), New Delhi from 1977 to 2005. Her field of specialization has been Materials Science and Solid State Ionics. She studied different materials and development of devices and systems based on them. She has worked extensively in the field of electrochemistry and semiconductor physics and chemistry. She was involved in the development of transmissive electrochromic devices using sol-gel technology that have application for automative as well as architectural windows. These windows are "smart" or "energy efficient" as they save energy by dynamic modulation of radiant energy. She has published more than 100 research papers, authored an e-book on Electrochromism and translated several popular

science English books in Marathi. Since its inception in the year 1987, she was involved in all the activities of the Delhi Branch of IWSA in various capacities for a period of 25 years (till she migrated to Australia).

(v) Dr. Ruchika Malhotra - Artificial Intelligence & Image Processing

Dr. Ruchika Malhotra is Associate Head and Professor in the Discipline of Software Engineering, Department of Computer Science & Engineering, Delhi Technological University (formerly Delhi College of Engineering), Delhi, India. She is Associate Dean in Industrial Research and Development, Delhi Technological University. She was awarded with prestigious Raman Fellowship for pursuing Postdoctoral research in Indiana University Purdue University Indianapolis USA. She received her master's and doctorate degree in software engineering from the University School of Information Technology, Guru Gobind Singh Indraprastha University, Delhi, India. She was an Assistant Professor at the University School of Information Technology, Guru Gobind Singh Indraprastha University, Delhi, India. She has received IBM Faculty Award 2013. She is recipient of Commendable Research Award by Delhi Technological University. Her h-index is 31 as reported by Google Scholar. She is author of book titled “Empirical Research in Software Engineering” published by CRC press and co-author of a book on Object Oriented Software Engineering published by PHI Learning. Her research interests are in software testing, improving software quality, statistical and adaptive prediction models, software metrics and the definition and validation of software metrics. She has published more than 200 research papers in international journals and conferences.

2. The story of Dr. Jyotsana Singh - A Journey from Slum to Ph.D. in Psychology

This is a story of girl namely Dr. Jyotsna Singh, who struggled a lot to get her academic and professional education. Her father had a factory of acrylic sheet. When she was 10 years old, her father’s factory started incurring losses and despite all efforts, it ended up in a loss and a bad time with a financial crises started. They got a small 10 feet by 10 feet room in a Slum. She completed her graduation while staying in this slum. The period was full of struggle, but with her courage and strong determination she managed to come out from this crises time. She was not only managing household expenses but also the expenses of her two younger brothers and today both are engineers and earning handsome salary. She used to take tuitions for kids, she also worked as part time in a doctor’s clinic and used to earn money to meet the expenses of household and her education and also for her brothers. During her graduation, she started working with a private bank as an intern and later on, her job got confirmed with the same bank. She worked for about 5 years in that bank and obtained loan from the bank to pay the college fee for her brothers. Due to these struggles, she did her Masters after a gap for 4-5 years, after graduation. Then, she went on to pursue her Ph.D. She is now a public speaker and attending seminars and conference and has received many awards. She has written 3 books. Book titles are – ‘Garbha Sankars –

Unborn Child Intellectual', 'Think and Heal – Cancer Psychosomatic', 'Mind Diet and Brain Gym'. She has started a foundation called Mind Care. Her mission is to secure the mental health of the next generations. She has won several awards such as, Young Researcher Award, Excellent Research Award 2020 (IARDO), Iconic Women of the Year 2020, Star Award 2020, just to name a few. She is also working on children's memory enhancement and parents' attitude towards them. She is a member of IWSA and highly inclined towards psychiatry and social work.

3. Hostel Girl Ms. Ayushi Srivastava used Mandala Art to spread awareness about Corona Virus.

Ms. Ayushi Srivastava is a Civil Engineer by profession and works for Offshore Infrastructures Limited. She stays in IWSA's Hostel at Navi Mumbai. Her passion is to promote social awareness and make people aware about the power and importance of the art and culture in their lives. She usually mamakes drawings on topics which are of social relevance. She uses e-waste for creating arts and has a collection of Scrap CDs with Ganesha image pasted on them. Recently, she used her Mandala art skills to make people aware about Corona Virus. She created black concentric circles and in the centre gave the message to stay home for safety. At the periphery of the circles, she made four sections. The two upper sections used soap and hand wash and the two lower sections depicted corona warriors like police and doctors. She painted a gun on the top to symbolize killing of the virus. This painting of hers was widely covered by local press and her message reached a large number of people. She has won several awards for her work of art that gives a societal message and uses e-waste materials.

Achievers from IWSA

Dr. Susan Eapen

Dr. Indira Priyadarsini

Dr. M.A. Vijayalakshmi

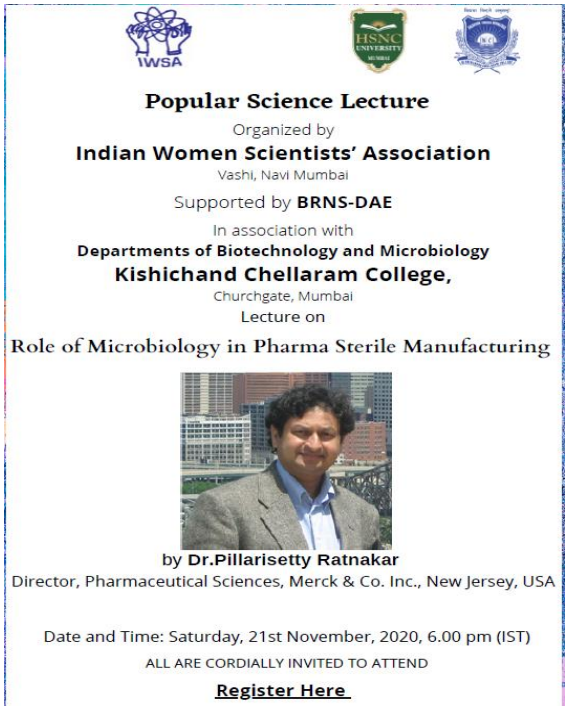
Dr. Suhasini Agnihotry

Dr. Ruchika Malhotra

Dr. Jyotsana Singh

Ms. Ayushi Srivastava

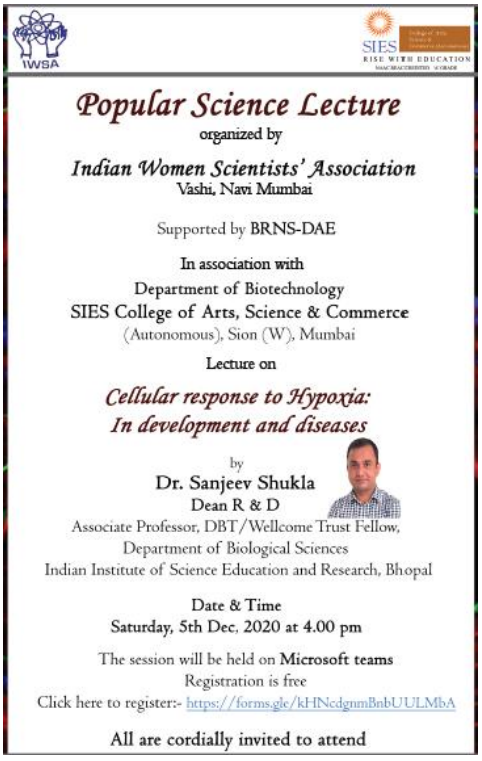
Pictures of BRNS Lectures (Continued)



21st November 2020

21st November 2020

28th November 2020



5th December 2020

BRNS Lecture at UC College, Aluva, on 12th December 2021

Dr. Lalitha Dhareshwar participated in the Panel Discussion in IISF 2020, on 23rd December 2020

The five day INSPIRE program on Value Based Education, conducted online by Heartfulness Education Trust as a part of IWSA ECCE 25 year's celebration from 7th to 11th, December 2020

Demonstration of Science Experiments to Students during Online Science Nurture Classes which Started in December 2020

Fig 1

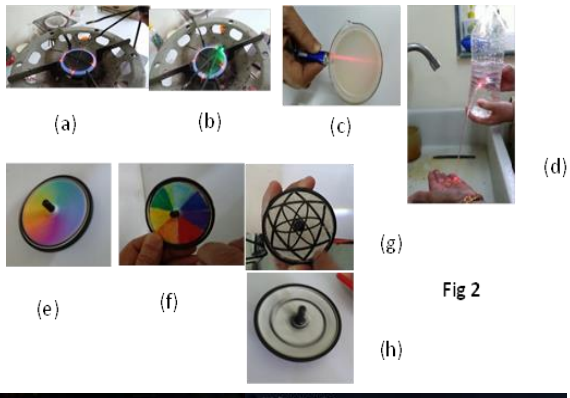
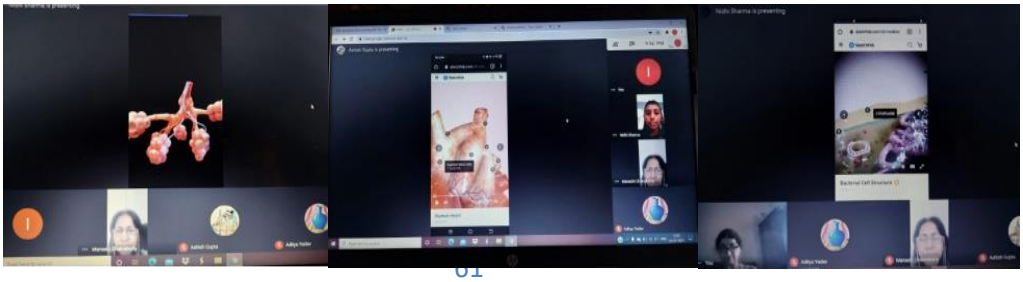
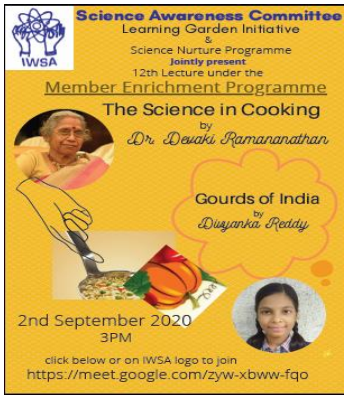


Fig 2



Learning Garden Member Enrichment Program Lectures



2nd September 2020

9th September 2020

16th September 2020

23rd September 2020

30th September 2020

7th October 2020

10th October 2020

14th October 2020

16th October 2020

Learning Garden Member Enrichment Program Lectures

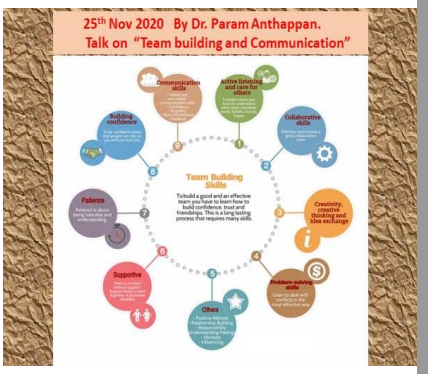
21st October 2020

28th October 2020

4th November 2020

11th November 2020

18th November 2020



25th November 2020

2nd December 2020

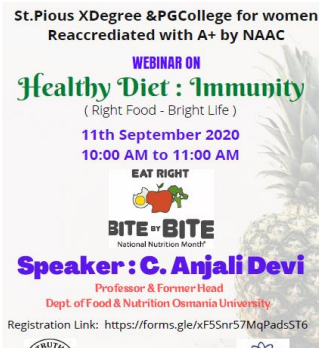
16th December 2020

30th December 2020

Activities from Branches contd.

International Webinar Series on "Recent Advances in Drug Discovery and Pharmaceutical Sciences" on 7th to 10th October 2020, Bengaluru Branch

Laser Optics Workshop 14th December 2020, Bengaluru Branch



Webinar on Healthy and Diet 11th November 2020, Hyderabad Branch

Webinar on Medicinal Plants 10th October 2020, Kalpakkam Branch

Webinar on "Crosslinked poly(ionic liquid) for the removal of antimony ions" on 21st November 2020, Kalpakkam Branch

Distribution of Medicinal Plants in December 2020, Kalpakkam Branch

Webinar on "Nutritious food" during the Rashtriya Poshan Maah, 1st to 30th September 2020, Kolhapur Branch

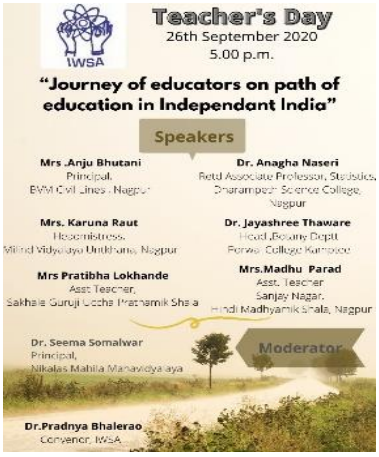
Workshop on "Bonsai Making" on 18th October 2020, Kolhapur Branch

Celebration of "World Child Right's Day" on 12th December 2020, Kolhapur Branch

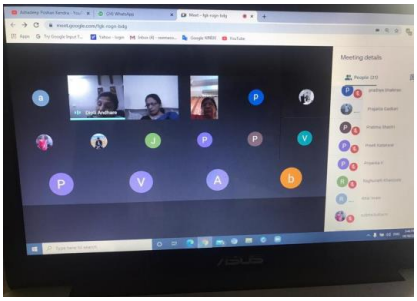
Webinar on Breast Cancer Awareness on 16th October 2020, Nagpur Branch

Celebration of Children's Day on 28th November 2020, Nagpur Branch Screen Shot of a Child speaking from Pune

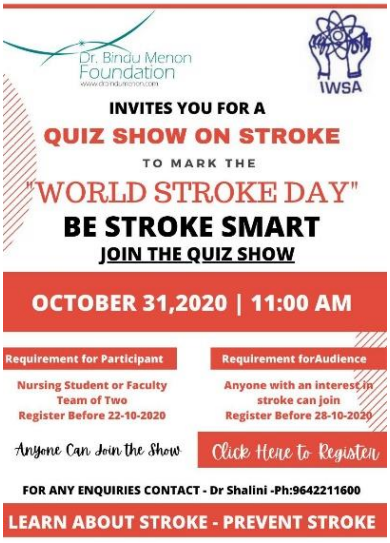
Webinar on "Maa" on 4th October 2020, Roorkee Branch



Teacher's Day Celebration on 26th September 2020, Nagpur Branch



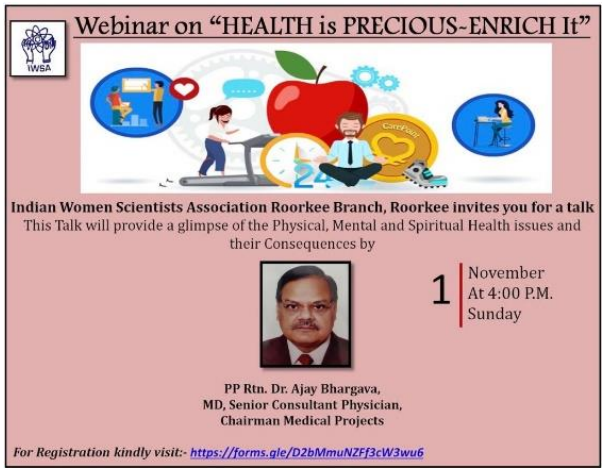
Celebration of World Food Day on 30th October 2020, Nagpur Branch



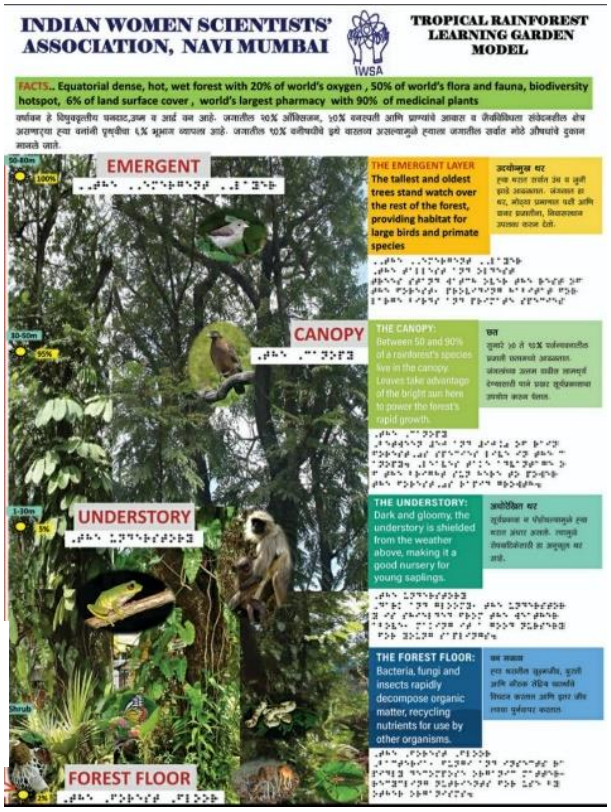
Virtual Stroke Quiz conducted on 31st October, 2020, Nellore Branch

BOOK POST

Regd. No.N.R.24208/74
ISSN 0972-6195



Webinar on "Health is Precious – Enrich it" on 1st November 2020 Roorkee Branch



A Poster prepared by Learning Garden Group with explanations in English, Marathi and Braile on Display at IWSA HQ, Navi Mumbai

To

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