PHYTOPIA

REAP life

(An extended publication of Vegetos)

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A Newsletter of

SOCIETY FOR PLANT RESEARCH

SPR-PHYTOPIA

SPR PARADOX: FOUNDER'S REPORT

Society for Plant Research is moving ahead with the ventures of scientific interest and its recent issue of PHYTOPIA is going to be released shortly. The dedicated team of editors is working hard to publish it at regular intervals but despite all their efforts, the publication is delayed. The entire team of Executive Body has recently decided to circulate the magazine PHYTOPIA to the students, researchers and faculties through our website and emails of all contacts. Articles as per the specified format, need to be invited from all stakeholders.

Society for Plant Research and its journal VEGETOS has completed 35 glorious years and has planned to prepare a documentary on its successful journey with lot of undulating travel. We have introduced Honorary Fellow Awards for globally recognized stalwarts with the intention of getting their academic patronage. Besides this, SPR is in continued practice of recognizing senior and young scientists by honoring them by conferring various awards which is a step ahead to expand the society and its publications VEGETOS and PHYTOPIA.

Under the able supervision of the Chief Editor, PHYTOPIA, Prof (Dr) Ashish Bhatnagar, entire team of editors is articulating useful information for the magazine so as to make it more useful and worth reading.

I would urge the editorial team to spare their valuable time to provide useful insight and introduce a few more relevant information which may attract the young researchers and students. Its regular periodicity is a big concern, and we all need to focus more on it. Currently, PHYTOPIA is available in soft copy for free distribution and can be downloaded from our website www.vegetosindia.org.

I wish to congratulate the team of editors of PHYTOPIA for organizing the information available to them and compiling them into the magazine. My sincere greetings and good wishes to the entire team of editors.

INFOCUS-THE EDITORS' PEN

Democracy is considered the best form of governance as theoretically every citizen is given a chance to contribute by raising voice, discussing and suggesting policy making and implementation. The choice to collectively move the country in their desired way. Thus, fifty percent of the countries in the world claim to be democratic. But such development is always marred by myopia as the populist thought process is mostly not the most judicious one.

An elected leader has the onus to showcase his/her abilities to provide all amenities to a larger section of society for continuing re-elections and leading again and again. S/he also must look after the requirements of those who funded his/her election. The coal lobby, cotton lobby, sugarcane lobby, wine lobby and what not. If one has to show progress every 6 months or even on an annual basis, then maintenance of a natural forest or a water body cannot be the mirror of progress and development that a regime can win vote for. No doubt a subject like environment takes backseat under these circumstances.

Our philosophies to manage the society we live in must focus not on the individual but the family, not the family but society, not society but humanity, not humanity but life on this planet. As everything depends on everything else.

Being the ones who keep analyzing development, technology and environment, we continue our efforts to find ways to sensitize people towards the larger benefit of the life itself and believe in our own abilities such as imagination: engineering enzymes to degrade plastic and creating biodegradable plastics that do not form microplastics, collaborations: the process of formation of nitroplast- a novel organelle, and discoveries that may change the world such as historical memory in the bacterial domain. This issue brings some of these findings that may inspire you.

Ashish Bhatnagar

Scientists in the US succeed in engineering an enzyme to degrade a class of plastics

Less than 10% of plastics are recycled every year. Poly(ethylene terephthalate) (PET) is used to make many consumer packaging, from textiles to food grade material to bottles and accounts for 12% of global wastes. Theoretically it is expected that PET can be degraded by rapid enzymatic depolymerization followed by repolymerization or conversion/valorization into other products. However, PET hydrolases are of not much use due to several reasons.

Recently, Lu et al. at the University of Texas at Austin in USA used a structure-based, machine learning algorithm to engineer a PET hydrolase able to work at 30-50^{0}C and a range of pH levels. They called it FAST-PETase (functional, active, stable and tolerant PETase) which contains five mutations and shows that all untreated, postconsumer-PET from 51 different plastic containers, 5 different polyester fibres and fabrics and water bottles could be degraded almost completely in a week. After completing the degradation cycle, the team was able to resynthesize PET from the recovered monomers.

Sources: Lu H, Diaz DJ, Czarnecki NJ et al. Machine learning-aided engineering of hydrolases for PET depolymerization. Nature 604, 662–667 (2022). https://doi.org/10.1038/s41586-022-04599-z

David N. 1.5.2022. Engineers Create an Enzyme That Breaks Down Plastic Waste in Hours, Not Decades. Sciencealert.com

Nitroplast : A novel nitrogen fixing organelle evolved from the symbiont *Candidatus Atelocyanobacterium thalassa* in alga *Braarudosphaera bigelowii*

Scientists have documented a major evolutionary event, primary endosymbiosis, where two lifeforms merge into one organism for the first time in over a billion years. This was observed between marine algae and a bacterium, with the findings published in Cell and Science. Endosymbiosis, where one organism engulfs another to form an internal organelle, is rare and crucial for complex life. Previous instances include mitochondria formation around 2.2 billion years ago and chloroplast formation about a billion years ago.

The current event involves the algae *Braarudosphaera bigelowii* and the bacterium UCYN-A. The bacterium, now an organelle called a "nitroplast," helps the algae fix nitrogen from the atmosphere. Advanced X-ray imaging revealed synchronized replication and division between the algae and UCYN-A, confirming their deep integration. Protein analysis showed UCYN-A relies on the algae for essential proteins, a hallmark of organelle formation. This discovery may have significant implications for agriculture, as understanding nitroplasts could lead to engineering similar systems in crop plants. Scientists believe further studies on nitroplasts and their evolutionary journey will uncover more about their potential and presence in other organisms.

Sources: Baisas L. 2024 For the first time in one billion years, two lifeforms truly merged into one organism.

Popular Science. https://www.popsci.com/science/two-lifeforms-merged-into-one/
Massana R. 2024 The nitroplast: A nitrogen-fixing organelle. Science 384,160-161. DOI:10.1126/science.ado8571

Coale TH, Loconte V, Turk-Kubo KA, Vanslembrouk B, Mak WKE, Cheung S, Ekman A, Chen J-H, Hagino K, Takano Y, Nishimura T, Adachi M, Le Gros M, Larabell C and Zehr JP. 2024. Nitrogen-fixing organelle in a marine alga. Science 384, 217-222(2024). DOI:10.1126/science.adk1075

Biodegradable innovation: Plastics that prevent microplastics and health risks

Researchers at the University of California San Diego, in collaboration with Algenesis, have made a significant breakthrough in biodegradable plastics, discovering plant-based polymers that biodegrade completely, even at the microplastic level, in less than seven months. This development addresses the environmental and health crisis caused by traditional plastics and microplastics, which have persisted in the environment for centuries and have been found in oceans, soil, and even human bodies.

Microplastics, tiny fragments from everyday plastic products, pose significant risks due to their durability. Traditional plastics take 100 to 1000 years to decompose, exacerbating pollution. The researchers developed algae-based polymers that fully biodegrade, preventing microplastic accumulation.

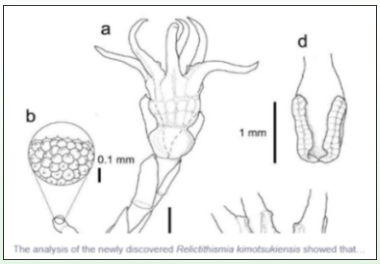
Led by Professors Michael Burkart and Robert Pomeroy, the team focused on creating biodegradable materials that could replace existing plastics without lasting environmental harm. Initial tests showed promising results, and further rigorous testing, including respirometry and gas chromatography/mass spectrometry, confirmed the complete biodegradability of the algae-based polymers. This innovation marks a critical step toward sustainable, eco-friendly materials that mitigate the impact of plastic pollution on the planet and human health.

Source: Sexton C. 2024. Biodegradable breakthrough: Plastics that don't create microplastics or make us sick. https://www.earth.com/news/biodegradable-breakthrough-plastics-that-wont-make-us-sick/

Kobe University 2024 Researchers discover a new plant species whose name tells a story. https://phys.org/news/2024-02-species-story.html

New fairy lantern species and genus discovered in Japan

A new species and genus of fairy lantern, tiny white plants that feed on fungi, has been discovered in Japan—a rare occurrence in a country known for its extensive flora research. Fairy lanterns (Thismiaceae) do not photosynthesize but feed on fungal mycelia, often remaining hidden under fallen leaves. Kobe University botanist Suetsugu Kenji,



with local botanists, found this new plant, initially thought to be a new species of *Thismia*, but later identified it as a new genus due to its unique features. Named "Mujina-no-shokudai" or "badger's candleholder," the Latin name is *Relictithismia kimotsukiensis*. This discovery is the first new plant genus found in Japan in almost 100 years. The research underscores the need for ongoing botanical exploration, as many species may still be undiscovered. Given its limited distribution, the plant is vulnerable to environmental changes, prompting further ecological studies on its interactions with fungal hosts and the impact of environmental alterations.

Source: Kobe University 2024 Researchers discover a new plant species whose name tells a story. https://phys.org/news/2024-02-species-story.html

Suetsugu K, Nakamura Y, Nakano T, Tagane S. 2024. Relictithismia kimotsukiensis, a new genus and species of Thismiaceae from southern Japan with discussions on its phylogenetic relationship. J Pl Res (2024). DOI: 10.1007/s10265-024-01532-5

Bacterial Memory : How *Escherichia coli* recall nutrient exposures across generations

Researchers have discovered that *Escherichia coli* bacteria exhibit a form of memory related to their exposure to nutrients, which they can pass down to future generations. Published in the Proceedings of the National Academy of Sciences USA, the study found that bacteria in colonies, after experiencing swarming behavior due to nutrient levels, were more likely to swarm again in subsequent generations. This behavior was linked to specific genes regulating iron uptake and suggests that bacteria use these memories to locate favorable environments with optimal nutrient levels. Understanding bacterial memory could inform new strategies against antibiotic-resistant infections, as bacteria in collective structures are more resilient to treatments.

Source: Parshall A. Bacteria Make Decisions Based on Generational Memories https://www.scientificamerican.com/article/bacteria-make-decisions-based-on-generational-memories/ Scientific American. Microbial Memory. Jan 29, 2024.

Rizwana Tabassum

2000-year-old archaeological, botanical and isotopic data in India provide clues to future climate adaptation

The site of Vadnagar in semi-arid Gujarat region witnessed mild to intense monsoon precipitation during Historic and Medieval periods respectively and post medieval period (1300-1900 CE; LIA) bore a resilient crop economy based on small-grained cereals (millets; C4 plants) reflecting human adaptation in response to a protracted weakening of the summer monsoon, according to a new study. The study can help inform strategies to adapt to future climate change.

A team of researchers from Birbal Sahni Institute of Palaeosciences (BSIP) presented a circa 2500-year human occupation sequence spanning multiple environmental changes at the Vadnagar archaeological site based on archaeological, botanical, and isotopic data.

Scientists have been tracing historical data on variations of rainfall and its consequences on changing cropping pattern, vegetation and cultural development during the last 2000 years. This might provide insights into the past human responses to climate change and help us learn lessons in possible strategies to handle future climate change.

The data from the site indicate that food production was maintained, even during climate deterioration. It showed *Hordeum vulgare, Triticum aestivum, Oryza sativa, Sorghum bicolor, Lathyrus sativus* and *Gossypium* sp. during 200 BCE to 500 CE; *Hordeum vulgare, Triticum aestivum, Oryza sativa, Sorghum bicolor, Lens culinaris* and *Linum usitatissimum* during 500CE to 1300 CE and *Hordeum vulgare, Triticum aestivum, Oryza sativa* and *Sorghum bicolor, Pennisetum glaucum* and *Vigna radiata* during 1300 CE-1900 CE.

Source: PIB Delhi, Publication link: http://doi.org/10.1016/j.qsa.2023.100155.
https://dst.gov.in/2000-year-old-archaeological-botanical-and-isotopic-data-india-provide-clues-future-climate

Odisha declares Gupteswar in Koraput district as its fourth biodiversity heritage site

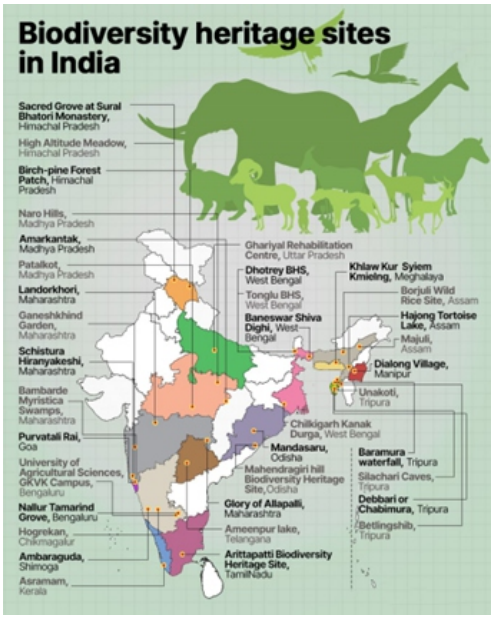
Biodiversity Heritage sites (BHS) are well-defined areas that are unique, ecologically fragile ecosystems with a high diversity of wild and domesticated species, the presence of rare and threatened species and keystone species. As of February 2024, India has a total of 45 (BHS) (National Biodiversity Authority).

Recently the government of Odisha declared the Gupteswar forest in Koraput district as its fourth (BHS), which is adjacent to the Gupteswar Shiva temple in the Dhondrakhol reserve forest under the Jeypore forest division. Mandasaru in Kandhamal district, Mahendragiri in Gajpati and Gandhamardan in Bargarh and Bolangir districts are the other three biodiversity heritage sites of the state.

The Gupteswar forest spread over 350 hectares has sacred grooves traditionally worshiped by the local community and is home to at least 608 faunal species, including the mugger crocodile, kanger valley rock

gecko, sacred grove bush frog and various avifauna such as black baza, Jerdon's baza, Malaber trogon, common hill myna, white-bellied woodpecker and banded bay cuckoo. The limestone caves within the forest are home to eight species of bats, two of which are under the near-threatened category.

Its rich floral diversity includes 182 species of trees, 76 species of shrubs, 177 species of herbs, 69 species of climbers, 14 species of orchids and threatened medicinal plants such as Indian trumpet tree, Indian snake root, Cumbi gum tree, garlic pear tree, Chinese fever vine, Rohituka tree, Jodpakli, Indian joint fir and a number of wild crop relatives of ginger and turmeric.



Source: The Hindu Bureau

India adds five more wetlands to its list of Ramsar sites

On the eve of World Wetlands Day 2024, India has added five more Ramsar sites to existing 75 emphasizing an integral role for human survival by environmental protection and conservation.

These sites are: Karaivetti Bird Sanctuary, Tamil Nadu; Magadi Kere Conservation Reserve, Karnataka; Longwood Shola Reserve Forest, Tamil Nadu; Anka Samudra Bird Conservation Reserve, Karnataka; and Aghanashini Estuary, Karnataka.

Earlier in August 2022, India achieved a significant milestone of taking the total number of Ramsar Sites to 75 during the 75th Year of Independence. Due to a significant policy push from the Government of India, the number of Ramsar sites has increased from 26 to 80 in the last ten years, of which 38 have been added in the last three years alone. Tamil Nadu continues to have maximum number of Ramsar Sites (16 sites) followed by Uttar Pradesh (10 sites).

This year, the Ministry of Environment, Forest & Climate Change (MoEFCC), Government of India in collaboration with the Government of Madhya Pradesh, has organized the national World Wetlands Day event at Sirpur Lake, Indore, a Ramsar site designated in 2022. The theme of WWD-2024 is **'Wetlands and Human Wellbeing'** which underscores the critical role wetlands play in enhancing our lives. It highlights how wetlands contribute to flood protection, clean water, biodiversity and recreational opportunities, all of which are essential for human health and prosperity.

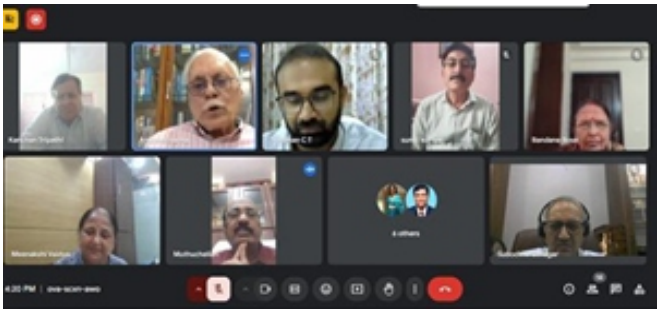
Source: PIB Delhi

SPR TIDINGS

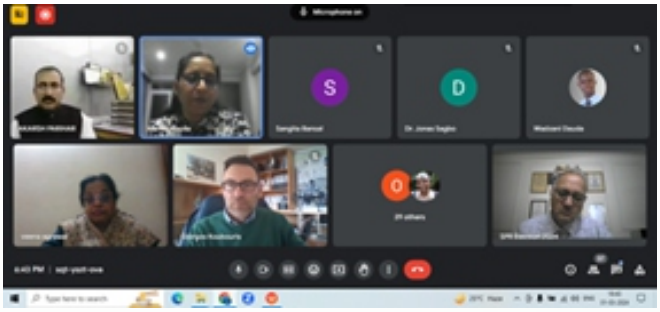
Renu & Rajbala Junia

Under the aegis of Society for Plant Research and VEGETOS, various activities were taken up. Especially the regular meetings of the newly elected Executive Body, Society for Plant Research and the Editorial Board of VEGETOS were conducted virtually. A few clips of those meetings are presented below.

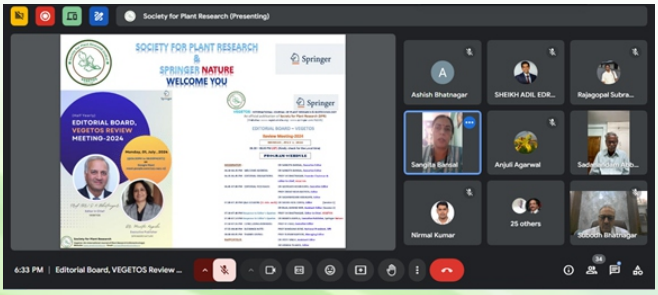
Executive Body Virtual Meeting 16.2.2024



Executive Body Virtual Meeting 21.6.2024



Editorial Board Meeting – 1.3.2024



Editorial Board Meeting – 1.7.2024

Glimpses of other activities of
Society for Plant Research & VEGETOS


DEPARTMENT OF BOTANY
ALIGARH MUSLIM UNIVERSITY, ALIGARH
NATIONAL SEMINAR ON
"GOOD AGRICULTURAL PRACTICES OF SELECTED MEDICINAL PLANTS"


ALIGARH MUSLIM UNIVERSITY, ALIGARH
SPR-Mini Symposium on
"Biotechnological & Genomic tools to combat climate change"
NATIONAL SEMINAR ON


DR. NAGMA ABBASI
CEO AND FOUNDER
NEXTGEN LIFE SCIENCES
PVT. LTD, NEW DELHI


Graphic Era
Hill University
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SPRINGERNATURE

Renu

Professor Panchanan Maheshwari: Father of Indian Plant Embryology

Prof. Panchanan Maheshwari was an eminent botanist specializing in plant embryology, morphology and anatomy, plant physiology, and biochemistry who earned the title of Father of Indian Embryology due to his pioneering and outstanding contributions to the fields of plant embryology and plant tissue culture in India. He is renowned for establishing the technique of "**test-tube fertilization of angiosperms**" which allowed the creation of new hybrid plants that could not previously be crossbred naturally. He stressed the need for initiation of work on artificial culture of immature embryos. He laid the foundation for the development of plant embryology and helped it emerge as an independent field of research through his pioneering research, books and academic mentorship.

Ancestral History

Maheshwari was born on 9 November 1904 in the City of Jaipur, India. The word Panchanan in Sanskrit means an intellect of five faces or people. The appropriateness of the name soon became apparent. His father was a clerk but struggled hard to give his son the best possible education and nurtured the scientific training and advancement of his son. Panchanan went to school in Jaipur and cleared Matriculation at the age of 13. Because of his weak eyesight he could not take up medicine, but nevertheless he pursued a career in science.

Educational Career

Dropping medical career, he was sent to Allahabad where he joined the Ewing Christian College and came under the influence of an American missionary-teacher, Dr Winfield Dudgeon. He pursued his studies in science at the University of Allahabad, taking successively the degree of Bachelor of Science (1925), Master of Science (1927), and Doctor of Science (1931). It was in this period, and under the general guidance of Dr Dudgeon, who was an able microtechnician trained under Professor C. J. Chamberlain of Chicago, that Maheshwari laid the foundations of his own skill as a microtechnician which, together with his avid interest in plants, was to motivate his career and distinguish his future influence upon his students and colleagues and upon the subject of his choice.

Service Career

Panchanan Maheswari started his career as a lecturer at Ewing Christian College, formerly Allahabad Christian College, in 1930. He resigned from college due to his travels to Europe in 1936. He provided

his service again for Allahabad University from 1937 to 1939. During this period, he also joined Lucknow University, Lucknow, as Head of the Department of Botany (July to September 1939). In November 1939, he joined Dhaka University, Dhaka as Head of the Department of Botany. In 1949, he was invited by Vice-Chancellor Sir Morris Jwier to chair the post of Head of the Department of Botany at Delhi University, where he worked till his retirement.

Details of family

At thirteen years of age, Prof. Maheshwari tied the knot. His wife, Shanti, did not speak English and did not travel with him on any of his numerous subsequent trips, but she did learn how to be a micro technician under her husband's guidance and was a great help to him in some of his work by preparing sections and slides. Three boys and three daughters, totalling six children, pursued careers in science, and two of whom studied botany in the United States. One of his son Satish became Professor in the Department of Botany at the University of Delhi.

Contributions

Maheshwari's early work include the development of gametophytes and embryo of *Boerhaavia diffusa* and causes of sterility in *Albizzia lebbek*. He reported a new type of tetrasporic, 16-nucleate embryo sac in *Acalypha indica*. He made a systematic and thorough study of the parastitic angiospermous families such as Loranthaceae and Santalaceae, which changed our understanding of their morphology, embryology and phylogeny. Besides, about 100 families of angiosperms were studied for their embryological data, which led to their correct systematic position. In addition to ongiosperms, Mahaeshwari and his students studied other groups of plants such as mosses *(Physcometrium coorgens)* and gymnosperms (Pinus, Cedrus, Cupressus, Biota, Gnetum, etc). He laid emphasis on methodology. Many botanists, recognizing his role in Indian botany, have paid their tributes by naming several taxa after him: *Ascarina maheshwarii* Swamy (Chloranthaceae), *Isoetespanchananii Pant* and *Shrivastava (quillwort)*, *Zatropha maheshwarii* Subramanyam and Nayar (Euphorbiaceae), Maheshwariella bicornuta Pant and Nautiyal (a compressed seed from the lower Gondwanans of India), *Oldenlandia maheshwarii* Santapau and Merchant (Rubiaceae), *Panchanania jaipurensis* Subramanian (a hyphomycetous fungus), *Eutryblidiella panchanani* Mukerji and Dhawan (an ascomycetous fungus) and *Sepedonium maheshwarianum* Mukherji (an imperfect fungus).

He established the school of botany in Delhi University which produced several prominent scholars. Much of plant science in India can trace its origins to this school whose contributions had a significant impact on agriculture. Maheshwari founded the University of Delhi Botanical Society; and its magazine Botanica. He was the driving force behind founding of International Society of Plant Morphologists and its official organ Phytomorphology. He was the Editor, Phytomorphology; Maheshwari's Book Dictionary of Economic Plants in India is a valuable reference work. At Harvard (1954-47), he completed his magnum opus, An Introduction to Embryology of Angiosperms (published 1950, translated into Russian 1959); Editor of INSA Publications (1963-66). He prepared a detailed report on Botany in Indian Universities in 1963 for University Grants Commission.

Awards, Honorary Doctorates, Recognitions by Scientific Academies/Societies, Honorary positions held and Assignments

Panchanan Maheshwari was a scientific citizen of the world and many academies felt honoured to make

him a Foundation Fellow. Maheshwari was the recipient of DSc (hc) from Mc Gill University, Canada. He received the Birbal Sahni Medal, (Indian Botanical Society) (1959); General President, Indian Science Congress Association (1963) and Sunder Lal Hora Memorial Medal of INSA (1964).Maheshwari was elected a Fellow of the Royal Society (FRS) in 1965, he was second Indian Botanist to receive this accolade. He was the Fellow, Indian Academy of Sciences, Bangalore and National Academy of Sciences (India), Allahabad (President, 1964-65); Corresponding Member, American Botanical Society; Hony Foreign Fellow, American Academy of Art and Sciences; Foreign Member, Kaiserliche Deutsche Akademic des Naturforscher Leopoldina. Deutsche Botanishcer Gesselschaft and Royal Dutch Botanical Society; Member, Indian Botanical Society; Member; Council (1956, 1961-62), Secretary (1957-60) INSA. Dr Maheshwari was a member of the Science Advisory Committee to the Cabinet and had great contributions to leading scientific organizations in the country. He was the General President-elect of the Indian Science Congress Association for 1968, a role he could not fulfil on account of his untimely death on 18 May 1966. The Indian National Science Academy has instituted the 'Professor Panchanan Maheswari Memorial Lecture' in his honour.

THE ART PART

विकास या विनाश

विनाश की कीमत पर विकास
मान गये यार
पेड काट कर सड़क बना दी
तकनीको की लहर चला दी
प्रकृति का दोहन करते
फिर भी कितने है लाचार,
मान गये यार
छोड़ पुरानी औषधियों को
दिए धड़ाधड़ टीके पेल
कितने घर वीरान हो गए
और जिंदगी बंटाधार
मान गये यार
जंगल काट बबूल उगा दी
फल के पेड़ लगाना भूल
छाया को हर पथिक तरसता
सांस भी लेना है दुश्वार
मान गये यार
धरती का पानी भी बेचा
छेडी हथियारो की होड़
खेत और खलिहान उजड़ गये
उग आई है खरपतवार
मान गये यार

प्रोफेसर (डॉ0) सुबोध भटनागर
भूतपूर्व अधिष्ठाता, जैवप्रौद्योगिकी (सेवानिवृत्त)
कृषि विश्वविद्यालय, मेरठ

THE BIG WINDOW

Rajbala Junia

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Walk-in-Interview for award of Research Fellowships as Research Associate (RA) in ITR, Chandipur last date:11/12/2024
category: JRF/RA
Advertisement and Application Form: Open
Publish date: 20/11/2024
Visit site for more details: https://drdo.gov.in/drdo/careers

SWATI (Science for Women-A Technology & Innovation) Portal Launched in New DelhiSWATI portal is to create a single online portal representing Indian women and Girls in STEMM (Science, Technology, Engineering, Mathematics & Medicine). The portal was announced by Dr Renu Swarup, former secretary of the Department of Biotechnology (DBT) on International Women's Day in 2021. It was launched by the Principal Scientific Advisor to the Government Of India, Dr Ajay Kumar Sood on the occasion of International Day of Women and Girls in Science on 11 February, 2024 to promote gender equality and empower women and girls. The portal is a complete interactive database; and the first-of-its-kind in India which was developed by National Institute of Plant Genome Research (NIPGR), New Delhi. It is intended to serve as a gateway to view the expertise and contributions of Indian women in science. The portal is designed for all Indian women in STEMM, ranging from students pursuing graduate and post graduate courses in India to research scholars, post-doctoral researchers, administrative staff, scientist, science communicators, academic faculty, entrepreneurs, technical officers, lab technicians etc. Women working outside India can also join the portal, provided they have studied STEMM subjects in India at some point. Unemployed Indian women are especially encouraged to join the portal if they have previously studied STEMM subjects in India. Source: PIB Delhi