

# **Indian Science in Indian Media**

**Highlights of ISW stories - August 2017**

## Lab notes: Can the artificial sweetener aspartame cause sterility? A new study on has found reduced sperm quality in rats fed with aspartame

01 August, 2017

Bhavya Khullar

A new study has red-flagged aspartame, an artificial sweetener, after it was found to adversely hit sperm quality in rats.

The study, published in the *International Journal of Impotence Research*, has reported reduced sperm quality – in terms of motility and viability – in rats fed with aspartame for 90 days. They also showed higher numbers of abnormal sperm as well as defects in the structure of testes.

“Instead of circular shape, seminiferous tubules (that make sperm) showed poorly differentiated sperm-producing cells which clearly show the defective architecture within the testis of aspartame-treated animals,” said I Ashok of Dr ALM PG Institute of Basic Medical Sciences, who led the study.

Aspartame is known to break down into phenylalanine, aspartic acid, and methanol during digestion in the body. The researchers attribute harmful impacts of aspartame to methanol, which, they say, induces oxidative stress by releasing free radicals. “In rats, the metabolism of methanol is fast, which is why they were made folate deficient to mimic the slow metabolism of methanol found in humans,” Ashok explained.

“As aspartame consumption is on the rise among common people, it is essential to create awareness regarding its usage,” researchers said, while suggesting more studies to evaluate the effect of aspartame in humans.

Harikumar Nair, professor at the School of Biosciences, Mahatma Gandhi University in Kerala, who is not connected with this study, told India Science Wire that, “the direct effect of aspartame on male hormone testosterone must be evaluated. Testosterone hormone plays a major role in male reproductive health including sperm viability, motility, and testis structure. In the longer run, retrospective studies with humans should also be carried out using surveys or questionnaires.”

The study team included I Ashok, PS Poornima, D Wankhar, R Ravindran, and R Sheeladevi at the Dr ALM PG Institute of Basic Medical Sciences and Pondicherry University.

<https://scroll.in/pulse/845652/lab-notes-can-the-artificial-sweetener-aspartame-cause-impotence>

## हिरोशिमा के रेडियोधर्मी तत्व में मिले हिमालयी भूकंपों से जुड़े कई संकेत

01/08/2017



उमाशंकर मिश्र । (इंडिया साइंस वायर) : हिमालय में आए अब तक के सबसे तीव्र भूकंप के बारे में भारतीय भू-वैज्ञानिकों ने अहम खुलासा किया है। पूर्वी हिमालय के अगले हिस्से में वर्ष 1950 में आए 8.6 रिक्टर की तीव्रता वाले इस भूकंप को असम-तिब्बत भूकंप के नाम से जाना जाता है। सतह पर इस भूकंप के स्पष्ट संकेत न होने के कारण पहले इसके विस्तार और प्रभाव के बारे में भू-वैज्ञानिकों को जानकारी नहीं थी। वैज्ञानिक समुदाय के बीच यह धारणा थी कि इस भूकंप के लिए जिम्मेदार भ्रंश सतह के भीतर हो सकते हैं। अध्ययन के बाद पहली बार इस भूकंप के कारण सतह पर दरार होने का पता चला है। अध्ययन में यह भी स्पष्ट हुआ है कि इस भूकंप के कारण हिमालय के इस क्षेत्र में संचित तनाव आंशिक अथवा पूरी तरह से मुक्त हो गया है। इसके कारण वैज्ञानिकों का मानना है कि इस क्षेत्र में निकट भविष्य में किसी बड़े भूकंप की आशंका कम हो गई है। यह अध्ययन देहरादून स्थित वाडिया इंस्टीट्यूट ऑफ हिमालयन जियोलॉजी और संस्थानों ने मिलकर किया है। यूरेशियन और भारतीय भौगोलिक प्लेटों में निरंतर टकराव होने के कारण करीब 2500 किलोमीटर की लंबाई में फैले हिमालय में छोटे-बड़े भूकंप अक्सर आते रहते हैं। इन दोनों भौगोलिक प्लेटों के निरंतर टकराव से पैदा होने वाला तनाव संचित होता रहता है और इस ऊर्जा के प्रस्फुटन से भूकंपों का जन्म होता है। लेकिन हिमालय की जटिल बनावट के कारण इस क्षेत्र में होने वाली भौगोलिक हलचलों और उसके कारण पड़ने वाले प्रभाव की जानकारी भू-वैज्ञानिकों को आसानी से नहीं मिल पाती है।

अध्ययनकर्ताओं की टीम में शामिल डॉ. आर. जयनगोंडापेरूमल ने इंडिया साइंस वायर को बताया कि “आमतौर पर भू-वैज्ञानिक यह आकलन करने में जुटे रहते हैं कि इस तरह के भूकंप भविष्य में हिमालय के किन क्षेत्रों में और कब आ सकते हैं। इसके लिए पूर्व भूकंपों, भौगोलिक हलचलों और उनके प्रभाव के बारे में जानकारी होना आवश्यक है। इस अध्ययन से मिली जानकारियों की मदद से भविष्य में हिमालय में होने वाली भौगोलिक उथल-पुथल के बारे में कई अन्य खुलासे भी हो सकते हैं।”

अध्ययन की एक और खास बात यह है कि इसमें सीएस-137 आइसोटोप को डेटिंग के लिए उपयोग किया गया है। यह रेडियोधर्मी तत्व हिरोशिमा नागासाकी पर परमाणु हमले का एक सह-उत्पाद है। रेडियोकार्बन डेटिंग संभव न होने के कारण अध्ययन के दौरान पूर्वी हिमालय में पाए गए सीएस-137 आइसोटोप को डेटिंग का आधार बनाया गया और पासीघाट क्षेत्र (अरुणाचल प्रदेश) में ट्रेंच बनाकर मल्टी-रेडियोमीट्रिक विश्लेषण किया गया।

डॉ. पेरूमल ने बताया कि “पहली बार इस अध्ययन में वर्ष 1945 में हिरोशिमा और नागासाकी में की गई परमाणु बमबारी के रेडियोधर्मी प्रभावों के भारतीय उप-महाद्वीप में पहुंचने का भी खुलासा हुआ है। वैज्ञानिकों को जापान के इन दोनों शहरों में की गई परमाणु बमबारी से उत्पन्न सीएस-137 आइसोटोप हवा के जरिये भारतीय उप-महाद्वीप में पहुंचने के प्रमाण मिले हैं। वर्ष 1948 में हवा के बहाव का विश्लेषण करने के बाद वैज्ञानिक इस निष्कर्ष पर पहुंचे हैं।”

भारतीय एवं यूरोशियन प्लेटों के निरंतर होने वाले टकराव के कारण पिछले 100 वर्षों में पांच बड़े भूकंप इस क्षेत्र में आए हैं। डॉ. पेरूमल के अनुसार ‘हिमालय में भी सागरीय निम्नस्खलन क्षेत्रों जैसी तीव्रता के भूकंप आते हैं और 1950 के असम-तिब्बत भूकंप का संबंध पूर्वी हिमालय के अग्रभाग में आए अन्य भूकंपों से हो सकता है।’ उन्होंने बताया कि ‘हिमालयी क्षेत्र में मुख्य रूप से आठ रिक्टर परिमाण से बड़े भूकंपों का उद्गम स्थल उच्च हिमालय है। यहां पर उत्पन्न हिमालय के अग्रभाग तक चट्टानों को विस्थापित करते हैं।’

वाडिया इंस्टीट्यूट ऑफ हिमालयन जियोलॉजी, जियोलॉजिकल सर्वे ऑफ इंडिया, फिजिकल रिसर्च लैबोरेट्री, सीडैक, कुमाऊं विश्वविद्यालय और पांडिचेरी विश्वविद्यालय के शोधकर्ताओं द्वारा संयुक्त रूप से किया गया यह अध्ययन हाल में साइंटिफिक रिपोर्ट्स नामक शोध पत्रिका में प्रकाशित किया गया है। अध्ययनकर्ताओं की टीम में डॉ. पेरूमल के अलावा प्रियंका सिंह राव, अर्जुन पांडेय, राजीव लोचन मिश्रा, ईश्वर सिंह, रविभूषण, एस रामाचंद्रन, चिन्मय शाह, सुमिता केडिया, अरुण कुमार शर्मा और गुलाम रसूल भट्ट शामिल थे। (इंडिया साइंस वायर)

<http://www.prabhasakshi.com/news/proventhings/many-signs-related-to-the-himalayan-earthquake-found-in-the-radioactive-element-of-hiroshima/28562.html>

## Electricity from water tech ready for takeoff

Dr. T.V.Venkateswaran and Jyoti Singh

01/08/2017

**New Delhi:** It was like a dream come true. One year ago, scientists at the National Physical Laboratory (NPL) in New Delhi demonstrated that it was possible to generate electricity from water – at room temperature and without the need for any external energy. The innovation is now ready for next stage of development.

“We are waiting for the government and the industry to take the initiative. A pilot plant can be set up within one and a half years,” said Dr Ravinder Kumar Kotnala in an interview. Dr Kotnala, along with his associate, Jyoti Shah, has developed the hydroelectric cell using a novel approach.

Dr Kotnala, Chief Scientist at NPL, was fascinated by the potential of humidity-sensing nature of porous magnesium ferrite nanomaterial at room temperature. The material showed a change in electrical potential in the presence of humidity in the atmosphere. This set them thinking: can we exploit the same difference in potential energy to generate electricity?

One thing led to another and soon enough they found that a small piece of magnesium ferrite measuring three square inch can generate about 250 milli ampere (mA) of power. A slightly bigger prototype measuring four square inch was made and it was also found effective. It was clear that the cell could be scaled up.

Explaining his work, Dr Kotnala said the cell was fundamentally a type of galvanic cell that derives electrical energy from spontaneous oxidation-reduction (redox) reactions of an electrolyte with a cathode and an anode. In a school laboratory, for instance, a galvanic cell is made by inserting a piece of zinc metal and a piece of copper wire into a lemon fruit. When the two metal pieces are connected to a bulb, it glows. It happens because of a redox reaction of the lemon juice with two dissimilar metal pieces.

In the hydroelectric cell, Dr Kotnala and his team used a pellet of lithium substituted magnesium ferrite which had a zinc plate electrode stuck on one side and a silver comb electrode on the other. When the system was sprinkled with water at room temperature, it generated a stable flow of electricity.

“Magnesium has high affinity for hydroxide ion (OH), and it pulls a hydroxide ion from the normal H<sub>2</sub>O(water) when it comes in contact. The remaining hydrogen combines with another H<sub>2</sub>O molecule to form hydronium (H<sub>3</sub>O). Normally, within a matter of seconds, hydronium and hydroxide ions will recombine to produce once again two molecules of water. But in our cell, hydronium ions get trapped inside the nanopores of lithium-substituted magnesium ferrite and generate an electric field. The electric field helps in further dissociation of water. This cascades and continuous electricity is produced,” explained Dr Kotnala.

Oxidation reaction of hydroxide ions at Zinc electrode releases two electrons which are collected on silver electrode. A net current flow results in the cell due to a potential difference developed between the electrodes.

Scientists across the globe have been trying to produce electricity from water for over 70 years now. Chemical dissociation of water molecules by surfaces of oxides such as Silicon dioxide, Titanium dioxide, Magnesium Oxide and Ferric Oxide had been theoretically calculated and even experimentally observed. But, all the efforts to develop a practical hydroelectric cell had failed till now. In this context, the work of Dr Kotnala using lithium substituted magnesium ferrite could be a game changer.

A small hydroelectric cell made with a magnesium ferrite pellet measuring three sq in has generated about 250 mA of power. A prototype made with a pellet measuring four square inch material has also been found effective. This implies that the scaling up of the cell is possible. It is expected that when connected in a series, the cells would be able to produce enough electricity to drive a small electric motor or energise a LED bulb.

“There are many advantages of hydroelectric cell compared to electrochemical cells. For instance, they would be portable. Also, in other cells, anode and cathode gets eroded after a period of time. But in hydroelectric cells Zinc can be reused or recycled and silver extracted out,” says Dr Kotnala. The cell releases hydrogen gas and zinc hydroxide, neither of which pollute environment in the manner that fossil fuels do. Hydroelectric cells are no burden on the environment. It is the world’s first acid and alkali-free cell.

Dr Kotnala heads the Environmental Sciences and Biomedical Metrology division at NPL. He completed his doctorate in silicon solar cell from IIT Delhi. He has expertise in a wide range of subjects including Spintronics, electronic materials, Spin Hall Effect, humidity sensor, solar cell and hydroelectric cell. A recipient of many national and international awards and recognition, he has also published more than 360 research papers in international journals. He has nine patents in his name. (India Science Wire)

<https://newsroom24x7.com/2017/08/01/electricity-from-water-tech-ready-for-takeoff/>

## Hiroshima isotopes help solve Himalayan quake puzzle

Umashankar Mishra

01/08/2017

Indian geologists unlock the mystery surrounding the 1950 Assam-Tibet earthquake - the biggest to rock the Himalayas so far with a magnitude of 8.6 on the Richter scale. The quake, which rocked Assam and Tibetan region on August 15, 1950 had taken the lives of between 1,500 to 3,300 people. 1950 Assam-Tibet earthquake - the biggest to rock the Himalayas so far with a magnitude of 8.6 on the Richter scale Dehradun - Indian geologists have unlocked the mystery surrounding the 1950 Assam-Tibet earthquake - the biggest to rock the Himalayas so far with a magnitude of 8.6 on the Richter scale. The quake, which rocked Assam and Tibetan region on August 15, 1950 had taken the lives of between 1,500 to 3,300 people. It was the sixth largest earthquake of the 20th century and also the largest known earthquake to have not been caused by an oceanic subduction. Scientists, for the first time now, have found evidence that it was not a 'blind earthquake' and that there was a rupture on the surface. The earthquake helped release energy - either fully or partially - accumulated in the region due to constant collision of the Indian and Eurasian tectonic plates. "The fact that the energy would have released fully or partially suggests that there was no possibility of another such big earthquake in the area in the near future," scientists have concluded. Till now geologists did not have a clear picture of the quake as it had occurred in a highly inaccessible part of the Himalayas and there was no sign of any rupture on the surface. It was postulated that the fault responsible for the quake was deep inside the ground and thus it may be considered a 'blind earthquake.' A new study was conducted at Pasighat in Arunachal Pradesh by digging a trench and performing a multi-radiometric analysis. Researchers used Cesium137 - a radioactive isotope released in the environment after bombing of Hiroshima and Nagasaki in 1945 and probably transported by wind from there – as a 'chronomarker' for the study of sediments. "It is for the first time evidence has been found for the transportation of radioactive material from Hiroshima and Nagasaki into the Indian subcontinent. Our wind analysis of 1948 suggests that radioactive clouds were transported by strong easterly winds to the north-eastern India, where fallout on the sediments occurred by a process of dry deposition of aerosol," explained Dr. R Jayangondaperumal, a member of the research team from Dehradun-based Wadia Institute of Himalayan Geology. The study results have been published in journal Scientific Reports. The tectonic activity in the Himalayan region due to collision of Indian and Eurasian plates results in accumulation of huge amounts of



## Electricity from Water Tech Ready for Takeoff

Dr. T.V.Venkateswaran and Jyoti Singh

01/08/2017



It was like a dream come true. One year ago, scientists at the National Physical Laboratory (NPL) in New Delhi demonstrated that it was possible to generate electricity from water - at room temperature and without the need for any external energy. The innovation is now ready for next stage of development.

“We are waiting for the government and the industry to take the initiative. A pilot plant can be set up within one and a half years,” said Dr Ravinder Kumar Kotnala in an interview. Dr Kotnala, along with his associate, Jyoti Shah, has developed the hydroelectric cell using a novel approach.

Dr Kotnala, Chief Scientist at NPL, was fascinated by the potential of humidity-sensing nature of porous magnesium ferrite nanomaterial at room temperature. The material showed a change in electrical potential in the presence of humidity in the atmosphere. This set them thinking: can we exploit the same difference in potential energy to generate electricity?

One thing led to another and soon enough they found that a small piece of magnesium ferrite measuring three square inch can generate about 250 milli ampere (mA) of power. A slightly bigger prototype measuring four square inch was made and it was also found effective. It was clear that the cell could be scaled up.

Explaining his work, Dr Kotnala said the cell was fundamentally a type of galvanic cell that derives electrical energy from spontaneous oxidation-reduction (redox) reactions of an electrolyte with a cathode and an anode. In a school laboratory, for instance, a galvanic cell is

made by inserting a piece of zinc metal and a piece of copper wire into a lemon fruit. When the two metal pieces are connected to a bulb, it glows. It happens because of a redox reaction of the lemon juice with two dissimilar metal pieces.

In the hydroelectric cell, Dr Kotnala and his team used a pellet of lithium substituted magnesium ferrite which had a zinc plate electrode stuck on one side and a silver comb electrode on the other. When the system was sprinkled with water at room temperature, it generated a stable flow of electricity.

“Magnesium has high affinity for hydroxide ion (OH), and it pulls a hydroxide ion from the normal H<sub>2</sub>O (water) when it comes in contact. The remaining hydrogen combines with another H<sub>2</sub>O molecule to form hydronium (H<sub>3</sub>O). Normally, within a matter of seconds, hydronium and hydroxide ions will recombine to produce once again two molecules of water. But in our cell, hydronium ions get trapped inside the nanopores of lithium-substituted magnesium ferrite and generate an electric field. The electric field helps in further dissociation of water. This cascades and continuous electricity is produced,” explained Dr Kotnala.

Oxidation reaction of hydroxide ions at Zinc electrode releases two electrons which are collected on silver electrode. A net current flow results in the cell due to a potential difference developed between the electrodes.

Scientists across the globe have been trying to produce electricity from water for over 70 years now. Chemical dissociation of water molecules by surfaces of oxides such as Silicon dioxide, Titanium dioxide, Magnesium Oxide and Ferric Oxide had been theoretically calculated and even experimentally observed. But, all the efforts to develop a practical hydroelectric cell had failed till now. In this context, the work of Dr Kotnala using lithium substituted magnesium ferrite could be a game changer.

A small hydroelectric cell made with a magnesium ferrite pellet measuring three sq in has generated about 250 mA of power. A prototype made with a pellet measuring four square inch material has also been found effective. This implies that the scaling up of the cell is possible. It is expected that when connected in a series, the cells would be able to produce enough electricity to drive a small electric motor or energise a LED bulb.

“There are many advantages of hydroelectric cell compared to electrochemical cells. For instance, they would be portable. Also, in other cells, anode and cathode gets eroded after a period of time. But in hydroelectric cells Zinc can be reused or recycled and silver extracted out,” says Dr Kotnala. The cell releases hydrogen gas and zinc hydroxide, neither of which pollute environment in the manner that fossil fuels do. Hydroelectric cells are no burden on the environment. It is the world’s first acid and alkali-free cell.

Dr Kotnala heads the Environmental Sciences and Biomedical Metrology division at NPL. He completed his doctorate in silicon solar cell from IIT Delhi. He has expertise in a wide range of subjects including

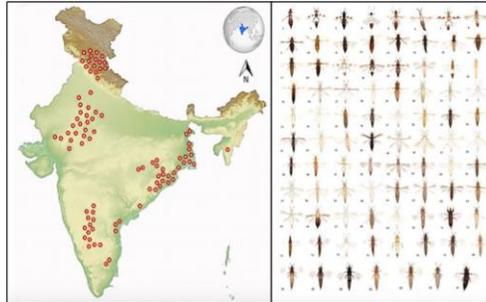
Spintronics, electronic materials, Spin Hall Effect, humidity sensor, solar cell and hydroelectric cell. A recipient of many national and international awards and recognition, he has also published more than 360 research papers in international journals. He has nine patents in his name. (India Science Wire)

<http://theindiasaga.com/social-sector/electricity-from-water-tech-ready-for-takeoff>

## Bringing precision into pest identification

Bhavya Khullar

01/08/2017



*Left: Samples were collected from various regions from India indicated in red. Right: Different species of thrips insects classified on the basis of physical features. (Photo: India Science Wire)*

In a new study published in *Scientific Reports*, scientists describe a new method to precisely identify a class of plant sucking pests which affect several commercially important crops.

Thrips are tiny plant sucking insects, one to three millimeters in length that cause damage to crops by direct feeding and by transmitting plant viruses. At present, these insects are identified based on their physical features like color and body architecture. A major obstacle in correct identification is their small size and high degree of similarity at some stages of their life cycle. Identifying these insects correctly is important for designing appropriate pest management strategies.

Now scientists at the Centre for DNA Taxonomy, Zoological Survey of India in Kolkata, have developed a DNA barcoding technique to identify thrips insect species in India and found that this technique is effective. It could be of immense value as thrips cause huge losses to crops such as onion, chilli, brinjal, capsicum, watermelon and tomato. Identifying thrips correctly can help design relevant pest management strategies to prevent these losses.

Researchers collected 336 insect samples from 78 locations in India. The sample collection was done for 4 years between 2011 and 2015. In 3 years, they have made a library of 370 DNA sequences that can be used for precisely identifying these plant pests. DNA analysis was done to analyze the sequence of the mitochondrial cytochrome oxidase gene, said Kaomud Tyagi, who is the first author on the study.

“We have standardized and confirmed DNA barcoding method to be used for identifying thrips species correctly. Our study has also revealed that similar looking insects can belong to different

species. Identifying species of thrips is now possible at the larval stage or even from a small portion of the body”, said, Vikas Kumar, a member of the research team.

Thrips also leave white streaky trails after feeding on fruits making them unfit for exports. In the long run, using DNA barcoding for identifying thrips could help increase income from exports, believes

Kumar. The study will help design appropriate pest management strategies as different species respond to different pesticides and doses.

Sharad Mohan, a scientist at the Indian Agricultural Research Institute, New Delhi, who is not connected to the study agrees. He said, “barcoding is of immense value in validating the diversity of pests in different agro-climatic zone of India. Instead of using conventional taxonomic ways that may take months, barcoding helps in identifying pests that helps recommend and implement specific management protocols without wasting much time.”

Kailash Chandra, Director of ZSI, said “we are starting a new project on large scale barcoding of insect pests and vectors of agricultural and veterinary importance soon”.

This article was originally published by India Science Wire.

<https://indiabioscience.org/news/2017/bringing-precision-into-pest-identification>

## Pushpa Mittra Bhargava – Conscientious Scientist and Advocate of Scientific Temper

Dinesh C Sharma

02/08/2017

Bhargava, widely considered as father of modern biology in India, stood for ethical values in science.



*RENOWNED SCIENTIST AND RATIONALIST DR PUSHPA MITTRA BHARGAVA*

*File Photo: P. Anil Kumar/ Outlook*

In the death of Dr Pushpa Mittra Bhargava, India has lost one of the most vocal advocates of scientific temper and rationality in India. Bhargava, widely considered as father of modern biology in India, stood for ethical values in science. He was an institution builder who also played a pivotal role in policy making in science and technology in the past four decades.

Bhargava was an unconventional scientist. He believed in doing and promoting world class biology and biotechnology research in India, yet he opposed the way biotechnology was used to further commercial interests. He was deeply involved in founding the Department of Technology (DBT), yet he openly criticized when the very institution faltered in the implementation of biotechnology regulation. Bhargava stood on the side of victims of Bhopal gas tragedy when the mainstream scientific establishment was shying away from studying long-term health impacts of the toxic gas.

As a scientist and a thinker, Bhargava was always ready to provide his services to the government but he quickly retracted when things did not go his way. He never chose of compromise with his values, irrespective of the government in power. He crossed swords with the Janata government in 1977 over unceremonious dismantling of the “Method of Science”

exhibition which he had conceived and developed. He quit as Vice-chairman of the National Knowledge Commission (NKC) following the difference of opinion, during the UPA regime and returned his Padma award during the NDA period. In the Rajiv Gandhi period, he was a member of the scientific advisory committee to the Prime Minister.

Bhargava believed in promoting excellence in scientific research. He could persuade the government to hive off his research unit at the Regional Research Laboratory (now known as the Indian Institute of Chemical Technology) as a separate research institute. That's how the Centre for Cellular and Molecular

Biology (CCMB) was born as a constituent lab of the Council of Scientific and Industrial Research (CSIR). He wanted this lab to be developed as a centre for excellence in life sciences. In private conversations, he mentioned that labs focused on specific areas of research should be developed under the leadership of individual scientists, modelled on the lines of Max Plank Institutes in Germany.

The CCMB campus in Hyderabad was built under his personal supervision and bears the stamp of his personality. He regretted that he could not opt for a modern architecture and had to settle for a CPWD design, but he improvised a lot within that framework. For instance, he requisitioned none other than M F Husain to do a mural for CCMB. It was also the first lab in India to have an 'artist-in-residence' – famous painter A Suryaprakash. Painting exhibitions were held regularly in CCMB in the 1980s. The only parallel would be the Tata Institute of Fundamental Research (TIFR), whose founder Homi Jehangir Bhabha was an art connoisseur and an accomplished painter himself.

The kind of detailing that went into building CCMB was remarkable. Not only did the lab provide all necessary amenities for scientists to do research such modern animal lab and continuous water supply, but also an enviable workplace in general. Canteen, open areas, lawns, guest house and reception – everything was designed and planned aesthetically. Bhargava, along with his wife Manorama, personally selected drapes and curtains used in the guesthouse. The cloth was specially weaved in handloom centres like Pochampally. Every room had different

décor. “These rooms are fit for kings and queens to stay,” Bhargava had told the writer about the international guest house at CCMB.

When Department of Atomic Energy established a lab for preparation of p32- labelled nucleotide molecules at CCMB, Bhargava gave it a creative name – *Jonaki*(Bengali word for firefly).

Over the years, CCMB not only gave birth to other research institutes such as the Centre for DNA Fingerprinting and Diagnostics (CDFD), but also spurred development of Hyderabad as a biotechnology cluster. Several scientists from CCMB became entrepreneurs setting up biotech, healthcare and bioinformatics ventures.

Bhargava did not choose to retire into a cocoon after his long stint with CSIR. He remained active until the end, engaging in a range of activities with causes close to his heart. For instance, Medically Aware and Responsible Citizens of Hyderabad (MARCH) headed by him exposed malpractices in health care industry. He was also chairman of the Sambhavana Trust which runs a public clinic for victims of the gas tragedy in Bhopal.

<https://www.outlookindia.com/website/story/pushpa-mittra-bhargava-conscientious-scientist-and-advocate-of-scientific-temper/299997>

## भारत में आधुनिक जीव-विज्ञान के जनक डॉ. पुष्पमित्र भार्गव

02/08/2017

Navneet Kumar Gupta

डॉ. पुष्पमित्र भार्गव वैज्ञानिक शोध-कार्यों के साथ-साथ देश में विज्ञान को बढ़ावा देने के लिए सरकारी नीतियों के गुण-दोषों पर प्रतिक्रिया देते रहते थे

- हैदराबाद की क्षेत्रीय अनुसंधान प्रयोगशाला में उन्होंने करियर आरंभ किया। इस संस्थान को आज भारतीय रसायनिकी प्रौद्योगिकी संस्थान के नाम से जाना जाता है। इस संस्थान में उन्होंने 1953 तक कार्य किया।
- 1977 में उन्होंने कोशिकीय एवं आण्विक जीव-विज्ञान केन्द्र की स्थापना की। उनके समय में इस संस्थान की एक विशेषता यह थी कि उस दौरान संस्थान की सभी प्रयोगशालाएं 24 घंटे खुली रहती थीं।
- डॉ. भार्गव ने जैव-प्रौद्योगिकी विभाग की स्थापना में भी महत्वपूर्ण भूमिका निभाई। विज्ञान और प्रौद्योगिकी विभाग से स्वतंत्र एक जैव-प्रौद्योगिकी विभाग की स्थापना का सुझाव उन्होंने ही दिया था।

भारत में आधुनिक जीव-विज्ञान के पितामह कहे जाने वाले वैज्ञानिक डॉ. पीएम भार्गव का निधन वैज्ञानिक जगत के साथ-साथ पूरे देश के लिए एक गंभीर क्षति है। डॉ. पुष्पमित्र भार्गव देश के उन गिने-चुने वैज्ञानिकों में से थे जो वैज्ञानिक शोध-कार्यों के साथ-साथ देश में विज्ञान को बढ़ावा देने के लिए सरकारी नीतियों के गुण-दोषों पर भी अक्सर प्रतिक्रिया व्यक्त करते रहते थे।

22 फरवरी, 1928 को राजस्थान के अजमेर में एक मध्यवर्गीय परिवार में जन्मे पीएम भार्गव के पिता रामचंद्र भार्गव जन-स्वास्थ्यकर्मी थे। जब वह 10 वर्ष के थे तो उनका परिवार उत्तर प्रदेश आ गया और उनकी आगे की शिक्षा-दीक्षा वहीं पर हुई।

वर्ष 1944 में उन्होंने उत्तर प्रदेश में रहकर गणित, भौतिकी और रसायन-विज्ञान में स्नातक की पढ़ाई पूरी की और 1946 में लखनऊ विश्वविद्यालय से कार्बनिक रसायन में एमएससी की उपाधि प्राप्त की। यहीं से उन्होंने संश्लेषित रसायन विज्ञान में अपनी पीएचडी पूरी की। उसके बाद उन्होंने लखनऊ विश्वविद्यालय और उस्मानिया विश्वविद्यालय में शिक्षण कार्य किया। 23 वर्ष की उम्र में ही उनके कई शोधपत्र प्रकाशित हो चुके थे।

हैदराबाद की क्षेत्रीय अनुसंधान प्रयोगशाला में उन्होंने करियर आरंभ किया। इस संस्थान को आज भारतीय रसायनिकी प्रौद्योगिकी संस्थान के नाम से जाना जाता है। इस संस्थान में उन्होंने 1953 तक कार्य किया। वर्ष 1953 में वे पोस्ट-डॉक्टरेट फैलोशिप पर अमेरिका चले गए।

अमेरिका में रहकर उन्होंने कैंसर की दवा के विकास में महत्वपूर्ण शोध कार्य किया। वर्ष 1956 से 1957 के दौरान उन्होंने ब्रिटेन के राष्ट्रीय आयुर्विज्ञान संस्थान में विशिष्ट वेलकम ट्रस्ट फैलो के रूप में कार्य किया, जहां उनके जीवन में महत्वपूर्ण मोड़ आया। यही वह समय था जब जीव-विज्ञान का क्षेत्र उन्हें आकर्षित करने लगा और उन्होंने जीव-विज्ञान में शोध कार्य आरंभ कर दिया।

वर्ष 1977 में उन्होंने हैदराबाद में कोशिकीय एवं आण्विक जीव-विज्ञान केन्द्र (सीसीएमबी) की स्थापना की। वह इस संस्थान के संस्थापक निदेशक थे। उनके समय में इस संस्थान की एक विशेषता यह थी कि उस दौरान संस्थान की सभी प्रयोगशालाएं 24 घंटे खुली रहती थीं। शोधार्थी किसी भी समय वहां पर जाकर अपना शोध कार्य कर सकते थे। शोधार्थियों को सभी उपकरणों के उपयोग की छूट थी। ऐसे वातावरण में यह संस्थान उत्कृष्ट शोध कार्यों के कारण पूरी दुनिया में प्रसिद्ध हुआ। आज सीसीएमबी आधुनिक जीव-

विज्ञान के विभिन्न क्षेत्रों में शोध करने वाला एक प्रमुख अनुसंधान संगठन है। डॉ. भार्गव फरवरी, 1990 तक सीसीएमबी के निदेशक रहे।

डॉ. भार्गव ने जैव-प्रौद्योगिकी विभाग की स्थापना में भी महत्वपूर्ण भूमिका निभाई। विज्ञान और प्रौद्योगिकी विभाग से स्वतंत्र एक जैव-प्रौद्योगिकी विभाग की स्थापना का सुझाव उन्होंने ही दिया था। उनके इस सुझाव पर तत्कालीन सरकार ने एक समिति का गठन किया और इस प्रकार वर्ष 1986 में जैव-प्रौद्योगिकी विभाग अस्तित्व में आया।

आनुवांशिक अभियांत्रिकी, तंत्रिका-विज्ञान और जीवन की उत्पत्ति संबंधी वैज्ञानिक कार्यों में उनका उल्लेखनीय योगदान रहा है। उनके अनेक शोधपत्र राष्ट्रीय और अंतरराष्ट्रीय शोध-पत्रिकाओं में प्रकाशित हुए। इसके अलावा उन्होंने विज्ञान पर आधारित कई लोकप्रिय लेख भी लिखे।

उन्होंने वैज्ञानिक दृष्टिकोण के प्रसार में महत्वपूर्ण भूमिका निभाई और लोगों को अंधविश्वासों से दूर रहने के लिए कई व्याख्यान दिए। विज्ञान संचार के लिए कार्यरत राष्ट्रीय संस्था विज्ञान प्रसार के अनेक वैज्ञानिक कार्यक्रमों को भी उनका मार्गदर्शन मिला। वर्ष 2005 से 2007 तक वह राष्ट्रीय ज्ञान आयोग के उपाध्यक्ष भी रहे।

भार्गव सरकारी नीतियों पर समालोचक के रूप में प्रसिद्ध रहे। वह भारत सरकार द्वारा गठित जेनेटिक इंजीनियरिंग एग्जल कमेटी में सुप्रीम कोर्ट द्वारा नामित सदस्य भी रहे।

(इंडिया साइंस वायर)

<http://www.downtoearth.org.in>

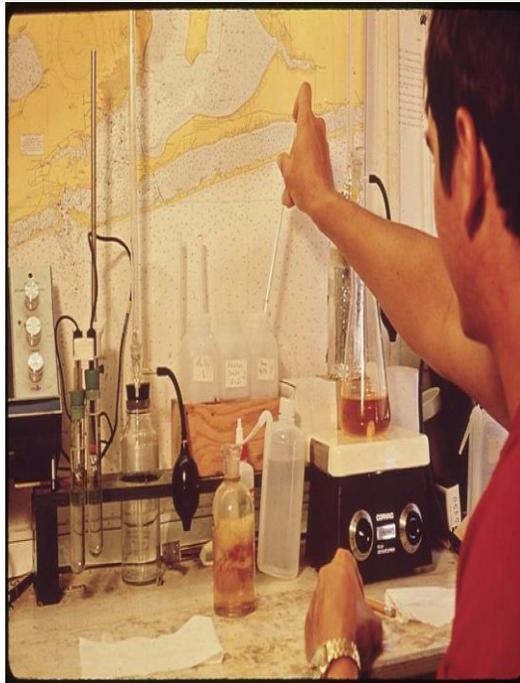
## Technology to generate electricity from water without any energy ready for takeoff

TV Venkateswaran, Jyoti Singh

02/08/2017

The innovation is now ready for next stage of development and awaiting government's support.

- A small piece of magnesium ferrite measuring three square inch can generate about 250 milli ampere (mA) of power
- The work of Dr Kotnala using lithium substituted magnesium ferrite could be a game changer.



📷 Scientists across the globe have been trying to produce electricity from water for over 70 years now.

*Credit: Wikimedia Commons*

It was like a dream come true. One year ago, scientists at the National Physical Laboratory (NPL) in New Delhi demonstrated that it was possible to generate electricity from water—at room temperature and without the need for any external energy. The innovation is now ready for next stage of development.

“We are waiting for the government and the industry to take the initiative. A pilot plant can be set up within one and a half years,” said Dr Ravinder Kumar Kotnala in an interview. Dr

Kotnala, along with his associate, Jyoti Shah, has developed the hydroelectric cell using a novel approach.

Dr Kotnala, Chief Scientist at NPL, was fascinated by the potential of humidity-sensing nature of porous magnesium ferrite nanomaterial at room temperature. The material showed a change in electrical potential in the presence of humidity in the atmosphere. This set them thinking: can we exploit the same difference in potential energy to generate electricity?

One thing led to another and soon enough they found that a small piece of magnesium ferrite measuring three square inch can generate about 250 milli ampere (mA) of power. A slightly bigger prototype measuring four square inch was made and it was also found effective. It was clear that the cell could be scaled up.



*Dr Ravinder Kumar Kotnala. Credit: India Science Wire*

Explaining his work, Dr Kotnala said the cell was fundamentally a type of galvanic cell that derives electrical energy from spontaneous oxidation-reduction (redox) reactions of an electrolyte with a cathode and an anode. In a school laboratory, for instance, a galvanic cell is made by inserting a piece of zinc metal and a piece of copper wire into a lemon fruit. When the two metal pieces are connected to a bulb, it glows. It happens because of a redox reaction of the lemon juice with two dissimilar metal pieces.

In the hydroelectric cell, Dr Kotnala and his team used a pellet of lithium substituted magnesium ferrite which had a zinc plate electrode stuck on one side and a silver comb electrode on the other. When the system was sprinkled with water at room temperature, it generated a stable flow of electricity.

“Magnesium has high affinity for hydroxide ion (OH), and it pulls a hydroxide ion from the normal H<sub>2</sub>O (water) when it comes in contact. The remaining hydrogen combines with another H<sub>2</sub>O molecule to form hydronium (H<sub>3</sub>O). Normally, within a matter of seconds, hydronium and hydroxide ions will recombine to produce once again two molecules of water. But in our cell, hydronium ions get trapped inside the nanopores of lithium-substituted magnesium ferrite and generate an electric field. The electric field helps in further dissociation of water. This cascades and continuous electricity is produced,” explained Dr Kotnala.

Oxidation reaction of hydroxide ions at Zinc electrode releases two electrons which are collected on silver electrode. A net current flow results in the cell due to a potential difference developed between the electrodes.

Scientists across the globe have been trying to produce electricity from water for over 70 years now. Chemical dissociation of water molecules by surfaces of oxides such as Silicon dioxide, Titanium dioxide, Magnesium Oxide and Ferric Oxide had been theoretically calculated and even experimentally observed. But, all the efforts to develop a practical hydroelectric cell had failed till now. In this context, the work of Dr Kotnala using lithium substituted magnesium ferrite could be a game changer.

A small hydroelectric cell made with a magnesium ferrite pellet measuring three sq in has generated about 250 mA of power. A prototype made with a pellet measuring four square inch material has also been found effective. This implies that the scaling up of the cell is possible. It is expected that when connected in a series, the cells would be able to produce enough electricity to drive a small electric motor or energise a LED bulb.

“There are many advantages of hydroelectric cell compared to electrochemical cells. For instance, they would be portable. Also, in other cells, anode and cathode gets eroded after a period of time. But in hydroelectric cells Zinc can be reused or recycled and silver extracted out,” says Dr Kotnala. The cell releases hydrogen gas and zinc hydroxide, neither of which pollute environment in the manner that fossil fuels do. Hydroelectric cells are no burden on the environment. It is the world’s first acid and alkali-free cell.

Dr Kotnala heads the Environmental Sciences and Biomedical Metrology division at NPL. He completed his doctorate in silicon solar cell from IIT Delhi. He has expertise in a wide range of subjects including Spintronics, electronic materials, Spin Hall Effect, humidity sensor, solar cell and hydroelectric cell. A recipient of many national and international awards and recognition, he

has also published more than 360 research papers in international journals. He has nine patents in his name. (India Science Wire)

<http://www.downtoearth.org.in/news/electricity-from-water-tech-ready-for-takeoff-58383>

## TN deploying artificial reefs to save sinking islands

Dinesh C Sharma

03/08/2017

Tamil Nadu hits upon an idea to prevent erosion of ecologically sensitive islands and regenerate the coral diversity in the Gulf of Mannar by deploying artificial reef made of concrete. Deployment of artificial reefs, parallel to the sinking island in the seaward side reduces the effect of currents and waves and protects fish diversity. Deploying artificial reefs Chennai - India is amongst the 16 countries at 'extreme risk' of global warming and some of its islands could disappear with the sea level rise in the times to come. But Tamil Nadu has hit upon a novel idea to protect vulnerable islands on its coast by deploying artificial reef. Artificial reefs, made of concrete, have been found to be capable of preventing further erosion of ecologically sensitive islands and also regenerate coral biodiversity in the Gulf of Mannar region. "We have successfully demonstrated this in Vaan Island in the Mannar region. The island which had sunken to a great extent over decades has regained some of its area," said Dr H Malleshappa, head of the Tamil Nadu State Climate Change Cell. Vaan is one of the 21 islands in the Gulf of Mannar, which was declared marine biodiversity park in 1986. Indiscriminate mining of coral and use of destructive fishing practices in the past few decades have fully submerged two of the islands while Vaan was on the verge of submergence when the project began in 2015. Its area had been reduced from 16 hectares in 1986 to 2 hectares in 2014. The area of Vaan Island has increased by 2.24 hectares in low tide and 1.8 hectare in mean tide between December 2015 and August 2016. The restoration of Vaan Island is one the climate adaptation projects funded by the Ministry of Environment, Forests and Climate Change. The state has been given Rs 25 crore for the project. It is the first attempt in India to protect and restore a sinking island. Deployment of artificial reefs parallel to the sinking island in the seaward side reduces the effect of currents and waves, enhances fish habitats for higher fish production and protection of fish diversity. Natural corals get attached to artificial reefs over time and start regeneration. Following the success in Vaan, Tamil Nadu has proposed to undertake restoration of two more islands and has approached Green Climate Fund for funding of Rs 100 crore. The first two phases of the project were funded by the TN Coastal Zone Protection Authority, starting in February 2015. The project had two components in these phases – coral rehabilitation and artificial reef deployment. In the first phase, three square kilometres of degraded area around the island was rehabilitated with native

coral species using standard coral transplantation techniques. Rehabilitated coral sites were monitored regularly to document survival and growth of the transplanted corals. The survival rate is 80 to 90 percent and spawning has been observed in transplanted corals. The coral rehabilitation project was started with technical expertise from the Suganti Devadason Marine Research Institute. In the second phase, artificial reefs were deployed. For this, the Indian Institute of Technology Madras (IIT-M) conducted wave dynamic and

bathymetry studies. Based on this the design of artificial reefs was finalised and locations identified for deploying artificial reef modules. Each module is 2.5 meter in width, 2 meter in height and 1 meter in longitudinal length, and weighs 1.8 tonnes. The concrete reefs have been deployed 250 meters from the island in a semi-circular constellation. In the first two phases, 4600 modules have been deployed in eight months. Now with more funding available, the plan is to take the total number of artificial reefs to 10,000 in two layers. None of the islands are inhabited but they support livelihoods of people. Therefore, one of the key objectives of the project is to undertake eco development activities among coastal communities to enhance their adaptive capacity, Dr Malleshappa added. Though the reason for erosion of islands is a combination of several factors such as coral mining in destructive fishing techniques, experts point out that sea level rise due to climate variation is posing additional threat to coastal islands.

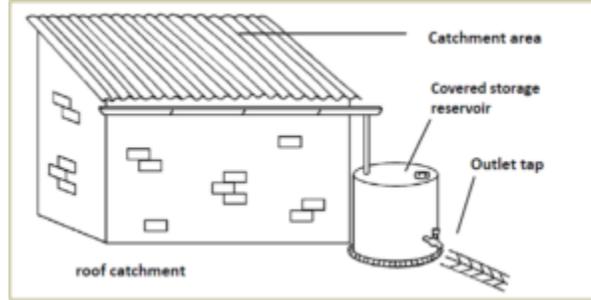
<http://www.indiansciencejournal.in/science-news/tn-deploying-artificial-reefs-to-save-sinking-islands-211174>

## आर्थिक रूप से भी फायदेमंद हो सकती है रूफ वाटर हार्वेस्टिंग

उमाशंकर मिश्र

03/08/2017

पानी की कमी झेल रहे पर्वतीय इलाकों में छत पर वाटर हार्वेस्टिंग करना पानी की किल्लत से निजात दिलाने के साथ-साथ आर्थिक रूप से भी फायदेमंद हो सकता है। भारतीय कृषि अनुसंधान परिषद (आईसीएआर) के वैज्ञानिकों द्वारा किए गए एक ताजा अध्ययन में यह बात सामने आई है।



मेघालय के रि-भोई जिले के उमियम में किए गए इस अध्ययन के अंतर्गत छत पर वाटर हार्वेस्टिंग के जरिये इकट्ठा किए गए पानी का उपयोग किसानों ने जब खेती और पशुपालन में किया तो उनकी आमदनी वर्ष के उन महीनों में कई गुना बढ़ गई, जब पानी की कमी के कारण वे बेरोजगार हो जाते थे। अध्ययन से पता चला है कि रूफ वाटर हार्वेस्टिंग करने से पानी की किल्लत दूर होने के साथ-साथ रोजगार में भी 221 प्रतिशत बढ़ोतरी हुई और पानी के कुशलतापूर्वक उपयोग की क्षमता में भी वृद्धि दर्ज की गई। किसानों ने एकत्रित किए गए इस पानी का इस्तेमाल घरेलू उपयोग के अलावा ब्रोकोली, राई, शिमला मिर्च, मक्का, टमाटर और फ्रेंचबीन जैसी फसलों की खेती के साथ-साथ पॉल्ट्री एवं पशुपालन में किया। इससे उन्हें आर्थिक रूप से काफी फायदा हुआ। शोधकर्ताओं के अनुसार “सूअर पालन के साथ खेती करने वाले जो किसान वाटर हार्वेस्टिंग मॉडल से जुड़े थे, उन्हें औसतन 14,910 रुपये की शुद्ध आमदनी हुई। इसी तरह पॉल्ट्री के साथ खेती करने वाले किसानों को 11,410 रुपये की औसत आय प्राप्त हुई, जो अन्य किसानों की आमदनी से क्रमशः 261 प्रतिशत एवं 176 प्रतिशत अधिक थी।”

अध्ययन में शामिल पूर्वोत्तर पर्वतीय क्षेत्र अनुसंधान परिसर के वैज्ञानिक डॉ अनूप दास ने इंडिया साइंस वायर को बताया कि “इस प्रयोग के जरिये हम बताना चाहते हैं कि पर्वतीय इलाकों में रूफ वाटर हार्वेस्टिंग बरसात के पानी को एकत्रित करने का उपयुक्त जरिया बन सकती है। इसकी मदद से वर्ष के सूखे महीनों में भी लघु स्तरीय कृषि से किसान मुनाफा कमा सकते हैं।” उमियम

के पर्वतीय क्षेत्रों में रहने वाले 11 किसान परिवारों को इस अध्ययन में शामिल किया गया था। छत के जरिये बरसाती पानी इकट्ठा करने के लिए उनके घर के आसपास पॉलीफिल्म युक्त जलकुंड (वाटर टैंक) बनाए गए। घर की छतों को कैचमेंट एरिया के तौर पर उपयोग करते हुए उसे पाइपों के जरिये पॉलीथीन युक्त वाटर टैंक से जोड़ दिया गया। इस प्रयोग के लिए प्रत्येक किसान के घर के आसपास औसतन 500 वर्गमीटर क्षेत्र को शामिल किया गया था।

वाटर टैंक में सिल्ट और गंदगी के जमाव को रोकने के लिए जस्ते, कंक्रीट या फिर एस्बेस्टस की छतों का उपयोग कैचमेंट एरिया के रूप में किया गया और फूस की छत पर पॉलीथीन की परत चढ़ा दी गई। इस तरह एकत्रित किए गए पानी की गुणवत्ता बेहतर होती है और उसे पीने के लिए भी उपयोग कर सकते हैं। प्रत्येक वाटर टैंक में औसतन 53 घन मीटर पानी जमा हुआ, जिसमें अन्य मौसमी दशाओं में होने वाली बरसात के कारण इकट्ठा किया गया 16 घन मीटर पानी भी शामिल था। डॉ. अनूप दास के मुताबिक “पहाड़ी इलाकों में घाटियों के जलस्रोतों में तो पानी जमा हो जाता है, पर ऊंचे क्षेत्रों में मौजूद जलस्रोतों से पानी का रिसाव एक समस्या है। इससे निपटने के लिए जलकुंड बनाकर उसकी सतह में पॉलीथीन की परत लगाने से पानी का रिसाव नहीं हो पाता और शुष्क महीनों में लोग पानी की किल्लत से बच जाते हैं। अभी इस मॉडल में और भी सुधार किए जा सकते हैं। लेकिन इतना तो तय है कि यह मॉडल पहाड़ों के लिए उपयोगी होने के साथ-साथ कम वर्षा वाले मैदानी इलाकों में भी पानी की कमी से निपटने में कारगर साबित हो सकता है।”

मेघालय के उमियम में स्थित आईसीएआर के पूर्वोत्तर पर्वतीय क्षेत्र अनुसंधान परिसर, बारामती स्थित राष्ट्रीय अजैविक स्ट्रैस प्रबंधन संस्थान, झांसी स्थित भारतीय चरागाह और चारा प्रबंधन संस्थान के वैज्ञानिकों द्वारा किया गया यह अध्ययन शोध पत्रिका करंट साइंस के ताजा अंक में प्रकाशित किया गया है। अध्ययनकर्ताओं की टीम डॉ अनूप दास के अलावा आरके सिंह, जीआई रामकृष्ण, जयंत लयेक, एके त्रिपाठी, एसवी न्गाचान, बीयू चौधरी, डीपी पटेल, डीजे राजखोवा, देवासीश चक्रवर्ती और पीके घोष शामिल थे। (इंडिया साइंस वायर)

<http://www.spandanfeatures.com/roof-water-harvesting-may-also-be-financially-beneficial/>

## जलवायु कारकों से भी प्रभावित होता है पक्षियों का गायन

04/08/2017

शुभ्रता मिश्रा

वास्को-द-गामा (गोवा), अगस्त (इंडिया साइंस वायर): अक्सर माना जाता है कि पक्षी अपने जीवनसाथी को लुभाने के लिए गाते हैं। भारतीय वैज्ञानिकों ने पाया है कि पक्षियों के सुरीले गायन पर कई खगोलीय और मौसमीय कारकों का भी असर पड़ता है। हिमालय की तलहटी में विशेष रूप से पाए जाने वाले काला पिद्दा (सेक्सिकोला कैप्राटा) नामक उष्णकटिबंधीय सुरीले पक्षी पर हरिद्वार के गुरुकुल कांगड़ी विश्वविद्यालय के जीव-विज्ञान और पर्यावरण-विज्ञान विभाग के शोधकर्ताओं द्वारा किए गए अध्ययन में ये रोचक तथ्य सामने आए हैं।

अध्ययनकर्ताओं ने पाया है कि “वातावरण, तापमान, नमी, हवा के बहाव की दिशा एवं गति और वर्षा जैसे जलवायु कारकों के साथ-साथ सूर्योदय का समय, दिन की अवधि और चंद्रमा की गतिविधियों का संबंध भी सुरीले पक्षियों के गायन से होता है।” नर पक्षियों के गायन शुरू करने के समय, गाने की अवधि एवं उसकी लम्बाई और एक मिनट में पक्षियों द्वारा निकाली जाने वाली विभिन्न ध्वनियों समेत पक्षियों के गायन व्यवहार से जुड़े विभिन्न तथ्यों का अध्ययन करने के बाद शोधकर्ता इस नतीजे पर पहुंचे हैं। सुरीले पक्षी काला पिद्दा पर वर्ष 2015 में जनवरी एवं फरवरी के महीनों में यह अध्ययन उस वक्त किया गया जब भारत में वसंत ऋतु की शुरुआत होती है। नर काला पिद्दा पक्षी आमतौर पर जनवरी के अंत में ही गायन शुरू करते हैं और फरवरी के पहले हफ्ते से उनका गायन एक निश्चित अंतराल पर होने लगता है। अध्ययनकर्ताओं की टीम में नवजीवन दड़वाल और दिनेश भट्ट शामिल थे। यह अध्ययन शोध पत्रिका करंट साइंस के जुलाई अंक में प्रकाशित किया गया है।

सुरीले पक्षियों की अधिकांश प्रजातियों में केवल नर पक्षी ही गाते हैं और प्रत्येक प्रजाति का अपना विशिष्ट स्वर और गायन शैली होती है। अध्ययन क्षेत्र से कुल 12 नर पक्षियों को चुना गया था। उनमें से छह पक्षियों पर प्रतिदिन सुबह नजर रखते हुए स्टॉप-वांच की मदद से उनके गायन शुरू करने के समय को नोट किया जाता था और उनकी सुरीली ध्वनियों को रिकॉर्ड किया जाता था। पक्षियों की पहचान के लिए उनके प्रजनन के मौसम की शुरुआत में ही नर पक्षियों में प्लास्टिक के रंग-बिरंगे बैंड बांध दिए गए थे। पक्षियों के गायन के समय विभिन्न जलवायु कारकों

के मापन के लिए मौसम स्टेशन से प्राप्त आंकड़ों का इस्तेमाल किया गया था। अध्ययन में पाया गया है कि नर व मादा दोनों प्रकार के सुरीले पक्षियों के गायन पर जलवायु कारकों का असर होता है। सुरीले पक्षियों के गायन और उनकी प्रजनन प्रक्रिया में भी संबंध पाया गया है। अध्ययनकर्ताओं के अनुसार पक्षियों के प्रजनन की शुरुआत के मौसम का असर उनके गीत गाने पर भी पड़ता है।

अध्ययन में शामिल वैज्ञानिकों के अनुसार “तापमान, नमी और हवा की गति के कम या ज्यादा होने से पक्षियों के गायन की दर भी उसी अनुपात में कम या ज्यादा हो जाती है। गाने वाले पक्षियों में मौसम के पूर्वानुमान को भांप लेने की एक अद्भुत क्षमता होती है। ध्यान से सुना जाए तो मौसम के बदलने से सुरीले पक्षियों के गीत गाने का अंदाज और गाने की अवधि बदल जाती है। सुबह के समय और गोधूली बेला में भी मौसम के खुशनुमा होने से पक्षियों का सुर विशेष मधुरता लिए होता है।”

अध्ययनकर्ताओं के अनुसार “चांदनी के प्रकाश का असर भी सुरीले पक्षियों के गायन पर पड़ता है। पूर्णिमा के दिन पक्षियों का गाना कम समय तक सुनाई देता है। जबकि अमावस्या को पक्षी ज्यादा कलरव करते पाए गए। रात की चांदनी में मौसम ठंडा होने या हवाएं तेज चलने के बाद सुबह पक्षियों के गीत गाने की दर बढ़ जाती है। पर्यावरणीय कारकों के कारण सुरीले पक्षियों के गायन पर पड़ने वाले प्रभाव का यही असर उनकी प्रजनन क्रिया पर भी पड़ता है।” इस शोध को विज्ञान एवं प्रौद्योगिकी विभाग (डीएसटी) और विश्वविद्यालय अनुदान आयोग (यूजीसी) द्वारा वित्त-पोषित किया गया था।(इंडिया साइंस वायर)

<http://www.spandanfeatures.com/birds-singing-are-are-influenced-by-climate-factors/>

## India Not To Depend On US For High Precision Time Measurement

04/08/2017

Sunderarajan Padmanabhan

New Delhi : India today took a major step to help the strategic and other sectors in the country to be independent of the US- based GPS system by ensuring that Indian Space Research Organisation (ISRO)'s recently set up indigenous regional navigation positioning system named as Navigation with Indian Constellation (NavIC) was based on the Indian clock system instead of that of US.

ISRO signed an agreement with the Council of Scientific and Industrial Research (CSIR)'s New Delhi-based National Physical Laboratory (NPL) under which it will receive globally certified high precision time measurements from the Laboratory on a regular basis.

NPL, which maintains the time standards for the country, gets its clocks certified by the France-based International Bureau of Weights and Measures, which is the global agency that maintains UTC, the global standards time. The time measurement provided by NPL would be the same as that provided by US Naval Observatory on whose basis GPS function.

Speaking to journalists after the MOU was signed, ISRO and NPL scientists said that though there will be no difference at all between the time measurements provided by NPL and GPS, the move to NPL timing would be highly advantageous as it would mean India will not be any more depended on GPS.

During the Gulf War, GPS signals were barred from some part of the Gulf region resulting in difficulties for the affected countries. The move to NPL would avoid such exigencies, they noted.

High precision time measurements are becoming increasingly important for different sectors of the economy. The smart grids for electricity distributions, for instance, need precise time synchronisation. The same applies to high speed communication such as voice over internet protocol, calling and video conferencing and for all types of financial transaction, stock handling, digital archiving, time-stamping and international trade.

The MOU was signed in the presence of Union Minister for Science and Technology, Dr. Harsh Vardhan, and Minister of State in charge of Departments of Space and Atomic Energy, Jitendra Singh. (India Science Wire)

<http://theindiasaga.com/nation/india-not-to-depend-on-us-for-high-precision-time-measurement>

## For Future Cancer Drugs, Scientists Look To Clues From Outer Space

04/8/2017 Bhavya Khullar



Microgravity conditions experienced by astronauts in space induce stress and strain around human cells. Cancer cells have also been known to die under microgravity. Scientists are exploring if this knowledge can be used to develop novel ways to find new drugs.

A group of Indian scientists has figured out the mechanism of cancer cells dying under microgravity, and believe that this can be used to find new drugs in future.

The research group at Indian Institute of Technology Madras subjected cultured colorectal cancer cell lines to microgravity and observed that they die within 48 hours. Cancer cells died due to apoptosis, which is death induced by cancer cells themselves in response to stress. For simulating microgravity conditions, an equipment called Rotational Cell Culture System-High Aspect Ratio Vessel was used.

“Cancer cells initiate their own death, it is also called programmed cell death. They did so by increasing the levels of two proteins called PTEN and FOXO3 and reducing the levels of another protein, Akt, when they experienced microgravity,” researchers said.

When brought back to normal gravity conditions, they stopped dying and started proliferating again which is their ‘normal’ state, Professor Rama Shanker Verma, who led the study, told India Science Wire. However, the time taken for cancer cells to start proliferating again was longer-nearly three weeks as opposed to less than a week when they do not experience any

microgravity, added Raj Pranap Arun, a member of the research team which published its findings in journal Scientific Reports.

“We can exploit the properties of cancer cells under microgravity to find potential drug targets”, believes Professor Verma. The team is now extending the work to cancer stem cells that are responsible in cases of relapse.

Syed Ehtesham Hasnain, professor at Jamia Hamdard Institute of Molecular Medicine, New Delhi, who is not connected to the study, commented that “it is a long way to find a new drug against cancer. But this study has taken an interesting route to address a fundamental problem and may help identify novel drug targets to intervene against cancer.”

The research team also included Divya Sivanesan and Prasanna Vidyasekar from IIT Madras and National University of Singapore. (India Science Wire)

<http://theindiasaga.com/social-sector/for-future-cancer-drugs-scientists-look-to-clues-from-outer-space>

## आर्थिक रूप से भी फायदेमंद हो सकती है रूफ वाटर हार्वेस्टिंग

04/08/2017

उमाशंकर मिश्र



पानी की कमी झेल रहे पर्वतीय इलाकों में छत पर वाटर हार्वेस्टिंग करना पानी की किल्लत से निजात दिलाने के साथ-साथ आर्थिक रूप से भी फायदेमंद हो सकता है। भारतीय कृषि अनुसंधान परिषद (आईसीएआर) के वैज्ञानिकों द्वारा किए गए एक ताजा अध्ययन में यह बात सामने आई है।

मेघालय के रि-भोई जिले के उमियम में किए गए इस अध्ययन के अंतर्गत छत पर वाटर हार्वेस्टिंग के जरिये इकट्ठा किए गए पानी का उपयोग किसानों ने जब खेती और पशुपालन में किया तो उनकी आमदनी वर्ष के उन महीनों में कई गुना बढ़ गई, जब पानी की कमी के कारण वे बेरोजगार हो जाते थे। अध्ययन से पता चला है कि रूफ वाटर हार्वेस्टिंग करने से पानी की किल्लत दूर होने के साथ-साथ रोजगार में भी 221 प्रतिशत बढ़ोतरी हुई और पानी के कुशलतापूर्वक उपयोग की क्षमता में भी वृद्धि दर्ज की गई।

किसानों ने एकत्रित किए गए इस पानी का इस्तेमाल घरेलू उपयोग के अलावा ब्रोकोली, राई, शिमला मिर्च, मक्का, टमाटर और फ्रेंचबीन जैसी फसलों की खेती के साथ-साथ पॉल्ट्री एवं पशुपालन में किया। इससे उन्हें आर्थिक रूप से काफी फायदा हुआ। शोधकर्ताओं के अनुसार “सूअर पालन के साथ खेती करने वाले जो किसान वाटर हार्वेस्टिंग मॉडल से जुड़े थे, उन्हें औसतन 14,910 रुपये की शुद्ध आमदनी हुई। इसी तरह पॉल्ट्री के साथ खेती करने वाले किसानों को 11,410 रुपये की औसत आय प्राप्त हुई, जो अन्य किसानों की आमदनी से क्रमशः 261 प्रतिशत एवं 176 प्रतिशत अधिक थी।”

अध्ययन में शामिल पूर्वोत्तर पर्वतीय क्षेत्र अनुसंधान परिसर के वैज्ञानिक डॉ. अनूप दास ने इंडिया साइंस वायर को बताया कि “इस प्रयोग के जरिये हम बताना चाहते हैं कि पर्वतीय इलाकों में रूफ वाटर हार्वेस्टिंग बरसात के पानी को एकत्रित करने का उपयुक्त जरिया बन सकती है। इसकी मदद से वर्ष के सूखे महीनों में भी लघु स्तरीय कृषि से किसान मुनाफा कमा सकते हैं।”

उमियम के पर्वतीय क्षेत्रों में रहने वाले 11 किसान परिवारों को इस अध्ययन में शामिल किया गया था। छत के जरिये बरसाती पानी इकट्ठा करने के लिए उनके घर के आसपास पॉलीफिल्टर युक्त जलकुंड (वाटर टैंक) बनाए गए। घर की छतों को कैचमेंट एरिया के तौर पर उपयोग करते हुए उसे पाइपों के जरिये पॉलीथीन युक्त वाटर टैंक से जोड़ दिया गया। इस प्रयोग के लिए प्रत्येक किसान के घर के आसपास औसतन 500 वर्गमीटर क्षेत्र को शामिल किया गया था।

वाटर टैंक में सिल्ट और गंदगी के जमाव को रोकने के लिए जस्ते, कंक्रीट या फिर एस्बेस्टस की छतों का उपयोग कैचमेंट एरिया के रूप में किया गया और फूस की छत पर पॉलीथीन की परत चढ़ा दी गई।

इस तरह एकत्रित किए गए पानी की गुणवत्ता बेहतर होती है और उसे पीने के लिए भी उपयोग कर सकते हैं। प्रत्येक वाटर टैंक में औसतन 53 घन मीटर पानी जमा हुआ, जिसमें अन्य मौसमी दशाओं में होने वाली बरसात के कारण इकट्ठा किया गया 16 घन मीटर पानी भी शामिल था।

डॉ. अनूप दास के मुताबिक “पहाड़ी इलाकों में घाटियों के जलस्रोतों में तो पानी जमा हो जाता है, पर ऊंचे क्षेत्रों में मौजूद जलस्रोतों से पानी का रिसाव एक समस्या है। इससे निपटने के लिए जलकुंड बनाकर उसकी सतह में पॉलीथिन की परत लगाने से पानी का रिसाव नहीं हो पाता और शुष्क महीनों में लोग पानी की किल्लत से बच जाते हैं। अभी इस मॉडल में और भी सुधार किए जा सकते हैं। लेकिन इतना तो तय है कि यह मॉडल पहाड़ों के लिए उपयोगी होने के साथ-साथ कम वर्षा वाले मैदानी इलाकों में भी पानी की कमी से निपटने में कारगर साबित हो सकता है।”

मेघालय के उमियम में स्थित आईसीएआर के पूर्वोत्तर पर्वतीय क्षेत्र अनुसंधान परिसर, बारामती स्थित राष्ट्रीय अजैविक सूत्रस प्रबंधन संस्थान, झांसी स्थित भारतीय चरागाह और चारा प्रबंधन संस्थान के वैज्ञानिकों द्वारा किया गया यह अध्ययन शोध पत्रिका करंट साइंस के ताजा अंक में प्रकाशित किया गया है। अध्ययनकर्ताओं की टीम डॉ. अनूप दास के अलावा आरके सिंह, जीआई रामकृष्ण, जयंत लयेक, एके त्रिपाठी, एसवी न्गाचान, बीयू चौधरी, डीपी पटेल, डीजे राजखोवा, देवासीश चक्रवर्ती और पीके घोष शामिल थे। (इंडिया साइंस वायर)

<http://www.prabhasakshi.com/news/proventhings/roof-water-harvesting-can-be-economical/28776.html>

## Artificial reefs to save sinking islands

07/07/2017

Dinesh C. Sharma

A new technique of using artificial reefs could save islands from sinking due to sea-level rise and climate change.



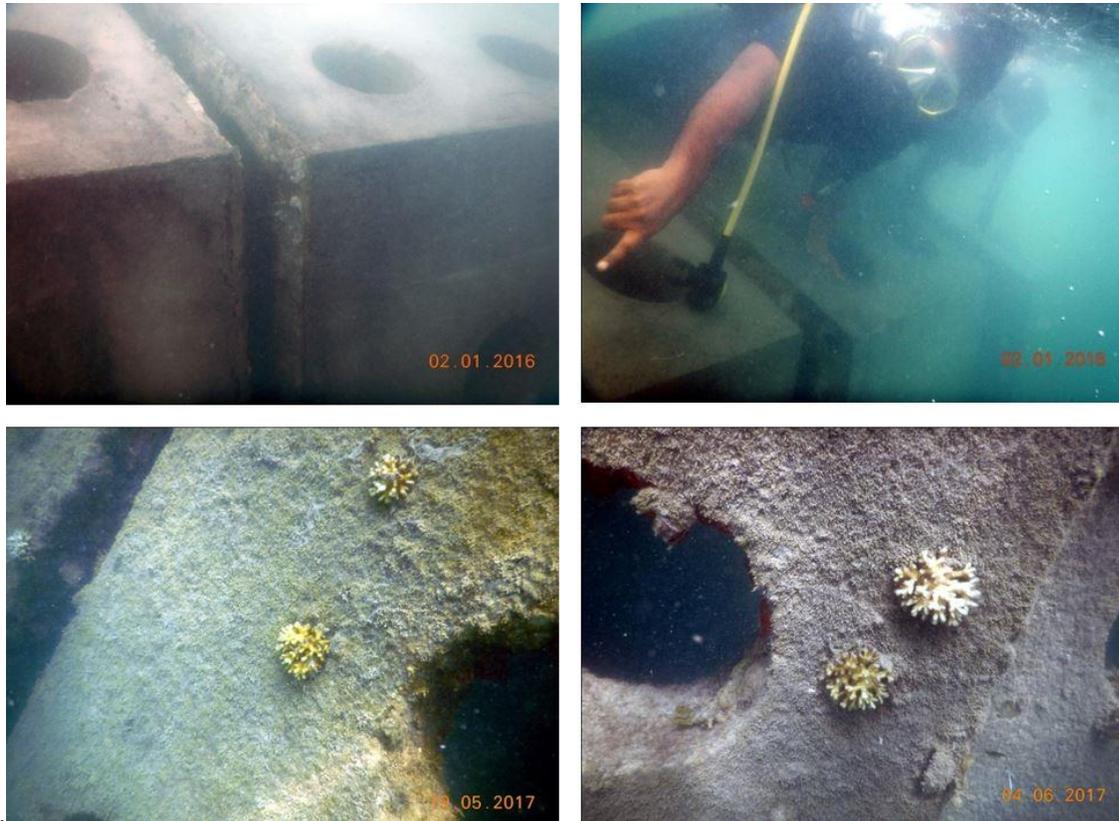
*Artificial reefs get immersed in the sea. (Source: India Science Wire)*

Sinking islands may become a reality with sea-level rise and climate change in decades to come. Tamil Nadu has hit upon a novel idea to protect such islands on its coast--deployment of artificial reefs near vulnerable islands.

Artificial reefs, made of concrete, have been found to be capable of preventing further erosion of ecologically-sensitive islands and also regenerate coral biodiversity in the Gulf of Mannar region. "We have successfully demonstrated this in Vaan island in the Mannar region. The island which had sunken to a great extent over decades has regained some of its areas," said Dr H. Malleshappa, head of the Tamil Nadu State Climate Change Cell.

Vaan is one of the 21 islands in the Gulf of Mannar which was declared marine biodiversity park in 1986. Indiscriminate mining of coral and use of destructive fishing practices in the past few decades have fully submerged two of the islands while Vaan was on the verge of submergence

when the project began in 2015. Its area had been reduced from 16 hectares in 1986 to two hectares in 2014. “Following the deployment of artificial reefs, new accretion has occurred,” Dr Malleshappa told India Science Wire on the sidelines of a workshop on climate change



*Artificial reefs. (Source: India Science Wire)*

The area of Vaan island has increased by 2.24 hectares in low tide and 1.8 hectares in mean tide between December 2015 and August 2016. The restoration of Vaan island is one of the climate adaptation projects funded by the National Adaptation Fund for Climate Change of the Ministry of Environment, Forests and Climate Change. The state has been given Rs 25 crore for the project.

It is the first attempt in India to protect and restore a sinking island. Deployment of artificial reefs parallel to the sinking island on the seaward side reduces the effect of currents and waves, enhances fish habitats for higher fish production and protection of fish diversity. Natural corals get attached to artificial reefs over time and start regeneration. Following the success in Vaan, Tamil Nadu has proposed to undertake the restoration of two more islands and has approached Green Climate Fund for funding of Rs 100 crore.

How corals were rehabilitated

The first two phases of the project were funded by the TN Coastal Zone Protection Authority, starting in February 2015. The project had two components in these phases--coral rehabilitation and artificial reef deployment. In the first phase, 3 sq km degraded area around the island was rehabilitated with native coral species using standard coral transplantation techniques. Rehabilitated coral sites were monitored regularly to document survival and growth of the transplanted corals. The survival rate is 80 to 90 percent and spawning has been observed in transplanted corals. The coral rehabilitation project was started with technical expertise from the Suganti Devadason Marine Research Institute.

In the second phase, artificial reefs were deployed. For this, the Indian Institute of Technology Madras (IIT-M) conducted wave dynamic and bathymetry studies. Based on this, the design of artificial reefs was finalised and locations identified for deploying artificial reef modules. Each module is 2.5 meter in width, 2 meter in height and 1 meter in longitudinal length, and weighs 1.8 tonnes. The concrete reefs have been deployed 250 meters from the island in a semi-circular constellation. In the first two phases, 4600 modules have been deployed in eight months. Now, with the funding from Adaptation Fund, the plan is to take the total number of artificial reefs to 10,000 in two layers.

None of the islands are inhabited but they support livelihoods of people. Therefore, one of the key objectives of the project is to undertake eco development activities among coastal communities to enhance their adaptive capacity, Dr Malleshappa added.

Though the reason for the erosion of islands is a combination of several factors such as coral mining in destructive fishing techniques, experts point out that sea-level rise due to climate variation is posing an additional threat to coastal islands. “Low-lying coastal areas are more vulnerable to impacts of climate change as they are highly prone for inundation due to sea-level rise,” observed Dr K. Palanivelu, director of the Centre for Climate Change and Adaptation Research at Anna University.

The media workshop on climate change was organised by the Centre for Media Studies, GIZ and MoEFCC. (India Science Wire)

<http://www.indiawaterportal.org/articles/artificial-reefs-save-sinking-islands>

स्मृति शेष

## आधुनिक जीव-विज्ञान के पितामह थे डॉ. भार्गव



डॉ. पुष्पमित्र भार्गव

वैज्ञानिक चिरादरी में कुछ गिने-चुने वैज्ञानिक ही होते हैं, जो वैज्ञानिक शोध-कार्यों के साथ-साथ जनमानस में विज्ञान को लोकप्रिय बनाने के लिए कार्य करते हैं। डॉ. पुष्पमित्र भार्गव ऐसे ही विलक्षण वैज्ञानिकों में से एक थे। डॉ. पुष्पमित्र भार्गव का 1 अगस्त, 2017 को हैदराबाद में निधन हो गया।

जनमानस इन्हें डॉ. पीएम भार्गव के नाम से जानता था। भारत में आधुनिक जीव-विज्ञान के पितामह कहे जाने वाले वैज्ञानिक डॉ. पीएम भार्गव का निधन वैज्ञानिक जगत के लिए एक अतृपणीय घति है।

डॉ. पीएम भार्गव का जन्म 22 फरवरी, 1928 का राजस्थान के अजमेर में एक मध्यमवर्गीय परिवार में हुआ था। उनके पिता रामचंद्र भार्गव जन-स्वास्थ्यकर्मी थे। जब वह 10 वर्ष के थे, तो उनका परिवार उत्तरप्रदेश आ गया। उनकी आरंभिक शिक्षा-दीक्षा उत्तरप्रदेश में हुई।

वर्ष 1944 में डॉ. पीएम भार्गव ने गणित, भौतिकी और रसायन-विज्ञान में स्नातक की पढ़ाई पूरी की। लखनऊ विश्वविद्यालय से ही उन्होंने सन् 1946 में क्रायनिक रसायन में एम.एससी. की उपाधि प्राप्त की। यहीं से उन्होंने संश्लेषित रसायन विज्ञान में अपनी पीएच.डी. भी पूरी की। इसके बाद वह शैक्षणिक क्षेत्र में आ गए।

उन्होंने लखनऊ विश्वविद्यालय और उस्मानिया विश्वविद्यालय में शिक्षण कार्य किया। 23 वर्ष की उम्र में ही उनके 14 शोधपत्र प्रकाशित हो चुके थे।

इसके बाद उन्होंने हैदराबाद की क्षेत्रीय अनुसंधान प्रयोगशाला में शोध कार्य आरंभ किया। इस संस्थान को आज भारतीय रासायनिक प्रौद्योगिकी संस्थान के नाम से जाना जाता है। इस संस्थान में उन्होंने 1953 तक कार्य किया। विज्ञान के प्रति उनकी रुचि ने उन्हें आगे शोध कार्य करने के लिये प्रेरित किया। जिसके चलते वर्ष 1953 में उन्हें पोस्ट-डॉक्टरेट फेलोशिप के लिए अमेरिका जाना पड़ा।

### कैंसर की दवा के विकास में योगदान

अमेरिका में पीएम भार्गव ने कई वैज्ञानिक शोध संस्थानों में कार्य किया। यूनिवर्सिटी ऑफ चिकॉगो में उन्हें शैक्षिक स्तर की प्रयोगशाला में कार्य करने का अवसर मिला। यहाँ रहकर उन्होंने कैंसर की दवा के विकास में महत्वपूर्ण भूमिका निभाई। वर्ष 1956 से 1957 के दौरान उन्होंने ब्रिटेन के राष्ट्रीय आणुविज्ञान संस्थान में 'स्पेशल येलकम ट्रस्ट फेलो' के रूप में कार्य किया, जहाँ उनके जीवन में महत्वपूर्ण मोड़ आया। यही वह समय था जब जीव-विज्ञान का क्षेत्र उन्हें आकर्षित करने लगा और उन्होंने जीव-विज्ञान में शोध कार्य आरंभ किया। आनुवंशिक अभियांत्रिकी, संज्ञिका-विज्ञान और जीवन की उत्पत्ति संबंधी वैज्ञानिक कार्यों में उनका उल्लेखनीय योगदान रहा है। उनके अनेक शोधपत्र राष्ट्रीय और अंतरराष्ट्रीय शोध-पत्रिकाओं में प्रकाशित हुए।

### सीसीएमवी के संस्थापक निदेशक

सन् 1958 में वे वापस भारत लौट आए और हैदराबाद स्थित वैज्ञानिक एवं

औद्योगिक अनुसंधान परिषद् की क्षेत्रीय अनुसंधान प्रयोगशाला में कार्य करना आरंभ किया। अपने शोध कार्यों से वैज्ञानिक जगत में ख्याति प्राप्त कर चुके डॉ. पीएम भार्गव का सबसे महत्वपूर्ण योगदान अभी उनकी प्रतीक्षा कर रहा था।

उन्होंने देश में जीवविज्ञान पर अंतरराष्ट्रीय स्तर के अनुसंधान संस्थान की स्थापना की आवश्यकता को रेखांकित किया था। उनके इस विचार की पूर्ण रूप होने में अधिक समय नहीं लगा। 1 अप्रैल, 1977 का दिन था, जब उनका सपना पूरा हुआ और देश को जीवविज्ञान के क्षेत्र में अनुसंधान का एक नया केंद्र मिला। इस संस्थान का नाम दिया गया 'कॉशिकीय एवं आण्विक जीव-विज्ञान केंद्र'। जिसे 'सेंटर फॉर सेल्स्युलर एंड मोलिक्यूलर बायोलॉजी' यानी सीसीएमवी के नाम से भी जाना जाता है।

हैदराबाद में स्थित कॉशिकीय एवं आण्विक जीव-विज्ञान केंद्र की स्थापना में डॉ. पीएम भार्गव ने अग्रणी भूमिका निभाई। डॉ. पीएम भार्गव इस संस्थान के संस्थापक निदेशक थे। उनके समय में इस संस्थान की एक विशेषता यह थी कि उस दौरान संस्थान की सभी प्रयोगशालाएँ चौबीसों घंटे खुली रहती थीं। शोधकर्ता किसी भी समय प्रयोगशालाओं में अपना शोध कार्य कर सकते थे। लक्ष्य ही या लक्षितियों, प्राथक शोधार्थी को सभी उपकरणों के उपयोग की शूट की। ऐसे वातावरण में यह संस्थान उत्कृष्ट शोध कार्यों के कारण पूरी दुनिया में प्रसिद्ध हुआ। आज सीसीएमवी आधुनिक जीव-विज्ञान के विभिन्न क्षेत्रों में शोध करने वाला एक प्रमुख अनुसंधान संगठन है। डॉ. भार्गव फरवरी, 1990 तक सीसीएमवी के निदेशक रहे।

वही वह संस्थान है, जिसे आज भारत में डीएनए फिंगर प्रिंटिंग के जनक संस्थान

के रूप में भी जाना जाता है। इसी संस्थान में डीएनए फिंगर प्रिंटिंग तकनीक के उपयोग के द्वारा, कई बड़ी हत्याओं के पीछे के सच को सामने लाया जा सका।

### जैव-प्रौद्योगिकी विभाग की स्थापना में अग्रणी भूमिका

डॉ. पीएम भार्गव ने भारत सरकार के जैव-प्रौद्योगिकी विभाग की स्थापना में भी महत्वपूर्ण भूमिका निभाई। उन्होंने ही विज्ञान और प्रौद्योगिकी विभाग से स्वतंत्र, एक जैव-प्रौद्योगिकी विभाग की स्थापना का सुझाव दिया था। उनके इस सुझाव पर तत्कालीन सरकार ने एक समिति का गठन किया और इस प्रकार वर्ष 1986 में जैव-प्रौद्योगिकी विभाग अस्तित्व में आया।

### प्रखर विज्ञान संघारक के रूप में डॉ. भार्गव

उन्होंने वैज्ञानिक दृष्टिकोण के प्रसार में महत्वपूर्ण भूमिका निभाई और लोगों को अंधविश्वासों से दूर रहने के लिए कई व्याख्यान दिए। उन्होंने विज्ञान पर आधारित कई लोकप्रिय लेख भी लिखे। विज्ञान संघार से संबंधित अनेक कार्यक्रमों को उनका मार्गदर्शन मिला। वर्ष 2005 से 2007 तक डॉ. पीएम भार्गव राष्ट्रीय ज्ञान आयोग के उपाध्यक्ष भी रहे।

उन्होंने प्रसिद्ध परमाणु वैज्ञानिक राजा रमन्ना के साथ मिलकर सन् 1981 में 'ए स्टेटमेंट ऑफ साइंटिफिक टेम्पेर' नामक दस्तावेज का संकलन किया था। डॉ. पीएम भार्गव ने सतीश धवन जैसे अंतरिक्ष वैज्ञानिकों के साथ मिलकर वैज्ञानिक दृष्टिकोण के प्रसार के लिए एक राष्ट्रीय संस्था की स्थापना पर भी जोर दिया था। हालाँकि वर्तमान में विज्ञान एवं प्रौद्योगिकी विभाग के अंतर्गत कार्यरत 'विज्ञान प्रसार' और वैज्ञानिक एवं औद्योगिक अनुसंधान परिषद् के अंतर्गत कार्यरत राष्ट्रीय विज्ञान संघार एवं ज्ञान संस्थान (निकेयर) वैज्ञानिक

दृष्टिकोण के प्रसार प्रसार में लगे हैं।

### सरकारी नीतियों के समालोचक

डॉ. पीएम भार्गव सरकारी नीतियों के गूण-दोषों पर भी अक्सर प्रतिक्रिया व्यक्त करते रहते थे। भार्गव सरकारी नीतियों पर समालोचक के रूप में प्रसिद्ध रहे। वह भारत सरकार द्वारा गठित जैनेटिक इंजीनियरिंग एग्जल कमिटी में राष्ट्रीय कॉर्ड द्वारा नामित सदस्य भी रहे।

### डॉ. भार्गव की कुछ प्रमुख पुस्तकें

डॉ. पीएम भार्गव ने अनेक पुस्तकें लिखीं। कुछ पुस्तकों का लेखन कार्य उन्होंने अन्य वैज्ञानिकों के साथ मिलकर भी किया। उनकी कुछ प्रमुख पुस्तकों में 'व टू फेस ऑफ ब्यूटी: साइंस एंड आर्ट' एवं 'द सागा ऑफ इंडियन साइंस सिंस इंडिपेंडेंस: इन ए नटशेल' आदि हैं। राष्ट्रीय पुस्तक व्यास यानी एनबीटी द्वारा प्रकाशित उनकी पुस्तक 'गंजेल, डेडिल एंड साइंस: ए कलेक्शन ऑफ आर्टिकल ऑफ साइंटिफिक टेम्पेर' को काफी सराहा गया।

### अनेक पुरस्कारों से सम्मानित

डॉ. भार्गव को अनेक प्रतिष्ठित पुरस्कारों से सम्मानित किया गया था। केंब्रिज की 'क्लेयर हॉल लाइव फेलोशिप' से भी उन्हें सम्मानित किया गया था। भारत सरकार द्वारा सन् 1986 में उन्हें पद्मभूषण सम्मान से सम्मानित किया गया था, लेकिन सन् 2015 में उन्होंने सरकार को यह सम्मान वापस लौटा दिया था। भारत के अलावा अनेक देशों ने उन्हें उनके वैज्ञानिक कार्यों के कारण सम्मानित किया। वर्ष 1998 में उन्हें फ्रांस के सर्वोच्च असेनिक सम्मान 'लोजन डी ऑनर' से भी सम्मानित किया गया था।

### नवीन कुमार गुप्ता

(लेखक विज्ञान संघारक हैं और नई दिल्ली स्थित संस्था 'विज्ञान प्रसार' में परियोजना अधिकारी हैं।)

## New Technology Can Keep Coconut Water Fresh For Four Months

09/08/2017

Bbhavya Khullar



Scientists at the Indian Institute of Technology, Kharagpur have found a new method to increase shelf life of tender coconut water. They claim that it can help retain original taste of coconut water for as long as up to 18 weeks.

Fresh tender coconut water is a popular, low-calorie nutritious drink, but untreated coconut water has a shelf life of only 24 hours. The method developed by Sankha Karmakar and Sirshendu De at the Department of Chemical Engineering, IIT Kharagpur increases shelf life without the use of any preservatives.

The new method involves eliminating suspended debris using a nylon mesh and sterilization through a hollow Polyacrylonitrile fiber tube for an hour. This process removes bacteria and other microbes which increases its shelf life, researchers said. Coconut water thus sterilized was stored in wax-sealed glass or polypropylene bottles in a refrigerator at 5 degree Celsius and tested every month for quality and its properties.

Sterilization using membranes is known but it has been used for coconut water for the first time, and the polyacrylonitrile membrane used has been modified for this purpose, researchers said.

Karmakar told India Science Wire that, “independent experts - professors, PhD students and two kids - tasted treated coconut water. They were asked to score it on different counts such as appearance, texture, aroma, flavor, color and overall quality, besides purchase intention”. He says that the new method of preserving coconut water maintained the clarity and taste for 18 weeks. The results of the study have been published in Journal of Food Engineering.

Amit Jain, professor at Department of Chemical Engineering, Guru Ghasidas Vishwavidyalaya, Bilaspur, who was not involved with the study but was one of the tasters, commented that the

new method is better because it increases the shelf life without adding preservatives. However, he cautioned that “membranes used for sterilization are prone to fouling or clogging and this could limit large scale use of this process”. If membranes are maintained appropriately by routine cleaning, the method can be used on industrial scale and can also be optimized for other beverages, he said.

Researchers claim the method can be scaled to an industrial scale in lesser cost. Currently available preservation methods such as pasteurization, microwave heating, freezing, and refrigeration have some limitations. While heating reduces taste and quality, refrigeration increases cost during transportation that limits marketability.

<https://www.outlookindia.com/website/story/new-technology-can-keep-coconut-water-fresh-for-four-months/300200>

## Indian scientists resurrect century old malaria drug

09/10/2017

Jyoti Singh

A neglected and old anti-parasitic drug used during the World War II is emerging as a new weapon in the fight against malaria as malaria parasite becomes resistant to currently available drugs.

A group of Indian researchers have resurrected acriflavine or ACF which was used as an anti-parasite drug in the last century, and have found it to be effective against malaria parasite. Now they are working to make this molecule more effective using nanotechnology.

Researchers at the Special Centre for Molecular Medicine at Jawaharlal Nehru University (JNU) have got a patent for antimalarial properties of ACF. They have now joined hands with scientists at the National Institute of Immunology (NII) to develop a nano-formulation of the drug and to study its potential in animal models. The Department of Biotechnology (DBT) is funding this joint effort.

ACF was previously used as a trypanocidal agent against a range of infections during World War II. But due to preferential use of chloroquine for treatment of malaria, its antimalarial activity was never investigated. “It was used as an antibacterial and anti-parasitical agent but it was not known as antimalarial agent. We have found that it is effective as an antimalarial molecule also,” said Prof Suman Dhar of JNU. “We believe nanoformulation of ACF will help release the molecule slowly into the host. This will increase its stability, and it will be then conjugated with specific antibodies to make it more specific.”

The researchers have already shown that ACF inhibits the growth of both chloroquine-sensitive and chloroquine-resistant strains of human malarial parasite, *Plasmodium falciparum*. It was also found to clear malarial infection from bloodstreams of mice infected with *Plasmodium berghei*. In addition, they have found that ACF is preferentially accumulated in the parasitized red blood cells.

Chloroquine and pyrimethamine, which were used as primary chemotherapeutic drugs, are of little use now since the parasite has developed resistance to them. Though there is a decline in global burden of malaria continues to be a major health problem in many countries. Recent reports of resistance to artemisinin, the only effective antimalarial drug at present, are causing concern among health agencies globally.

The team of researchers includes Prof Suman Dhar from Special Center for Molecular Medicine at JNU; Dr Jaydeep Bhattacharya and Dr Deepak Gaur from School of Biotechnology at JNU; and Dr Agam P. Singh from NII, New Delhi.

<http://healthanalyticsindia.com/healthopinion.php?id=323>

## 24 घंटे चलने वाला नारियल पानी अब चार माह रहेगा ताजा

नई दिल्ली, आइएसडब्ल्यू : कम कैलोरी वाला वेहद पोषिक पेय नारियल पानी हर लिहाज से सेहत के लिए फायदेमंद है। इसके साथ बस एक कमी है कि यह केवल 24 घंटे ही ताजा रहता है। ...लेकिन भारतीय वैज्ञानिकों ने इसका गस्ता ढूंढ निकाला है। आइआइटी खड़गपुर के वैज्ञानिकों ने ऐसी तकनीक तैयार की है, जिसकी मदद से 18 सप्ताह तक नारियल पानी का स्वाद और पोषिकता बरकरार रहेगी।

आइआइटी खड़गपुर के केमिकल इंजीनियरिंग विभाग के सांख्य कर्माकर और सिद्देन्दू डे ने यह विधि ढूंढी है, जिसकी मदद से बिना कोई प्रिजर्वेटिव (संरक्षक) मिलाए नारियल पानी को उम्र बढ़ाई जा सकती है।

**यह है विधि :** वैज्ञानिकों के मुताबिक, सबसे पहले उन्होंने नायलॉन की जाली से नारियल पानी की अशुद्धियों को दूर किया। इसके बाद खोखले पॉलीसिब्रोनिटील फाइबर ट्यूब की मदद से एक घंटे तक इसे स्टेरलाइज (कीटाणुशोधन) किया। इस प्रक्रिया से नारियल पानी से जीवाणु व अन्य सूक्ष्म कीटाणु नष्ट हो गए। फिर यह स्टेरलाइज किया हुआ नारियल पानी गिलास या पॉलीप्रोपलीनकी बोतलों में भरकर उसे मोम से सील कर दिया, जिसे रेफ्रिजरेटर में पांच डिग्री सेल्सियस पर रखा गया।



आइआइटी खड़गपुर के केमिकल इंजीनियरिंग विभाग के शोधकर्ताओं ने खोजी विधि

शोधकर्ताओं के मुताबिक, हर सप्ताह इसे पीकर इसकी गुणवत्ता को जांच की गई।

**यह मिले परिणाम :** कर्माकर के मुताबिक, हमने इस नारियल पानी को स्वतंत्र विशेषज्ञों, प्रोफेसरों, पीएचडी छात्रों और दो बच्चों को पिलाया। उनसे इस पानी से संबंधित विभिन्न बिंदुओं जैसे इसका स्वाद, गुणवत्ता, रंग, सुगंध आदि पर नंबर देने को कहा। इस प्रयोग से सामने आया कि इस विधि का प्रयोग कर नारियल पानी को 18 सप्ताह तक ताजा रखा जा सकता है, क्योंकि सभी ने ये ही कहा कि इसके सभी गुण बिल्कुल ताजे नारियल पानी जैसे ही हैं। यह अध्ययन फूड इंजीनियरिंग जर्नल में प्रकाशित हुआ है।

## Indian scientists turn sugar industry waste into next-gen battery material

10/08/2017

Dinesh C Sharma

Indian scientists demonstrate waste water from some of the dirtiest industrial processes can be turned into a carbon source for preparation of energy storage materials. Researchers led by scientists at Central Salt and Marine Research Institute use sugar and distillery industry waste to develop functionalized carbon material which has energy storage properties. Sugar Factory (For representative purpose only) Gandhinagar (ISW) - Indian scientists have demonstrated that waste water from some of the dirtiest industrial processes can be turned into a carbon source for preparation of energy storage materials. Researchers led by scientists from Bhavnagar-based Central Salt and Marine Research Institute (CSMRI) have used sugar and distillery industry waste to develop functionalized carbon material which has energy storage properties. Such electrochemical material can be used to make electrodes, sensors and supercapacitors which find applications in digital devices. In a two-step process, spent wash from a distillery was acidified to bring its pH down to about 2. The acidified solution was stirred overnight at room temperature, resulting in precipitation of solid mass or sludge. This solid mass was then sun-dried and calcined at elevated temperatures to generate functionalized carbon material which has energy storage properties, scientists explained. Water-intensive industries like sugar and distilleries produce huge amounts of liquid and solid wastes including biomethanated spent wash which was used in the study. "Instead of dumping into landfills and generating leachate, solid sludge can be activated with a metal precursor and calcined at elevated temperatures under inert atmosphere. The inherent presence of sulphur and nitrogen containing impurities in the sludge acts as dopants and in combination with the metal precursor it can provide an alternate charge storage mechanism to the material," said Dr Ramavatar Meena, one of the co-authors of the study. The study results have been published in Journal of Hazardous Materials. The sulphur and nitrogen impurities in the sludge in combination with a metal precursor impart 'pseudocapacitance' to carbon material. "Electrochemical studies have shown good charge-discharge cycles with almost 100 percent capacitance retention even after 1000 cycles," Dr Meena added. After recovery of sugar from sugarcane juice in an evaporation process, the residue left is molasses which is fermented in distilleries for bio-ethanol production. For every litre of ethanol produced, 12 to 14 litres of water is consumed. This results in high quantities of waste in the form of spent wash which is an environmental hazard. The methodology developed can be used for wastewaters with high 'total organic carbon' content generated by other polluting industries such as tanneries. Besides extraction of carbon material, a combination of adsorption and low pressure reverse osmosis (RO) can be used to further treat wastewater making it reusable in sugar industries as well as for irrigation purposes. "Our aim is to reduce dependency

of sugar industries and distilleries on fresh water by making them self-sufficient in terms of water consumption," the researchers said. Studies are also underway to recover potable water from this highly contaminated wastewater.

<http://www.indiansciencejournal.in/industrial-technology/indian-scientists-turn-sugar-industry-waste-into-next-gen-battery-material-213104>

## Sugar industry waste turned into next-generation battery material

10/08/2017

Dinesh C Sharma

The methodology developed can be used for wastewaters generated by other polluting industries like tanneries

### Quick Read

- Water-intensive industries like sugar and distilleries produce huge amounts of liquid and solid wastes
- Wastewater from some of the dirtiest industrial processes can be turned into a carbon source for preparation of energy storage materials

Indian scientists have demonstrated that wastewater from some of the dirtiest industrial processes can be turned into a carbon source for preparation of energy storage materials.

Researchers led by scientists from Bhavnagar-based Central Salt and Marine Research Institute (CSMRI) have used sugar and distillery industry waste to develop functionalised carbon material which has energy storage properties. Such electrochemical material can be used to make electrodes, sensors and supercapacitors which find applications in digital devices.

In a two-step process, spent wash from a distillery was acidified to bring its pH down to about 2. The acidified solution was stirred overnight at room temperature, resulting in precipitation of solid mass or sludge. This solid mass was then sun-dried and calcined at elevated temperatures to generate functionalized carbon material which has energy storage properties, scientists explained.



*Dr. Ramavatar Meena with CSMRI research team. Credit: India Science Wire*

Water-intensive industries like sugar and distilleries produce huge amounts of liquid and solid wastes including biomethanated spent wash which was used in the study. “Instead of dumping

into landfills and generating leachate, solid sludge can be activated with a metal precursor and calcined at elevated temperatures under inert atmosphere. The inherent presence of sulphur and nitrogen containing impurities in the sludge acts as dopants and in combination with the metal precursor it can provide an alternate charge storage mechanism to the material,” Dr Ramavatar Meena, one of the co-authors of the group told India Science Wire. The study results have been published in Journal of Hazardous Materials.

The sulfur and nitrogen impurities in the sludge in combination with a metal precursor impart ‘pseudocapacitance’ to carbon material. “Electrochemical studies have shown good charge-discharge cycles with almost 100 percent capacitance retention even after 1000 cycles,” Dr Meena added.

After recovery of sugar from sugarcane juice in an evaporation process, the residue left is molasses which is fermented in distilleries for bio-ethanol production. For every litre of ethanol produced, 12 to 14 liters of water is consumed. This results in high quantities of waste in the form of spent wash which is an environmental hazard.

The methodology developed can be used for wastewaters with high ‘total organic carbon’ content generated by other polluting industries such as tanneries. Besides extraction of carbon material, a combination of adsorption and low pressure reverse osmosis (RO) can be used to further treat wastewater making it reusable in sugar industries as well as for irrigation purposes. “Our aim is to reduce dependency of sugar industries and distilleries on fresh water by making them self-sufficient in terms of water consumption,” researchers said. Studies are also underway to recover potable water from this highly contaminated wastewater.

The research team included Ashesh Mahto, Rajeev Gupta, Krishna Kanta Gharab, Divesh N. Srivastava, Pratyush Maitib, R. Meena (all from CSMRI), D. Kalpana (Central Electrochemical Research Institute -Madras Unit), Paul Zavala-Revirae (Chemical Engineering & Metallurgy Department, Universidad de Sonora, Mexico) and S.K. Nataraja (Centre for Nano and Material Sciences, Jain University). The study was supported by the Department of Science and Technology (DST). (India Science Wire)

<http://www.downtoearth.org.in/news/sugar-industry-waste-turned-into-next-generation-battery-material-58421>

## स्वास्थ्य जांच में कारगर हो सकते हैं मेले

10/08/2017

Umashankar Mishra

सिंहस्थ कुंभ में लोगों की उच्च रक्तचाप एवं ओरल हेल्थ की जांच करने के बाद शोधकर्ता इस नतीजे पर पहुंचे हैं। इस अध्ययन में पांच हजार से अधिक लोगों को शामिल किया गया था



- अध्ययन के दौरान ब्लड प्रेशर की जांच के आधार पर 5,760 लोगों में हाइपरटेंशन यानी उच्च रक्तचाप की जांच की गई, जिसमें से 1783 (33.6 प्रतिशत) लोग उच्च रक्तचाप से पीड़ित पाए गए।
- गैर-संचारी बीमारियों के लक्षण देर से सामने आते हैं। समय रहते इनकी पहचान जरूरी है। कई मामलों में पाया गया है कि समय रहते कैंसर की पहचान हो जाए तो बीमारी से उबरने में मदद मिल सकती है।
- भारत में होने वाली 60 प्रतिशत मौतें हृदयघात, स्ट्रोक, मधुमेह, अस्थमा और कैंसर जैसी गैर-संचारी बीमारियों के कारण होती हैं। इसमें से 55 प्रतिशत लोगों की मौत समय से पहले हो जाती है।

कुंभ जैसे आयोजनों में लाखों की संख्या में लोग शामिल होते हैं। इन आयोजनों में उच्च रक्तचाप जैसे गैर-संचारी रोगों से ग्रस्त लोगों की समय रहते पहचान करके इन बीमारियों की रोकथाम की प्रभावी योजना बनाई जा सकती है।

वर्ष 2015 में नासिक में आयोजित सिंहस्थ कुंभ में लोगों की उच्च रक्तचाप एवं ओरल हेल्थ की जांच करने के बाद शोधकर्ता इस नतीजे पर पहुंचे हैं। इस अध्ययन में पांच हजार से अधिक लोगों को शामिल किया गया था।

अध्ययन के दौरान ब्लड प्रेशर की जांच के आधार पर 5,760 लोगों में हाइपरटेंशन यानी उच्च रक्तचाप की जांच की गई, जिसमें से 1783 (33.6 प्रतिशत) लोग उच्च रक्तचाप से पीड़ित पाए गए। इसमें से उच्च रक्तचाप से पीड़ित 1580 लोगों को अपनी बीमारी के बारे में पहले जानकारी नहीं थी।

अध्ययनकर्ताओं की टीम में शामिल डॉ. सत्तित बलसारी ने इंडिया साइंस वायर को बताया कि “उच्च रक्तचाप के कारण हर साल लाखों लोग हृदय संबंधी रोगों से ग्रस्त होकर मौत का शिकार बन जाते हैं क्योंकि उन्हें बीमारी के बारे में जानकारी नहीं होती। यह अध्ययन कम संसाधनों में उच्च रक्तचाप की जांच की आवश्यकता एवं उसकी व्यवहारिकता को दर्शाता है और जन-स्वास्थ्य के रणनीतिकारों को सचेत करता है कि इन बीमारियों से संबंधित स्वास्थ्य कार्यक्रमों को अमल में लाने से पहले उसके दीर्घकालीन प्रभाव का मूल्यांकन जरूरी है।”

गैर-संचारी बीमारियों के लक्षण देर से सामने आते हैं। इसलिए समय रहते इनकी पहचान करना जरूरी है। कई मामलों में पाया गया है कि समय रहते कैंसर की पहचान हो जाए तो बीमारी से उबरने में मदद मिल सकती है। भारत में होने वाली 60 प्रतिशत मौतें हृदयघात, स्ट्रोक, मधुमेह, अस्थमा और कैंसर जैसी गैर-संचारी बीमारियों के कारण होती हैं। इसमें से 55 प्रतिशत लोगों की मौत समय से पहले हो जाती है, जिसके कारण पीड़ित परिवारों और देश पर आर्थिक एवं सामाजिक दबाव बढ़ जाता है।

स्वास्थ्य एवं परिवार कल्याण मंत्रालय ने गैर-संचारी रोगों से निपटने के लिए एक राष्ट्रीय कार्यक्रम शुरू किया है, जिसके अंतर्गत हाइपरटेंशन, डायबिटीज, मुंह का कैंसर, स्तन कैंसर और सर्विक्स कैंसर समेत पांच प्रमुख बीमारियों को केंद्र में रखा गया है। इस कार्यक्रम के अंतर्गत जन-समूह आधारित स्वास्थ्य जांच के जरिये बीमारियों का पता लगाने की पहल की गई है।

डॉ. बलसारी के मुताबिक “भारत के विभिन्न राज्यों में विभिन्न भीड़ भरे आयोजनों में गैर-संचारी बीमारियों की जांच के लिए कार्यक्रम चलाए जाते हैं। लेकिन फॉलो-अप और रेफरल

सिस्टम कमजोर होने के कारण उनका मकसद पूरा नहीं हो पाता। इस तरह के स्वास्थ्य जांच कार्यक्रमों को प्रभावी बनाने के लिए इन कार्यक्रमों का फॉलो-अप बेहद जरूरी है।”

इंडियन डेंटल एसोसिएशन, एमजीवी डेंटल कॉलेज-नासिक के अलावा अमेरिका के बेथ इस्राइल डिकोनेस मेडिकल सेंटर और हार्वर्ड एफएक्सबी सेंटर फॉर हेल्थ ऐंड ह्यूमन राइट्स, अलबर्ट आइंस्टीन कॉलेज ऑफ मेडीसिन और वेल कॉर्नेल मेडिसिन के शोधकर्ताओं द्वारा किया गया यह अध्ययन हाल में *जर्नल ऑफ ह्यूमन हाइपरटेंशन* में प्रकाशित किया गया है।

(इंडिया साइंस वायर)

<http://www.downtoearth.org.in>

# बिजली सब्सिडी से गिर रहा है भूजल स्तर

नई दिल्ली, आइएसडब्ल्यू : विभिन्न राज्यों में भूजल के गिरते स्तर पर समय-समय पर विशेषज्ञ चेतावनी देते रहे हैं। पंजाब में किए गए एक नए अध्ययन से पता चला है कि भूजल में गिरावट के लिए किसानों को दी जाने वाली बिजली सब्सिडी जिम्मेदार है। इस सब्सिडी व अन्य छूटों के कारण किसान चावल की खेती की ओर आकर्षित हुए हैं, जिसके लिए अधिक पानी की जरूरत होती है।

**36 फीसद बढ़ा चावल का रकबा :** अध्ययनकर्ताओं की टीम में शामिल डॉ. शिवेंद्र कुमार श्रीवास्तव के मुताबिक, सिंचाई के लिए भूजल की उपलब्धता के साथ-साथ उच्च एवं सुनिश्चित पैदावार, समर्थन मूल्य, बेहतर बाजार और खासतौर पर मुफ्त बिजली मिलने से किसान चावल की ओर ज्यादा आकर्षित हुए हैं। शोधकर्ताओं के मुताबिक, वर्ष 1980-81 में पंजाब में चावल की खेती 18 फीसद क्षेत्र में होती थी। 2012-13 में चावल का रकबा 36 फीसद बढ़ गया। चावल की खेती में गन्ने के मुकाबले 45 फीसद और मक्के से 88 फीसद तक अधिक भूजल की खपत होती है।



## राज्य की आर्थिक स्थिति पर भी दवाव

वर्ष 1997 में पंजाब सरकार ने किसानों के लिए बिजली सब्सिडी शुरू की थी, जिसका दवाव पर्यावरण के साथ-साथ राज्य सरकार के खजाने पर भी लगातार बढ़ रहा है। वर्ष 2016-17 में राज्य सरकार का ऊर्जा सब्सिडी बिल 5,600 करोड़ रुपये था, जो मौजूदा बिल वर्ष में बढ़कर 10 हजार करोड़ रुपये हो गया है। इसमें बिजली के लिए कृषि क्षेत्र को दी जाने वाली सर्वाधिक 7,660 करोड़ रुपये की रियायत शामिल है।

## यह है बचाव का रास्ता

राज्य में कृषि में भूमिगत जल के उपयोग के नियमन के लिए वर्ष 2009 में कानून बनाया गया था। अध्ययनकर्ताओं के अनुसार इस पर सख्ती से अमल किया जाए तो जलस्तर में वृद्धि हो सकती है, लेकिन अध्ययन से पता चला है कि इस नियम के बावजूद जलस्तर में गिरावट हुई है। पंजाब में बिजली सब्सिडी बंद की जाती है तो भूजल स्तर में सुधार के साथ राज्य की आर्थिक हालत भी दुरुस्त हो सकती है। इससे किसानों की आय कम हो सकती है, पर फसलों पर होने वाला उनका मुनाफा बना रहेगा।

## इन्होंने किया अध्ययन

भारतीय कृषि अनुसंधान परिषद से संबद्ध राष्ट्रीय कृषि आर्थिकी एवं नीति अनुसंधान संस्थान, केंद्रीय समुद्री मत्स्य अनुसंधान संस्थान और नीति आयोग के अध्ययनकर्ताओं द्वारा किया गया यह अध्ययन हाल में करंट साइंस शोध पत्रिका में प्रकाशित किया गया है।

## Okra on your dinner plate? Thank Indian scientists for it

August 11, 2017

Dr T V Venkateswaran and Jyoti Singh

The new okra variety 'Kashi Pragati' developed by Varanasi-based Indian Institute of Vegetable Research (IIVR) has been a favourite in the market, earning a revenue of Rs 816 crore and generating the employment for about eight crore people New Delhi: Round-the-year availability of vegetables like okra (bhindi) and green peas are not only adding to the choice of consumers but also to incomes of vegetable farmers. Behind this development are efforts of Indian scientists who are developing new varieties of common vegetables, making them tasty as well as sturdy. Vegetables are an integral part of Indian diets and essential for ensuring food and nutrition security of people. The Varanasi-based Indian Institute of Vegetable Research (IIVR), under Indian Council of Agricultural Research, is exclusively devoted to research on vegetables with focus on improving their quality and productivity.

“Your favourite *bhindi masala* or *bhindi fry* is on your dinner plate, its thanks, IIVR”, says Dr Bijendra Singh, Director of the Institute. Almost all of okra grown in India is based on the parent variety developed by the institute.

Earlier farmers used to grow low yielding and hard to harvest varieties of the popular vegetable. The traditional varieties grew very tall but had very few pods. Farmers had to pluck the vegetable frequently. When they waded through fields, small hairy thorns of the plant caused irritation and itching all over their body. The plants were also susceptible to Yellow Mosaic virus, a deadly infection.



Dr Bijendra Singh, Director, Indian Institute of Vegetable Research (IIVR).

Scientists at IIVR developed a new variety, which has found favour with farmers. Today farmers all across India grow hybrids made from this parent variety. “Our okra variety *Kashi Pragati* has till now earned a revenue of Rs 816 crore and has generated employment for about eight crore people, mostly unskilled and landless,” Dr Singh noted in an interview.

The new variety is bushy and shorter. This makes it easy to harvest the pods. The nodes where flowers and pods emerge have also multiplied. The total number of leaves, and length of the stem have reduced and biomass that got saved in the process has been diverted to production of more number of flowers. All of this results in higher yield per crop. The Institute has also made the plant resistant to Yellow Mosaic Virus using plant breeding techniques.

The story is similar with green pea or mutton. Till the Institute stepped in, harvests of crop planted at the beginning of winter were generally sweet, but those planted after January suffered from powdery mildew disease. They were also not as tasty and the yields were low. The new two varieties of peas called *Kashi Uday* and *Kashi Nandini* developed at IIVR are heat-tolerant, have higher yield and are resistant to powdery mildew disease. “Ninety percent of green peas grown in India today are those developed by this institute,” says Dr Singh.

As per Dr Singh, the work is in progress on pumpkin, carrot and moringa (drumstick), which are celebrated as important vegetables by FAO as they are rich in vitamins and other nutrients.

Though it may not look that appetizing, pumpkin is a rich source of beta carotene, vital antioxidants, and vitamin A. Mature uncut pumpkin can have a shelf life of more than a year. Carrot has beta-carotenes, falcarinol, Vitamin-A, dietary fibers, minerals, and antioxidants in ample quantity. Moringa, which is also called ‘paradise tree’, has seven times more vitamin C than orange and has a high level of protein. While cow milk has about 3.4% protein, moringa has almost double that level, at 6.6% protein.

The institute has, among other things, been focusing on research to ensure that farmers are able to pluck their vegetables over a period of time. “Weather and virus are not the only challenges for a farmer. Vagaries of the market also determine their profit. Many times harvested vegetables flood the market and purchase price drops. If farmers could hold out for few more days, they may get better deal,” says Dr Singh.

For instance, radish, if left in the farm for more than three days, develops pithiness and its value goes down. IIVR has developed a new variety with more leaves. “The leafy radish can be left in the field for more than ten to fifteen days and the farmers can wait for the market rates to pick up before they sell their products”, he says.

India produces 14% of world’s vegetable and IIVR has played a major role in this. The institute has developed as many as 64 new varieties and is working on 24 more. As global warming is looming large, it is also working on developing vegetable varieties that can withstand climate change.

Vegetables provide a diversified, flavoured, colourful, tasty, low caloric, and micronutrient-rich ingredients to one’s meal. They are good source of vitamins, minerals and dietary fiber. Vitamin C in fruits and vegetables promote absorption of minerals such as calcium and iron. Vegetables are a valuable source of phytonutrients that have protective functions in human body and the antioxidants present in abundance in vegetables protect cells from cancer-causing agents. Low consumption of vegetables and fruits is considered as the sixth main risk factor for mortality in the world.

An alumnus of Banaras Hindu University (BHU), Dr Singh has contributed extensively to the development of hybrid varieties of Okra, green pea, and radish and has forged national and international linkages in vegetable researches. He is a recipient of many honors and recognitions within and outside the country. He was awarded by ICAR in 2003 for his outstanding research. In 2014 he was bestowed with Dr Biswjeet Chaudhary Memorial award by the Indian Society of Vegetable Science. He has authored seven books and has published over 130 research papers. (India Science Wire)

<http://www.biovoicenews.com/okra-dinner-plate-thank-indian-scientists/>

## भूजल स्तर में गिरावट के लिए जिम्मेदार है बिजली सब्सिडी

11/08/2016

उमाशंकर मिश्र



विभिन्न राज्यों में भूजल के गिरते स्तर पर समय-समय पर विशेषज्ञ चेतावनी देते रहे हैं। पंजाब में किए गए एक नए अध्ययन से पता चला है कि भूजल में गिरावट के लिए किसानों को दी जाने वाली बिजली सब्सिडी भी जिम्मेदार हो सकती है। गिरते भूजल स्तर का सीधा संबंध फसल पद्धति से पाया गया है। राज्य में भूमिगत जल स्तर पर गहराते संकट के लिए चावल की फसल सबसे अधिक जिम्मेदार है। वर्ष 1980-81 में पंजाब में चावल की खेती 18 प्रतिशत क्षेत्र में होती थी। वर्ष 2012-13 में राज्य में चावल का रकबा 36 प्रतिशत बढ़ गया। जबकि चावल की खेती में गन्ने के मुकाबले 45 प्रतिशत और मक्के की अपेक्षा 88 प्रतिशत तक अधिक भूजल की खपत होती है।

भारतीय कृषि अनुसंधान परिषद से सम्बद्ध राष्ट्रीय कृषि आर्थिकी एवं नीति अनुसंधान संस्थान, केंद्रीय समुद्री मत्स्य अनुसंधान संस्थान और नीति आयोग के अध्ययनकर्ताओं द्वारा किया गया यह अध्ययन हाल में करंट साइंस शोध पत्रिका में प्रकाशित किया गया है। अध्ययनकर्ताओं का कहना है कि फसल उत्पादन में प्रति घन मीटर खर्च होने वाले पानी के लिहाज से देखें तो अन्य फसलों की अपेक्षा चावल की खेती पंजाब के पारीस्थितिक तंत्र के मुफीद नहीं है।

अध्ययनकर्ताओं की टीम में शामिल डॉ. शिवेन्द्र कुमार श्रीवास्तव ने इंडिया साइंस वायर को बताया कि “पिछले कुछ वर्षों में पंजाब की फसल पद्धति में बदलाव देखने को मिला है और चावल की खेती के साथ-साथ भूमिगत जल पर किसानों की निर्भरता तेजी से बढ़ी है। सिंचाई के लिए भूजल की उपलब्धता के साथ-साथ उच्च एवं सुनिश्चित पैदावार, समर्थन मूल्य, बेहतर

बाजार, रियायती कृषि इन्पुट्स और खासतौर पर मुफ्त बिजली मिलने से किसान इस गैर-परंपरागत फसल की ओर ज्यादा आकर्षित हुए हैं।”

वर्ष 1997 में पंजाब सरकार ने किसानों के लिए बिजली सब्सिडी शुरू की थी, जिसका दबाव पर्यावरण के साथ-साथ राज्य के खजाने पर भी लगातार बढ़ रहा है। वर्ष 2016-17 में राज्य सरकार का पावर सब्सिडी बिल 5,600 करोड़ रुपये था, जो मौजूदा वित्त वर्ष में बढ़कर 10 हजार करोड़ रुपये हो गया है। इसमें बिजली के लिए कृषि क्षेत्र को दी जाने वाली सर्वाधिक 7,660 करोड़ रुपये की रियायत शामिल है।

राज्य में कृषि में भूमिगत जल के उपयोग के नियमन के लिए वर्ष 2009 में कानून बनाया गया था। अध्ययनकर्ताओं के अनुसार इस पर सख्ती से अमल किया जाए तो जलस्तर वृद्धि हो सकती है। लेकिन अध्ययन से पता चला है कि इस नियम के बावजूद जलस्तर में गिरावट हुई है। किसानों को अन्य फसलों की ओर आकर्षित करने की सरकार की कोशिश भी नाकाम रही है। वहीं, बिजली सब्सिडी और समर्थन मूल्य के कारण चावल मुनाफे वाली फसल बनी हुई है।

अध्ययनकर्ताओं के अनुसार “पंजाब में बिजली सब्सिडी बंद की जाती है तो भूजल के दीर्घकालिक उपयोग और राज्य की खस्ता आर्थिक हालत को दुरुस्त करने में मदद मिल सकती है। इससे किसानों की आय कम हो सकती है, पर फसलों पर होने वाला उनका मुनाफा बना रहेगा। सामुदायिक सिंचाई यंत्रों की स्थापना के साथ-साथ भूजल बाजार को बढ़ावा देने से भी किसान किफायती तरीके से भूमिगत जल के उपयोग के लिए प्रेरित हो सकते हैं।”

अध्ययन से यह भी पता चला है कि “भूमिगत जल स्तर कम होने से विभिन्न आकार की जोत वाले किसानों के कृषि अर्थतंत्र पर असर पड़ता है। लेकिन सबसे अधिक नुकसान छोटे एवं सीमांत किसानों को उठाना पड़ता है। भूजल स्तर में कमी से पारिस्थितिक संतुलन प्रभावित होता है। इससे किसानों पर आर्थिक बोझ बढ़ जाता है और भूमिगत जल के वितरण में सामाजिक-आर्थिक विषमता को भी बढ़ावा मिलता है।” (इंडिया साइंस वायर)

<http://www.prabhasakshi.com/news/proventhings/electricity-subsidy-is-responsible-for-the-decline-in-ground-water/29161.html>

## A new material combo to keep soldiers warm at high altitudes

**12/08/2017 Bhavya Khullar**

Soldiers sometimes have to be at high altitude with sub-zero temperatures for prolonged periods of time. To keep warm, they use a variety of strategies. This could include warm clothing, using heat packs, or electric blankets. But, they do not provide comprehensive solutions.

While warm clothes do prevent loss of body heat, they fail to generate any heat on their own, hot water bottles fail to retain the heat for long durations and electric heating pads or blankets require electric supply which has a risk of causing skin burn and thus making them unfit for prolonged use.

Now, scientists at the Defence Laboratory Jodhpur (DLJ), and the Indian Institute of Technology-Jodhpur (IITJ) have designed a new combination of previously known materials that could help save soldiers and those living in cold regions from adverse events such as frostbite and hypothermia.

The scientists have made this new combo-material using sodium acetate trihydrate and ethylene glycol that can retain significant amount of heat for long. The combo-material is a type of "phase change material", that have been previously used for making thermal management devices for regulating human body temperature, reducing temperature fluctuations inside buildings, and for storing solar energy.

Sodium acetate trihydrate is known to make efficient heat packs. But, it has several disadvantages. For example, it is hard and lumped, with sharp edges that makes it prone to puncture or damage during use. Also, it provides heat at nearly 57 degree Celsius as opposed to a temperature of 40 degree Celsius, which is required to manage frostbites.

The scientists at DLJ and IITJ have now found that it can be made more flexible and its heat retention time could be increased by about 10% by adding ethylene glycol and thus made suitable for thermal therapeutic applications such as for frostbites.

The scientists, Ambesh Dixit, Rohitash Kumar, Sumita Vyas, and Ravindra Kumar have published their results in a recent issue of science journal Nature's Scientific Reports.

"Novel ethylene glycol and aqueous sodium acetate trihydrate composite phase change materials with enhanced thermo-physical properties have been designed and developed. It is a promising material for applications such as body warming, building heating under adverse conditions and seasonal solar thermal energy storage," they said in their report.

Mohammed Farid, professor at the Department of Chemical and Materials Engineering, University of Auckland, New Zealand, who is not connected to the study but works with similar materials agrees that, “scientists have improved the performance of the material through modifications. It will also make it more comfortable to use,” he says.

<http://netindian.in/news/2017/08/12/00042802/new-material-combo-keep-soldiers-warm-high-altitudes>

## Soldiers At High Altitudes Can Now Feel Warm, Combat Frostbites

12/08/2017

Bhavya Khullar



Soldiers sometimes have to be at high altitude with sub-zero temperatures for prolonged periods of time. To keep warm, they use a variety of strategies. This could include warm clothing, using heat packs, or electric blankets. But, they do not provide comprehensive solutions.

While warm clothes do prevent loss of body heat, they fail to generate any heat on their own, hot water bottles fail to retain the heat for long durations and electric heating pads or blankets require electric supply which has a risk of causing skin burn and thus making them unfit for prolonged use.

Now, scientists at the Defense Laboratory Jodhpur (DLJ), and the Indian Institute of Technology-Jodhpur (IITJ) have designed a new combination of previously known materials that could help save soldiers and those living in cold regions from adverse events such as frostbite and hypothermia.

The scientists, have made this new combo-material using sodium acetate trihydrate and ethylene glycol that can retain significant amount of heat for long . The combo-material is a type of ‘phase change material’, that have been previously used for making thermal management devices for regulating human body temperature, reducing temperature fluctuations inside buildings, and for storing solar energy.

Sodium acetate trihydrate is known to make efficient heat packs. But, it has several disadvantages. For example, it is hard and lumped, with sharp edges that makes it prone to puncture or damage during use. Also, it provides heat at nearly 57 degree Celsius as opposed to a temperature of 40degree Celsius, which is required to manage frostbites.

The scientists at DLJ and IITJ have now found that it can be made more flexible and its heat retention time could be increased by about 10% by adding ethylene glycol and thus made suitable for thermal therapeutic applications like for frostbites.

The scientists, Ambesh Dixit, Rohitash Kumar, Sumita Vyas, and Ravindra Kumar have published their results in a recent issue of science journal Nature's *Scientific Reports*.

“Novel ethylene glycol and aqueous sodium acetate trihydrate composite phase change materials with enhanced thermo-physical properties have been designed and developed. It is a promising material for applications such as body warming, building heating under adverse conditions and seasonal solar thermal energy storage”, they said in their report.

Mohammed Farid, professor at the Department of Chemical and Materials Engineering, University of Auckland, New Zealand, who is not connected to the study but works with similar materials agrees that, “scientists have improved the performance of the material through modifications. It will also make it more comfortable to use”, he says. (India Science Wire)

<http://theindiasaga.com/defence-security/soldiers-at-high-altitudes-can-now-feel-warm-combat-frostbites>

## Seven defining S&T contributions that have impacted every Indian

14/08/2017

Dinesh C Sharma

As India completes 70 years of its independence, it is time to introspect at the contribution of science and technology to national development. Several scientific and technological developments have touched the lives of common people in the last seven decades, though limelight is often hogged by achievements in fields like space and atomic energy.

In the past seven decades, India has built satellites and sent probes to the moon and Mars, established nuclear power stations, acquired nuclear weapon capability and demonstrated firepower in the form of a range of missiles. Undoubtedly these are all fabulous achievements of Indian scientists and technologists.

At the same time, scientific research – combined with favourable public policies – has made India self-sufficient in production of food, milk, fruits and vegetables, drugs and vaccines. All this has had great social and economic impacts and directly and indirectly touched the lives of ordinary Indians. Developments in communications and information technology have enabled timely forecast of weather and early warning of cyclones, saving thousands of lives.

These are all results of investments made in scientific research soon after the independence and science-politics network built in decades prior to that. Investment in scientific research was 0.1 percent of GNP in 1947. It went up to 0.5 percent in less than a decade. Scientists like Shanti Swarup Bhatnagar, Homi Jehangir Bhabha and Prasanta Chandra Mahalanobis not only built scientific institutions but also helped shape policies.

Here are seven defining contributions of Indian science and technology since 1947:

**Green Revolution:** In 1947, India produced about 6 million tonnes of wheat which was grossly inadequate to meet the total demand forcing the country to depend on large scale imports. With measures such as land reforms, improvements in irrigation facilities, fertilizer production and Intensive Agriculture District Programme, wheat production rose to 12 million in 1964 – which was still insufficient to feed all Indians. While all this was going on, plant breeder Benjamin Peary Pal at the Indian Agriculture Research Institute was working on improving wheat varieties to achieve disease resistance and yield. The first breakthrough came in 1961 when a dwarf spring wheat variety with the Norin-10 dwarfing gene – developed by Normal Borlaug in Mexico- was grown in IARI. It had reduced height but long panicles. Later semi-dwarf varieties were grown in farmers' fields, yielding great results. These developments led to launch of the High Yielding

Varieties Programme covering not just wheat but rice, maize, sorghum and pearl millet. The All India Coordinated Wheat Research Project under Pal remains an outstanding example of agriculture research. By 1970, wheat production went up to 20 million tonnes and rice production to 42 million tonnes. Thus began the Green Revolution, making India self-sufficient in foodgrain production in the decades to come.

**White Revolution:** At the time of the independence, India was not only importing foodgrains but also milk products like baby food, butter and cheese. In 1955, India was importing 500 tonnes of butter and 3000 tonnes of baby food from dairy companies in Europe. The dairy movement had started in 1946 with the founding of the Kaira District Cooperative Milk Producers Union Limited under the leadership of Tribhuvandas Patel. In 1949, Verghese Kurien arrived in Anand to fulfil the condition laid down in the bond he had signed with the government at the time of going to America for higher education with government scholarship. He stayed back and became General Manager of the cooperative in 1950. The dairy faced a problem of fluctuating milk production as surplus milk would find no takers. European dairy companies were not willing to part with milk powder technology and were of the view that buffalo milk can't be converted into milk powder. H M Dalaya, a young dairy engineer working with Kurien at Anand, demonstrated with experiments that buffalo milk can be converted into milk powder. Dalaya assembled a device using a spray paint gun and an air heater to make powder from buffalo milk, for the first time in the world. Later he showed that a commercially available machine, Niro Atomizer, could do the same. This laid the foundation for a dairy revolution in India and a national milk grid, making the country self-sufficient.

**Satellite and communication revolution:** When Vikram Sarabhai, as chairman of the Indian National Committee for Space Research, in mid-1960s envisioned the use of satellite technology for communication, remote sensing and weather prediction, few people believed him because India then did not possess any capability in building a rocket or a satellite. He wanted India to use space technology for education, health and rural development. Within a decade, India not only developed such a capability but demonstrated to the world peaceful use of space technology with the success of the Satellite Instructional Television Experiment (SITE), and the launch of Aryabhata satellite from the Soviet Union. In another decade, Indian scientists launched the landmark INSAT and IRS series of satellites, bringing communication and television services to millions of people across the country. Timely prediction of weather events like cyclones using

India-made satellites has helped save lives. Through pioneering use of the VSAT (Very Small Aperture Terminal) technology, banking and other services were revolutionized in the 1980s.

**Drugs and vaccines manufacturing:** India today is known as ‘pharmacy of the world’ as Indian companies are supplying affordable drugs and vaccines to not only developing but also to developed countries. It has been a long journey from the time when Indian drug industry was dominated by foreign companies whose drugs were prohibitively costly. In order to break the hold of multinational corporations, the central government established Hindustan Antibiotics Limited in 1954 and then the Indian Drugs and Pharmaceuticals Limited (IDPL) with Soviet assistance. These public sector units – along with national laboratories like National Chemicals Laboratory (NCL), Regional Research Laboratory Hyderabad (now known as Indian Institute of Chemical Technology) and Central Drug Research Institute – played a central role in generating necessary knowledge base and human resources needed for Indian industry to grow. The Patent Act of 1970 recognised only process patents, paving the way for Indian companies to make copies of patented drugs using alternative processes. CSIR labs developed processes for a range of drugs – ciprofloxacin, diclofenac, salbutamol, omeprazole, azithromycin etc. – and transferred the technology to private companies. Over next two decades, all this helped develop indigenous capabilities in both R&D and manufacturing.

**C-DOT and telecom revolution:** Like most other sectors, telecom sector too was dependent on supplies from multinational corporations, and due to high costs as well as shortage of foreign exchange new technology could not come in. The switching technology was considered strategic and only a handful of companies possessed it. The waiting period for a telephone line in India in the 1970s was several years, and connectivity in rural areas was extremely poor. The first attempt to develop an indigenous electronic exchange was initiated at the Telecom Research Centre (TRC) in the 1960s and the first breakthrough was a 100-line electronic switch developed in 1973. Around the same time, scientists at the Tata Institute of Fundamental Research (TIFR), along with those from IIT Bombay, developed a digital Automatic Electronic Switch for the army. These efforts got a boost in 1984 when the government established the Centre for Development of Telematics (C-DOT) by pooling scientific teams from TRC and TIFR under the leadership of Sam Pitroda. The rural telephone exchange developed by Indians could work under harsh conditions and without air conditioning. The technology developed in public sector was transferred for free to private companies, ending the monopoly of multinational giants and

rapidly bringing connectivity to rural areas. C-DOT exchange became popular in dozens of developing nations.

**IT revolution and railway computerisation:** The data processing industry in India during the decades after the independence was dominated by two multinationals – IBM and ICL. The data processing machines of these two firms were in use in the government, public sector, armed forces as well as research institutes. These companies brought old and discarded machines to India and leased them at high rentals. India needed latest computers for applications like National Sample Surveys, nuclear reactor development and other research. In order to break the monopoly of big companies and spur indigenous software and hardware development, the Department of Electronics was established in 1970. Public sector companies like Electronics Corporation of India Limited (ECIL), Computer Maintenance Corporation (CMC) and state electronics development corporations were established. The skills and knowledge thus developed got transferred to private industry. The first major application of information technology was the passenger reservation project of the Railways launched in 1986. It was the largest such project which demonstrated how technology can improve efficiency, cut corruption and touch the lives of millions without the need for them owning a digital gadget.

**Blue Revolution:** The ‘blue revolution’ refers to adoption of a set of measures to boost production of fish and other marine products. It was formally launched with the establishment of the Fish Farmers’ Development Agency during the Fifth Five-year Plan in 1970. Later on, similar development agencies were set up for brackish water development to boost aquaculture in several states. The objective of all this was to induce new techniques of fish breeding, rearing and marketing, as well as initiate production of other marine products like prawns, oysters, seaweeds, pearls and so on, using new techniques and scientific inputs. Scores of new technologies developed by research institutes under the Indian Council of Agriculture Research (ICAR) have been transferred to fish farmers all over the country. (India Science Wire)

<https://newsroom24x7.com/2017/08/14/seven-defining-st-contributions-that-have-impacted-every-indian/>

## 70 years of Independence: India poised to join league of global scientific leaders

15/08/2017

[Dr T. V. Venkateswaran](#)



The Science Technology and Innovation policy of 2013 envisages positioning India among the top five global scientific powers by 2020.

Shedding its hesitant and cautious approach of the past with regard to participating in global mega science projects, India has taken bold steps in recent years to join international scientific quests.

The Science Technology and Innovation policy of 2013 envisages positioning India among the top five global scientific powers by 2020. In addition to home-grown science and engineering projects, the policy advocated participation in global science projects arguing that as a civilised country we must also participate in global mega science projects aiming to find out, for example, the ultimate structure of matter or the origin of the universe.

Here are some of India's Big Science initiatives:

>Feeling the fabric of space-time: The detection of [gravitational waves](#) for the first time in February 2016 after a century of speculation and decades of tenacious attempts to improve sensitivity of instruments to detect these elusive waves, was hailed as the 'discovery of the century'. Of over 1000 scientists from 15 countries who jointly made this discovery, 39 were from India. Indian scientists made direct contributions € " ranging from designing algorithms used to analyse signals registered by detectors to ascertain those from a gravitational wave to

working out parameters like estimating energy and power radiated during merger, orbital eccentricity and estimating the mass and spin of the final black hole and so on. Currently, there are only two detectors in operation, both in America. Building on their strength, Indian astronomers are proposing to build the third detector somewhere in Maharashtra. Called Indian [LIGO](#) (IndiGO), the instrument matching the two LIGO observatories in the US would enable scientists to pinpoint the source of gravitational waves.

>Big Bang: India became a full Associate Member of "God particle" fame CERN on 16 January 2017, thereby getting full access to data generated at the world's largest particle physics laboratory. Currently, [CERN](#) has 22 member states. Indian scientists have helped build the [Large Hadron Collider \(LHC\)](#), the most powerful particle collider in the world as well as the construction of two significant CERN experiments, CMS and ALICE. Incidentally, CMS is one of the two experiments that discovered the Higgs Boson, popularly called as 'God particle' and ALICE creates conditions that existed at the time of big bang.

>Digging deep: Shivajisagar lake was impounded in the Koyna region in Maharashtra to create an artificial reservoir in 1962. The massive earthquake of magnitude 6.3 that occurred in 1967 brought to light dangers of Reservoir Triggered Seismicity (RTS). Since its construction, the region has witnessed 22 earthquakes exceeding magnitude 5, 200 exceeding magnitude 4 and several thousand smaller earthquakes. Indian geophysicists have drilled a seven-km deep borehole in this earthquake zone and have established an on-the-spot observatory to study earthquakes. The observatory is studying physical and mechanical properties of rocks before, during and after a quake; physical and chemical changes in the earth's crust that occur during an earthquake; and temperature change that impels melting of rocks. Geologists are hopeful that the knowledge garnered from the web of 15 earthquake sensors and the on-spot data collection, has potential for making earthquake forecasts possible in future.

>Making of atoms: India is part of the international Facility for Antiproton and Ion Research (FAIR) coming up at Darmstadt, Germany for studying the building blocks of matter and the evolution of the Universe. This sophisticated accelerator complex will use high-energy, precisely-tailored ion beams to mimic the conditions inside the core of stars and early phase of the universe.

The 1.2-billion euro facility will study the structure of matter and the evolution of the universe since the Big Bang. While the Helium and hydrogen were formed in the early universe, rest of

the elements it is postulated were cooked inside the stars. The facility would also shed light on the creation of heavy elements in stars and also the interiors of planets. Indian institutions will be engaged in building NUSTAR (Nuclear Structure, Astrophysics and Reactions), CBM (Compressed Baryonic Matter) and PANDA (Antiproton Annihilation at Darmstadt) in addition to building equipment to be used at the heart of the FAIR accelerator.

<https://in.news.yahoo.com/70-years-independence-india-poised-013147479.html>

## India surges ahead in science and technology

14/08/2017

Dinesh C. Sharma and Dr T. V. Venkateswaran

*India has made significant contributions in the field of science and technology. It is expected to grow in the years to come.*



*The blue revolution changed the way India looked at its marine wealth. (Source: IWP Flickr photos)*

As India completes 70 years of its independence, let's take a moment to introspect the contribution of science and technology to national development. Several scientific and technological developments have touched the lives of common people, though limelight is often hogged by achievements in fields like space and atomic energy.

In the past seven decades, India has built satellites and sent probes to the moon and Mars, established nuclear power stations, acquired nuclear weapon capability and demonstrated firepower in the form of a range of missiles. Undoubtedly these are all fabulous achievements of Indian scientists and technologists.

At the same time, scientific research, combined with favourable public policies, has made India self sufficient in the production of food, milk, fruits and vegetables, drugs and vaccines. All this has had great social and economic impact which directly and indirectly touched the lives of ordinary Indians. Developments in communications and information technology have enabled the timely forecast of weather and early warning of cyclones, saving thousands of lives. Among the many defining contributions of science and technology in the early years of Indian independence, blue and green revolutions stand out as exceptional. In the later years, India also began participating in global mega science projects taking bold steps to join international scientific quests.

Here's a lowdown on some of India's exceptional work in the past and some ongoing projects in the field of science and technology.

**Blue revolution:** The blue revolution refers to the adoption of a set of measures to boost production of fish and other marine products. It was formally launched with the establishment of the Fish Farmers' Development Agency during the Fifth Five-year Plan in 1970. Later on, similar development agencies were set up for brackish water development to boost aquaculture in several states. The objective of all this was to induce new techniques of fish breeding, rearing and marketing, as well as initiate production of other marine products like prawns, oysters, seaweeds, pearls and so on, using new techniques and scientific inputs. Scores of new technologies developed by research institutes under the Indian Council of Agriculture Research (ICAR) have been transferred to fish farmers all over the country.

**Green revolution:** In 1947, India produced about six million tonnes of wheat which was grossly inadequate to meet the total demand forcing the country to depend on large scale imports. With measures such as land reforms, improvements in irrigation facilities, fertiliser production and Intensive Agriculture District Programme, wheat production rose to 12 million in 1964, which was still insufficient to feed all Indians. While all this was going on, plant breeder Benjamin Peary Pal at the Indian Agriculture Research Institute was working on improving wheat varieties to achieve disease resistance and yield. The first breakthrough came in 1961 when a dwarf spring wheat variety with the Norin-10 dwarfing gene—developed by Normal Borlaug in Mexico—was grown in IARI. It was short but had long panicles. Later, semi-dwarf varieties were grown in farmers' fields, yielding great results. These developments led to the launch of the [High Yielding Varieties Programme](#) covering not just wheat but rice, maize, sorghum and pearl millet. The All India Coordinated Wheat Research Project under Pal remains an outstanding example of agriculture research. By 1970, wheat production went up to 20 million tonnes and rice production to 42 million tonnes. Thus began the green revolution, making India self-sufficient in foodgrain production in the decades to come.



*Accurate cyclone prediction can save many lives. (Source: IWP Flickr photos)*

**Predicting rain:** The India Meteorological Department (IMD) is developing a dynamic weather prediction model involving 3D mathematical simulation of the atmosphere on the computer and to test variations of dynamic models to ferret out the best ones for the operational forecast of rainfall. While the ultimate goal is to get operational weather forecasts at a horizontal resolution of 12 km, by 2019, [National Monsoon Mission](#) will provide a block-level weather forecast. With the improvements in forecast, 24-hour track and intensity forecast error of the tropical cyclones reduced from 141 km to 97 km and “landfall error” from 99 km to 56 km during 2006 to 2015. The accurate forecast of the recent cyclones, Phailin, HudHud and [Vardah](#) saved thousands of human lives.

**Churning the sea:** Using research vessel [Gaveshani](#), Indian researchers had collected samples of polymetallic nodules from the Arabian Sea in 1981 and India was given a pioneer area for the exploration of deep sea minerals in the Central Indian Ocean Basin in 1987. Subsequently, extensive surveys were carried out leading to allocation of an area of 150,000 sq km with exclusive rights under the UN Law of the sea. India has access to an area of 75,000 sq km with an estimated resource of about 100 million tons of strategic metals such as copper, nickel, cobalt besides manganese and iron. As various national institutions have developed technologies for the extraction of metals from the minerals, India will soon establish [First Generation Mine site](#) (FGM) with an area of 18,000 sq km and harvest natural resources from the sea bed. The multi-purpose deep ocean mission will also try to harness deep ocean energy, deep sea fishing along with deep sea mining. Further technologies for seawater desalination to obtain potable water will also be undertaken. (India Science Wire)

<http://www.indiawaterportal.org/articles/india-surges-ahead-science-and-technology>

## Ten top science projects to take India to the league of global leaders

14/08/2017

Dr T. V. Venkateswaran

Shedding its hesitant and cautious approach of the past with regard to participating in global mega science projects, India has taken bold steps in recent years to join international scientific quests. These projects will take India to the league of global players in science and technology. PSLV-C25 for Mars Orbiter Mission (Image courtesy: ISRO) New Delhi (ISW) - Shedding its hesitant and cautious approach of the past with regard to participating in global mega science projects, India has taken bold steps in recent years to join international scientific quests. The Science Technology and Innovation policy of 2013 envisages positioning India among the top five global scientific powers by 2020. In addition to home-grown science and engineering projects, the policy advocated participation in global science projects arguing that as a civilised country we should also participate in global mega science projects aiming to find out for example the ultimate structure of matter or the origin of the universe. Here are some of India's Big Science initiatives: Feeling the fabric of space-time: The detection of gravitational waves for the first time in February 2016 after a century of speculation and decades of tenacious attempts to improve sensitivity of instruments to detect these elusive waves, was hailed as the 'discovery of the century'. Of over 1000 scientists from 15 countries who jointly made this discovery, 39 were from India. Indian scientists made direct contributions - ranging from designing algorithms used to analyse signals registered by detectors to ascertain those from a gravitational wave to working out parameters like estimating energy and power radiated during merger, orbital eccentricity and estimating the mass and spin of the final black hole and so on. Currently there are only two detectors in operation, both in America. Building on their strength, Indian astronomers are proposing to build the third detector somewhere in Maharashtra. Called Indian LIGO (IndiGO), the instrument matching the two LIGO observatories in the US would enable scientists to pinpoint the source of gravitational waves. Big Bang: India became a full Associate Member of "God particle" fame CERN on January 16, 2017, thereby getting full access to data generated at the world's largest particle physics laboratory. Currently, CERN has 22 member states. Indian scientists have helped build the Large Hadron Collider (LHC), the most powerful particle collider in the world as well as construction of two significant CERN experiments, CMS and ALICE. Incidentally CMS is one of the two experiments that discovered the Higgs Boson, popularly called as 'God particle' and ALICE creates conditions that existed at the time of big

bang. Digging deep: Shivajisagar Lake was impounded in the Koyna region in Maharashtra to create an artificial reservoir in 1962. The massive earthquake of magnitude 6.3 that occurred in 1967 brought to light dangers of Reservoir Triggered Seismicity (RTS). Since its construction, the region has witnessed 22 earthquakes exceeding magnitude 5, 200 exceeding magnitude 4 and several thousand smaller earthquakes. Indian geophysicists have drilled a seven-km deep borehole in this earthquake zone and have established an on-the-spot observatory to study earthquakes. The observatory is studying physical and mechanical properties of rocks before, during and after a quake; physical and chemical changes in the earth's crust that occur during an earthquake; and temperature change that impels melting of rocks. Geologists are hopeful that the knowledge garnered from the web of 15 earthquake sensors and the on-spot data collection, has potential for making earthquake forecasts possible in future.

Making of atoms: India is part of the international Facility for Antiproton and Ion Research (FAIR) coming up at Darmstadt, Germany for studying the building blocks of matter and the evolution of the Universe. This sophisticated accelerator complex will use high-energy, precisely-tailored ion beams to mimic the conditions inside the core of stars and early phase of the universe. The 1.2-billion euro facility will study the structure of matter and the evolution of the universe since the Big Bang. While the Helium and hydrogen was formed in the early universe, rest of the elements it is postulated were cooked inside the stars. The facility would also shed light on the creation of heavy elements in stars and also the interiors of planets. Indian institutions will be engaged in building NUSTAR (Nuclear Structure, Astrophysics and Reactions), CBM (Compressed Baryonic Matter) and PANDA (Antiproton Annihilation at Darmstadt) in addition to building equipment to be used at the heart of the FAIR accelerator.

Looking back in time: India has joined nine other nations to build the world's largest and most sensitive radio telescope - Square Kilometre Array (SKA). It will combine signals received from thousands of small parabolic and dipole antennas spread over a distance of several thousand kilometres across Africa and Australia. Karoo desert in South Africa will host the core of the 350 megahertz to 14 gigahertz mid-frequency dish array while the Australian telescope will observe lower-frequency scale, from 50 to 350 megahertz and the total detection area of the receiver dishes would exceed 1 square kilometre. A large number of dipole antennas are capable of receiving very low frequencies while the 3000 odd parabolic antennas operate at higher frequencies. Combining signals from all these thousands of antennas would simulate a single giant radio telescope with extremely high sensitivity. The sensitivity of this

radio telescope would be fifty times more than any other radio telescope and it will be able to survey the sky 10,000 times faster enabling astronomers to even capture faint radio signals emitted by cosmic sources billions of light years away from Earth. With such a powerful telescope, astronomers could peer deep into the universe, way back in time when the first stars were emerging.

**Shining like Sun: The International-Thermonuclear-Experimental-Reactor (ITER)** has embarked upon an ambitious project to build a little bit of Sun in laboratory conduction. While the conventional nuclear reactor breaks a heavy atom like plutonium to gather the binding energy, the fusion reactor will fuse two light elements like say hydrogen into helium to harness the energy. As fusion reactors will not use any radioactive materials, yet generate immense energy, it is considered as a clean-green source of energy. The high temperature in the core of the stars results in light elements becoming highly ionised and attain plasma state. It is in this plasma state that two or more light elements could fuse. If we have to re-create such a condition on Earth, then we need to make a small amount of hydrogen into plasma before we can achieve fusion. One of the challenges is to contain high temperature plasma in a confinement to achieve the fusion. The experimental nuclear fusion reactor being built at Cadarache in south of France hopes to harness fusion reaction to generate energy. European Union, United States, Japan, China, Russia, South Korea and India are jointly building and operating this test facility. Institute for Plasma Research, Ahmedabad is contributing crucial parts of the tokamak reactor's gigantic cryostat.

**Predicting rain: The India Meteorological Department (IMD)** is developing a dynamic weather prediction model involving 3D mathematical simulation of the atmosphere on computer and to test variations of dynamic models to ferret out the best ones for operational forecast of rainfall. While the ultimate goal is to get operational weather forecasts at a horizontal resolution of 12 km, by 2019 National Monsoon Mission will provide block level weather forecast. With the improvements in forecast, 24-hour track and intensity forecast error of the tropical cyclones reduced from 141 km to 97 km and 'landfall error' from 99 km to 56 km during 2006 to 2015. The accurate forecast of the recent cyclones, Phailin, Hudhud and Vardah saved thousands of human lives.

**Churning the sea: Indian research vessel, Gageshani,** had collected samples of poly metallic nodules from Arabian Sea in 1981, giving the country an unenviable position in exploration of deep sea minerals in the Central Indian Ocean Basin in 1987. Subsequently extensive surveys were carried out leading to allocation of an area of 150,000 sq km with exclusive rights under the UN Law of the sea. India has access to an area of 75,000 sq

km with an estimated resource of about 100 million tons of strategic metals such copper, nickel, cobalt besides manganese and iron. As various national institutions have developed technologies for extraction of metals from the minerals, soon India would establish First Generation Mine-site (FGM) with an area of 18,000 sq km and harvest natural resources from the sea-bed. The multi-purpose deep ocean mission would also try to harness deep ocean energy, deep sea fishing along with deep sea mining. Further technologies for sea water desalination to obtain potable water would also be undertaken. Looking deep: The Thirty Meter Telescope (TMT), world's advanced ground based telescope, is expected to outsmart all ground-based telescopes once it is operational. Made of 492 individual segments, the telescope mirror would have a reflective diameter of 30 meters and would be 81 times more powerful than any other telescope. It a partnership project involving CalTech, Universities of California, Canada, Japan, China and India. While initial location chosen was Hawaii, Hanle in Ladakh was also considered as an alternative. However, it may perhaps be finally located in Chile. Building of such a massive telescope is a technological challenge. The mirror segments have to be aligned precisely with each other and the adoptive optics proposed would eliminate the twinkling effect caused by atmospheric thermal disturbances. India will develop and manufacture 15% of the mirror segments and assembly. Reaching for stars: India had taken the world by surprise, when it's Mars Orbiter Mission succeeded in its first attempt. Indian spacecraft reached the moon before that. Currently AstroSAT a multi wavelength space telescope is operational. ISRO in the coming years would add many more deep space missions to its credit. Chandrayan 2- with a lander and rover is proposed to be launched some time inn 2018-19. A mission to study the Sun – Aditya, is in the offing. Building upon the success of the Mars Orbiter Mission, ISRO is planning to send yet another spacecraft to study Mars. Indian space programme in addition to providing telecom, weather, navigational services, would also take a pride of place among the spacefaring nations of the world. Technological spinoffs of mega projects such as LHC or FAIR are immense. Technology developed in CERN went into making mammograms used for breast cancer detection, while the positron used in particle physics experiments gave us PET (Positron Emission Tomography). The study of fundamental particles is sure to yield newer imaging technologies. That's why it is important to invest in mega science projects. In arrangement with:

India                      Wire                      Service                      Image                      courtesy:                      ISRO

## नई पहल

कोयला या जीवाश्म गैस के बजाय पावर-टू-गैस टेक्नोलॉजी से उत्पादित सिंथेटिक अक्षय गैस का होगा उपयोग



# बिजली किल्लत दूर करेगा नया ग्रिड मॉडल

वास्कोडिगामा (गोवा), आइएसडब्ल्यू : दक्षिण एशियाई क्षेत्रीय सहयोग संगठन (सार्क) देशों में बिजली आपूर्ति की दिक्कतों को दूर करने के लिए वैज्ञानिकों एक नया ग्रिड मॉडल तैयार किया है। यह शत फीसद अक्षय ऊर्जा पर आधारित संकेन्द्रित विद्युत प्रणाली पर काम करता है। सार्क देशों के लिए वर्ष 2030 तक की अनुमानित लागत संरचना और प्रौद्योगिकी की स्थिति को मद्देनजर रखते हुए यह मॉडल तैयार किया गया है।

**24 घंटे होगी आपूर्ति :** इस मॉडल में कोयला या जीवाश्म गैस के बजाय पावर-टू-गैस टेक्नोलॉजी से उत्पादित की गई सिंथेटिक अक्षय गैस का उपयोग किया जाता है। ऊर्जा के भंडारण के लिए सिस्टम और प्रॉस्पेरर बैट्रियों का उपयोग किया गया है। इसके उपयोग से हर मौसम में बिजली की आपूर्ति 24 घंटे की जा सकती है। ग्रिड एकीकरण मॉडल में सार्क क्षेत्र में उपलब्ध भूतापीय ऊर्जा, अलवणीकरण जल और औद्योगिक गैस की मांग से संबंधित आंकड़ों का उपयोग करते हुए सौर ऊर्जा, पवन ऊर्जा, ऊर्जा भंडारण, ऊर्जा ब्रिजिंग और विद्युत संचरण समेत सभी तकनीकों को एकीकृत रूप में शामिल करके परीक्षण किया गया था। इसमें पाया गया है कि सार्क देशों के लिए अक्षय ऊर्जा पर आधारित एकीकृत विद्युत प्रणाली से कम कार्बन वाली बिजली उपलब्ध कराई जा सकती है।



## टीम में ये रहे शामिल

इस मॉडल को विकसित करने वाले अध्ययनकर्ताओं की टीम में फिनलैंड में शोधरत भारतीय वैज्ञानिकों आशीष गलगी एवं वीएचयू के वैज्ञानिक पीयूष चौधरी के अलावा फिनलैंड की लेप्पीनरान्टा यूनिवर्सिटी ऑफ टेक्नोलॉजी के वैज्ञानिकों दिमित्री वोग्दाओनोव और क्रिस्चिन ब्रेयर शामिल थे। उनका यह शोध प्लास नामक जर्नल में प्रकाशित किया गया है।

## लागत होगी कम

अध्ययनकर्ताओं के अनुसार सार्क देशों के सभी क्षेत्रों को आपस में एक केंद्रीकृत एकीकृत ग्रिड से जोड़ दिया जाए तो यहाँ सम्मिलित रूप से बिजली की कुल लागत में प्रति मेगावाट लगभग 333 रुपये तक की गिरावट हो सकती है।

## ज्यादातर आबादी बिजली से वंचित

भारत समेत सभी सार्क देश पाकिस्तान, बांग्लादेश, श्रीलंका, भूटान, मालदीव, नेपाल और अफगानिस्तान अपर्याप्त बिजली आपूर्ति से जूझ रहे हैं। इन देशों की ज्यादातर आबादी बिजली से वंचित है और घरेलू जरूरतों के लिए भी उन्हें बिजली नहीं मिल पाती है। इस संकट से निपटने के लिए ग्रिड एकीकरण मॉडल सार्क में महत्वपूर्ण भूमिका निभा सकता है।

## CSIR-IMTECH Chandigarh to Develop New TB Drug

**16/08/2017**

**Sunderarajan Padmanabhan**

New Delhi, August 16: The Institute of Microbial Technology, a constituent laboratory of the Council of Scientific and Industrial Research (CSIR), has identified two new molecules against tuberculosis and has joined hands with a private drug company for their further development.

Initial studies have shown promise of more effective and safe oral-based treatment regime to tackle all types of tuberculosis including multi-drug and extensively drug resistant forms, Dr. Anil Koul, director of the Chandigarh-based laboratory, told on Wednesday.

For further development of the new molecule, the CSIR lab will work with Johnson & Johnson. The agreement signed on Wednesday also covers two additional molecules developed by J&J for which the CSIR lab will collaborate with the drug company.

For all the four new molecules, preliminary studies have indicated they could be put together to develop a new drug regime for the disease. An agreement has been signed to explore the validity of initial findings. “While we will provide microbiology and medicinal chemistry expertise, the company will provide preclinical resources and drug development support,” he added.

Asked about aspects such as funding pattern for the project, Dr. Koul said all details like milestones, actual working relationships and costs are being worked. He added that other research institutions working in the area of TB were welcome to contribute to the programme. “We are interested in finding a lasting solution to the TB problem. All assistance is welcome.”

“India can move forward on the path of innovation and development and leverage its efforts through creating and strengthening desired partnership with industry in the domain of health research,” commented Dr. Harsh Vardhan, minister for science and technology.

<https://biotechtimes.org/2017/08/16/csir-imtech-chandigarh-develop-new-tb-drug/>

## Scientists Develop Natural Material For Faster Blood Clotting

16/08/2017

DR SWATI SUBODH

Indian scientists have developed a nature-inspired biomaterial with enhanced blood clotting efficiency to treat injuries.

Excessive blood loss due to injury may result in serious medical complications and, in extreme situations, even death. The problem could be severe in case of patients with impaired blood clotting capacity such as in hemophilia. To address this challenge, Indian scientists have developed a nature-inspired biomaterial with enhanced blood clotting efficiency to treat injuries. The new material has been developed by scientists at Indian Institute of Science Education and Research, Kolkata (IISERK) and Saha Institute of Nuclear Physics, Kolkata. Researchers have modified natural biomaterials, peptides, to develop sealants with improved strength, stability and clotting properties.

Computer based analyses was employed, using various approaches, to generate sealant structures with desired properties, explained Prof Dhananjay Bhattacharyya, a senior researcher of the study. These structures were then synthesized and evaluated under laboratory conditions.

These tests revealed that the engineered sealant was able to self-assemble, much like human body's natural clotting mechanism, to form an interwoven structure resembling a clot but in nearly half the time. This enhanced clotting rate can play an extremely crucial role in treating injuries sustained during accidents or military combat, researchers pointed out.

The natural material of the engineered sealant will ensure that it is tolerated by the body with minimal inflammatory response. It is also bio-degradable, similar to the natural clotting factor. "Such sealants might be potentially translated into clinics for handling traumatic coagulopathy and for treating patients suffering from impaired blood clotting", felt Sinha Roy.

The researchers claim that the sealant may also find use in treating injuries where surrounding healthy skin tissue is absent and the body is incapable of closing its own wounds. The study also proposes the use of the engineered sealants in suture-free wound closing, such as in deep cuts or after surgical procedure.

The research team included Snehasish Ghosh, Sanchita Mukherjee, Chiranjit Dutta, Kasturee Chakraborty, Paramita Gayen, Somnath Jan, Dhananjay Bhattacharyya and Rituparna Sinha Roy. (India Science Wire)

<https://www.outlookindia.com/website/story/scientists-develop-natural-material-for-faster-blood-clotting/300421>