



INAE Quarterly e-Newsletter Vol. IX, Issue 6, Dec 1, 2018

Academy Activities

Academy News

Articles by INAE Fellows

Engineering and Technology Updates

Engineering Innovation in India

Previous E-newsletter

From the Editor's Desk

Looking back and looking forward

I have been writing 'Editorial' for the INAE e-newsletter for the past six years. I have enjoyed every moment of this journey. I am grateful to INAE for granting me the opportunity to work together.

This is my last editorial for the e-newsletter. I have tried to cover various areas, in the hope that my colleagues will like it. I have said nothing new. I have said what they already knew. Knowing the known has been my favorite past time. I have asked questions, like, what sites/sites are most appropriate to set up innovation centres.

Read more

Purnendu Ghosh  
Chief Editor of Publications

Editorial Board, INAE

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Search

Recent Activities

Proceedings of the Brain Storming Session: Industrial By-Products for Sustainable Development held on

Aug-22-2018 at IIT Bombay

Competition of Prof. Jai Krishna and Prof. SN Mitra Memorial Award

Lectures

INAE e-Newsletter

Quarterly e-Newsletter for December 2018

Forthcoming Activities

Electromagnetics (IWF)

13th - 15th Dec

Generaly Council (AGM) Annual Convention

## **From the Editor's Desk**

### **Looking back and looking forward**

I have been writing 'Editorial' for the INAE e-newsletter for the past six years. I have enjoyed every moment of this journey. I am grateful to INAE for granting me the opportunity to walk together.

This is my last editorial for the e-newsletter. I have tried to cover various issues, in the hope that my colleagues will like it. I have said nothing new. I have said what they already knew. Knowing the known has been my favourite past time. I have asked questions, like, what sized cities are most appropriate to set up innovation centres. I have talked about the oil of twenty-first century – water. "One of the most important limitations is that no one wants to think that he has more than what is required by him." Many of our engineering problems, I feel, need non-engineering solutions, besides of course engineering solutions.

In one of the editorials, I said, "In this century biology has become so important that it can't be left only to the biologists." I said, in the changing world, our future engineers are expected to develop a "feeling for the organism". I wanted to know - How best can we address the problems of biology to engineering students?

I talked about the role of Fellows of the Academy in nation building. Regarding the design of scientific meetings, I felt, for 'session free afternoons' the preferable place is where there are minimal distractions. "Picturesque places do not necessarily distract, but could be so. Austere facility for holding the meets is really what one needs to encourage."

In view of the increasing population and rapid urbanization the need to critically examine underground structures was one of the subjects of my editorial. In another, I wrote, "There are few things that need to be said again and again; lest they are forgotten. Our old sacred texts have followed this practice. Ethics is one such thing." Cicero said, "public safety must be pre-eminent in everything engineers do."

Engineering is polymathic; "further afield your knowledge extends the greater potential you have for innovation", say the experts. We have to ask ourselves – Do we take pride in designing a thing and manufacturing it as we take pride in packaging and selling it?

One of the difficult questions I asked was - Is it too much if we expect our politicians to understand the needs of an open system in society? 'Smart' people think that politics is not their cup of tea. They don't want to take the plunge in the muddy waters of politics. We also don't want un-smart and mediocre people to run the country. What is the solution then? Like many, I believe, our country needs political leaders who have relatively large neocortex. These large neocortex containing politicians can only restore faith of the people in the virtues of politics and public service. We the humans have a deep yearning to visualise the big canvas, and work together effectively to see the big picture. Perhaps this is one of the major driving forces of becoming a world leader.

Does retirement mean a waste of intellectual capital? Perhaps, elders possess better crystallized intelligence; a reflection on one's knowledge base, what one knows, knows it well. Perhaps, the younger lot have better grasp on fluid intelligence; a reflection on one's capacity to learn and manipulate new information. Perhaps, retirement is not a waste of intellectual capital.

Engineers are expected to develop cost effective engineering solutions, and to deal with tough situations soft armoury is not enough. Country, not only wants exceptional scientists and engineers, but also people who are temperamentally innovators, and think they fit into the country's core values. The young generation knows how to find support for what they need. They are not afraid to take risks. Mistakes strengthen their self-confidence. In an innovation ecosystem, "experienced people can mingle with newbies."

The essence of Indian diversity is that you can be many things, and also one thing. The Indian identity is not only 'surviving' but also 'absorbing', says Amartya Sen. Individual is an intersection of varieties of identities. "To assert one identity is not to deny another." Our identity is also not that fragile, as many think. "I think the assumption of fragility has done a great damage, a lot of harm to our ability to absorb from other

cultures,” asserts Sen. India is a tolerant and multicultural nation and has a long tradition of heterodoxy, openness, and reasoned discourse. To see India “as overwhelmingly religious, or deeply anti-scientific, or exclusively hierarchical, or fundamentally sceptical involves significant oversimplification of India’s past and present,” is how Sen sums up Indian identity.

We feel good when we see the faster version of life. Can we ask ourselves a simple question - Are we losing the ability to endure the long shot, the slow dissolve, the sustained monologue; are we missing subtlety, amidst plenty?

At the end, my humble salute to the most beautiful minds

A beautiful mind has the desire to know and capacity to understand  
It believes in connectivity and continuum  
It values relationships that do not terminate with the termination of the purpose  
It envisions the visible and perceives the invisible  
It knows, but doesn’t display  
It can be absent-minded but can change the mindset  
Often unpredictable, misunderstood, imperfect, disproportionate, and limited  
Transcends, sometimes, but mostly, ahead of time

A very HAPPY NEW YEAR to all my distinguished colleagues.

PURNENDU GHOSH



**Purnendu Ghosh**  
**Chief Editor of Publications**

## ACADEMY ACTIVITIES

### **Abdul Kalam Technology Innovation National Fellowship**

The second call for nominations for the year 2018-19 has been announced for the INAE-SERB, DST Abdul Kalam Technology Innovation National Fellowship, launched in the year 2017; to recognize, encourage and support translational research by Indian Nationals working in various capacities of engineering profession, in **public funded institutions in the country**.

The Fellowship is applicable to persons engaged in the engineering profession only. The nominee should have a minimum of 5 years' service left in the parent organization. The Fellowship amount is Rs 25,000/- per month in addition to salary being drawn. A Research Grant of Rs.15.00 lakh per annum, which can be utilized for engineering research and innovation activity including hiring of manpower, consumables, national and international travel for research purposes, chemicals, equipment, etc will also be provided. A maximum of 10 Fellowships will be awarded per year. The duration of the Fellowship will be initially for three years, extendable by upto two more years depending on the performance and the Fellowship can be held for a maximum of 5 years. The guidelines and nomination proforma for the subject Fellowship can be downloaded from INAE website [www.inae.in](http://www.inae.in)

Nominations are accepted for the Fellowship throughout the year. In addition, two calls for nominations are announced in each Financial Year. A soft copy of the nomination is required to be forwarded to INAE through email followed by one ink signed original hard copy to be sent to INAE Office, Gurgaon through Speed Post/Courier.

**All the nominees who had applied earlier in response to the first call for nominations for the Financial Year 2018-19 are not eligible to apply again this year, since a nominee may apply only once in a year. However, a nominee may apply again once in each subsequent Financial Year till he/she has a residual service of five years left in his/her parent organization.**

**The last date for the receipt of nominations for the second call of Nominations for the Financial Year 2018-19 is Dec 31, 2018.**

**Selection of Candidates for conferment of Abdul Kalam Technology Innovation National Fellowship by the Search – cum - Selection Expert Committee during Meeting on July 2, 2018**  
The Search – cum - Selection Expert Committee for the Abdul Kalam Technology Innovation National Fellowship, during its first meeting for the Financial Year 2018-19, held on July 2, 2018, considered the quality of the translational research in the proposals and selected the following for conferment of the Fellowship w.e.f August 1, 2018.

- i) Prof B Ravi, IIT Bombay
- ii) Prof PV Madhusudhan Rao, IIT Delhi
- iii) Prof Amrutur Bharadwaj, Indian Institute of Science, Bangalore
- iv) Dr G Kumaraswamy, CSIR -NCL, Pune
- v) Prof Samir K Pal, SN Bose National Centre for Basic Sciences, Kolkata

### **Engineers Conclave 2018 (EC-2018)**

The sixth Engineers Conclave 2018 (EC-2018) was organized jointly with Larsen & Toubro (L&T) on Oct 4-6, 2018 at L&T LDA, Lonavala. The two themes for EC-2018 were “**Defence Manufacturing in Industry**” coordinated by L&T (Defence) and “**Engineering Challenges in Urban Infrastructure**” coordinated by INAE. Mr. SN Subrahmanyam, CEO & MD, L&T was the Chair and Dr BN Suresh, President, INAE was the Co-Chair of EC-2018. Dr. Subhash Bhamare,

Hon'ble Raksha Rajya Mantri was the Chief Guest for the occasion and Dr. Ajay Kumar, Secretary Defence Production was the Guest of Honour.

The Inaugural Session commenced with the lighting of the lamp and the Invocation which was followed by the Welcome Address by Mr. BA Damahe, Convener, EC-2018. The dignitaries on the dais then addressed the gathering. Dr BN Suresh, President, INAE delivered the Presidential Address during which he highlighted the mandate of the Academy along with the background and aim of the Conclave.



*Left to Right: Dr. BN Suresh delivering the Presidential Address, Mr. JD Patil, Dr. Ajay Kumar, Dr. Subhash Bhamare and Mr. SN Subrahmanyam*

During the address by Mr. JD Patil, Whole-time Director (Defence Business) & Sr. Executive Vice-President, L&T, he shared the history and major verticals of L&T Defence Production with respect to Theme I of the Conclave. Thereafter, Mr. SN Subrahmanyam, CEO & MD, L&T and Chair, EC-2018 addressed the audience and emphasized on the aspects of Information Modelling with respect to Urban Infrastructure. He cited various examples wherein L&T has taken initiative of incorporating various tools of Information Modelling.

The Guest of Honour Dr. Ajay Kumar, Secretary Defence Production appreciated the importance of the two themes of the Conclave which are of national importance. He briefed the gathering on New Defence Procurement Policy with special emphasis on the ease of procurement and import/export of Defence equipments.





*Dr. Ajay Kumar, Secretary, Defence Production & Guest of Honour, EC-2018 delivering Address during Inaugural Function on Oct 4, 2018 at L&T LDA Lonavala*

Dr. Subhash Bhamare, Hon'ble Raksha Rajya Mantri, Chief Guest emphasized the importance of the Defence Manufacturing in Industry with respect to the relevance of being self-reliant in Defence, as a major initiative towards Make in India Campaign and Nation's security. Since a number of dignitaries and senior luminaries in the fields of Defence Manufacturing participated in the two-day event, he also recommended the forwarding of the actionable recommendations to his Ministry for consideration.



*Dr. Subhash Bhamare, Hon'ble Raksha Rajya Mantri delivering Address during the Inaugural Function of EC-2018 on Oct 4, 2018 at L&T LDA Lonavala*

The highlights of the Conclave were the four Plenary Talks delivered by Mr. Madhukar Srivastava, Head, Technology & Solution, L&T on 'Smart Cities: Bringing About Urban Revolution'; Swami Swatmananda, Chinmaya Mission, Mumbai on 'Science, Technology & Spirituality'; Mr. JD Patil, Member of Board, L&T on 'Policy Drivers & Enablers to Create a Vibrant National Defence Industrial Base' and Dr. Mangu Singh, MD, DMRC on 'Future of Metro Transportation in India'.

A sideline Luncheon meeting chaired by Dr. Subhash Bhamare, Hon'ble Raksha Rajya Mantri on "Defence Production Policy 2018: Converting Vision to Reality – What is needed to make it?" was held with concerned stakeholders and senior dignitaries.

Eminent experts and senior functionaries from Government, Academia, R&D and Industry participated in the conclave to deliberate on the important themes of the EC-2018. There were about 300 participants including 80 INAE Fellows and Young Associates in the Engineers Conclave 2018. The five Technical Sessions on Theme -I on 'Defence Manufacturing in Industry' were on "Ecosystem Creation for Defence Manufacturing"; "Design & Make in India": Boosting Industrial R&D in Defence"; "Policy Interventions to Facilitate Public-Private- User Partnership"; "Role of Talent and Skill Development" and "Enabling International Collaboration in Defence Manufacturing". Similarly, the five Technical Sessions on Theme -II on 'Engineering Challenges in Urban Infrastructure' were on "Challenge of Building Flyovers under 180 Days"; "Technologies for Traffic Movement Including Synchronizing Traffic Signals"; "Technologies for Rapid Mass Movement"; "Technologies for City Waste and Environment Management" and "Connected Citizen: Digital Enablement of Services Offering". Parallel Panel Discussion Sessions on the two themes on Way Forward were held which were chaired by respective Coordinators viz. Theme I by Mr. A Ramchandani, VP, L&T Defence and Theme II by Mr. KV Praveen, EVP & Head, Road Runways & Elevated Corridor, L&T and Mr. Madhukar Srivastava, Head, Technology & Solution, L&T.

The Conclave ended with the Valedictory Session chaired by Dr. R Chidambaram, Padma Vibhushan and Former Principal Scientific Advisor to the Govt. of India wherein the summary of deliberations emanated from five Technical Sessions of the two themes were presented by the respective Coordinators. The Valedictory Address was then delivered by Dr. R Chidambaram. Actionable recommendations based on the deliberations of the two themes are under compilation which will be forwarded to the concerned Government Departments/Agencies for consideration.

#### **National Frontiers of Engineering Symposium (12NatFoE) at IIT Guwahati**

The Twelfth National Frontiers of Engineering (12NatFoE) Symposium was held from September 17-18, 2018 at IIT Guwahati. Prof Gautam Biswas, FNAE, Director, IIT Guwahati had kindly consented to host the 12NatFoE Symposium at IIT Guwahati. Prof Sukumar Nandi, FNAE was the Convenor of 12NatFoE Symposium. The aim of the symposium was to bring together young and outstanding engineering professionals (aged ~30-45 years) from industry, universities, and research organizations to deliberate upon emerging and leading-edge research and development work in the domain of engineering and technology. Convening engineering professionals and technologists from various fields and providing a platform for brainstorming the contemporary and futuristic issues related to frontiers areas cross-disciplinary translational research and innovation. The overall purpose of the symposium was to interact and achieve synergy among Civil Engineering, Computer Engineering & Information Technology, Electronics and Communication Engineering, Mechanical Engineering and Biomedical Engineering disciplines at distinctive scientific levels through presentations and discussions in the following four thematic areas:

- Remote Sensing and Image Processing
- Cyber Security
- Additive Manufacturing
- Medical diagnostics and therapeutics



*Prof Gautam Biswas, FNAE, Director IIT Guwahati Delivering Welcome Address*

Forty professionals from various institutes and R&D labs, industries & start-ups attended the event and share their contributions. They discussed in respect to these themes for generation of useful new ideas that could culminate in technologies of new generation. Sixteen distinguished scholars presented very stimulating talks and closely interacted in four thematic sessions in two days. Prof. Gautam Biswas, FNAE, Director, IIT Guwahati in his Inaugural Address pointed out the need of cross-disciplinary Research and Development to fulfil the needs of Industry 4.0. A Panel Discussion with four overview talks, moderated by Padma Shri Prof. Sankar Pal, FNAE, Distinguish Scientist and Former Director of Indian Statistical Institute, Kolkata. The topic of the Panel Discussion was “Technology as the Bridge Between Science and Society” and the Panel Members chosen were those who have created technology for societal uses and who have successfully created their start-ups to help the society. The response of the audience to the Panel Discussion was very encouraging. Specifically, summarizing of the deliberations by the moderator was well conducted.

The two Pre-Dinner talks were delivered by distinguished personalities, Dr Gulshan Rai, National Cyber Security Coordinator, Prime Minister’s Office, Government of India and Shri V. P. Pathak, Director General Railway Stores, Ministry of Railways, Government of India. The speakers in their talks brought out very interesting points in their respective fields for meeting the pressing need of the society. Prof. Sankar K. Pal delivered an exceptional Valedictory Speech with emphasis on the need for R&D in India and role of INAE in the nation building; which was very well received by the audience. He also ascertained that themes of the Symposium were well chosen as they are in line with NITI Aayog’s current projection of areas of national interest.

A large number of Research Scholars and Faculty Members of IIT Guwahati also attended the Symposium and contributed in the organization of the symposium. The cross-functional interactions and networking between the participants from various domains of engineering in the Symposium allowed a larger perspective to the participants, and exposed them to some of the immediate need of the society and also gave them an overview of research work happening in various parts of India.



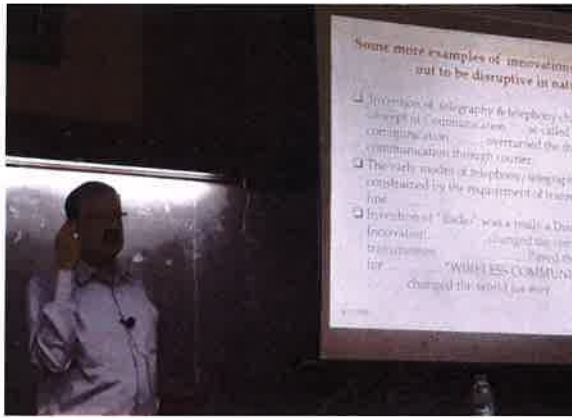


*Prof Sankar Pal, FNAE, Distinguish Scientist, Former Director ISI and Shri V P Pathak, Director General Railway Stores, Ministry of Railways with participants*

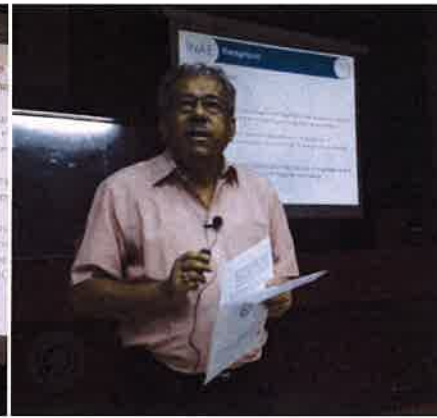
### **Local Chapter Events - INAE Kolkata Chapter**

#### **Celebrating 50th Anniversary of National Engineers Day - INAE Kolkata Chapter**

National Engineers Day is celebrated in India on 15 September every year to honour Bharat Ratna Sir Mokshagundam Visvesvaraya, a great engineer, scholar, statesman, and educator of this country, on his birth day. On this occasion, INAE Kolkata Chapter organized a lecture meeting in the MegnadSaha Auditorium at the University of Calcutta, on 17 September, 2018 (15 Sep, being Saturday). Prof. Parthasarathi Chakrabarti, Director, IEST Shibpur delivered **Engineers Day Lecture** on "*Impact of Disruptive Innovations on Engineering Science & Technology*". This motivational lecture was indeed well received by the audience and raised enthusiastic discussion among the participants. Padma Shri Prof. Sankar K. Pal, FNAE, Distinguished Scientist and former Director, Indian Statistical Institute, Kolkata, addressed the audience in a special session, "*Elevate your Career with INAE*". He highlighted the vast opportunities and immense scope that INAE provides to every engineer – career improvement possibilities for undergraduate students, research scholars, young faculty members, entrepreneurs, and accomplished professors. Prof. Pal also highlighted the various recent activities of the INAE, and encouraged them to publish their research works and disclosures on engineering innovations in "INAE Letters", which is a flagship journal of the Academy and is published by Springer. Prof. Debatosh Guha, FNAE, Secretary, INAE Kolkata Chapter and Director of CRNN, University of Calcutta, conducted the proceedings of the meeting. The event was attended by more than 80 participants including INAE Fellows, researchers, graduate students, and young faculty members from various departments of several universities, institutes, and industries in Kolkata and around. Prof. Amlan Chakrabarti, Dean of Technology, University of Calcutta, inspired the young engineers to be associated with the Academy and explore various professional opportunities.



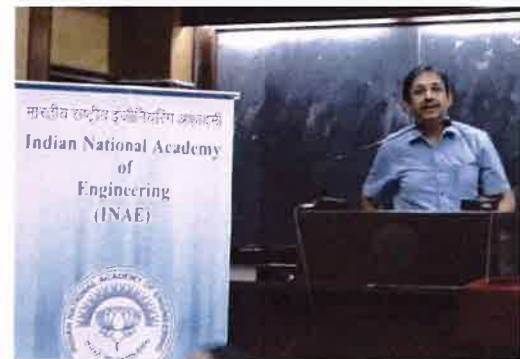
*Prof. P Chakrabarti delivering his lecture*



*Prof. S K Pal addressing the audience*



*Audience present at the program*



*Prof D Guha, FNAE conducting the proceedings*

### **Extension of AICTE-INAE DVP Scheme to Retired INAE Fellows**

INAE together with All India Council for Technical Education (AICTE) launched "AICTE-INAE Distinguished Visiting Professorship Scheme" during 1999. Under this scheme, Industry experts are encouraged to give series of lectures at an educational institution in their proximity for a specific time period. This scheme has become popular among industry experts as well as educational institutions. Based on the deliberations during meetings with AICTE held last year it was decided that the scheme be extended to all retired INAE Fellows and retired persons from Industry. The frequency of visits to an engineering college by a DVP has been increased to up to two times a semester with a maximum period of three days per visit. The honorarium paid to the visiting Industry Expert has been increased to Rs. 10,000/- per lecture day as approved by AICTE. The AICTE-INAE DVP Scheme has since been extended to the retired INAE Fellows and nominations have since been invited under the scheme. Accordingly, the nominations under the AICTE-INAE Distinguished Visiting Professorship Scheme were invited from the Fellowship and the thirteen applications received from the Fellows were selected by the Selection Committee as Distinguished Visiting Professors.

### **INAE Annual Convention 2018**

The Annual Convention of the Academy is being held on **December 13-15, 2018 at Research Centre Imarat (RCI), Hyderabad, followed by a local excursion on December 16, 2018.** The highlights of the Annual Convention are as under.

- (i) Lectures by winners of Life Time Contribution Award in Engineering in the evening on December 13, 2018 followed by INAE Fellows Dinner.
- (ii) Inaugural Session on Dec 14, 2018.

- (iii) Two Plenary Talks by eminent personalities on Dec 14-15, 2018.
- (iv) Industry Session on Dec 15, 2018 in which the winners of the INAE Innovator Entrepreneur Award 2018 will make a presentation on the innovations for which they have been awarded.
- (v) Technical Sessions on Dec 14, 2018 in which newly elected Fellows (whose Fellowship is effective from Nov 1, 2018) and INAE Young Engineer Awardees 2018 will be making presentations relating to their own significant engineering contributions.
- (vi) The Grand Awards Function in the afternoon of December 14, 2018 wherein Innovative Student Projects Awards, Innovator Entrepreneur Award, Young Engineer Awards, Prof. Jai Krishna and Prof. SN Mitra Memorial Awards and the Life Time Contribution Awards in Engineering will be presented by the President, INAE.
- (vii) The Annual General Meeting of Fellows of the Academy in the forenoon of Dec 15, 2018 including Induction Ceremony.
- (viii) Meetings of INAE Forums on the sidelines of the Annual Convention.
- (ix) A local excursion on Dec 16, 2018 to visit prominent places in and around Hyderabad.

In addition, a Cultural Programme prior to the Dinner will be organized on December 14, 2018. All INAE Fellows and Young Associates have been invited to participate in the Annual Convention 2018. To view the Block Programme of the Annual Convention, **CLICK HERE**.

#### **INAE on Facebook and Twitter**

INAE has created a Facebook and Twitter Account to post the news of recent INAE activities in the Social Media. The same can be viewed at the link below.

- (a) Facebook -link <https://www.facebook.com/pages/Indian-National-Academy-of-Engineering/714509531987607?ref=hl>
- (b) Twitter handle link <https://twitter.com/inaehq1>

All INAE Fellows are requested to visit and follow the above to increase the visibility of INAE in Social media.

#### **Important Meetings held during September, October and November 2018**

- **Meeting of Project Monitoring Committee (PMC) of the Medium-Term Research Study (MTRS) on "Lessons from Some of the Major Disasters in India" held on Sept 18, 2018 at IITRoorkee**
- **Meeting of the INAE Forum on "Civil Infrastructure" on Sep 21, 2018 at New Delhi**
- **Meetings of the INAE Forum on Technology Foresight & Management Forum held on Sept 24, 2018 and Oct 29, 2018 at INAE Office, Gurgaon**
- **First meeting of the Frugal Innovation Nurturing Programme at NIAS, Bengaluru on Sept 20, 2018**

➤ **Meeting with Prof K VijayRaghavan, PSA to the Govt. of India on Nov 22, 2018 at New Delhi**

**Academia Industry Interaction**

*AICTE-INAE Distinguished Visiting Professorship Scheme*

Industry-academia interactions have become essential as with the world over technological changes in recent times these can impart relevant knowledge to the students in the engineering institutions, that is sustainable in the changing conditions. While industries could gain by using the Academia's knowledge base to improve the industry's cost, quality and global competitive dimensions; thereby reducing dependence on foreign know-how and expenditure on internal R&D, academicians benefit by seeing their knowledge and expertise being fruitfully utilized practically and also by strengthening of curricula of educational programs being offered at engineering colleges/institutions. INAE together with All India Council for Technical Education (AICTE) launched "AICTE-INAE Distinguished Visiting Professorship Scheme" in 1999. Under this scheme, Industry experts are encouraged to give a few lectures in engineering institutions. This scheme has become popular among industry experts as well as engineering colleges.

Brief details pertaining to recent visits of industry experts under this scheme are given below.

|   |   |   |
|---|---|---|
| <p>Dr Debi Prasad Das<br/>Senior Scientist, CSIR –<br/>Institute of Minerals and<br/>Materials Technology</p> | <p>Silicon Institute of<br/>Technology,<br/>Bhubaneswar<br/><br/>July 6, 2018</p> | <p>Delivered lectures on "R&amp;D Project Proposals and Funding Opportunities" and "How to write a Research Journal Article in Engineering and Science". As per the feedback from the engineering institution, the DVP has also participated in curriculum revision and helped faculty members in ongoing projects.</p>   |
| <p>Mr. S. Krishna Kumar<br/>Former Senior Vice<br/>President (Retired),<br/>Lucas TVS Ltd,<br/>Chennai</p>    | <p>RMK Engineering<br/>College, Chennai<br/><br/>July 20, 23, 24, 2018</p>        | <p>Delivered lectures for training the Faculty for establishing Centre of Excellence - Automotive R&amp;D - on "Concurrent Engineering, Product Benchmarking, Failure Modes and Effects Analysis (FMEA) and Quality Function Deployment (QFD)", "Lean Manufacturing, Fatigue Design, Highly Accelerated Life Testing of Products, Statistical Quality Control and Process Capability" and "Product Reliability, Reliability Engineering, B10 Life, Mean Time to Failure (MTTF) and Mean Time Between Failures (MTBF) along with Actual Industrial Case Studies". Suggestions were also given by the industry expert on curriculum development. As per the feedback from the engineering college, the scheme offers students appropriate knowledge based on rich industry experience of the Industry Expert.</p> |





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|  | October 11-13,2018   | Delivered lectures on " Development in Textile Fibres" and "High Performance Fibres". As per the feedback from faculty coordinator the DVP also helped in Project Title identification and syllabus revision. It was expressed that the DVP scheme is beneficial for both students and faculty members.  |
| Prof MR Madhav<br>Professor Emeritus and<br>Visiting Professor, IIT<br>Hyderabad and JNTUH                                 | Gayatri Vidya Parishad<br>College of Engineering,<br>Visakhapatnam<br><br>August 8, 2018   | Delivered lecture on "Carrying Capacity of Foundations- A Fallacy". As per the feedback from the Engineering College the DVP reviewed the course structure and advised regarding introduction of more courses related to Transportation sector.  |
| Dr. Ananta Lal Das<br>Ex Director, Society for<br>Applied Microwave<br>Electronics Engineering<br>and Research<br>(SAMEER) | National Institute of<br>Technical Teachers<br>Training and Research,<br>Chandigarh<br><br>August 8-10, 2018<br><br><br><br><br><br><br><br><br><br>Oct 8-10, 2018 | Delivered lectures on "Antennas for Wireless and mobile communication", "Shared Aperture Antennas, Integrated RF Systems Architecture and their Challenges" and "Radio Wave Propagation in Wireless and Mobile Communication". Topics for projects were identified and suggestion given accordingly. As per the feedback received from the engineering college the suggestions on curriculum given by the Industry Expert have been considered duly, so to prepare the students to meet the requirements of working in an industry.<br><br>Delivered lectures on " Feeding Techniques in Antenna", "Antenna Measurement Techniques" and "Frequency Selective Surfaces and Applications". As per the feedback received from the college, research experience of the DVP helped students in identifying research problems. |
| Dr Manish Roy<br>Scientist 'F', Defence<br>Metallurgical Research<br>Laboratory,<br>Kanchanbagh                            | Indian Institute of<br>Engineering Sciences<br>and Technology,<br>Shibpur<br><br>August 8-9, 2018  | Delivered lectures on " X-ray diffraction and its applications: Part I Production and Properties of X-ray" and "X-ray Diffraction and its applications: Part II Structure Factor and Intensities". Also guided project. As per the feedback from the Faculty Coordinator, this scheme helps academicians to work on problems with practical and industrial relevance. The scheme also provides opportunity to fine tune existing curriculum and introduce new courses.   |

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|  | <p>Department of Metallurgical Engineering, JNTUH, Hyderabad</p> <p>September 12, 2018</p>        | <p>Delivered lecture on "Diffusion Coatings". According to the feedback from engineering college the scheme helps academicians to work on problems with practical and industrial relevance. Students also get an opportunity to interact with an Industrial Expert.</p>  |
| <p>Prof. Bankim Chandra Majumdar<br/>Formerly Professor, Department of Mechanical Engineering, IIT Kharagpur</p> | <p>Adhiyamaan College of Engineering, Tamil Nadu</p> <p>August 16, 2018 &amp; August 20, 2018</p> | <p>Delivered lectures on "Recent Advances in the Design of Fluid Film Bearings". Interacted with PG students regarding their theses work. As per the feedback from the Faculty Coordinator of the associated engineering college, the scheme is very useful for both the faculty members and students.</p>   |
|  | <p>National Institute of Science and Technology, Berhampur, Odisha</p> <p>August 22-24, 2018</p>  | <p>"Tribological Design of Machines and Related Topics", "Recent Advances in the Design of Fluid Film Bearings", "Tribology Case Studies", "Use of Various boundary conditions for the solution of basic equations of fluid film bearings and materials and oil properties". Also had discussions with faculty members. According to the feedback from the engineering college, the lectures from the DVP have been interactive and helped students understand the topics in real time. The lectures in Tribology have also been beneficial for the faculty members.</p> |
|  | <p>Adhiyamaan College of Engineering, Tamil Nadu</p> <p>September 3-5, 2018</p>                   | <p>Delivered lectures on "On the stability of Fluid Film bearings", "Advances in Friction Theory". According to the feedback from engineering college the scheme is useful as interaction with senior Faculty of eminence motivates faculty members and students.</p>  |
|  | <p>September 27-29, 2018</p>  | <p>Delivered lectures "On advances of wear of materials-Part I" and "On advances of wear of materials-Part II". He also had an interaction session with faculty members on curriculum development relating to Machine Design in Tribology. According to the feedback from the engineering college the interaction has been beneficial particularly on that of curriculum design.</p>   |
|  | <p>National Institute of Science and</p>  | <p>Delivered lectures on "Concept of Gas-Lubricated Bearings", "Concept of</p>   |

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|   | Technology,<br>Berhampur, Odisha<br><br>October 4-6, 2018   | Elastohydrodynamic lubrication" and "Design and Selection of Antifriction Bearings". He had also held discussions on few professional electives. According to the feedback from the engineering college the scheme provides a very good opportunity to the students and faculty members for interacting with such a distinguished Professor.  |
| Dr. D. Antony Louis Piriyakumar<br><br>Director-Startup, Agape Piriyakumar AI Solutions   | Thiagarajar College of Engineering, Madurai<br><br>August 28-29, 2018<br><br><br><br>October 16-17,2018 | Delivered lectures on "Computer Vision-RANSAC/Image Alignment/Segmentation and clustering -K-means, Graph cut", "Image Processing, Image Transforms DFT, DCT", "Intellectual Property Rights", "Computer Vision", "Image Processing -General Elective" and " How to do Research Projects" Had participated in review of projects for M.E. Students. According to the feedback from the engineering College the DVP has suggested changes in syllabus of subjects on Computer Vision and Image Processing.<br><br>Delivered lectures on "Machine Learning -I", "Machine Learning -II", " Patent", "Machine Learning in Computer Vision" and "SVM Classification". According to the feedback from the faculty coordinator, the interactions gave an insight to recent trends of AI. |
| Prof. V Radhakrishnan<br><br>Formerly Professor, Department of Mechanical Engineering, IIT Madras& Emeritus Professor of Indian Institute of Space Science and Technology | College of Engineering, Pune<br><br>August 29-31,2018   | Delivered lectures on "Linear Measurements-Advances" and "Precision Engineering Concepts". Held discussions on Projects with students and faculty members. Also taken up presentation of PhD scholars research work. According to the feedback from college, the inputs of the visiting professor have helped the department to strengthen the research activity of students and faculty.   |
| Dr SL Mannan<br><br>Former Outstanding Scientist and Director Metallurgy and Materials Group, Indira Gandhi Centre for Atomic Research,                                   | PSG College of Technology, Coimbatore<br><br>September 3-5,2018   | Delivered lectures on "Dislocation Theory I", "Dislocation Theory II" and "Materials for Fast Breeder Reactors". According to the feedback from college, these interactions are beneficial for students and faculty.<br><br>Delivered lectures on "Strengthening  |

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| Kalpakkam  | September 24-25, 2018  | Mechanisms-Lecture I" and "Strengthening Mechanisms-Lecture II". According to feedback from Engineering College, the DVP also discussed career opportunities for graduate engineers in Department of Atomic Energy. He had also discussed projects and schemes of UG and PG programmes.   |
| Dr MV Ramana Murthy, Scientist 'G', Director, ICMAM-PD, National Institute of Ocean Technology | KCG College of Technology, Chennai<br>September 25, 2018   | Delivered lecture on "Shoreline Changes using RS & GIS". According to the feedback from the engineering college the DVP has guided students for real time projects and have taken part in course development.   |
| Dr Ashok Tripathy<br>DG CPRI And Sr. Prof and Advisor, SIT                                     | Silicon Institute of Technology, Bhubaneswar<br><br>September 4, 2018<br><br>September 28-29, 2018                               | Delivered lecture on "Engineering: The New Prospects". As per the feedback received from the Faculty Coordinator of engineering institution, with such interactions students are exposed to real time situations in industries that will further prepare them to meet industry requirement after graduation.<br><br>Delivered lectures on "Power Electronics: Application to Industry" and " Why, what and how of Electrical Substations". As per the feedback received, the industry expert suggested applying of the ideas to real time problem specification based on selected case studies. |
| Mr. Kezar Ali Shah<br>General Manager (Environment), Wonder Cement Ltd.                        | College of Technology & Engineering, Maharana Pratap University of Agriculture & Technology, Udaipur<br><br>October 8 & 11, 2018 | Delivered lecture on "Town plan of Udaipur City" and "Construction of Metro Rail in India". According to the feedback received from the Faculty Coordinator of the associated college, the presentation made by the DVP helped the students of Civil Engineering discipline understand features of town planning and practical aspects.   |
| Dr SK Gupta<br>Ex Project Coordinator (Saline Water), CSSRI                                    | Karnal Institute of Technology and Management<br><br>October 15-17, 2018   | Delivered lectures on " Stepping the Ladder: Nation Building through Engineering Profession", "India's Water Scenario: Management Strategies" and "Interactive lecture and discussions on project selection and formulation". According to the feedback from the Engineering College the DVP had also helped to identify project topics. It was also mentioned that the interaction with the DVP has been very helpful for faculty members and the students as it provided an   |

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|  |  | opportunity for them to know about current developments. |
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### International Conferences/Seminars being organized by IITs/other Institutions

To view a list of International Conferences/Seminars being held in the month of December 2018, January 2019 and February 2019 click [here](#).

### Honours and Awards

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| 1. | Dr Sanak Mishra, FNAE, Senior Advisor, MIDHANI (Mishra Dhatu Nigam Limited), and formerly Secretary General & Executive Head, Indian Steel Association; and formerly Vice President, ArcelorMittal & Chief Executive Officer of its Projects in India was conferred the "Lifetime Achievement Award" from Ministry of Steel, Govt. of India in recognition of his outstanding contributions to Indian Metallurgy. Dr Sanak Mishra received the "Lifetime Achievement Award" from the Govt. of India, Ministry of Steel, on the occasion of the National Metallurgists' Day (NMD) on Nov 14, 2018. The award was presented to him by Shri Binay Kumar, Secretary Department of Steel.   |
| 2. | Prof Indranil Manna, FNAE Professor, Department of Metallurgical and Materials Engineering and formerly Director, Indian Institute of Technology Kanpur was conferred the National Metallurgist Award 2018 of the Ministry of Steel, Government of India.  |
| 3. | Prof Amit Agrawal, FNAE, Institute Chair Professor, department of Mechanical Engineering, Indian Institute of Technology Bombay, Mumbai conferred with the Shanti Swarup Bhatnagar Prize for the Year 2018.  |
| 4. | Prof RP Mohanty, FNAE Senior Advisor, ICFAI Group, Hyderabad and Formerly Vice-President, The Associated Cement Companies Ltd., Mumbai, Formerly Chair Professor, Dean and Advisor, ITM Group of Institutions, Navi Mumbai; Vice-Chancellor, Siksha 'O' Anusandhan University, Bhubaneswar has been conferred with the "Life Time Achievement Award" by Indian Institution of Industrial Engineering on 27th, September, 2018 in the Diamond Jubilee Convention and International Conference on "Role of Industrial Engineering In Industry 4.0 Paradigm" held in Bhubaneswar for his profound contributions to the field of industrial engineering for the last 51 years. He received the award from the Former President of Mauritius Mr Rajkeswur Purryag, who was the Chief Guest in the Inaugural Function. |
| 5. | Prof Mahesh Tandon, FNAE, Managing Director, Tandon Consultants New Delhi has been conferred with the Distinguished Alumnus Award by Indian Institute of Technology Roorkee for the Year 2018 for Excellence in Engineering or Technology Innovation and his significant contributions in the development of a culture of innovation in the structural engineering industry.   |

### News of Fellows

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| 1. | Dr Saptarshi Basu, FNAE, DST-SwarnaJayanti Fellow in Engineering Sciences, Associate |
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|   | Professor, Department of Mechanical Engineering, Indian Institute of Science, Bangalore has been elected as Fellow of ASME (American Society of Mechanical Engineers) in 2018. He has also been elected as Associate Fellow of AIAA (American Institute of Aeronautics and Astronautics) class of 2019.   |
| 2 | Capt NS Mohan Ram, FNAE, Consultant, TVS Motor Company Ltd, Hosur (Tamil Nadu) has launched his book on <b>“Recycling of End of Life Automobiles, with Special Focus on India and Developing Nations”</b> on Sept 26, 2018 at Anna University, Chennai. The first copy of the book was presented by Dr Sumantran, FNAE, Chairman, Celeris Technologies to Shri C Samayamoorthy, IAS, Transport Commissioner/State Transport Authority, Govt. of Tamil Nadu. Prof MK Surappa, FNAE, Vice Chancellor, Anna University, presided over the event. This book looks at sustainability, the role of recycling, the relevance of recycling scrapped automobiles, the status and systems in developed nations and developing nations, the Indian scenario and offers suggestions for the future and a road map. The book was published by Productivity and Quality Publishing Pvt. Ltd. Chennai and has received excellent press coverage. |
| 3 | Mr Ajay N Deshpande, FNAE and Ex CMD of EIL, delivered a lecture on 'Career Options in EPC Companies Having Technology Focus' to the faculty and students of the School of Engineering Studies at Shiv Nadar University and discussed the research needs of the oil and gas industry for identifying potential research projects.   |
| 4 | Prof V K Jain, FNAE, Formerly Professor, Dept. of Mechanical Engineering, Indian Institute of Technology Kanpur has been appointed Editor-in-Chief of the new journal entitled "Journal of Micromanufacturing" launched by SAGE publishers in the month of May 2018.  |
| 5 | Ms Kiran Mazumdar-Shaw, FNAE, founder, chairperson and managing director of Biocon Limited has been elected as the female Foreign Fellow of Australian Academy of Technology and Engineering (ATSE), Australia during the year 2018 in recognition of her contributions to the field of Biotechnology.  |
| 6 | Prof K. Bhanu Sankara Rao, FNAE Formerly Head, Mechanical Metallurgy Division, Indira Gandhi Centre for Atomic Research, Kalpakkam; and Formerly Professor and Dean, School of Engineering Sciences & Technology, University of Hyderabad, Hyderabad has assumed the office of Pratt And Whitney Distinguished Chair Professor at University of Hyderabad in the School of Engineering Sciences and Technology on Oct 1, 2018.  |

**BLOCK PROGRAMME FOR ANNUAL CONVENTION 2018**

**December 13-15, 2018 at Research Centre Imarat (RCI), Hyderabad**

**DECEMBER 13, 2018**

- 1730 - 1900hrs. - INAE Governing Council Meeting
- 1900 – 2030 hrs. - Award Lectures by two winners of Life Time Contribution Award in Engineering 2018
- 2030 hrs. onwards - INAE Fellows Dinner

**DECEMBER 14, 2018**

- 0900 – 0930 hrs. - Registration
- 0930 – 1030 hrs. - Inaugural Session
- 1030 – 1100 hrs. - TEA
- 1100 – 1145 hrs. - First Plenary Talk
- 1200 – 1330 hrs. - Technical Presentations by Fellows & Young Engineers (parallel session)  
*(15 minutes presentations by 6 speakers in each sessions)*
- | <b>Parallel Session-1</b>   | <b>Parallel Session-2</b>  |
|---|--|
| Engineering Section I (Civil Engineering),<br>Engineering Section III (Mechanical Engineering),<br>Engineering Section IV (Chemical Engineering),<br>Engineering Section VII (Aerospace Engineering) and<br>Engineering Section VIII (Mining, Metallurgical and<br>Materials Engineering) | Engineering Section II (Computer Engineering and<br>Information Technology),<br>Engineering Section V (Electrical Engineering),<br>Engineering Section VI (Electronics & Communication Engineering),<br>Engineering Section IX (Energy Engineering) and<br>Engineering Section X (Interdisciplinary Engineering and<br>Special Fields) |
- 1330 – 1415 hrs. - LUNCH
- 1415 – 1730 hrs. - Parallel Technical Presentations session(*...to be continued*)  
*(15 minutes presentations by 13 speakers in each sessions)*
- 1730 – 1830 hrs. - High Tea for Networking of Fellows along with families
- 1800 - 1830 hrs. - High Tea for IP and other awardees along with their families
- 1830 – 1930 hrs. - Grand Award Function
- 1930 – 2030 hrs. - Cultural Programme
- 2030 – 2130 hrs. - Dinner

**DECEMBER 16, 2018**

**DECEMBER 15, 2018**

- 0930 – 1030 hrs. - **Industry Session**
- 1030 – 1115 hrs. - **Second Plenary Talk**
- 1115 – 1145 hrs. - **TEA**
- 1145 – 1345 hrs. - **AGM of Fellows to include induction of newly elected Fellows & Young Associates**
- 1345 – 1445 hrs. - **LUNCH& DISPERSAL**
  - **Local Excursion tour for all interested INAE Fellows/Young Associates along with their spouses only.**
  - **Dispersal after the tour**

## **International Conferences in December 2018, January 2019 and February 2019**

2nd International Conference on Electronic Systems, Signal Processing and Computing Technologies ICESC- 2018 on Dec 7-8, 2018 at Nagpur, Maharashtra,  
<https://conferencealerts.com/show-event?id=202640>

ICIIT 2018: International Conference on Intelligent Information Technologies on Dec 11-14, 2018 at Chennai, TamilNadu  
<https://conferencealerts.com/show-event?id=202987>

10th International Conference on Advanced Computing on Dec 13-15, 2018 at Chennai,  
<https://conferencealerts.com/show-event?id=203630>

25th IEEE International Conference on High Performance Computing, Data, and Analytics on Dec 17-20, 2018 at Bengaluru, Karnataka,  
<https://conferencealerts.com/show-event?id=201896>

3rd International Conference on Sustainable Energy and Environmental Challenges on Dec 18-21, 2018 at Roorkee, Uttarakhand  
<https://conferencealerts.com/show-event?id=205508>

Springer- 3rd International Conference on Smart Computing & Informatics (SCI) on Dec 21-22, 2018 at Bhubaneswar, Odisha,  
<https://conferencealerts.com/show-event?id=205466>

ICACIE 2018 - 3rd International Conference on Advanced Computing and Intelligent Engineering on Dec 22-24, 2018 at Bhubaneswar, Odisha,  
<https://conferencealerts.com/show-event?id=202728>

International Congress on Engineering and Technology 2018 on Dec 27-28, 2018 at Pune,  
<https://conferencealerts.com/show-event?id=205442>

International Conference on Innovations in Mechanical Engineering-2019 on Jan 4-5, 2019 at Hyderabad,  
<https://conferencealerts.com/show-event?id=205180>

15th International Conference on Distributed Computing and Internet Technology on Jan 10-13, 2019 at Bhubaneswar, Odisha,  
<https://conferencealerts.com/show-event?id=201054>

2019 Third IEEE International Conference on Electrical, Computer and Communication Technologies (IEEE ICECCT 2019) on Feb 20-22, 2019 at Coimbatore  
<https://conferencealerts.com/show-event?id=203429>

## Civil Engineering

### 1. Smart Technology for Synchronized 3D Printing of Concrete



*Multidisciplinary team of researchers consisting of roboticists, civil engineers, mechanical engineers and material scientists, with the 3D concrete structure printed by the two robots concurrently in a single print.*

Scientists from Nanyang Technological University, Singapore (NTU Singapore) have developed a technology where two robots can work in unison to 3D-print a concrete structure. This method of concurrent 3D-printing, known as swarm printing, paves the way for a team of mobile robots to print even bigger structures in future. Developed a team at NTU's Singapore Centre for 3D Printing, this new multi-robot technology was published in *Automation in Construction*, a top tier journal for civil engineering. Using a specially formulated cement mix suitable for 3-D printing, this new development will allow for unique concrete designs currently not possible with conventional casting. Structures can also be produced on demand and in a much shorter period. Currently, 3D-printing of large concrete structures requires huge printers that are larger than the printed objects, which is unfeasible since most construction sites have space constraints. Having multiple mobile robots that can 3D print in sync means large structures like architectural features and specially-designed facades can be printed anywhere as long as there is enough space for the robots to move around the work site. The NTU robots 3D-printed a concrete structure measuring 1.86m x 0.46m x 0.13m in eight minutes. It took two days to harden and one week for it to achieve its full strength before it was ready for installation. "We envisioned a team of robots which can be transported to a work site, print large pieces of concrete structures and then move on to the next project once the parts have been printed," explained lead researcher from NTU's School of Mechanical and Aerospace Engineering. Printing concrete structures concurrently with two mobile robots was a huge challenge, as both robots have to move into place and start printing their parts without colliding into each other. Printing the concrete structure in segments is also not acceptable, as joints between the two parts will not bond properly if the concrete does not overlap during the printing process. This multi-step process starts by having the computer map out the design to be printed and assign a specific part of the printing to a robot. It then uses a special algorithm to ensure that each of robot arm will not collide with another during the concurrent printing. Using precise location positioning, the robots then move into place and print the parts in good alignment, ensuring that the joints between the separate parts are overlapped. Finally, the mixing and pumping of the specialized liquid concrete mix have to be blended evenly and synchronized to ensure consistency. Professor Chua Chee Kai, Executive Director of the Singapore Centre for 3D Printing said disruptive Industry 4.0 technologies like additive manufacturing, can be advanced even further when combined with other innovative technologies like robotics, AI, materials science and green manufacturing techniques. "This multiple robot printing project is highly interdisciplinary, requiring roboticists to work with materials scientists to make printable concrete. To achieve the end result of a strong concrete structure, we had to combine their expertise with mechanical engineers and civil engineering experts." "Such an innovation demonstrates to the industry what is feasible now, and prove what is possible in the future if we are creative in developing new technologies to augment conventional building and construction methods." Moving forward, the NTU research team will look at integrating even more robots to print larger scale structures, optimizing printing algorithm for consistent performance and to improve the concrete material for faster curing



## 2. Helping Computers Fill in The Gaps Between Video Frames



*Machine learning system efficiently recognizes activities by observing how objects change in only a few key frames.*

Given only a few frames of a video, humans can usually surmise what is happening and will happen on screen. If we see an early frame of stacked cans, a middle frame with a finger at the stack's base, and a late frame showing the cans toppled over, we can guess that the finger knocked down the cans. Computers, however, struggle with this concept. MIT researchers describe an add-on module that helps artificial intelligence systems called convolutional neural networks, or CNNs, to fill in the gaps between video frames to greatly improve the network's activity recognition. The researchers' module, called Temporal Relation Network (TRN), learns how objects change in a video at different times. It does so by analyzing a few key frames depicting an activity at different stages of the video — such as stacked objects that are then knocked down. Using the same process, it can then recognize the same type of activity in a new video. In experiments, the module outperformed existing models by a large margin in recognizing hundreds of basic activities, such as poking objects to make them fall, tossing something in the air, and giving a thumbs-up. It also more accurately predicted what will happen next in a video — showing, for example, two hands making a small tear in a sheet of paper — given only a small number of early frames. One day, the module could be used to help robots better understand what's going on around them. “We built an artificial intelligence system to recognize the transformation of objects, rather than appearance of objects,” says Bolei Zhou, assistant professor of computer science at the Chinese University of Hong Kong. “The system doesn't go through all the frames — it picks up key frames and, using the temporal relation of frames, recognize what's going on. That improves the efficiency of the system and makes it run in real-time accurately.” Two common CNN modules being used for activity recognition today suffer from efficiency and accuracy drawbacks. One model is accurate but must analyze each video frame before making a prediction, which is computationally expensive and slow. The other type, called two-stream network, is less accurate but more efficient. It uses one stream to extract features of one video frame, and then merges the results with “optical flows,” a stream of extracted information about the movement of each pixel. Optical flows are also computationally expensive to extract, so the model still isn't that efficient. “We wanted something that works in between those two models — getting efficiency and accuracy,” Zhou says. The researchers trained and tested their module on three crowdsourced datasets of short videos of various performed activities. The first dataset, called Something-Something, built by the company TwentyBN, has more than 200,000 videos in 174 action categories, such as poking an object so it falls over or lifting an object. The second dataset, Jester, contains nearly 150,000 videos with 27 different hand gestures, such as giving a thumbs-up or swiping left. The third, Charades, built by Carnegie Mellon University researchers, has nearly 10,000 videos of 157 categorized activities, such as carrying a bike or playing basketball. When given a video file, the researchers' module simultaneously processes ordered frames — in groups of two, three, and four — spaced some time apart. Then it quickly assigns a probability that the object's transformation across those frames matches a specific activity class. For instance, if it processes two frames, where the later frame shows an object at the bottom of the screen and the earlier shows the object at the top, it will assign a high probability to the activity class, “moving object down.” If a third frame shows the object in the middle of the screen, that probability increases even more, and so on. From this, it learns object-transformation features in frames that most represent a certain class of activity. In testing, a CNN equipped with the new module accurately recognized many activities using two frames, but the accuracy increased by sampling more frames. For Jester, the module achieved top accuracy of 95 percent in activity recognition, beating out several existing models. Some other activity-recognition models also process key frames but don't consider temporal relationships in frames, which reduces their accuracy. The researchers report that their TRN module nearly doubles in accuracy over those key-frame models in certain tests.

### 2. New Robot Picks A Peck of Peppers and More



*The world's most advanced sweet pepper harvesting robot, developed in a consortium including Ben-Gurion University of the Negev (BGU) researchers, was introduced last week at the Research Station for Vegetable Production at St. Katelijne Waver in Belgium. SWEEPER is designed to operate in a single stem row cropping system, with non-clustered fruits and little leaf occlusion. The team spearheaded efforts to improve the robot's ability to detect ripe produce using computer vision, and has played a role in defining the specifications of the robot's hardware and software interfaces, focusing on supervisory control activities.*

The world's most advanced sweet pepper harvesting robot, developed in a consortium including Ben-Gurion University of the Negev (BGU) researchers, was introduced last week at the Research Station for Vegetable Production at St. Katelijne Waver in Belgium. SWEEPER is designed to operate in a single stem row cropping system, with non-clustered fruits and little leaf occlusion. Preliminary test results showed that by using a commercially available crop modified to mimic the required conditions, the robot currently harvests ripe fruit in 24 seconds with a success rate of 62 percent. The BGU team spearheaded efforts to improve the robot's ability to detect ripe produce using computer vision, and has played a role in defining the specifications of the robot's hardware and software interfaces, focusing on supervisory control activities. Polina Kurtser, a member of the team, says robotic harvesting will revolutionize the economics of the agriculture industry and dramatically reduce food waste. "The Sweeper picks methodically and accurately," she says. "When it is fully developed, it will enable harvesting 24/7, drastically reduce spoilage, cut labour costs and shield farmers from market fluctuations." Additional research is needed to increase the robot's work speed to reach a higher harvest success rate. Based upon these latest results, the Sweeper consortium expects that a commercial sweet pepper harvesting robot will be available within four to five years, and that the technology could be adapted for harvesting other crops.

Source <https://www.sciencedaily.com/releases/2018/09/180923141651.htm>

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#### 4. Polymer Coating Cools Down Buildings

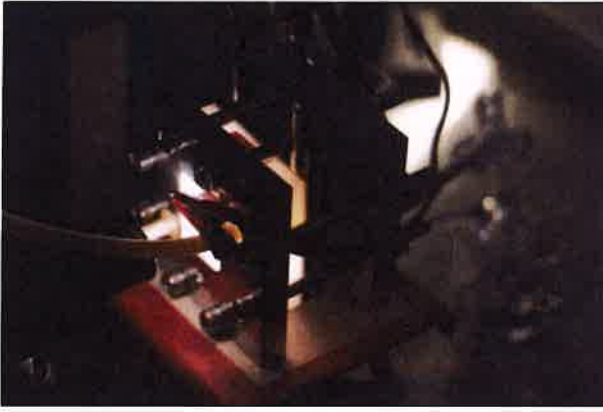


*When exposed to the sky, the porous polymer PDRC coating reflects sunlight and emits heat to attain significantly cooler temperatures than typical building materials or even the ambient air.*

With temperatures rising and heat-waves disrupting lives around the world, cooling solutions are becoming ever more essential. This is a critical issue especially in places where summer heat can be extreme and is projected to intensify. But common cooling methods such as air conditioners are expensive, consume significant amounts of energy, require ready access to electricity, and often require coolants that deplete ozone or have a strong greenhouse effect. An alternative to these energy-intensive cooling methods is passive daytime radiative cooling (PDRC), a phenomenon where a surface spontaneously cools by reflecting sunlight and radiating heat to the colder atmosphere. PDRC is most effective if a surface has a high solar reflectance ( $R$ ) that minimizes solar heat gain, and a high, thermal emittance ( $\epsilon$ ) that maximizes radiative heat loss to the sky. If  $R$  and  $\epsilon$  are sufficiently high, a net heat loss can occur, even under sunlight. Developing practical PDRC designs has been challenging: many recent design proposals are complex or costly, and cannot be widely implemented or applied on rooftops and buildings, which have different shapes and textures. Up to now, white paints, which are inexpensive and easy to apply, have been the benchmark for PDRC. White paints, however, usually have pigments that absorb UV light, and do not reflect longer solar wavelengths very well, so their performance is only modest at best. Researchers at Columbia Engineering have invented a high-performance exterior PDRC polymer coating with nano-to-microscale air voids that acts as a spontaneous air cooler and can be fabricated, dyed, and applied like paint on rooftops, buildings, water tanks, vehicles, even spacecraft -- anything that can be painted. They used a solution-based phase-inversion technique that gives the polymer a porous foam-like structure. The air voids in the porous polymer scatter and reflect sunlight, due to the difference in the refractive index between the air voids and the surrounding polymer. The polymer turns white and thus avoids solar heating, while its intrinsic emittance causes it to efficiently lose heat to the sky. The team including Yuan Yang, assistant professor of materials science & engineering and Jyotirmoy Mandal, lead author of the study -- built upon earlier work that demonstrated that simple plastics and polymers, including acrylic, silicone, and PET, are excellent heat radiators and could be used for PDRC. The challenges were how to get these normally transparent polymers to reflect sunlight without using silver mirrors as reflectors and how to make them easily deployable. They decided to use phase-inversion because it is a simple, solution-based method for making light-scattering air-voids in polymers. Polymers and solvents are already used in paints, and the Columbia Engineering method essentially replaces the pigments in white paint with air voids that reflect all wavelengths of sunlight, from UV to infrared. "This simple but fundamental modification yields exceptional reflectance and emittance that equal or surpass those of state-of-the-art PDRC designs, but with a convenience that is almost paint-like," says Mandal. The researchers found their polymer coating's high solar reflectance ( $R > 96\%$ ) and high thermal emittance ( $\epsilon \sim 97\%$ ) kept it significantly cooler than its environment under widely different skies, e.g. by  $6^\circ\text{C}$  in the warm, arid desert in Arizona and  $3^\circ\text{C}$  in the foggy, tropical environment of Bangladesh. "The fact that cooling is achieved in both desert and tropical climates, without any thermal protection or shielding, demonstrates the utility of our design wherever cooling is required," Yang notes. The team also created coloured polymer coatings with cooling capabilities by adding dyes. The group took environmental and operational issues, such as recyclability, bio-compatibility, and high-temperature operability, into consideration, and showed that their technique can be generalized to a range of polymers to achieve these functionalities. The work highlights the importance of radiative cooling and represents an important breakthrough by demonstrating that hierarchically porous polymer coatings, which can be prepared cheaply and conveniently, give excellent cooling even in full sunlight.



### 5. Device That Integrates Solar Cell and Battery Could Store Electricity Outside the Grid



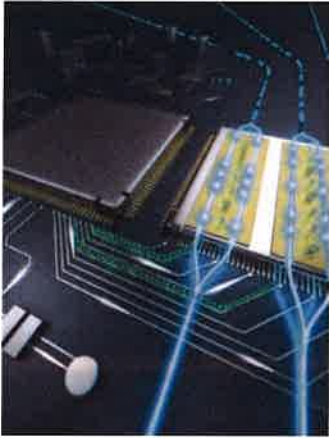
*This image shows a new integrated solar flow battery with a 14.1 percent efficiency.*

Scientists in the United States and Saudi Arabia have harnessed the abilities of both a solar cell and a battery in one device -- a "solar flow battery" that soaks up sunlight and efficiently stores it as chemical energy for later on-demand use. Their research could make electricity more accessible in remote regions of the world. While sunlight has increasingly gained appeal as a clean and abundant energy source, it has one obvious limitation -- there is only so much sunlight per day, and some days are a lot sunnier than others. In order to keep solar energy practical, this means that after sunlight is converted to electrical energy, it must be stored. Normally this takes two devices -- a solar cell and a battery -- but the solar flow battery is designed to perform like both. "Compared with separated solar energy conversion and electrochemical energy storage devices, combining the functions of separated devices into a single, integrated device could be a more efficient, scalable, compact, and cost-effective approach to utilizing solar energy," says Song Jin, a professor of chemistry at the University of Wisconsin-Madison. Jin and his team developed the device in collaboration with Jr-Hau He, a professor of electrical engineering at King Abdullah University of Science and Technology (KAUST) in Saudi Arabia. The solar flow battery has three different modes. If energy is needed right away, it can act like a solar cell and immediately convert sunlight to electricity. Otherwise, the device can soak up solar energy by day and store it as chemical energy to deliver it later as electricity when night falls or the sky grows cloudy. The device can also be charged by electrical energy if needed, just like a typical battery. The team's most recent solar flow battery model is able to store and deliver electricity from solar energy more efficiently than any other integrated device currently in existence. Jin believes the solar flow battery could help transcend the limitations of the electrical grid by making electricity more readily available to people living in rural areas and providing an alternative source of energy when traditional electrical systems fail. "These integrated solar flow batteries will be especially suitable as distributed and stand-alone solar energy conversion and storage systems in remote locations and enable practical off-grid electrification," says Jin. Manufacturing current solar flow batteries is still too expensive for real-world markets, but Jin believes simpler designs, cheaper solar cell materials, and technological advances could help cut costs in the future. And while the current model is comparatively quite efficient, the team has plans to further improve its design. Some of the current device's voltage is still going to waste -- meaning the scientists may need to tweak the redox species and photoelectrode materials that work in tandem to convert solar energy input into electrical output. But Jin believes that, with further research, solar flow batteries may soon be practical. "We believe we could eventually get to 25% efficiency using emerging solar materials and new electrochemistry," says Jin. "At this efficiency range, without using the expensive solar cells, it should be quite competitive with other renewable energy technologies. Then I think commercialization could be possible."

Source: <https://www.sciencedaily.com/releases/2018/09/180927145525.htm>

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### 6. Smaller, Faster and More Efficient Modulator Sets to Revolutionize Optoelectronic Industry



*The new tiny modulator drives data at higher speeds and lower costs.*

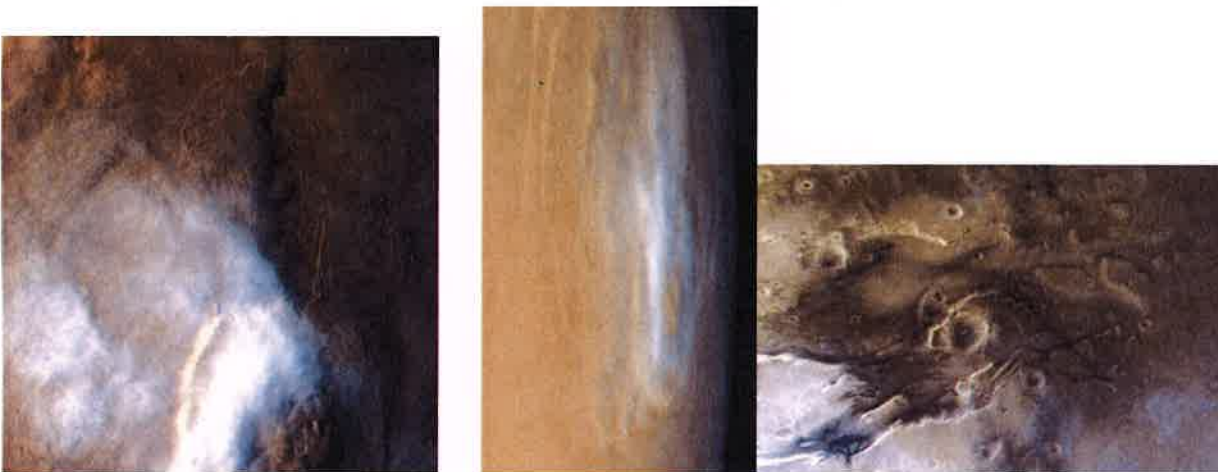
A research team comprising members from City University of Hong Kong, Harvard University has successfully fabricated a tiny on-chip lithium niobate modulator, an essential component for the optoelectronic industry. The modulator is smaller, more efficient with faster data transmission and costs less. The technology is set to revolutionize the industry. The electro-optic modulator produced in this breakthrough research is only 1 to 2 cm long and its surface area is about 100 times smaller than traditional ones. It is also highly efficient -- higher data transmission speed with data bandwidth tripling from 35 GHz to 100 GHz, but with less energy consumption and ultra-low optical losses. The invention will pave the way for future high-speed, low power and cost-effective communication networks as well as quantum photonic computation. The research project is titled "Integrated lithium niobate electro-optic modulators operating at CMOS-compatible voltages". Electro-optic modulators are critical components in modern communications. They convert high-speed electronic signals in computational devices such as computers to optical signals before transmitting them through optical fibres. But the existing and commonly used lithium niobate modulators require a high drive voltage of 3 to 5V, which is significantly higher than 1V, a voltage provided by a typical CMOS (complementary metal-oxide-semiconductor) circuitry. Hence an electrical amplifier that makes the whole device bulky, expensive and high energy-consuming is needed. Dr Wang Cheng, Assistant Professor in the Department of Electronic Engineering at CityU and the research teams at Harvard University and Nokia Bell Labs have developed a new way to fabricate lithium niobate modulator that can be operated at ultra-high electro-optic bandwidths with a voltage compatible with CMOS. "In the future, we will be able to put the CMOS right next to the modulator, so they can be more integrated, with less power consumption. The electrical amplifier will no longer be needed," said Dr Wang. Thanks to the advanced nano fabrication approaches developed by the team, this modulator can be tiny in size while transmitting data at rates up to 210 Gbit/second, with about 10 times lower optical losses than existing modulators. "The electrical and optical properties of lithium niobate make it the best material for modulator. But it is very difficult to fabricate in nanoscale, which limits the reduction of modulator size," Dr Wang explains. "Since lithium niobate is chemically inert, conventional chemical etching does not work well with it. While people generally think physical etching cannot produce smooth surfaces, which is essential for optical transmission, we have proved otherwise with our novel nano fabrication techniques." With optical fibres becoming ever more common globally, the size, the performance, the power consumption and the costs of lithium niobate modulators are becoming a bigger factor to consider, especially at a time when the data centres in the information and communications technology (ICT) industry are forecast to be one of the largest electricity users in the world. This revolutionary invention is now on its way to commercialization. Dr Wang believes that those who look for modulators with the best performance to transmit data over long distances will be among the first to get in touch with this infrastructure for photonics. "Millimetre wave will be used to transmit data in free space, but to and from and within base stations, for example, it can be done in optics, which will be less expensive and less lossy," he explains. He believes the invention can enable applications in quantum photonics, too.

## 7. India's Mars Orbiter Mission Completes Four Years in Orbit: ISRO



*Mars Orbiter Mission is the only Martian artificial satellite which could image the full disc of Mars in one view frame and also image the far side of the Martian moon Deimos.*

India's maiden interplanetary mission -- the Mars Orbiter Mission (MOM) -- has completed four years orbiting the red planet, on Sept 24, 2018 according to ISRO. The mission, launched by the Indian Space Research Organization (ISRO) on November 5, 2013, successfully placed itself into Martian orbit on September 24, 2014 in its first attempt. Although the designed mission life of MOM was six months, the satellite has continued to beam back science data from Mars for the past four years. It's been 4 years since I am around! Thank you for your love and support," the ISRO's Mars Orbiter twitter handle said recently. The tweet included an image taken by the orbiter of Olympus Mons -- the largest known volcano of the solar system. MOM is built with full autonomy to take care of itself for long periods without any ground intervention. The spacecraft came out of communication 'blackout' during this period. MOM is the only Martian artificial satellite which could image the full disc of Mars in one view frame and also image the far side of the Martian moon Deimos. The Mars Colour Camera has acquired over 980 images so far. The mission has also helped scientists successfully prepare a global atlas of Mars. Images from Mars Colour Camera are shown below.

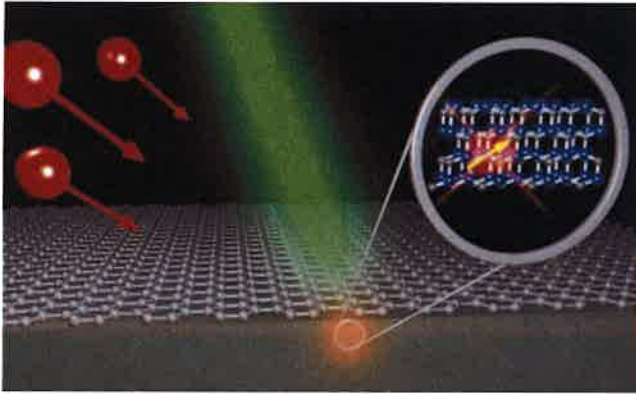


Source <https://economictimes.indiatimes.com/news/science/indias-mars-orbiter-mission-completes-four-years-in-orbit-isro/articleshow/65949237.cms>

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## 8. A 'Recipe Book' That Creates Colour Centers in Silicon Carbide Crystals



*Green SiC substrate at the bottom with the graphene layer on top irradiated by protons, generating a luminescent defect in the SiC crystal*

Silicon carbide (SiC), a material known for its toughness with applications from abrasives to car brakes, to high-temperature power electronics, has enjoyed renewed interest for its potential in quantum technology. Its ability to house optically excitable defects, called colour centers, has made it a strong candidate material to become the building block of quantum computing. Now, a group of researchers has created a list of "recipes" physicists can use to create specific types of defects with desired optical properties in SiC. In one of the first attempts to systematically explore colour centers, the group used proton irradiation techniques to create the colour centers in silicon carbide. They adjusted proton dose and temperature to find the right conditions that reliably produce the desired type of color center. Atomic defects in the lattice of SiC crystals create colour centers that can emit photons with unique spectral signatures. While some materials considered for quantum computing require cryogenically low temperatures, colour centers in SiC can emit at room temperature. As the push to create increasingly smaller devices continues into atom-scale sensors and single-photon emitters, the ability to take advantage of existing SiC integrated circuit technology makes the material a standout candidate. To create the defects, Michael Krieger and his colleagues bombarded SiC samples with protons. The team then let the SiC go through a heating phase called annealing. "We're doing a lot of damage to these crystals," Krieger said. "However, during annealing, the crystal structure recovers, but defects are also formed -- some of them are the desired colour centers." To ensure that their recipes are compatible with usual semiconductor technology, the group opted to use proton irradiation. Moreover, this approach doesn't require electron accelerators or nuclear reactors like other techniques used to create colour centers. The data from using different doses and annealing temperatures showed that producing defects in SiC follows a pattern. Initially protons generate predominantly silicon vacancies in the crystal, then those vacancies sequentially transform into other defect complexes. Studying the defects' low-temperature photoluminescence spectra led the team to discover three previously unreported signatures. The three temperature-stable (TS) lines were shown to correlate with proton dose and annealing temperature. Krieger said these TS lines have exciting properties and further research is already going on as the group hopes to utilize and control those defects for use in SiC-based quantum technology devices.

Source <https://www.sciencedaily.com/releases/2018/10/181001130339.htm>

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### 9. Supersizing Solar Cells: Researchers Print Module Six Times Bigger Than Previous Largest



*A perovskite solar module the size of an A4 sheet of paper, which is nearly six times bigger than 10x10 cm<sup>2</sup> modules of that type reported before, has been developed by Swansea University researchers, by using simple and low-cost printing techniques. The breakthrough shows that the technology works at a larger scale, not just in the lab, which is crucial for encouraging industry to take it up.*

A perovskite solar module the size of an A4 sheet of paper, which is nearly six times bigger than 10x10 cm<sup>2</sup> modules of that type reported before, has been developed by Swansea University researchers, by using simple and low-cost printing techniques. The breakthrough shows that the technology works at a larger scale, not just in the lab, which is crucial for encouraging industry to take it up. Each of the many individual cells forming the module is made of perovskite, a material of increasing interest to solar researchers as it can be made more easily and cheaply than silicon, the most commonly-used material for solar cells. Perovskite solar cells have also proved to be highly efficient, with scores for power conversion efficiency (PCE) -- the amount of light striking a cell that it converts into electricity -- as high as 22% on small lab samples. The team used an existing type of cell, a Carbon Perovskite Solar Cell (C-PSC), made of different layers -- titania, zirconia and carbon on top -- which are all printable. Though their efficiency is lower than other perovskite cell types, C-PSCs do not degrade as quickly, having already proved over 1 year's stable operation under illumination. The Swansea team's breakthrough comes from the optimization of the printing process on glass substrates as large as an A4 sheet of paper. They ensured the patterned layers were perfectly aligned through a method called registration, well-known in the printing industry. The entire fabrication process was carried out in air, at ambient conditions, without requiring the costly high-vacuum processes which are needed for silicon manufacture. The Swansea team achieved good performance for their modules:

- up to 6.3% power conversion efficiency (PCE) when assessed against the "1 sun" standard, i.e. full simulated sunlight. This is world-leading for a C-PSC device of this size.
- 11% PCE at 200 lux, roughly equivalent to light levels in an average living room
- 18% PCE at 1000 lux, equating to light levels in an average supermarket.

The high efficiency ratings under indoor lighting conditions demonstrate that this technology has potential not only for energy generation outdoors but also for powering small electronic devices -- such as smartphones and sensors -- indoors. A lead researcher at Swansea University's SPECIFIC Innovation and Knowledge Centre, said: "Our work shows that perovskite solar cells can deliver good performance even when produced on a larger scale than reported so far within the scientific community. This is vital in making it economical and appealing for industry to manufacture them. The key to our success was the screen-printing process. We optimized this to avoid defects caused by printing such large areas. Accurate registration of layers and patterning the blocking layer helped improve connections between cells, boosting overall performance. There is more work still to do, for example on increasing the active area -- the percentage of the substrate surface that is actually used for producing power. We are already working on it. But this is an important breakthrough by our team, which can help pave the way for the next generation of solar cells."

### 10. Wireless Communication Breaks Through Water-Air Barrier



MIT Media Lab researchers have designed a system that allows underwater and airborne sensors to directly share data. An underwater transmitter directs a sonar signal to the water's surface, causing tiny vibrations that correspond to the 1s and 0s transmitted. Above the surface, a highly sensitive receiver reads these minute disturbances and decodes the sonar signal.

MIT researchers have taken a step toward solving a longstanding challenge with wireless communication: direct data transmission between underwater and airborne devices. Today, underwater sensors cannot share data with those on land, as both use different wireless signals that only work in their respective mediums. Radio signals that travel through air die very rapidly in water. Acoustic signals, or sonar, sent by underwater devices mostly reflect off the surface without ever breaking through. This causes inefficiencies and other issues for a variety of applications, such as ocean exploration and submarine-to-plane communication. MIT Media Lab researchers have designed a system that tackles this problem in a novel way. An underwater transmitter directs a sonar signal to the water's surface, causing tiny vibrations that correspond to the 1s and 0s transmitted. Above the surface, a highly sensitive receiver reads these minute disturbances and decodes the sonar signal. "Trying to cross the air-water boundary with wireless signals has been an obstacle. Our idea is to transform the obstacle itself into a medium through which to communicate," says a lead researcher. The system, called "translational acoustic-RF communication" (TARF), is still in its early stages, he says. But it represents a "milestone," he says, that could open new capabilities in water-air communications. Using the system, military submarines, for instance, wouldn't need to surface to communicate with airplanes, compromising their location. And underwater drones that monitor marine life wouldn't need to constantly resurface from deep dives to send data to researchers. Another promising application is aiding searches for planes that go missing underwater. Today's technological workarounds to this wireless communication issue suffer from various drawbacks. Buoys, for instance, have been designed to pick up sonar waves, process the data, and shoot radio signals to airborne receivers. But these can drift away and get lost. Many are also required to cover large areas, making them impracticable for, say, submarine-to-surface communications. TARF includes an underwater acoustic transmitter that sends sonar signals using a standard acoustic speaker. The signals travel as pressure waves of different frequencies corresponding to different data bits. For example, when the transmitter wants to send a 0, it can transmit a wave traveling at 100 hertz; for a 1, it can transmit a 200-hertz wave. When the signal hits the surface, it causes tiny ripples in the water, only a few micrometers in height, corresponding to those frequencies. To achieve high data rates, the system transmits multiple frequencies at the same time, building on a modulation scheme used in wireless communication, called orthogonal frequency-division multiplexing. This lets the researchers transmit hundreds of bits at once. Positioned in the air above the transmitter is a new type of extremely-high-frequency radar that processes signals in the millimeter wave spectrum of wireless transmission, between 30 and 300 gigahertz. The radar, which looks like a pair of cones, transmits a radio signal that reflects off the vibrating surface and rebounds back to the radar. Due to the way the signal collides with the surface vibrations, the signal returns with a slightly modulated angle that corresponds exactly to the data bit sent by the sonar signal. A vibration on the water surface representing a 0 bit, for instance, will cause the reflected signal's angle to vibrate at 100 hertz. A key challenge was helping the radar detect the water surface. To do so, the researchers employed a technology that detects reflections in an environment and organizes them by distance and power. As water has the most powerful reflection in the new system's environment, the radar knows the distance to the surface. Once that's established, it zooms in on the vibrations at that distance, ignoring all other nearby disturbances. The next major challenge was capturing micrometer waves surrounded by much larger, natural waves. The smallest ocean ripples on calm days, called capillary waves, are only about 2 centimeters tall, but that's 100,000 times larger than the vibrations. Rougher seas can create waves 1 million times larger. "This interferes with the tiny acoustic vibrations at the water surface," the lead researcher says. To solve this, the researchers developed sophisticated signal-processing algorithms. The researchers also hope that their system could eventually enable an airborne drone or plane flying across water's surface to constantly pick up and decode the sonar signals as it zooms by.



## Engineering Innovation in India

### Kerala-Based Firm Develops India's First Underwater Robotic Drone



India's first underwater robotic drone developed at a hardware incubator which can send real-time video of ships and other underwater structures to help with their repair and maintenance, was launched in September 2018. It was handed over to the Naval Physical and Oceanographic Laboratory (NPOL) of DRDO. The first commercial Remotely Operated Vehicle (ROV)/underwater drone, EYEROVTUNA, was developed by EyeROV Technologies, a company incubating at Maker Village, which is one of the largest hardware incubators in the country. NPOL, a laboratory of Defence Research and Development Organisation (DRDO), placed the first order of the product, a Maker Village release said. The drone will be used by NPOL for research and development activities which in turn would result in commercial product for defence purposes. The robotic drone, developed by Johns T Mathai and KannappaPalaniappan P of EyeROV Technologies, can be navigated up to a depth of 50 metre to take real-time HD video images to examine ship hulls or undersea cables or bridge moorings, eliminating the need for costlier and riskier manual inspection by divers. EyeROV, which was tested on India's first solar ferry in Kerala's Vaikom, offers high manoeuvring capability at low cost and can be put to uses ranging from inspections of ship hulls, ports, dams and nuclear power plants, to search and rescue, naval mine detection and ocean studies.

Source <http://www.securitytoday.in/indian-news/kerala-based-firm-develops-indias-first-underwater-robotic-drone/>

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