



INAE e-Newsletter Vol X Issue 2, May 1, 2019

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From the Editor's Desk

From the Editor's Desk

During last year we have published the INAE e - Newsletter on quarterly basis. Publishing the newsletter once in three months has been causing a delay in bringing the reports on several events that are being organised by INAE as well as the reports on the conferences and symposia conducted by several reputed academic, research and industrial organisations. Some of the communications from INAE to the Fellowship are also getting invariably delayed. Since many of the important technical meetings in the country and elsewhere are being conducted at a very short notice, we are not in a position to alert the Fellowship and Young Associates in time to enable their participation and correspondence. In view of this, it has been decided to publish the e-Newsletter every month from May 2019 onwards for effective communication. An active co-operation of all the Fellows and Young Associates is being solicited to inform the INAE about the important scientific and technical events that are being conducted in the vicinity of your currently located area and if possible, compile a brief summary on the scientific and technological aspects that are covered at the event for the possible publication in the monthly newsletter. Furthermore, Fellowship can compile the information on the recent advances that are taking place in their chosen specialisation and can share this information with the Fellowship through the e-Newsletter. There is a lot of scope for everybody to interact with the Fellow members and share your thoughts through the newsletter.

All of you are aware that INAE has instituted a scheme of mentoring of engineering teachers and students by Fellows of INAE. It has been running successfully since its inception in 2006. Many of the students and teachers mentored by Fellows have done exceedingly well in their subsequent assignments. Many of the young Undergraduate students have received INAE innovative thesis awards for commanding research work that has been conducted by them. Several teachers mentored by Fellows received the best Ph.D thesis awards from INAE and various professional societies. Some of the research papers published by the mentored teachers in the International journals have been adjudged as the best papers published in their journals during the corresponding calendar years. Mentors have provided an excellent carrier guidance to the young students. This has enabled the young students to take up the advanced research work in various reputed national laboratories and reputed universities for their doctoral work. Though several Fellows are doing excellent job in selecting and mentoring the students, the Fellows coming forward to take up this assignment are not significant in number. It is being requested that the Fellowship take the mentorship seriously and we are looking forward for their participation large in number. It has been decided to publish the significant research reports submitted by the students at the end of the mentoring period on INAE website.



Prof. K. Bhanu Sankara Rao
Chief Editor, INAE Publications

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ACADEMY ACTIVITIES

Announcements-Nominations have been invited for the following:

- **INAE Young Entrepreneur Award 2019:** Last Date for receipt of Nominations- **June 30, 2019**
- **Innovative Student Projects Award:** Last Date for receipt of Nominations- **July 7, 2019**
- **Abdul Kalam Technology Innovation National Fellowship:** Last Date for receipt of Nominations for the **first phase of 2019-2020 – August 10, 2019**
- **Nominations invited for Life Time Contribution Award in Engineering 2019; Outstanding Teachers Awards for 2019; Prof Jai Krishna Memorial Award and Prof. SN Mitra Memorial Award for the year 2019:** Last date of receipt of nominations is **May 15, 2019.**

International Seminar on Civil Aviation- Regional Air Connectivity

INAE in association with the Ministry of Defence Production and Ministry of Civil Aviation organized a one-day International Seminar on “Civil Aviation - Regional Air Connectivity” as a part of Aero India on 21st February, 2019 at Bangalore. “Aero India 2019” is a biennial major aviation event scheduled during 20 – 24 February 2019 at Bangalore. The genesis of planning of the event was that Dr Ajay Kumar, Secretary, Department of Defence Production in his address during the Inaugural Session of Engineers Conclave 2018, organized by INAE jointly with Larsen & Toubro (L&T) on Oct 4-6, 2018 at L&T LDA, Lonavala, desired that INAE organize a one-day International Conference on Aerospace technologies in the Aero India Show planned in February 2019 at Bangalore. This initiative was in line with the earlier efforts of INAE wherein the recommendations emanating from Engineers Conclave 2017 regarding “Development and Production of Regional Civil Aircraft in India” were submitted to Niti Aayog; who had taken up the case for instituting a Special Purpose Vehicle (SPV) as recommended by INAE for approval of the PMO. The approval has since been accorded and the Ministry of Civil Aviation directed to process the case to form a SPV to head the initiative. The event was a good opportunity where national and international speakers have contributed to come up with actionable recommendations to be progressed with the concerned agencies.

The emphasis of the INAE seminar was on next generation regional turbo prop aircraft since India has emerged as a huge market for regional turbo props and the Government is supporting development of next gen turbo prop in collaboration with Global majors. Global leaders from industry, major R&D labs, Academia, Indian aircraft industry, airline operators and government leadership participated in this seminar. The Programme of the Seminar included the Inaugural Session, Plenary Talks, three Technical Sessions a Panel Discussion. The seminar provided an excellent platform for globally recognized engineering luminaries to interact with the national domain experts and bring out actionable recommendations for the way forward.



Left to Right: Mr. Jitendra Jadhav, Ms. Vandana Aggarwal, Dr. Shekhar C Mande, Dr. Sanak Mishra, Dr VK Saraswat,, Dr. G Satheesh Reddy and Dr. BN Suresh

The Inaugural Session commenced by felicitating the dignitaries and the Welcome Address by Dr BN Suresh, Immediate Past-President, INAE and Chairman, Advisory Committee wherein the background and aim of the event were highlighted. Dr Sanak Mishra, President, INAE then delivered the Presidential Address during which included the major initiatives and landmark activities of INAE.



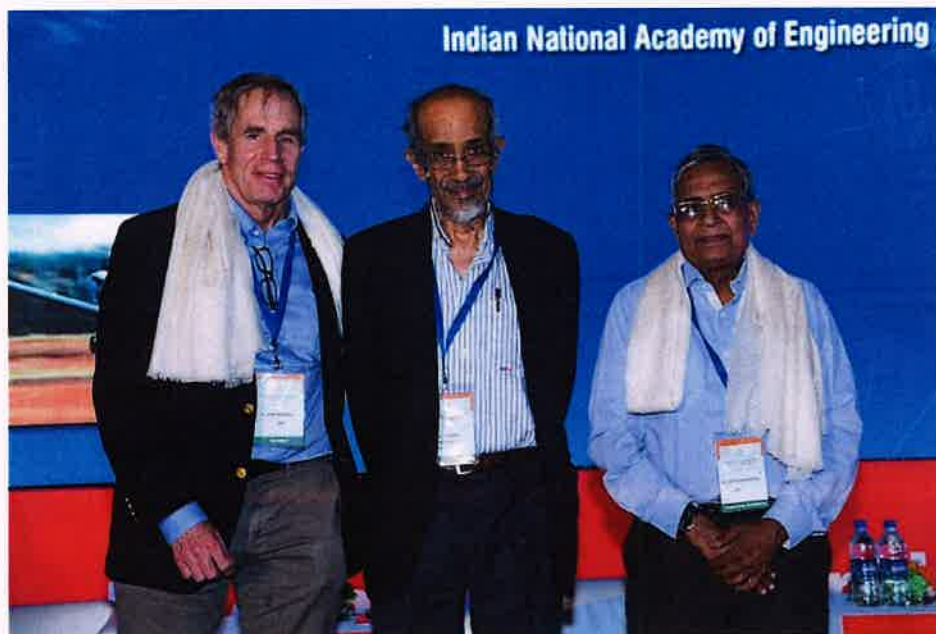
Dr. Sanak Mishra, President, INAE addressing the gathering during the Inaugural Session

The Guests of Honour Ms. Vandana Aggarwal, Eco. Adviser, MOCA; Dr. Shekhar C Mande, DG, CSIR; Dr. G Satheesh Reddy, Chairman DRDO then delivered their address. Dr. Shekhar C Mande during his address mentioned that the economic development of a region is directly linked to air connectivity and therefore organizing the Seminar on this topic of Regional Air Connectivity is of high relevance. Dr. VK Saraswat, Member, Niti Aayog, Chief Guest during his address emphasized that the right ecosystem in the country has been created to take up the tasks of building Regional Transport Aircraft (RTA) with the development of LCA, SARAS and HANSA. He also highlighted that there is a need to look up the next generation of aerodynamics, the laminar flow, the wave drag reduction, light weight by choosing right materials and reducing noise. The Session ended with a Vote of Thanks by Mr. Jitendra J Jadhav, Director, NAL and Chairman, Organizing Committee.



Dr. VK Saraswat, Member Niti Aayog, Chief Guest of the event addressing the gathering

The highlights of the seminar were two Plenary Talks delivered by Prof. John Hansmann, MIT, USA on 'Air Transportation Trends and Implications for Regional Transport in India' and Dr. Kota Harinarayana, Formerly Programme Director, ADA, Bangalore and President, Aeronautical Society of India, Bangalore on 'Next generation Turboprop Development - Challenges & Opportunities'.



Left to Right: Prof. John Hansman, Prof. Roddam Narsimha and Dr. Kota Harinarayana

The three Technical Sessions held during the Seminar were based on 'Regional Transport Aircraft'; 'Regional Aircraft Design' and 'RTA Powerplant'. The Session on 'Regional Transport Aircraft' included Keynote speakers from Indigo and SpiceJet Airlines who shared their experiences on their requirements for a Next generation Regional Turboprop. During the session, Dr. Andreas Kloeckner from Institute of System Dynamics & Control, DLR, Germany shared his views on 'Challenges and Solutions for Certified Electric Aircraft in Commercial Applications'. Technical inputs on 'Precision Navigation for All Weather Approaching at Low Cost Airports' was also covered during this Session by one of the Keynote Speaker from ISRO.

During the next Technical Session on 'Regional Aircraft Design'; presentations were made by two International speakers viz. Mr. Nikolai Talikov, Chief Designer, Ilyushin Design Bureau on 'Regional Turboprop Programs of the Ilyushin Design Bureau' and Mr. Agung Nugroho, President Director, Regio Aviasi Industri, Indonesia on 'Regional Transport Aircraft Program of Indonesia (R80)'. Last Technical Session on 'RTA Powerplant' included two presentations by Ms. Nivine Kallab, Senior Director, Strategic Planning & Business, Pratt & Whitney, Canada on 'Regional Aircraft Trends of the Future, P&WC's View of the Indian Market' and Mr. Uma Maheshwar D, Executive Chief Consulting Engineer, GE India on 'GE Aviation- Next Generation Propulsion for Regional Connectivity'.

The event concluded with the Panel Discussion on 'Ecosystem of Manufacturing of Civil Aircraft in India' chaired by Prof. K. Vijay Raghavan, Principal Scientific Adviser to the Government of India wherein the suggestions from eminent panellists and participants were summarised. Ms. Vandana Aggarwal, Eco-Adviser, MOCA highlighted that India would be buying about 2100-2200 aircrafts (scheduled carriers) as for Boeing and Airbus estimates in the next two decades. The total cost for that is about 300 billion US dollars and is a right stage for India to enter the aviation Industry with the manufacture of RTA and thereby save the precious foreign exchange.

Prof. K. VijayRaghavan, Principal Scientific Advisor, Govt. of India then summarised the proceedings and said that the SPV created needs to have management leaders, economists, financiers who come from industry as well as non-engineering backgrounds with an understanding of the market. He emphasized that this kind of a leadership is critical for the success of project. He brought out that engineers and scientists tend to look at this as a technical problem as a proof of their technological competence. However, in today's world, it is possible to get the most complex things done if a talented group of engineers gets together by working with companies around the globe. Having technical competency is an absolute necessity. In addition, the other components are needed to succeed. The post proceedings of the Seminar are under compilation which will be forwarded to the concerned Govt. Departments/Agencies for consideration.

Abdul Kalam Technology Innovation National Fellowship

Indian National Academy of Engineering (INAE) and Science and Engineering Research Board (SERB), Department of Science and Technology (DST) had launched the INAE-SERB, DST Abdul Kalam Technology Innovation National Fellowship 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 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 and a Research Grant of Rs.15.00 lakh per annum will also be provided. An Overhead of Rs.1.00 lakh per annum will also be provided to the host institute. 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. 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.

The first call for nominations to be considered for the subject Fellowship, during the Financial Year 2019-2020 has been announced. All nominees who had applied in previous Financial Years are eligible to apply again once in response to either the first call or second call for nominations announced for the Financial Year 2019 - 2020. As per guidelines, a nominee may also 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 to be considered in response to the first call for nominations for the Financial Year 2019- 2020 is August 10, 2019.**

Technical Visit of INAE Governing Council Members to L&T Complex Talegaon on March 7, 2019 on the sidelines of the Governing Council Meeting held at Pune on March 8, 2019

A technical visit was organized for the Members of the INAE Governing Council to L&T Complex, Talegaon on March 7, 2019, a day prior to the Governing Council meeting held at Pune on March 8, 2019. The programme was realized thanks to the concerted efforts of Mr. MV Kotwal, FNAE and Dr. Pradip, Vice-President, INAE who played a key role in organizing the two days events on 7th and 8th March 2019 at Talegaon and Pune respectively. The Strategic Systems Complex (SSC), a state-of-the-art facility set up by L&T at Talegaon is one of the finest facilities for realisation of series production and proto versions of Strategic Weapon Platforms, Sensors and Military Engineering Systems. All Pune based Fellows had been specially invited to participate in the visit and there were about 70 other participants from local Engineering Colleges and Industry, besides Governing Council members and INAE Secretariat Staff who attended the technical visit to L&T Strategic Systems Complex (SSC) at Talegaon on March 7, 2019. A detailed Programme for the visit was formulated which was appreciated by all delegates who attended the event.

The programme commenced with the Tree Plantation Ceremony by Dr Sanak Mishra, President, INAE as per the traditional practice of promoting green initiatives of L&T. This was followed by a Group Photograph of all participants. The function commenced with convening of all delegates at the "Town Hall" followed by Inauguration and Lighting of the Lamp. Mr MV Kotwal, FNAE then spoke on the context of the event on behalf of INAE Pune Local Chapter and Capt Brijesh Kalra, Vice-President, and Head, L&T Strategic Systems Complex, Talegaon highlighted the setting of the context on behalf of L&T. Brief presentations were made by key personnel of L&T including by Mr Parag Saxena on "L&T and its Role in Defence Industry" and by Mr Koustubh Phalnikar on "Focus on Technology in L&T Defence". This was followed by the plant visit and the participants were divided into groups to facilitate ease of conduct of the visit. The plant visit was very informative and interesting and included visits to the Electronics Shop, ISF and AIT 1 and 2. After the visit the participants convened at the Atrium, Administration Building for High Tea and returned to the Town Hall. The technical programme then resumed with the presentation of a case study on "Development of an Eco System for Hi-Tech Manufacturing" covering opportunities and eco-system created by L&T. Two business partners of L&T then made brief presentations of their success stories highlighting the experience sharing in Hi-Tech Manufacturing and development of products for L&T Defence. After this, five eminent panel members including Mr. Arun Ramchandrani, FNAE shared their thoughts on relevant technical issues followed by Open House interaction.

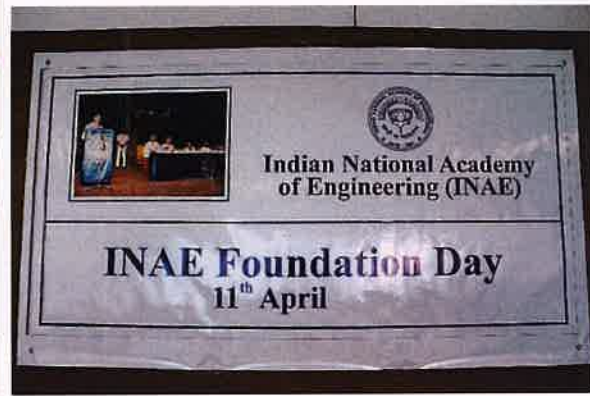
A novel and unique experience for the participants was witnessing the ceremony for lowering of the Indian Flag. All the participants stood in lines near the Flag Post and the Flag was lowered slowly and ceremoniously which was accompanied by appropriate bugle calls and the lowering was simultaneous with the bugle calls. All persons present were given instructions about when to salute when the guards conducted the March Past and the Flag lowering ceremony. The event was a unique opportunity for networking between Fellows, delegates and invitees and it was expressed by the senior leaders of L&T that the technical experts at L&T SSC were motivated with the visit of galaxy of such specialists at their Facilities. Mr. Kotwal, FNAE in his address mentioned that Pune Engineering Forum of the INAE Pune Local Chapter is operational and efforts would be made to involve the engineering students and faculty from academic institutions in various projects to be undertaken under aegis of INAE Pune Engineering Forum. Prof. Indranil Manna, Vice-President, INAE mentioned that the technical visit at L&T SSC, Talegaon was very informative and useful wherein facilities exhibiting the skill of operation, level of integration and reach of L&T made during the last 30-40 years has made us proud as engineers. The Academia- Industry interface is an important component for the growth of the nation and efforts are being made by INAE to involve experts from Academia and Industry in various activities from time to time. Mr. JD Patil, FNAE, Whole-time Director (Defence Business) & Sr. Executive Vice-President, Larsen & Toubro Ltd., Mumbai promised to extend full support from L&T in various activities of INAE. Dr Sanak Mishra, President, INAE delivered the Concluding Remarks. He expressed his gratitude to L&T during the Vote of Thanks proposed by him wherein he thanked Mr. JD Patil, Mr. Arun Ramchandani, FNAE and all officials of L&T who were responsible for the event on 7th March 2019 at Talegaon successful and memorable for all delegates. A dinner for all the participants was organized at Taj Gateway Hotel, Pune. Mr. JD Patil, FNAE, Whole-time Director (Defence Business) & Sr. Executive Vice-President, Larsen & Toubro Ltd., Mumbai along with L&T officials also attended the dinner. Dr Sanak Mishra, President, INAE during his briefing in the Governing Council meeting on March 8, 2019 expressed his deep appreciation to Mr MV Kotwal and Dr Pradip for their efforts to realize the technical visit to L&T Strategic Systems Complex, Talegaon on 7th March 2019 jointly organized with INAE Pune Local Chapter and L&T.

INAE Foundation Day Celebrations on April 11, 2019

Indian National Academy of Engineering (INAE) was raised on 20th April 1987 having registered by the Registrar of Societies and was formally inaugurated on 11th April 1988 at New Delhi by the then Prime Minister, Mr. Rajiv Gandhi at a colourful Foundation Function in New Delhi. In order to commemorate this momentous occasion, INAE has decided to celebrate the FOUNDATION DAY of INAE on 11th April every year, from now onwards. It was also decided that this Foundation Function would be celebrated every year on April 11 with a suitable activity in the respective location of the INAE Local Chapters with the INAE Fellows and INAE Young Associates.

➤ INAE Foundation Day Celebrations at INAE Office, Gurgaon

The Foundation Day Celebrations at INAE Office, Gurgaon were organized on April 11, 2019 wherein Dr Sanak Mishra, President, INAE addressed the INAE staff headed by Brig Rajan Minocha, Executive Director, INAE in an informal meeting in which Shri Pradeep Chaturvedi, FNAE was also present. Dr Sanak Mishra welcomed all present and gave a brief overview of the history of INAE and the various locations in which the INAE office was housed. He also held interactions with the INAE staff about their experience in working at INAE office. Dr Sanak Mishra briefed all present on the recent activities and initiatives of the Academy that have increased its visibility in the engineering fora, as well as the policy domain. He also highlighted regarding the important forthcoming activities being planned in the near future. The meeting was an occasion for a lively interaction session of the INAE Staff wherein their suggestions and views regarding improved office functioning were sought by Dr Sanak Mishra, President, INAE which was followed by high tea.



Dr Sanak Mishra, President, INAE cutting the cake on Foundation Day Celebrations at INAE Office, Gurgaon



Group Photo of INAE Staff with Dr Sanak Mishra, President, INAE with Shri Pradeep Chaturvedi, FNAE to his right and Brig Rajan Minocha, Executive Director, INAE to his left

➤ INAE Foundation Day Celebrations at Bangalore

INAE Foundation Day-2019 was celebrated by INAE - Bangalore Chapter (BC), at a function organized for the occasion on April 11, 2019 at Golden Jubilee Hall, ECE Dept, Indian Institute of Science, Bangalore. Dr VK Aatre, Chairman, INAE BC personally guided the EC of INAE BC in organising the function. The two-hour Programme commenced with the Welcome Address by Dr AR Upadhya, Hon. Secretary, INAE BC wherein he briefly presented the milestones successfully achieved by INAE and its contributions since its founding in 1987. About 30 INAE Fellows/Young Associates participated in the function. The function was graced by the presence of Dr BN Suresh, Immediate Past President, INAE. Prof Anurag Kumar, Director, IISc though could not be present in person due to pressing engagements, conveyed his kind greetings for the success of the event. The following two talks were presented in the function:

1. "Employment Opportunities in Small Towns due to Digital Technologies", by Dr Sridhar Mitta , Founder & Managing Director, Next Wealth Entrepreneurs Pvt Ltd, Bangalore
2. " Elements of a Proposal for a Study on Status of Engineering in the Country", by Dr Rudra Pratap, Professor, CeNSE, IISc, Bangalore.



Dr VK Aatre, Chairman, INAE BC in front seat



Audience at IISc, Bangalore



Left to Right: Dr AR Upadhyha and Dr BN Suresh, Immediate Past-President, INAE

Both the lectures were well received and generated good discussions. This was followed by brief addresses by Dr BN Suresh and Dr VK Aatre. The programme concluded with the Vote of Thanks by Prof G Jagadeesh, Jt. Secretary, INAE BC. Special thanks were given to Prof KJ Vinoy, Member EC, INAE-BC and his team for the excellent local arrangements for the function.

➤ **INAE Foundation Day Celebrations at Kolkata**

INAE Foundation Day was celebrated by INAE Kolkata Chapter, on 11th April, Thursday at the University of Calcutta, Salt Lake Campus (Board Room, Centre of Nanoscience and Nanotechnology, JD 2, Sector III, Salt Lake, Kolkata). All local INAE Fellows and Young Associates and their colleagues and students were invited to join the celebration.



Prof Sankar Pal, FNAE cutting the cake with Prof Sushmita Mitra, FNAE and Prof Debatosh Guha, FNAE to his left

➤ **INAE Foundation Day Celebrations at Kharagpur**

INAE foundation Day was celebrated by the INAE Kharagpur Chapter during a function organized on April 11, 2019 at Indian Institute of Technology Kharagpur wherein all INAE Fellows and Young Associates located in the vicinity were invited. The function was convened by Prof Indranil Manna, Vice-President, INAE

INAE Local Chapter Activities

➤ **INAE-Bangalore Chapter's Outreach Programme with Visvesvaraya Technological University (VTU), Karnataka.**

The programme, started in August 2017 to help the faculty to initiate new technology areas in teaching and research, has made good progress. A Joint Coordination Committee was set up for the purpose of planning and coordination of the programme of specialist lectures. Several lectures on specialised topics were delivered by Fellows of INAE in the VTU Centre for PG Studies and in several VTU affiliated engineering colleges in Bangalore. However, in order to centralise the activity and broad base it in terms of participation, it was subsequently decided in Dec 2018 to conduct the programme of lectures on the fourth Thursday of every month at the Bangalore Regional Centre of VTU with invitation to all concerned colleges. The following lecture programmes have been conducted in this manner since Jan 2019.

- (i) 4 Jan 2019: Dr Aloknath De, FNAE , Senior VP &CTO, Samsung India Software Operations Pvt Ltd, Bangalore –“IOT: Essence, Intelligence & Impact” and Dr TV Prabhakar, IISc, Bangalore -“IOT Applications in Automotive Sector”
- (ii) 21 Feb 2019: Dr Ananda Mohan PV, FNAE , Technology Advisor, CDAC, Bangalore - VLSI Analog Filters & Oversampled A/D Conversion
- (iii) 28 March 2019: Prof Sreenivasa S Murthy, FNAE, Distinguished Visiting Professor, NIAS, Bangalore & IIT Ropar- "Renewable Energy and Sustainable Technologies", and Dr Hoysall N Chanakya, IISc, Bangalore- Infusing Sustainability into Emerging Climate Friendly Energy Technologies - the case of Biomethanation”.

➤ **INAE Kolkata Chapter's Science Day Celebration on Feb 28, 2019**

National Science Day is celebrated throughout India on 28 February each year to commemorate the invention of the Raman Effect by Indian physicist and Nobel Laureate Sir C. V. Raman. On this occasion, like every year, Indian National Academy of Engineering (INAE) Kolkata Chapter organized a lecture meeting at the Meghnad Saha Auditorium, Science College Campus of the University of Calcutta. Prof. Bhargab B. Bhattacharya, President, INAE Kolkata Chapter, presided over the function.

Shri Amitava Roy, Director, Variable Energy Cyclotron Centre (VECC), Kolkata delivered a lecture on 'Cyclotrons and its applications in research and health care', sharing his experience during his glorious journey over the last few decades in this field. **Prof. Prasanta K. Basu**, formerly Professor of the University of Calcutta, gave a talk on 'Raman effect and its application in electronics, communication, and other engineering areas'. Both lectures were highly appreciated by the audience. This event was attended by more than 70 students, researchers, and faculty members from different colleges, institutes and universities in and around Kolkata. The program was conducted by Prof. Debatosh Guha, Secretary, INAE Kolkata Chapter. The event was covered by Kolkata Doordarshan Kendra (DD7 Bangla) and aired on 8 March 2019 for public view.



Shri Amitava Roy addressing the audience



Prof. P. K. Basu addressing the audience



Felicitation of Shri Roy by Prof. B. B. Bhattacharya



Prof. D. Guha conducting the function



Audience present at the Meghnad Saha Auditorium, Kolkata

➤ INAE Mumbai Local Chapter

INAE Mumbai Local Chapter had a meeting at Indian Institute of Technology (IIT) Bombay under the Chairmanship of Prof Devang Khakhar, Director, IIT Bombay on March 6, 2019 for reactivating the Chapter. Mr. D. P. Misra, FNAE welcomed the Fellows who had come for the meeting. He mentioned that at the INAE Annual Convention held Hyderabad in December 2018, a number of Mumbai-based Fellows held an informal meeting and expressed their opinion that the INAE Mumbai Chapter be revived. The present meeting was an outcome of that. Mr. Misra requested Prof. Devang Khakhar, Director IITB to chair the meeting. Prof. Khakhar welcomed all the Fellows to IIT Bombay. He mentioned that the INAE Mumbai Chapter had been formed over a decade ago, but in recent years no activities have been held. It would be very worthwhile to revive the Chapter, and he was glad to see the number of Fellows who were present at the meeting. Prof. Khakhar requested that the Fellows go through a round of introductions, and the 36 Fellows who were present briefly introduced themselves.

Prof. J. Vasi, who was earlier Chair of the Chapter, gave a brief background in which he also alluded to the meeting of Fellows in Hyderabad, where it was felt that IIT Bombay and BARC (and other DAE-related organisations), being home a large cohort of Fellows, should take the lead in the re-formation of the Chapter. He also mentioned that he had received inputs from some Fellows that activities should also occasionally be arranged in South Mumbai. Prof. Khakhar said that one of the main purposes of the meeting was to consider whether the INAE Mumbai Chapter should be revived, and if so, to elect the Executive Committee for the Chapter. The Fellows unanimously agreed that the Chapter be revived.

Prof. Khakhar mentioned that based on the input received from the Hyderabad meeting, he had discussed the matter with Mr. K. N. Vyas, Secretary DAE. They felt that it would be appropriate to have 2 Co-Chairs for the Chapter, one each from IITB and DAE and an Honorary Secretary and Treasurer. It was felt that in addition to the above 4 members, the Executive Committee may have 6 more members, representing, if possible, different Sections of INAE.

Accordingly, the following Executive Committee was elected:

Prof. A. K. Suresh	Co-Chair
Prof. R. B. Grover	Co-Chair
Prof. D. N. Singh	Hon. Secretary
Mr. D. P. Misra	Treasurer
Prof. K. Ramamritham	Member
Prof. B. K. Dutta	Member
Mr. K. Sreekumar	Member
Prof. S. Mahapatra	Member
Dr. U. Kamachi Mudali	Member
Dr. (Mrs.) S. B. Roy	Member

It was decided that the above Committee would hold office till December 31, 2019. A formal process of nominations and elections would be held in November/December 2019 for the Executive Committee which would be elected for the normal 3-year term starting in January 2020.

There followed a discussion on the activities of the Mumbai Chapter. Many interesting ideas emerged. These are as follows:

- Talks and Seminars on regular basis, including Webinars
- Mentorship of Entrepreneurs
- Mentorship of Young Engineers
- Industry-R&D-Academia Interactions, including deployment of developed technologies
- Involvement with the State Government, eg Maharashtra State Innovation Council
- Engineers Day Celebration
- Inputs on Engineering Education
- INAE e-Newsletter
- Involvement of INAE Young Associates in activities
- Wider use of electronic media (webinars, interaction via WhatsApp, Facebook, etc.)

It was decided to put together a detailed list of forthcoming events for the year 2019. The meeting concluded with a Vote of Thanks to the Chair. The Fellows dispersed for informal discussions over high tea.

Third Report by INAE Forum on “Technology, Foresight and Management for Addressing National Challenges”

The INAE Forum on “Technology, Foresight and Management for Addressing National Challenges” under the Chairmanship of Mr VK Agarwal, FNAE, has brought out the third Report on addressing pertinent issues and concerns regarding Rural Urban Continuum and development of High-Speed Rail in the country. The topics covered under the report are among the thrust areas of national engineering interest. The first topic on Rural Urban Continuum is appropriate as the Urban -Rural -Divide is a perceivable challenge that needs to be overcome for socio- economic growth and sustainable development. The second topic of the report addresses all the issues, international experiences and lessons in creating of a High-Speed Rail system which are highly relevant in today’s context as High-Speed Rail has tremendous potential to revolutionize train travel in the country. A soft copy of the report has been posted on INAE website and can be downloaded from the link given below

<https://www.inae.in/storage/2019/01/Third-Report-INAЕ-Forum-on-Technology-Foresight-min.pdf>

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 March 2019 and April 2019

- Meeting of Steering Committee on Research Schemes/Proposals held on March 5, 2019 at INAE Office, Gurgaon
- INAE Governing Council meeting held on March 8, 2019 at Pune
- Meeting of INAE Forum on Civil Infrastructure held on Mar 16, 2019 at CRRI, New Delhi
- Meeting of INAE Forum on Engineering Interventions for Disaster Mitigation held on April 5, 2019 at INAE office, Gurgaon

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.

Prof MR Madhav, FNAE Professor Emeritus and Visiting Professor, IIT Hyderabad and JNTUH	Vallurupalli Nageswara Rao Vignana Jyothi Institute of Engineering and Technology, Hyderabad January 3-5,2019	Delivered lectures on "Mechanics/Geomechanics-Revisited", Reinforcement soil 'Interactions Under Transverse and Oblique Forces'" and "Revolution in Civil Engineering Materials". According to the feedback provided by the engineering college, the DVP has helped to identify relevant projects based on the topics taught. He has also guided students in their projects.
	Gayatri Vidya Parishad College of Engineering, Visakhapatnam January 9-10, 2019	Delivered lectures on "Supporting Foundations" and "Pavements with Geosynthetics". According to the feedback from the engineering college, Prof Madhav helped in introduction of a course relevant to the existing curriculum and his visits have been beneficial for both UG and

	February 28 and Mar 1, 2019	PG students. Delivered lecture on "Reinforced Earth Walls-Design & Construction" and "Case studies in Geotechnical Engineering". According to the feedback from engineering college the DVP had guided projects and helped identifying projects. He had also advised on syllabus of Infrastructure Engineering and to explore starting of M.Tech.
Dr. Lalit Kumar, FNAE Chairman CEPTAM, DRDO, New Delhi; Director (Retd), MTRDC, DRDO, Bangalore	Siddaganga Institute of Technology, Tumkur January 30 & February 1- 2,2019 2018	Delivered lectures on "Advances in Microwave Applications-Part I", "Microwave Imaging " and " Advances in Microwave Applications-Part II". According to the feedback from the faculty coordinator, the DVP has helped in identifying research studies and suggested improvement in curriculum. The scheme is very helpful in course delivery project guidance and research mentoring.
Dr. D. Antony Louis Piriyakumar Director-Startup, Agape Piriyakumar AI Solutions	Thiagarajar College of Engineering, Madurai February 3-5,2019	Delivered lectures on ""Machine Learning: Neural Networks", " Lateral Thinking", "Python with Open CV". According to the feedback from the faculty coordinator the DVP has helped in developing curriculum. The interaction with the DVP has helped understand the current research in Deep learning. He has also given an insight to the layers of Convolutional layers of deep networks that can help scholars and students to develop innovative deep algorithms.
Prof. V. Radhakrishnan, FNAE, Professor, Department of Mechanical Engineering, IIT Madras & Emeritus Professor of Indian Institute of Space Science and Technology	Department of Aerospace Engineering, IIST February 4-5,11, 2019	Delivered lectures on "Engineering Academic Research", " Innovative Research" and "Art and Craft of Publishing Research Papers". According to the feedback from the engineering college, the expert inputs from the DVP have helped PhD scholars, faculty members and students.
Dr Jayanta Kumar Saha Deputy General Manager (Applications) Institute for Steel Development & Growth	Faculty of Engineering and Technology, Jadavpur University February 6-8, 2019	Delivered lectures on "Overview of Steel Making Including Alternate Steel Making importance and Steel Usage in Different Segments", "Steel Products and its Usage in Various Segments" and "Overview of Corrosion Protection of Structural Steel Against Atmospheric Environment Exposure". According to the feedback from college the sessions helped students to correlate applications with theoretical knowledge. The projects guided by him are industry oriented which help students to enhance their knowledge.
	Indian Institute of Engineering Sciences and	Delivered lectures on "Overview of Iron and Steel Making", "Technology & Innovation for

	Technology, Shibpur February 19-21, 2019	Steel Industry" and "Industry 4.0 Relevance in Iron & Steel Industry". According to the feedback from the faculty coordinator, the interactive sessions conducted by the DVP helped to correlate the applications with theoretical knowledge.
Dr Manish Roy Scientist 'F', Defence Metallurgical Research Laboratory, Kanchanbagh	Department of Metallurgical Engineering, JNTUH, Hyderabad February 6-7,11,2019 Indian Institute of Engineering Science and Technology, Shibpur March 11-13,2019	Delivered lectures on " X-ray Diffraction and its Applications: Part III Identification of Phases & Structure of Polycrystalline Aggregates", " X-ray Diffraction and its Applications: Part IV Phase diagram Determination, Precise Parameter Measurement and Order Disorder Transformation" and "X-ray Diffraction and its Applications: Part V Quantitative Phase Analysis and Measurement of Residual Stress" .According the feedback from the college, the scheme is excellent as it helps academicians to work on problems with practical and industrial relevance. It also helps the post Graduate and Doctoral students to identify new area of research. Delivered lectures on "Converter Steel Making", "Measurement of Fracture Toughness" and "Diffusion in Solids". According to the feedback from college, the scheme is excellent and provides a great opportunity to academicians and experts from research to interact with a purpose.
Dr Chaitanyamoy Ganguly, FNAE Distinguished Scientist, DAE	Dr. MN Dastur School of Materials Science and Engineering, Indian Institute of Engineering Science and Technology, Shibpur February 14-16, 2019	Delivered lectures on "Materials Research for Energy Security and Environmental Protection", "Materials Research Funding in India - How to write a Research Proposal Case Study: Applications for BRNS Research Grants" and "Prospects and Challenges of Food, Fuel, Electricity & Water Security and Mitigation of Greenhouse Gas Emission". According to the feedback received from the engineering college the DVP has guided on research proposals and given valuable inputs for revising academic programme.
Prof. Bankim Chandra Majumdar, FNAE, Formerly Professor, Department of Mechanical Engineering, IIT Kharagpur	Adhiyamaan College of Engineering, Tamil Nadu February 21-23,2019 National Institute of Science and Technology, Berhampur, Odisha March 7-9,2019	Delivered lectures on " Oil Flow and Thermal Equilibrium in Journal Bearings", "Hydrostatic Bearings" and "Elasto-hydrodynamic bearings". According to the feedback from the engineering college the DVP had advised students on their Thesis work and held discussions on syllabus of Tribological Design of Machine elements. Delivered lectures on "Centre of Gravity" and "Trusses". According to the feedback from the engineering college the DVP guided projects and has given advice on teaching methodologies to be followed. The student

		community has benefited from the scheme. The students had actively participated and made it an interactive session.
Mr. Nawal Kishore Gupta Formerly Deputy Director LPSC/ISRO	Madhav Institute of Technology & Science, Gwalior Feb 25-28,2019 & Mar 1, 2019	Delivered lectures on "Introduction to World Space Program Scenario - An Overview", "Introduction to ISRO: Planetary Sciences and Astronomy" and "Calculations of Planet Orbits and Escape Velocity". According to the faculty coordinator, the DVP has also guided projects. and the scheme has created a positive impact on students as they could learn about 'Aerospace Propulsion' directly from ISRO Scientist.
Dr SL Mannan, FNAE, Former Outstanding Scientist and Director Metallurgy and Materials Group, Indira Gandhi Centre for Atomic Research, Kalpakkam	PSG College of Technology, Coimbatore March 11-12, 2019	Delivered lectures on "Fatigue Deformation and Fracture - Part I" and "Fatigue Deformation and Fracture-Part II". According to the feedback from the engineering college, the scheme is beneficial for both faculty and students. The DVP had guided on-going projects and held discussions on syllabus of B.E. Metallurgical Engineering course.

International/National Conferences/Seminars being organized by IITs/other Institutions

To view a list of International/ National Conferences/Seminars being held in the month of May 2019, click here.

Honours and Awards

1.	Dr G Satheesh Reddy, FNAE, Secretary to Government of India, Dept of Defence R&D, Chairman, Defence Research and Development Organisation (DRDO), Scientific Adviser to Raksha Mantri and Director General, Aeronautical Development Agency (ADA), has been conferred with the prestigious AIAA Missile Systems Award 2019 by American Institute of Aeronautics and Astronautics (AIAA), one of the world's largest and reputed aerospace technical societies. The award recognizes excellence in developing and implementing missile systems technology and for inspired leadership of missile systems programmes. Dr G. Satheesh Reddy was selected for his over three decades of significant national contributions toward indigenous design, development, and deployment of diversified strategic and tactical missile systems, guided weapons, advanced avionics, and navigation technologies in India. He is the first Indian to be conferred with this Award. The news clippings regarding the same may be viewed at the links given below https://www.thehindu.com/todays-paper/tp-national/drdo-chairman-wins-missile-systems-award/article26422423.ece https://timesofindia.indiatimes.com/city/hyderabad/international-award-for-satheesh-reddy/articleshow/68237684.cms
2.	Prof Bikramjit Basu, FNAE, Honorary Professor, University of Manchester, UK; Guest Professor, Wuhan University of Technology, China and Professor, Materials Research Centre, Indian Institute of Science, Bangalore has been selected to be elevated to the grade of Fellow of The American Ceramic Society, founded in 1899. Recognition of this achievement will be given at the ACerS Honours and Awards Banquet at the 121st Annual Meeting of the American Ceramic Society on, September 30, 2019 in Portland Oregon, USA.
3.	Dr. Prahlada Ramarao, FNAE, Pro Chancellor S-VYASA, Director, Centre for Energy Research and Adjunct Faculty, Dept of Management IISc and NIAS, Bengaluru has been nominated by the

	President of India, in his capacity as the Visitor of Indian Institute of Science (IISc), Bangalore as his nominee on the Court of the Institute as per Clause 8.1 (a) of the Scheme, Regulations and Bye-Laws of IISc Bangalore.
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News of Fellows

1	Prof DN Singh, FNAE, Institute Chair Professor, Geotechnical Engineering Division, Department of Civil Engineering, Indian Institute of Technology Bombay, Mumbai was Principal Investigator of a study led by IIT Bombay which was featured in an article titled “Mineral Contents of Buldhana’s Lonar Lake Similar to Moon Rocks: IIT-Bombay Study” published in Hindustan Times, Mumbai on March 25, 2019. Prof DN Singh has requested for suggestions and comments on the article which may be viewed at the link given below
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<https://www.hindustantimes.com/mumbai-news/mineral-contents-of-buldhana-s-lonar-lake-similar-to-moon-rocks-iit-bombay-study/story-sl9v4p3gBvp2oIorYDY77H.html>

2	Dr Debabrata Das, FNAE, Visiting Professor, Former Head and Renewable Energy Chair Professor, Department of Biotechnology and Former Professor-in-Charge P K Sinha Center for Bioenergy, Indian Institute of Technology, Kharagpur has jointly authored a book with Dr Jhansi L. Varanasi titled "Fundamentals of Biofuel Production Processes" published by CRC Press, USA in 2019. Focusing on fundamentals of biofuel production from renewable energy sources and biohydrogen production, this book offers a complete understanding of the bioconversion processes.
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News of Young Associates

1	Dr Koteswararao V. Rajulapati, Associate Professor, School of Engineering Sciences and Technology, University of Hyderabad, Hyderabad was elected in March 2019 as "Fellow of Telangana Academy of Sciences (FTAS)" in recognition of his contributions to Science & Technology.
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International/National Conferences in May 2019

2nd International Conference on Computational & Experimental Methods in Mechanical Engineering on May 3-5, 2019 at Greater Noida, Uttar Pradesh
<https://conferencealerts.com/show-event?id=210368>

International Conference on Advanced Technologies in Science and Engineering on May 8, 2019 at Trivandrum, Kerala
<https://conferencealerts.com/show-event?id=214226>

International Conference on Advances in Computing and Information Technology (IACIT-2019) on May 10-11, 2019 at Bengaluru
<https://conferencealerts.com/show-event?id=212245>

International Conference on Artificial Intelligence and Data Engineering on May 23-24, 2019 at Nitte, Karkala, Karnataka
<https://conferencealerts.com/show-event?id=209990>

Civil Engineering

1. Indian Railways' Surat Station to Become World-Class Multi-Modal Transport Hub

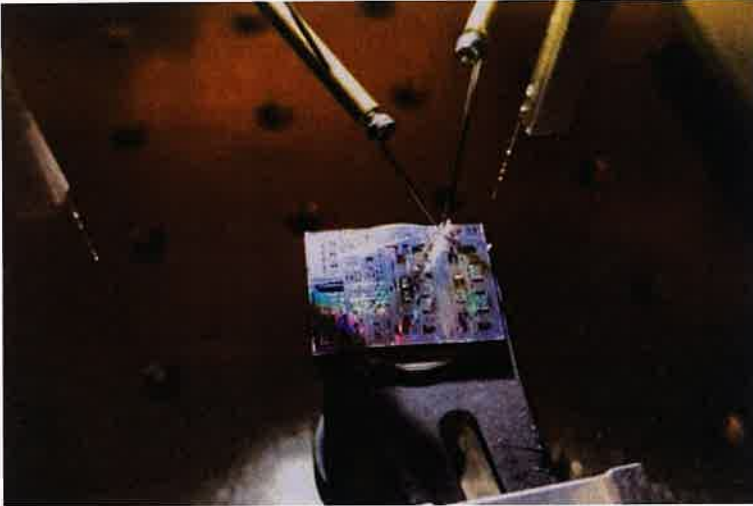


Indian Railways is all set to transform Surat station in Gujarat into a world-class railway station! Not only that, by integrating all modes of transport, the entire building will be developed into a multi-modal transport hub (MMTH). For the implementation of the project, all the three levels of administration-Indian Railways' Central Railway zone, state government's Gujarat State Road Transport Corporation and Surat Municipal Corporation of local authorities have come together to pool their lands and form an SPV (Special Purpose Vehicle), named SITCO. The project will be headed by Indian Railways Station Development Corporation (IRSDC). Here are 5 facts about the upcoming Surat railway station redevelopment project:

- 1.) The station building will be turned into an MMTH and will include a swanky railway station, bus terminal, big ticketing hall, wide station lobby, modular passenger friendly concourse, connecting bridges, retail and offices space in the commercial towers among other facilities.
- 2.) In addition to these facilities, the MMTH will be connected with the Surat Metro, BRTS and suburban network. Earlier, SK Lohia, MD of IRSDC told Financial Express Online that the project will be the costliest till now.
- 3.) Increasing the viability of the project, the proposed commercial development BUA (Built-up Area) has been increased to 8.40 lakh sq.m. from 5.07 lakh sq.m. Moreover, to fulfill parking/fire requirements as per local bylaws, the term BUA has been modified to exclude any upper floors or basements.
- 4.) From 3,54,864 sq.m., the proposed commercial area at ground level has been increased to 7,84,596 sq.m. Also, the west side's commercial area has been increased by shifting the proposed quarters of Indian Railways to Udhna.
- 5.) The estimated cost of Surat's MMTH project, for which the centre, state government as well as the urban local body have together for the first time by pooling their lands, has been reduced to an amount of Rs 895 crore from Rs 1,008 crore.

Source <https://www.masterbuilder.co.in/indian-railways-surat-station-to-become-world-class-multi-modal-transport-hub/>

2. Engineering for High-Speed Devices



If you use a smartphone, laptop, or tablet, then you benefit from research in photonics, the study of light. The research involved fabricating devices at UD's Nanofabrication Facility.

If you use a smartphone, laptop, or tablet, then you benefit from research in photonics, the study of light. At the University of Delaware, a team led by Tingyi Gu, an assistant professor of electrical and computer engineering, is developing cutting-edge technology for photonics devices that could enable faster communications between devices and thus, the people who use them. The research group recently engineered a silicon-graphene device that can transmit radiofrequency waves in less than a picosecond at a sub-terahertz bandwidth -- that's a lot of information, fast. "In this work, we explored the bandwidth limitation of the graphene-integrated silicon photonics for future optoelectronic applications," said graduate student Dun Mao, the first author of the paper. Silicon is a naturally occurring, plentiful material commonly used as a semiconductor in electronic devices. However, researchers have exhausted the potential of devices with semiconductors made of silicon only. These devices are limited by silicon's carrier mobility, the speed at which a charge moves through the material, and indirect bandgap, which limits its ability to release and absorb light. Now, Gu's team is combining silicon with a material with more favorable properties, the 2D material graphene. 2D materials get their name because they are just a single layer of atoms. Compared to silicon, graphene has better carrier mobility and direct bandgap and allows for faster electron transmission and better electrical and optical properties. By combining silicon with graphene, scientists may be able to continue utilize technologies that are already used with silicon devices -- they would just work faster with the silicon-graphene combination. To combine silicon with graphene, the team used a method they developed and described in a paper published in 2018 in *npj 2D Materials and Application*. The team placed the graphene in a special place known as the p-i-n junction, an interface between the materials. By placing the graphene at the p-i-n junction, the team optimized the structure in a way that improves the responsivity and speed of the device. This method is robust and could be easily applied by other researchers. This process takes place on a 12-inch wafer of thin material and utilizes components that are smaller than a millimeter each. Some components were made at a commercial foundry. The combination of silicon and graphene can be used as a photodetector, which senses light and produces current, with more bandwidth and a lower response time than current offerings. All this research could add up to cheaper, faster wireless devices in the future. "It can make the network stronger, better and cheaper," said a researcher. "That is a key point of photonics."

Source <https://www.sciencedaily.com/releases/2019/03/190329134756.htm>

Mechanical Engineering

3. Solar-Powered Moisture Harvester Collects and Cleans Water from Air

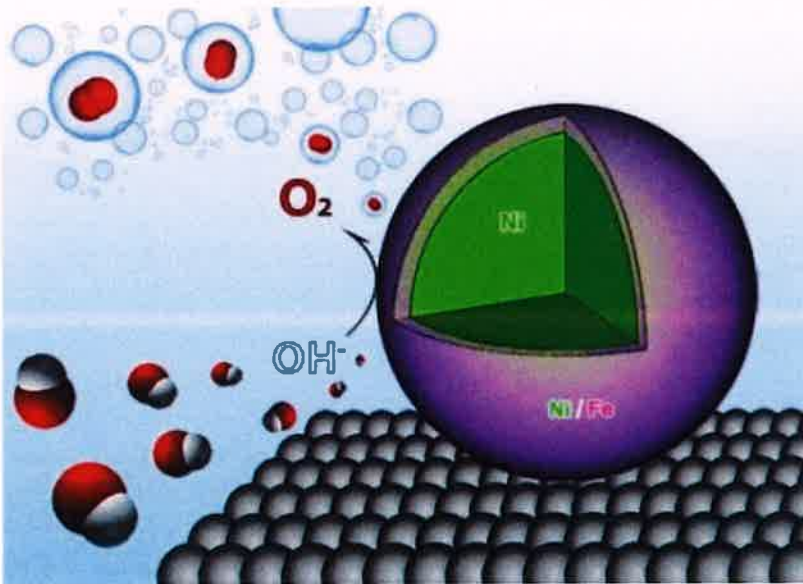


Scientists at Research Labs at UT Austin examining a sample of their newly-developed hydrogel.

Access to clean water remains one of the biggest challenges facing humankind. A breakthrough by engineers at The University of Texas at Austin may offer a new solution through solar-powered technology that absorbs moisture from the air and returns it as clean, usable water. The technology relies on hydrogels, gel-polymer hybrid materials designed to be "super sponges" that can retain large amounts of water. A research team led by Guihua Yu in UT Austin's Cockrell School of Engineering combined hydrogels that are both highly water absorbent and can release water upon heating. This unique combination has been successfully proved to work in humid and dry weather conditions and is crucial to enabling the production of clean, safe drinking water from the air. With an estimated 50,000 cubic kilometers of water contained in the atmosphere, this new system could tap into those reserves and potentially lead to small, inexpensive and portable filtration systems. "We have developed a completely passive system where all you need to do is leave the hydrogel outside and it will collect water," said Fei Zhao, a postdoctoral researcher on Yu's team and co-author of the study. "The collected water will remain stored in the hydrogel until you expose it to sunlight. After about five minutes under natural sunlight, the water releases." This technology builds upon a 2018 breakthrough made by Yu and Zhao in which they developed a solar-powered water purification innovation using hydrogels that cleans water from any source using only solar energy. The team's new innovation takes that work a step further by using the water that already exists in the atmosphere. For both hydrogel-based technologies, Yu and his research team developed a way to combine materials that possess both hygroscopic (water-absorbing) qualities and thermal-responsive hydrophilicity (the ability to release water upon simple heating). "The new material is designed to both harvest moisture from the air and produce clean water under sunlight, avoiding intensive energy consumption," said Yu, an associate professor of materials science and mechanical engineering. Harvesting water from moisture is not exactly a new concept. Most refrigerators keep things cool through a vapor condensation process. However, the common fridge requires lots of energy to perform that action. The UT team's technology requires only solar power, is compact and can still produce enough water to meet the daily needs of an average household. Prototype tests showed daily water production of up to 50 liters per kilogram of hydrogel. Representing a novel strategy to improve upon atmospheric water harvesting techniques being used today, the technology could also replace core components in existing solar-powered water purification systems or other moisture-absorbing technologies.

Source <https://www.sciencedaily.com/releases/2019/03/190314123149.htm>

4. Cost-Effective Method for Hydrogen Fuel Production Process



Researchers at the U of A have designed nanoparticles that act as catalysts, making the process of water electrolysis more efficient.

Nanoparticles composed of nickel and iron have been found to be more effective and efficient than other, more costly materials when used as catalysts in the production of hydrogen fuel through water electrolysis. The discovery was made by University of Arkansas researchers Jingyi Chen, associate professor of physical chemistry, and Lauren Greenlee, assistant professor of chemical engineering, as well as colleagues from Brookhaven National Lab and Argonne National Lab. The researchers demonstrated that using nanocatalysts composed of nickel and iron increases the efficiency of water electrolysis, the process of breaking water atoms apart to produce hydrogen and oxygen and combining them with electrons to create hydrogen gas. Chen and her colleagues discovered that when nanoparticles composed of an iron and nickel shell around a nickel core are applied to the process, they interact with the hydrogen and oxygen atoms to weaken the bonds, increasing the efficiency of the reaction by allowing the generation of oxygen more easily. Nickel and iron are also less expensive than other catalysts, which are made from scarce materials. This marks a step toward making water electrolysis a more practical and affordable method for producing hydrogen fuel. Current methods of water electrolysis are too energy-intensive to be effective.

Source <https://www.sciencedaily.com/releases/2019/03/190319121737.htm>

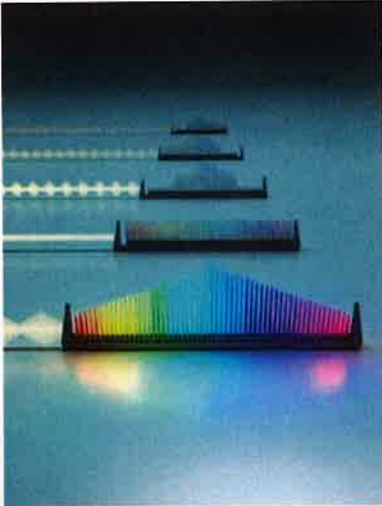
5. Researchers Boost Intensity of Nanowire LEDs



Model of nanowire-based light-emitting diode showing that adding a bit of aluminum to the shell layer (black) directs all recombination of electrons and holes (spaces for electrons) into the nanowire core (multicolored region), producing intense light.

Nanowire gurus at the National Institute of Standards and Technology (NIST) have made ultraviolet light-emitting diodes (LEDs) that, thanks to a special type of shell, produce five times higher light intensity than do comparable LEDs based on a simpler shell design. Ultraviolet LEDs are used in a growing number of applications such as polymer curing, water purification and medical disinfection. Micro-LEDs are also of interest for visual displays. NIST staff are experimenting with nanowire-based LEDs for scanning-probe tips intended for electronics and biology applications. The new, brighter LEDs are an outcome of NIST's expertise in making high-quality gallium nitride (GaN) nanowires. Lately, researchers have been experimenting with nanowire cores made of silicon-doped GaN, which has extra electrons, surrounded by shells made of magnesium-doped GaN, which has a surplus of "holes" for missing electrons. When an electron and a hole combine, energy is released as light, a process known as electroluminescence. The NIST group previously demonstrated LEDs that produced light attributed to electrons injected into the shell layer to recombine with holes. The new LEDs have a tiny bit of aluminum added to the shell layer, which reduces losses from electron overflow and light reabsorption. The brighter LEDs are fabricated from nanowires with a so-called "p-i-n" structure, a tri-layer design that injects electrons and holes into the nanowire. The addition of aluminum to the shell helps confine electrons to the nanowire core, boosting the electroluminescence fivefold. "The role of the aluminum is to introduce an asymmetry in the electrical current that prevents electrons from flowing into the shell layer, which would reduce efficiency, and instead confines electrons and holes to the nanowire core," first author Matt Brubaker said. The nanowire test structures were about 440 nanometers (nm) long with a shell thickness of about 40 nm. The final LEDs, including the shells, were almost 10 times larger. Researchers found that the amount of aluminum incorporated into fabricated structures depends on nanowire diameter. Group leader Kris Bertness said at least two companies are developing micro-LEDs based on nanowires, and NIST has a Cooperative Research and Development Agreement with one of them to develop dopant and structural characterization methods. The researchers have had preliminary discussions with scanning-probe companies about using NIST LEDs in their probe tips, and NIST plans to demonstrate prototype LED tools soon.

6. On-Chip, Electronically Tunable Frequency Comb



A new integrated electro-optic frequency comb can be tuned using microwave signals, allowing the properties of the comb -- including the bandwidth, the spacing between the teeth, the height of lines and which frequencies are on and off -- to be controlled independently. It could be used for many applications including optical telecommunication.

Lasers play a vital role in everything from modern communications and connectivity to bio-medicine and manufacturing. Many applications, however, require lasers that can emit multiple frequencies -- colors of light -- simultaneously, each precisely separated like the tooth on a comb. Optical frequency combs are used for environmental monitoring to detect the presence of molecules, such as toxins; in astronomy for searching for exoplanets; in precision metrology and timing. However, they have remained bulky and expensive, which limited their applications. So, researchers have started to explore how to miniaturize these sources of light and integrate them onto a chip to address a wider range of applications, including telecommunications, microwave synthesis and optical ranging. But so far, on-chip frequency combs have struggled with efficiency, stability and controllability. Now, researchers from the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS) and Stanford University have developed an integrated, on-chip frequency comb that is efficient, stable and highly controllable with microwaves. "In optical communications, if you want to send more information through a small, fiber optic cable, you need to have different colors of light that can be controlled independently," said Marko Loncar, the Tiansai Lin Professor of Electrical Engineering at SEAS and one of the senior authors of the study. "That means you either need a hundred separate lasers or one frequency comb. We have developed a frequency comb that is an elegant, energy-efficient and integrated way to solve this problem." Loncar and his team developed the frequency comb using lithium niobate, a material well-known for its electro-optic properties, meaning it can efficiently convert electronic signals into optical signals. Thanks to the strong electro-optical properties of lithium niobate, the team's frequency comb spans the entire telecommunications bandwidth and has dramatically improved tunability. "Previous on-chip frequency combs gave us only one tuning knob," said a researcher. "It's a like a TV where the channel button and the volume button are the same. If you want to change the channel, you end up changing the volume too. Using the electro-optic effect of lithium niobate, we effectively separated these functionalities and now have independent control over them." This was accomplished using microwave signals, allowing the properties of the comb -- including the bandwidth, the spacing between the teeth, the height of lines and which frequencies are on and off -- to be tuned independently. "Now, we can control the properties of the comb at will pretty simply with microwaves," said Loncar. "It's another important tool in the optical tool box." "These compact frequency combs are especially promising as light sources for optical communication in data centers," said Joseph Kahn, Professor of Electrical Engineering at Stanford and the other senior author of the study. "In a data center -- literally a warehouse-sized building contains thousands of computers -- optical links form a network interconnecting all the computers so they can work together on massive computing tasks. A frequency comb, by providing many different colors of light, can enable many computers to be interconnected and exchange massive amounts of data, satisfying the future needs of data centers and cloud computing.

7. ISRO Launches Intelligence Satellite EMISAT and 28 Other Satellites



The Indian Space Research Organisation (Isro) on Monday April 1, 2019 launched the EMISAT satellite along with 28 other satellites from other nations, including 24 from the US from the Sriharikota launch station at 9:27 am. Isro's PSLV C45 lifted off from the Satish Dhawan Space Centre carrying India's EMISAT and 28 satellites from global customers, including the US. The mission would witness Isro placing payloads in three orbits and conducting space experiments for the first time. The EMISAT satellite is an intelligence satellite. According to Isro's statement, the EMISAT is aimed at electromagnetic measurement. This comes days after DRDO's successful testing of an anti-satellite missile with Mission Shakti that boosts India's national security. Isro's third generation workhorse Polar Satellite Launch Vehicle (PSLV) was used in the launch. This was PSLV's 47th flight, Isro said.

Source <https://www.indiatoday.in/science/story/isro-emisat-satellite-28-countries-pslv-1491024-2019-04-01>

8. New Family of Glass Good for Lenses



A doctoral student in materials science and engineering, pours new composition of germanosilicate glass into form.

A new composition of germanosilicate glass created by adding zinc oxide has properties good for lens applications, according to Penn State researchers. This marks the discovery of a novel glass family. The researchers invented a new family of zinc germanosilicate glass that has a high refractive index comparable to that of pure germania glass. The samples also showed high transparency, good ultra-violet-shielding properties, and good glass forming ability, making them suitable for lens applications. Germanosilicate glass is essential in the manufacture of optical amplifiers, waveguides, and solid-state lasers. "The motivation for the study was the need for new glass compositions that have a high refractive index while still being processable at an industrial scale," said John Mauro, professor of materials science and engineering. A glass' refractive index determines its use. "The benefit of a high refractive index is its capacity for designing low-thickness lenses," said Ye Luo, doctoral student in materials science and engineering. In glass synthesis, however, achieving a high refractive index typically has a few roadblocks. Lead oxide can accomplish this, but it requires the use of toxic raw materials. Non-lead constituents that encourage a high refractive index can make the glass much more difficult to form, or prone to crystallization and therefore more opaque. By finding the optimum balance of zinc oxide with the other components of the glass composition, the researchers avoided these issues. Zinc oxide showed UV shielding properties in the study samples. This should not be surprising, Mauro said, given that inorganic sunscreen is based on zinc oxide. With UV shielding, a zinc-oxide-containing glass could be used for everyday applications such as car windows or eyeglasses. The glass samples also showed favorable forming properties. As a "long glass," the new compositions can be formed over a broader temperature range, making them much simpler to manipulate during formation. This property, the resistance to crystallization, and the lower cost of zinc oxide compared to germania all make this new glass composition a practical choice for manufacturing on a mass scale, the researchers said.

Source <https://www.sciencedaily.com/releases/2019/04/190403155432.htm>

9. Simple, Inexpensive Frame to Boost Solar Cell Efficiency



Parks previously saw a design for a frame that would allow the solar panel to track the sun using hanging weights.

Scientists have designed a metal frame that increases the amount of sunlight captured by a solar cell, enhancing its energy production by almost one-third. The simple, inexpensive and ingenious method could increase solar energy captured for people in remote regions that are off the grid, researchers said. While solar panels offer a clean source of renewable energy, they are typically mounted on a fixed frame and only optimally oriented towards the sun during specific hours of the day. The researchers previously saw a design for a frame that would allow the solar panel to track the sun using hanging weights. However, the design had not been tested to see how it actually performed. Nor had it been optimised for affordability to ensure commercial viability and adoption. The researcher Parks worked with students at the Mbarara University of Science and Technology in Uganda to design a frame using metal tubing that a local welder could easily obtain and assemble. We have created a frame using inexpensive materials that allows the solar panels to track the arc of the sun throughout the day,” Parks said. “This approach could make solar energy more affordable to households and small businesses in the developing world,” In her design, a bucket of rocks is placed on the west side of the frame and a bucket of water is placed on the east side. Using a controlled leak from the water bucket, the weight shifts and the panel slowly rotates from east to west throughout the day

Source <https://indianexpress.com/article/technology/science/simple-inexpensive-frame-to-boost-solar-cell-efficiency-5617581/>

10. Improving 3D-Printed Prosthetics and Integrating Electronic Sensors



The mold of local teen hand that was scanned during the development of a personalized prosthetic.

With the growth of 3D printing, it's entirely possible to 3D print your own prosthetic from models found in open-source databases. But those models lack personalized electronic user interfaces like those found in costly, state-of-the-art prosthetics. Now, a Virginia Tech professor and his interdisciplinary team of undergraduate student researchers have made inroads in integrating electronic sensors with personalized 3D-printed prosthetics -- a development that could one day lead to more affordable electric-powered prosthetics. This newly published research out of the lab of Blake Johnson, a Virginia Tech assistant professor in industrial and systems engineering, took a step forward in improving the functionalities of 3D-printed personalized wearable systems. By integrating electronic sensors at the intersection between a prosthetic and the wearer's tissue, the researchers can gather information related to prosthetic function and comfort, such as the pressure across wearer's tissue, that can help improve further iterations of these types of prosthetics. The integration of materials within form-fitting regions of 3D-printed prosthetics via a conformal 3D printing technique, instead of manual integration after printing, could also pave the way for unique opportunities in matching the hardness of the wearer's tissue and integrating sensors at different locations across the form-fitting interface. Unlike traditional 3D printing that involves depositing material in a layer-by-layer fashion on a flat surface, conformal 3D printing allows for deposition of materials on curved surfaces and objects. The ultimate goal is to create engineering practices and processes that can reach as many people as possible, starting with an effort to help develop a prosthetic for one local teen. To develop the prosthetics integrated with electronic sensors, the researchers started with 3D scanning data, which is similar to taking pictures at various angles to get the full form of an object -- in this case, a mold of the teenager's limb. They then used 3D scanning data to guide the integration of sensors into the form-fitting cavity of the prosthetic using a conformal 3D printing technique. The process developed by the research team will lend itself to further applications in personalized medicine and design of wearable systems. "Personalizing and modifying the properties and functionalities of wearable system interfaces using 3D scanning and 3D printing opens the door to the design and manufacture of new technologies for human assistance and health care as well as examining fundamental questions associated with the function and comfort of wearable systems," Johnson said. Johnson used his related research expertise in additive biomanufacturing and a team of interdisciplinary undergraduate researchers to 3D print the bionic hand that would become the basis of the now-published research. Personalized prosthetics still have space for improvements, and Johnson's team will continue to research and develop new techniques in additive manufacturing to make improvements on wearable bionic devices.

Engineering Innovation in India

Space Wars: India Successfully Tests Anti-Satellite Weapon in 'Mission Shakti'



A Prithvi missile defence interceptor.

India's Defence Research and Development Organisation (DRDO) successfully carried out the country's first anti-satellite (ASAT) weapon test against an out-of-service Indian satellite orbiting the Earth at 300 kilometres altitude on Wednesday, 27 March 2019, at 11.16 am Indian Time. The test was carried out by DRDO from its test range in Balasore and reportedly took three minutes from launch and target impact through to post-impact confirmation. The ASAT test means that India is now one of four countries to have carried out a kinetic, direct-ascent ASAT missile test along with the United States, Russia, and China. The missile used was a three-stage version of DRDO's ballistic missile defence interceptor, likely a modified variant of the Prithvi Defence Vehicle (PDV), an exo-atmospheric interceptor missile that has been tested three times – first in 2014, then 2017, and most recently in February of this year. The significance of the test is that India has tested and successfully demonstrated its capability to interdict and intercept a satellite in outer space based on complete indigenous technology. The Indian ASAT test has been dubbed Mission Shakti (Sanskrit for 'power') and, according to Prime Minister Modi, means that, "We are not just capable to defend on land, water and air, but now also in space." "Mission Shakti' is an important step towards securing India's safety, economic growth and technological advancement," Prime Minister Modi added. The capability achieved through the Anti-Satellite missile test provides credible deterrence against threats to our growing space-based assets from long range missiles, and proliferation in the types and numbers of missiles," the Ministry of External Affairs' statement said.

Source <https://spacewatch.global/2019/03/space-wars-india-successfully-tests-anti-satellite-weapon-in-mission-shakti/>