



E-Newsletter

INAЕ e-Newsletter Vol. X, Issue 7, October 14, 2019

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From the Editor's Desk

From the Editor's Desk

I am very much delighted to learn that the names of 2019 Class of INAE Fellows, YOUNG ENGINEER AWARDEES, Innovative Student Project Awardees (PhD, M.Tech, B.Tech) have been announced very recently. Selection of the deserving candidates for the above awards has been a very tedious process and the honours were achieved against very stiff competition. I wish to congratulate all the awardees for achieving the distinction going through several steps of scrutiny. Every year, it is a customary practice to publish the engineering and technology research work of newly elected fellows, young engineer awardees and Innovative Student Project awardees in INAE publications, bringing out their salient contributions in their own field that led to their richly deserving recognition. Earlier we used to publish the newly elected Fellows contributions in Annals of INAE. This year onwards we will be publishing the original research/review papers of newly elected fellows, young engineer awardees and Innovative Student Project awardees in the Transactions of Indian National Academy of Engineering (An International Journal of Engineering and Technology) after peer review process. Springer has been publishing INAE Letters since last four years. It has attracted significant number of contributions from several researchers from India and abroad. The statistics reveal that the review process is very stringent and only the papers with high standard are getting through for publication. With the intention of improving the quality of INAE publications further and to garner wider acceptance in the national and international arena, the scope of the papers to be published in INAE publication has been enlarged. The existing format will be changed to include papers besides short communications. The title of INAE Letters is getting changed to "Transactions of Indian National Academy of Engineering (An International Journal of Engineering and Technology)" to accommodate the (i) Invited/ and or contributed review articles of length not exceeding 12,000 words, (ii) Original research articles pertaining to Engineering and Technology of length not exceeding 6000 words, and (iii) Technical notes of approximately 3500 words. All the newly elected Fellows, Young Engineer awardees and Innovative Student Project awardees are requested to submit their valuable original research contributions (Co-authors are permitted), technical notes or review papers to INAE Letters by 30th November 2019. After peer review, the accepted papers will be published in Transactions of INAE. The submission is to be made online to INAE letters. This arrangement is necessitated because the new title will be effective from January 2020 onwards. All the submitted papers will be transferred to Transactions of INAE as on 1st January 2020. On accepting the paper, it will be first published "on line" without delay. Looking forward to your valuable research/review paper submission so that we can bring them together in one issue as early as possible. I wish and hope that all the members of engineering and technology communities together will make Transactions of INAE as a gateway for publishing high quality and innovative research work of international standard.



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Engineers Conclave 2019

The seventh Engineers Conclave 2019 (EC-2019) was organized jointly with Bharat Electronics Limited (BEL) on Sept 19-21, 2019 at BEL Academy of Excellence (Nalanda), Bangalore. The two themes of EC-2019 were “Defence Technology & Innovation” coordinated by BEL and “Transformation of Rural India Using Digital Technologies” coordinated by INAE. Shri MV Gowtama, CMD, BEL was the Chair and Dr Sanak Mishra, President, INAE was the Co-Chair of EC-2019. The programme commenced in the forenoon of Sept 19, 2019 with an enlightening Plenary Talk on “Dimensions of Digital Revolution” by Dr Gulshan Rai, Former National Cyber Security Coordinator of India. The talk gave an overview of the national perspectives and components pertaining to fostering a Digital Transformation and also highlighted the forecast in Cyber Technology in the country, over the next decade. The Plenary Talk was followed by the parallel Technical Sessions on the two themes of the Conclave.

The Inaugural Session of the Engineers Conclave 2019 was held on Sept 19, 2019 (afternoon) which was graced by the Chief Guest, Hon’ble Raksha Mantri Shri Rajnath Singh. The session featured an invocation by staff of BEL and the lighting of the lamp by the dignitaries on the dais viz the Chief Guest, Hon’ble Raksha Mantri Shri Rajnath Singh; Shri MV Gowtama, CMD BEL; Dr Sanak Mishra, President, INAE; Dr G Satheesh Reddy, Secretary, Department of Defence R&D and Chairman, DRDO; Shri Mahesh V, Director (R&D) BEL and Chairman, Organizing Committee EC-2019 and Shri V.V.R. Sastry, FNAE, Former CMD BEL. The dignitaries on the dais addressed the gathering: Shri Mahesh V welcomed the delegates; Shri MV Gowtama highlighted the importance of the conclave; Dr Sanak Mishra presented a perspective of INAE and its activities and Dr G Satheesh Reddy briefed upon some latest developments in Defence R&D including the Light Combat Aircraft (LCA). He was delighted to apprise the august audience that the Hon’ble Raksha Mantri Rajnath Singh on the forenoon of the same day, Sept 19, 2019 flew in the Tejas fighter aircraft from the HAL airport in Bangalore, becoming the first Defence Minister to fly in the indigenously-built Light Combat Aircraft (LCA).



Dignitaries on the Dais in the Inaugural Session (Left to Right) Shri Mahesh V, Shri MV Gowtama, Hon’ble Shri Rajnath Singh, Dr G Satheesh Reddy, Dr Sanak Mishra and Shri VVR Sastry

An interesting highlight of the Inaugural Session was the inauguration of the Product Development & Innovation Centre (PD&IC) of BEL by the Chief Guest, Hon'ble Shri Rajnath Singh through electronic mode. Shri MV Gowtama, CMD, BEL informed the gathering that the Centre will focus on IPR creation in strategic areas, reducing external dependence for critical subsystems, and standardisation of subsystems. The centre will also contribute to the 'Make in India' initiative of the government and is expected to provide a single window interface for DRDO and other R&D houses, and strengthen transfer of technology (ToT) processes and collaborative design efforts through involvement of start-ups and MSMEs.



*Inauguration of the Product Development & Innovation Centre, BEL
by Hon'ble Shri Rajnath Singh*

Hon'ble Shri Rajnath Singh also unveiled a high-power transmitter for Akash-NG RF seeker, designed by the Microwave Tube Research & Development Center (MTRDC), and concurrently developed along with BEL, based on a production order from the Research Centre Imarat (RCI). During his address he reiterated the government's commitment to reach out to remote villages through the Digital India initiative. He opined that the development of critical and cutting-edge technologies in defence would help save foreign exchange, which can be used for other development activities. He thanked INAE and BEL for inviting him to the Conclave and expressed that he keenly awaited the outcome of the Engineers Conclave 2019 in terms of the recommendations emanating from the deliberations and wished the event success. The Inaugural Session concluded with the proposing of the Vote of Thanks by Shri V.V.R. Sastry, FNAE, Former CMD BEL.



Unveiling of a high-power transmitter for Akash-NG RF seeker by Hon'ble Shri Rajnath Singh



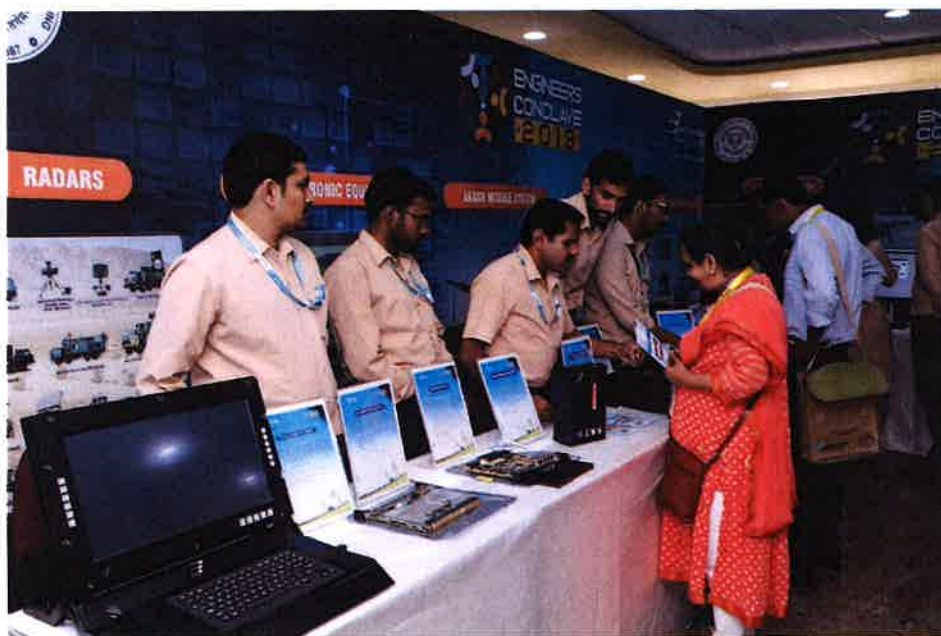
Dr Sanak Mishra, President, INAE presenting a Memento to Dr G Satheesh Reddy, Secretary, Department of Defence R&D and Chairman, DRDO

The parallel Technical Sessions on the two themes of the conclave were well attended by eminent Fellows of INAE, invited dignitaries and delegates from Bharat Electronics Ltd. The Conclave was attended by about 120 INAE Fellows and Young Associates from across the country, who actively participated in the deliberations including as speakers and session chairs. Eminent experts and senior functionaries from Academia, R&D and Industry also participated in the conclave as delegates. The Technical Sessions on Theme - I on "Defence Technology and Innovation" were on Emerging Technologies & Trends for Defence, R&D in Defence, Policies, Growth Drivers and

Skill Development, Strategic Partnerships/ Enabling International Cooperation and Success Stories & Way forward. Theme II on Transformation of Rural India Using Digital Technologies” covered the sessions on the topics of Rural Digital Connectivity, e-Governance and Services, Enhancing Rural Livelihood Opportunities, Capacity Building Needs of Digital Rural India and Aspiring Rural India.

The Plenary talks held during the conclave both on technical and general topics captivated the audience. The second Plenary Talk by Art of Living Founder HH Sri Ravishankar was held through videoconference and was coordinated by a devotee of his ashram. The talk brought out the need for professionals with high pressure jobs such as engineers and technocrats to reduce tension in their lives in order to lead a healthy and meaningful life. The Third Plenary Talk on “Engineering Marvel” by Shri V. Gopinath, Chief Architect, EDRC, Project Director (SOU) L&T gave an enthralling pictorial representation of the various stages in the planning, designing and construction of the Statue of Unity (SOU) dedicated to the Iron Man of India, Sardar Vallabhbhai Patel. This towering piece of engineering is not only the tallest statue in the world but is a marvellous engineering feat by Indian engineers, artists and technologists as was brought out in the excellent presentation which was not only informative but a visual delight. The Fourth Plenary Talk on “Made in India – How to Make It Happen” was by Capt S. Prabhala (Retd), Former CMD BEL which covered strategies for achieving self-reliance in defence industry by development of indigenous technologies.

An entertaining cultural programme was also held in the evening of Sept 19, 2019 which featured a classical dance recital by a young artiste. An exhibition showcasing the products developed and manufactured indigenously by Bharat Electronics Limited was organized on the sidelines of Engineers Conclave. The delegates showed enthusiasm in their technical queries and appreciation of the products including Electronic Voting Machines, Radars, Electronic Warfare Systems, Akash Missile Systems, Opto-Electronic Equipment, Sonars and Akash Missile Systems.



Exhibition Showcasing Products Developed by Bharat Electronics Ltd on the sidelines of EC-2019

A Panel Discussion on the two Themes was held in the forenoon of Sept 21, 2019 wherein the panellists comprised of the respective Technical Session Chairs and the Moderators were the Coordinators of each concerned theme. The Panel Discussion focussed on the points to be included in the recommendations to be compiled post conclave, based on the pertinent issues and suggestions emanating from the deliberations in the parallel technical sessions on both themes.

The Panel Discussion was followed by the Valedictory Session of EC-2019 which commenced with the Introductory Remarks and Welcome by Dr Sanak Mishra, President, INAE. Dr VK Saraswat, Member, Niti Aayog was the Chief Guest of the Valedictory Session. During the session, the summing up of the two themes was done by the respective Coordinators. The summing up of Theme I: Defence Technology & Innovation was done by Shri. Mahesh V, Dir (R&D) BEL, Coordinator, Theme-I, EC-2019 while that of Theme II: Transformation of Rural India Using Digital Technologies was presented by Dr. V. Jayaraman, Coordinator, Theme-II, EC-2019.



Chief Guest of Valedictory Session, Dr VK Saraswat, Member, Niti Aayog delivering Address



Presentation of Memento to Chief Guest, Dr VK Saraswat by Dr Sanak Mishra, President, INAE

Dr VK Saraswat, Member, Niti Aayog delivered a thought provoking Valedictory Address wherein he emphasized that both themes of the conclave are apt and highly relevant in the present context. He expounded regarding a few initiatives and suggestions that would be desirable to enhance the innovativeness and productivity in the development of indigenous defence technologies in the country. He also emphasized the important parameters to be addressed in order to achieve the goal of transformation of Rural India using Digital Technologies and looked forward to the

recommendations emanating as an outcome of the conclave. The Vote of Thanks on behalf of BEL was proposed by Smt. Padmini Balachandra, GM TP/CO, BEL. The Engineers Conclave 2019 was an astounding success and actionable recommendations emanating from the deliberations are under compilation for forwarding to the concerned stakeholders from the Government Departments/Agencies.

INAE Local Chapter Activities

INAE Kolkata Chapter - Celebrating National Engineers Day 2019

INAE Kolkata Chapter celebrated National Engineers Day on September 18, 2019 at the Gurukul Campus of the Institute of Engineering and Management, Saltlake Electronics Complex, Kolkata. On this occasion, Prof. Indranil Manna, Vice-President, INAE and Professor, Department of Metallurgical and Materials Engineering, Indian Institute of Technology Kharagpur delivered the “Engineers Day Lecture” on “Towards Academic Excellence and Technology Development”. In his thought provoking talk, Prof. Manna addressed the ancient gurukul system of pursuing knowledge and several transformations with time and change of our society. He described the national initiative of Government of India called IMPacting Research INnovation and Technology (IMPRINT) and its goal of translational research through collaboration between academia and industry. At the end, he highlighted the various programs and initiatives taken by INAE. This motivational talk was well received by the audience and raised enthusiastic discussions among the participants.

Prof. Sankar K. Pal, FNAE, Distinguished Scientist and former Director, Indian Statistical Institute, Kolkata, addressed the audience and encouraged the young group of engineers to elevate their career with INAE. He also highlighted the vast opportunities and immense scope that INAE provides to every engineer. Prof. Bimalendu Bhusan Bhattacharya, FNAE, S.N. Bose National Centre for Basic Sciences, Kolkata also participated in the celebrations. Prof. A.K. Nayak, Principal, IEM formally welcomed the gathering and Prof. Debatosh Guha, FNAE, Secretary, INAE Kolkata Chapter conducted the proceedings of the meeting. The event was attended by more than 50 participants including INAE Fellows, researchers, graduate students, and young faculty members from various departments of several universities, institutes, and industries located in and around Kolkata.



Prof. Indranil Manna delivering the lecture



Prof. S K Pal addressing the audience



Audience present at the program



Prof. Debatosh Guha conducting the proceedings

INAE Annual Convention 2019

The Annual Convention of the Academy will be held on **December 12-14, 2019 at Birla Institute of Scientific Research (BISR), Statue Circle, Jaipur, followed by a local excursion on December 15, 2019.** The highlights of the Annual Convention are as under.

- (i) Lectures by winners of Life Time Contribution Award in Engineering; Prof. Jai Krishna & Prof. SN Mitra Memorial Awards; and Outstanding Teachers Award in the evening of December 12, 2019 followed by INAE Fellows Dinner.
- (ii) Inaugural Session on Dec 13, 2019
- (iii) Two Plenary Talks by eminent personalities on Dec 13-14, 2019.
- (iv) Industry Session on Dec 14, 2019 in which the winners of the INAE Young Entrepreneur Award 2019 will make a presentation on the innovations for which they have been awarded.
- (v) Technical Sessions on Dec 13, 2019 in which newly elected Fellows (whose Fellowship is effective from Nov 1, 2019) and INAE Young Engineer Awardees 2019 will be making presentations relating to their own significant engineering contributions.
- (vi) The Grand Awards Function on December 13, 2019 wherein the Innovative Student Projects Awards, Young Entrepreneur Award, Young Engineer Awards, Prof. Jai Krishna and Prof. SN Mitra Memorial Awards; Outstanding Teacher Award and the Life Time Contribution Awards in Engineering will be presented by the President, INAE.
- (vii) The Annual General Meeting including Induction Ceremony of Fellowship/newly selected Young Associates and Special General Meeting of Fellows of the Academy in the forenoon of December 14, 2019.
- (viii) A local excursion on Dec 15, 2019 to visit prominent places in and around Jaipur.
- (ix) Cultural Programme and Dinner on December 13, 2019.

All INAE Fellows and Young Associates have been invited to participate in the forthcoming INAE Annual Convention 2019.

Report Pertaining to Technical Contributions by INAE Fellows/News of INAE Fellows

- **The prestigious 13th Dr. Dara P. Antia lecture, 'A Discourse on the Art of Leadership Practice' delivered by Dr. Sanak Mishra, President, Indian National Academy of Engineering on September 17, 2019 in the College of Engineering, Pune**

"Leadership is contextual and there is no such thing as universal leadership", said Dr Sanak Mishra while delivering the 13th Dr. Dara P. Antia Memorial lecture. He developed the discourse on the 'Art of Leadership Practice' among the august gathering of over 250 participants from academia, industry and research institutions in the prestigious annual national event of the Indian Institute of Metals (IIM), at College of Engineering, Pune.

Citing many examples of leaders like *Yudhishthir, Moses, Adi Shankaracharya, Lincoln, Gandhi* and *Einstein*, he pointed out that the context of their leadership was very clear and sharp at different times. Leadership is about influencing the mindset, behavior and actions, in that order, of people that come across in our lives or the people at our workplace and even the people who are our next-door neighbours.

The 'Metaphysical Powerhouse', the novel concept developed by the speaker detailed the different types of powers and their hierarchy, to influence people. One by one, unfolding the petals of different inner power centers like the power of mind, the power of communication, power of relationships with intrinsic abilities, based on the foundation of tradition, heritage, culture and values were explained in detail with their order of importance and hierarchy.

The Power of the Mind as explained by the speaker, is the Supreme Power and the expanse of the Mind is infinitely larger than the expanse of the ever-expanding Universe. The Knowledge also has different types, like Spiritual, Scientific, Relational and Carnal. The term 'Pragna', appears in the Vedic literature refers to a composite of the highest and the transcendental form of intelligence, awareness and understanding the state of wisdom which is higher than the knowledge obtained by reasoning and inference. 'Pragna' is synonymous to 'Comprehension', the ability to perceive and to conceive, and to generalize. This ability is only found with the individual and it can never come to an institution.

Leaders have comprehension and that is why they can connect situations and events of significance. The leaders can facilitate the formulation of a *Strategy*, develop a *Plan*. Their approach goes beyond just providing solutions, thus 'Leaders engineer the innovations' in processes to make them more efficient at the workplace. 'Leaders implement changes by reducing the distance between minds.' '*Common Purpose* and engagement for mass action hold the key to such transformation, *to the speed and completeness of change with methods of task implementation and closure.*'

The transformational change in an organization will mean that all its members act collectively and in unison and for a common purpose. Only *leaders* are capable of unifying the collective energy of their followers in one direction. An organization is also like a powerhouse. It deals not only with human resources, but also simultaneously with financial, technological and natural resources for the purpose of materialistic gains such as productivity and profitability.

The leader is able to leverage his powers as an *individual*, namely the power of the mind, the power of communication, the power of relationships and the power of intrinsic ability along with all the powers of the *organization* streamlining various processes, systems, assets and structures in their right proportions leading to a perfectly balanced organization.

'Every leader has a Mission, to one that his followers should be able to subscribe', the eminent speaker Dr. Sanak Mishra concluded. Towards the end of the discourse, he also shared the mission statements of the organization module of Rourkela Steel Plant which was developed under his

leadership to turn around the company's fortunes, based on the collective strength of the people in the plant.

Dr. Mishra explained that life seems to have five dimensions. These are *physical space* (length, breadth and height), *mind space* (mental space), *time and matter* (mass, or substance). The true leaders impact *all dimensions of life* along with the ***fifth dimension*** being *Dr. Sanaka's concept of 'Samskar'*. '*Samskar is a way of living, of say a human being or a group of human beings, as they anticipate and cope with the changes that occur around them. We have to add Samskar as the fifth dimension of life.* Institutions, Societies and Civilizations which survive are those whose *leaders* carry out a continuous *Samskar*.

At the end of the discourse, the speaker discussed the qualities of responsibility and courage of a good leader. The responsibility is something that is never handed over; what can be handed over is accountability. It is a reflection of one's own inner urge to respond to the call of the inner self. However, to be responsible one has to have courage. It takes courageous approach to uphold principles, to invoke and uphold values. The leader should have courage to do the right things and also the courage not to do things which are not right.

Finally, Dr. Sanak Mishra, President Indian National Academy of Engineering and a visionary leader of corporate India mentioned that, 'taking responsibility is the ultimate essence of personal courage'. '***Leadership lies in taking up responsibility, in facilitating others, and in letting people make a significant contribution to a befitting cause- with full freedom, dignity and without fear. Be a Leader!!***'

The 13th Dr. Dara P. Antia lecture by Dr. Sanak Mishra, ended with huge round of applause and appreciation from the potential leaders of student fraternity, academicians and corporates for getting enlightened on a discourse on '***The Art of Leadership practice***' in College of Engineering Pune.

The Dr. Dara Antia Memorial Lecture function started with the welcome address by Professor B. B. Ahuja, Director, College of Engineering Pune, followed by a welcome address by Dr. U. Kamachi Mudali, currently the President, Indian Institute of Metals and the Chief Executive of the Heavy Power Board, DAE and by Mr. Hemant Nerurkar, Chairman of the Dr Dara Antia Memorial Lecture Committee. Dr. Kamachi Mudali recalled the pioneering contributions made by Dr. Dara Antia in building the IIM on extremely sound foundations and that is the reason it has withstood the test of time – it is today the premier professional body for the minerals, metals and materials engineering fraternity in the country, with more than 10,000 members drawn from industry, academia and the research institutions. Mr Nerurkar introduced the distinguished speaker and felicitated Dr Sanak Mishra with a scroll and a memento, on this occasion. Professor N B Dhokey, former chairman of the IIM Pune Chapter and currently the honorary secretary, Dr. Dara Antia Memorial Lecture Committee proposed the vote of thanks.



Mr Hemant Nerurkar, former MD, Tata Steel and currently, Chairman, Dr. Dara Antia Memorial Lecture Committee felicitating Dr. Sanak Mishra, the distinguished speaker this year. Dr. Kamachi Mudali, the current President, IIM (extreme left) and Dr. BB Ahuja, Director, College of Engineering, Pune (extreme right) are also seen in the picture



Dr. Kamachi Mudali, the current President, IIM (extreme left) felicitating Dr. Sanak Mishra. Mr Hemant Nerurkar Chairman, Dr. Dara Antia Memorial Lecture Committee and Dr. BB Ahuja, Director, College of Engineering, Pune (extreme right) are also seen in the picture



From Left to Right: Dr. Pradip, Vice-President, INAE; Professor S Banerjee, Professor BB Ahuja, Mr. Jehangir Ardeshir, Mr Hemant Nerurkar, Dr. Sanak Mishra, Dr. Kamachi Mudali, Mr. Kushal Saha, Dr. Satyam Sahay and Professor NB Dhokey

Academia Industry Interaction

AICTE-INAE Distinguished Visiting Professorship Scheme

Industry-academia interactions over technological changes have become essential in recent times so that relevant knowledge that would be sustainable in the changing conditions can be imparted to the students in the engineering institutions. 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, academics 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.

Dr. D. Antony Louis Piriya Kumar Director-Startup, Agape Piriya Kumar AI Solutions	Thiagarajar College of Engineering, Madurai August 13-14, 2019	Delivered lectures on "Python for Engineers" and "Analog Devices". As per the feedback received from the engineering college, the visiting professor has contributed to research work by faculty members which helped facilitate submission of research proposals in fields of Computer Vision and Image Processing. He also interacted with faculty members and gave inputs on research projects and filing of patents.
Mr. VVR Sastry, FNAE Former Chairman Managing Director, BEL and Executive Director, Centre for Development of Telematics (CDOT)	Madanapalle Institute of Technology & Science, Chittoor, AP August 30, 2019	Delivered lecture on "Digital Economy-Technology Evolution". As per the feedback received from the Engineering College, the interactions with the visiting professor helped the students to garner new ideas regarding Digital Economy which was very useful for their project work.
Dr. SL Mannan, FNAE Former Outstanding Scientist and Director	PSG College of Technology, Coimbatore	Delivered lectures on "Introduction to Mechanical Behaviour" and "Dislocation Theory & Deformation Mechanisms". According to the

<p>Metallurgy and Materials Group, Indira Gandhi Centre for Atomic Research, Kalpakkam</p>	<p>September 25-26, 2019</p> <p>Government College of Engineering, Salem</p> <p>September 16-18, 2019</p>	<p>feedback received from the engineering college, he has also guided students in their projects and suggested changes in the syllabi. In addition, the scheme is beneficial for both the students and teachers and the college would like to have more such interactive sessions with the DVP.</p> <p>Delivered lectures on “Dislocation Theory-I”, “Relevance of Nuclear Power and Structural Materials for Prototype Fast Breeder Reactor”, “Dislocation Theory -II” and “Dislocation Theory -III”. As per the feedback received from the faculty coordinator, the interactions between the DVP and students and the faculty members were very useful. The head of the institute has also expressed his appreciation of the interactions and would like that the same be continued.</p>
<p>Prof. Perumal Chellapandi, FNAE Formerly Head, Mechanics and Hydraulics Division, IGCAR, Kalpakkam</p>	<p>PSG College of Technology, Coimbatore</p> <p>September 17-19, 2019</p>	<p>Delivered lectures on "Pressure Vessel and Piping". According to the feedback received from the engineering college, the visiting professor has guided student projects. He has also formulated two one credit courses for the UG and PG students and PhD scholars. It has been expressed that the scheme has enabled the interaction of eminent expert with students and research scholars to provide insights and encourage research.</p>
<p>Prof. ML Kothari FNAE Formerly Professor/ Power Grid Chair Professor, Department of Electrical Engineering IIT Delhi</p>	<p>MBM Engineering College, Jodhpur</p> <p>August 6-8, 2019</p> <p>Dayalbagh Education Institute, Agra</p> <p>September 16-18, 2019</p>	<p>Delivered lectures on "Power System Stability: Swing Curve, Transient and Small Signal Stability", "Equal Area Criterion of Stability, Transient Stability Limit, Critical Clearing Angle and Critical Clearing Time" and "Stability Analysis Considering Unbalanced Faults & Solution of Swing Equation". As per the feedback received from the engineering college, besides taking lectures, the DVP has also given inputs for guidance of PhD thesis and helped in initiating modernization of PG curriculum in Power Systems discipline. The lectures taken by the visiting professor were also considered to be of very high standard and have motivated and inspired students and faculty members in their research work.</p> <p>Delivered lectures on "Smart Grid: An Introduction", "Smart Grids: Wide Area Measurement Systems", "Flexible AC Transmission Systems", "Load - Frequency Control - Part I", "Outcome Based Education Accreditation System" and " Load - Frequency Control-Part II". According to the feedback</p>

		received from the engineering college, the visiting professor has guided student projects and has also suggested that a new elective course be introduced. The faculty has expressed that the scheme helps in improving knowledge of both students and faculty members of the engineering college.
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Important Meetings held during September 2019

- **INAE Governing Council Meeting on September 6, 2019 at New Delhi**
- **Meeting of the Search-cum-Selection Expert Committee (SSEC) for Abdul Kalam Technology Innovation National Fellowship on September 30, 2019 at INAE Office, Gurgaon**

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 October 2019, click here.

News of Fellows

1.	<p>Dr Sanak Mishra, President, INAE and Formerly Managing Director, Rourkela Steel Plant and Director, Steel Authority of India Ltd.(SAIL); Vice-President, ArcelorMittal and CEO India Projects; Secretary General, Indian Steel Association was the Guest of Honour and Chief Speaker at the Engineers Day Celebrations organized by Rourkela Steel Plant, in association with Institution of Engineers on September 15, 2019 at Civic Centre, Rourkela Steel Township.</p> <p>Dr Sanak Mishra was also the distinguished speaker and delivered the Dr Dara P Antia Memorial Lecture: A Discourse on the Art of Leadership Practice organized by the Indian Institute of Metals Pune Chapter and Dr Dara P Antia Memorial Lecture Committee on September 17, 2019 at College of Engineering, Pune. Dr. Dara Antia, was a recipient of the INAE "Lifetime Contribution in Engineering" Award. He was the Founding Member of the Indian Institute of Metals and a Distinguished Alumnus of Banaras Hindu University. He also had the unique distinction of being the very first Indian to receive his Sc.D. in Metallurgical Engineering from MIT USA (1943).</p>
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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>

International/National Conferences in October 2019

1st International Conference on Innovative and Advanced Engineering Research on 18th to 19th October 2019 at Pune

<https://conferencealerts.com/show-event?id=219230>

International Conference on Recent Trends in Computing, Communication and Networking Technologies ICRTCCNT'19 on 18th to 19th October 2019 at Chennai

<https://conferencealerts.com/show-event?id=215450>

International Conference on Chemical Engineering, Bioprocess, Textile, Mining, Energy Technologies (TECHNOVA-2019) on 19th October 2019 at New Delhi

<https://conferencealerts.com/show-event?id=219774>

International Conference on Civil, Computer Science, Information Tech., Mechanical, Electrical & Electronics Eng (CIME-2019) on 19th October 2019 at New Delhi

<https://conferencealerts.com/show-event?id=219775>

The International Conference on Artificial Intelligence in Manufacturing & Renewable Energy on 25th to 26th October 2019 at Bhubaneswar

<https://conferencealerts.com/show-event?id=218829>

1. Engineers Produce Water-Saving Crop Irrigation Sensor

A team of University of Connecticut researchers engineered a soil moisture sensor that is more cost effective than anything currently available and responds to the global need to regulate water consumption in agriculture. Designed and tested on the university's farm, the sensors are small enough to insert into the soil with ease and less expensive to manufacture than current technology. "Advances in hydrological science are hampered by the lack of on site soil moisture data," said Guiling Wang, study author and professor of civil and environmental engineering at UConn. "It's really hard to monitor and measure things underground. The challenge is that the existing sensors are very expensive and the installation process is very labour intensive." The sensors developed by the team of UConn engineers -- environmental, mechanical, and chemical -- are expected to save nearly 35% of water consumption and cost far less than what exists. An alternate monitoring option, soil moisture data collected from remote sensing technology such as radars and radiometers on board satellites, have suffered from low resolution. But the new technology developed by UConn Professor Baikun Li's group can provide high spatio-temporal resolution data needed for hydrology model development in Wang's group. In the UConn prototype, wires are connected from the sensors to an instrument that logs data. Researchers conducted field tests of the sensors -- performing side-by-side tests with commercial sensors under various environmental conditions throughout a 10-month period. The effects of the environmental variations on soil moisture throughout the period were clearly reflected. Critically, the small sensors can also be easily sent around the world given the fact that soil moisture plays a fundamental role in agricultural decision-making globally. Accurate soil moisture sensing is essential to ensure a water level that produces the most robust crops while not wasting the natural resource. The UConn researchers are also working on a nitrogen sensor that is the same model of the water sensors. These would help provide farmers with information on when fields need fertilizing. Currently, nitrogen sensors are not available using this type of technology.

Source <https://www.sciencedaily.com/releases/2019/09/190926114007.htm>

2. Your Video can ID you Through Walls with help of WiFi

Researchers in the lab of UC Santa Barbara professor Yasamin Mostofi have enabled, for the first time, determining whether the person behind a wall is the same individual who appears in given video footage, using only a pair of WiFi transceivers outside. This novel video-WiFi cross-modal gait-based person identification system, which they refer to as XModal-ID (pronounced Cross-Modal-ID), could have a variety of applications, from surveillance and security to smart homes. For instance, consider a scenario in which law enforcement has a video footage of a robbery. They suspect that the robber is hiding inside a house. Can a pair of WiFi transceivers outside the house determine if the person inside the house is the same as the one in the robbery video? Questions such as this have motivated this new technology. "Our proposed approach makes it possible to determine if the person behind the wall is the same as the one in video footage, using only a pair of off-the-shelf WiFi transceivers outside," said Mostofi. "This approach utilizes only received power measurements of a WiFi link. It does not need any prior WiFi or video training data of the person to be identified. It also does not need any knowledge of the operation area." In the team's experiments, one WiFi transmitter and one WiFi receiver are behind walls, outside a room where a person is walking. The transmitter sends a wireless signal whose received power is measured by the receiver. Then, given video footage of a person from another area -- and by using only such received wireless power measurements -- the receiver can determine whether the person behind the wall is the same person seen in the video footage. "However, identifying a person through walls, from candidate video footage, is a considerably challenging problem," said Mostofi. Her lab's success in this endeavour is due to the new proposed methodology they developed. "The way each one of us moves is unique. But how do we properly capture and compare the gait information content of the video and WiFi signals to establish if they belong to the same person?" The researchers have proposed a new way that, for the first time, can translate the video gait content to the wireless domain. "Our approach is multi-disciplinary, drawing from areas of both wireless communications and vision," said Chitra Karanam, one of three Ph.D. students on the project. Given some video footage, the team first utilized a human mesh recovery algorithm to extract the 3D mesh describing the outer surface of the human body as a function of time. They then used Born electromagnetic wave approximation to simulate the RF signal that would have been generated if this person was walking in a WiFi area. Next they employed their time-frequency processing approach to extract key gait features from both the real WiFi signal (that was measured behind the wall) and the video-based simulated signal. The two signals are then compared to determine if the person in the WiFi area is the same person in the video. The researchers' processing pipeline involves a series of mathematical functions, including Short-time Fourier transform and Hermite functions, in order to get the spectrogram of the received signal. "A spectrogram carries the frequency-time content of the signal, which implicitly carries the gait information of the person," explained Belal Korany, another Ph.D. student involved in the effort. Several important gait features are then extracted from both spectrograms and properly compared to declare if the person in the video is behind the wall. "We have tested this technology extensively on our campus," said Herbert Cai, the third Ph.D. student on the project. The lab has tested their new technology on 1,488 WiFi-video pairs, drawn from a pool of eight people, in three different behind-wall areas, and achieved an overall accuracy of 84% in correctly identifying the person behind the wall.

Source <https://www.sciencedaily.com/releases/2019/09/190930180950.htm>

3. A Student-Built Robot Reports For Duty



Meet SARA, the humanoid assistant created by six girls from Shri Shankarlal Sundarbai Shasun Jain College for Women. SARA responds coyly when asked how she's doing — but that is only because she is just over a day old, and still learning the ways of humans. An acronym for Shasun's Adaptive Robotics Assistant, SARA is launched at the college's cultural fest, Shreyas 2k19. From a scene straight out of Isaac Asimov's *I, Robot*, the silvery machine glides to the stage amidst loud cheers and waves unblinkingly at the crowd. At six feet tall and weighing 29.2 kgs, the robot is driven by Artificial Intelligence and was built to welcome guests and visitors into the college. As the launch unfolds with a presentation on the making of the robot, SARA's creators — third-year students of Computer Applications — S Nivedeinee, R Madhumitha, A Khushi, S Vithika, R Hemapriya and M Bhavana Kanooga, narrate their journey excitedly. The six-month process began with determining the height of the robot and its targeted function. Once that was finalised, the programming was encoded and frames of mild steel along with a shell of FRP (Fibre Reinforced Plastic) were designed to sculpt the machine. Ultrasonic sensors to detect obstacles, a webcam capable of facial recognition and a seven-inch interactive tablet were then fitted in to ensure maximum output. "The robot first understands the query posed to her and then responds appropriately, also recognising frequently asked questions. A work in progress, she currently only knows English but is quickly learning Tamil and other languages," says Khushi. Where can one find SARA in the future? "She will act as the first level of interaction with any visitor, greeting them and fielding questions on basic aspects of the college such as the number of courses. Besides details about her technology, she knows the tagline of the college and further commands can be given through an Android application that we have developed," answers Subhashini Reddy, brand manager of the group of institutions. Politely standing to the side, the lifelike machine reaffirms this statement with a slight nod of the head, "Hi, I am SARA. How may I assist you?"

Source <https://www.thehindu.com/sci-tech/humanoid-robot-made-by-chennai-students/article29499575.ece>

4. Product Authentication at Your Fingertips

Imagine if water vapour in your breath or surrounding your fingertips revealed invisible patterns on commercial products -- smartphones, laptops -- that verified the products' authenticity and aided anticounterfeiting efforts. Imagine, too, if fast, stable, and reversible colour switching could be easily developed in solids, opening up promising applications in colour displays, signage, sensors, and information encryption. A team led by a chemist at the University of California, Riverside, has brought this fantasy closer to reality by fabricating for the first time "plasmonic" colour-switchable films of silver nanoparticles, or AgNPs. Until now, such colour changing of nanoparticles was mainly achieved in liquids, limiting their potential for practical applications. "Rapid and reversible tuning of plasmonic colour in solid films, a challenge until now, holds great promise for a number of applications," said Yadong Yin, a professor of chemistry, who led the research team. "Our new work brings plasmonic metal nanoparticles to the forefront of colour-converting applications." Plasmonic metal nanoparticles, such as gold and silver, have special optical properties because they efficiently absorb and scatter light at particular wavelengths. Their colours can be altered by changing the distance between their individual particles -- a feature that Yin's research team took advantage of to develop their plasmonic colour-switching film. The researchers coated a glass substrate with a layer of sodium borate, or borax. Then they sprayed AgNPs over the borax to form a film. Yin explained that each AgNP has capping ligands on its surface that introduce distance between the AgNPs. Without the buffer provided by the ligands, the nanoparticles would clump together. In the presence of water or moisture, borax turns to boric acid and releases hydroxyl ions. These ions "deprotonate" a chemical group of the ligands, resulting in the loss of a proton and the addition of a negative charge on the AgNPs. Repulsion forces push the negatively charged nanoparticles away from each other. The nanoparticles, which are pink, acquire new interparticle distances, causing them to reflect a different colour: yellow. When the moisture is removed, the boric acid converts back to borax by capturing hydroxyl ions, initiating a protonation of the ligand's chemical group. This causes a reduction in surface charges on the ligand, weakening the repulsion forces between the AgNPs and causing them to draw closer to each other and aggregate. With interparticle distances now reduced, the color of the AgNP film switches back from yellow to pink, demonstrating full reversibility. "Through this mechanism, we could rapidly achieve plasmonic color switching of the AgNP film in the presence or absence of moisture," Yin said. "In our experiments, we exposed the AgNP film to moisture of 80% relative humidity and found the film changed colors from pink to red, orange, and finally yellow." Making use of the relative humidity around human fingers -- as high as 100% -- Yin's team found AgNP films can change color in response to the proximity of a fingertip. This allows for a convenient, rapid, and touchless method that can be used in information encryption and product authentication," Yin said. Various high-resolution patterns can be effectively encrypted in the AgNP films through a lithography process and then decrypted when exposed to moisture in human breath or from fingertips. Other foreseeable applications include secure communication and calorimetric real-time environment or health monitoring." Yin's team found that the moisture-responsive AgNP films showed reversibility and repeatability in plasmonic colour switching for more than 1,000 cycles.

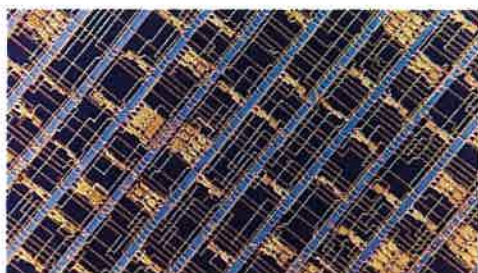
Source <https://www.sciencedaily.com/releases/2019/10/191001132701.htm>

5. Tunable Optical Chip Paves Way for New Quantum Devices

Researchers have created a silicon carbide (SiC) photonic integrated chip that can be thermally tuned by applying an electric signal. The approach could one day be used to create a large range of reconfigurable devices such as phase-shifters and tunable optical couplers needed for networking applications and quantum information processing. Although most optical and computer chips are made of silicon, there is increasing interest in SiC because it exhibits better thermal, electrical and mechanical properties than silicon while also being biocompatible and operating at wavelengths from the visible to infrared. Researchers led by Ali Adibi from the Georgia Institute of Technology detail how they integrated a microheater and an optical device called a microring resonator onto a SiC chip. The accomplishment represents the first fully integrated and thermally tunable SiC optical switch that operates at near-infrared wavelengths. "Devices such as the one we demonstrate in this work can be used as building-blocks for next generation quantum information processing devices and to create biocompatible sensors and probes," said the paper's first author Xi Wu. SiC is particularly attractive for quantum computing and communication applications because it has defects that can be optically controlled and manipulated as quantum bits, or qubits. Quantum computing and communication promises to be significantly faster than traditional computing at solving certain problems because data is encoded in qubits that can be in any combination of two states at once, allowing many processes to be performed simultaneously. The new work builds on the researchers' previous development of a platform called crystalline SiC-on-insulator that overcomes some of the fragility and other drawbacks of previously reported SiC platforms while providing an easy and reliable route for integration with electronic devices. "The SiC-on-insulator platform our group pioneered is similar to the silicon-on-insulator technology widely used in semiconductor industry for a variety of applications," said Tianren Fan, member of the research team. "It enables wafer-level manufacturing of SiC devices, paving the way toward commercialization of integrated photonic quantum information processing solutions based on SiC," said Ali A. Eftekhari, member of the research team. Fully exploiting the new platform's unique capabilities required developing the ability to tune its optical properties so that a single chip-based structure can be used to provide different functions. The researchers accomplished this by using the thermo-optic effect in which changing a material's temperature modifies its optical properties, such as refractive index. They began by fabricating tiny ring-shaped optical cavities, or microring resonators, using the crystalline SiC-on-insulator technology. In each resonator, light at certain wavelengths, called its resonance wavelengths, traveling around the ring will build up strength through constructive interference. The resonator then can be used to control the amplitude and phase of the light in a waveguide coupled to it. To create a tunable resonator with a high degree of control, the researchers fabricated electric heaters on top of the microrings. When an electric current is applied to the integrated microheater, it locally increases the temperature of the SiC microring and thus changes its resonant wavelengths thanks to the thermo-optic effect. The researchers tested the performance of the fabricated integrated microring resonators and microheaters by applying different levels of electrical power and then measuring the optical transmission of the waveguide coupled to the microring resonator. Their results showed that it is possible to achieve high-quality resonators with low-power thermal tunability through a robust device that can be manufactured using existing semiconductor foundry processes. The researchers are now working to build elements with the crystalline SiC-on-insulator platform for quantum photonic integrated circuits, including on-chip pump lasers, single photon sources and single photon detectors that could be used with the tunable microring resonator to create a fully functional chip for advanced optical quantum computing.

Source <https://www.sciencedaily.com/releases/2019/10/191002121721.htm>

6. The world's Most Advanced Nanotube Computer May Keep Moore's Law Alive



MIT researchers have found new ways to cure headaches in manufacturing carbon nanotube processors, which are faster and less power hungry than silicon chips. A team of academics at MIT has unveiled the world's most advanced chip yet that's made from carbon nanotubes—cylinders with walls the width of a single carbon atom. The new microprocessor, which is capable of running a conventional software program, could be an important milestone on the road to finding silicon alternatives. The electronics industry is struggling with a slowdown in Moore's Law, which holds that the number of transistors that can be packed on a silicon processor doubles roughly every couple of years. This trend is facing its physical limits: as the sizes of the devices shrink to a few atoms, electrical current is starting to leak from the metallic channels that shuttle it through transistors. The heat that's released saps semiconductors' energy efficiency—and may even cause them to fail. Carbon nanotubes could be the perfect solution. Not only are nanotube transistors faster than silicon ones, studies have found that chips made from nanotubes could be up to ten times more energy efficient. This efficiency boost could significantly extend electronic gadgets' battery life. Researchers have been working on alternative chips involving the molecules for decades, but manufacturing headaches have kept the processors stuck in research labs. The MIT team says it has found ways to overcome some of the biggest hurdles to producing them at scale. One problem is that when carbon nanotubes are made, they come in two types mixed together: the first are semiconductors that are perfect for creating integrated circuits, but the second conducts electrical current like a wire, which sucks more power and can even undermine a circuit's performance. To make the chips economically viable, a cost-effective way to minimize the impact of the latter group is needed. Another problem is that to make the chips, a uniform monolayer of carbon nanotubes needs to be deposited over a wafer. But this has proven hard to do because nanotubes have an annoying tendency to bunch together. A bundle of them that lands on a transistor can knock it out of action. These and other challenges intrigued Max Shulaker, an MIT professor who has worked on other notable projects in the field, and has received funding from the US Defense Advanced Projects Research Agency to develop nanotube technology. The group of researchers he leads has developed a working 16-bit microprocessor built from over 14,000 carbon nanotube transistors that Shulaker claims is the most complex ever demonstrated. The techniques they have come up with can be implemented with equipment used for making conventional silicon chips, which means chipmakers won't have to invest in expensive new gear if they want to make nanotube processors. When they looked into the intermixing problem, the researchers discovered that some kinds of logic gates, which are fundamental building blocks of digital circuits, were more resistant to problems triggered by metallic-like nanotubes than others. That led them to develop a new circuit design that prioritizes these gates, while minimizing the use of more sensitive metallic ones. To deal with the bundling problem, they coated a wafer in a polymer and then carefully washed it off in stages. This stripped off the nanotube clumps, leaving behind the monolayer needed to make the chip work most efficiently. The chip that the MIT researchers produced using these techniques is capable of running a simple program that produces the message "Hello, World." But if they are to displace silicon processors, carbon nanotube ones will ultimately need billions of transistors so they can run advanced software.

Source <https://www.technologyreview.com/s/614247/the-worlds-most-advanced-nanotube-computer-may-keep-moores-law-alive/>

7. ISRO releases images of Moon's surface clicked by Chandrayaan-2 Orbiter



The Indian Space Research Organisation (ISRO) recently released pictures captured by the Orbiter High-Resolution Camera (OHRC) onboard Chandrayaan-2. The OHRC provides very high spatial resolution images of Moon's surface. The image was clicked from an altitude of 100km, the space agency said. It covered a part of Boguslawsky E crater (named after a German astronomer), which lies in the southern polar region of Moon. ISRO has also maintained that Chandrayaan's orbiter has been functioning normally and performing experiments as planned. India's hopes of soft-landing a spacecraft on the Moon were dashed on September 7 after the space agency lost communication with Vikram lander during its final descent stage when it was just 335 metres above the lunar surface. It was said that the lander failed to bring down its speed to the level required to make a soft landing. The incident, which took place 13 minutes after Vikram began its descent, hoped to reduce its speed from 6,048 km per hour to about 7 km per hour or lower. Earlier this week, US space agency NASA had put out detailed images showcasing the lunar craters where Chandrayaan-2's Vikram lander might have landed. The images were taken from NASA's Lunar Reconnaissance Orbiter (LRO), which passed over the landing site on September 17 and took a set of high-resolution images of the area

Source <https://indianexpress.com/article/india/isro-chandrayaan-2-orbiter-moon-photos-6054118/>

8. A Gel That Makes Trees Fire-Resistant Could Help Prevent Wildfires



A gel developed by Stanford researchers could be sprayed on forests and vegetation to make them fire-resistant, helping to stop wildfires from spreading. It's made from cellulose polymers (extracted from plants) and particles of silica, which are chemically identical to sand, mixed with a flame-retardant fluid. Fire-fighting sprays are currently used on wildfires only in emergencies: this new approach would deploy them protectively before any fires can break out. The gel is nontoxic and biodegradable. The team tested the gel on plants in the laboratory and then on patches of grass by a road in California, supervised by local firefighters. They found it can withstand wind and up to half an inch of rain, so it only needs to be applied once per fire season. Wildfires caused by humans are a huge and growing problem, destroying millions of acres of forest every year. It's an issue that will only worsen as the Earth gets hotter. Many wildfires start in the same areas, like roadsides, campgrounds, and near remote electrical lines, which means local agencies could take a targeted approach, spraying the most "at risk" zones with the gel.

Source <https://www.technologyreview.com/f/614454/a-gel-that-makes-trees-fire-resistant-could-help-prevent-wildfires/>

9. A New Concept Could Make More Environmentally Friendly Batteries Possible



A new concept for an aluminium battery has twice the energy density as previous versions, is made of abundant materials, and could lead to reduced production costs and environmental impact. The idea has potential for large scale applications, including storage of solar and wind energy. Researchers from Chalmers University of Technology, Sweden, and the National Institute of Chemistry, Slovenia, are behind the idea. Using aluminium battery technology could offer several advantages, including a high theoretical energy density, and the fact that there already exists an established industry for its manufacturing and recycling. Compared with today's lithium-ion batteries, the researchers' new concept could result in markedly lower production costs. "The material costs and environmental impacts that we envisage from our new concept are much lower than what we see today, making them feasible for large scale usage, such as solar cell parks, or storage of wind energy, for example," says Patrik Johansson, Professor at the Department of Physics at Chalmers. "Additionally, our new battery concept has twice the energy density compared with the aluminium batteries that are 'state of the art' today." Previous designs for aluminium batteries have used the aluminium as the anode (the negative electrode) -- and graphite as the cathode (the positive electrode). But graphite provides too low an energy content to create battery cells with enough performance to be useful. But in the new concept, the graphite has been replaced by an organic, nanostructured cathode, made of the carbon-based molecule anthraquinone. The anthraquinone cathode has been extensively developed. The advantage of this organic molecule in the cathode material is that it enables storage of positive charge-carriers from the electrolyte, the solution in which ions move between the electrodes, which make possible higher energy density in the battery. "Because the new cathode material makes it possible to use a more appropriate charge-carrier, the batteries can make better usage of aluminium's potential. Now, we are continuing the work by looking for an even better electrolyte. The current version contains chlorine -- we want to get rid of that," says Chalmers researcher Niklas Lindahl, who studies the internal mechanisms which govern energy storage. So far, there are no commercially available aluminium batteries, and even in the research world they are relatively new. The question is if aluminium batteries could eventually replace lithium-ion batteries. "Of course, we hope that they can. But above all, they can be complementary, ensuring that lithium-ion batteries are only used where strictly necessary. So far, aluminium batteries are only half as energy dense as lithium-ion batteries, but our long-term goal is to achieve the same energy density. There remains work to do with the electrolyte, and with developing better charging mechanisms, but aluminium is in principle a significantly better charge carrier than lithium, since it is multivalent -- which means every ion 'compensates' for several electrons. Furthermore, the batteries have the potential to be significantly less environmentally harmful," says Patrik Johansson.

Source <https://www.sciencedaily.com/releases/2019/09/190930082249.htm>

10. Microneedle Biosensor Accurately Detects Patient's Antibiotic Levels in Real Time

Small, non-invasive patches worn on the skin can accurately detect the levels of medication in a patient's system, matching the accuracy of current clinical methods. In a small-scale clinical evaluation, researchers at Imperial College London have shown for the first time how microneedle biosensors can be used to monitor the changing concentration of antibiotics. Their findings show the sensors enable real-time monitoring of changes in antibiotic concentration in the body, with similar results to those obtained from blood tests. The team believes the technology could change how patients with serious infections are treated by showing how quickly their bodies 'use up' medications they are given. The researchers add that if future development and testing proves successful and the technology reaches the clinic, it could help to cut costs for the NHS, reduce drug-resistant infections and improve treatment for patients with life-threatening infections and improve the management of less serious ones. They add that biosensors could reduce the need for blood sampling and analysis as well as offer more efficient, personalised drug delivery that could potentially be delivered outside of the hospital setting for outpatients. Dr Timothy Rawson, from Imperial's Department of Infectious Disease and who led the research, said: "Microneedle biosensors hold a great potential for monitoring and treating the sickest of patients. When patients in hospital are treated for severe bacterial infections the only way we have of seeing whether antibiotics we give them are working is to wait and see how they respond, and to take frequent blood samples to analyse levels of the drugs in their system -- but this can take time. Our biosensors could help to change that. By using a simple patch on the skin of the arm, or potentially at the site of infection, it could tell us how much of a drug is being used by the body and provide us with vital medical information, in real time." Microneedle biosensors use a series of microscopic 'teeth' to penetrate the skin and detect changes in the fluid between cells. These teeth act as electrodes to detect changes in pH and can be coated with enzymes which react with a drug of choice, altering the local pH of the surrounding tissue if the drug is present. The technology has been used for continuous monitoring of blood sugar, but the Imperial group has, for the first time, shown its potential for use in monitoring changes to drug concentrations. In a small proof-of-concept trial, the Imperial team trialled the sensors in 10 healthy patients who were given doses of penicillin. Sensor patches (1.5 cm sq) were placed on their forearms and connected to monitors, with measurements taken frequently -- from 30 minutes before receiving oral penicillin, to four hours afterwards. Blood samples were taken at the same time points for comparison. Data collected from nine patients revealed that the sensors could accurately detect the changing concentration of penicillin in patients' bodies. The researchers found that while penicillin concentrations varied widely from patient to patient, the overall readings from the biosensors were similar to those from blood samples -- showing a marked decrease in drug concentration over time. According to the team, the early findings are positive, but they explain the study is limited by the very small sample size and the was only tested on a single antibiotic, in healthy patients. The researchers explain that along with further testing in larger patient groups to strengthen the initial findings, they will look to see how the sensors could help to optimise the dosing of penicillin and similar antibiotics. They add that the sensors could form the basis of a 'closed loop system', like an insulin pump -- where antibiotics are administered to patients and levels continuously monitored to ensure they receive a sufficient dose. Prof Tony Cass, from the Department of Chemistry said: "This small, early-stage trial has shown that the sensor technology is as effective as gold standard clinical analysis in detecting changes to the concentrations of penicillin in the human body. When further developed, this technology could prove critical for the monitoring and treatment of patients with severe infections. More widely it could be used to monitor many other drugs and personalise treatment in many diseases" Professor Alison Holmes, from Imperial's Department of Infectious Disease and director of the NIHR Health Protection Research Unit in HCAI and AMR at Imperial and the CAMO, said: "Technological solutions such as our microneedle biosensor could prove crucial in improving how we use and protect the arsenal of life-saving antibiotics we have available to treat patients. Ultimately, these types of collaborative, multidisciplinary solutions could lead to earlier detection and better treatment of infections, helping to save more lives and protect these invaluable medicines for generations to come."

Engineering Innovation in India

DRDO Successfully Test Fires BrahMos Supersonic Cruise Missile from Odisha Coast



The missile is being developed jointly by the Defence Research and Development Organisation and NPO Mashinostroyeniya of Russia.

Supersonic cruise missile BrahMos was successfully test fired on September 30, 2019 morning off the Odisha coast from the Integrated Test Range at Chandipur. BrahMos is the world's fastest supersonic missile, which can fly at almost three times the speed of sound. The guided cruise missile is being developed jointly by the Defence Research and Development Organisation, and Russia's NPO Mashinostroyeniya. It is named after two rivers – India's Brahmaputra and Russia's Moskva. "The missile was successfully test-fired for its full range of 290-km during the launch jointly conducted by DRDO and BrahMos Aerospace," a statement from the defence ministry said. "With this successful mission, the indigenous content in the formidable weapon has reached a high value, thus bolstering India's defence indigenisation and the flagship 'Make in India' programme." The missile was launched at 10.20 am. The missile featured Indian propulsion system, airframe, power supply among other indigenous elements, the statement added.

Source <https://scroll.in/latest/939007/drdo-successfully-test-fires-brahmos-supersonic-cruise-missile-from-odisha-coast>