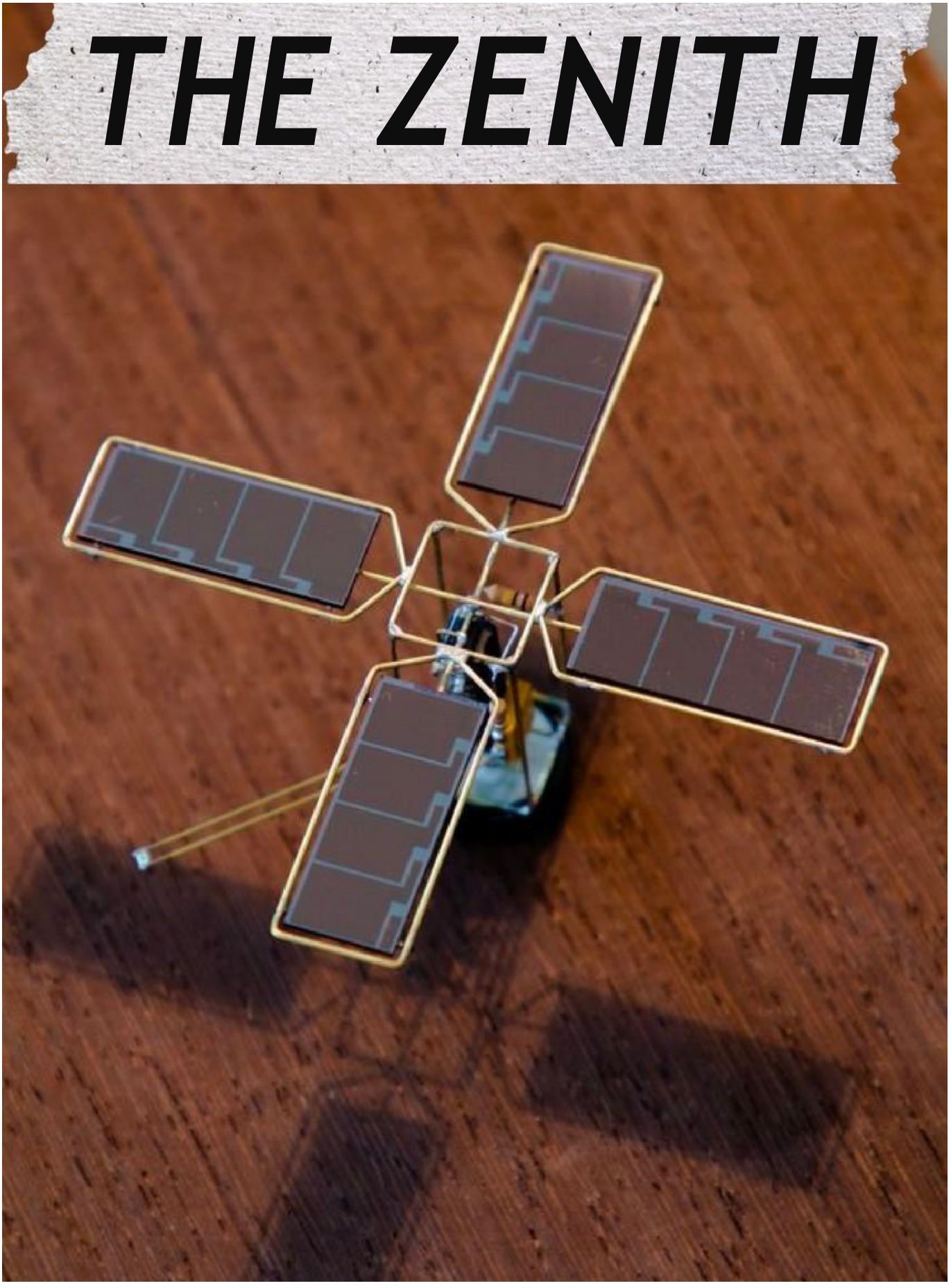
VOLUME 6: ISSUE 5 SEPTEMBER 2023

THE ZENITH



CONTENT

New 'droplet battery' could pave the way for miniature bio-integrated devices

University of Oxford researchers have made a significant step towards realising miniature bio-integrated devices, capable of directly stimulating cells. The work has been published today in the journal Nature.

Small bio-integrated devices that can interact with and stimulate cells could have important therapeutic applications, including the delivery of targeted drug therapies and the acceleration of wound healing. However, such devices all need a power source to operate. To date, there has been no efficient means to provide power at the microscale level. To address this, researchers from the University of Oxford's Department of Chemistry have developed a miniature power source capable of altering the activity of cultured human nerve cells. Inspired by how electric eels generate electricity, the device uses internal ion gradients to generate energy.

The miniaturized soft power source is produced by depositing a chain of five nanolitre-sized droplets of a conductive hydrogel (a 3D network of polymer chains containing a large quantity of absorbed water). Each droplet has a different composition so that a salt concentration gradient is created across the chain. The droplets are separated from their neighbours by lipid bilayers, which provide mechanical support while preventing ions from flowing between the droplets.

The power source is turned on by cooling the structure to 4°C and changing the surrounding medium: this disrupts the lipid bilayers and causes the droplets to form a continuous hydrogel. This allows the ions to move through the conductive hydrogel, from the high-salt droplets at the two ends to the low- salt droplet in the middle. By connecting the end droplets to electrodes, the energy released from the ion gradients is transformed into electricity, enabling the hydrogel structure to act as a power source for external components.

In the study, the activated droplet power source produced a current which persisted for over 30 minutes. The maximum output power of a unit made of 50 nanolitre droplets was around 65 nanowatts (nW). The devices produced a similar amount of current after being stored for 36 hours. The research team then demonstrated how living cells could be attached to one end of the device so that their activity could be directly regulated by the ionic current. The team attached the device to droplets containing human neural progenitor cells, which had been stained with a fluorescent dye to indicate their activity. When the power source was turned on, time-lapse recording demonstrated waves of intercellular calcium signalling* in the neurons, induced by the local ionic current.

New 'droplet battery' could pave the way for miniature bio-integrated devices

Dr Yujia Zhang (Department of Chemistry, University of Oxford), the lead researcher for the study, said: 'The miniaturized soft power source represents a breakthrough in bio-integrated devices. By harnessing ion gradients, we have developed a miniature, biocompatible system for regulating cells and tissues on the microscale, which opens up a wide range of potential applications in biology and medicine.'

According to the researchers, the device's modular design would allow multiple units to be combined in order to increase the voltage and/or current generated. This could open the door to powering next-generation wearable devices, bio-hybrid interfaces, implants, synthetic tissues, and microrobots. By combining 20 five-droplet units in series, they were able to illuminate a light- emitting diode, which requires about 2 Volts. They envisage that automating the production of the devices, for instance by using a droplet printer, could produce droplet networks composed of thousands of power units.

Professor Hagan Bayley (Department of Chemistry, University of Oxford), the research group leader for the study, said: 'This work addresses the important question of how stimulation produced by soft, biocompatible devices can be coupled with living cells. The potential impact on devices including bio-hybrid interfaces, implants, and microrobots is substantial.'

Science Daily
August 30, 2023
Source: University of Oxford

Expert Lectures/Seminars/Courses Organised

- Department of Electronics and Telecommunication Engineering of K. K. Wagh Institute of Engineering Education and Research Nashik, Students' Association of Electronics Engineers (SAEE) in collaboration with IETE Nashik subcenter organized a workshop on "Simulink, Simscape Stateflow and MBD" by Mr. Kunal Khandelwal (Chief Instructor, Autotech Training Centre, Goa) on 27th to 28th July 2023.

Expert Lectures/Seminars/Courses Organised

- Department of Electronics and Telecommunication Engineering of K. K. Wagh Institute of Engineering Education and Research Nashik, Students' Association of Electronics Engineers (SAEE) in collaboration with IETE Nashik subcenter organized a webinar on "Get Ready for Automation Industries" by Mr. Subodh Mone (Chief Instructor, Autotech Training Centre, Goa) on 12th August 2023.

- Training and Placement Cell and the Department of Electronics and Telecommunication Engineering of K. K. Wagh Institute of Engineering Education and Research Nashik, Students' Association of Electronics Engineers (SAEE) in collaboration with IETE Nashik subcenter organized an expert talk on “Placement and Internship Opportunities in the Field of Automation” by Mr. Subodh Mone (Chief Instructor, Autotech Training Centre, Goa) on 21st August 2023.

Expert Lectures/Seminars/Courses Organised

- Department of Electronics and Telecommunication Engineering of K. K. Wagh Institute of Engineering Education and Research Nashik, Students' Association of Electronics Engineers (SAEE) in collaboration with IETE Nashik subcenter organized a n expert talk on “Recent Trends in Network Security” by Mrs. Archana Deshmukh (Counselor and Soft Skill Trainer) on 21st August 2023.

- Department of Electronics and Telecommunication Engineering of K. K. Wagh Institute of Engineering Education and Research Nashik, Students' Association of Electronics Engineers (SAEE) in collaboration with IETE Nashik subcenter organized a webinar on “Tips to get into Software Industries” by Ms. Shrisha Sudhir (Technical Consultant, Birlasoft Technologies, Bangalore) on 28th August 2023.

Expert Lectures/Seminars/Courses Organised

- Department of Electronics and Telecommunication Engineering of K. K. Wagh Institute of Engineering Education and Research Nashik, Students' Association of Electronics Engineers (SAEE) in collaboration with IETE Nashik subcenter organized an expert talk on “Roadmap of MERN Technology” by Mr. Adarsh MALI (MERN Stack Developer, STAAH Hotel Software Company, Surat) on 28th August 2023.

Papers presented by Staff

Sr. No.	Author	Title of Paper	Organizer
1.	R. V. Chothe	A Combined Cryptography and Error Correction System based on Enhanced AES and LDPC	PCCOE, Pune
2.	S. V. Shelke	Combining Multiple Feature Extraction and Classification Methods to Study Performance of Handwritten Sanskrit Character Recognition	PCCOE, Pune

Papers presented by Staff

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This is to certify that

Rupaliben Vilas Chothe

has Presented a Paper at the 7th International Conference on Communication Control and Automation organized by PCET's Pimpri Chinchwad College of Engineering, Nigdi, Pune, India on 18th - 19 th August 2023.

Dr. Kishor Kirange
Conference Chair

Dr. Govind N. Kulkarni
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7th International Conference
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Computing Communication Control & Automation
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This is to certify that

Shraddha V. Shelke

has Presented a Paper at the 7th International Conference on Communication Control and Automation organized by PCET's Pimpri Chinchwad College of Engineering, Nigdi, Pune, India on 18th - 19 th August 2023.

Dr. Kishor Kirange
Conference Chair

Dr. Govind N. Kulkarni
Director

Industrial Training / Seminar / Workshop done by Staff

Sr. No.	Faculty Name	Event
1.	Dr Dinesh Chandwadkar	Implementation of Indian Knowledge System (IKS) for NEP 2020
2.	Dr Sunita Aniruddha Patil	Implementation of Indian Knowledge System (IKS) for NEP 2020

Industrial Training / Seminar / Workshop done by Staff

COEP Technological University Pune
and PVG's College of Engineering and Technology
& G. K. Pate (Wani) Institute of Management, Pune

Certificate of Participation

This is to certify that

Dr Dinesh Chandwadkar (K K Wagh Institute of Engineering Education and Research Nashik)

has participated in the Two-Day FDP on **"Implementation of Indian Knowledge System (IKS) for NEP 2020"** organised on 8th and 9th August 2023.

Prof. Rajendra Kaduskar
Director
PVG'S COET and GKPWIM, Pune

Prof. Sudhir Agashe
Vice Chancellor,
COEP Tech University, Pune

COEP Technological University Pune
and PVG's College of Engineering and Technology
& G. K. Pate (Wani) Institute of Management, Pune

Certificate of Participation

This is to certify that

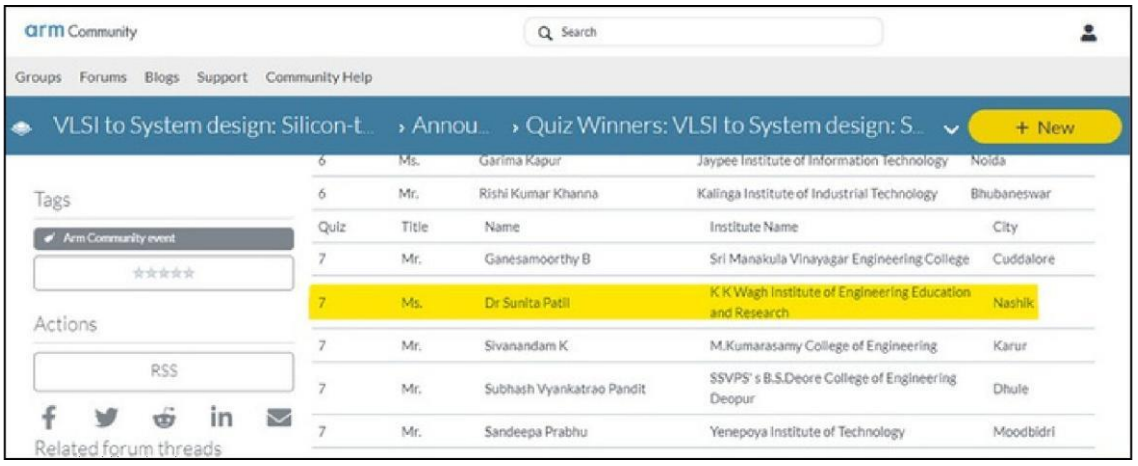
Dr Sunita Aniruddha Patil (K K Wagh Institute of Engineering Education and Research Nashik)

has participated in the Two-Day FDP on **"Implementation of Indian Knowledge System (IKS) for NEP 2020"** organised on 8th and 9th August 2023.

Prof. Rajendra Kaduskar
Director
PVG'S COET and GKPWIM, Pune

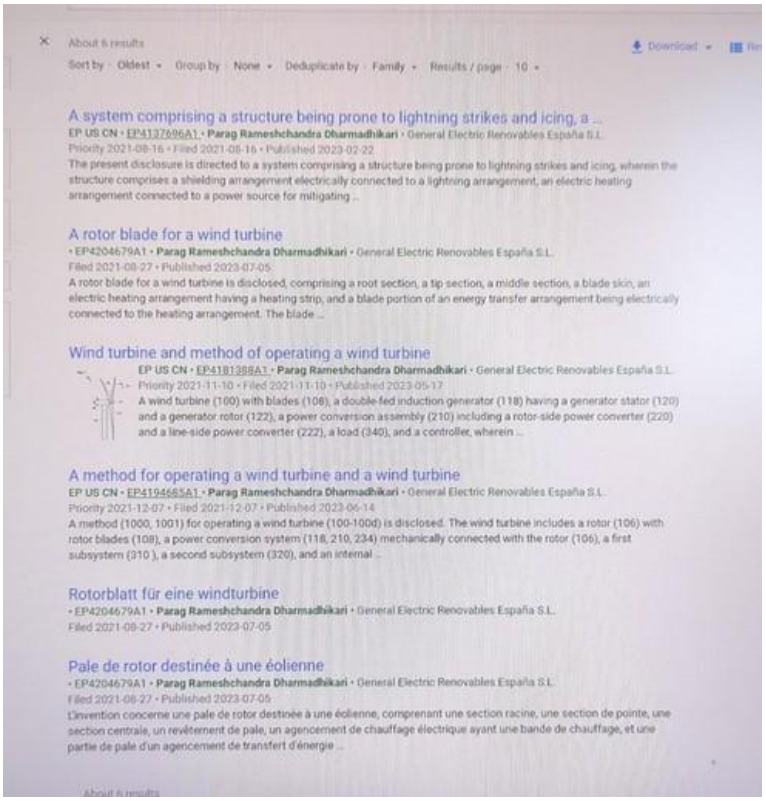
Prof. Sudhir Agashe
Vice Chancellor,
COEP Tech University, Pune

On 7th August, 2023, Dr. Sunita Patil (Ugale) emerged as the winner of the quiz conducted during the workshop titled "VLSI to System design: Silicon-to-end application approach" and got STM development boards.



Quiz	Title	Name	Institute Name	City
6	Ms.	Garima Kapur	Jaypee Institute of Information Technology	Noida
6	Mr.	Rishi Kumar Khanna	Kalinga Institute of Industrial Technology	Bhubaneswar
7	Mr.	Ganesamoorthy B	Sri Manakula Vinayagar Engineering College	Cuddalore
7	Ms.	Dr Sunita Patil	K K Wagh Institute of Engineering Education and Research	Nashik
7	Mr.	Sivanandam K	M.Kumarasamy College of Engineering	Karur
7	Mr.	Subhash Vyankatrao Pandit	SSVPS' s B.S.Deore College of Engineering Deopur	Dhule
7	Mr.	Sandeepa Prabhu	Yenepoya Institute of Technology	Moodbidri

Alumni Achievements



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Excel in quality technical education and research in Electronics and Telecommunication (E&TC) Engineering for sustainable development of industry and betterment of society.

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M2: To create an environment to enhance life-long learning and 21st century skills

M3: To inspire students' innovative thinking and creativity to promote research culture.