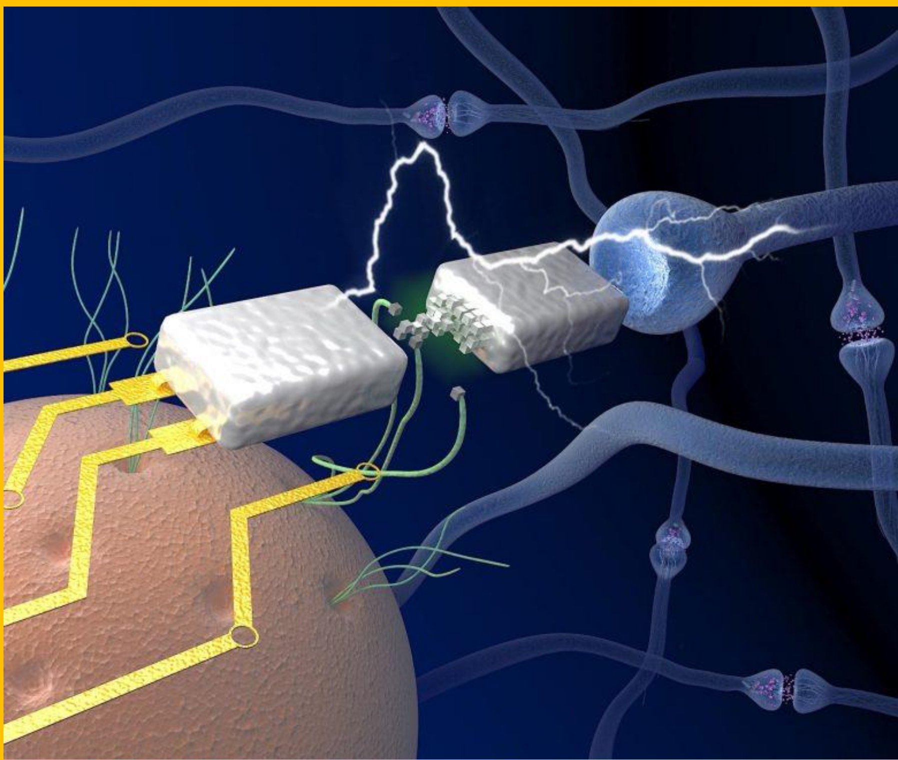
DEPERTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

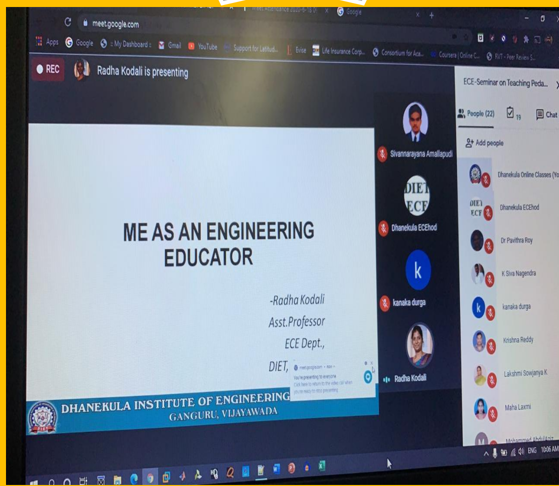
Tele Electro

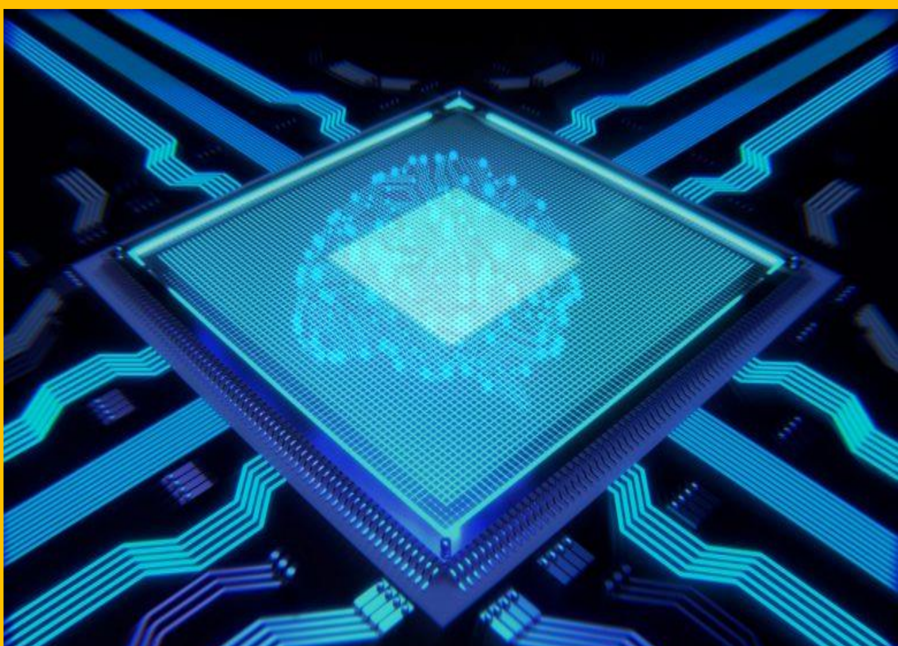


NEWSLETTER

Volume 7-Issue 1(June-July)

2020-21





Contents

DHANEKULA INSTITUTE OF ENGINEERING AND TECHNOLOGY :: GANGURU

DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY::GANGURU

Institute Vision

Pioneering Professional Education through Quality.

Institute Mission

1. Quality Education through state-of-art infrastructure, laboratories and committed staff.
2. Moulding Students as proficient, competent, and socially responsible engineering personnel with ingenious intellect.
3. Involving faculty members and students in research and development works for betterment of society.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Vision

- Pioneering Electronics and Communication Engineering Education & Research to Elevate Rural Community

Mission

- Imparting professional education endowed with ethics and human values to transform students to be competent and committed electronics engineers.
- Adopting best pedagogical methods to maximize knowledge transfer.
- Having adequate mechanisms to enhance understanding of theoretical concepts through practice.
- Establishing an environment conducive for lifelong learning and entrepreneurship development.
- To train as effective innovators and deploy new technologies for service of society.

Principal's Message

Dear Parents and Students,

It is with great pleasure that I welcome you to our College (DIET) Newsletter.

As Principal I am hugely impressed by the commitment of the college and the staff in providing an excellent all-round education for our students with our state of the art facilities. We as a team working together, strongly promote the zeal towards academic achievement among our students. The cultural, sports and other successes of all our students and staff are also proudly celebrated together. I congratulate the staff and students who brought latest technologies and concepts onto the day to day teaching learning platform. As long as our ideas are expressed and thoughts kindled, we can be sure of learning, as everything begins with an idea.

I appreciate every student who shared the joy of participation in co-curricular and extracurricular activities along with their commitment to curriculum. That little extra we do, is the icing on the cake. 'Do more than belong – participate. Do more than care – help. Do more than believe – practice. Do more than be fair – be kind. Do more than forgive – forget. Do more than dream – work.'

With a long and rewarding history of achievement in education behind us, our DIET community continues to move forward together with confidence, pride and enthusiasm.

I hope you enjoy your visit to the website, and should you wish to contact us, please find details at the www.diet.ac.in

Yours in Education,

Dr. Ravi Kadiyala
Principal

HOD's Message

The Department of Electronics & Communication Engineering (ECE) has consistently maintained an exemplary academic record. The greatest asset of the department is its highly motivated and learned faculty. The available diversity of expertise of the faculty with the support of the other staff prepares the students to work in global multicultural environment. The graduates of the Electronics & Communication Stream have been selected by some of the world's leading corporations & as well as by most of the leading Indian counter parts. We hope that we will continue to deliver our best to serve the society and mankind. It is also expected that our students will continue to pass-on the skills which they have developed during their stay at this department to whole of the world for a better society.

Dr.G.L.Madhumati

Professor & HOD

Dept. of ECE

Dhanekula Institute of Engineering & Technology

Editor's Note

Dear Readers,

It gives us great pleasure to bring you the first issue of **Tele-Electro** for the academic year 2020-21, the Department newsletter of Dhanekula Institute of Engineering & Technology, Ganguru.

The name and fame of an institute depends on the caliber and achievements of the students and teachers. The role of a teacher is to be a facilitator in nurturing the skills and talents of students.

This Newsletter is a platform to exhibit the literary skills and innovative ideas of teachers and students. **Tele-Electro** presents the achievements of students and contributions of teachers.

We profusely thank the management for giving support and encouragement and a free hand in this endeavour. Last but not the least we are thankful to all the authors who have sent their articles. We truly hope that the pages that follow will make an interesting read.

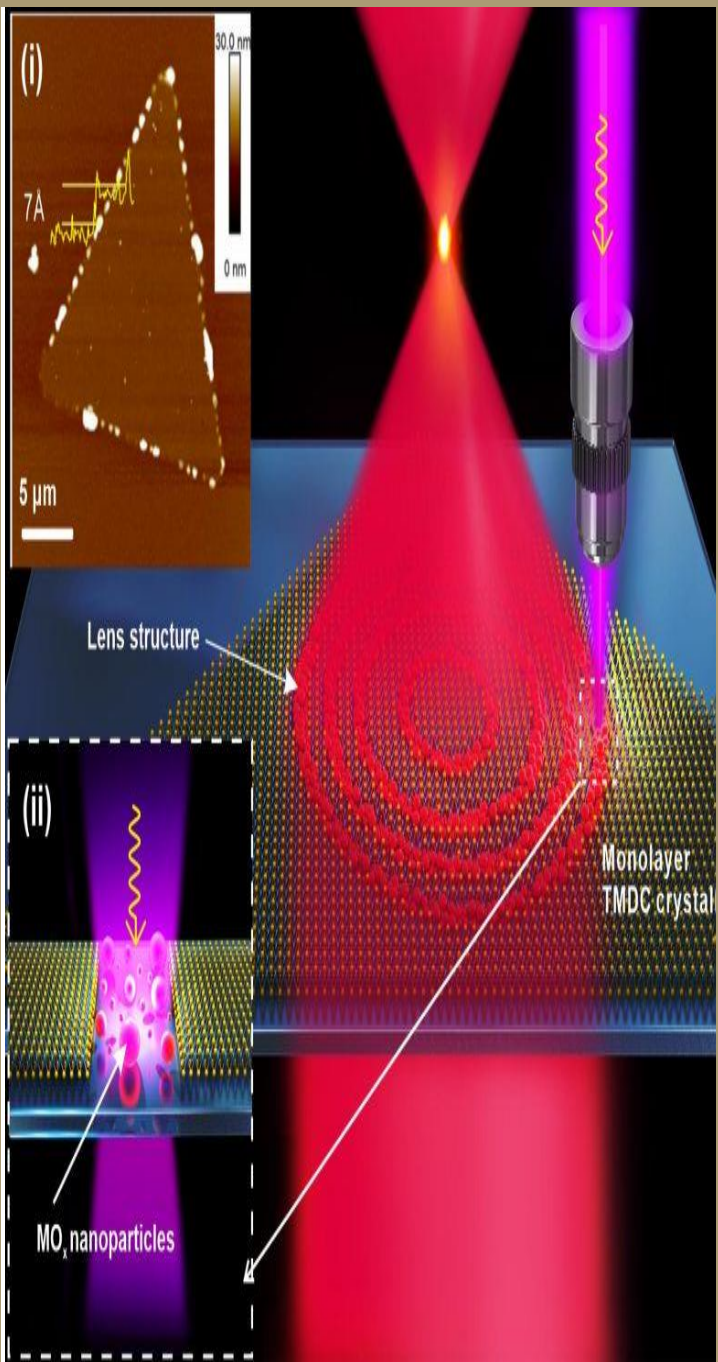
Mr. N Nagaraju
Faculty Member

G.U.Maheswara Reddy
Student Coordinator

G.Nagaraju
Student Coordinator

STUDENT ARTICLES

Ultrathin Flat Lenses for High Resolution Imaging Using Monolayer Transition Metal



Lenses are one of the most commonly used optical components in daily life, including eyeglasses, microscopic objectives, magnifying glass, and camera lenses. Conventional lenses are based on the principle of light refraction, using different materials, spherical surfaces, and spatial positions to achieve the control of light. The fabrication of conventional lenses including the processes of material selection, cutting, rough grinding, fine grinding, polishing, and testing. In order to minimize the aberrations including the chromatic aberration, spherical aberration and astigmatisms, it is necessary to stack multiple layers of lenses to form compound lenses, leading to the complexity and cumbersomeness of current camera equipment.

Therefore, tremendous effort has been devoted into the development of ultrathin flat lenses. Unlike conventional lenses, flat lenses use nanostructures to modulate light. By controlling the optical properties and the spatial position of each nano-element, advanced functions, such as achromatic and aberration-free focusing, high spatial resolution and special focal intensity distributions can be achieved. However, when the material thickness is reduced to the subwavelength scale, the insufficient phase or amplitude modulation based on the intrinsic refractive index and absorption of the materials results in poor lens performance.

In a new paper published in *Light Science & Application*, a team of scientists, led by Prof. Baohua Jia at Centre for Translational Atomaterials, Swinburne University of Technology, Australia, Prof. Qiaoliang Bao formerly at Monash University, Prof. Chengwei Qiu at National University of Singapore and co-workers have developed an innovative method to fabricate high performance lenses in monolayer two dimensional transitional metal dichalcogenide (TMDC) material by using a femtosecond laser to pattern nanoparticles. The lens has a sub-wavelength resolution and a focusing efficiency of 31%, laying the foundation for ultimately thin optical devices for use in nano-optics and on-chip photonic applications.

Although lenses made from multilayer TMDCs have been demonstrated before, when their thickness is reduced to the sub-nanometer scale, their insufficient phase or amplitude modulation results in focusing efficiencies of less than 1%. The international team discovered that it is possible to generate nanoparticles by using a femtosecond laser beam to interact with the monolayer TMDC material, which is significantly different from the process produced by a continuous wave laser. When the laser pulse is so short that the entire material remains cold after laser process, the nanoparticles can firmly attach to the substrate. The nanoparticles show very strong scattering to modulate the amplitude of light. Therefore, the lens made from the nanoparticles can provide subwavelength resolution and high efficiency, which allows the team to demonstrate diffraction-limited imaging by using the lenses.

Monolayer is the thinnest form of a material, which is the ultimate physical thickness limit. By using the monolayer for the lens fabrication, the process demonstrated in this study consumed the least material meeting the theoretical limitation. More importantly, the femtosecond laser fabrication technique is a one-step simple process, without the requirements of high vacuum or special environment, thus it provides the simplest way to fabricate an ultrathin flat lens. As a result, the lens can be easily integrated into any photonic or microfluidic devices for broad applications.

“We have used the thinnest material in the world to fabricate a flat lens, and prove that the good performance of the ultrathin lens can lead to high resolution imaging. It shows enormous potential in different applications, such as eyeglasses, microscopy lenses, telescopes and camera lenses. It is foreseeable that by using this technique, the weight and size of camera lenses can be significantly reduced in the near future.” Said Dr Han Lin, the first author from the Centre for Translational Atomaterials, Swinburne University of Technology.

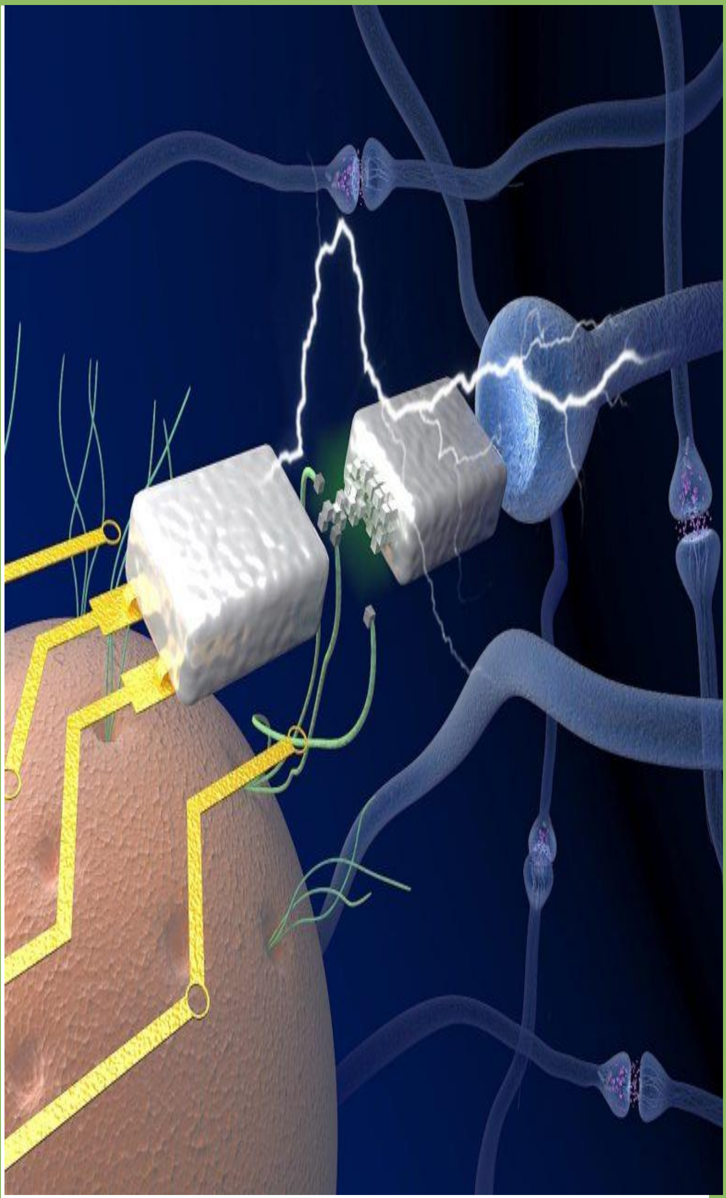
“We are excited to see unique outcome from femtosecond laser processing 2D materials. It opens up new possibility to fabrication photonic devices using scalable method.” Added by Prof. Baohua Jia, Director of Centre for Translational Atomaterials.

“We can integrate the monolayer 2D material lens onto desired devices by simply attaching the material then using a femtosecond laser to perform fabrication. The entire process is simple, and the method is flexible and low cost. Thus, we also see the great application potential of the method.” Commented by Prof. Qiaoliang Bao formerly at Monash University.

“We design our lens in such a way that image can be found at different focal planes, with different magnifications. This mechanism can be readily used to develop an optical zoom lens that is required in all cellphone cameras. Currently, lenses with different focal lengths are used to achieve different zoom function. However, our lenses can achieve different zoom rates simply with one design.” Prof. Chengwei Qiu from National University of Singapore forecasts.

Article by
Sushma
188T1A0403
III-ECE

New Electronics Devised That Mimic the Human Brain in Efficient Learning



University of Massachusetts Amherst researchers advance neuromorphic computing.

Only 10 years ago, scientists working on what they hoped would open a new frontier of neuromorphic computing could only dream of a device using miniature tools called memristors that would function/operate like real brain synapses.

But now a team at the University of Massachusetts Amherst has discovered, while on their way to better understanding protein nanowires, how to use these biological, electricity conducting filaments to make a neuromorphic memristor, or “memory transistor,” device. It runs extremely efficiently on very low power, as brains do, to carry signals between neurons. Details are published in *Nature Communications* today (April 20, 2020).

A memristor (a portmanteau of memory resistor) is a non-linear two-terminal electrical component relating electric charge and magnetic flux linkage. It was described and named in 1971 by Leon Chua, completing a theoretical quartet of fundamental electrical components which comprises also the resistor, capacitor and inductor.

As first author Tianda Fu, a Ph.D. candidate in electrical and computer engineering, explains, one of the biggest hurdles to neuromorphic computing, and one that made it seem unreachable, is that most conventional computers operate at over 1 volt, while the brain sends signals called action potentials between neurons at around 80 millivolts — many times lower. Today, a decade after early experiments, memristor voltage has been achieved in the range similar to conventional computer, but getting below that seemed improbable, he adds.

Fu reports that using protein nanowires developed at UMass Amherst from the bacterium Geobacter by microbiologist and co-author Derek Lovely, he has now conducted experiments where memristors have reached neurological voltages. Those tests were carried out in the lab of electrical and computer engineering researcher and co-author Jun Yao.

Yao says, “This is the first time that a device can function at the same voltage level as the brain. People probably didn’t even dare to hope that we could create a device that is as power-efficient as the biological counterparts in a brain, but now we have realistic evidence of ultra-low power computing capabilities. It’s a concept breakthrough and we think it’s going to cause a lot of exploration in electronics that work in the biological voltage regime.”

Lovely points out that Geobacter’s electrically conductive protein nanowires offer many advantages over expensive silicon nanowires, which require toxic chemicals and high-energy processes to produce. Protein nanowires also are more stable in water or bodily fluids, an important feature for biomedical applications. For this work, the researchers shear nanowires off the bacteria so only the conductive protein is used, he adds.

Fu says that he and Yao had set out to put the purified nanowires through their paces, to see what they are capable of at different voltages, for example. They experimented with a pulsing on-off pattern of positive-negative charge sent through a tiny metal thread in a memristor, which creates an electrical switch.

They used a metal thread because protein nanowires facilitate metal reduction, changing metal ion reactivity and electron transfer properties. Lovely says this microbial ability is not surprising, because wild bacterial nanowires breathe and chemically reduce metals to get their energy the way we breathe oxygen.

As the on-off pulses create changes in the metal filaments, new branching and connections are created in the tiny device, which is 100 times smaller than the diameter of a human hair, Yao explains. It creates an effect similar to learning — new connections — in a real brain. He adds, “You can modulate the conductivity, or the plasticity of the nanowire-memristor synapse so it can emulate biological components for brain-inspired computing. Compared to a conventional computer, this device has a learning capability that is not software-based.”

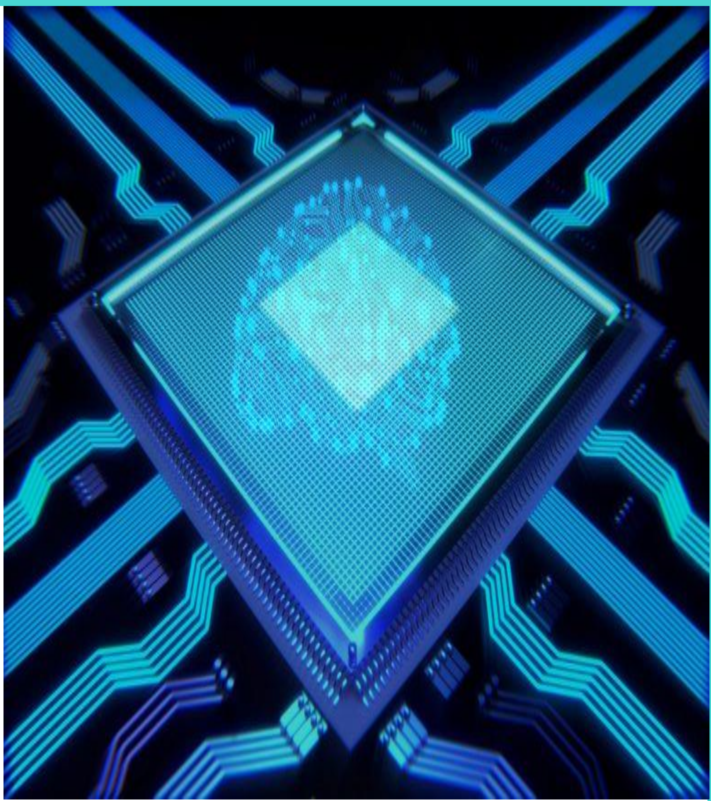
Fu recalls, “In the first experiments we did, the nanowire performance was not satisfying, but it was enough for us to keep going.” Over two years, he saw improvement until one fateful day when his and Yao’s eyes were riveted by voltage measurements appearing on a computer screen.

“I remember the day we saw this great performance. We watched the computer as current voltage sweep was being measured. It kept doing down and down and we said to each other, ‘Wow, it’s working.’ It was very surprising and very encouraging.”

Fu, Yao, Lovely and colleagues plan to follow up this discovery with more research on mechanisms, and to “fully explore the chemistry, biology and electronics” of protein nanowires in memristors, Fu says, plus possible applications, which might include a device to monitor heart rate, for example. Yao adds, “This offers hope in the feasibility that one day this device can talk to actual neurons in biological systems.”

Article by
Pravallika
188T1A0405
III-ECE

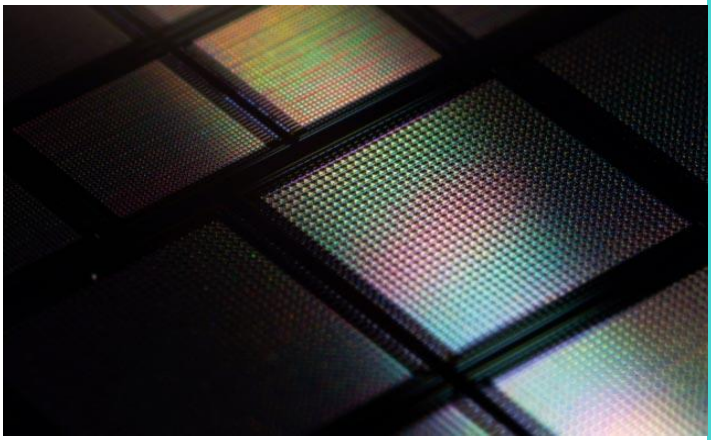
Engineers Put Tens of Thousands of Artificial Brain Synapses on a Single Chip for Portable AI Devices



MIT engineers have designed a "brain-on-a-chip," smaller than a piece of confetti, that is made from tens of thousands of artificial brain synapses known as memristors — silicon-based components that mimic the information-transmitting synapses in the human brain.

The researchers borrowed from principles of metallurgy to fabricate each memristor from alloys of silver and copper, along with silicon. When they ran the chip through several visual tasks, the chip was able to "remember" stored images and reproduce them many times over, in versions that were crisper and cleaner compared with existing memristor designs made with unalloyed elements.

Their results, published on June 8, 2020, in the journal *Nature Nanotechnology*, demonstrate a promising new memristor design for neuromorphic devices — electronics that are based on a new type of circuit that processes information in a way that mimics the brain's neural architecture. Such brain-inspired circuits could be built into small, portable devices, and would carry out complex computational tasks that only today's supercomputers can handle.

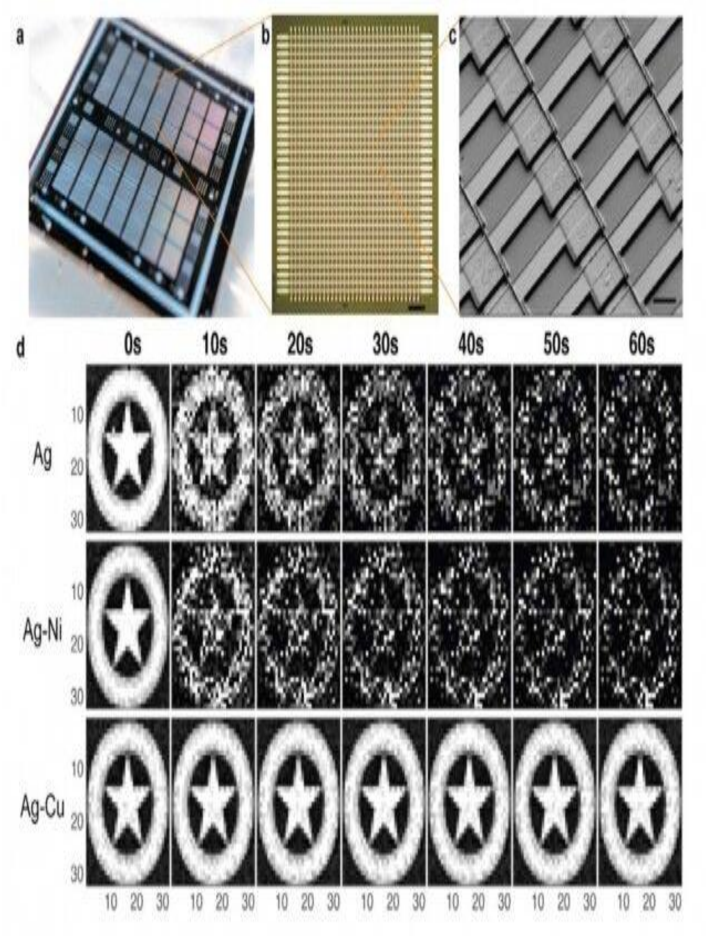


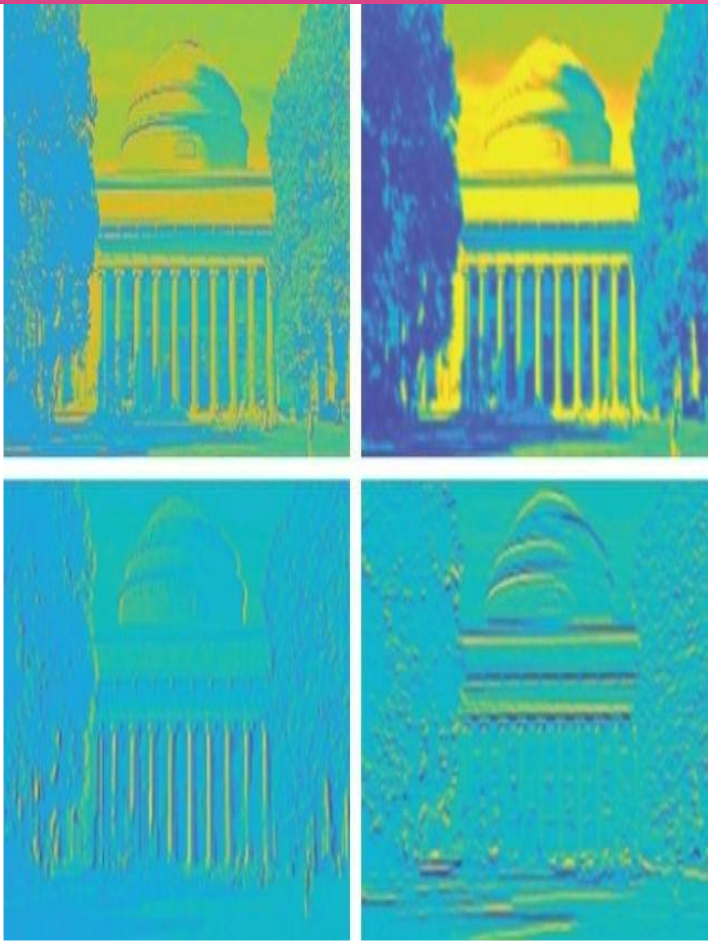
"So far, artificial synapse networks exist as software. We're trying to build real neural network hardware for portable artificial intelligence systems," says Jeehwan Kim, associate professor of mechanical engineering at MIT. "Imagine connecting a neuromorphic device to a camera on your car, and having it recognize lights and objects and make a decision immediately, without having to connect to the internet. We hope to use energy-efficient memristors to do those tasks on-site, in real-time."

Wandering ions

Memristors, or memory transistors, are an essential element in neuromorphic computing. In a neuromorphic device, a memristor would serve as the transistor in a circuit, though its workings would more closely resemble a brain synapse — the junction between two neurons. The synapse receives signals from one neuron, in the form of ions, and sends a corresponding signal to the next neuron.

A transistor in a conventional circuit transmits information by switching between one of only two values, 0 and 1, and doing so only when the signal it receives, in the form of an electric current, is of a particular strength. In contrast, a memristor would work along a gradient, much like a synapse in the brain. The signal it produces would vary depending on the strength of the signal that it receives. This would enable a single memristor to have many values, and therefore carry out a far wider range of operations than binary transistors.





Like a brain synapse, a memristor would also be able to "remember" the value associated with a given current strength, and produce the exact same signal the next time it receives a similar current. This could ensure that the answer to a complex equation, or the visual classification of an object, is reliable — a feat that normally involves multiple transistors and capacitors.

Ultimately, scientists envision that memristors would require far less chip real estate than conventional transistors, enabling powerful, portable computing devices that do not rely on supercomputers, or even connections to the Internet.

Existing memristor designs, however, are limited in their performance. A single memristor is made of a positive and negative electrode, separated by a "switching medium," or space between the electrodes. When a voltage is applied to one electrode, ions from that electrode flow through the medium, forming a "conduction channel" to the other electrode. The received ions make up the electrical signal that the memristor transmits through the circuit. The size of the ion channel (and the signal that the memristor ultimately produces) should be proportional to the strength of the stimulating voltage.

Kim says that existing memristor designs work pretty well in cases where voltage stimulates a large conduction channel, or a heavy flow of ions from one electrode to the other. But these designs are less reliable when memristors need to generate subtler signals, via thinner conduction channels.

The thinner a conduction channel, and the lighter the flow of ions from one electrode to the other, the harder it is for individual ions to stay together. Instead, they tend to wander from the group, disbanding within the medium. As a result, it's difficult for the receiving electrode to reliably capture the same number of ions, and therefore transmit the same signal, when stimulated with a certain low range of current.

Borrowing from metallurgy

Kim and his colleagues found a way around this limitation by borrowing a technique from metallurgy, the science of melding metals into alloys and studying their combined properties.

"Traditionally, metallurgists try to add different atoms into a bulk matrix to strengthen materials, and we thought, why not tweak the atomic interactions in our memristor, and add some alloying element to control the movement of ions in our medium," Kim says.

Engineers typically use silver as the material for a memristor's positive electrode. Kim's team looked through the literature to find an element that they could combine with silver to effectively hold silver ions together, while allowing them to flow quickly through to the other electrode.

The team landed on copper as the ideal alloying element, as it is able to bind both with silver, and with silicon.

"It acts as a sort of bridge, and stabilizes the silver-silicon interface," Kim says.

To make memristors using their new alloy, the group first fabricated a negative electrode out of silicon, then made a positive electrode by depositing a slight amount of copper, followed by a layer of silver. They sandwiched the two electrodes around an amorphous silicon medium. In this way, they patterned a millimeter-square silicon chip with tens of thousands of memristors.

As a first test of the chip, they recreated a gray-scale image of the Captain America shield. They equated each pixel in the image to a corresponding memristor in the chip. They then modulated the conductance of each memristor that was relative in strength to the color in the corresponding pixel.

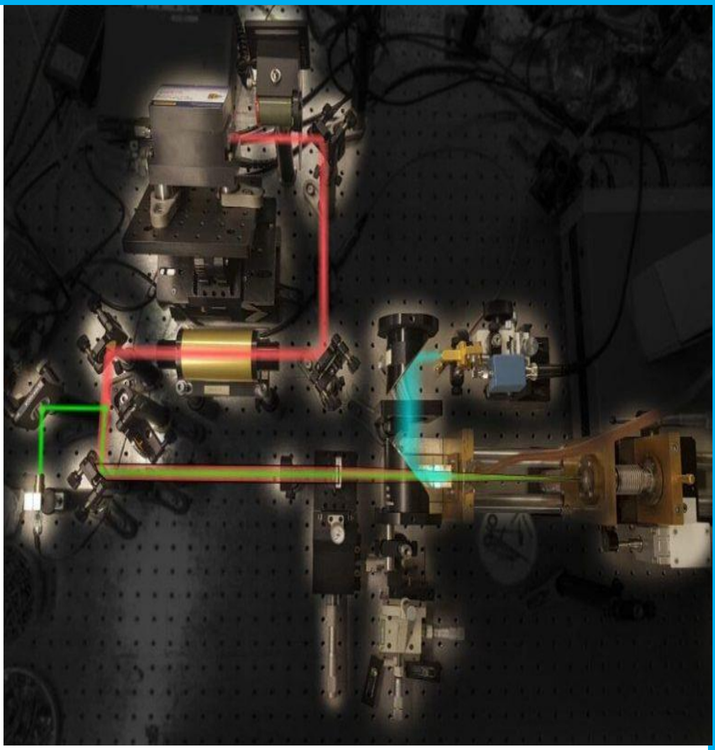
The chip produced the same crisp image of the shield, and was able to "remember" the image and reproduce it many times, compared with chips made of other materials.

The team also ran the chip through an image processing task, programming the memristors to alter an image, in this case of MIT's Killian Court, in several specific ways, including sharpening and blurring the original image. Again, their design produced the reprogrammed images more reliably than existing memristor designs.

"We're using artificial synapses to do real inference tests," Kim says. "We would like to develop this technology further to have larger-scale arrays to do image recognition tasks. And some day, you might be able to carry around artificial brains to do these kinds of tasks, without connecting to supercomputers, the internet, or the cloud."

Article by
P.Krishna Reddy
Assistant Professor

Terahertz Laser Paves the Way for Better Sensing, Imaging and Communications



New terahertz frequency laser opens up large, underused region of the electromagnetic spectrum.

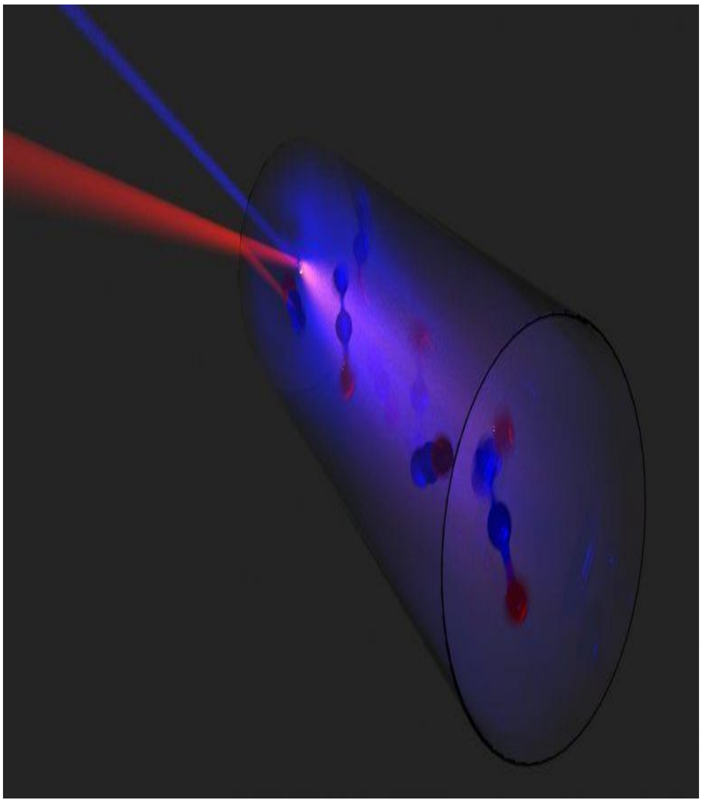
The terahertz frequency range — which sits in the middle of the electromagnetic spectrum between microwaves and infrared light — offers the potential for high-bandwidth communications, ultrahigh-resolution imaging, precise long-range sensing for radio astronomy, and much more.

But this section of the electromagnetic spectrum has remained out of reach for most applications. That is because current sources of terahertz frequencies are bulky, inefficient, have limited tuning or have to operate at low temperature.

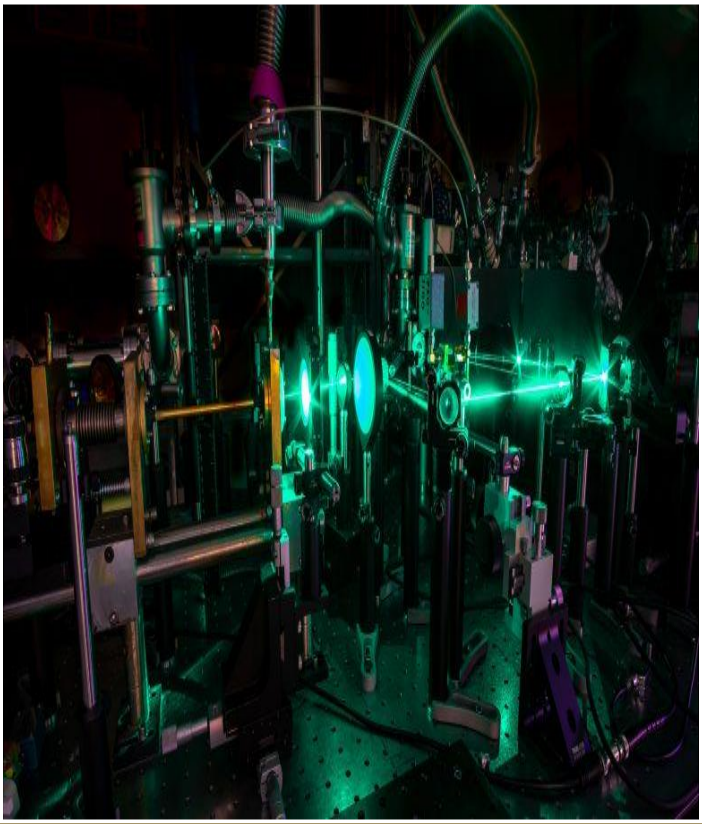
Now, researchers from the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS), in collaboration with MIT and the U.S. Army, have developed a compact, room temperature, widely tunable terahertz laser.

"This laser outperforms any existing laser source in this spectral region and opens it up, for the first time, to a broad range of applications in science and technology," said Federico Capasso, the Robert L. Wallace

Professor of Applied Physics and Vinton Hayes Senior Research Fellow in Electrical Engineering at SEAS and co-senior author of the paper.



"There are many needs for a source like this laser, things like short range, high bandwidth wireless communications, very high-resolution radar, and spectroscopy," said Henry Everitt, Senior Technologist with the U.S. Army CCDC Aviation & Missile Center and co-senior author of the paper.



Everitt is also an Adjunct Professor of Physics at Duke University.

While most electronic or optical terahertz sources use large, inefficient and complex systems to produce the elusive frequencies with limited tuning range, Capasso, Everitt and their team took a different approach.

To understand what they did, let's go over some basic physics of how a laser works.

In quantum physics, excited atoms or molecules sit at different energy levels — think of these as floors of a building. In a typical gas laser, a large number of molecules are trapped between two mirrors and brought to an excited energy level, aka a higher floor in the building. When they reach that floor, they decay, fall down one energy level and emit a photon. These photons stimulate the decay of more molecules as they bounce back and forth leading to amplification of light. To change the frequency of the emitted photons, you need to change the energy level of the excited molecules.

So, how do you change the energy level? One way is to use light. In a process called optical pumping, light raises molecules from a lower energy level to a higher one — like a quantum elevator. Previous terahertz molecular lasers used optical pumps but they were limited in their tunability to just a few frequencies, meaning the elevator only went to a small number of floors.

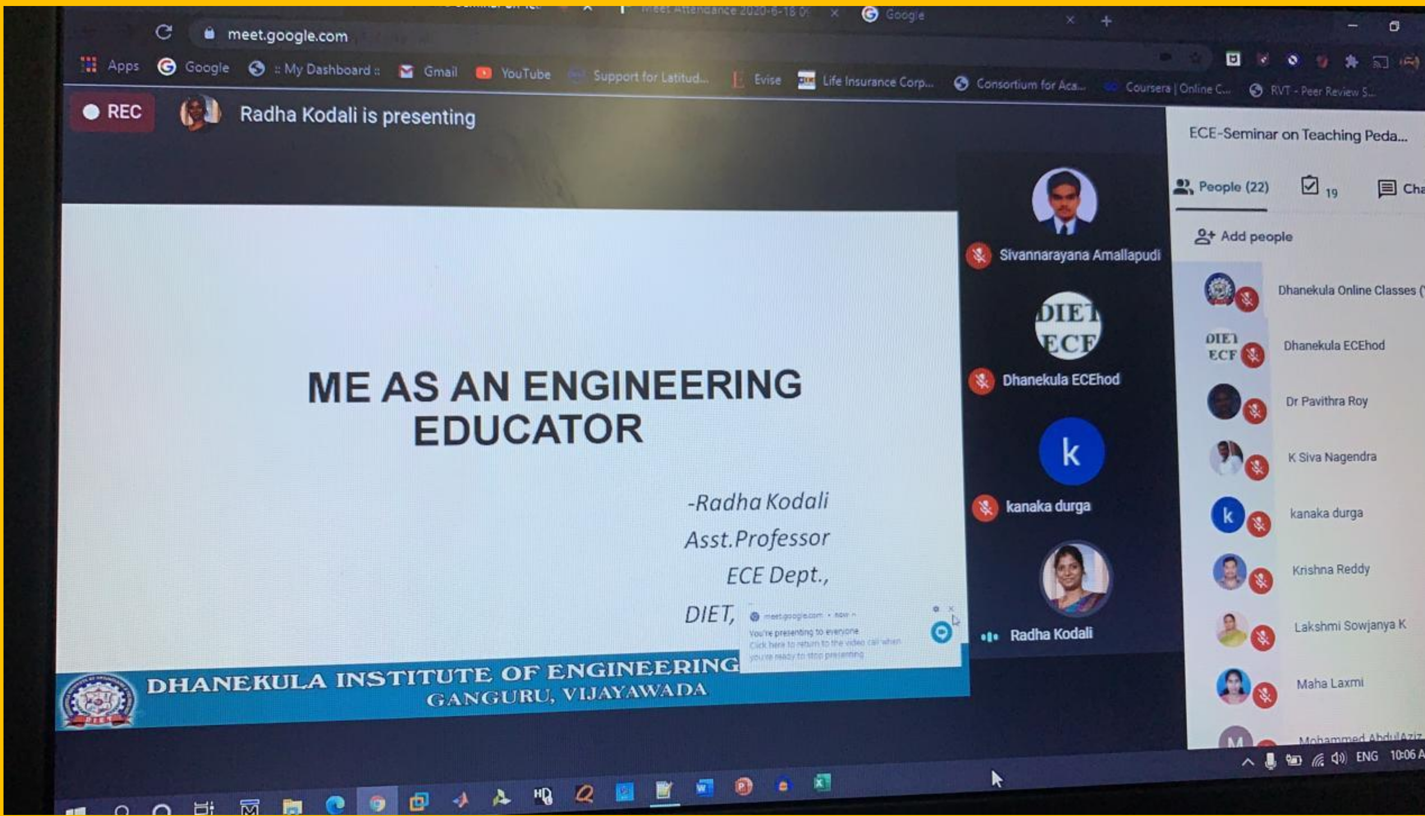
The breakthrough of this research is that Capasso, Everitt and their team used a highly tunable, quantum cascade laser as their optical pump. These powerful, portable lasers, co-invented by Capasso and his group at Bell Labs in the 1990s, are capable of efficiently producing widely tunable light. In other words, this quantum elevator can stop at every floor in the building.

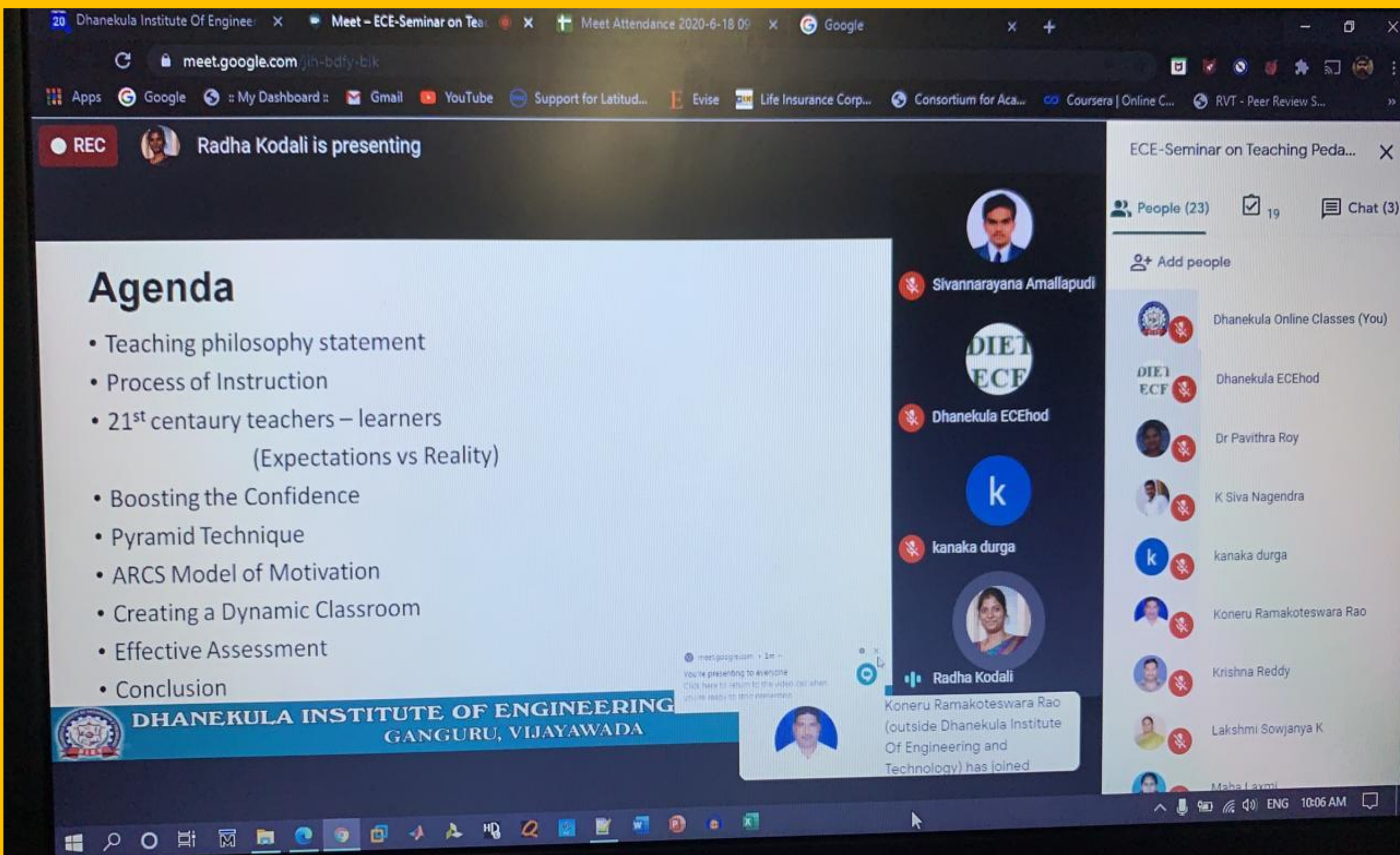
The theory to optimize the operation of the new laser was developed by Steven Johnson, Professor of Applied Mathematics and Physics at MIT, his graduate student Fan Wang and Everitt.

Article by
P.Rama Krishna
Assistant Professor

Seminars

The Electronics and Communication Engineering department had conducted a seminar on Teaching Pedagogy "Me as an Engineering Educator" by Kodali Radha, Assistant Professor, Dept. of ECE on 20-7-2020





Faculty Achievements

The Faculty were actively participated in the learning activities like attending FDP programs, Seminars, Workshops, Webinars, Publishing Research papers during june-july duration. The below table gives the total list of participations in the above mentioned events.

Event Name	FDPs Attended	Journals Published	Workshop/Seminar/Webinars
Total	46	13	26

List of the journals published by Faculty

S. No.	Faculty /Staff name	Paper / Book title	Events / Journals / Publisher	National/ International	DOI	Citations	Impact Factor (SCI)
1	Mr P.Veera Swamy	Automatic Control of Hydroponic Cultivation	International Research Journal of Engineering and Technology	International	_	_	7.529
2	Mr P.Veera Swamy	RF Based speed control system for vehicles	International Research Journal of Engineering and Technology	International	_	_	7.529
3	Dr P.Pavithra Roy	Automatic Building Trolley	International Research Journal of Engineering and Technology	International	_	_	7.529
4	Dr P.Pavithra Roy	Multi Purpose Smart Agriculture System	International Research Journal of Engineering and Technology	International	_	_	7.529
5	Dr G L Madhumati	Triple notch reconfigurable parasitic monopole patch antenna with defected ground structures	International Journal of Microwave and Optical Technology	International	_	_	0.64
6	Mr P.Krishna Reddy	Drunk and Drive Detection and Prevention system using alcoholic breath analyzer and tilt detector along with GSM	International Research Journal of Engineering and Technology	International	_	_	7.529

S. No.	Faculty /Staff name	Paper / Book title	Events / Journals / Publisher	National/ International	DOI	Citations	Impact Factor (SCI)
7	Mr P.Krishna Reddy	PEPE THE HANDWASH PROMOTING ROBOT	Journal of critical Reviews	International	10.31838/JCR.07.14.95	_	_
8	Mr P.Krishna Reddy	GATA-GPS-Arduino tracking,message and alert system for protection of wildlife animals	International Journal of advances in Engineering and Management	International	10.35629/5252-45122323	_	7.429
9	Mr P.Krishna Reddy	Implementation of Triple bit error correction BCH decoder with high decoding efficiency for emerging memories	International Research Journal of Engineering and Technology	International	_	_	7.529
10	Mr P.Veera Swamy	Drunk and Drive Detection and Prevention system using alcoholic breath analyzer and tilt detector along with GSM	International Research Journal of Engineering and Technology	International	_	_	7.529
11	Mr N.Naga Raju	B-Lines Detection in-vivo Lung using Morphological Image Processing	International Research Journal of Engineering and Technology	International	_	_	7.529
12.	Mr P.Veera Swamy	GATA-GPS-Arduino tracking,message and alert system for protection of wildlife animals	International Journal of advances in Engineering and Management	International	10.35629/5252-45122323	_	7.429
13.	Mr M.Venkateswara Rao	Triple notch reconfigurable parasitic monopole patch antenna with defected ground structures	International Journal of Microwave and Optical Technology	International	_	_	0.64

NSS EVENTS

DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY

NSS CELL

EVENT REPORT

Our college NSS Unit is organizing a "Online Live Yoga Session"
by P. Gopi Krishna garu, (Founder - Sri Bhagavathi Yoga Dhyan Mandir, Vijayawada)
on 21st June 2020 to celebrate "International Day of Yoga".

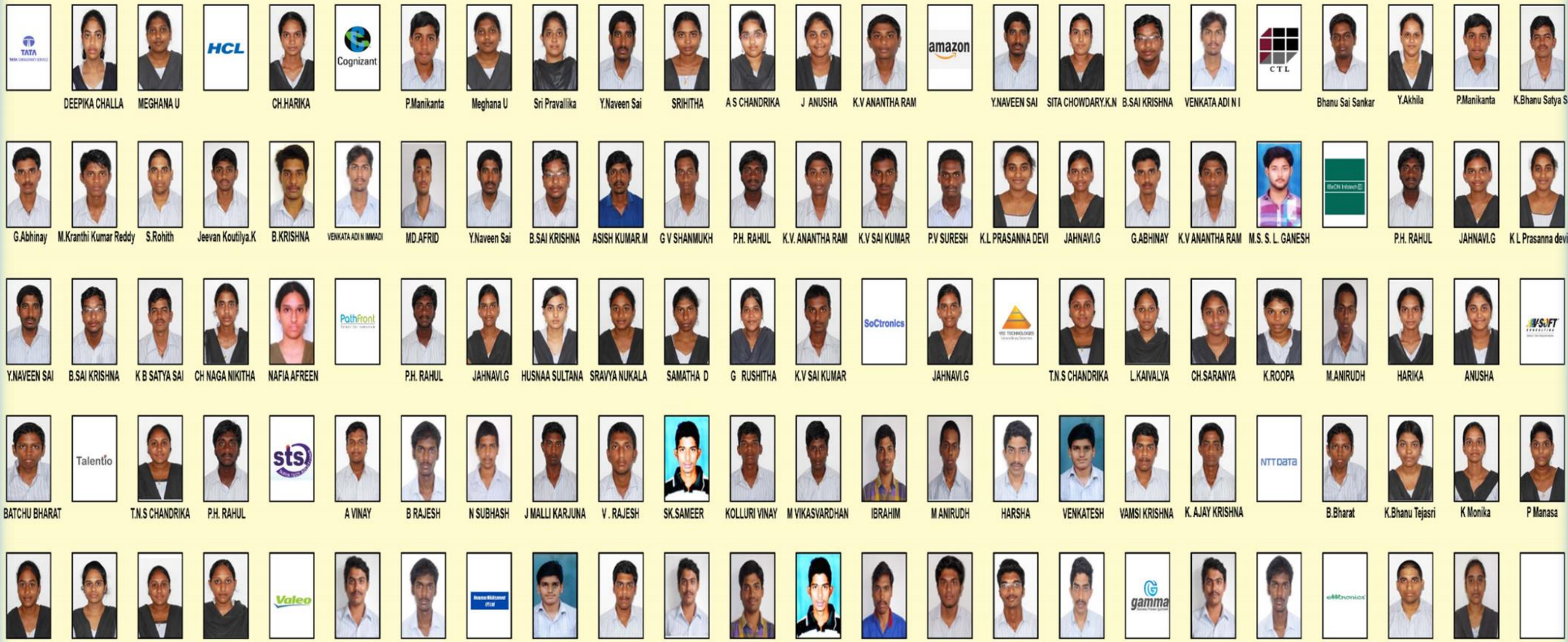
DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY

GANGURU, VIJAYAWADA – 521139

An ISO 9001-2015 Certified Institution & Accredited with NAAC & NBA

DEPARTMENT OF ECE — TRAINING, PLACEMENT & CAREER GUIDANCE CELL

WORDS REALLY FAIL TO EXPRESS OUR JOY AT THE NEWS OF YOUR SELECTION FOR THE REPUTED ORGANISATIONS RANGING FROM NATIONAL REPUTATION AND INTERNATIONAL RECOGNITION. YOUR SELECTION WAS HOWEVER, NO SURPRISE BECAUSE YOUNG AND TALENTED TECHNOCRATS OF YOUR CALIBER AND SUPERIOR INTELLIGENCE WERE BOUND TO FARE EXCELLENTLY.



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