The Zenith

March 01, 2020

Volume 3, Issue 2

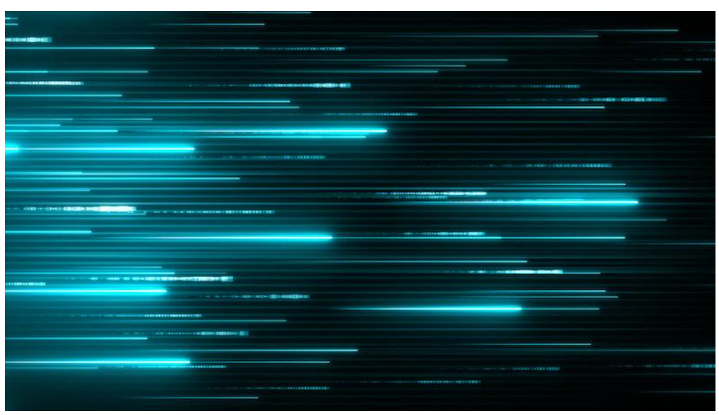
Contents:

Sound and light to generate ultra-fast data transfer

Researchers have made a breakthrough in the control of terahertz quantum cascade lasers, which could lead to the transmission of data at the rate of 100 gigabits per second -- around one thousand times quicker than a fast Ethernet operating at 100 megabits a second.

What distinguishes terahertz quantum cascade lasers from other lasers is the fact that they emit light in the terahertz range of the electromagnetic spectrum. They have applications in the field of spectroscopy where they are used in chemical analysis. The lasers could also eventually provide ultra-fast, short-hop wireless links where large datasets have to be transferred across hospital campuses or between research facilities on universities -- or in satellite communications.

To be able to send data at these increased speeds, the lasers need to be modulated very rapidly: switching on and off or pulsing around 100 billion times every second. Engineers and scientists have so far failed to develop a way of achieving this. A research team from the University of Leeds and University of Nottingham believe they have found a way of delivering ultra- fast modulation, by combining the power of acoustic and light waves. They have published their findings today (February 11th) in Nature Communications. John Cunningham, Professor of Nanoelectronics at Leeds, said: "This is exciting research. At the moment, the system for modulating a quantum cascade laser is electrically driven -- but that system has limitations.



High-speed data concept (stock image).
Credit: © Sergii / Adobe Stock

"Ironically, the same electronics that delivers the modulation usually puts a brake on the speed of the modulation. The mechanism we are developing relies instead on acoustic waves." A quantum cascade laser is very efficient. As an electron passes through the optical component of the laser, it goes through a series of 'quantum wells' where the energy level of the electron drops and a photon or pulse of light energy is emitted.

One electron is capable of emitting multiple photons. It is this process that is controlled during the modulation. Instead of using external electronics, the teams of researchers at Leeds and Nottingham Universities used acoustic waves to vibrate the quantum wells inside the quantum cascade laser. The acoustic waves were generated by the impact of a pulse from another laser onto an aluminium film. This caused the film to expand and contract, sending a mechanical wave through the quantum cascade laser.

Tony Kent, Professor of Physics at Nottingham said "Essentially, what we did was use the acoustic wave to shake the intricate electronic states inside the quantum cascade laser. We could then see that its terahertz light output was being altered by the acoustic wave." Professor Cunningham added: "We did not reach a situation where we could stop and start the flow completely, but we were able to control the light output by a few percent, which is a great start.

"We believe that with further refinement, we will be able to develop a new mechanism for complete control of the photon emissions from the laser, and perhaps even integrate structures generating sound with the terahertz laser, so that no external sound source is needed."

Professor Kent said: "This result opens a new area for physics and engineering to come together in the exploration of the interaction of terahertz sound and light waves, which could have real technological applications."

*Source: **University of Leeds***

Controlling light with light

Researchers from the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS), in collaboration with researchers at McMaster University and University of Pittsburgh, have developed a new platform for all-optical computing, meaning computations done solely with beams of light. "Most computation right now uses hard materials such as metal wires, semiconductors and photodiodes to couple electronics to light," said Amos Meeks, a graduate student at SEAS and co-first author of the research. "The idea behind all-optical computing is to remove those rigid components and control light with light. Imagine, for example, an entirely soft, circuitry-free robot driven by light from the sun."

These platforms rely on so-called non-linear materials that change their refractive index in response to the intensity of light. When light is shone through these materials, the refractive index in the path of the beam increases, generating its own, light-made waveguide. Currently, most non-linear materials require high-powered lasers or are permanently changed by the transmission of light.

Abstract beams of light (Stock Image)
Credit: © *Sozh* / *Adobe Stock*

Here, researchers developed a fundamentally new material that uses reversible swelling and contracting in a hydrogel under low laser power to change the refractive index. The hydrogel is composed of a polymer network that is swollen with water, like a sponge, and a small number of light-responsive molecules known as spiropyran (which is similar to the molecule used to tint transition lenses). When light is shone through the gel, the area under the light contracts a small amount, concentrating the polymer and changing the refractive index. When the light is turned off, the gel returns to its original state.

When multiple beams are shone through the material, they interact and affect each other, even at large distances. Beam A could inhibit Beam B, Beam B could inhibit Beam A, both could cancel each other out or both could go through -- creating an optical logic gate. "Though they are separated, the beams still see each other and change as a result," said Kalaichelvi Saravanamuttu, an associate professor of Chemistry and Chemical Biology at McMaster and co-senior author of the study. "We can imagine, in the long term, designing computing operations using this intelligent responsiveness."

"Not only can we design photoresponsive materials that reversibly switch their optical, chemical and physical properties in the presence of light, but we can use those changes to create channels of light, or self-trapped beams, that can guide and manipulate light," said co-author Derek Morim, a graduate student in Saravanamuttu's lab. "Materials science is changing," said Joanna Aizenberg, the Amy Smith Berylson Professor of Materials Science at SEAS and co-senior author of the study. "Self-regulated, adaptive materials capable of optimizing their own properties in response to environment replace static, energy-inefficient, externally regulated analogs. Our reversibly responsive material that controls light at exceptionally small intensities is yet another demonstration of this promising technological revolution."

This research was published in the Proceedings of the National Academy of Sciences. It was co-authored by Ankita Shastri, Andy Tran, Anna V. Shneidman, Victor V. Yashin, Fariha Mahmood, Anna

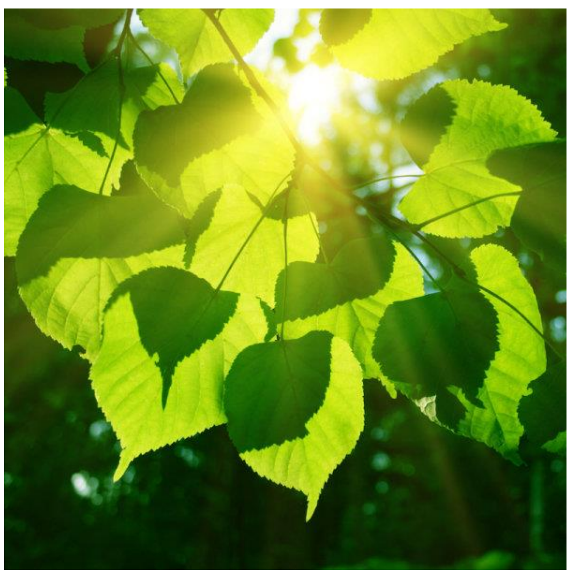
C. Balazs. It was supported in part by the US Army Research Office under Award W911NF-17-1-0351 and by the Natural Sciences and Engineering Research Council, Canadian Foundation for Innovation.

www.sciencedaily.com

Scientists unravel mystery of photosynthesis

Algae and photosynthetic bacteria have been doing the same for even longer, all with remarkable efficiency and resiliency. It's no wonder, then, that scientists have long sought to understand exactly how they do this, hoping to use this knowledge to improve human-made devices such as solar panels and sensors. Scientists from the U.S. Department of Energy's (DOE) Argonne National Laboratory, working closely with collaborators at Washington University in St. Louis, recently solved a critical part of this age-old mystery, homing in on the initial, ultrafast events through which photosynthetic proteins capture light and use it to initiate a series of electron transfer reactions.

"In order to understand how biology fuels all of its engrained activities, you must understand electron transfer," said Argonne biophysicist Philip Laible. "The movement of electrons is crucial: it's how work is accomplished inside a cell." In photosynthetic organisms, these processes begin with the absorption of a photon of light by pigments localized in proteins.



Sunlight and leaves (stock image)
Credit: © *Elena Volkova* / Adobe Stock

Each photon propels an electron across a membrane located inside specialized compartments within the cell. "The separation of charge across a membrane -- and stabilization of it -- is critical as it generates energy that fuels cell growth," said Argonne biochemist Deborah Hanson. The Argonne and

Washington University research team has gained valuable insight on the initial steps in this process: the electron's journey.

Nearly 35 years ago, when the first structure of these types of complexes was unveiled, scientists were surprised to discover that after the absorption of light, the electron transfer processes faced a dilemma: there are two possible pathways for the electron to travel. In nature, plants, algae and photosynthetic bacteria use just one of them -- and scientists had no idea why. What they did know was that the propulsion of the electron across the membrane -- effectively harvesting the energy of the photon -- required multiple steps. Argonne and Washington University scientists have managed to interfere with each one of them to change the electron's trajectory.

"We've been on this trail for more than three decades, and it is a great accomplishment that opens up many opportunities," said Dewey Holten, a chemist at Washington University. The scientists' recent article, "Switching sides -- Reengineered primary charge separation in the bacterial photosynthetic reaction center," published in the Proceedings of the National Academy of Sciences, shows how they discovered an engineered version of this protein complex that switched the utilization of the pathways, enabling the one that was inactive while disabling the other.

"It is remarkable that we have managed to switch the direction of initial electron transfer," said Christine Kirmaier, Washington University chemist and project leader. "In nature, the electron chose one path 100 percent of the time. But through our efforts, we have been able to make the electron switch to an alternate path 90 percent of the time. These discoveries pose exciting questions for future research." As a result of their efforts, the scientists are now closer than ever to being able to design electron transfer systems in which they can send an electron down a pathway of their choosing.

"This is important because we are gaining the ability to harness the flow of energy to understand design principles that will lead to new applications of abiotic systems," Laible said. "This would allow us to greatly improve the efficiency of many solar-powered devices, potentially making them far smaller. We have a tremendous opportunity here to open up completely new disciplines of light-driven biochemical reactions, ones that haven't been envisioned by nature. If we can do that, that's huge."

www.sciencedaily.com

Expert Lecture/Seminars/Courses/Industrial Visits Organized

- An Expert lecture was organized on "Enclosure Design" on 11th January 2020. Mr. Uday T. Karlekar (Head Operation, Lend-A-Hand India, Pune) was the resource person.

- An Expert lecture was organized on "Current Trends and Opportunities in Mobile App Development" on 4th February 2020. Mr. Vaibhav Mahajan (Product design and planning manager and founder of Abra-ca-Dabra software solutions, Nashik) was the resource person.

- Industrial visit to Solar Installation Site for BE students for the subject of Renewable Energy Systems & DSM on 13th February 2020.


- Industrial visit to Caprihans India Ltd. Nashik for TE students for the subject of PLC and Application on 14th February 2020.

- Spoken tutorial test on “C Language” was conducted for SE students under the subject of Data Structure & Algorithms on 4th January 2020.

Certificate for Completion of C Training

Spoken Tutorial

This is to certify that **RAGHVENDRAM JHA** has successfully completed **C** test organized at **K.K. Wagh Institute of Engineering Education & Research** by **KIRAN NAVALE** with course material provided by the Spoken Tutorial Project, IIT Bombay.

Passing an online exam, conducted remotely from IIT Bombay, is a pre-requisite for completing this training. **sharique ansari** at **K.K. Wagh Institute of Engineering Education & Research** invigilated this examination. This training is offered by the **Spoken Tutorial Project, IIT Bombay, funded by National Mission on Education through ICT, MHRD, Govt., of India.**

January 4th 2020

Prof. Kannan M Moudgalya
IIT Bombay

Certificate for Completion of C Training

Spoken Tutorial

This is to certify that **SHIVAM CHANDWADKAR** has successfully completed **C** test organized at **K.K. Wagh Institute of Engineering Education & Research** by **KIRAN NAVALE** with course material provided by the Spoken Tutorial Project, IIT Bombay.

Passing an online exam, conducted remotely from IIT Bombay, is a pre-requisite for completing this training. **sharique ansari** at **K.K. Wagh Institute of Engineering Education & Research** invigilated this examination. This training is offered by the **Spoken Tutorial Project, IIT Bombay, funded by National Mission on Education through ICT, MHRD, Govt., of India.**

January 4th 2020

Prof. Kannan M Moudgalya
IIT Bombay

- Spoken tutorial test on “C++ Language” was conducted for SE students under the subject of “Object Oriented Programming” on 4th January 2020.

Spoken Tutorial

Certificate for Completion of Cpp Training

This is to certify that **AJAY WAKODIKAR** has successfully completed **Cpp** test organized at **K.K. Wagh Institute of Engineering Education & Research** by **KIRAN NAVALE** with course material provided by the Spoken Tutorial Project, IIT Bombay.

Passing an online exam, conducted remotely from IIT Bombay, is a pre-requisite for completing this training. **sharique ansari** at **K.K. Wagh Institute of Engineering Education & Research** invigilated this examination. This training is offered by the **Spoken Tutorial Project, IIT Bombay, funded by National Mission on Education through ICT, MHRD, Govt., of India.**

February 10th 2020

Prof. Kannan M Moudgalya
IIT Bombay

Spoken Tutorial

Certificate for Completion of Cpp Training

This is to certify that **HRUGVED MANBHEKAR** has successfully completed **Cpp** test organized at **K.K. Wagh Institute of Engineering Education & Research** by **KIRAN NAVALE** with course material provided by the Spoken Tutorial Project, IIT Bombay.

Passing an online exam, conducted remotely from IIT Bombay, is a pre-requisite for completing this training. **sharique ansari** at **K.K. Wagh Institute of Engineering Education & Research** invigilated this examination. This training is offered by the **Spoken Tutorial Project, IIT Bombay, funded by National Mission on Education through ICT, MHRD, Govt., of India.**

February 10th 2020

Prof. Kannan M Moudgalya
IIT Bombay

- Students of FE have participated in Project Competition on 25th February 2020 at Sandip Institute of Technology and Research Centre, Nashik

  Students participated:

  a. Gaurav Patil
  b. Sanap Rushikesh
  c. Dnyandeep Sonawane
  d. Fardin Shaikh
  e. Bipinkumar Tiwari

SANDIP FOUNDATION | IEEE BOMBAY SECTION

Sandip Foundation's
Sandip Institute of Technology and Research Centre, Nashik
Computer Engineering Student Association

APEX 2020

THIS CERTIFICATE IS PROUDLY PRESENTED TO

Mr./Ms. Shaikh Fardin Aziz

For participating in Project Competition at National Level Competition APEX 2020, Organised by Department of Computer Engineering, Sandip Foundation's, SITRC Nashik on 24, 25 February 2020

Mr. Akshay Thakare, President, CESA Club, SITRC | Prof.(Dr.) Amol Potgantwar, Head of Department | Prof.(Dr.) Sanjay Gandhe, Principal

- Students of FE have participated in Project Competition on 17th February 2020 at Gokhale Education Society's R. H. Sapat College of Engineering, Management Studies and Research, Nashik

  Students participated:

  a. Dnyandeep Sonawane
  b. Fardin Shaikh
  c. Bipinkumar Tiwari


Gokhale Education Society's
R. H. Sapat College of Engineering Management Studies and Research, Nashik - 422 005, (M.S.), INDIA
DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION
TECHNICAL EVENT
This Certificate is awarded to Mr / Ms. Dnyandeep Sonawane
for being 1st / 2nd / 3rd / Participant / Volunteer in Project competition
in G-estronika-2k20 conducted on 17th Feb 2020
PROF. R. J. SHIMPI GESTRONIKA COORDINATOR
DR. S. P. AGNIHOTRI HEAD E & TC
DR. P. C. KULKARNI PRINCIPAL
PROF. P. M. DESHPANDE PROJECT DIRECTOR


Gokhale Education Society's
R. H. Sapat College of Engineering Management Studies and Research, Nashik - 422 005, (M.S.), INDIA
DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION
TECHNICAL EVENT
This Certificate is awarded to Mr / Ms. Fardin Aziz shaikh
for being 1st / 2nd / 3rd / Participant / Volunteer in Project competition
in G-estronika-2k20 conducted on 17th Feb 2020
PROF. R. J. SHIMPI GESTRONIKA COORDINATOR
DR. S. P. AGNIHOTRI HEAD E & TC
DR. P. C. KULKARNI PRINCIPAL
PROF. P. M. DESHPANDE PROJECT DIRECTOR

Campus Placement

Sr. No.	Name of the Company	No. of students Placed
1.	Emerson	5
2.	Infosys	6
3.	ICICI Prudential	2
4.	Amdocs	1

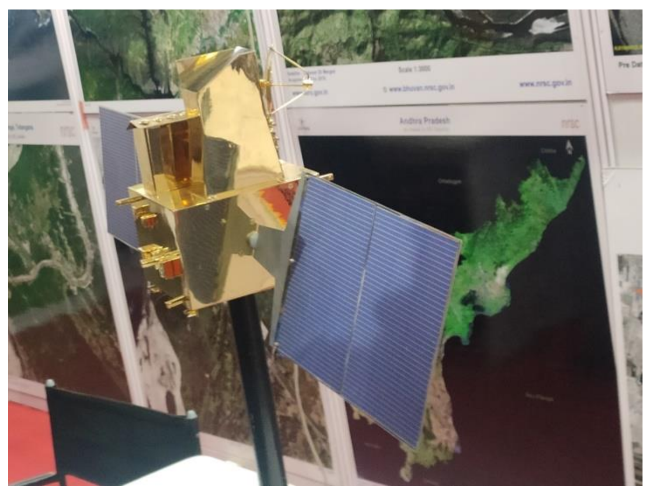
Industrial Training / Seminar/Workshop done by Staff

- Prof. K. Nirmalakumari and Prof. S. A. Karpe have attended workshop on “Artificial Intelligence using Raspberry Pi” at SNJB's College of Engineering, Chandwad, Nashik.


Poojya Kakaji
SNJB's Late Sau. Kantabai Bhavarlalji Jain College of Engineering
Jain Gurukul, Neminagar, Chandwad- 423101, Dist- Nashik
Accredited by NAAC with "A" Grade
Founder
A State Level Workshop on
“Artificial Intelligence using Raspberry Pi”
(Under the Quality Improvement Program of Savitribai Phule Pune University)
Certificate
This is to Certify that Mr/ Ms. K. Nirmala Kumari of K.K.W.I.E.E.R. Nashik has Participated in the State Level Workshop Organized by Department of Electronics & Telecommunication on 24th and 25th February 2020.
Prof. D. J. Pawar, Coordinator
Prof. R. A. Geete, Coordinator
ESTD - 1928
Dr. R. K. Agrawal, Convener
Dr. M. D. Kokate, Principal
In Association with
Raspi Invent


Poojya Kakaji
SNJB's Late Sau. Kantabai Bhavarlalji Jain College of Engineering
Jain Gurukul, Neminagar, Chandwad- 423101, Dist- Nashik
Accredited by NAAC with "A" Grade
Founder
A State Level Workshop on
“Artificial Intelligence using Raspberry Pi”
(Under the Quality Improvement Program of Savitribai Phule Pune University)
Certificate
This is to Certify that Mr/ Ms. Smita A. Karpe of K.K.W.I.E.E.R. Nashik has Participated in the State Level Workshop Organized by Department of Electronics & Telecommunication on 24th and 25th February 2020.
Prof. D. J. Pawar, Coordinator
Prof. R. A. Geete, Coordinator
ESTD - 1928
Dr. R. K. Agrawal, Convener
Dr. M. D. Kokate, Principal
In Association with
Raspi Invent

- Prof. K. S. Navale, Prof. S. S. Ansari, Prof. P. J. Mondhe and Prof. D. D. Khartad have visited International Robotics Exhibition “Techfest 2020” at IIT, Bombay on 5th January 2020.




COMPETITIONS
PROJECT CONSULTANCY
Arduino


DELIVERY DRONE
AeroVan
AeroHans

Published By

Department of E&TC

K.K. Wagh Institute of Engineering Education & Research, Nashik

Hirabai HaridasVidyanagari, Amrutdham, Panchavati Nashik-422003

Editor: Prof. Dipankar D. Khartad

E-mail: ddkhartad@kkwagh.edu.in

Vision

Provide quality education to create engineering professionals of global standards by keeping pace with rapidly changing technologies to serve the society.

Mission

M1: To educate the students with the state-of-the-art technologies and value based education to meet the growing challenges of industry.

M2: To provide scholarly ambience & environment for creating competent professionals.

M3: To inculcate awareness towards societal needs.