SSN

SYNERGY

DEPARTMENT OF
BIOMEDICAL ENGINEERING

VOLUME 6

ISSUE 2

EDITORIAL

EYE CATCHERS..

- NIRF Ranking
- NAAC Visit to SSN
- Smart India Hackathon
- MoU with Drexel University
- College Day
- Dr. Shiv Nadar Visit

WHATS INSIDE..

SYNERGY

FROM THE EDITORS' DESK

We are delighted to present to you the second quarterly edition of Synergy. This edition highlights the events, accomplishments and the progress of the students and the faculties from April to June, 2017. It also brings to your notice the most exciting and inspiring innovations in the biomedical world. We extend a warm welcome to the second year students to our department. The true sign of intelligence is not only knowledge but also imagination. So we look forward to a year of more creative and innovative works blending the scientific knowledge and ethics.

FROM THE HOD'S DESK

I am as always happy to put forth my thoughts in the prologue of the newsletter. Firstly, I'd like to congratulate the editorial members for their great work and sincere efforts. This edition brings out the campus updates, department activities and the many more accomplishments of the faculties and the students. I would like to congratulate all the final year students who have got placed in companies both on-campus and off-campus. My best wishes to the students who have got admits from universities abroad for their higher studies.

I welcome the second year students to the department and encourage them to make the best use of the resources and the facilities available. Let's strive hard to set the standards higher, reach greater places and bring laurels to the department. I wish you all the best for the upcoming semester.

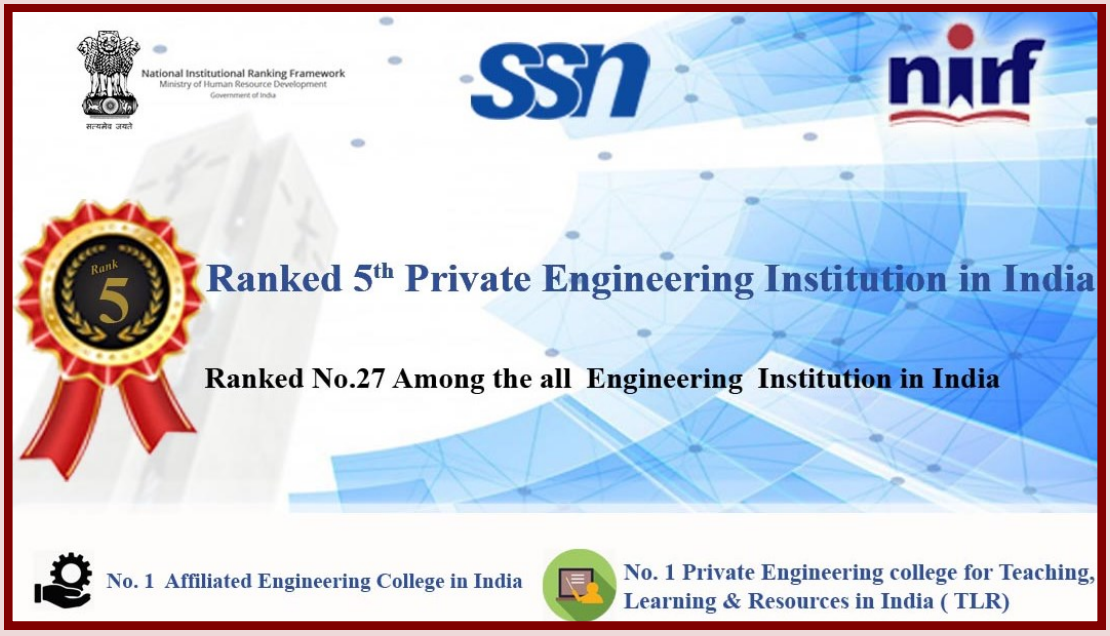
DR. A. KAVITHA
PROF. AND HEAD, BME

NIRF RANKING

SSN College of Engineering has been ranked **27th** by the National Institutional Ranking Framework 2017 released by the Ministry of Human Resources and Development, among all engineering colleges in India including IITs, NITs and Anna University.

Some of the key highlights of the rankings released by MHRD are as follows

- SSN is ranked number one private engineering institution in Teaching, Learning & Resources and 16th among all engineering institutions in the category.
- SSN is ranked ahead of some IITs, Banaras Hindu University, NIT Warangal, PSG, Delhi Technological University, etc.
- SSN is ranked number five among all private engineering institutions in India.
- SSN is the only affiliated, non-autonomous college in the top 100.



NAAC VISIT TO SSN

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The NAAC Peer Team consisting of Prof. B. V. Babu, Vice Chancellor, Galgotias University, Prof. Sachin Deshmukh, Dr. Babasaheb Ambedkar University, and Prof. Parsanjeet Kumar, Principal, MIMT, Noida visited the campus and all the departments. The NAAC meeting was held from June 19th—21st 2017.

NAAC Committee members during the Exit meeting with SSN board members.

NAAC Committee members along with Mrs. Kala Vijayakumar, President, SSN Institutions, Dr. S. Salivahanan, Principal and Heads of various departments

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SMART INDIA HACKATHON

SSN has been selected by AICTE as one of the 26 Nodal centres in India for conducting the Grand Finale of the Smart India Hackathon held on 1st and 2nd april 2017, world's largest hackathon event, organized by the Ministry of Human Resources and Development. Each participating team had to provide solutions for various problems put forth by 29 ministries.

SSN was the centre for the Ministry of Earth Sciences and the event was a huge success with important dignitaries visiting our campus. The special guests Mr Anbazhagan, Hon'ble Minister for Higher Education, Justice Anita Sumanth and Mr Lakshmi Narayanan, Vice Chairman, Cognizant shared their deep insights with the audience. Mr Prakash Javadekar, Hon'ble Minister, MHRD and Dr. Anil Sahasrabuddhe, Chairman, AICTE, delivered inspiring speeches over video conference. PM Narendra Modi addressed the students via video conferencing mode.

5 teams from SSN were selected for grand finale event. 2 teams (Team e-LEMON-ators and Techwhiz won prizes in the Ministry of Skill Development and Ministry of Postal Services.

SSN hosts 'The Smart India Hackathon 2017' focusing on problems related to Earth Sciences

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SSN COLLEGE OF ENGINEERING AND DREXEL UNIVERSITY,PHILADELPHIA SIGN MoU

- A MoU between SSN Engineering College and Drexel University was signed on 15th June 2017, Tuesday.
- Dr. Sriram Balasubramanian, Director and Co-chair, Clinical and Scientific Advisory Committee, Drexel University and Dr. Suzanne Rocheleau, Associate Dean of the Honors College, Drexel University visited SSN to get the document signed.
- The delegates were given a tour of the SSN Campus, BME Department and BME labs.

From left : Dr. Suzanne Rocheleau, Dr. Sriram Balasubramanian with Ms. Kala Vijayakumar, Dr. A. Kavitha, Ms.B. Divya

Faculty members of Drexel University interacting with BME faculty

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COLLEGE DAY

The SSN 21st College Day was held on Wednesday, the 5th April, 2017 in the Justice Pratap Singh Auditorium. Prof. Dr. Sudhindra Nath Panda, Director, National Institute of Technical Teachers' Training & Research was the Chief Guest. Prizes and medals were distributed for various achievements by students.

The following students from Biomedical Engineering department were awarded the merit scholarship

- Sucharitha S Prakash, II year
- Arun Kumar K, II year
- Pavithran PG, II year
- Bhargavi K, III year
- Divya Raghavi N, III year
- Sushmitha S, IV year
- Abirami R, IV year
- Tanushree Devi B,IV year
- Vishnu Priya K, M.E, Medical Electronics
- Vaishalini Venkatraman, M.E, Medical Electronics
- Vardhini P, M.E, Medical Electronics
- Sivaranjini S, M.E, Medical Electronics
- Diana Chris A, M.E, Medical Electronics

College day
celebration at the main auditorium

Dr. SHIV NADAR VISIT

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National Research Development Corporation, Ministry of Science & Technology held a competition for working professionals, students, research scholars all over India to demonstrate working prototypes which can be funded for commercialization. From over 150 teams 14 teams, which included 2 teams from SSN, were shortlisted for presentation at Indian National Science Academy New Delhi in the presence of Minister of Science and Technology Dr. Harsh Vardhan. The jury consisted of a team headed by Secretary of Niti Ayog. Finally the prototype "Mass Screening Device for Osteoarthritis" designed by Abirami, Thamizhamuthan, Meghla of final year Bio Medical Engineering secured the first prize of Rs. 50,000.

Dr. Shiv Nadar with Dr.S. Salivahanan, Ms. Kala Vijayakumar, Dr. A. Kavitha , students of BME Department –Abirami, Thamizhamudhan and Meghla

Students being felicitated

NAAC VISIT TO THE DEPARTMENT

The National Assessment and Accreditation Council (NAAC) is an organization that assesses and accredits higher education Institutions (HEIs) in India. It is an autonomous body funded by University Grants Commission of Government of India headquartered in Bangalore.

NAAC has identified the following seven criteria to serve as the basis of its assessment procedures:

- Curricular Aspects.
- Teaching-Learning and Evaluation.
- Research, Consultancy and Extension.
- Infrastructure and Learning Resources.
- Student Support and Progression.
- Governance, Leadership and Management

Members from NAAC accreditation with Dr.A.Kavitha, Prof and Head, BME and Dr.V.Mahesh, Associate Professor, BME

- Few of the student projects that were displayed during their visit to the department:

1. Mobility aid for the physically challenged— R. Divya, Meghna Murali and R. Manuj (III BME)
2. Low cost dialysis machine—R. Gopichandran, D. Suryaprakash, M. Vaibhav(BE)
3. Transliteration of Braille code into text in English language—Sugirtha KPSG(ME)
4. Analysis of functional connectivity of high functioning autism using task-based EEG—Vishnu Priya K. (ME)
5. Design and development of human hand prosthesis—Vaishalini Venkatraman (ME)
6. An external aid for amyotropic lateral sclerosis patients— S Viswanath, G. Praveen Kumar (II BME)
7. Development of Lower Extremity Exoskeleton- R RathiAdarshi, A Santhana Lakshmi, R Shruthi Sree(IV BME), S A Jerome Jayakar (III BME)
8. Mass screening device for osteoarthritis—R. Abirami, N. Meghala, S. Tamizhamuthan (IV BME)

PAPERS PUBLISHED

APRIL 2017

- Ms. Geethanjali B (AP/BME), Adalarasu K, Hemapraba A, Kumar S.P. and Rajasekaran R (2017) published a paper on Emotion analysis using SAM (Self-Assessment Manikin) scale, Biomedical Research, ISSN: 0970-938X (Scopus / Thomson Reuters)(IF = 0.236) (in press).

MAY 2017

- Krishnaveni S, Subashini R, Rajini V. Inactivation of bacteria suspended in water by using high frequency unipolar pulse voltage. J Food Process Eng. 2017; e12574. DOI: 10.1111/jfpe.12574, annexure 1, IF- 0.75 (5th May 2017)
- Dhanalakshmi M, Mariya Celin, T.A., Nagarajan T, Vijayalakshmi P. Speech-Input Speech-Output Communication for Dysarthric Speakers Using HMM-Based Speech Recognition and Adaptive Synthesis System. Circuits Syst Signal Process (2017). doi:10.1007/s00034-017-0567-9, annexure I, IF-1.178. (4th May 2017)
- Vidhusha S, Kavitha A, "Investigations on task based functional connectivity patterns in High Functioning Autism ", Proceedings of the International Conference on Mechanics in Medicine and Biology (ICMMB 2017), AusMedtech, Melbourne, 24-25 May, 2017.
- Sandhya C, Anandha Sree R, Vidhusha S, Kavitha A, "Speech Imagery based Vowel Classification using Brain Connectivity Estimators and Machine Learning Techniques", Proceedings of the International Conference on Mechanics in Medicine and Biology (ICMMB 2017), AusMedtech, Melbourne, 24-25 May, 2017.

JUNE 2017

- Velmurugan D, Santha AM, Dr. Sachin Sarate published a paper in an International Journal regarding “Dental implant materials, implant design, and role of FEA- A brief review” J. Evolution Med. Dent. Sci. 2017;6(44):3487-3492, DOI: 10.14260/Jemds/2017/753

WORKSHOPS ATTENDED

- Dr. Kavitha A. HOD/BME and Dr. Mahesh Assoc.Prof/BME attended a one day invited workshop on "An Overview of Medical Device Regulations", at IIT Madras on 6th April, 2017.

PROJECT EXHIBITION

- The Department organized a project exhibition for final years at BMI lab which was reviewed by Mr. Puhazhendi, Director Engineering, Perfint Healthcare Pvt. Ltd. Chennai. Cash prizes were awarded to the best projects. Valedictory on Association of Biomedical Engineers was conducted on the same day and certificates were issued to the association members. The programme was co-ordinated by Ms. Delpha J. AP/BME and Ms. Divya B. AP/BME.

DIAGNOSTIC PROJECTS OF BME DEPARTMENT SELECTED FOR PRESENTATION

BME Medical diagnostic projects have been shortlisted for presentation:

- Design and Development of Electro gastro gram Device for the Early Detection of Ulcer -Ms. Divya B. AP/BME
- Diagnosing Autism and its co morbidities using EEG - Dr. Kavitha A. Prof& Head/BME
- Classification of Myobacterium Tuberculosis stages in sputum smear images -Ms. Nirmala K. AP/BME (presented by Ms. Nithya R. AP/BME)
- Glaucoma Diagnosis Using Ultrasound Bio microscopy Images - Ms.Nirmala K. AP/BME (presented by Ms. Nithya R, AP/BME)
- Diagnosis of Hydrocephalus conditions by comparison of cerebral ventricles - Ms. Delpha J. AP/BME and Dr. S. Suresh Kumar, M. E, Ph.D
- Diagnosis of Degenerative Disc Disease (DDD) - osteoarthritis in spine, and design of suitable implants for stages of DDD - Dr. Kavitha A. Prof& Head/BME
- Remote Processing Server for Clinical Diagnosis of Skin tumours using dermal images- Dr. Suganthi L. Asso.Prof/BME

INTERACTION WITH HCL

- A preliminary meeting with HCL Medical division team was organised to discuss the potential of a few diagnosis based projects carried out at various departments of SSN.

- Ms. Kala Vijayakumar, President, SSNCE, Dr. Salivahanan, Principal, Dr. Ramasamy, Dean– Research, Dr. Idichandy, Chief Mentor, SSN Innovation Centre and SSN Incubation Centre and Dr. A. Kavitha, HoD/ BME, were present during the discussion.

- In this regard, two senior medical professionals: Dr. Udayakumar, Senior Consultant, Paediatric medicine, Sri Ramachandra Medical Center, Dr. Gowrishankar, Anaesthesiologist, Stanley Medical College visited us to evaluate the projects. Mr. Balram TG, Global Operations Director, HCL technologies was also present.

OTHER ACTIVITIES

- Dr. Sachin AP/BME, worked as Doctor on call at Smart India Hackathon 2017, organized in SSN College of Engineering.
- Ph.D confirmation meeting was conducted for Ms. R. Anandha Sree full time research scholar of Dr. Kavitha A. Prof & Head, BME in BME Conference room, SSNCE.
- Ms. Geethanjali B. AP/BME had synopsis meeting at VIT University, Vellore. The thesis titled “Analyzing the influence of music on Cognitive performance using physiological signals” was proposed and synopsis was evaluated in School of Bio-Sciences and Technology, VIT University.
- Orientation program was conducted for second year Biomedical students. Dr. Kavitha A. , Prof & Head, gave a presentation about the department activities and introduced faculty members and various facilities available in the department

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ASSOCIATION OF BME –VALEDICTION

The association of BME had conducted a valediction programme for the final years on 4th April 2017.

The office bearers for the current year are:

- I.Gokularam- President
- A.Santhana lakshmi - Vice-President
- R. Rathi Adarshi - Secretary
- Sai Aarthi Ganesh- Treasurer
- S. Abinaya - Coordinator

The winners of the Project exhibition were awarded on the day.

Third year students Ms.Shruthi Sree and Ms. Divya Raghavi (Joint secretary of ABE) being felicitated

New office bearers of Association of BME

Final year students with the Chief Guest Mr. K. Puhazhendi, Director, Engineering, Perfint Healthcare and Dr. A. Kavitha, HoD, BME

HIGHER STUDIES DETAILS

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- Ahila has got admission in NTU, Singapore for her post graduation in Biomedical Engineering
- Gopichandran has got admission in University of Kansas in Bioengineering
- Lavanya has been selected by Carnegie Mellon University for post graduation in Biomedical (Neural) Engineering
- Madhuvanthi has been admitted into University of Florida in Biomedical Engineering
- Sunanda has got into University of Buffalo, for her post graduation in Biomedical Engineering
- Sushmitha has got into University of Southern California, Biomedical Engineering
- Vaibhav has been admitted into the University of Southern California Biomedical Engineering

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ORIENTATION PROGRAMME

- Orientation programme for the II years were given by the faculty members of BME Department.
- A presentation about the department activities was given and the faculty members were introduced
- Various facilities available in the department for research and project works were mentioned.

ALUMNI VISIT

- The Department of BME is pleased to say that a number of alumni had come to visit the department in person .
- The students had a reminiscing time with the department professors.

From left Vallabhi, Deepa Daniel, Mohammad Ikram, Vijayalakshmi with Dr.Subashini, Assistant Professor, BME

WELCOME ABOARD..

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Dr. Vijay M.E., Ph.D

Dr. J. Vijay has 10 years of experience in the field of teaching. He completed his Bachelors degree in Electronics and Communication Engineering from Anna University in 2005 and obtained his master degree in Medical Electronics from College of Engineering, Guindy Campus in 2008. He has done his research in Medical Image Retrieval and obtained his Ph.D degree in medical informatics from Anna University in 2015. He has published more than 30 papers in peer reviewed journals and conferences. He is a recognized supervisor of Anna University, Chennai. He is now an Associate Professor in the department of Biomedical Engineering, SSN College of Engineering. He has authored two books titled "Image Retrieval Systems in PACS Environment" and "Basic Electrical and Electronics Engineering".

Dr. S. Bagyaraj M.E., Ph.D

Dr. S Bagyaraj received his B.E Degree in Electronics and Instrumentation Engineering with first class from Periyar University in 2002, M.E Degree in Medical Electronics with distinction from Anna University in 2005 and Ph.D. Degree in the Faculty of Information and Communication Engineering from Anna University in 2016. During his Ph.D., he developed a two-channel Near Infrared Spectroscopy System for studying the Brain activities during Cognitive tasks. Before joining to SSN he worked in Department of ECE, CEG campus, Anna University as Teaching Fellow and Teaching Research Associate for 8 years and 10 months.

WELCOME ABOARD..

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Dr. S. Arun Karthick M.Tech., Ph.D.,

Dr. S. Arun Karthick has completed his B.E Biomedical Engineering from Adhiyamaan Engineering College, Hosur in 2009, M.Tech in Nanotechnology from Anna University, Coimbatore in 2011 and Ph.D. in Faculty of Technology from A.C.Tech, Anna University Chennai. During his doctoral programme, he has published 9 research articles in reputed journals, developed and fabricated aerosol filtration efficiency tester as per ASTM standard and a lab model thermal bonding machine. He was awarded Junior Research Fellow & Senior Research Fellow by Board of Research in Nuclear Sciences, Mumbai (BRNS) and Basic Scientific Research Fellow by University Grants Commission, New Delhi (UGC) during his Ph.D.
Later He worked as Post Doctoral Fellow under Prof. T. Pradeep, DST Unit of Nanoscience, Department of Chemistry, Indian Institute of Technology Madras. During his Post-Doc he filed a Patent on Nasal filters titled "Multilayer Multifunctional Nasal Filter". His area of research is Nano-technology in specific using nanofibers and nanomaterials for filtration and biomedical application.

ADIEU..

Mrs. Delpha J and Mrs. Richa Malviya left the department of BME at SSN. We, from department of BME wish the very best in all their endeavors.

PLACEMENT DETAILS

Philps

- Keerthana M

ACCENTURE

- Aathira Haridas
- Bhavatharani S
- Chithra R
- Dixit K B
- Keerthana M
- Keerthana Priya S
- Krishna Bairavi
- Lekha R
- Madhumithra S K
- Megala N
- Monica A
- Nivethithaa S
- Nova Belle P N

HCL Medical Systems

- Abirami R
- Lekha R
- Madhumithra S K
- Megala N
- Surya Prakash D

Zoom Rx Healthcare solutions technology Pvt Ltd

- Vismaya M
- Prathyusha R

PLACEMENT DETAILS

Fresh Desk

- Rosheema Bala J B
- Deepika R

Healthcare Technology innovation Centre(off-campus)

- Thamizhamuthan.S
- Praveenkumar
- Sakthivel.S

Cognizant Technology Solutions

- Vinisha V
- Ranjitha G
- Narthana V
- Menta Tanurya
- Madhuvanthi S
- Ganesh Kumar D

Infosys Pvt Ltd

- Krriti R
- Mohamed Ajmal R

IDBI Federal Insurance

- Thariga.S
- Revathy.R

OTHER PLACEMENTS:

Ritu V	Zoho Corporation, Accenture
Sathiya Priya T	Bank Of America
Tanushree Devi B	LatentView Analytics Pvt Ltd
Mano	Perfint Health care (off-campus)
Atul Taneja	Mu Sigma Inc.
Chandramouli R	Pipe Candy Technologies Pvt Ltd
Kiruthiga M	Zifo R&D Solutions

UPCOMING EVENTS

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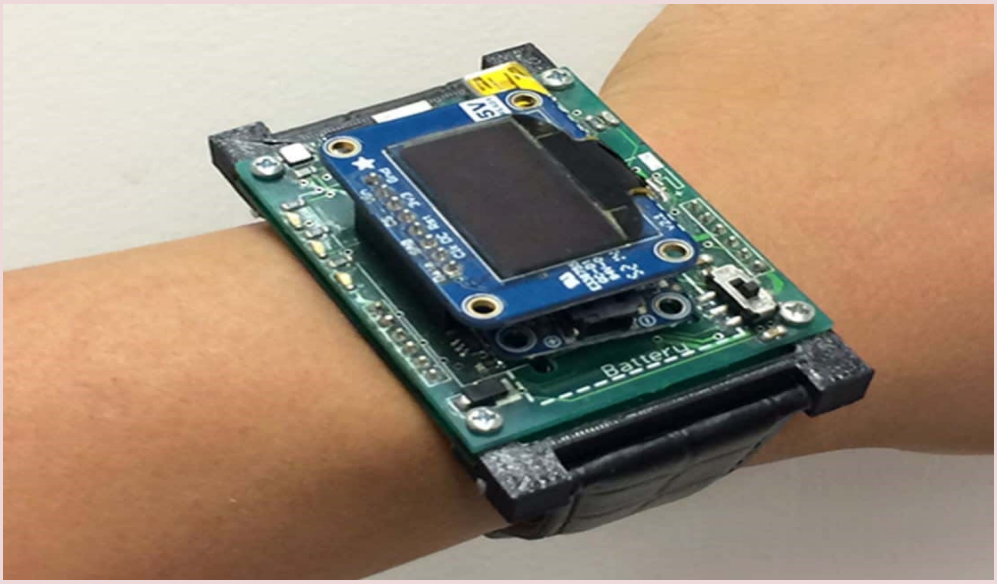
VIDHAAN

- Vidhaan is a one day intra college technical fest organised by Biomedical department at SSN.
- Various technical and non technical events will be conducted, with exciting prizes.
- It is scheduled to be held on 18th July 2017

DATA ANALYTICS WORKSHOP

- IEEE EMBS in association with BME department brings a chance to learn about data analytics using R through a workshop.
- It's a two day workshop conducted by the department of BME.

E- MOSQUITO!



Mosquitoes are some of the most adept bloodsuckers on Earth. With a quick jab, sharp mouthparts plunge into human skin in search of a juicy blood vessel.

It's no surprise, then, that bioengineers have used the pest as inspiration for a device to periodically and independently sample the blood of individuals with diabetes. Fingerpricking, the most common method used today, can be a tedious and painful process, and many companies have raced to develop alternative approaches, including glucose sensor implants and semi-automated monitoring devices.

Enter the "e-Mosquito." Since 2007, a team at the University of Calgary in Canada has been developing a fully autonomous, minimally invasive device that is pre-programmed to "bite" one's skin at various times during the day to monitor blood glucose levels. They recently premiered their latest prototype, a watch-like device that taps into capillaries under the skin and deposits a drip of blood onto a glucose-testing strip.

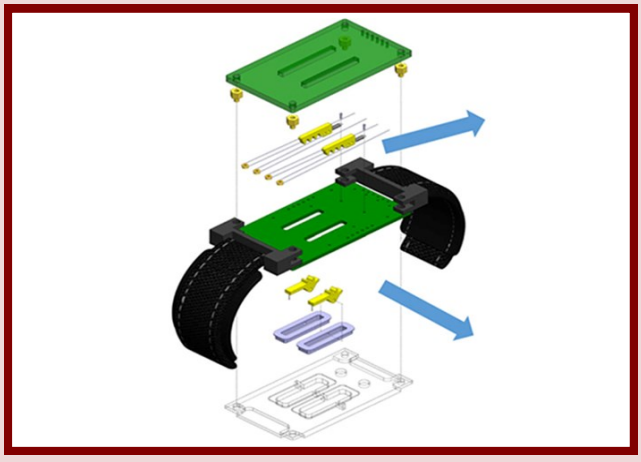
"It's a very significant step in demonstrating autonomous contact with the capillary." In addition to monitoring blood glucose, Mintchev imagines the device someday being used to do other blood tests, such as genetic testing or cancer screening, from the comfort of one's home.

Early versions of the device relied on .piezoelectric actuators to pierce the skin with a needle, but those moving parts were expensive and bulky So, the team switched to a shape memory alloy (SMA)-based actuator. This inexpensive composite metal contracts when heated, then re-forms into its original shape. When equipped with a small needle, the SMA-based actuators produced much greater penetration force into the skin than the bioelectric actuators and allowed the team to significantly miniaturize the device, says Mintchev.

Today, the prototype consists of two parts: a reusable watch-like top consisting of the battery, LED display, actuator and various other components, and a disposable bottom cartridge equipped with needle and test strip. The whole prototype is small enough to sit on the wrist and, more importantly, the penetrating needle reaches a capillary under the skin every single time, says Mintchev. The device can be pre-programmed to take samples at various times during the day and then wirelessly transmit the glucose results to a smartphone or doctor's office.

Although the current actuator consistently pierces a blood vessel, it only pulls up a small drop of blood—too small for reliable results on commercial glucose testing strips. So the team can either build a bulkier actuator that extracts enough blood to use on those strips (and creates a larger, more painful wound for the patient) or they can continue to miniaturize the device by developing custom glucose sensing technology.

A custom-designed strip, integrated around the needle, is the solution to this issue," he says. That way, the device can be made very small—worn as a bracelet or small arm cuff—and still get an accurate glucose reading from blood.



A representation of how the device is made

WIRELESS MRI COLONOSCOPY FOR SENSITIVE IMAGING OF VASCULAR WALLS

Magnetic Resonance Imaging (MRI) can diagnose soft tissues lesions based on subtle changes of signal intensity in their pathological states. Such capability, however, is often hindered by the limited detection sensitivity, especially for regions deep lying inside the body. With the advent of higher magnetic fields, array coils, faster imaging sequences and hyperpolarization schemes, the detection sensitivity of MRI has continuously increased over the past few decades.

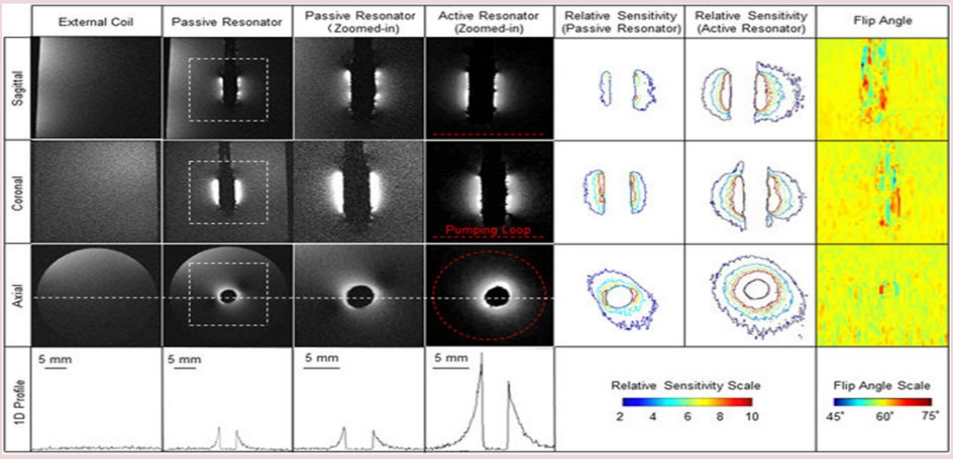
Recently, a complementary strategy has been proposed to further enhance MRI detection sensitivity with a Wireless Amplified NMR Detector (WAND). This approach is based on the general concept that weak MR signals from a local region of interest can be more sensitively detected by a localized coil. But unlike traditional micro coils that normally require wired connections for signal transmission, the WAND has a built-in parametric amplifier that can harvest wirelessly provided pumping power to amplify MR signals *in situ*. Instead of relying on passive coupling where the signal transmission efficiency could rapidly decay over larger distance separations, *in situ* amplification can greatly improve the signal transmission efficiency over larger distance separations and enhance the local detection sensitivity. The WAND was initially developed as an implantable detector to identify individual nephrons *in vivo*. It was later used inside the oesophagus to sensitively observe vascular walls in the neck and chest regions.

These previous versions of detectors had suboptimal homogeneity. They were unable to get panoramic views of their surroundings due to the lack of cylindrical symmetry. As a result, orientation adjustment was required to achieve reasonable homogeneity over a specified region. In this work, a new detector design with cylindrical symmetry is introduced to improve detection homogeneity. .

This symmetric detector can be non-surgically inserted from the rectal to sensitively image vascular walls that are deep lying inside the abdominal cavity, without the need for orientation adjustment. Compared to a standard external coil, the WAND can enhance detection sensitivity by up to 21-times for regions immediately adjacent to the detector's surface. For regions that are farther away, the detector has at least 5 times sensitivity gain even when the distance separation between the region of interest and the detector's cylindrical surface is large than its own diameter

Such detection capability enables high resolution imaging of bifurcated vessels with improved quality, paving way for longitudinal studies of subtle lesions on vascular walls. This detector can also be mounted on endoscopic catheters to sensitively diagnose tumour metastasis around the oesophagus or colon. Moreover, this wireless detector could potentially be used as swallowable pill that can travel inside tortuous small intestines to "see" across intestinal walls at real time.

A Wireless Amplified NMR Detector (WAND) with cylindrical symmetry has been fabricated and non-surgically inserted into a rodent lower digestive track to improve the imaging quality of deep-lying vessels inside the abdominal cavity. This symmetric detector has a compact design using two end-rings and two vertical legs to create two orthogonal resonance modes. Based on the principle of parametric amplification, the detector can harvest wireless pumping power with its end-rings and amplify Magnetic Resonance signals induced on its vertical legs.



2D GRE images of water phantom

https://www.science daily.com

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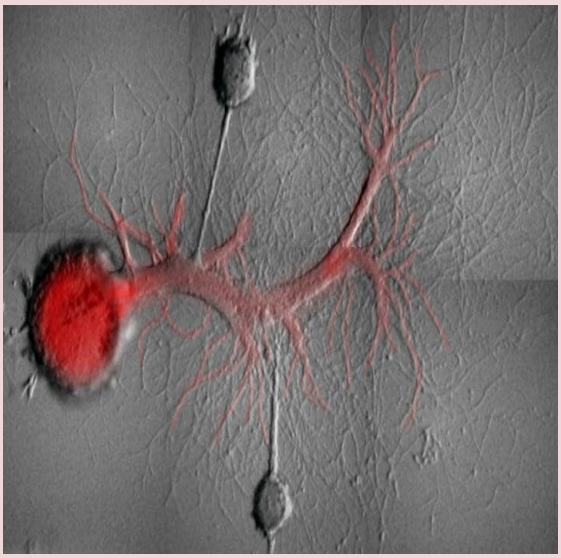
SELECT MEMORIES CAN BE ERASED, LEAVING OTHERS INTACT!!



New study of snail neurons suggests memories that trigger anxiety, PTSD could be 'erased' without affecting normal memory of past events

Different types of memories stored in the same neuron of the marine snail Aplysia can be selectively erased, according to a new study by researchers at Columbia University Medical Center (CUMC) and McGill University and published today in *Current Biology*.

The findings suggest that it may be possible to develop drugs to delete memories that trigger anxiety and post-traumatic stress disorder (PTSD) without affecting other important memories of past events.

During emotional or traumatic events, multiple memories can become encoded, including memories of any incidental information that is present when the event occurs. In the case of a traumatic experience, the incidental, or neutral, information can trigger anxiety attacks long after the event has occurred, say the researchers.

"The example I like to give is, if you are walking in a high-crime area and you take a shortcut through a dark alley and get mugged, and then you happen to see a mailbox nearby, you might get really nervous when you want to mail something later on," says Samuel Schacher, PhD, a professor of neuroscience in the Department of Psychiatry at CUMC and co-author of the paper. In the example, fear of dark alleys is an associative memory that provides important information -- e.g., fear of dark alleys -- based on a previous experience. Fear of mailboxes, however, is an incidental, non-associative memory that is not directly related to the traumatic event.

"One focus of our current research is to develop strategies to eliminate problematic non-associative memories that may become stamped on the brain during a traumatic experience without harming associative memories, which can help people make informed decisions in the future -- like not taking shortcuts through dark alleys in high-crime areas," Dr. Schacher adds.

Brains create long-term memories, in part, by increasing the strength of connections between neurons and maintaining those connections over time. Previous research suggested that increases in synaptic strength in creating associative and non-associative memories share common properties. This suggests that selectively eliminating non-associative synaptic memories would be impossible, because for any one neuron, a single mechanism would be responsible for maintaining all forms of synaptic memories.

The new study tested that hypothesis by stimulating two sensory neurons connected to a single motor neuron of the marine snail Aplysia; one sensory neuron was stimulated to induce an associative memory and the other to induce a non-associative memory.

By measuring the strength of each connection, the researchers found that the increase in the strength of each connection produced by the different stimuli was maintained by a different form of a Protein Kinase M (PKM) molecule (PKM Apl III for associative synaptic memory and PKM Apl I for non-associative). They found that each memory could be erased -- without affecting the other -- by blocking one of the PKM molecules.

In addition, they found that specific synaptic memories may also be erased by blocking the function of distinct variants of other molecules that either help produce PKMs or protect them from breaking down.

The researchers say that their results could be useful in understanding human memory because vertebrates have similar versions of the Aplysia PKM proteins that participate in the formation of long-term memories. In addition, the PKM-protecting protein KIBRA is expressed in humans, and mutations of this gene produce intellectual disability.

"Memory erasure has the potential to alleviate PTSD and anxiety disorders by removing the non-associative memory that causes the maladaptive physiological response," says Jiangyuan Hu, PhD, an associate research scientist in the Department of Psychiatry at CUMC and co-author of the paper.

"By isolating the exact molecules that maintain non-associative memory, we may be able to develop drugs that can treat anxiety without affecting the patient's normal memory of past events."

"Our study is a 'proof of principle' that presents an opportunity for developing strategies and perhaps therapies to address anxiety," said Dr. Schacher. "For example, because memories are still likely to change immediately after recollection, a therapist may help to 'rewrite' a non-associative memory by administering a drug that inhibits the maintenance of non-associative memory."

Future studies in preclinical models are needed to better understand how PKMs are produced and localized at the synapse before researchers can determine which drugs may weaken non-associative memories.

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