SYNERGY

A BIOMEDICAL NEWSLETTER

Volume 10 Issue 2

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EDITOR'S DESK

Warm greetings to everyone!!!

"There is no end to education. It is not that you read a book, pass an examination, and finish with education. The whole of life, from the moment you are born to the moment you die, is a process of learning."
– Jiddu Krishnamurti

In this edition of the department's newsletter, we share with you the great accomplishments of our students.

This edition covers the happenings in the department from the months of October to December 2021. We highlight the achievements and participation of the students and faculty.

Presenting to you the third issue of the ninth volume of SYNERGY

"Your Work is going to fill a large part of your life, and the only way to be truly satisfied is todo what you believe is great work. And the only way to do great work is to love what you do. If you haven't found it yet, keep looking. Don't settle."
- Steve Jobs

Wishing you all a very Happy New Year!!

The Editorial Board

HOD'S DESK

I am delighted to write the prologue for our department's quarterly newsletter- 'SYNERGY'. Firstly, I would like to congratulate the editorial team on doing a wonderful job. Each issue of SYNERGY brings light on our department activities, campus updates, faculty and student accomplishments.

I would like to convey my best wishes to our students who have got placed and those who have got admit into various universities!

As life is slowly settling into a normal pace, we look forward to having a healthy, prosperous and successful year ahead, and we wish you and your family the same!

Dr. A. Kavitha
Professor and Head,
Department of Biomedical Engineering

DEPARTMENT VENTURES

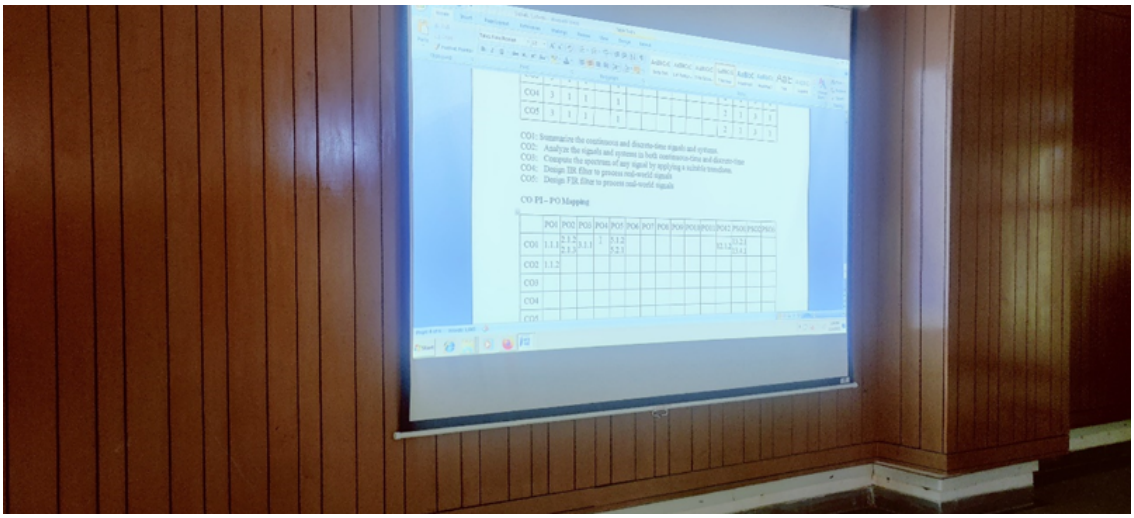
The **Department of Biomedical Engineering** (BME) had organized a **self-learning workshop** with all department faculty members in the following dates November 17, 19 and 20, 2021 at the BME Seminar Hall. AICTE has proposed an Examination reform policy by adopting Performance Indicators (PIs) against Program Outcomes (POs). In this connection, this workshop was organized.

Faculty members' participation in Performance Indicators

During the workshop, by following the COVID-19 safety protocols, the faculty members were teamed up to formulate the Core Competencies (CCs) and Performance Indictors (PIs) for the Biomedical program. The AICTE examination reforms document was used as the reference. Since the statements were not available for BME, competencies were slightly edited based on requirements and Performance indicators were retained/newly framed as per our domain specializations.

DEPARTMENT VENTURES

Once the Core competencies and Performance Indicators were prepared by the teams, those statements were reviewed, assessed and re-phrased by the program assessment committee (PAC) and Domain expert group (DEG) coordinators.



Review of Core Competencies, performance indicators and CO-PI-PO mapping

Weird But True

1. Honeybees flap their wings 230 times every second.

2. New Zealand has more sheep than people.

3. Ketchup was originally sold as medicine.

FACULTY VENTURES

External Recognition

- **Dr. Vijay Jeyakumar,** Associate Professor, Department of Biomedical Engineering attended **Doctoral committee meeting for the Ph.D. research scholar** Ms. C. Ramadevi, Supervised by Dr Narmadha T V, Professor, Department of EEE, St Joseph's College of Engineering, Chennai on October 04, 2021.

- **Dr. A. Kavitha**, Professor and Head, Department of Biomedical Engineering attended **BoS meeting for Department of Biomedical engineering**, Adhiyamaan College of Engineering on 23.10.2021.

- **Dr. Vijay Jeyakumar**, Associate Professor, Department of Biomedical Engineering delivered a talk on **"Data Science for precision Healthcare"** in a CSIR sponsored Seminar titled **"Data Science for Genomics and Precision Medicine"** organized by the Department of Computer Science and Engineering, KPR Institute of Engineering and Technology, Coimbatore on November 12, 2021.

- **Dr. K.Nirmala,** Associate Professor, Department of Biomedical Engineering attended the comprehensive viva voce meeting for the candidate Ms.Archana, pursuing Ph.D. program in SRM IST on 10th November 2021. Her research area is **"Design and development of EOG based circuit for health care".**

- **Dr. Mahesh Veezhinathan**, Associate Professor, Department of Biomedical Engineering has successfully delivered a **Plenary Talk** in the **Society for Neurochemistry India (SNCI) Satellite meeting** in collaboration with the **International Brain Research Organization (IBRO), Paris, France** organized by the Department of Biomedical Engineering, North Eastern Hill University (NEHU), Shillong, Meghalaya, India on 1st November, 2021.

- **Dr. Mahesh Veezhinathan**, Associate Professor, Department of Biomedical Engineering delivered a talk during **virtual faculty development programme on Research Excellence and Innovation** organized by Shrimati Indra Gandhi College, Trichy on 30th Nov. 2021.

FACULTY VENTURES

- **Dr. A. Kavitha**, Professor and Head of BME has been nominated as a **Margadarshak by AICTE**, to mentor other institutes that want to apply for Accreditation.

- **Dr. Sachin Gaurishankar Sarate**, Assistant Professor, Department of Biomedical Engineering delivered a guest lecture on "**Working Memory in Humans and Artificial Intelligence**" at **Virtual CME** on "**Learning and Memory - A journey to explore**" held on 10.11.2021 at ESIC Medical College and PGIMSR, KK Nagar, Chennai-78.

- **Dr. Sachin Gaurishankar Sarate**, Assistant Professor, Department of Biomedical Engineering delivered a guest lecture on "**Dimensions of Wellness**" as inaugural address at the **inauguration of Youth Red Cross (YRC) and National Service Scheme (NSS)** at Shiv Nadar University, Chennai in online mode on 20/11/2021.

- **Dr. S. Saranya**, Assistant Professor, Department of Biomedical Engineering delivered an **online invited lecture in CSIR sponsored national level seminar titled, "Recent advancement in Computational Biomechanical Modelling of Medical Prosthetic Implants & Early therapeutic methods for Osteopetrosis and Osteomyelitis using Mosquelet and HSCT Techniques"** on 12th November 2021 conducted by Dr.NGP Institute of Technology, Coimbatore.

- **Dr. Vijay Jeyakumar**, Associate Professor, Department of Biomedical Engineering is the **technical program committee member for the IEEE International Conference on Advanced computing Technologies & Applications (ICACTA) - 2022**, organized by Sri Krishna College of Engineering and Technology, Coimbatore, Tamil Nadu during March 4 & 5, 2022.

- **Dr. A. Kavitha**, Professor and Head, Department of Biomedical Engineering and **Ms. B. Divya**, Assistant Professor, Department of Biomedical Engineering had a **virtual meeting** with **a multidisciplinary team** including **Special Educators and Occupational therapists of Vidya Sudha - A special school** of Sri Ramachandra Institute of Higher Education and Research on 16 November 2021.

FACULTY VENTURES

- **Dr.L.Suganthi**, Assistant Professor, Department of Biomedical Engineering attended **6th meeting for BOS - Bio Medical Engineering**, at Sona College of Technology (Autonomous), Salem which is conducted by online on 24-11-2021.

- **Dr. Vijay Jeyakumar**, Associate Professor, Department of Biomedical Engineering delivered a talk on "**Wearable Devices for Healthcare 4.0**" in one week online Faculty Development Programme on "**Recent Innovative Trends in Biomedical Engineering and Technology**" on 17.12.2021, organized by the Department of Biomedical Engineering, Mepco Schlenk Engineering College, Sivakasi.

- **Dr. Vijay Jeyakumar**, Associate Professor, Department of Biomedical Engineering received **certificate of appreciation** from **Ministry of Education Innovation cell and AICTE** for acting as a primary evaluator in '**Toycathon, 2021**' during Dec 2021.

- **Dr Vijay Jeyakumar**, Associate Professor, Department of Biomedical Engineering delivered a talk in the title "**Why Deep learning Techniques in Medical Image retrieval System**" in **ISTE** sponsored Faculty Development Programme "**research opportunities in artificial intelligence and machine learning**", organized by the Department of ECE, Sri Sairam Institute of Technology, Chennai on December 21, 2021.

Exercise Your Brain

What is next in this sequence of numbers: 1, 11, 21, 1211, 111221, 312211, _____?

Answer: 13112221. Each sequence of numbers is a verbal representation of the sequence before it. Thus, starting with 1, the next sequence would be "one one," or "11." That sequence is followed by "two one," or "21," and so on and so forth.

FACULTY VENTURES

- **Dr. Mahesh Veezhinathan**, Associate Professor, Department of Biomedical Engineering delivered a talk as Eminent Speaker in the **National Workshop on Machine Learning and Its Applications** on Dec 10, 2021 organized by Department of Electrical and Electronics Engineering, Sri Sivasubramaniya Nadar College of Engineering during Dec 09 - 10, 2021.

- **Dr. Mahesh Veezhinathan**, Associate Professor, Department of Biomedical Engineering acted as **primary Evaluator** in **Toycathon 2021** organized by **Ministry of Education Innovation Cell**, Govt. of India and AICTE during Dec 2021.

- **Dr.B.Geethanjali**, Associate Professor, Department of Biomedical Engineering was a **Primary evaluator** in **Toycathon 2021** conducted by **MHRD Innovation Cell (MIC) and AICTE** during Dec 2021.

- **Dr. A. Kavitha**, Professor and Head, Department of Biomedical Engineering attended second DC meeting of Ms. N. Swathi Nalla of **Hindustan Institute of Science and Technology** on 13 December 2021.

Research Activity

- Amogh Gupta, Harish Balaji, R. Sundareswaran, **Dr. Mahesh Veezhinathan**, Associate Professor, Department of Biomedical Engineering,**Dr.B.Geethanjali**, Associate Professor, Department of Biomedical Engineering, '**Group Leverage Centrality and its Applications in Brain Networks**' IOP Conf. Series: Materials Science and Engineering, 1187, 1-10, 2021, Scopus, doi:10.1088/1757-899X/1187/1/012001.

- **Dr.S. Arun Karthick**, Associate Professor, Department of Biomedical Engineering ,T.K. Ragavi, K. Naresh, P.S. Rama Sreekanth have published a paper based on A study on **collagen-PVA and chitosan-PVA nanofibrous matrix for wound dressing application**, Materials Today: Proceedings,2021
  Scopus, https://doi.org/10.1016/j.matpr.2021.11.421,
  12-06-2021

FACULTY VENTURES

Conference Activity

- **Dr. N. Punitha**, Assistant Professor, Department of Biomedical Engineering authored a paper, along with Vardhini P (IITM) and Ramakrishnan S (IITM), titled "**Analysis of Preterm Pregnancies using Empirical Mode Decomposition based Fractal Features**" and presented at the 55th Annual Conference of the German Society for Biomedical Engineering (BMT 2021), Hannover during October 5- 7, 2021

- Prasidha Prabhu, Harshini Ramaswamy and **Dr. K.Nirmala**, Associate Professor, Department of Biomedical Engineering presented a paper entitled "**A Quantitative Study on Shaping Filters in Computed Tomography Image Reconstruction**" in 2021 IEEE Global Conference for Advancement in Technology, (sponsored by IEEE Bangalore Section) organized by Nagarjuna College Of Engineering & Technology, Bangalore during 1-3 October 2021.

- P Aichinger, **Dr. S. Pravin Kumar**, Associate Professor, Department of Biomedical Engineering Hugo Lehoux, Jan G Svec, **Artificial high-speed videos of normohponic and dysphonic vocal fold vibration, Viennese workshop on voice quality research (Edition 5.1)**, online meeting – October 29, 2021.

Looking For Courses To Do?

1. https://nptel.ac.in/
2. https://www.coursera.org/in
3. https://www.edx.org/
4. https://www.udemy.com/

FACULTY VENTURES

- Tuhina Sheryl Abraham presented a paper titled "**Automated labelling of teeth from OPG images using convolutional neural network**", co-authored by **Dr. Vijay Jeyakumar**, Associate Professor, Department of Biomedical Engineering in **XV Biennial Conference of IBS-IR** on "**Statistical Challenges in Clinical Trials**" organized by International Biometric Society (Indian Region) & Department of Statistics ICMR-National Institute for Research in Tuberculosis, Chennai on November 16, 2021.

- Swetha Sridhar, V. Varshini, P. Florina Jane, **Dr.B.Geethanjali**, Associate Professor, Department of Biomedical Engineering and **Dr. Mahesh Veezhinathan**, Associate Professor, Department of Biomedical Engineering presented a paper titled "**Perception of Blithe music on the Brain**" in **Fourth International Conference on Electrical, Computer and Communication Technologies (ICECCT)**, 2021, pp. 1-8, doi: 10.11 09/ICECCT52121.2021.9616701.

- **Dr. S. Arun Karthick**, Associate Professor, Department of Biomedical Engineering attended the **Nature conference** on "**Nature Forum on Decentralized Water Technologies for Point of Consumption**" organised by Springer Nature on Nov 30, 2021.

- **Dr. K.Nirmala**, Associate Professor, Department of Biomedical Engineering E.C.Sowmiya, L.Suganthi presented a paper titled **Pulse Rate Estimation with a Smartphone Camera using Image Processing Algorithms** in the 3rd International Conference on Data Science, Machine Learning & Applications 2021 **(ICDSMLA 2021**)on 26th December 2021(virtual mode).

- **Dr. K.Nirmala**, Associate Professor, Department of Biomedical Engineering and C.Vinothkumar presented a paper titled, "**Markov Random Field based Compression of Encrypted Medical Images**" in 3rd International Conference on Communication and Intelligent Systems (**ICCIS 21**)organized by National Institute of Delhi in association with the Soft Computing Research Society (**SCRS**), New Delhi, during December 18-19, 2021.

FACULTY VENTURES

- **Dr. S. Arun Karthick**, Associate Professor, Department of Biomedical Engineering presented a paper entitled "**Functionalised Nasal Filter for PM2.5 Filtration**" in the International Conference on **Advanced Materials and Mechanical Characterization** organized by SRM Institute of Science And Technology in association with the Indian Institute of Science (IISc), Indian Institute of Technology (IIT) Delhi, IIT Madras, IIT Hyderabad, IIT Indore, Indian Institute of Metals Chennai Chapter, ASM International Chennai Chapter, Indian Ceramic Society, Indian Physics Association, and American Ceramic Society India Chapter during Dec 2-4, 2021.

Project News

- Nisha S, Nithya Shree B, Rakshitha S of Third year BME students under the guidance of **Dr. Vijay Jeyakumar**, Associate Professor, Department of Biomedical Engineering have submitted an Internally funded students project proposal in the title " **Smartphone Based Non-Contact Blood Pressure Measurement using convolutional Neural Networks**" on October 20, 2021.

- Project Title: **Development of an Intelligent System for Non-invasive Characterisation of Uterine Contractions during Pregnancy**, PI: **Dr. N. Punitha**, Assistant Professor, Department of Biomedical Engineering; Mentor: **Dr. A. Kavitha**, Professor and Head, Department of Biomedical Engineering, Budget: Rs. 15.50 Lakhs, Funding Agency: DST-SYST.

- **Dr. S. Arun Karthick**, Associate Professor, Department of Biomedical Engineering received funding for the Project titled **"Electrospun Chitosan/Sericin/Ag nanoparticles incorporated biohybrid nanofibrous matrix for wound healing application"**, from the funding agency *SERB* for a total budget **(INR): 23,17,832.**

FACULTY VENTURES

- **Dr. N. Punitha**, Assistant Professor, Department of Biomedical Engineering is designated as PI for the project proposal titled "**Development of an Intelligent System to Characterise Uterine Contractions during Pregnancy**" which has been accepted for internal funding for duration of 24 months with a budget of **2.95 Lakhs**.

- **Dr. R. Subashini**, Assistant Professor, Department of Biomedical Engineering received a project titled: **Assessment of antimicrobial mechanisms of biogenic nanoparticles on microbes,** sanctioned by Sri Sivasubramaniya Nadar College of Engineering for **Rs.3,50,000/-** for 2 years.

- **Dr. S. Saranya**, Assistant Professor, Department of Biomedical Engineering is sanctioned internally funded faculty project (SSN Trust) titled " **Quantitative tool for muscle strength evaluation**" for a duration of 24 months and with a budget of **2.9 lakhs.**

Patent Information

- **Dr Vijay Jeyakumar**, Associate Professor, Department of Biomedical Engineering received **first examination report from IP**, India for the patenting application number **202041043279** on December 03, 2021.

- **Dr Vijay Jeyakumar**, Associate Professor, Department of Biomedical Engineering received **first examination report from IP**, India for the patenting application number **202041043275** on December 13, 2021.

GATE is right around the corner

In diagnostic X-ray imaging, the following is not a part of EM Radiation interaction in soft tissue

a)Photoelectric Effect
b)Compton Scattering
c)Characteristic Radiation Production
d)Pair Production

Ans. b or d

FACULTY VENTURES

Scholar Related

- **Dr. Vijay Jeyakumar**, Associate Professor, Department of Biomedical Engineering convened the **First doctoral committee meeting for his research scholar Ms. Gowri Vidhya N** to confirm her course work papers on October 22nd, 2021 (Friday) at 04:30 pm.

- **Dr. Vijay Jeyakumar**, Associate Professor, Department of Biomedical Engineering convened **the First doctoral committee meeting for his research scholar Ms. Pradeep N** to confirm his course work papers on October 23rd, 2021 (Saturday) at 11:00 am.

- **Dr. S. Pravin Kumar**, Associate Professor, Department of Biomedical Engineering conducted the **first DC meeting with DC members Dr. A. Kavitha**, Professor and Head, Department of Biomedical Engineering and Dr. Prakash Boominathan, Sri Ramachandra Medical University for his part-time research scholar, Mr. Mukesh on 20.10.21.

- **Dr. S. Pravin Kumar**, Associate Professor, Department of Biomedical Engineering attended the **first DC meeting of Research Scholar** Ms. V. Ramya (Supervisor: Dr. Jayaparvathi, Prof/ECE) on Wednesday, 20.10.2021.

- **DC Meeting** of **Ms. Nithya Rajagopalan**, Assistant Professor, Department of Biomedical Engineering R, was held on 24.11.2021 at 11.00 am through online mode. along with Supervisor Dr. N. Venkateswaran, Professor, ECE Department, DC members **Dr. A. Kavitha**, Professor and Head, Department of Biomedical Engineering, SSNCE and Dr. S. Shenbagadevi Professor (Retd. Anna University), ECE Department attended the meeting.

- **Ms. Nithya Rajagopalan**, Assistant Professor, Department of Biomedical Engineering (Anna University Part-time scholar) completed her **Ph.D. public viva-voce examination** on 30.12.2021. She was guided by Dr. N. Venkateswaran, Prof, Department of ECE, SSNCE. Dr. P. Palanisamy, Prof, Department of ECE, NIT, Thiruchirappalli and Dr. Nagarajan G, Prof, Department of ECE, Puducherry Technological University were present during the meeting.

FACULTY VENTURES

FDP/Workshop/Webinar Attended

- **Dr Vijay Jeyakumar**, Associate Professor, Department of Biomedical Engineering attended an event "**Entrepreneurship Development Program**" organized by Centre for Technology Development & Transfer, Anna University in partnership with iGrantha Inc. USA on October, 16, 2021.

- **Dr. S.Saranya**, Assistant Professor, Department of Biomedical Engineering, attended **5-days online FDP** on the theme "**Inculcating Universal Human Values in technical Education**" organized by AICTE from 25.10.2021-29.10.2021.

- **Dr. M. Dhanalakshmi**, Assistant Professor, Department of Biomedical Engineering participated & completed successfully **AICTE Training and Learning (ATAL) Academy Online Elementary FDP on "Introduction to Speech Processing and its Applications using AI-ML (ISPA)- 2021**" from 25/10/2021 to 29/10/2021 at Centre for Development of Advanced Computing, Kolkata.

- **Dr. Pauline John**, Assistant Professor, Department of Biomedical Engineering has attended a webinar online, on "**Biomedical Optics Programming: Education, Inclusion, Diversity, Mentoring**" organized by Journal of Biomedical Optics on 15.11.2021.

Did You Know?

Artificial organs are often described as the Holy Grail of bioengineering —an important research area that lies at the intersection of medicine, life sciences and engineering.
The first real breakthrough in artificial organ design came in 1982, with Jarvik-7, the first fully functioning artificial heart to be successfully implanted in a human. The medical researcher, Robert Jarvik, and inventor Willem Kolff are credited with the design of Jarvik-7.

FACULTY VENTURES

- **Dr. Pauline John**, Assistant Professor, Department of Biomedical Engineering has attended a webinar online, on "**Photonics in the fight against COVID-19**" organized by SPIE Photonics West on 13.11.2021.

- **Dr. Vijay Jeyakumar**, Associate Professor, Department of Biomedical Engineering has participated in **Four days online workshop** on "**Artificial Intelligence and Assistive Technologies for Enhanced Learning and Inclusive Education: Concepts, Recent Trends and Research Challenges**" held from November 18th to 21st, 2021, jointly organized by IIT Bhubaneshwar, VIT Vellore in collaboration with School of science and Technology, Notttingham Trent University, UK.

- **Dr. N. Punitha**, Assistant Professor, Department of Biomedical Engineering attended five day Faculty Development Program on "**Advancement of Digital Health and Medical Innovations during Pandemic**" under **AICTE - ATAL** Scheme organised by the Department of Biomedical Engineering. Govt. Model Engineering College, Kochi from 06.12.2021 to 10.12.2021.

- **Dr. N. Punitha**, Assistant Professor, Department of Biomedical Engineering attended six day **AICTE–ISTE** Sponsored Refresher on "**Value Based Education System–Current and Future Scenario**" by Panimalar Institute of Technology, Chennai from 13.12.2021 to 18.12.2021.

- **Dr. S. Arun Karthick**, Associate Professor, Department of Biomedical Engineering attended One-week virtual **AICTE-ISTE** Sponsored Faculty Development Program on "**Thermoelectric materials and Energy Harvesting**" Conducted by School of Mechanical Engineering, Shri Mata Vaishno Devi University, Katra (J & K) from 21.12.2021-27.12.2021.

- **Dr.B.Geethanjali**, Associate Professor, Department of Biomedical Engineering has attended **five online FDP on Mathematical Foundations of Data Science** organized by the Dept of CSE ,**PSG iTech**, in association with **PSG CARE** and **PSG Tech**, Coimbatore from 9.10.2021 to 21.11.2021 through Zoom Platform

FACULTY VENTURES

- **Dr. Pauline John**, Assistant Professor, Department of Biomedical Engineering attended online AICTE Sponsored FDP on "**Advanced Manufacturing of Biomedical Devices for Precision Health Technologies**" Conducted at the Indian Institute of Technology Tirupati from 13.12.2021-17.12.2021.

- **Dr. Mahesh Veezhinathan**, Associate Professor, Department of Biomedical Engineering participated & completed successfully **AICTE** Training And Learning (**ATAL**) Academy Online Elementary FDP on "**Advancement of Digital Health and Medical Innovations during Pandemic** " from 06/12/2021 to 10/12/2021 at Model Engineering College.

- **Dr. K.Nirmala**, Associate Professor, Department of Biomedical Engineering, attended two days virtual workshop on **Trends in semiconductor Technology**, organized by department of Electronics and communication engineering of Sri sivasubramaniya Nadar college of Engineering during 17-18 December, 2021

- **Dr. N. Punitha**, Assistant Professor, Department of Biomedical Engineering attended a virtual National workshop on "**How to improve authors citations**" organised by the Department of Chemical Engineering, SSN College of Engineering on 16.12.2021

- **Dr. Mahesh Veezhinathan**, Associate Professor, Department of Biomedical Engineering has attended a Webinar on "**Machine Learning**" organized by Dept. of EEE, SSN CE on 17.12.2021.

Trivia Time

What container would you choose for a placenta?

a) red pail
b) grey tote
c) yellow pail
d) regular waste

Ans. a. red pail

FACULTY VENTURES

- **Ms. B. Divya**, Assistant Professor, Department of Biomedical Engineering A.S. Retnapandian, A. Yaamini, and **Dr.A. Kavitha**, Professor and Head, Department of Biomedical Engineering presented a poster titled "**Biometric subject identification by EEG time-frequency analysis**" at A Virtual Symposium and Workshop Brain, Mind, and Body: Cognitive Neuroengineering for Health and Wellness On December 15, 2021, 10:45am-11:00am PT.

- **Dr. R. Subashini**, Assistant Professor, Department of Biomedical Engineering has attended the Virtual National Workshop on "**How to improve authors citations**" on 16-12-2021 (Thursday) organized by Department of Chemical Engineering, Sri Sivasubramaniya Nadar College of Engineering, Chennai, India.

- **Dr. A. Kavitha**, Professor and Head, Department of Biomedical Engineering attended workshop on **Examination reforms** organized by Faculty development cell (**AICTE**) and **NITTR** Bhopal during Dec 27-19, 2021.

Events Conducted

- **Dr. S.Saranya**, Assistant Professor, Department of Biomedical Engineering and **Ms.B.Divya**, Assistant Professor, Department of Biomedical Engineering Organized a guest lecture titled "**Brain Computer Interfaces: State of the Art and Future**" delivered by "Dr.Aniruddh Ravindran, BCI Research Scientist, Ford Motor Company, California, USA" on "12.10.2021" held Via Online platform" for " III &IV Year BME students".

- **Dr.K.Nirmala**, Associate Professor, Department of Biomedical Engineering organized a virtual guest lecture titled "**Rehabilitative audiology**" on 7 th October 2021. The guest talk was delivered by Ms.Praveena Davis, Head, Department of Audiology and Speech Language Pathology, Academic Coordinator, Head of Research Projects, National Institute of Speech and Hearing, Trivandrum, Kerala.

- **Dr. Vijay Jeyakumar**, Associate Professor, Department of Biomedical Engineering has arranged a guest lecture for the final year BME students as part of their Elective course **UBM1731 "Biometric Systems"** in the title "**Fingerprint Recognition for Forensic Applications**" on October 01, 2021 (Friday) at BME seminar Hall. The presentation was given by Dr. Ram Prasad, Assistant Professor, Department of Computer Science and Engineering, SNU Chennai.

FACULTY VENTURES

- On October 25, 2021, **Ms.B.Divya**, Assistant Professor, Department of Biomedical Engineering and **Dr.S.Saranya**, Assistant Professor, Department of Biomedical Engineering organised a guest lecture on "**Point of Care Diagnostics**" for third-, fourth-, and pg students. **Mr.Sarath S Nair, Scientist/Engineer 'E' Department Coordinator**, Department of Medical Devices Engineering, Biomedical Technology Wing (BMT Wing), Sree Chitra Tirunal Institute for Medical Sciences, was the session's speaker.

- Dr. Pauline John, Assistant Professor, Department of Biomedical Engineering has organized a **guest lecture** titled "**Trends in Cardiac and Pulmonary Assist Devices**" delivered by "**Dr. Madan Mohan, Senior Consultant and Interventional Cardiologist, MGM Healthcare**" on "19.11.2021" held via Online platform as a part of the subject, PMD 1301 Assist Devices and Implant Technology, for the Medical Electronics, ME. II year/III sem students of BME, which was also attended by II, III, IV Year UG students of BME.

Industry Collaboration

- **Dr.A.Kavitha**, Professor and Head, Department of Biomedical Engineering and **Dr.K.Nirmala**, Associate Professor, Department of Biomedical Engineering had discussion with **Mr.Arvind Srinivas, General Manager and Business Head - Ultrasound @ Philips** regarding the syllabus for the **subject Medical Imaging Techniques** on October 13th 2021.

Alumni Interactions

- Mohamed Irfan Mohamed Refai (2011) completed his doctorate by defending the work titled **Moving On: Measuring Movement Remotely after Stroke, in University of Twenty, Netherlands**. Interaction with **Dr. A. Kavitha**, Professor and Head, Department of Biomedical Engineering regarding possible collaboration.

FACULTY VENTURES

Other Activities

- **Dr.S.Saranya**, Assistant Professor, Department of Biomedical Engineering delivered a virtual guest Lecture on the title " **Role of musculoskeletal analysis in occupational health and wellbeing** " for the III and final year BME students of Karpagam Academy of Higher Education, Coimbatore on 13.10.2021.

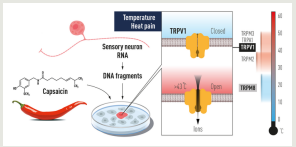
- R Anitha, **Dr. R Subashini**, Assistant Professor, Department of Biomedical Engineering P Senthil Kumar, published a book chapter, **titled: Application of Life Cycle Sustainability Assessment to Evaluate the Future Energy Crops for Sustainable Energy and Bioproducts**, Editor: Subramanian Senthilkannan Muthu, Head of Sustainability SgT Group and API Kowloon Hong Kong, Springer, Singapore, 57-80, 2021.

- **Dr.L.Suganthi**, Assistant Professor, Department of Biomedical Engineering appointed as **question paper setter** for the end semester examination at *Easwari engineering college* (an autonomous institution), Ramapuram, Chennai.

- **Dr. Vijay Jeyakumar**, Associate Professor, Department of Biomedical Engineering, **Dr.K.Nirmala**, Associate Professor, Department of Biomedical Engineering and **Dr. Sachin Gaurishankar Sarate**, Assistant Professor, Department of Biomedical Engineering, **Non-contact measurement system for COVID-19 vital signs to aid mass screening—An alternate approach**, Ramesh Poonia, Basant Agarwal, Sandeep Kumar, Mohammad Khan, Goncalo Marques, Janmenjoy Nayak]\7/ Elsevier Edition 01 and Page No. 75 - 92 ISBN: 978-0-12-824557-6 10/30/2021.

- A **three-day in-house workshop** was organized by the **Department of BME** to discuss ***AICTE examination reforms, Competency and Performance Indicators (PIs)*** on November 17, 19 and 20, 2021. During the workshop, the faculty members actively participated in creating Competencies and PIs for POs and PSOs.

The Nobel Prize



The Nobel Assembly at the Karolinska Institute has decided to award the 2021 Nobel Prize in Physiology or Medicine to David Julius and Ardem Patapoutian "for their discoveries of receptors for temperature and touch".

For more information: https://www.nobelprize.org/prizes/medicine/2021/press-release/

FACULTY VENTURES

- **Dr. A. Kavitha**, Professor and Head, Department of Biomedical Engineering and **Ms. Divya**, Assistant Professor, Department of Biomedical Engineering conducted **review for the external internship student** ' Ms. Sivaranjani Kubendiran' undergraduate with a B.Sc. Physics degree from Auxilium College (Autonomous – Affiliated to Thiruvalluvar University) – Vellore, and evaluated the progress of the work and made suggestions for improvement. She is working in project title "Analysis of EEG in a neurodevelopmental disorder.

- **Dr. A. Kavitha**, Professor and Head, Department of Biomedical Engineering conducted a virtual meeting for **Centre for Healthcare Technologies** and introduced the team and discussed goals to put forth.

- Virtual reality (VR) team, **Ms. Divya**, Assistant Professor, Department of Biomedical Engineering, Mr. Immanuel Adam and Ms. Yaamini along with **Dr. A. Kavitha**, Professor and Head, Department of Biomedical Engineering attended a meeting with **Professor Sean Smith from the University of Kansas, USA** on December 6, 2021.

- **Ms. Divya B**, Assistant Professor, Department of Biomedical Engineering appointed as "**Question paper setter**" for the End Semester Theory Examinations to be held in Nov./Dec. 2021 under an autonomous scheme Paavai Engineering College

- A meeting with **Prof. Samudra** was scheduled on December 13, 2021 at 06:30 pm to discuss **Biomedical Engineering department's performance indicators**. During the meeting, all **BME faculty members** interacted with Prof. Samudra about their course's **CO-PI-PO mapping**.

STUDENT PURSUITS

Co-Curricular Activities

- **Chandramouli K**, III year BME completed an online course on Sports Psychology organized by Skill Nation, Chennai from 28/09/2021 to 03/10/2021.

- **Hevanthika M**, III year BME, participated in a State Level Technical Competition organized by iCUBE at Sri Venkateswara College of Engineering, Chennai, and ended as the Runner up from 19/09/21 to 03/10/21.

- **Sachin Raj SP**, III year BME, attended a workshop on " Intro to Neural Networks and Deep learning" by Great learning in October 2021.

- **Sachin Raj SP**, III year BME, attended a workshop on " Intro to machine learning" by Kaggle on 1/10/21.

- **Sachin Raj SP**, III year BME, attended a workshop on "TCS iON Career Edge - Young Professional" by TCS from 05/10/2021 to 10/10/2021.

- **R Dhanush Babu**, III year BME participated in the Workshop on "PCB Designing and Fabrication techniques using ALTIUM" conducted by Sai Incubation Centre on 01/11/2021 & 02/11/2021

- **Jacob**, from II year BME attended Fusion 360 workshop on 10/11/21

- **Supraja Vaidhyanathan**, from II year BME, attended and cleared NPTEL courses on Biomedical nanotechnology with 81% and Introduction to basic cognitive processes with 54%.

- **Supraja Vaidhyanathan**, from II year BME attended an online Techlearn Python Coding workshop on 18/11/2021.

- **Supraja Vaidhyanathan**, from II year BME attended Online Tech Club Talks on The art of getting a research internship on 12/11/2021, Crafting the perfect resume on 18/11/2021, and The secrets of core internships on 20/11/2021, conducted by SSN College of Engineering.

STUDENT PURSUITS

- **R Dhanush Babu**, III year BME participated in the Workshop on "Deep Learning Networks for Image Processing" organized by IEEE India Council on 22/12/2021 & 23/12/2021 in virtual mode.

- **R Dhanush Babu**, III year BME participated in the "National Level Workshop on Machine Learning and its applications" organized by the Department of EEE (SSN College of Engineering) on 9/12/2021 & 10/12/2021 in virtual mode.

Extra-Curricular Activities

- **Kritik Varshi B**, III Year BME, won the third place in the YMCA YOUTH CONCLAVE 4.0 (MUN) conducted by Amity University on 2/10/21 & 3/10/21.

- **Shri Thrisha Arunkumar**, II year BME was part of the organizing committee and designer team for the Online Start-Up Smackdown Event held on 2/10/21 & 3/10/21.

- **Supraja Vaidhyanathan**, II year BME was part of the organizing committee and designer team for the Online Start-Up Hackathon which was conducted by SSN Lakshya on 2/10/21 & 3/10/21.

- **Shri Thrisha Arunkumar**, II year BME was part of the organizing committee and designer team for the SSN Invente held on 8/10/21 & 9/10/21 in the online mode.

- **Supraja Vaidhyanathan**, II year BME, was part of the organizing committee and designer team for the SSN Invente, on 8/10/21 & 9/10/21 in the online mode.

- **Supraja Vaidhyanathan**, II year BME bagged the second place in Sketchx SSN Invente, in an online event conducted on 8/10/21.

Biology Bytes

A compound extracted from scorpion venom and a novel imaging tool called a scanning fiber endoscope could help illuminate brain tumors during surgery.

STUDENT PURSUITS

- **Supraja Vaidhyanathan**, II year BME, participated in Startup Smackdown of SSN Invente 2021 on 08/10/2021.

- **Aarathy Sundaresan**, III year BME, displayed a stall of her own label at Fika Chennai, on 9/10/21 and was published in Deccan Chronicle newspapers.

- **Supraja Vaidhyanathan**, II year BME, participated in the 'Webinar on Radiology' conducted by SSN IEEE-EMBS on 10/10/21.

- **Sowmick Rakesh S**, Ashwin Kumar M, and Arushi Sahu of III Year BME bagged the first place in the Video Making competition conducted by YUVA SHAKTHI Youth Welfare Association on 29/10/2021.

- **Shri Thrisha Arunkumar**, II year BME participated in the Group Discussion conducted by Yuva Shakthi on 31/10/21 through online mode.

- **Supraja Vaidhyanathan**, II year BME, participated in an Online Group Discussion On Corruption conducted by Yuva Shakthi on 31/10/2021.

STUDENT PURSUITS

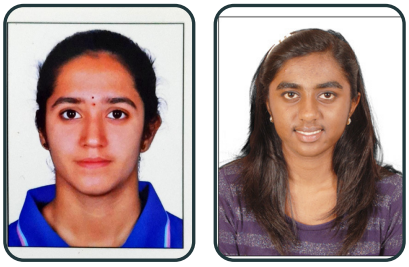
Company Placement and Higher Studies

-ARTHI V (IV YEAR)

The placement season for the academic year 2021-2022 began with a great amount of energy from the students and the placement cell. The companies that began the placement season fell under the Marquee and Super Dream category, followed by the core and dream categories. The students of the Department of Biomedical Engineering have outdone themselves in the past five months by setting a great placement record.

The first company where our department students got placed was Amazon, which is an American Multinational technology company which focuses on e-commerce for 2 different positions, Area manager and Operations Manager.

A total of 6 students - Anjana A, Divya Rajesh Kannan, Harini P, Namitha Ramakrishnan, Sai Kavya Neharika M C, and Vishnuvazzala Sasya Subramanyam from our department got placed in Amazon. The students were offered a Marquee salary package of 28.6 LPA.



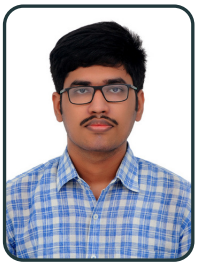
Following this, a core company - Zifo R&D, a pharmaceutical research oriented company took students for the role of Junior Analyst. A total of 7 students - Anieya Israel, Basundhara Bhattacharjee, Harishree S, Keerthana B, Priyam Vardhini M, Ragavender Ramesh, and Sivagami Vishnukumar bagged offers after a rigorous interview process.

STUDENT PURSUITS



ZIFO
RnD SOLUTIONS



Thus grew the impetus and enthusiasm shown to placements by our students and faculty. Accenture recruited one student, Lal Bhaveen P for the role of Advanced application Engineering Analyst and Crayon data recruited another student, Abishek Dius I L for the role of Associate customer scientist.

accenture
High performance. Delivered.

crayon

This was then followed by dream companies like LatentView, Tazapay and ZoomRx. LatentView, a Data and Analytics company recruited 3 students - Crossny Snowlin R, Divya Sindhu M, and Srinidi S for the role of Analyst.

LatentView
Actionable Insights Accurate Decisions



STUDENT PURSUITS

Tazapay, a payments and commerce company recruited one student, Pooranima G for the role of Software Development Intern. ZoomRx, a Healthcare Consulting Firm recruited two students, Raghavi L and Yuvasri A, for the role of Business Associate.

Some of the regular offers included recruitment of 8 students for Cognizant, 9 for Tata Consultancy Services and 3 students for Wipro.

Despite the unfortunate Covid-19 scenes, placements for the year 2021 have been relatively high and promising. It is also to note that many students are pursuing a future with higher studies and many with their own paths to success in various fields.

THINK PIECE

VIRTUAL REALITY IN HEALTHCARE

-N. SRINIDHI (III Year BME)

From fancy tales fit for enthralling sci-fi enthusiasts only a while back, virtual reality has firmly established itself as a transformational technology for various industries.

Healthcare, suddenly the focus area owing to the ongoing COVID-19 pandemic, has been one of the main beneficiaries of VR innovation across multiple areas. So, what can VR do to increase efficiency, accessibility and testing in healthcare?

The VR Landscape:
The global spending on VR in the healthcare market is projected to reach $30.40 billion by 2026, exhibiting a CAGR of 42.4% during 2019-2026. According to another report by Statista, “by 2020, the virtual reality industry will reach revenue of USD 21.5 billion.” These reports show that virtual reality in the healthcare industry will be a sizable chunk of the total market.

It has truly not just moved the imagination of science-fiction fans, but also clinical researchers and real-life medical practitioners. This field is relatively new, however as the technology grows and richer VR content is generated, it will see even greater adoption and better results. It is set to have an increasingly positive effect on patients’ lives and physicians’ work.

The VR that lets you pretend to be a star quarterback or space pirate can also help train young professionals or even provide pain and anxiety relief to patients. The AR that puts Pikachu in your city park can also assist physicians with real-time information to use in diagnosis or even surgery.

THINK PIECE

What makes VR invaluable is the innovative ways in which it addresses some of the problems faced by the healthcare industry. A few among such problems being:

- Ground-level problems, as the situation seems to be in a permanent state of demand greatly exceeding the supply
- Logistical issues with limited access and availability of equipment, which is often outdated, not even nearly as effective as it should be.
- And the permanent problem is with the lack of available personnel in many local institutions. The real situation is that they are often struggling to handle intense workflow not to mention emergencies.

Below are some of the pioneering virtual solutions aimed at changing the face of healthcare:

Medical Training:
Virtual Reality can transport you inside the human body – to access & view areas that otherwise would be impossible to reach. VR technology allows trainees to learn human body structure, create a real-life situation to help them practice and guide professionals to become a successful surgeon. It gives a real control, the trainee can rehearse on it as many times as he/she gets their hands on and of course, it involves less cost as it doesn't require expensive trainers, equipment, etc. trainees can just put on the VR headset and start practicing.

THINK PIECE

Treatment:

1)Robotic Surgery

- Robotic surgery is a recent innovation in which surgery is performed using a robotic device, e.g. robotic arm which is controlled by a human surgeon. This means fewer risks of complications during surgery and a faster procedure. The robotic device is accurate, meaning smaller incisions, reduced blood loss and faster recovery.

2)Patient Education

The ability to view the inside of the human body in Virtual Reality is not only useful for doctors, but also for patients. VR allows patients to be taken through their surgical plan by virtually stepping into a patient-specific 360° VR reconstruction of their anatomy & pathology. The outcome is an enhanced understanding of the treatment and therefore higher patient satisfaction.

3)Battling phobias

This is one of the most inveterate forms of VR therapy to help patients overcome their fears. The therapy is like graded-exposure therapy, where the doctors help their patients to discover their anxiety and slowly allow them to grab control over their anxiety problems one step at a time.

4)Therapy for people with disabilities or chronic conditions

Virtual reality in the medical field has also been used to help people with disabilities or with chronic conditions experience things they may not be able to experience otherwise. They have helped paralyzed people learn to walk again and helped terminally ill cancer patients experience their bucket-list wishes. Similarly, the Fove headset has been used to help children with physical disabilities play the piano by tracking eye movement in an app the company created called “Eye Play the Piano”. And these are a few examples of the therapeutic uses that VR technology.

5)Pain Management & Physical Therapy

VR’s healing capabilities aren’t just limited to psychological issues but have been proved to work for pain management & physical treatment too. A study showed that full VR immersion for those undergoing physical therapy after a skin graft acted as a distraction and subsequently reduced pain levels for the patients. VR for physical therapy has also been shown to be effective in speeding up recovery time.

THINK PIECE

6)Personal fitness

There are many ways virtual reality is improving healthcare by reaching patients directly. VR personal fitness apps can gamify your workout or transport you to virtual environments to make workouts more fun. There are a wide variety of these programs already available. These programs can improve patients' overall health and prevent future health problems, VR fitness programs can help teach you workouts and give you feedback on your movements, make exercise into a series of games or encourage you to work out even when the weather is bad by providing scenic backgrounds for running on a treadmill or riding a stationary bike. These VR experiences could also play a role in physical therapy.

Future Of VR:

Given the evidence for an expanding market and growth in the field of emerging technologies in healthcare, it has been estimated that health care uses of virtual reality will be the second-largest share of the VR market by 2022.

THINK PIECE

Overall, VR offers revolutionizing ways to advance patient care as well as medical procedures, training and many more opportunities. These virtual environments also help healthcare in achieving targets such as streamlined costs, more efficiency. In times to come, the technology will provide a healing touch to patients while sharpening the skills of medical practitioners, thereby adding value to the entire healthcare ecosystem.

THINK PIECE

PLASMONICS IN BIOMEDICINE

-MANNAT UPPAL & MOHAMMED ADHIL S, II YEAR ME

The utilization of plasmonic nanoparticles for biomedical applications has been abundantly researched, providing significant improvement in the development of ultrasensitive bioassays and effective therapy. The unique surface plasmon resonance phenomena of both plasmonic films and nanoparticles with their absorption and scattering abilities have much potential in revolutionizing diagnosis, treatment and evaluation of diseases, in particular cancer.
Bioassays

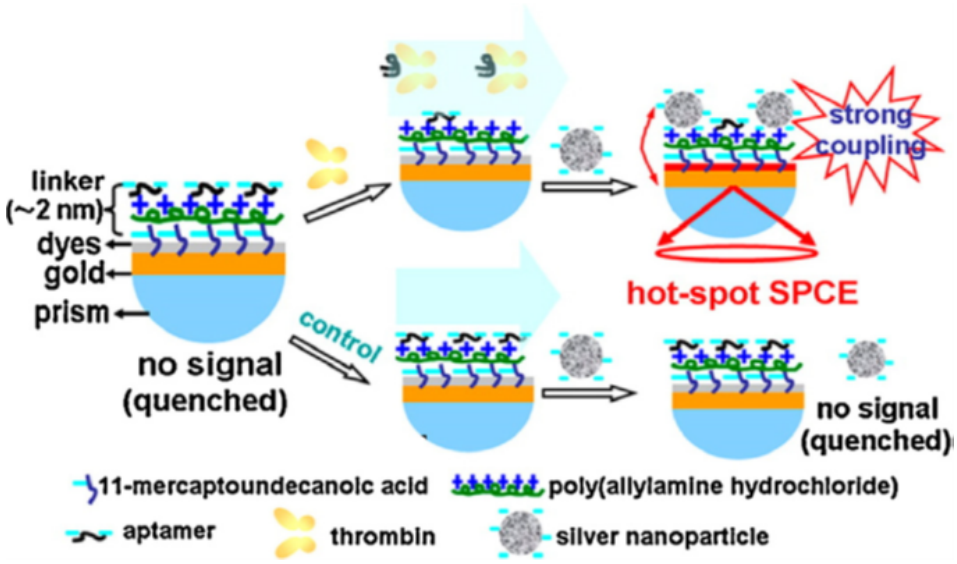
Metal-enhanced fluorescence
Plasmonic enhancement of fluorescence comes due to the coupling of fluorophores to the strongly confined electromagnetic fields of plasmonic nanoparticles or plasmonic metal films. These strongly confined electromagnetic fields are generated as a result of interaction between light and localized surface plasmons of plasmonic nanoparticles or surface plasmon polaritons for films. The plasmonic materials then relay the radiation outward, increasing the radiative scattering efficiency of the fluorophores. More recently, interactions between plasmonic nanoparticles and fluorophores were explained by the radiating plasmon model, whereby the enhanced emissions and decreased lifetimes of the fluorophores are due to the coupling of the fluorophores at their excited states with surface plasmons of the nanoparticles.

For the construction of metal-enhanced fluorescence assays, the distance-dependence of metal enhanced fluorescence has been extensively employed. To further improve the sensitivity of metal-enhanced fluorescence, different strategies targeting the individual components of fluorescence assays have been developed.

THINK PIECE

Bioassays based on distance-dependence of metal-enhanced fluorescence

Two different approaches exist for the use of the distance-dependent property of metal-enhanced fluorescence for bioassays, namely the quenching-to-coupling approach and the signal enhancement approach. The quenching-to-coupling approach refers to a 'molecular beacon-like' approach whereby a single molecule, usually DNA, conjugated to a fluorophore acts like a molecular beacon, with initial quenching of the fluorophore due to close proximity of the DNA—fluorophore conjugate to the plasmonic nanostructure.



Schematic representation of the aptamer-based bioassay whereby strong plasmonic coupling occurs between the silver nanoparticles and the gold film, inducing high fluorescence emission.

THINK PIECE

Improving sensitivity via other components of fluorescent bioassays
Other than the distance-dependence of metal-enhanced fluorescence for sensitivity improvement, strategies targeting the fluorophore, bio affinitive agents, the antibody surface as well as the type of plasmonic film have been explored. Deng et al. proposed the use of lanthanide fluorophores like europium with long fluorescence lifetimes such that a high background rejection can be achieved. By adding a europium chelate into a silver/silica core—shell nano com- posite, a maximum fluorescence enhancement of 9.5-fold was obtained.

Despite a decrease in fluorescence lifetime accompanying the increase in fluorescence enhancement of the core/shell nanocomposite, the fluorescence lifetime of the europium chelate doped nano composite was still found to be much longer than that of cellular auto-fluorescence, thus allowing for the use of such lanthanide-doped plasmonic nano composites for cellular applications.

In addition, at high intensities of excitation light, fluorescence enhancement factors significantly increased up to 146 folds for the europium chelate doped nano composite due to the fluorescence saturation InControl samples while no fluorescence saturation was observed with the europium chelate doped nanocomposite.

Surface plasmon resonance and localized surface plasmon resonance assays. Surface plasmons refer to the coherent oscillations of conduction electrons on a metal surface when excited by electromagnetic radiation at the interface between a metal and a dielectric. Two surface plasmon modes are usually employed: propagating surface plasmon resonance (PSPR) at flat smooth metal—dielectric interfaces and localised surface plasmon resonance (LSPR) when surface plasmons are confined on either periodic, colloidal or other nano-systems. PSPR-based bioassays work by coupling a metallic thin film to a prism or a grating

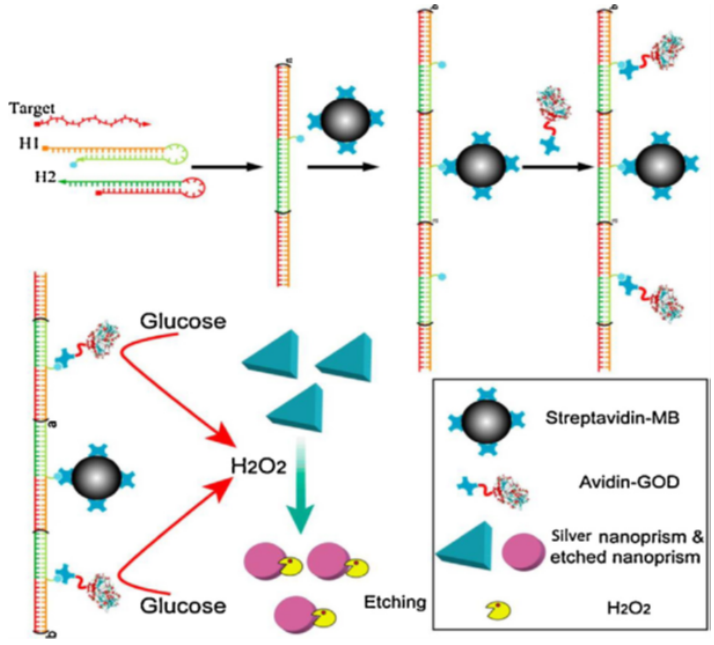
THINK PIECE

PSPR-based bioassays

To improve the sensitivity of PSPR-based bioassays, the sensing of the unique properties of the PSPR film other than the PSPR shift and the coupling of other plasmonic nanostructures to modify the field have been investigated like the work done by Yu and colleagues. They studied the sensitivity of both the extraordinary emission and the surface plasmon resonance of corrugated gold films fabricated by nano imprint lithography to refractive index changes.

Two surface plasmon resonance bands were observed for the corrugated gold films: one between the gold film and the polycarbonate film that the gold was deposited on and the second between the gold film and the superstrate applied on it. The intensity of the extra ordinary transmission was found to be dependent on the refractive index of the superstrate applied on the corrugated gold film,

with a greater intensity observed as the refractive indexes of the polycarbonate film and the superstrate got closer to each other. The change in intensity of the extraordinary was found to have a sensitivity of up to 8.96a.u./RIU, while the sensitivity of the red shift in the surface transmission plasmon band for the plasmon mode between the gold film and the superstrate was found to have a sensitivity of up to 812nm/RIU. The latter was used for the quantification of cysteine.



Schematic illustration of the construction of an etching assay for the detection of target DNA.

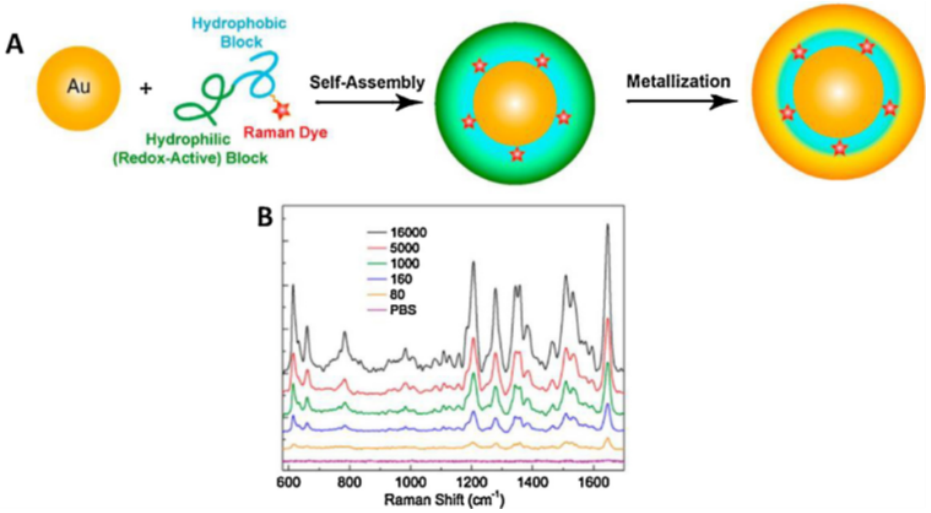
THINK PIECE

Surface enhanced Raman scattering (SERS)

Raman scattering refers to the scattering of photons that are higher or lower in frequency as compared to the incident photon that strikes an analyte due to the vibrations and rotations of an analyte.

A Raman spectrum is unique to the analyte and can be used for its identification, imaging and quantification. However, Raman signals are very weak due to the extremely small scattering cross-sections of Raman active molecules. SERS thus enhances the sensitivity of Raman bioassays for qualitative and quantitative detection of bioanalyses. Two mechanisms for the surface enhancement of Raman scattering by plasmonic nanostructures have been proposed, with the electromagnetic enhancement being more widely accepted as the one with the greater effect.

Electromagnetic enhancement occurs due to LSPR of the nanoparticles concentrating the incident light, creating an intense local electromagnetic field. SERS signals are further increased when "hotspots' 'are formed, due to LSPR coupling of multiple nanoparticles. SERS can be performed with or without Raman labels, with the latter enhancing the intrinsic Raman signal of an analyte.



(A)Schematic illustration of the core—shell gold nanoparticle with the nanogap and (B) enhancement in Raman signals for the detection of MCF-7 breast cancer cells.

THINK PIECE

Therapeutic application

Many therapeutic applications of plasmonic nanoparticles have been proposed such as photothermal therapy, photodynamic therapy, drug delivery, diagnosis and even alter gene expression.

Improving the photothermal conversion efficiency

Two main strategies have been proposed in improving the photothermal conversion efficiency of gold nanostructures: the generation of new nanostructure sand the coupling to improve photothermal conversion efficiency. New nanostructures have been fabricated using unique synthetic methods to improve their photothermal conversion efficiency. Studies have shown that gold nanorods of an appropriate dimension (28nm×8 nm) are most effective for plasmonic photo thermal therapy amongst individual gold nanoparticles such as nanospheres, nanoshells and nanorods. Huang etal. Further demonstrated that hierarchically assembled of gold nanoparticles allow LSPR to be fine tuned in the near-infrared (NIR) region for enhanced photothermal conversion efficiency.

As shown in Fig. 11, bio degradable poly(ethylene glycol)-b-poly(-caprolactone) coated gold nanoparticles are capable of forming nanovesicles(BGV) of densely packed gold nano particles which induce strong plasmonic coupling between adjacent gold nanoparticles, thus displaying a photothermal conversion efficiency of 37%.

The rapid progress of therapeutic applications of plasmonic nanoparticles has offered ample opportunities in biomedicine.

THINK PIECE

EPISODIC RECALL IN HUMANS

-ELAKIYA SIVAKUMAR (IV YEAR)

*For her blog "the pneuma in Machine"
The link to the Blog: http://thepneumainmachine.in/

How does the Brain work? There are 10 billion neurons in the brain. It can be roughly assumed that every action (voluntary or involuntary) and thought (even the ones you are not “thinking” about) have a different combination of these many, many neurons firing together.
However, to make things infinitely easier, there is a rough division of labour (and their structure) within the many neurons of the brain. And hence there is clear sectioning of the region as well.

Roughly, each brain region has a different function. However, spatial navigation, episodic memory, consciousness are complex that they require different brain regions to work together.

This leads to circuitry within the brain. This roughly a pathway that is required to reach a particular goal. For example, let’s consider solving math problems. The first time you ever do differentiation a pathway (circuitry) is established. The more differentiation you do, the better/faster this connection gets.

In general, neuroscientists have a saying, “neurons that fire together, tend to fire together.”
The interesting part is: when you do, say integration, half of the neurons involved in differentiation might also fire! So there is insane plasticity.

THINK PIECE

EPISODIC MEMORY: There are many different types of memories: short term-, medium term- and long term- memory (based on the life of the memory); there is also working memory, operational memory. These are associated with the skills you learn.

The focus of my research episodic memory. Unlike the other types of memory where learning is involved, episodic memory is more about encoding.

This means that the brain doesn't have a second chance to look at the same exact information/cues to occur. It is solely based on one-time experience. However, it is extremely powerful.

The stability of such powerful encoding arises from a number of factors: location (spatial navigation, hippocampus), emotion (frontal cortex), and time sequences (medial lobes where time cells are present)

Thus, we can see that encoding of memory is a composite process involving different brain regions.

Taking an example, consider eating candy for the first time- you remember where it happened, the face of your parents, the colour of the candy- all encoded by the hippocampus; you remember feeling happy – the emotional cortex; you might even remember the taste!

The memory is distributed throughout different regions in the brain, but what is it united by? The deep brain waves- theta and gamma! These waves produce a synchronization effect that causes all the neurons to work together.

THINK PIECE

So during one particular time instant- a time cell fires and a bunch of neurons across different regions fire and an episodic memory is encoded. During the recollection process, the same set of neurons fire- the wave is recreated!

The phase relationship between Hippocampal Place Units and the EEG Theta Rhythm

BACKGROUND:
Hippocampus has special cells called "place cells" which fire during human's navigation within any environment. It's like a GPS system within the brain.

The place cells fire together in a complex manner: different combinations of place cells form different locations within the brain.

When the place cells fire, they form "spike patterns" which has shown to be coinciding with the peak of theta wave obtained from deep brain.

RESULTS
The spatial cells fire in bursts- this is associated a peak phase of the theta wave (deep brain wave).
Human Hippocampal Theta Oscillations and the Formation of Episodic Memories

BACKGROUND
Hippocampal theta is associated with synaptic plasticity, information coding, and memory function in several species.
In rodents 4-6Hz theta waves are observed during encoding and retrieval processes.

In this paper, power spectra analysis of the intracranially recorded EEG signals is performed.
The hypothesis is that there is an increase in power of the theta waves during successful memory encoding as well as retrieval.

THINK PIECE

WHY DOES THE THETA POWER INCREASE?

The synchronization between different regions of the brain increases during a successful episodic recall. This synchronization causes increase in the oscillatory activity of the brain which in turn causes an increase in the theta power. The exact generation of the theta waves is roughly because of the neuronal activity in the deep brain structures. However, the exact dynamics are still a mystery.

RESULTS

- The theta band in humans was found to be between 4-8Hz.
- The neural oscillatory studies showed an increase the power spectra analysis.
- The phase was also found to be associated with the spiking bursts of the neurons.

IMPLICATIONS ON AI

- Episodic recall in human beings is the basis for autonomous systems.
- Pattern recognition and synchronous systems also benefit from the data of episodic recall.

Learning/teachable AI

THINK PIECE

BIOMEDICAL ENGINEERING- ANCIENT TO MODERN TIMES

-DHARSHAN A. H. (III YEAR)

Today's world is in such a fast pace; every scope available at present constantly requires improvement and development. For example, we would have never imagined about wireless communication if not there was development from the prototype of the telephone invented by Sir Alexander Graham Bell. Every new concept needs verification, republication and mandates an updated version of itself every day. There is no exception for the medical field as well. Medicine is an integral part of mankind; it demands wholehearted involvement of the experts in all aspects. Every new complication requires a new solution. Along with medical science, medical systems and technologies are an integral part in diagnosis, monitoring and treatment of patients. But there arise various questions:

· Why is technological advancement so important in medicine?
· What are the advancements in the medical field?
·How has medical technology evolved and improved health standards in the world?
·Who are responsible for these medical technology advancements?
· Where are these technologies actually applied?
· How is are these medical systems designed?

There are even more questions which can be framed. The suitable answers to these never-ending questions will be from the ever-booming field of biomedical engineering.

THINK PIECE

An extremely diverse and ever-expanding scope, biomedical engineering is undoubtedly one of the most important and irreplaceable foundational elements of the medical industry. It has completely changed the outlook of general medicine and has given a promising ray of hope to both medical practitioners and the common man who accesses these services.

This field is essentially a bridge between medicine and designing or engineering, since creating medical systems, machinery, devices and other products require design expertise and qualification in engineering.

As we all know, necessity is the mother of all inventions. At a time where complex medical conditions were life-threatening, and at the same time exploring and analysing certain things were considered a taboo, the scope of medicine was so limited that people started losing hope when they were diagnosed with various diseases.

But, medical experts like Sushrutha from India, roughly during 600 BCE, broke away all taboos and started researching on various diseases by dissecting cadavers, using remnant bones for device designing and instrumentation, prescribing medicines for particular diseases and paved way to a well-defined and diverse method of diagnosis, treatment and medical instruments required for surgery in the medical domain of Ayurveda, one of the ancient Indian medical practices.

In his book SushruthaSamhita (m. Treatise of Sushrutha), in 184 chapters he has given descriptions of 1,120 illnesses, 700 medicinal plants, 64 preparations from mineral sources and 57 preparations based on animal sources.

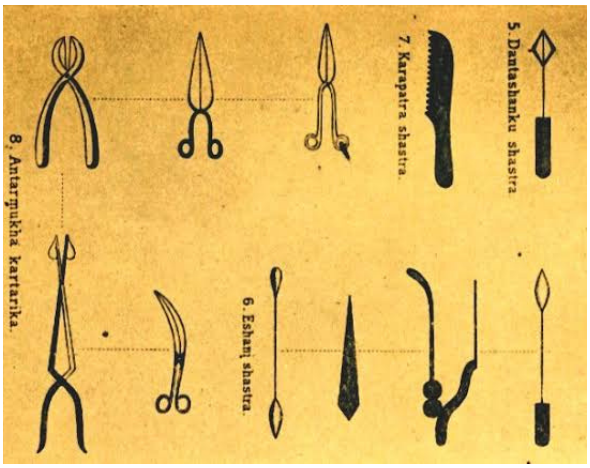
THINK PIECE

He describes the surgical procedure of rhinoplasty, a surgical procedure of the nose, in Sushruta Samhita. There are also citations that Sushruta moulded artificial legs from iron, an early version of the technique known as prosthesis. Sushruta documented the surgical tools used for specific procedures in the Sushruta Samhita.

He divided them into four plates, which describe hundreds of surgical tools including tongs, scalpels, catheters, probes, needles, specula, syringes, forceps, saws, and scissors.

These instruments are twenty in number such as, the Mandalagra, the Karapatra, the Vriddhipatra, the Nakhashastram, the Mudrika, the Utpalapatra, the Arddhadhara, the Suchi, the Kushapatra, the Atemukha, the Shararimukha, the Antarmukha, the Trikurchaka, the Kutharika, the Vrihimukha, the Ara, the Vetasapatraka, the Vadisha, the Dantashanku, and the Eshani. Most of his tools were made of steel and many are still used in a modern form by doctors today.

Translated verses from Sushruta Samhita:
"Instruments that are fitted with handles of easy grip and are made of good and pure iron, well-shaped, sharp, and are set with edges that are not jagged and end in well-formed points or tops, should be deemed as the best of their kind.



THINK PIECE

An instrument used either in connection with the measures of secretion or cutting by uplifting (Vyadhana) should be set with an edge as fine as the human hair, while an instrument of incision should have an edge half as thin as that of the former.

Surgical instruments should be tempered with one of the three substances such as, alkali, water, and oil. Instruments used in cutting an arrow, a bone, or any foreign matter (Shalya) pricked into the human body, should be tempered with alkali, whereas those that are made use of in cutting, cleaving, and lopping off the flesh (from an affected part), should be tempered with water.

Instruments used in opening (Vyadhana) a vein (Shira) or in cutting open a nerve (Snayu) should be tempered with oil, and should be whetted upon a species of stone-slab resembling a Masha pulse in colour, and their set-edge should be protected by putting it in a sheath made of Shalmali wood."

In today's modern world, medicine has improved manifold. Due to the existence of electricity and development in electronics and machine technology, we have now evolved biomedical engineering to a very advanced standard. Right from MRI scans, X-Rays, CT scans, angioplasty, advanced catheters, laser treatment mechanisms, digital pulse oximeters, heart health monitors, advanced patient monitoring systems etc., there are many ways of medical approach to various complications in today's world.

THINK PIECE

One of the new developments in Magnetic Resonance Imaging (MRI) is Functional Magnetic Resonance Imaging (fMRI), which is a class of imaging methods developed in order to demonstrate regional, time-varying changes in brain metabolism.

These metabolic changes can be "consequent to task-induced cognitive state changes or the result of unregulated processes in the resting brain". Since its introduction in the year 1990, fMRI has been used in a very large number of studies in the fields of cognitive neuroscience, clinical psychiatry or psychology, and presurgical planning.

Similarly, heart attack prediction devices are a new introduction in the biomedical engineering sphere where a smartphone application can detect the risk of heart attack on patients from data sourced from a sensor setup which would be fitted on the patient.

Lasik is a laser eye surgery used to correct refractive errors. In this procedure, a thin laser beam is used to cut the front surface of your eye (the cornea) and change its shape. The new shape of the cornea will allow light beams to once again focus on the retina.

It is a non-invasive method of eye surgery and is a milestone in modern day medical advancement as people prefer non-surgical ways for treatment than surgery due to surgical site morbidity and other discomforts usually faced by people after surgery.

There are plenty of other medical advancements than the ones discussed, the above being only certain examples. Similarly, our ancient civilisation was so advanced with clear-cut knowledge on the human body and the techniques in medical instrumentation, even in a backward era of no technology and scientific temperament.

To summarize, at all times of existence, man's important focus has always been on improving health standards and medical approach of several disorders. Hence, biomedical engineering has always been a subtle yet significant part of our development. History stands proof to this fact, and the modern age is still witnessing the wonders of biomedical engineering with awe.

CREATIVE ENDEAVOURS

Nurse.

A man died under my care today.
Several do, tears swirled,
Such is the state of the world
Drowning in dismay.
He held my hands,
The grip of a newborn holding on
To dear life, Will his weapon.
I look at the thin bands
Of his fingers against mine
And see flashes of several before
Which held on with the same fervor
Inevitably falling limp, then their ashes in brine.
There is no structure or integrity
In a mind not allowed to dwell
On circumstances that make your heart swell.
I still look down in brevity.
Since long I have been detached
Lest my heart give out, hiding,
Behind an illusion of my tidings
And clothe myself in denial unmatched.

Supraja Vaidhyanathan
II year BME

CREATIVE ENDEAVOURS

Blending.

I sit amidst the bustling crowd
Of children and parents
Under a lazy winter sky
With a book in hand,
Seeing but not looking
At the passing sigmoid shapes-
Brightly clothed, brightly toned
Squeals of joy, few of which
Catch my passing eyes.
I see her in parts, this child,
Her hair, petulant, untamed,
Flying, as though it is a mane,
With enough rebellion against gravity
That matches her scream of joy
As she slides down
Right into the arms of her laughing father.
A small smile peeks over his shoulder,
And my lips tilt in response,
To that one soul who knew I sit here.
I quickly look back down into my book.
I blend in again into a scene
Where I clearly don't belong,
Except for a smile bestowed
In acknowledgement
Of a timid existence.
I never got to know her name.

Supraja Vaidhyanathan
II year BME

CREATIVE ENDEAVOURS

An Aura of Hope

Sitting on the tree branches, the birds chirp away excitedly.
The sunlight beam illuminates all of the entire realm.
The icy river reflects the light of love back to the sky in denial.
The riverbanks, spread out like a green blanket,
encourages the river to give up its cold arrogance,
and says "Flow endlessly like you, the real you.".
Distant yet Prodigious they stand, the mountains,
Glazed with snow at the peak,
Hiding their faces ever so playfully
behind the passing clouds.
Butterflies dancing from flower to flower.
flaunting their friend God's talented artwork.
Spring it was beautifully blooming.
Yes, I was surrounded by this serene beauty.
Yes, it was real but a dream,
As my mother held my hand, gently gripping it.
Me, not being able to respond, lay still in bed.
Her grief, yet her hope was what she gifted me more.
Yes, I was surrounded by the aura of hope.

Janani T
III year BME

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