Vel Tech
Rangarajan Dr. Sagunthala
R&D Institute of Science and Technology
(Deemed to be University Estd. u/s 3 of UGC Act, 1956)

SYMBIOSIS

A BIOMED COLLAB NEWSLETTER

AY: 2019-2020

1st Edition

CONTENTS

Editor's Desk

The editor takes an immense pleasure in bringing in the 1st annual newsletter of the Department of Biomedical Engineering, SYMBIOSIS, 1st Ed.

SYMBIOSIS, 1st Ed. includes a variety of flavours that include the thoughtful message from the HoD's Desk, Talk-of-The-Town from the Faculty's Desk, Cites on Biomedical Engineering Department, Faculty and Students, and Think-Pieces from the Students.

In the next year, we will come back with the next edition of SYMBIOSIS with different technical/non-technical flavours, initiatives and new achievements.

We thank the management for their avid support and the enthusiastic readers of the SYMBIOSIS.

Dr. K. Ganeshlenin, Ph.D
Assistant Professor

Department of Biomedical Engineering

Vel Tech University is one of the few Institutes offering Biomedical Engineering in Tamil Nadu, with an immense aim of providing a different learning environment to inculcate out-of-box thinking. The department of Biomedical Engineering was established in 2017 under the school of Electrical and Communication of Engineering with an aim to connect engineering and biology. True to its mission, the department is propelling itself to become a major educator in biomedical instrumentation and allied engineering by employing diverse workforce. The department has raised to the standards of world class laboratories by setting up Brain Computer Interface (BCI) from open BCI. The department has introduced a major pedagogical shift by incorporating integrated lab courses in curriculum with the motive of giving learn by doing experience to the students.

Vision - To be recognized by society at large as an excellent department, offering quality higher education in Biomedical Engineering and thereby enabling graduates to serve and strengthen Indian healthcare sector and excel at an international level.

Mission - Infuse critical thinking skills by providing strong foundation which enables them for continuing education. Educate the students with state of the art cutting edge technology to compete in global arena. Create research environment in the state-of-the-art biomedical engineering with the support of well experienced and respected faculty.

HoD's Desk

I am much privileged to be the part of the opening newsletter SYMBIOSIS from Biomedical Engineering Department in Vel Tech. We will share with you a summary of our news and events, as well as articles that will offer you a better of our department and our teaching and learning methodologies.

I can beam with proud that, after our much hardship we have brought this into flourishing. The editorial team did an outstanding job developing and producing the newsletter. I would like to record my gratitude to the coordinators, faculty and students for putting their crania together to make this newsletter a reality. The wide spectrum of articles in different sections gives me a sense of pride that our students and professors possess creative potential and original thinking in ample measures. Each article is entertaining, interesting and absorbing.

Students' holistic development starts when they engage in activities other than academics. I take this opportunity to request our students to take sincere efforts to embrace new challenges so that our next issue becomes a paperback. I can say proudly and confidently that, we as faculty team are ready to provide platform to realize students dream. So, start your music, think big and try hard to achieve your goals.

Dr. N. M. Masoodhu Banu, Ph.D
Professor

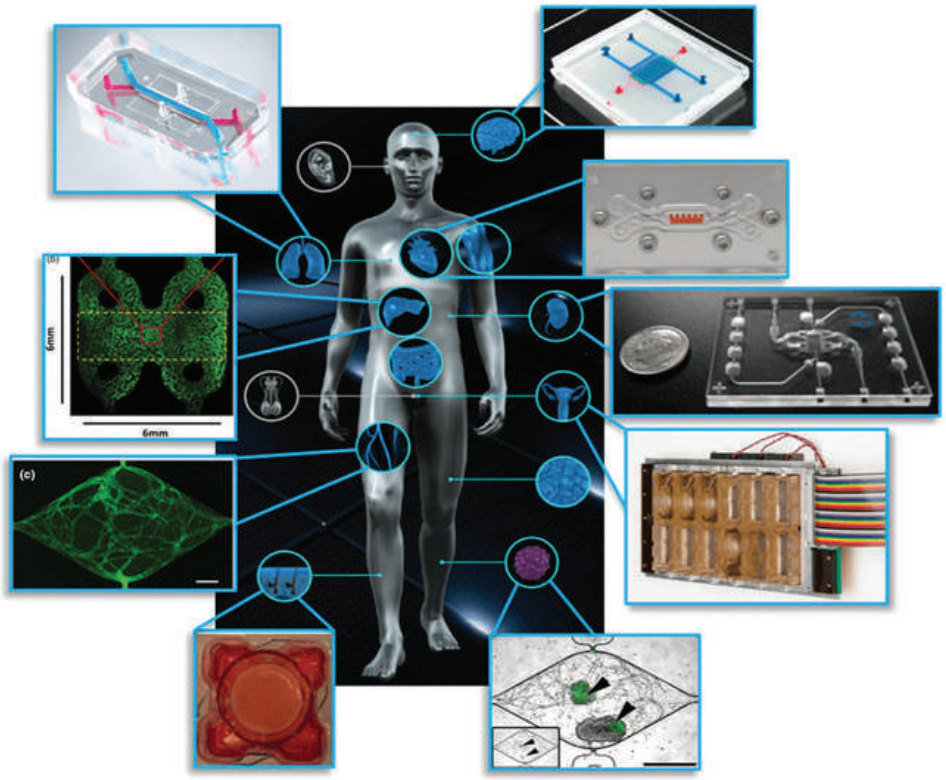
Faculty's Desk

"Talk-of-The-Town"
Organ-On-A-Chip

Organ-on-chip is an emerging technology that has broad applications in precision medicine, drug development, and toxicology from the perspective of different organs. OOC is a biomimetic system built on the microfluidic chip that mimics the environment of a physiological organ and its functions in vitro. OOC has been designed to overcome the failure of 2D cell culture systems and animal models.

OOC is a promising interdisciplinary technique emulating in vivo physiology and pathology for in vitro disease modeling, drug screening, and precision medicine. Multiple organs have been integrated in a single chip for different functions, for example, the gut compartment for drug absorbance, the liver compartment for drug metabolism, and the kidney compartment for drug elimination. Similarly, a heart-liver-skin organ system has been developed to analyze the effects of acute and chronic drug exposure on both heart and liver functions. Likewise, intestine, liver, skin, and kidney compartments are sequentially connected and have been integrated on a single platform with stable homeostasis across different organ compartments for testing the systemic toxicity of drugs.

The studies by different government agencies across the world, including the Food and Drug Administration (FDA) and National Institutes of Health (NIH) have continuously found the results from drug development and drug testing in preclinical animal samples are poorly predicting the responses in humans.



Ref: Low, L. A. & Tagle, D. A. Tissue chips – innovative tools for drug development and disease modeling. Lab Chip17, 3026–3036 (2017).

The future perspective of OOC is to integrate sensors into the chips, which monitor key physiological parameters easily in an effective and efficient way. Multi organ-on-chip have been designed and the ultimate goal of OOC is to integrate all organs into a single chip to finally achieve Human-on-a-chip for drug testing.

Dr. Thiyam Deepa Beeta, Ph.D
Assistant Professor

Department Cites

- The Department of BME has organized three webinars by inviting the industry personnel, whose information is given below
  - Webinar on "From neuroscience to product commercialization" by Dr. Dhanush R, Research Associate, III, Biomedical Division, Department of Applied Mechanics, IIT, Madras - 12.7.2020
  - Webinar on "Laboratory Instruments and Career Opportunities" by Mr. Shahul Moideen, Technical Service Specialist, Abbott Diagnostic division, Oman - 17.7.2020
  - Webinar on "Importance of Ultrasound in Healthcare" by Mr. Kailash Sreekandan, Ultrasound Business Head – Gulf, Jordan & Lebanon, Siemens Healthineers, UAE - 17.7.2020

- The Department of BME has organized an event visit to Medicall - 2019 at Chennai Trade Centre, Nandambakkam, Chennai on 27.7.2019

- The Department of BME has organized a workshop entitled "DSP Processor Hands on" by Mr T Anatha Velavan on 14.9.2019

- To bridge the gap between industry expectation and department learning outcomes, the Department of BME has organized two programs by inviting the experts both from industry/abroad, whose details are given below
  - "Fundamentals of BioMEMS and Microfluidics" by Dr. Arvind Chandrasekar, North Carolina A&T, State University, USA - June 27- 29, 2019

  - "Plant Biodiversity, Bio prospecting and the Sustainable Development Goals (SDGs)" by Prof. Takashi Watanabe and Prof.Raju Aedla from Kumamoto University, Japan - Jan 27-29, 2020

Research Activities

A. Funded Projects

- The faculties in the Department of BME have obtained funded projects, whose details are given below.

  - Dr. Thiyam Deepa Beeta under the title "Multiclass motor imagery EEG signals classification for Brain Computer interfacing systems"
  - Dr. G Saranya under the title "Compressed sensing using optimization techniques"

B. Research Articles

- The faculties in the Department of BME have published articles in national/international journals/conferences, whose details are given below.

S.No	Author and Title	Name of the Journal/Conference	Year of publication
1	Prasanna Ram, N.M.Masoodhu Banu, Effect of copper and graphene material on bow-tie structured antenna for 1.2 GHz application	Radio electronics and Communications Systems	2019
2	Ganeshlenin Kandasamy, Recent advancements in manganite perovskites and spinel ferrite-based magnetic nanoparticles for biomedical theranostic applications	Nanotechnology	2019
3	Ganeshlenin Kandasamy, Atul Sudame, Dipak Maity, Shalini Soni, Kumari Sushmita, Naga Suresh Veerapu, Suryasarathi Bose, and C.V. Tomy, Multifunctional magnetic-polymeric nanoparticles based ferrofluids for multi-modal in vitro cancer treatment using thermotherapy and chemotherapy	Journal of Molecular Liquids	2019
4	Saranya G, An efficiet Data Hiding Method in Images	International Journal of Electrical and Computer Engineering	2019

5	Arunkumar Kathiravan, Annasamy Gowri, Themmila Khamrang, Madhu Deepan Kumar, Namasivayam Dhenadhayalan, King-Chuen Lin, Marappan Velusamy, and Madhavan Jaccob, Pyrene-Based Chemosensor for Picric Acid - Fundamentals to Smartphone Device Design	Analytical Chemistry	2019
6	Annasamy Gowri, Rajendran Vignesh, Arunkumar Kathiravan, Anthracene based AIEgen for picric acid detection in real water samples	Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy	2019
7	Annasamy Gowri, Vijayakumar Veeraragavan, Murugavel Kathiresan, Arunkumar Kathiravan, A pyrene based colorimetric chemosensor for CO2 gas detection triggered by fluoride ion	Chemical Physics Letters	2019
8	S Vennila Preethi, Sunaina M Cherian, Two layer model to simulate trans dermal drug delivery for skin psoriasis	International Journal of Pharmaceutical Sciences And Research	2020
9	N.M.Masoodhu Banu, Merline A, Sujithra T, PO Assessment and Attainment through POGIL Based Classes	Journal of Engineering Education Transformation	2020
10	M. Brindha, R. Shelishiyah, Vasantha Valli, Molecular Docking Analysis of CFTR Inhibitors	2020 IEEE sixth International Conference on Biosignals, Images and Instrumentation (ICBSII2020)	2020
11	Arunkumar Kathiravan, Annasamy Gowri, Venkatesan Srinivasan, Trevor A. Smith, Muthupandian Ashokkumar and Mariadoss Asha Jhonsi, A simple and ubiquitous device for picric acid detection in latent fingerprints using carbon dots	Analyst	2020

C. Invited Talks

- The faculties in the Department of BME have given invited talks in other institutions, whose details are given below
  - Dr. N.M.Masoodhu Banu has given invited lecture on "DSP Processor Architecture and programming" at K.L.N College of Engineering, Pottapalayam, Sivaganga

- Dr. N.M.Masoodhu Banu has given invited lecture on "Brain Computer Interface" at Sethu Institute of Technology, Kariapatti

D. Faculty Development Program

The faculties in the Department of BME have attended Faculty Development Program (FDP), whose details are given below.

S.No	Name of Faculty	Name of FDP	Date of FDP (From Date To Date)	Institution
1	Dr. Thiyam Deepa Beeta	Medical Image Processing	19/05/2020 to 25/05/2020	Kalasalingam Academy of Research and Education
		Preparing for NBA Accreditation with a case study of course and Program Outcomes Attainment	28/05/2020 to 30/05/2020	IQAC of AISSMS IOIT, Pune
		Health care and Clinical Research	4/6/2020 to 10/6/2020	Sathyabama Institute of Science and Technology
		Get ready for AI with Matlab and Simulink	18/6/2020 to 20/6/2020	Sai Ram Engineering College
2	Dr. G Saranya	Preparing for NBA Accreditation with a case study of course and Program Outcomes Attainment	28/05/2020 to 30/05/2020	IQAC of AISSMS IOIT, Pune
		Health care and Clinical Research	4/6/2020 to 10/6/2020	Sathyabama Institute of Science and Technology
		Get ready for Ai with Matlab and Simulink	18/6/2020 to 20/6/2020	Sai Ram Engineering College

S.No	Name of Faculty	Name of FDP	Date of FDP (From Date To Date)	Institution
3	Ms. Shelishiyah Raymond	Health care and Clinical Research	4/6/2020 to 10/6/2020	Sathyabama Institute of Science and Technology
		Get ready for Ai with Matlab and Simulink	18/6/2020 to 20/6/2020	Sai Ram Engineering College
4	Ms. Sunaina Mariam Cherian	Get Ready for AI with Matlab and Simulink	18.06.2020 to 20.06.2020	Sai Ram Engineering College
		Medical Image Processing	19.05.2020 to 25.05.2020	Kalasalingam Academy of Research Education
5	Mr. V Karthik Raj	AI and IoT for Medical Applications	01.06.2020 to 03.06.2020	GMR Institute of Technology
		Artificial Intelligence in Healthcare Sector	08.07.2020 to 10.07.2020	Karpaga Vinayaga College of Engineering and Technology
		E-content Development for Higher Education	23.05.2020	Karpaga Vinayaga College of Engineering and Technology
		Get Ready for AI with Matlab and Simulink	18.06.2020 to 20.06.2020	Sri Sai Ram Engineering College
		LaTeX	25.05.2020 to 31.05.2020	Karpaga Vinayaga College of Engineering and Technology
		Learning through Gamification	30.04.2020	PSNA College of Engineering and Technology
		Machine learning techniques for brain computer interface applications	30.07.2020 to 01.08.2020	Karunya institute of technology and science

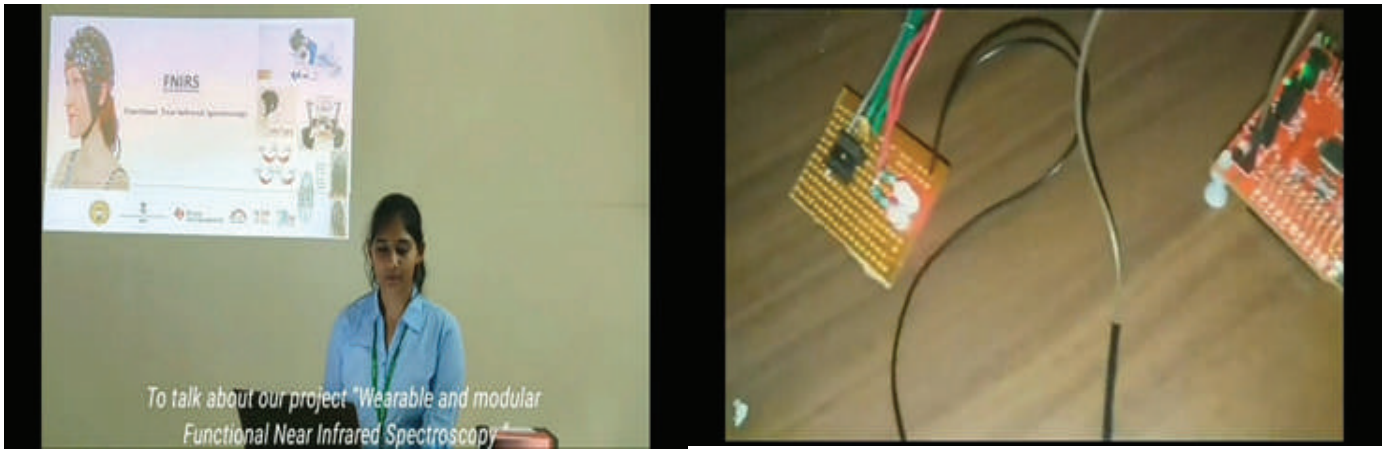
S.No	Name of Faculty	Name of FDP	Date of FDP (From Date To Date)	Institution
		Preparing for NBA Accreditation with a Case Study of Course and Program Outcomes Attainment	28.05.2020 to 30.05.2020	AISSMS Institute of Information Technology
		Role of Robotics and AI during COVID-19	03.05.2020	VELS Institute of Science, Technology & Advanced Studies
6	Mrs. Dhana Sony C	Recent Trends in Biomedical Application	13.07.2020 to 17.07.2020	Karunya institute of technology and science
7	Dr. K. Ganeshlenin	Health care and Clinical Research	4/6/2020 to 10/6/2020	Sathyabama Institute of Science and Technology
		Advancements in Biomedical Engineering	16/7/2020 to 18/7/2020	Karpaga Vinayaga College of Engineering and Technology
		Emerging Trends in Biomedical Engineering	10/6/2020 to 16/6/2020	Kalasalingam Academy of Research and Education

Student Cites

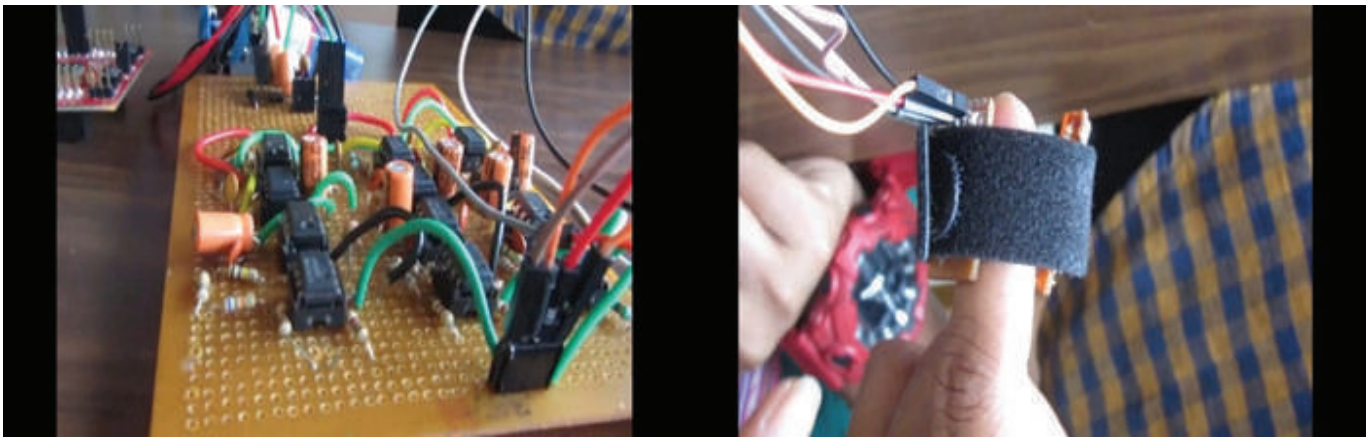
- At the India Innovation Challenge Design Contest 2019 (IICDC) conducted by Texas Instruments three student teams from undergraduate Biomedical Engineering have been screened for quarterfinal phase and got their Texas Instruments MSP430 boards and the required additional component from Texas free of cost. The student team details are given below.

S.No	Student Team	Project Mentor	Project Title
1	G. S. Shrinidhi D. Perumal M. Praveen Kumar R. Bala Krishnah K. Karthick M. Subhiksha	Ms. Sunaina Mariam Cherian	Wearable and Modular Functional Near Infrared Spectroscopy

S.No	Student Team	Project Mentor	Project Title
2.	Minhajul Ahmed, Jeffery Calwin, Sushanto Das, MD.Azaharuddin Ansari, Sweta Jha, Carlin Sagunthala	Dr. Thiyam Deepa Beeta	Watchdog Multiple Physiological System
3.	Steve, Sneha Saji, Sushmita, Renie Malvina, Lahun	Dr. N. M. Masoodhu Banu	Low Cost BCI Headset



Wearable and Modular Functional near infrared spectroscopy



Watchdog Multiple Physiological System

- Students have participated in activities apart from their curriculum and the list of activities participated is given in the below table.

S.No	Name	Event	Organised By
1	Shehin Shajahan	Football match	Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology
2	Jayanth V	Cycling fitness challenge Cycling (organ donar ride) Virtual ride event	Uzhavan sports arena JCI CLUB Uzhavan sports arena
3	Md. Azaharuddin Ansari	1st Last Square Chess Academy Rapid & Blitz District Level Open & Children Chess Tournament – 2019"	Last Square Chess Academy (LSCA)
4	Akash.D	100 and 1500 meters Running	Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology
5.	Renie Melvinia Basaiawmoit	Book review - Wonder Wisdom	Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology

MD. Azaharuddin Ansari at 1st and Last Square Chess Academy Rapid & Blitz District Level Open and Children Chess Tournament

Jayanth. V at Gift-An-Organ Campaign

Student's Think-Piece

Biomedical Engineering (BME) is an interdisciplinary field that integrates the concepts from several engineering disciplines as well as medicine for innovation, design and manufacturing of new medical devices, for maintenance of the existing medical devices and many more. In other words, BME is bridge that connects medical discipline with engineering discipline to provide better healthcare application.

BME includes the concepts from several engineering streams such as Electrical and Electronics Engineering, Mechanical Engineering, Computer Science along with Medicine, which makes it different than other engineering streams. We can also say it's all in one!

There was always a gap between medicine and engineering i.e. doctors only has knowledge about the human body but they aren't taught about engineering concepts due to which they can't come up with any solution to create any medical device on their own. In the similar way, engineers (other than BME) only has knowledge about engineering concepts but no idea about the human body which makes then incompatible in designing medical devices. Now, doctors and engineers can solve this issue by working together which is good idea but here it difficult for engineers to think from the doctor's perspective as they still lack the knowledge about human body. At this point, the biomedical engineer plays a vital role to fill this gap between doctor and engineer as he/she is familiar with both concepts i.e. medical as well as engineering.

Good thing about BME is that he/she fits in any stream but at the same time it's a time taking process and one should be sincere to his/her work and patience during the journey. A biomedical engineer has to spend lots of time to gain knowledge as he/she has to learn about the entire engineering stream along with medical principles. Some of the specializations of BME are :

- Bioinstrumentation: It is the application of electrical and electronics engineering principles in healthcare application by maintaining, designing and developing medical devices.
- Biomechanics: It is the study of reaction of human body structure, function due to any kind of force, motion.
- Rehabilitation engineering: It is the application of engineering principles to design and develop devices to aid the disabled peoples and helps in healing process of physical or cognitive loss of function due to any reasons.
- Biomaterials: It deals with the materials which can be used for the designing and development of the implantable and extracorporeal devices.
- Brain computer interface (BCI): Brain computer interface is also called as brain-machine interface sometime. It deals with the recording, analyzing and converting the brain signal to control any device to perform some specific functions.
- Clinical engineering: It is the application of engineering principles in hospitals. A clinical engineer involves with the doctors, nurses and other staffs to utilize the health care facilities effectively and to maintain and manage the database.

BME has enormous scope and have very good employment opportunity. A biomedical engineer can work in several places such as hospitals, rehabilitation centers, government, pharmaceutical industry, manufacturing, molecular biology industry, educational institutions, etc for management, innovation, design and development of new technologies.

Note: There is a big confusion among the students who want to deep dive into BME in their bachelor is that he/she doesn't have to study mathematics much but in reality, he/she will be studying concepts of mathematics during his/her bachelor and then it depends upon the specialization they choose for their post-graduation whether it includes mathematics in large part or not. For example, if a student is choosing signal processing as his/her post-graduation program then surely, he/she has to study mathematics in large portion of the syllabus but if he/she chooses tissue engineering for his/her post-graduation program then he/she don't have to study mathematics much.

Some new concepts evolving around the world in the field of biomedical engineering: As we know, Neurons can communicate with each other by using chemical and electrical signals. Light is the source of energy that can be converted to electrical signal. There are several types of cells having different functionality. And there are different types of neuron cells such as basket cells which inhibit their targets, pyramidal cell excites the target. Now some microorganism has light sensitive protein which responds to certain wavelength of light. So, some researchers took such light sensitive proteins from microorganism and inserted it in neuron to control some specific kind of neurons or the neurons at a specific area of the brain using light.

In the similar fashion, light is also very important factor for maintaining proper circadian rhythm. Recent research has shown there is another kind of cell apart from rods and cones in the eyes called as intrinsically photosensitive retinal ganglion cell (ipRGCs) which does not contribute to the vision but sends the signal directly to the super-chiasmatic nucleus which lead to the suppression of melatonin often called as sleep hormone. Therefore, it is highly possible to balance our circadian rhythm by controlling the light around us. And this can improve the productivity of people and can prevent from several disease caused due to sleep disturbance

Azaharuddin Ansari
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