



**MANIPAL SCHOOL OF LIFE SCIENCES**

**MANIPAL**

*(A constituent unit of MAHE, Manipal)*

# VIVUS

*A Blend of Science, Creativity & Fun*

**Issue 7.3, April - June 2021**



## WHAT'S INSIDE:

*Events*

*Worldwide Science*

*Guest Interviews*

*Zen Pen*

*Creative Nook*

# From the Editor

***Time moves irrespective of anything in this universe. Everyone has waved their hands to the gloomy days of the viral 2021, expecting some “Positive Vibes” ahead this year.***

## Dear Readers,

We hope you all are doing well. We are extremely pleased to present you with the most awaited newsletter of MSLS, VIVUS 7.3. As our tagline says, this issue is ***“A Blend of Science, Creativity and Fun.”*** Creativity is a conserved trait within humans that is expressed on a context basis. We generally go through a diverse set of situations during our lifetime. The creativity within us is expressed to the maximum when we are on the verge of losing something or ascending the heights or accidentally. This creativity which I mean not only includes extra-curricular activities but making Science more interesting as well. Just a ***“swipe”*** on your smartphone will enable you to browse millions of contents but only something creative catches your attention and prevents you from scrolling-up. In the present world, the term ***“Viral”*** is mostly used, which implies that the majority of the people are getting attracted by that specific content. In this competitive world, one has to be as creative as the word ***“Euouae”*** if not, your work is going to be ***“floccinaucinihilipilificated”***.

In this issue of the newsletter (Apr 2021 to Jun 2021), we bring you the summary of the Events organized at MSLS. Science as always is going to be interesting especially when you make new connections. The newsletter has a gist of talks from some of our most valued MAHE alumni and Guest Lectures from some of the leading scientists working in different fields across the globe. This issue also showcases the research highlights of MSLS along with the inspiring interviews of Prof. Dai Kato and Prof. Ryoji Kurita.

**VIVUS 7.3** is packed with interesting articles which will ***“Relieve your stress”***, make you think of the ***“Hidden scientists”***, tell you about ***“how to charge yourself, the life before and after COVID”***, and suggest you ***“ways to invest your money”*** (so that you don't get bankrupt). Articles that integrate Science and lifestyle like the ***fast fashion, and the planet*** and you will come to know how the ***“plants sense their sisters”***.

As said by Issac Newton “If I have seen further, it is by standing on the shoulders of giants”, we are delighted to present you with the thought-provoking interviews of Prof. Dai Kato (AIST, Japan) and Prof. Ryoji Kurita (AIST, Japan). We wholeheartedly thank **Prof. Dai Kato-san** and **Prof. Ryoji Kurita-san** for providing us with their valuable time. Further, we travel to “Chanderkhani Pass” in our travelogue section, while the poets amongst us describe “rainy day” and “crossroad”. As you move ahead you have colorful paintings, drawings, and also beautiful photographs. An overview of ***“Spirituality and Science”*** and a challenging crossword to wrap up.

We hope that you will have a great time reading. This newsletter is an outcome of several ideas which are organized with the support of our beloved Director, **Dr. K. Satyamoorthy** and we sincerely thank him for his unwavering support. We owe immense gratitude to our faculty advisors, **Dr. TG Vasudevan, Dr. Vidhu Sankar Babu** and **Dr. Saadi Abdul Vahab** for their valuable suggestions in improving the output.

We thank the **editorial team** of VIVUS 7.3 for their hard work in making this happen. First and foremost a huge thanks to all the authors, artists, photographers and designers who have provided us with their mesmerizing works. We extend our thanks to **Mr. Ankit Singh Tanwar, Ms. Arya K, Ms. Manasa G Shetty, Mr. Dinesh Reghunathan, Mr. Nadeem Khan G, Ms. Rekha KN.** for organizing and compiling the content. We also heartfully thank **Ms. Indira, Ms. Sindhoora KM, Mr. Sriharikrishnaa S, Ms. Aswathy S Nair, Ms. Soundaryaa Bargunam, Mr. Darshan CM** and **Ms. Shruptha Padival** for their help in editing the articles.

**Once again, we thank each and everyone who has contributed to make VIVUS in shape.  
We sincerely believe that this newsletter will generate some good vibes within you.  
“Creativity is contagious and let it spread”.  
Have a Great Time Reading...!**



**Mr. Sampara Vasishtha**  
Editor

# Presenting VIVUS: Volume 7, Issue 3 Manipal School of Life Sciences, MAHE, Manipal



**Cover Photo "Tranquility" by: Panchami P.**  
(location: Maravanthe Beach)

## MAGAZINE DESIGN



**Mr. Ankit Singh Tanwar**



**Ms. Arya K.**

## COMPILATION



**Mr. Dinesh Reghunathan**



**Mr. Sampara Vasishta**



**Mr. Nadeem Khan G**



**Ms. Rekha KN**



**Ms. Manasa G Shetty**

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# A SNEAK PEEK

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2. Universal Access to Vaccine & Medicines Campaign

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4. PhD Viva-voce
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2. Prof. Ryoji Kurita

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# EVENTS





# INTERNATIONAL YOGA DAY

As per the directives of UGC, New Delhi and keeping in view the protocols and advisories issued by the Government of India/UGC/State Government for prevention of COVID pandemic, Manipal School of Life Sciences observed International Yoga Day on Jun 21, 2021, by organizing an essay competition for the faculty, students, research scholars and staff of the School. The essay competition titled “Yoga – A path to physical and spiritual healing” was held. The completed essays were uploaded to the institutional mail. Out of the essays received 3 essays were selected for the awards.



## UNIVERSAL ACCESS TO VACCINE & MEDICINES CAMPAIGN

As per the directives of UGC, New Delhi and keeping in view the protocols and advisories issued by the Government of India/UGC/State Government for prevention of COVID pandemic, Manipal School of Life Sciences conducted an essay writing competition on the topic “Universal Access to Vaccine & Medicines Campaign” for the faculty, students, research scholars and staff of the School. Everyone actively participated in the competition. The completed essays were uploaded to the institutional mail. Out of the essays received, 3 essays were selected for the awards.



# WORLDWIDE SCIENCE





# ALUMNI Engagement



## Dr. Swati Suresh Dudhal

Scientist & Project leader at Pitie-Salpetriere Hospital, Paris, France

MSc MBHG 2011-2013

**Lecture Title:** *Selenoprotein N as a novel regulator of the muscle progenitor's cell fate decision process: balancing differentiation and self-renewal*

24/4/2021

## Dr. Dhanya K. Nambiar

Instructor, Department of Radiation Oncology, Stanford University, Stanford, USA

BSc Biotechnology 2003-2006 and MSc MBT 2006-2008

**Lecture Title:** *Galectin-1 Mediated Immune Evasion in Head and Neck Cancers*



22/5/2021

## Dr. Venu Seenappa

Manager- Division of Molecular Genetics, LifeCell International Pvt. Ltd., Chennai

PhD (completed 2017)

**Lecture Title:** *Diagnosis of Single Gene Disorders - An Application of Molecular Assays*



26/6/2021

21/4/2021



***Title: Supramolecular Chemistry for Bio-applications:  
Responsive Nanocarriers for RNA Delivery***

**Dr. P. K. Hashim**

Project Researcher, Department of Chemistry and  
Biotechnology, The University of Tokyo, Japan

1/6/2021

***Title: A Journey from Nanobot to Drexler's Engines of Creation***

**Dr. Anirban Bandyopadhyay**

Principal Research Scientist, International Center for Materials  
and Nanoarchitectonics (MANA) & Research Center for the  
Advanced Characterization and Measurements (RCACM), National  
Institute for Materials, Science (NIMS), Tsukuba, Japan



## DAILAB-CAFE

15/6/2021



***Title: Delineating the metal ornamented nanocomposite and  
role of transcriptional pathway during in vitro wound healing***

**Dr. Harishkumar Madhyastha**

Department of Cardiovascular Physiology, School of Medicine,  
University of Miyazaki, Miyazaki, Japan

***Title: Measurements of cancer cell properties by using "magcups"***

**Dr. Hyonchol KIM**

Cellular and Molecular Biotechnology Research Institute., The  
National Institute of Advanced Industrial Science and Technology  
(AIST), Japan, Department of Biotechnology and Life Science.,  
Tokyo University of Agriculture and Technology (TUAT), Japan

17/6/2021



18/6/2021



***Title: Basic and application of ostracod bioluminescence***

**Prof. Yoshihiro OHMIYA**

National Institute of Advanced Industrial Science & Technology,  
(AIST), Japan, Osaka Institute of Technology (OIT), Japan

# GUEST LECTURES



## Dr. Rajendra Prasad

Dean, Faculty of Science, Engineering and Technology,  
Director, Amity Institute of Integrative Sciences and Health,  
Director, Amity Institute of Biotechnology, Amity University, Gurgaon, Haryana



**Lecture Title:** "A journey of 25 years with a multidrug transporter: a lot more to discover"

16/4/2021

## Dr. Anita Mahadevan

Professor, Department of Neuropathology, NIMHANS, Bangalore, Karnataka



**Lecture Title:** "Looking Back: Two Decades of Brain Banking in India"

3/5/2021

## Dr. Rajeev K Sukumaran

Senior Principal Scientist & Head, Microbial Processes and Technology Division, CSIR-National Institute for Interdisciplinary Science and Technology, Thiruvananthapuram, Kerala



**Lecture Title:** "Large scale gene expression analysis for understanding microorganism response to environmental cues"

29/5/2021

# GUEST LECTURES

## Dr. R. Sathish Kumar

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Professor & Head,  
Department of  
Biotechnology,  
Bharathiar University,  
Coimbatore, Tamil  
Nadu

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Lecture Title: "Plant  
Metabolic Engineering- an  
overview with case studies"

5/6/2021

## Dr. Sriram Sridharan

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Bioinformatics Analyst  
Genomics Analysis  
Laboratory  
Salk Institute for  
Biological Studies, La  
Jolla, CA, USA

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Lecture Title: "Genomic  
signatures underlying DNA  
replication stress:  
A Clinical Relevance"

12/6/2021

## Dr. Chinnarajan Ravindran

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Biological  
Oceanography  
Division  
CSIR - National  
Institute of  
Oceanography,  
Dona Paula, Goa

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Lecture Title: "A zebrafish  
model for host-pathogen  
interaction"

18/6/2021

## Dr. Murali Krishna Ghatkesar

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Assistant Professor of  
Micro and Nano  
engineering,  
Department of  
Precision and  
Microsystems  
Engineering, Technical  
University (TU) – Delft,  
Netherlands

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Lecture Title:  
"Micromechanical probes for  
cellular and sub-cellular  
analysis"

28/6/2021

THE LONG WAIT IS OVER!



# PhD *Viva-voce* examinations

Year 2021

**Candidate:** Ms. Supriti Ghosh

**Examiner:** Prof AJS Bhanwer,  
Department of Human Genetics  
Guru Nanak Dev University, Amritsar



**Candidate:** Ms. Mangala Hegde

**Examiner:** Dr. Sanjay Gupta,  
Cancer Research Institute, ACTREC,  
Tata Memorial Center, Kharghar,  
Navi Mumbai



**Candidate:** Ms. Melisa Jovita Andrade

**Examiner:** Dr. Paturu Kondaiah,  
INSA Senior Scientist,  
Department of Molecular Reproduction,  
Institute of Science, Bangalore



# PUBLICATIONS

## Analysis of Nuclear Encoded Mitochondrial Gene Networks in Cervical Cancer

Meneur C, Eswaran S, Adiga D, S S, G NK, Mallya S, Chakrabarty S, Kabekkodu SP.

***Asian Pac J Cancer.***

## RPA facilitates rescue of keratinocytes from UVB radiation damage through insulin-like growth factor-I signalling

Andrade MJ, Van Lonkhuyzen DR, Upton Z, Satyamoorthy K.

***J Cell Sci.***

## Cytotoxicity and radiosensitizing potency of Moscatilin in cancer cells at low radiation doses of X-ray and UV-C

Pujari I, Thomas A, Thomas J, Jhavar N, Guruprasad KP, Rai PS, Satyamoorthy K, Babu VS.

***3 Biotech.***

## Repositioning of antidiabetic drugs for Alzheimer's disease: possibility of Wnt signaling modulation by targeting LRP6 an in silico based study

Manandhar S, Priya K, Mehta CH, Nayak UY, Kabekkodu SP, Pai KSR.

***J Biomol Struct Dyn.***

## Native and non-native host assessment towards metabolic pathway reconstructions of plant natural products

Pujari I, Thomas A, Sankar Babu V.

***Biotechnol Rep (Amst).***

## **Advances in development and application of human organoids**

Shankaran A, Prasad K, Chaudhari S, Brand A, Satyamoorthy K.

**3 Biotech.**

## **He-Ne laser accelerates seed germination by modulating growth hormones and reprogramming metabolism in brinjal**

Swathy PS, Kiran KR, Joshi MB, Mahato KK, Muthusamy A.

**J Cell Sci.**

## **Label-Free Characterization of Collagen Crosslinking in Bone-Engineered Materials Using Nonlinear Optical Microscopy**

Hung CW, Mazumder N, Lin DJ, Chen WL, Lin ST, Chan MC, Zhuo GY.

**Microsc Microanal.**

## **Targeting receptor-ligand chemistry for drug delivery across blood-brain barrier in brain diseases**

Anthony DP, Hegde M, Shetty SS, Rafic T, Mutalik S, Rao BSS.

**Life Sci.**

## **A comprehensive review on the carcinogenic potential of bisphenol A: clues and evidence**

Khan NG, Correia J, Adiga D, Rai PS, Dsouza HS, Chakrabarty S, Kabekkodu SP.

**Environ Sci Pollut Res Int.**

## **Brief review on repurposed drugs and vaccines for possible treatment of COVID-19**

De P, Chakraborty I, Karna B, Mazumder N.

**Eur J Pharmacol.**

## **Comprehensive analysis of regulation of DNA methyltransferase isoforms in human breast tumors**

Hegde M, Joshi MB.

**J Cancer Res Clin Oncol.**

## Untargeted metabolomics and DNA barcoding for discrimination of *Phyllanthus* species

Kiran KR, Swathy PS, Paul B, Shama Prasada K, Radhakrishna Rao M, Joshi MB, Rai PS, Satyamoorthy K, Muthusamy A.

*J Ethnopharmacol.*

## Recent trends in smartphone-based detection for biomedical applications: a review

Banik S, Melanthota SK, Arbaaz, Vaz JM, Kadambalithaya VM, Hussain I, Dutta S, Mazumder N.

*Anal Bioanal Chem.*

## Elucidating Methods for Isolation and Quantification of Exosomes: A Review

Kurian TK, Banik S, Gopal D, Chakrabarti S, Mazumder N.

*Mol Biotechnol.*

## Contribution of nuclear and mitochondrial gene mutations in mitochondrial encephalopathy, lactic acidosis, and stroke-like episodes (MELAS) syndrome

Chakrabarty S, Govindaraj P, Sankaran BP, Nagappa M, Kabekkodu SP, Jayaram P, Mallya S, Deepha S, Ponmalar JNJ, Arivinda HR, Meena AK, Jha RK, Sinha S, Gayathri N, Taly AB, Thangaraj K, Satyamoorthy K.

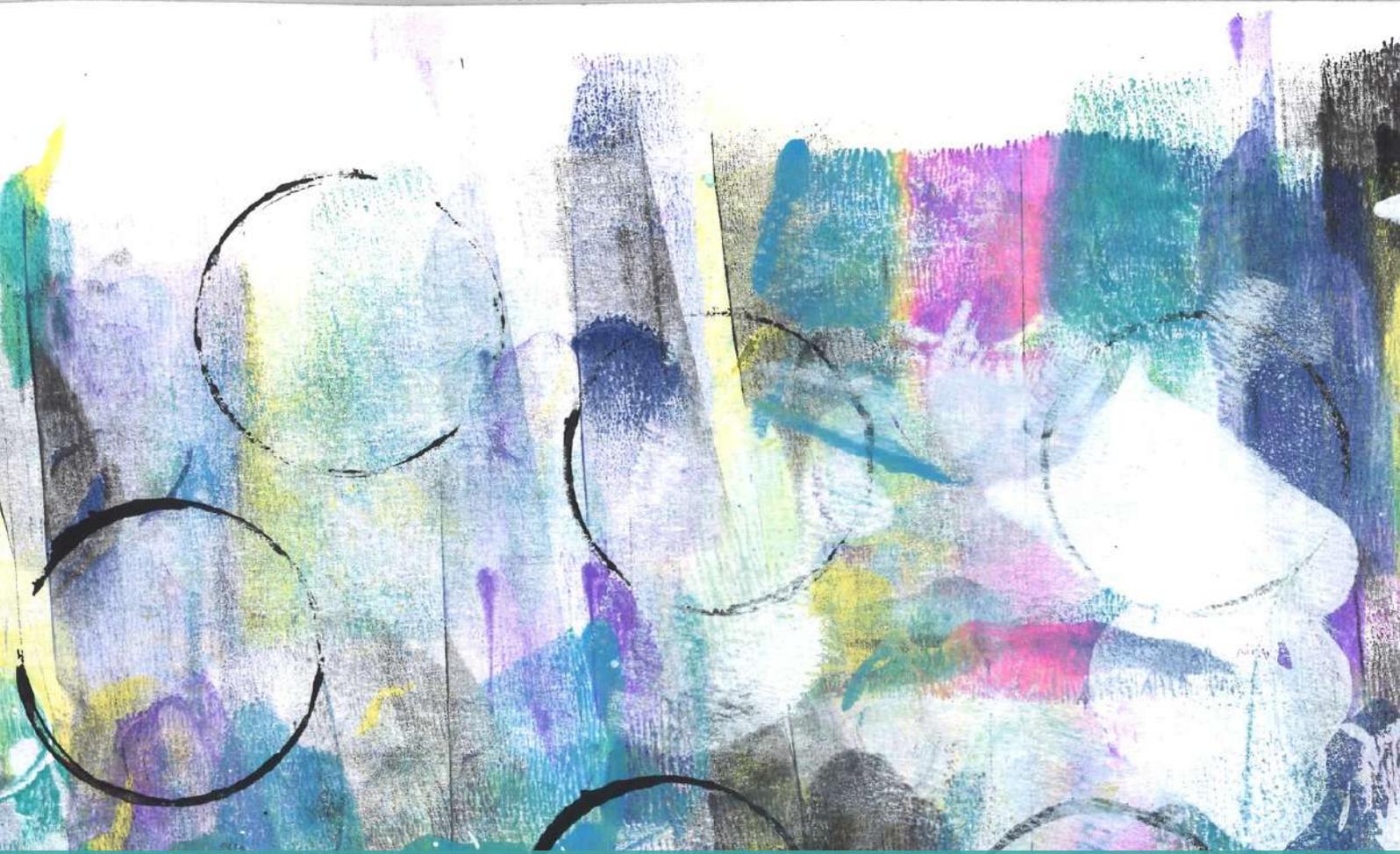
*J Neurol.*

## Influence of VDR and HFE polymorphisms on blood lead levels of occupationally exposed workers

Mani MS, Puranik A, Kabekkodu SP, Joshi MB, Dsouza HS.

*Hum Exp Toxicol.*





# INTERVIEWS



**Interviewer:** Sima Chaudhari  
PhD scholar, Department of Cell and Molecular Biology  
**Transcribed by:** Dinesh Reghunathan  
PhD scholar, Department of Cell and Molecular Biology

**Both the interviews were conducted online**



## PROF. DAI KATO

### PERSONAL PROFILE

I am Dai Kato from AIST, Japan. Thank you for giving me this opportunity. First, I would like to introduce myself. I majored in polymer chemistry in graduate school in 1998. This was the beginning of my career as a researcher. In the Masters course, I developed biodegradable polyamino acid (microparticles or films) for cell culture, and in the Doctoral course, I studied the ultrathin film of polysiloxane for permselective membrane. In 2003, I received my PhD in Polymer Chemistry. After that, I came to AIST and started studying nanocarbon films for electroanalysis of various analytes such as biomolecules, foods and environmental substances. Therefore, I have consistently been working in material sciences in my research career.

Now, I would like to reply to the interview questions given by Sima-san (-san is an honorific title in Japanese). Sima-san stayed in our lab for 2 months in 2019 and worked with us. Please note that these replies are my opinions as an individual.

### **1. How do you perceive research environment in modern science? How has it changed over the years?**

When I started my research in 1998, the Internet was just beginning to spread. I feel that we are now in a convenient environment where we can easily access a lot of information about research. Meanwhile, due to the overabundance of information, it has become time-consuming to sort out and extract the truly necessary information. I also feel that the human network has changed. In fact, in the case of my research, I have established collaborations with researchers whom I have never met face-to-face but only through the web. This was more accelerated under the COVID-19 situation. From the above, in terms of the research environment, I recognize that the values of information and human networks are changing drastically. By the way, in 1998, the submission of research papers was mainly done by mailing hard copies, not by electronic submission as now. Can you imagine?

### **2. What is your envisioned aspect in scientific research, which inspired you to get into the field?**

I think the most fascinating aspects of scientific research are the ability to create new materials and discover new phenomena. Therefore, I believe that “researchers” are also “creators”. Creators should be the ones who give empathy to someone. The material sciences that I have been consistently working on is a broad research field that can create many new materials and contribute and inspire various fields.

### ***3. Could you share some insights on exciting developments in the field of nanotechnology?***

Nanotechnology has been integrated into many research fields and has contributed to innovative developments. One of the most successful and familiar examples is genome sequencing technology. For example, both the SMRT sequencing technology (PacBio) and the Nanopore sequencing technology (e.g., Oxford Nanopore Technologies) use nanostructured substrates as the PCR reaction site. The combination of these nanotechnologies has resulted in a great breakthrough in the current performance of genome sequencing.

### ***4. How is the carbon film-based electrochemical detection system efficient over others?***

An electrochemical method is based on the oxidation/reduction reaction of the target substance. The electrochemical method offers some advantages such as direct and highly sensitive detection. In addition, the detector can be configured in a compact size, making it suitable for on-site measurement. On the other hand, the disadvantage is that the target substances are limited to those that can be electrochemically reacted on the electrode. Therefore, we have developed nanocarbon films as electrode materials to realize the versatility of target substances. We have realized the direct detection of methylated cytosine in DNA and the glial transmitter kynurenic acid using this nanocarbon film electrode. This is advantageous over other electrodes such as conventionally available metals and graphite carbon electrodes because these analytes cannot be measured sensitively with the above electrodes. We have also achieved highly sensitive detection of the musty odor compound geosmin. The chemical structure of geosmin is not active for fluorescence, UV, or electrochemical detection, so it has only been detectable by mass spectrometry. We have developed a nanocarbon electrode embedded with platinum nanoparticles, which allows geosmin to cause an oxidation reaction, and have found that it is capable of electrochemical detection of geosmin. This enables us to realize on-site measurement of geosmin in soil. Since there have been few reports of electrochemical detection of the three analytes mentioned above, we believe that the nanocarbon film is a promising electrode material.

### ***5. Can you kindly shed some light on how to approach failed experiments and advise the young researchers on how to troubleshoot experimental errors?***

In my case, I have experienced many more failed experiments than successful ones. Since research is about clarifying what is unclear for us, experiments are supposed to be more likely to lead to failure. I think if all experiments were successful, research would not be interesting. The results of failures will feed the next success, so the most important point in the research process is to consider the failure data carefully by yourself. It is also important to have discussions with your boss and colleagues instead of thinking by yourself all the time. You might get some hints that you can't come up with on your own. I think the worst thing is to just repeat the experiment without considering the results of the failure. This makes the consideration more complicated as well as wasting time on unnecessary or similar experiments. And I think it is important how to accelerate the cycle of hypothesis/proof of concept in your study. Some researchers in the world are very efficient, fast, and productive in this cycle.

In a recent episode of my research, I studied the diffusion of fat-soluble vitamins by using electroanalysis with nanocarbon electrodes combined with the fluorescence correlation spectroscopy (FCS) method. The first six months after we started, there were many failures. This is because all experimental conditions (available instruments, solutions, equipment setup, etc.) that were optimized for each other were different. Once we found conditions that could be commonly used in both experiments, we got all the data in three months and finally published the paper (it took a total of one year!) (D. Kato et al., *Anal. Chem.*, 93, 14231 (2021)). Since this research was a new topic for me to start in a new environment, I was very happy to have our paper accepted.

## **6. What is the impact of exciting new nanocarbon film electrodes developed by your lab in the field of DNA methylation studies?**

The nanocarbon film electrode has attracted attention since we used it for the electroanalysis of methylated DNA. We have found that we can discriminate and detect both methylcytosine and cytosine bases by direct oxidation based on their different oxidation potentials using the nanocarbon film electrode. As an extended topic of this study, we tried to detect hydroxymethylcytosine in the genome at lower concentrations than methylcytosine. This research was challenged by the interviewer, Sima-san, who stayed in our lab for an internship. Although her stay was only two months, Sima-san and we have successfully published a paper on the results we got! (S. Chaudhari et al., Sens Actuators B, 314, 128092 (2020). Thank you once again, Sima-san!

## **7. Can you please share advice to young researchers on how to start their research career?**

I think the most important point is that you can talk about your research dreams in your future research career. So, in order to make sure that you can talk about your research from different viewpoints, you can try to get interested in various other fields. This includes constructing a human network. Secondly, as a realistic thing to do, I recommend that you do multiple research topics to keep producing research results. And finally, if you are an academic researcher, you must publish your work. Professor Whitesides of MIT, a famous professor in the field of chemistry, described in his paper: If your research does not generate papers, it might just as well not have been done. "Interesting and unpublished" is equivalent to "non-existent" (G. M. Whitesides, Adv. Mater., 16, 1375 (2004)). I perceive this to be a very simple but important message for researchers.

## **8. What is your opinion about collaborations with academic institutions and industries?**

I believe that collaboration is a good opportunity to further develop my own research. In fact, I am also collaborating with both academic and industrial institutions. I believe that meaningful collaboration with any institution can only be achieved on the basis of well-established basic research. Also, it takes time to get promising results from collaboration, so it is important to have good communication with each other.





# PROF. RYOJI KURITA

## PERSONAL PROFILE

Ryoji Kurita received his PhD from Kyushu University in the field of analytical chemistry in 2004. He is currently the leader of the Nano-biodevice Research Group in the Biomedical Research Institute of the National Institute of Advanced Industrial Science and Technology (AIST), Japan. His current research interests are biosensors and lab-on-a-chip systems for biomedical applications, especially epigenomics

### ***1. What is your approach towards science? Can you please enlighten us on your scientific journey so far?***

My research approach is to develop analytical system to reveal the functions of living organisms. In order to reveal complex and precise biological phenomena, it is necessary to develop new biomolecule measurement technology that could not be achieved by conventional system. I would like to solve these problems by precisely detecting proteins and nucleic acids with high spatiotemporal resolution and sensitivity, which has been impossible until now.

Specifically, we are conducting basic research on original biomolecule measurement technology that incorporates nanomaterials and bioanalysis, and we are also consistently conducting device development and real sample measurement. Lab members with diverse backgrounds (material science, surface science, micromachining technology, electrochemistry, nucleic acid chemistry, polymer chemistry, multivariate analysis technology, etc.) are gathered in our lab. With the cooperation of lab members, I would like to contribute to the development of next-generation medical care, drug discovery, and life science by making it possible to measure biomolecules easily and quickly.

### ***2. What does the future hold for research and scientific innovations in the field of electrochemistry?***

Electrochemistry is important in the field of energy. My major is analytical chemistry, not energy. I adopted electrochemical technique as one of the analytical methods and developed an electrochemical biosensor that measures neurotransmitters in the brain. I obtained a PhD, summarizing the electrochemical biosensor development and measurement results from brain cells. In order to measure neurotransmitters, there is a need to detect molecules with high sensitivity in a very small amount, and electrochemical analysis is considered to be one of the useful approaches.

Electrochemical analysis is low-cost and easy to create on a small device. In other words, it has merit as a principle of disposable biosensors. Until now, optical analysis methods such as fluorescence and luminescence have been the mainstream in biomolecule measurement. It is expected that the optical analysis will continue to be used in the research lab, but biomolecules that require "quick and simple measurement" will develop into electrochemical biosensors for home use. The blood glucose sensor is an example of a typical electrochemical sensor.

### **3. Could you share some strategies and approaches used in developing immunosensor to determine trace level cardiac marker (BNP) in your lab?**

Conventional bioanalysis methods require complex operations and take a lot of time to measure trace biomolecules such as B-type natriuretic peptide (BNP). BNP is one of the important cardiac markers. In heart disease, it is necessary to obtain analysis results quickly in order to decide the treatment policy and improve the treatment result. (For example, in the case of cancer, even if it takes one day to obtain the test result, it does not have a big effect on the treatment result.)

We developed a BNP sensor that provides rapid results for the quick diagnosis of a patient's condition. The developed BNP sensor has the function of concentrating the molecules produced as a result of immunoassay on the gold surface. By measuring the highly concentrated molecules, we developed a biosensor that can detect BNP in a short time. Various technologies were required, and it was necessary to comprehensively proceed with material design / synthesis, microfabrication technology, and equipment prototyping.

### **4. What are the current challenges prevailing in the field?**

The technical innovation in biomolecule measurement is remarkable, and it is becoming possible to measure single molecule. Many papers on biosensors have been published, but I think there are few technologies that can be useful as tools for medical diagnosis and analysis of biological phenomena. For example, measuring biomolecules in an ideal solution, impurity-free buffer is far from physiological conditions. Unless it can be measured under the physiological conditions of a mixture of various impurities, it is meaningless as a biological analysis method. I am worried that an increasing number of researchers are not thinking about developing the next technology just to publish their papers.

### **5. What is your advice to young science enthusiasts who want to establish a career in science and technology?**

When you are young, an interest in science is sufficient. I think one of the most important things in research is continuity. Research life often goes wrong, so it is important to stay interested. First of all, please do your research with your interest. And when you reach a certain age, I would like you to think about how your research results will be useful to the world.

### **6. What are your activities in a given day? What kind of lifestyle do you believe in?**

When I was young, I also worked on weekends. But now that I am married and have a family, I spend the weekend with my family. I go home around 20:00 on weekdays and do housework. Since I have my lab and students and experimental staff, I have less chance to experiment by myself. It is hard to say what kind of lifestyle is best, but I think you need an age to devote yourself to research, and an age to balance research and private life.

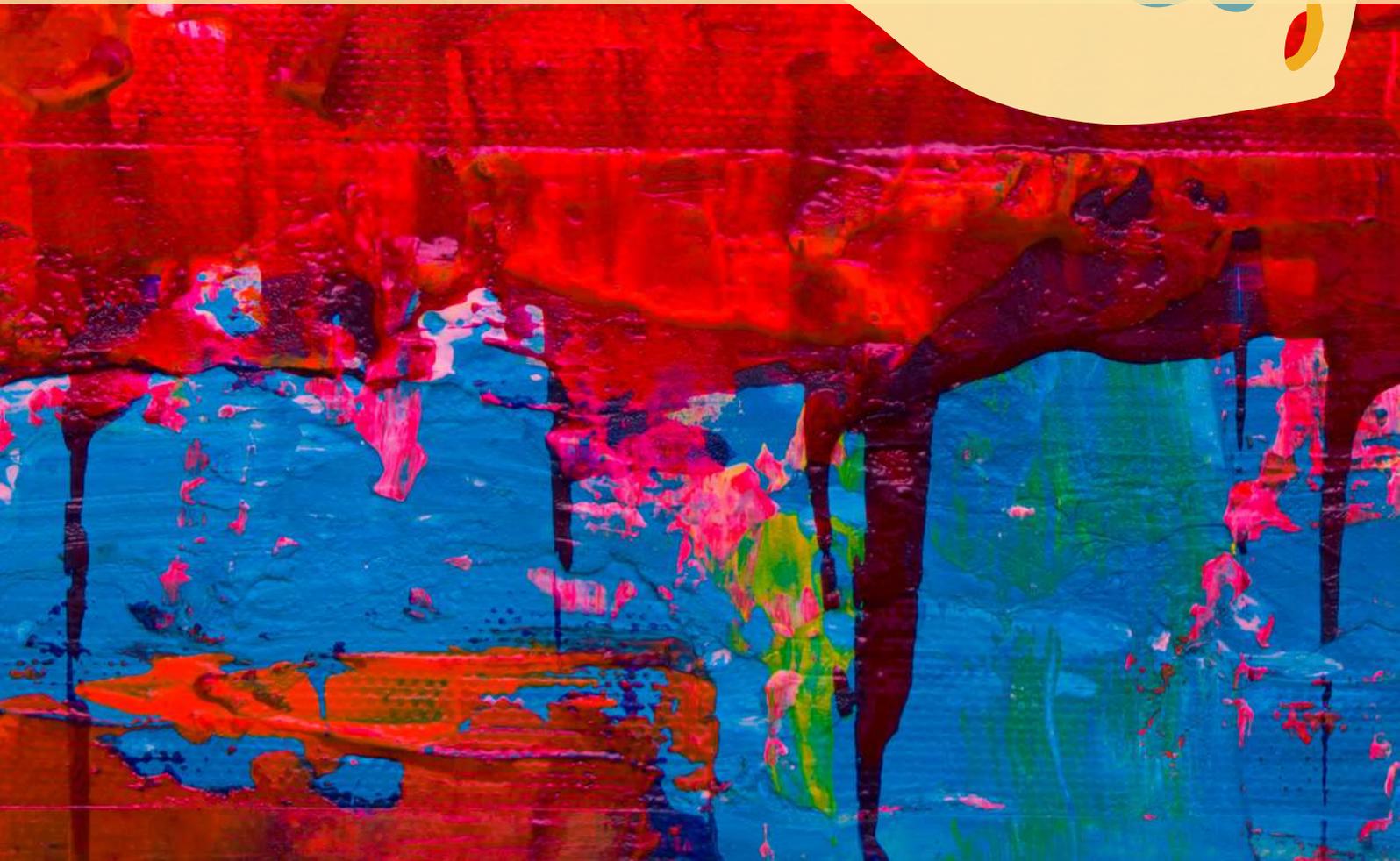
### **7. What is your view on the way and progress of global scientific scenario?**

Science used to be one of the disciplines, but now it is deeply involved in everything (economics, military, etc.). I also feel that science has become an investment target. I am worried that researchers will not be able to carry out research activities based on pure academic interest.

Looking back over the past few decades, research themes in the field of science have also changed in fashion. Knowledge of science is being shared immediately around the world, and the change should accelerate. However, in my opinion, one of the universal themes is health. Health is an eternal theme for humankind, and it is expected that research and development aimed at extending healthy life expectancy by making full use of advanced information processing technology will continue in the future.



# ZEN PEN





# How cooking can help relieve stress?

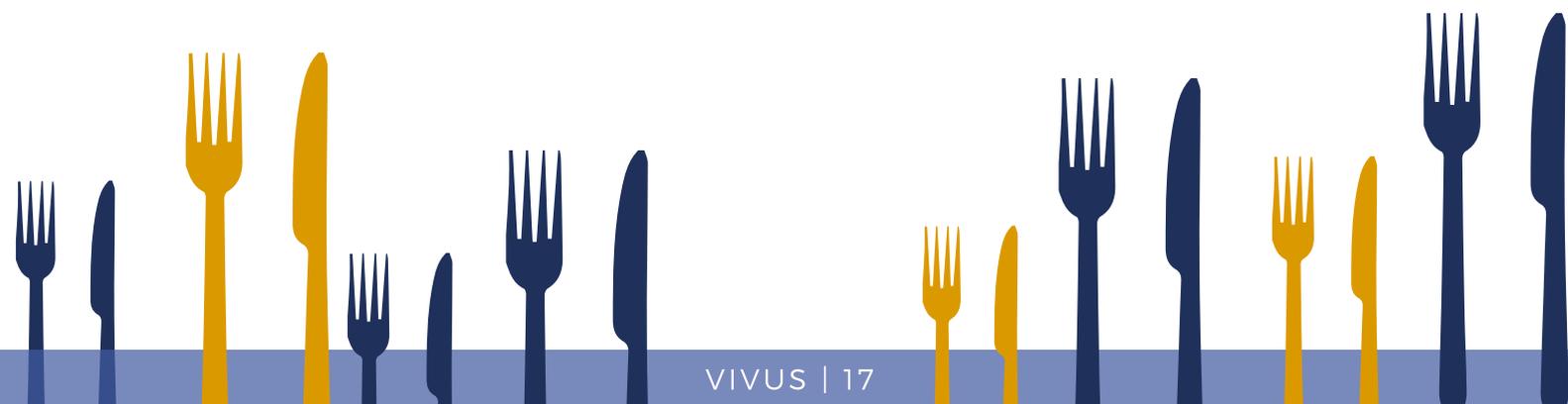


Article by Anjali Warriar  
PhD Scholar  
Department of Biotechnology

Cooking home-made meals is an excellent approach to make sure that a person is getting all the required nutrients and nourishment that they need in the right amount. However, it may not look very evident that cooking at home can also effectively relieve stress. Even if you are not a culinary master, merely spending some time in the kitchen can make your mind and body feel liberated. It is an opportunity for you to take a break from your busy life, to unleash your creativity, engage your brain, and even connect with people (or places) you wouldn't otherwise be able to visit.

## **Get your hands dirty**

When life becomes a nightmare, we all look for an escape from reality. Cooking is an exceptional escape route for so many people, including me. The true smell and sight of a clean and full fledged functional kitchen is a great way to stimulate all your senses. Regardless of whether you are cutting the vegetables, or standing by listening to the oil sizzle, crackling mustards, or catching an aroma of something from inside the oven, this sensory experience is one of the best ways to temporarily disconnect from world around you. The dish you cook or the ingredients that are being used does not matter as long as you end up preparing atleast a small portion of your meal, leaving you with the best 'me time' you could ask for on a stressful and hectic day.



## Emotional liberation



Food carries an emotional value for many people. It is a way to celebrate cultural customs and traditions, or mark a special day, or comfort sickness. Cooking can activate memory as it engages our senses. The aroma of cooking can take you back to your grandma's home or may be your beloved cafe or excursion. Immerse yourself in those memories while cooking and you will experience the most beautiful, peaceful, stress relieving, mood-boosting and energizing way of spending your free time.

Psychologists are now using cooking or baking as therapy tools (culinary therapy) that helps in behavioural activation. It is believed to alleviate depression by increasing goal-oriented behaviour and curbing procrastination. Cooking also boosts your mental health as cooking is an act of patience, mindfulness, problem-solving ability, a means of communication, an outlet for creative expression, and helps raise one's confidence as you have a decent outlook on accomplishing something positive for yourselves or your friends and family. According to research published in *The Journal of Positive Psychology*, people who regularly engage in little, creative projects like baking or cooking report feeling calmer, more focused, and happier in their daily lives. Cooking requires time management, which encourages individuals to take charge, giving them a sense of power.

Cooking together with your family is additionally an incredible method for reinforcing your family bonds and making new memories. It allows you to relate with people all the more pleasantly and can be a great way to take a break. However, do not hesitate to guarantee your kitchen as your own space. It's totally acceptable to concede that allowing more people in your kitchen makes you worry. Cooking can be a very personal and remedial experience, and it is essential to do it the way which is most effective for you.

### Cook what brings you joy

Try not to let the feeling of dread toward disappointment deflect you from attempting new things in the kitchen. Preparing a meal is such a rewarding and stimulating experience that anybody can take part in. Start with recipes that could possibly be made with just a couple of ingredients if you are nervous about being an amateur cook. Prepare meals that you are thrilled about and keen on making. If you are only picking complicated dishes you know you will not enjoy making, what is supposed to be a stress-relieving pass time can rapidly transform into a taxing and daunting activity. Remember, pretty much every dish can be changed and made yours, and the excitement when you work on a recipe is unexplainable. At the end of the day, cooking something from scratch by being creative and modifying the recipe according to your taste transmits the feeling of accomplishment and shows that you can decide on your own what you want. It makes you feel far more worthy than how your mind has convinced you to believe.

So, rather than waiting for someone to drag you out of your bed and save your day, become your own rescuer. Cook something, just anything that will make you feel better mentally and emotionally. Remember to let your creative side shine and not suppress it by limiting its options.



# Letters to a Young Scientist

**BY E.O. WILSON**  
*(Book summary)*



Article by Arya K.  
PhD Scholar

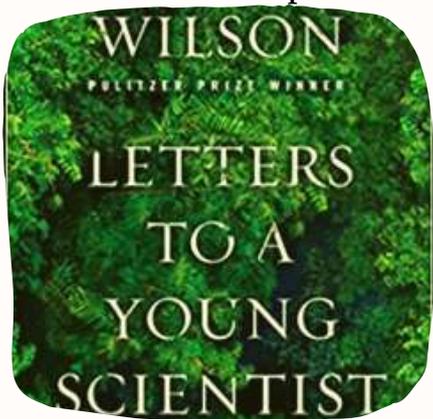
Department of Plant Sciences

*Dr. Edward Osborne Wilson (June 10, 1929 – December 26, 2021)* is one of the eminent and premier biologists, naturalists, and writers of the world and also a Pulitzer Prize winner. His field of expertise is myrmecology (study of ants) in which he was considered a pioneer. Wilson is called the father of socio-biology and biodiversity for his extensive interventions on environmental and religious and ethical matters. He was an author of around 30 books including his autobiography "Naturalist" and 430 scientific articles in reputed journals like Nature and Science. His contributions as a renowned scientist and an influential author has earned him hundreds of awards and more than 40 honorary doctorates. In 1995, he was included among the 25 most influential personalities in America by 'Time' magazine.

*"Letters to a young scientist" is one of his books which came out in 2013, where Wilson compiles his perspectives in the form of small letters on a budding career in science to potential young scientists or those who just started their scientific journey. The author begins by assuring would-be scientists of their importance in the technological world and then the book contains 20 letters in five sections.*

"The Path to Follow" tries to calm down those who are hesitant to take science because of being not good in mathematics, by putting forward the possibility of collaborations to support, but as per his advice it is always very much important to choose a field or area which fascinates you, makes you feel it's your own, keeps your passion ignited and then work to be an expert in it.

"The Creative Process," focuses on the author's take on the nature of science, the scientific method, the way scientists think creatively, and what makes a scientist successful. He mentions it as a life of hard work, late nights, and no vacations. Even though many professionals including me and you may fit inside. But I wonder when science as a profession will adapt to allow time for people who don't adhere to this mould especially people who want to spend time with their families. "A Life in Science" talks about the events in his career, the discoveries he and his friends and colleagues made, and how they reached that 'WOW' point. In "Theory and the Big Picture", Wilson uses concrete examples to make the reader understand how hypothesis are made and theories will be tested for their reliability. He concludes by sharing his opinion on ethical scientific behaviors while working with the scientific community in the last chapter "Truth and ethics". This book sketches out some of the basic character traits like passion for science, observational skills, even daydreaming. It's a good read for a beginner in the field of science and the take-home message could be, enthusiasm, creativity, curiosity, and persistence are the keys to success.



# FAST FASHION AND THE PLANET

Article by Harsha K.  
PhD Scholar

Department of Plant Sciences



***Have you heard of the popular culture phrase “Fashion is to die for”? But is it worth killing the planet for? Fast fashion is fast in sense of production, consumption, and disposition. In fast fashion, a trend or a popular taste at that given time is set by the popular culture or runway culture of individual designers.***



These trends are picked up by the notable high-end stores and are mass-produced and marketed at a breakneck speed to meet the shopper's demand. The shoppers rush to buy into popular trends while they are still at the peak of popularity and quickly dispose of them as the popularity wears off. Fast fashion plays along with the idea of staying relevant and paints repeating clothes as fashion blunders. This blunder makes no sense as the trends keep on making a comeback from time to time. From an anthropological point of view, clothing which started as a layer of protection for humans against harsh weather conditions has turned into a symbol of social stature.

These garments are relatively cheap, are made to last a short amount of time. Although this trend is not as popular in countries with low spending power such as India, countries in the west are heavily invested. Many brands cater to this market worldwide; H&M, Zara, GAP, Old Navy, USPA, Being Human, Levi's, are some of the well-known Fast Fashion brands. Underpaid, sweatshops and bad working conditions of the people who make these products aside, these products also take a huge toll on the environment and are not a sustainable practice.

Fast fashion is a direct product of rampant industrialization and consumerism. With industries able to produce more in less time, they need to be able to sell more to make a profit and stay in business. This has led to these companies copying whatever celebrities wear to sell as a necessity to be included in society. Companies use advertising, sponsorships, and continuous change in inventory to push for sales. These changing inventories are branded as summer collection, winter collection, autumn collection, Diwali collection, christmas collection, etc. Online shopping enabling people to buy whatever they please in minutes combined with the human need to be socially accepted leads to the success of these marketing strategies. Consumers are manipulated to buy into the short-spanned trends at their peak of popularity and when the trend loses its fame, they are discarded. So, what happens to the unsold and disposed clothes? Why is mass production harmful? How is this not sustainable? One may ask. I mean, they are just clothes. Right? Since fast fashion clothes are relatively cheap, and the trend keeps changing, we are more likely to throw them away after a short time of use. Fast fashion brands also throw away unsold clothes as the trend dies down. These clothes end up in landfills polluting their surrounding environment. This causes textile pollution.....

Yes, my dear readers, textile pollution has been trending. Environmental Protection Agency of the United States of America estimated that 17 million tons of textile wastes were generated in the year 2018 alone. And this is one nation's textile waste accounted for. The number of wastes generated each year by all the countries is unimaginable and unaccounted for.

Unlike automobiles, electronics, and other heavy industries, clothing does not look like an environmental hazards industry, but the is that the production of anything that is not necessary is a waste of resources. This might not seem like much until we factor in the amounts of resources that are spent on the production of clothing. The industry uses over 90 billion cubic meters of water every year. Around 20% of the world's water pollution is caused due to the textile industry, which can be majorly attributed to dying. A single item of clothing could cost us up to 3000 Litres of water to produce.

The water toll aside, the clothing industry also requires a lot of energy which is mostly derived from coal and other fossil fuels in most of the countries they are made in. As much as 1.2 billion tonnes of carbondioxide is released by the fast fashion industry every year.

Fast fashion is also a huge consumer of plastics; microfibers released by washing these clothes are the largest source of microplastic pollution too. Though there are many other problems with fast fashion, it is probably easier to see the fast fashion industry for what it is once we know the facts. This harmless looking industry is a slow killer of the environment and extremely unsustainable. And worst of all this is completely unnecessary. It is also important to keep in mind that we have only looked at the clothing side of fast fashion here; shoes, make-up, accessories like bags and watches, eyewear, headwear, jewellery, etc. come with their own set of environmental impacts.

But honestly, though, it is equally as easy to be environmentally conscious as it is to be carried away by the new sale this week. How can we help curb this ever-growing problem? The answer is ethical consumption. Buying clothes from ethical brands that follow slow fashion, eco-friendly production of clothes and articles, and ethical labour policies, etc. That is an expensive alternative though. We could also buy better quality clothing and accessories, 'ever greens' like t-shirts and jeans as opposed to the new trendy onesie which will be gone and uncool in a few weeks or buy clothes made with hemp fibre, cotton, wool, or other natural fabric instead of plastic infused materials or repairing, reusing, and repurposing the already bought clothes. We could also buy second-hand clothes or exchange them among peers even using hand-me-downs from older siblings. Even just not buying clothing unless it is necessary are steps enough to put an end to this trend. Fashion maybe be to die for, but it is not worth killing the planet for. Remember there is "No *PLANET B*".

# ಮಳೆಗಾಲದ ಒಂದು ದಿನ !



ಮುಸುಕಿನ ಮುಂಜಾವಿನಲಿ

ಅದೋ ಹನಿಗಳ ಪಿಸುಮಾತುಗಳು !

ತುಸು ಎದ್ದು, ನಾ ನಸುನಕ್ಕು ಕುಳಿತೆ

ಹಸಿ ಚಿಗುರು ಹೊಸ ಲೋಕವ ಕಂಡಂತೆ...

ಮೈರೋಮಾಂಚನವ ತಂದಿತ್ತು ಆ ದಿನ

ಅದುವೇ ಮಳೆಗಾಲದ ಒಂದು ದಿನ !

Poem by: U. Sangeetha Shenoy

PhD Scholar

Department of Cell and Molecular Biology

ಮನದ ಬಾಗಿಲಿಗೆ ನೆನಪಿನ ಅಲೆಗಳು ಬಡಿದಾಗ

ಮತ್ತೆ ಮರುಕಳಿಸಿದವು ಆ ಮಧುರ ದಿನಗಳು

ಅಂತರಂಗದ ಅಂಗಳದಿ, ಸುರಿದ ನೆನಪುಗಳ ಸಿಂಚನ

ಮನದ ದಾಹ ತಣಿಸಲು ಇಳೆಗಿಳಿದಂತೆ.....

ಅದ ನೋಡಿ ಮನ ಬರೆದ ಹೊಸ ಭಾಷ್ಯ ನೂತನ

ಅದುವೇ ಮಳೆಗಾಲದ ಒಂದು ದಿನ !

ಕೊರೆಯುವ ಚಳಿಯಲ್ಲಿ, ಅಜ್ಜಿಯ ಬಿಸಿ ಹಪ್ಪಳದ ರುಚಿ

ರಸಾನುಭೂತಿಯ ತರುವ, ಬಾಲ್ಯದ ಕ್ಷಣಗಳು

ನೆನಪಿನ ಪುಟಗಳನು ಮೆಲುಕು ಹಾಕುತ್ತಾ ಕುಳಿತೆ ನಾ

ಬೀಸುವ ಗಾಳಿ ಹಸಿರೆಯನ್ನು ಚದುರಿಸಿದಂತೆ...

ಅದನೆನೆಯೆ, ಮನ ಮೌನವ ಸಾರಿತ್ತು ಆ ದಿನ

ಅದುವೇ ಮಳೆಗಾಲದ ಒಂದು ದಿನ !

ಕೆಸರಿನ ನೀರಲ್ಲೂ, ಹಸಿರ ಕಂಡು

ಕುಣಿದು ಕುಪ್ಪಳಿಸಿದ ಆ ದಿನಗಳು

ಭೋರ್ಗರವ ಮಳೆಗೆ ತೆರದ ಛತ್ರಿಯ ಕಂಡು

ನೆನಪಿನ ಲಹರಿಯಲಿ ನಾ ತೊಯ್ದು ನಿಂತೆ

ಕಡಲಲೆಗಳಲ್ಲಿ ತೇಲುವ ನಾವೆಯಂತೆ....

ಭಾವನಾ ಲೋಕದಲ್ಲಿ ಸಂಚರಿಸಿ, ಚಂಚಲಿತವಾಗಿದ್ದೆ ಆ ದಿನ

English Translation  
By Sangeetha

# A Rainy Day

One early morning..  
The drizzling drops of rain gently patting the rooftop,  
I woke up with a pleasant smile  
Just like a sprouting seedling ...  
Yes it was a cheerful morning..  
A rainy day!!!

When the waves of memories strike on my mind,  
My heart melted, just like a snow..  
My eyes could feel the filling thirst...  
With cold breeze and tiny drops  
It was a joyful day..  
A rainy day!!!

The rainy roads with greeny leaves  
A shiny sun and blowing wind  
I could sense it on the window panes  
It was a really blissful day...  
A rainy day!!!

Grandma's hot food in one hand and umbrella in other  
When I head through the rain, splashing the puddles  
I could feel every drop of rain...  
Memories in my mind were flowing like an endless stream  
Yes it was a beautiful day..  
A rainy day!!!

# LIFE PRE-AND POST-COVID

Article by Kausalya N M

Department of Biophysics

**‘Pre Covid times’ and ‘Covid times’ have become very common phrases that are used in our daily vocabulary, along with the addition of ‘Quarantine’ and ‘lockdown’. However, these were not the only changes we have seen in our day-to-day lives. The Covid-19 pandemic has brought its own set of challenges and changes which were not exclusive to the health sector worldwide.**



The World Health Organization declared the outbreak of the coronavirus as a Public Health Emergency of International concern on 30.01.2020, and as a pandemic on 11.03.2020. We never imagined living locked within our homes during all days of the week. It was equally unimaginable to not go to work, schools, colleges for an entire year or two, and still get the work done. However, today, due to the pandemic, digitalization and virtualization has seamlessly blended into our lives and become the new norm.

The pandemic was also a time when most were able to take a long well-deserved break from the daily grind of work, and spend some quality time with their families, initially at least, until the online mode of work and schooling was adopted. This time-off was beneficial for most of us, to develop new hobbies, or rediscover old ones. Many also found ways to capitalize on their hobbies and talents, eventually leading to a boom in the online startup sector, adding to the ‘Go Local’ agenda. Speaking of breaks, it turns out that we human beings weren’t the only ones that got the break from our normal, and hectic lives. Mother nature too got a break from all the human intervention and activities for a while throughout the lockdown period when most, if not all human activities outdoors had come to a standstill.

The news was rife with articles about the rivers being cleaner and wild animals reclaiming cities. A significant reduction in the global emission of greenhouse gases has been reported by many researchers.

The wedding industry was also majorly hit during the pandemic because socializing was nearly impossible during the time, due to the fear of infection and further spreading of the coronavirus. Many weddings were postponed, while some were still held, albeit with very few people around. Holding a low-key wedding in the premises of one’s home became the new norm during the pandemic, for such a thing was unthinkable or considered strange during life pre-covid. The ‘Pandemic Weddings’ as they are called, saw the virtual presence of friends and extended families. We also saw ‘Shaguns’ or blessings in the form of money being transferred online. This again was something unheard of before the pandemic.

In fact, almost all our monetary transactions became online. Platforms and apps such as GPay, Paytm, Paypal, PhonePe, etc., made it possible for online, cashless transactions even in the smallest of shops in remote areas as well, when such a thing was beyond our imagination before the pandemic. Today, digital money transaction is adopted by all.

Now, the world is trying to cope up with the pandemic, and life is going back to a new normal, where we see the different work models such as remote working, hybrid working, etc. Schools and colleges are also excited to welcome their students back, and the teachers are eager to meet their students in person and happy to see the corridors filled with students.

Travelling and outing itineraries have an extra page of terms and conditions along with the precautions and measures to be taken against Covid19. The mask became an inextricable part of our dress codes as well. It feels weird to not go out without a mask on now.

Our kitchen shelves saw a drastic increase in the number of healthy food products and home remedies during the pandemic. Handwashes and hand sanitizers became an important part of our groceries list, along with masks. There was an increasing interest in the home remedies suggested by our grandparents during the pandemic, which was otherwise usually ignored in favor of a doctor's appointment for every trivial ailment. We (the younger generation) also discovered the small joys and benefits of cooking at home, rather than just ordering takeout from any restaurant, a practice which was the norm pre-covid. However, as the second wave of the pandemic is subsiding, there is an increase in the consumption of restaurant takeouts. Let us just attribute it to our restlessness after being confined in our homes throughout the lockdowns and most of the pandemic.

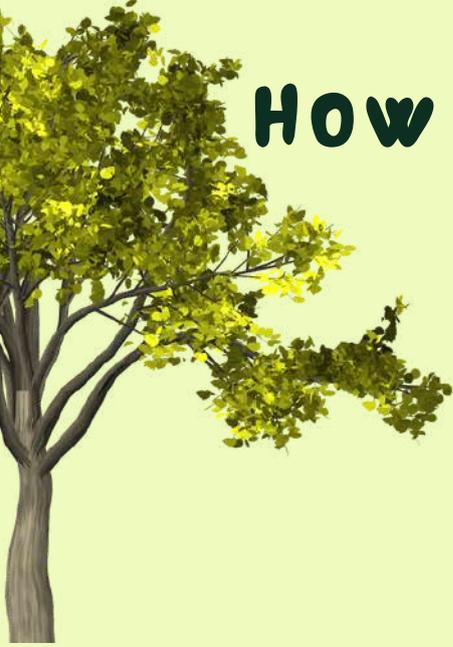
Talking about being holed up at homes, we must agree that the lockdown was endurable thanks to the OTT platforms such as Netflix and Amazon Prime and the filmmakers who fed us with a steady supply of fresh online content throughout the pandemic and continue to do so.

The OTT platforms have also given their users access to diverse content from all over the world to choose from. Another form of pastime that most of us developed during the lockdown was the habit of doing window shopping online. This was also boosted by the numerous offers on online shopping platforms. We would inadvertently find ourselves browsing for things online and fill our carts for hours but in actuality buy very few things or nothing!

The pandemic has also taken a toll on our physical and mental health. The lockdown meant the closing of all public areas like gyms and parks, and thereby physical exercise was not something that could be done very easily in our homes. However, this gave rise to the popularity of home workouts and yoga that could be performed in the comfort of our homes. The overall mental health of the population took a nosedive after a series of lockdowns, and long periods of home confinement. This gave rise to strong discussions regarding general mental health, which otherwise wasn't being taken seriously before the pandemic.

Overall, the Covid-19 pandemic was something none was prepared for, and yet all had to come to terms with. While the terrible loss of numerous lives is something we will always remember and mourn over, it also gave us many lessons which none will forget. We learnt to value our relationships with family and friends, and gave importance to our physical and mental health, and have started to have difficult conversations regarding the same. This would not have been possible if we had been stuck in our very busy daily lives pre covid. The pandemic has also driven home the power which mother nature holds over us, and that we as her dependents must abide by her laws.

# HOW DO PLANTS SENSE THEIR SISTERS?



Article by Soundaryaa B  
PhD Scholar  
Department of Plant Sciences



*Plants are stationary organisms that cannot relocate themselves. Whereas animals are organisms that are motile and are territorial. Plants exhibit remarkable features that are very often missed out. They can synthesise their food. To do so, they have adapted the body geometry of flattened leaves to allow maximal utilization of sunlight. It is astounding how trees that are as tall as four-story apartments can take up water and nutrients for their sustenance.*

How can plants bend in ways to allow space for their neighbouring plants? In an avenue, they can bend from either end to form an arch. This shape sensing mechanism in plants is called proprioception. Plants can sense shapes and respond to external cues to alter the same via mechanical stress and strain. At any moment, plants can not only gain positional signals but also directional signals to orient their geometry in space. Parameters, both biotic and abiotic are external cues initiating this sensory mechanism. The tissue geometry mediated mechanical feedback along with molecular network mediated geometric feedback influence plant self-shaping mechanisms.

In this regard, plants exhibit cognitive abilities that could be correlated with that of animals such as kinship and altruism. In conclusion, plants exhibit movements that are small yet significant. It is a curiosity driven study to get to the bottom of research in plant movements.

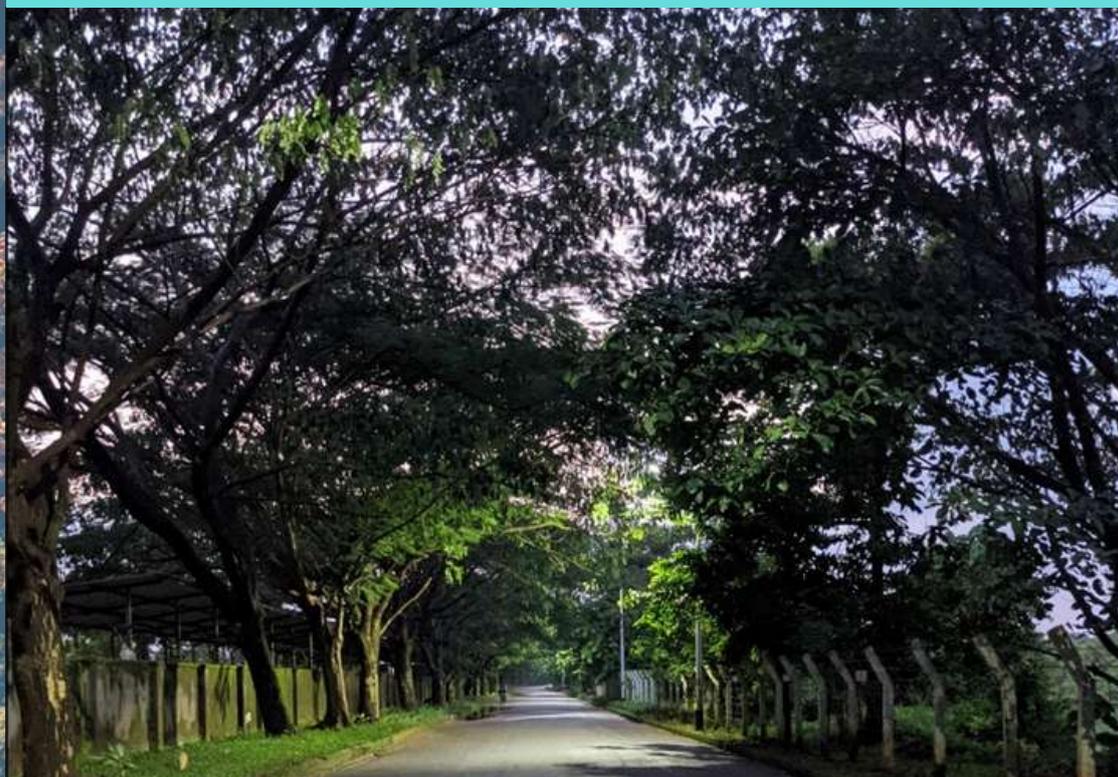


# Commonly observed *proprioception* in plants

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**LOCATION: LAL BAGH, BANGALORE**



**LOCATION: END POINT, MANIPAL**

Photos by

*Nidhi S Mukundan*

PhD Scholar

Department of Plant Sciences





# HIDDEN SCIENTISTS



Article by  
Sampara Vasishta  
PhD Scholar  
Department of Ageing  
Research

Extensive research continues in the context of the covid-19 pandemic. Intellectuals, administrators, scientists, doctors, and many other professionals have joined together to form multidisciplinary teams to save human lives. Preventing the infection by following the safety protocols and vaccination are the major ways prescribed to reduce the mortality rate across the globe. Today we have got different varieties of vaccines developed by various organizations.

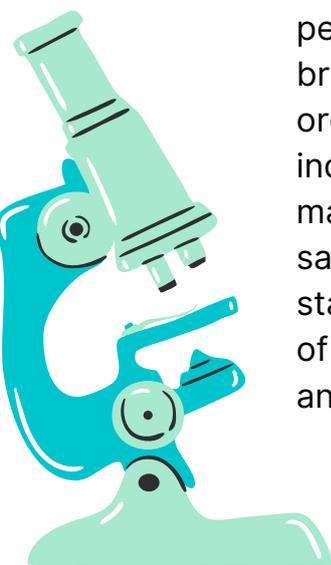
The life of a researcher is not something predefined like a 9 am-5 pm job. It is a career where one spends day and night in the laboratories finding answers to various questions. Even an unexpected result may provide an answer. Despite this hard work, they are being unnoticed at times. Does anyone know the names of the scientists who discovered the vaccines against COVID-19? We do not know. It is a pity that even for the indigenous vaccine the name of the scientists or the team behind its discovery did not come out. We are always living in the hype of branded things.



We saw only the corporates saying that our company has launched it. Who gets categorized under 'our'? To whom is the credit going? This is not only happening in the case of vaccines, but similar perspective prevails elsewhere too. Consider a film industry where thousands work together to give an output on the screen. But the audience decides to watch the movie based on the fame of the director, the musicians, the major cast, and the production who are being recognized round the clock. No one knows the ground staff and support staff names or faces in the outside world. An old proverb says, 'where there is a will there is a way.' If the leader wishes to recognize all the contributing members, s/he can do it. The only thing people are looking for is brand value. But, it is equally important to recognize everyone responsible for your success.

The French philosopher Bernard of Chartres said that *"that we are like dwarfs on the shoulders of giants, so that we can see more than they, and things at a greater distance, not by any sharpness of sight on our part, or any physical distinction, but because we are carried high and raised by their giant size."* We have the famous Jenner Institute on behalf of the name of Edward Jenner who pioneered the concept of vaccination. One more example is the automobile Tata Sumo which has been named after Mr. Sumant Moolgaonkar, the then managing director of Tata Motors. In the year 1675, Sir Isaac Newton in his letter to Robert Hooke wrote *"If I have seen further it is by standing on the shoulders of giants."* In 1998, during the presentation at a conference of The History and Heritage of Science Information Systems at Pittsburgh, Eugene Garfield used the phrase "On the shoulders of giants" while praising Robert King Merton, Derek John de Solla Price (1922-1983), Manfred Kochen (1928-1989) and Henry Small, who made extensive contributions towards citation indexing and science mapping.

Everyone may not work to get publicity, but the organizations must recognize the in-house talents and bring them into the limelight and showcase their skilled personnel to the public. They are someone who is working day and night by brushing their minds to develop something to save mankind. In the end, the organization as a whole may be responsible to produce and market it. But the individual or the team who has connected the dots and developed a vaccine or maybe any other product has to be recognized not only by giving perks and salary hikes (which may make them happy) but also by giving a respectable stature in the society. Today, advancements in science are enhancing the lives of humans. Hence, everyone must respect the masters behind the extensive and exhaustive work filled with lots of sacrifices.



# INVESTMENT - CHOOSE WISELY & EARN HIGH

This column is an outline and possible avenues available for a person to do savings for future benefits. This does not contain any promotion of any venture and it purely deals with currently available options in the Indian market.

Caution: The readers are advised to make the correct decision by taking guidance from the experts in the concerned field.



Article by

Sriharikrishnaa S

PhD Scholar

Department of Cell and Molecular  
Biology

## What is an investment?

An Investment is an asset or object offered to generate profits or upward thrust in price. An boom withinside the price of an asset over-called appreciation. For example, an investor might also additionally buy a economic asset now with the concept that the asset will offer profits withinside the destiny or will later be bought at a better price.

### 1) RD - Recurring Deposit

Recurring Deposits (RD) offer clients with the ability to make investments an quantity in their preference every month and save money. RD money owed are provided with the aid of using maximum of the banks and non-banking economic companies (NBFCs) in India with tenures starting from 6 months to ten years. The interest rates are ranging from 5.00% - 7.85%. RD gives a fixed interest on the invested amount at a particular frequency until the pre-decided time period or upon maturity. RD schemes intention to inculcate a periodical saving habit. It may be a quantity as small as Rs.10. A premature withdrawal penalty will be charged based on banking policy. Therefore, even as making an investment in a ordinary deposit account, pick out a bank that provides higher rate of interest and a low fee on premature withdrawal.

### 2) FD-Fixed Deposit

A Fixed deposit, referred as FD, is an investment provided by banks, in addition to NBFCs to their clients to assist savings. In an FD, for a fixed period of time investment can be made. At the end of the tenure, entire principal and interest amount will be credited. Banks offer different rates of interest for a fixed deposit account based on the tenure. The duration varies from a minimum of 7 days to a maximum of 10 years. The major advantage of FD is interest rates are guaranteed irrespective of market fluctuations. Investors aren't allowed to withdraw the cash earlier than maturity, if a demand arises penalty must be paid. An alternative of availing loan against FD in case of urgent need and can avoid premature FD closure.

### 3) Provident Fund

A provident fund is a government- managed retirement financial savings that has been made compulsory in many countries. Both the worker and the organization make contributions towards a fund this is supposed to offer financial help to the worker after retirement.



#### 4) Mutual Fund

Mutual funds (MF) are the most famous investments option these days. A mutual fund is an investment vehicle formed when an asset management company (AMC) or fund house pools investments from several individuals and institutional investors with common investment objectives. A professional fund manager purchases securities such as stocks and bonds and controls the investment with the intention to provide optimum returns. The performance of MFs is dependent on the underlying assets such as type of fund (open or close-ended), SIP investment.

#### 6) Share Market

Stock Market, in its wider definition, refers to the gathering of exchanges and different venues in which stocks of publicly traded corporations are bought, sold, and issued. Such economic sports are executed via dependent formal exchanges (whether physical or electronic) or via over the counter (OTC) marketplaces that follows a system of rules and regulations. In an essence, inventory markets offer steady and controlled environment in which marketplace members may also reliably exchange stocks and different appropriate economic property with low risk.

#### 5) Cryptocurrency

A cryptocurrency is a virtual cash that may be used to shop for items and services, however it makes use of an internet ledger and robust encryption to stable online transactions. Much of the interest in those unregulated currencies is hypothetical, with speculators sending values excessive at times. Cryptocurrency operates on blockchain technology. Blockchain is a decentralized method that handles and records transactions across many computers. Cryptocurrencies may match up in value, however many traders see them as mere speculations, now no longer actual investments. The reason is it would not generate cash flow and has to pay more for the currency and so it is called as "the greater fool" theory of investment.

#### 7) Gold

Gold has been traditionally considered as greatest investment. The very nature of what makes gold treasured has been its shortage and rarity, which has endured to draw humans to this day. The incorporation of gold and different treasured metals into a funding portfolio may be accomplished in exceptional ways, inclusive of gold cash and gold bars.



# Charging the Human Chakra through Music



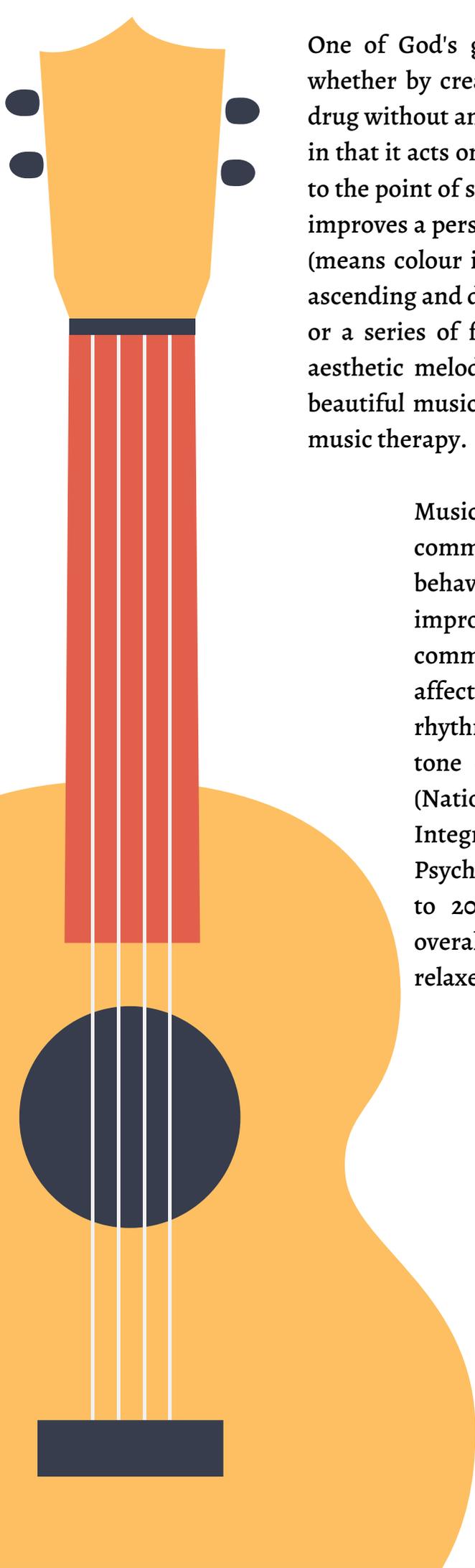
Article by  
Venkidesh B S  
PhD Scholar  
Department of Radiation  
Biology and Toxicology



“From my 16 years of musical journey, I could say that Music brings out the best in people, bringing us closer to the realm of flow and creativity and allows us to live our lives to the fullest.”

*-Venkidesh B S*

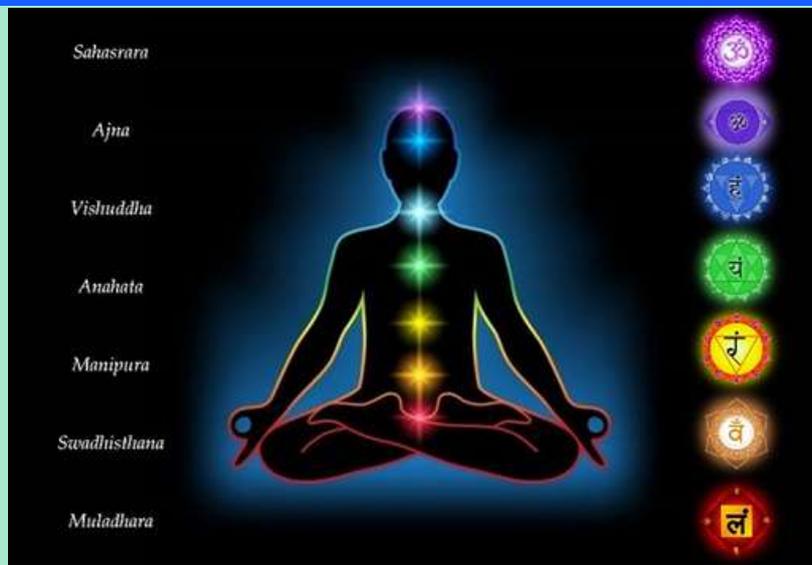




One of God's greatest gifts to humanity is the ability to enjoy music, whether by creating it or listening to it. Music has been considered as a drug without any side effects. In addition, music performs similarly to yoga in that it acts on the human body to awaken and develop suitable functions to the point of self-realization via energy pathways. Music is a treasure that improves a person's personality and other aspects of life. Importantly 'raga' (means colour in Sanskrit) is the basis of Indian classical music. With its ascending and descending movement consisting of either a complete octave or a series of five, six, or seven notes, raga is a scientific, precise, and aesthetic melodic form. This brings out the harmony in sound forming beautiful music and healing effect in curing diseases, which is termed as music therapy.

Music is extensively used to treat children with learning or communication difficulties, autism, or emotional and behavioural disorders (aggression), with the purpose of improving one's behaviour, social acceptance, and social communication. There are lot of studies reporting how the ragas affects the brain. Different ragas elicit different emotions; rhythms are effective predictors of emotional reaction, and the tone of the composition influences the emotion experienced (National Brain Research Centre, India along with the Centre for Integrative Neuroscience and Neurodynamics, School of Psychology and Clinical Language Sciences, UK). While listening to 20 various Hindustani ragas, untrained subjects showed overall positive brain wave frequency power, which is equal to relaxed meditative states (NIMHANS, Bengaluru).

'Neelambari' (a Carnatic raga) is a sleep-inducing raga that is used to help people get a good night's sleep. In Southern India, this raga is used in lullabies to help babies fall asleep faster. Similarly, listening to the raga 'Desi-Todi' for 30 minutes, produces a significant decrease in the systolic and diastolic blood pressure, to reduce stress, anxiety and depression and enhanced feeling of life satisfaction. Also, the raga 'Malahari', improves concentration whereas raga 'Kapi' improves attention and enhanced task performance (VIT Chennai & Vellore). This has been practised since ancient times, as Vedic literature states that a composite form of sound known as the 'mantra' can vibrate the Chakras of the body.



\*\*\*(Spend some time experimenting with the sounds from the symbols of each chakra shown in the figure. And feel how might they benefit you and the needs of your nervous system, as well as all your systems at a given time)

The term “Chakra” refers to a wheel, which spins the energies throughout the body in a circular pattern. There are mainly seven chakras which are located along the spine extending out the front and back of the body (Figure). The chakras are formed by the meeting of three interconnected energy shafts ascending the spine, one on each side of the Shushumna, the central channel. The human energies can be charged by the means of sound or a group of sounds that circulates throughout the body.

In another aspect of music and body physiology, music is employed as a relaxation strategy because it slows down the heart rate and induces a sense of calmness. It has been shown that people listening to fast or loud music have a faster heart rate whereas those who listening to less sound and calm music, especially classical music, have a slower heart rate. As a result, a lower heart rate leads to a longer life.

# Chanderkhani Pass

Article by Dhanraj S B  
PhD Scholar

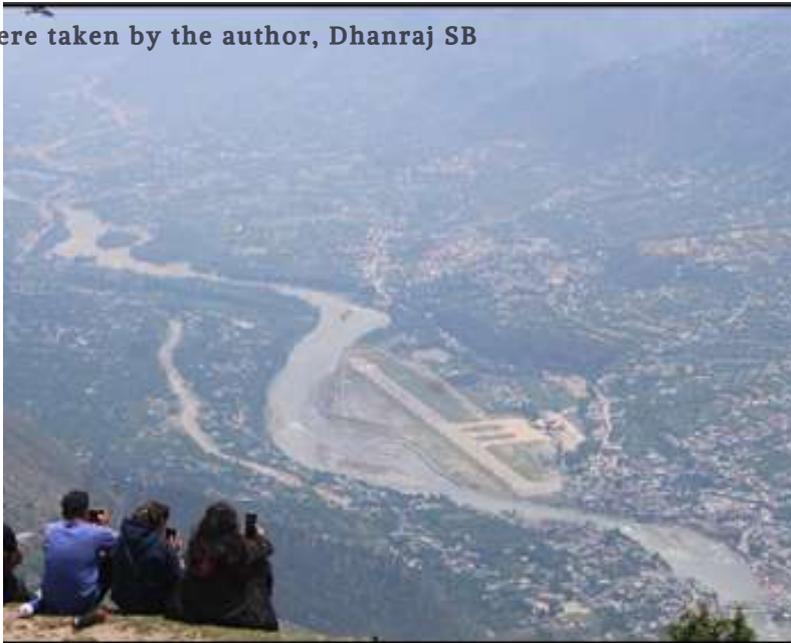
Department of Cell and Molecular  
Biology

**India** is an extremely diverse country with landscape ranging from mountain ranges, deserts, snow-capped mountains, oceans and many more. This diverse geography is home for a wide range of flora and fauna. Exploring such diverse geography is always a bliss. In this travelogue, we take you along through the heavenly spell of Himachal Pradesh, situated in the Western Himalayas, and one of the eleven mountain states of India. This mountain state is spread across valleys with many rivers flowing through them





All the photographs in this article were taken by the author, Dhanraj SB



Kullu is one town in Himachal Pradesh located on the banks of the Beas river. This town lies in a valley which was formed by the Beas river. To the north of Kullu lies a snow bound pass which connects villages of Rumsu and Pulag, known as Chanderkhani pass. This beautiful pass is at a height of 12,000 feet from sea level. This pass is said to be the place where the Saptarishi Jamadagni once sat for meditation. The place comes to life once every year from April to May, when the snowfall stops and the peaks are filled with ice. Beginners and adventure enthusiasts alike come to visit other peaks in the nearby region around this time of the year for a hike. Hike in these regions is a bit troublesome for beginners, as it may lead to altitude sickness. It is thus rightly recommended to acclimatize for at least 2 days in the Kullu region with some physical activity before heading to the hike itself. Chanderkhani pass can be reached by hiking through a unique and beautiful path. The route we followed was: Bijli Mahadev temple, Sola Tanki, Mountinag, Ubla thach, Dohra Nala, Chanderkhani pass, Naya Tapru, and finally ended in Naggar village.

Bijli Mahadev temple is a religious place. This holds a temple for Lord Shiva on a mountain top where they have placed a 60 feet long pillar of wood in front of the temple, which usually gets lightning every year and is believed to attract the divine blessings in the form of lightning.

The view of the Beas River and Bhuntar airport from the temple captivates your eyes.. If we hike for some time from the temple, we reach Sola Tanki, meaning 16 tanks. This place actually has big tanks filled with water which gets circulated to all the regions nearby, as it is difficult to get fresh water sourced at the top of the mountain. This place is around 7900 feet from sea level. After we fell asleep, we had a heavy downpour with a hailstorm. Some of the tents were run down with water, so we had to clear up some path for the water to flow the other way instead into the tent.

On the way ahead we reached our next camping site, Mountinag. Mountinag is at around 9100 feet from sea level and is named after a local deity of that area. This route has a lot of pine trees on the way and has got a great view of the whole valley. We could even see the Bijli Mahadev temple that we crossed the previous day. The campsite had a beautiful view of snow-capped mountains in the distance, which were really amazing to view. These places clearly says out loud that it is all about the journey and not about the destination... *(to be continued)*

*Journey through this beautiful landscape will be continued in the next issue (7.4).*





# Spirituality and Science an Overview



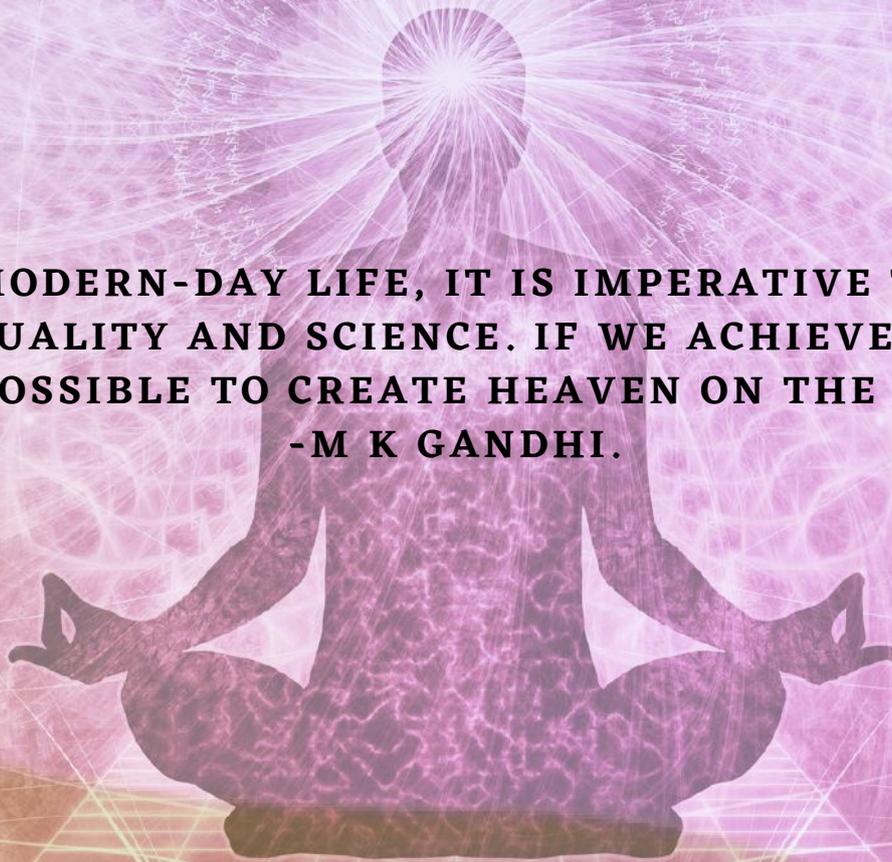
Article by

Vinay C M

PhD Scholar

Department of Biotechnology

**IN TODAY'S MODERN-DAY LIFE, IT IS IMPERATIVE TO RECONCILE BOTH SPIRITUALITY AND SCIENCE. IF WE ACHIEVED THIS, THEN IT IS POSSIBLE TO CREATE HEAVEN ON THE EARTH  
-M K GANDHI.**



## ಅಧ್ಯಾತ್ಮಿಕತೆ ಮತ್ತು ವಿಜ್ಞಾನದ ಒಂದು ಪಕ್ಷಿ ನೋಟ

ಅಧ್ಯಾತ್ಮ ಮತ್ತು ವಿಜ್ಞಾನ ಎರಡು ಒಂದೇ ನಾಣ್ಯದ ಎರಡು ಮುಖಗಳು. ಇವೆರಡು ಒಂದಕ್ಕೊಂದು ಪೂರಕವಾಗಿದೆ. ಹಿಂದೆ ಋಷಿ, ಮುನಿಗಳು ಹೇಳಿದ ಯೋಗ ಮತ್ತು ಭಾರತೀಯ ವೈದ್ಯ ಪದ್ಧತಿಯ ಮೂಲಕ ಅಧ್ಯಾತ್ಮ ಮತ್ತು ವಿಜ್ಞಾನ ಪರಸ್ಪರ ಪೂರಕ ಎಂದು ಸಾಭೀತುಪಡಿಸುತ್ತಿವೆ. ಮನುಷ್ಯನನ್ನು ಸಂಕಷ್ಟ ಸ್ಥಿತಿಯಿಂದ ಧನ್ಯತೆಯ ಸ್ಥಿತಿಗೆ, ಅಸಹಾಯಕ ಪರಿಸ್ಥಿತಿಯಿಂದ ಸ್ವಾತಂತ್ರ ನಿರ್ಭೀತಿಗಳ ಸ್ಥಿತಿಗೆ ಒಯ್ಯುವುದೇ ಅಧ್ಯಾತ್ಮ ಮತ್ತು ವಿಜ್ಞಾನದ ಗುರಿಯಾಗಿದೆ. ಈ ನಿಟ್ಟಿನಲ್ಲಿ ಅರ್ಥಮಾಡಿಕೊಳ್ಳಬೇಕಾದ ಮೂರು ಅಂಶಗಳು ಯಾವುವೆಂದರೆ: ಭೋಗ, ಯೋಗ, ಮತ್ತು ರೋಗ. ಮೊದಲನೆಯದು ಇಂದ್ರಿಯ ಸುಖವನ್ನು, ಎರಡನೆಯದು ಆಧ್ಯಾತ್ಮಿಕ ಬೆಳವಣಿಗೆಯನ್ನು, ಮೂರನೆಯದು ದೈಹಿಕ ಮತ್ತು ಮಾನಸಿಕ ಅಸ್ವಸ್ಥತೆಯನ್ನು ಸೂಚಿಸುತ್ತದೆ. ಶ್ರೀ ರಾಮಕೃಷ್ಣರು ಹೇಳುತ್ತಾರೆ "ಮಾನವನು ಜೀವನ ಸಾರ್ಥಕ ಮಾಡಿಕೊಳ್ಳಲು ಭೋಗದಿಂದ ಯೋಗದ ಸ್ಥಿತಿಗೆ ಏರಬೇಕು. ಹಾಗಾಗದಿದ್ದರೆ ಅದು ಅವನನ್ನು ರೋಗದ ಸ್ಥಿತಿಯಲ್ಲಿ ಕೆಡವುತ್ತದೆ". ಮನುಷ್ಯನು ಭೋಗದಿಂದ ಯೋಗದ ಸ್ಥಿತಿಗೆ ಏರಬೇಕಾದರೆ, ಅಧ್ಯಾತ್ಮಿಕ ಅಂಶಗಳನ್ನು ಅರಿತುಕೊಳ್ಳಬೇಕು. ಅವು ಯಾವುವೆಂದರೆ, ಮನೋನಿಗ್ರಹ, ಧನಾತ್ಮಕತೆ, ಕರ್ಮ, ಧ್ಯಾನ ಮತ್ತು ನಂಬಿಕೆ. ಈ ವಿಷಯಗಳನ್ನು ಗಮನದಲ್ಲಿ ಇಟ್ಟುಕೊಂಡು ಜೀವನದ ಗುರಿ ಮತ್ತು ಪ್ರಾಮುಖ್ಯತೆಯನ್ನು ಅರ್ಥಮಾಡಿಕೊಳ್ಳಬೇಕು.

ಭಾರತ ಅಧ್ಯಾತ್ಮಿಕ ವಿಜ್ಞಾನದ ತಳಹದಿಯನ್ನು ಹೊಂದಿದೆ. ವಿಶ್ವ ಆರೋಗ್ಯ ಸಂಸ್ಥೆಯ ಪ್ರಕಾರ ಅಧ್ಯಾತ್ಮಿಕ ವಿಜ್ಞಾನವನ್ನು ನಾಲ್ಕನೆಯ ಆಯಾಮ ಎಂದು ಗುರುತಿಸಿದ್ದಾರೆ. ಕಳೆದ ಮೂರು ದಶಕಗಳಿಂದ, ಭಾರತದಲ್ಲಿ ಸಾಂಕ್ರಾಮಿಕವಲ್ಲದ ರೋಗಗಳು ಹೆಚ್ಚು ಉಲ್ಬಣಗೊಳ್ಳುತ್ತಿವೆ. ಅಂಕಿ ಅಂಶಗಳ ಪ್ರಕಾರ, 2005ರಲ್ಲಿ ಈ ರೋಗಗಳಿಗೆ ತುತ್ತಾದವರ ಸಂಖ್ಯೆ ಶೇಕಡ 53% ಆದರೆ, ಮನ್ಮೂಚನೆಗಳ ಪ್ರಕಾರ 2030ರಲ್ಲಿ ಇದು ಮುಕ್ಕಾಲು ಭಾಗದಷ್ಟು ಜನರು ಭಾಧೆಗೆ ಒಳಗಾಗುತ್ತಾರೆ ಎಂದು ಅಂದಾಜಿಸಲಾಗಿದೆ. ಈ ನಿಟ್ಟಿನಲ್ಲಿ, ಕಳೆದ ಎರಡು ದಶಕಗಳಿಂದ ಆಧುನಿಕ ವಿಜ್ಞಾನವು ಮನಸ್ಸು ಮತ್ತು ದೇಹದ ಅಕ್ಷವನ್ನು ಅರಿತುಕೊಳ್ಳಲು ಪ್ರಾರಂಭಿಸಿದೆ. ಅನೇಕ ಸಂಶೋಧನೆಗಳ ಪ್ರಕಾರ, ಅಧ್ಯಾತ್ಮಿಕ ಆರೋಗ್ಯದ ಅಭ್ಯಾಸಗಳು ಸಕಾರಾತ್ಮಕ ಸಂಬಂಧವನ್ನು ಹೊಂದಿವೆ ಎಂದು ಧೃಢಪಡಿಸಿವೆ. ಇದರಿಂದ ಮನುಷ್ಯನು ಆರೋಗ್ಯಕರವಾದ ಜೀವನವನ್ನು ಅನುಭವಿಸಲು ಸಾಧ್ಯವಾಗುತ್ತದೆ.

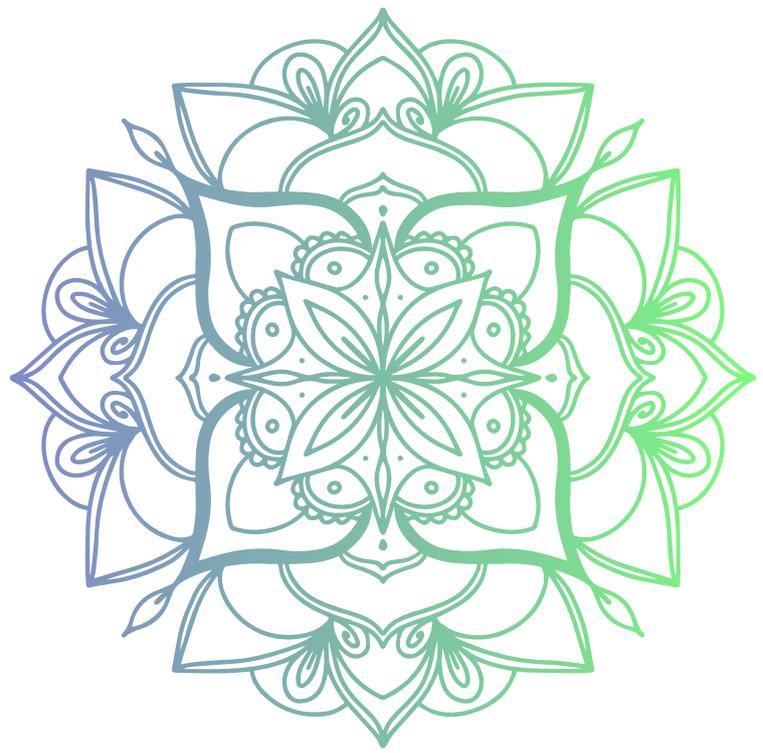
ಇಂದಿನ ಆಧುನಿಕ ಜೀವನ ಶೈಲಿಯಲ್ಲಿ, ಅಧ್ಯಾತ್ಮಿಕತೆ ಮತ್ತು ವಿಜ್ಞಾನ ಈ ಎರಡರ ಸಮನ್ವಯವನ್ನು ಸಾಧಿಸುವುದು ಅನಿವಾರ್ಯವಾಗಿದೆ. ಇದನ್ನು ನಾವು ಸಾಧಿಸಿದರೆ, ಗಾಂಧೀಜಿ ಹೇಳಿದಂತೆ ಭೂಮಿಯ ಮೇಲಿನ ಸ್ವರ್ಗವನ್ನು ಸೃಷ್ಟಿಸಿದಂತೆಯೇ ಸರಿ.



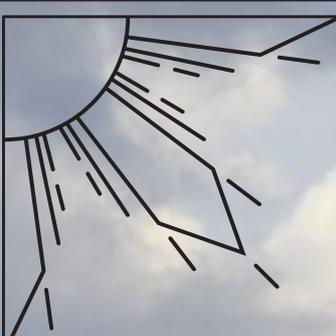
# English Translation

## By Vinay

**Spirituality and Science** are two facets of the same coin, and both are complementary to each other. Spirituality and science have traditionally been complementary through the practice of yoga and the Indian traditional system of medicine, as mentioned by the sages. The goal of this new dimension is to uplift the man from a state of hardship to a state of affairs, and from a helpless situation to the state of free will. To achieve this, three factors need to be understood: bhoga, yoga, and roga. The first refers to sensual enjoyment, the second to spiritual growth, the third to physical and mental illness. According to Sri Ramakrishna Paramahansa "Man must rise from sensual enjoyment to a state of yoga. Otherwise, it will put him in a state of disease". A man must be aware of the spiritual aspects in order to progress from sensual enjoyment to the state of yoga. They are mindfulness, positivity, karma, meditation, and worship. We must keep these things in mind in order to understand the purpose and importance of life.



India is the foundation of spiritual science. According to the World Health Organization (WHO), spiritual science is recognized as a fourth dimension. Non-communicable diseases (NCDs) have been on the rise in India for the last three decades. According to forecasts, approximately 53% of people suffered from these NCDs in 2005, and it is expected that 75% of people will be affected by these NCDs by 2030. In this aspect, modern science has begun to realize the axis of mind and body for the past two decades and also many researchers showed that there is a positive correlation between spiritual health practices and improved health. These practices enable the person to live a happy and healthy life.



# CROSSROAD



Swathi M

PhD Scholar

Department of Ageing  
Research

Back again here I am  
As I was Yesterday,  
Uncertain of the path ahead, Broken  
Dream left to rot,  
Stuck I am now at a Crossroad

The strangers that become Friends  
And the friends that became Strangers,  
Are all now a distant Memory,  
Stuck I am, now at the Crossroad

The faded Signboard,  
The broken Compass,  
Whom to Find, whom to Trust,  
The walk is Long,  
The time is Lost,  
Stuck I am at the Crossroad





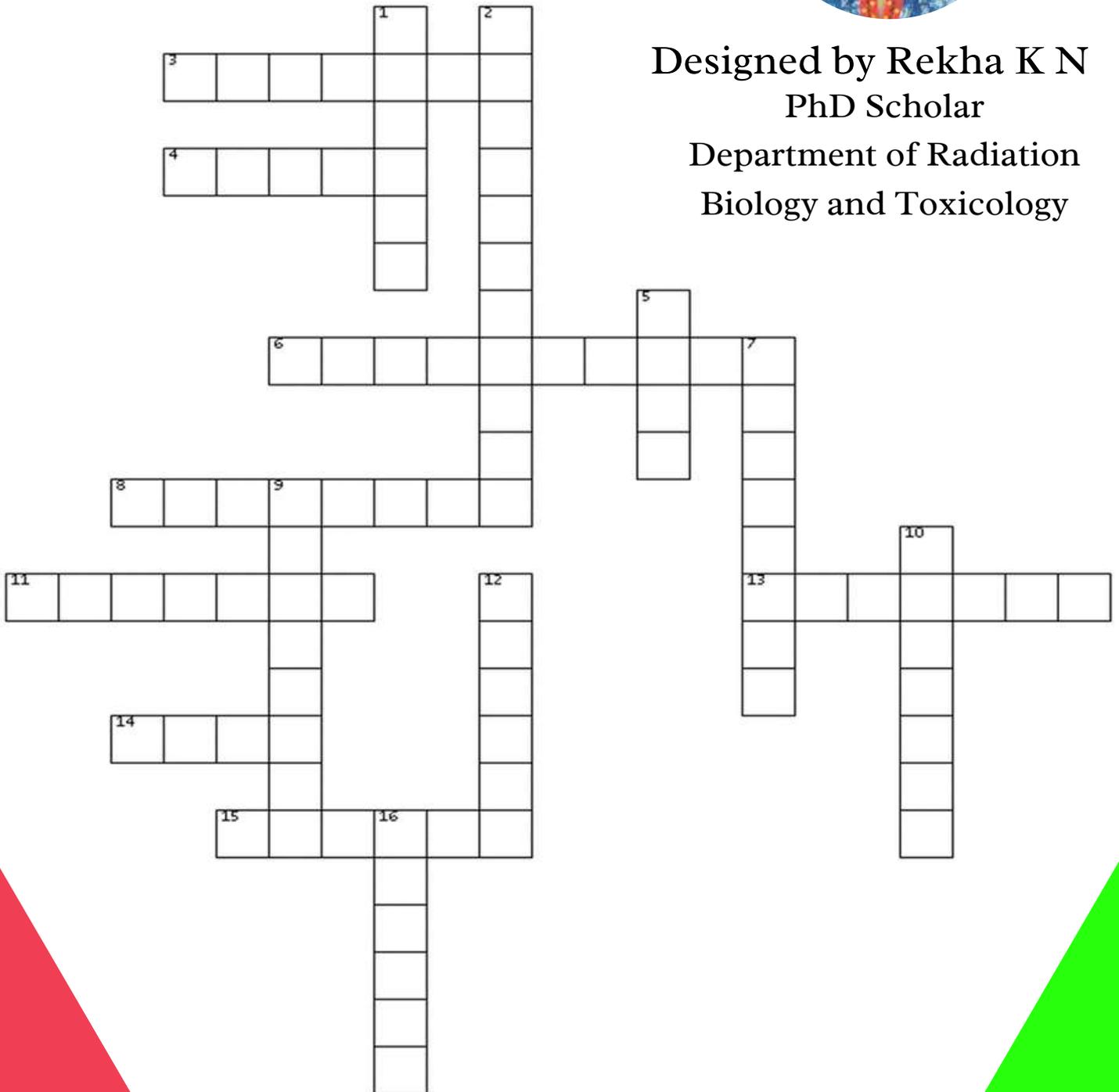
**CREATIVE  
NOOK**

# CROSSWORD!

## Know Your Nobel Laureates



Designed by Rekha K N  
PhD Scholar  
Department of Radiation  
Biology and Toxicology



*(Clues in the next page)*

## Across

3. This Indian American scientist was one among the three people, instrumental in interpreting the genetic code and its role in protein synthesis
4. This person's discovery explained how the cells respire through the extraction of energy from food and oxygen lead the citric acid cycle being famously named after him
6. The discovery of 'mobile genetic elements' famously known as transposons is the result of the singular effort of this American cytogeneticist
8. This American neurologist and biochemist's work led to the discovery of prions, a new class of infectious and self-reproducing pathogens that lead to several fatal and transmissible neurodegenerative diseases in animals
11. One of the pioneer scientists involved in the discovery of curative effects of the world's first broadly effective antibiotic substance
13. The successful conception through the technique of in-vitro fertilization is attributed to this prominent physiologist
14. This scientist, through his work on Malaria and how it enters the organism, laid the foundation for subsequent research on Malaria
15. This pharmacologist and biologist was one of the discoverers of the G-proteins that play an important role in the cellular signal transduction

## Down

1. This virologist was instrumental in discovering the role of the Papilloma Viruses in cervical cancer
2. Successful blood transfusions were made possible due to the contribution of this scientist
5. Regarded as one of the founders of modern bacteriology, this physician and microbiologist was the discoverer of causative organisms of diseases like tuberculosis, cholera, and anthrax
7. The discovery of the mechanisms behind the biological synthesis of ribonucleic and deoxyribonucleic acid is credited to his name
9. This French woman virologist was instrumental in the discovery and identification of the Human Immunodeficiency Virus'
10. This British biochemist and physiologist was one of the two scientists involved in the discovery and isolation of insulin
12. This scientist is credited for his discoveries concerning the role played by the chromosome in heredity
16. This scientist discovered that X-ray irradiation could produce mutations

**Note:** Fill the **last names** of the discoverers to avoid confusions

Answers in last page



Water colour painting by: U. Sangeetha Shenoy  
PhD Scholar, Department of Cell and Molecular Biology

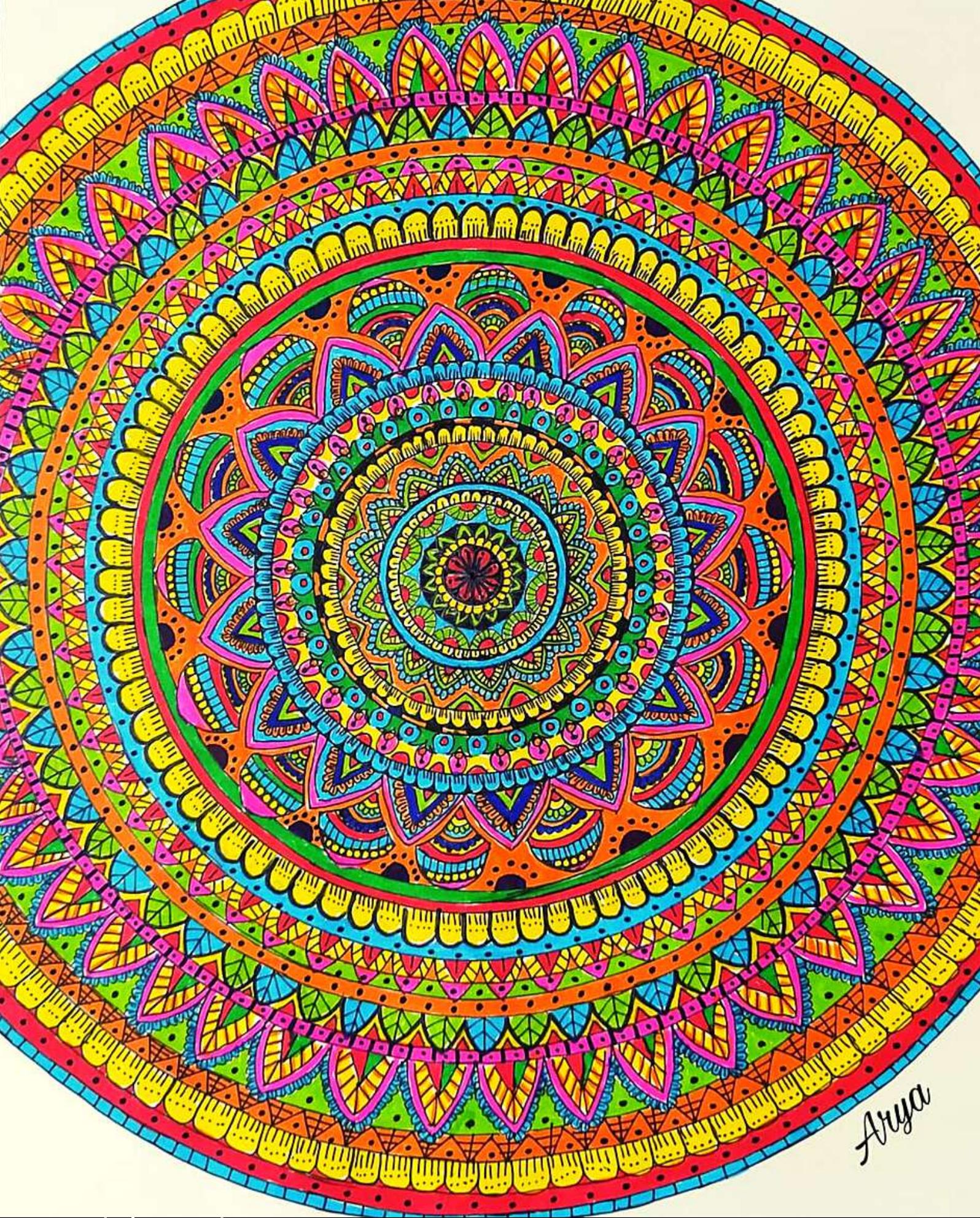


Pencil drawing by:  
Dr. Archana Kamath  
Project Assistant, Department of Cell  
and Molecular Biology





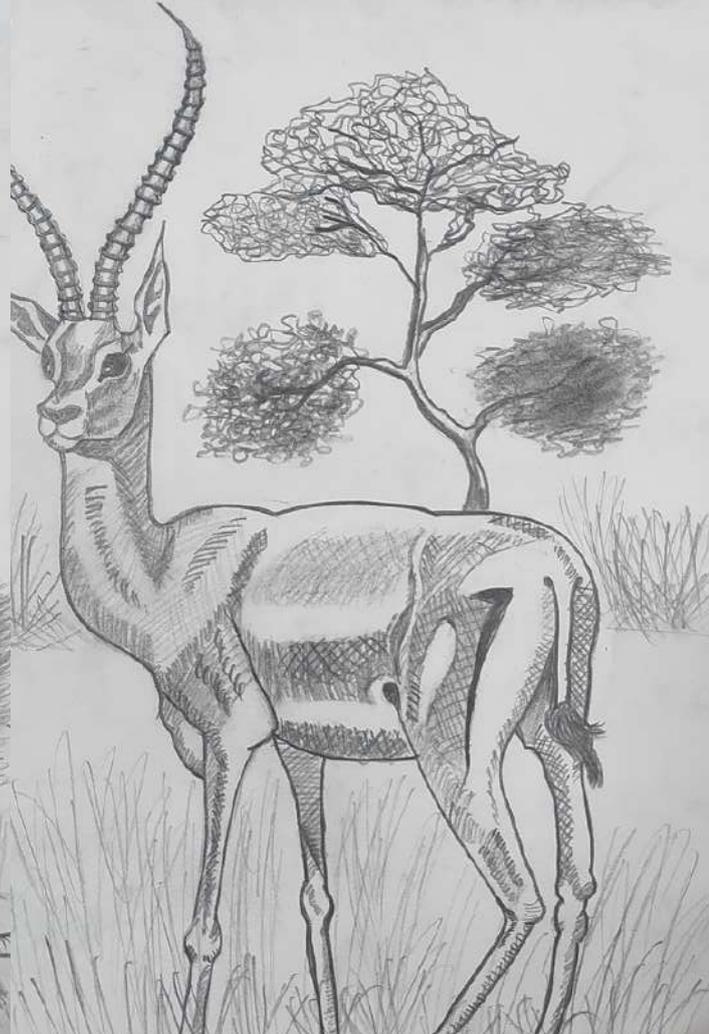
Photography by  
S. Vasishta,  
PhD Scholar, Department of Ageing Research  
*Captured using: Nikon D330 18-55mm lens*



Mandala art by:

Arya K.

PhD Scholar, Department of Plant Sciences



Pencil drawings by:  
Dhanush Acharya, BSc (Honours) Biotechnology



Photography by: Gagan R.  
PhD Scholar, Department of Biophysics  
*Captured using : Xiaomi Poco X3.*





Acrylic painting by:  
Chandni Sachdeva  
PhD Scholar, Department of Biotechnology





Photography by: P. Mishra

Captured using: *Vivo Z1 Pro.*

PhD Scholar, Department of Ageing Research





Water colour painting by: Pooja N.  
PhD Scholar, Department of Biophysics



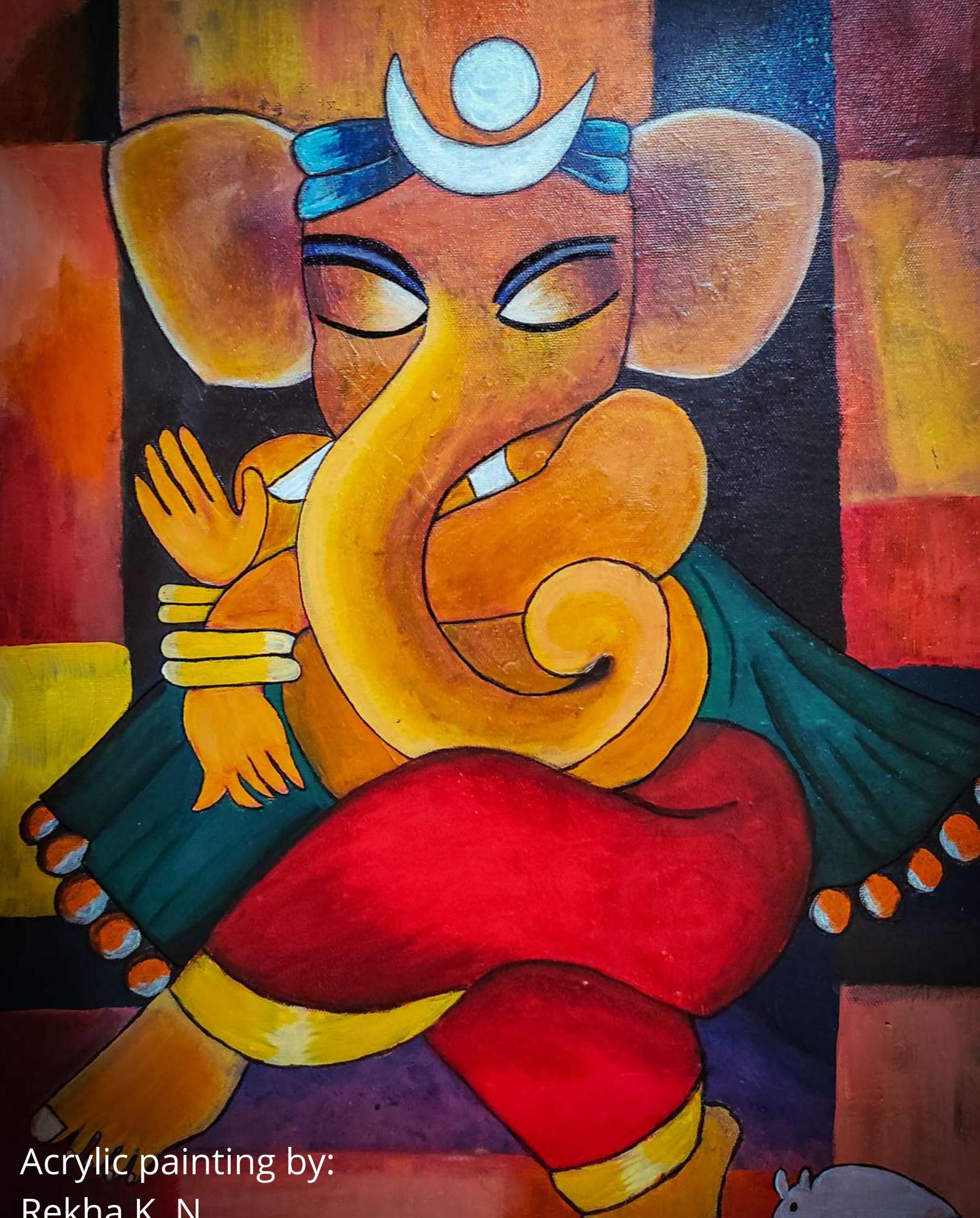


Photography by:

Apoorva J.

PhD Scholar, Department of Biotechnology

*Captured using: Oppo 5s.*



Acrylic painting by:

Rekha K. N.

PhD Scholar, Department of Radiation Biology and  
Toxicology



Glass painting by: Sindhoora K. M.  
PhD Scholar, Department of Biophysics



Photography by:

Pooja N.

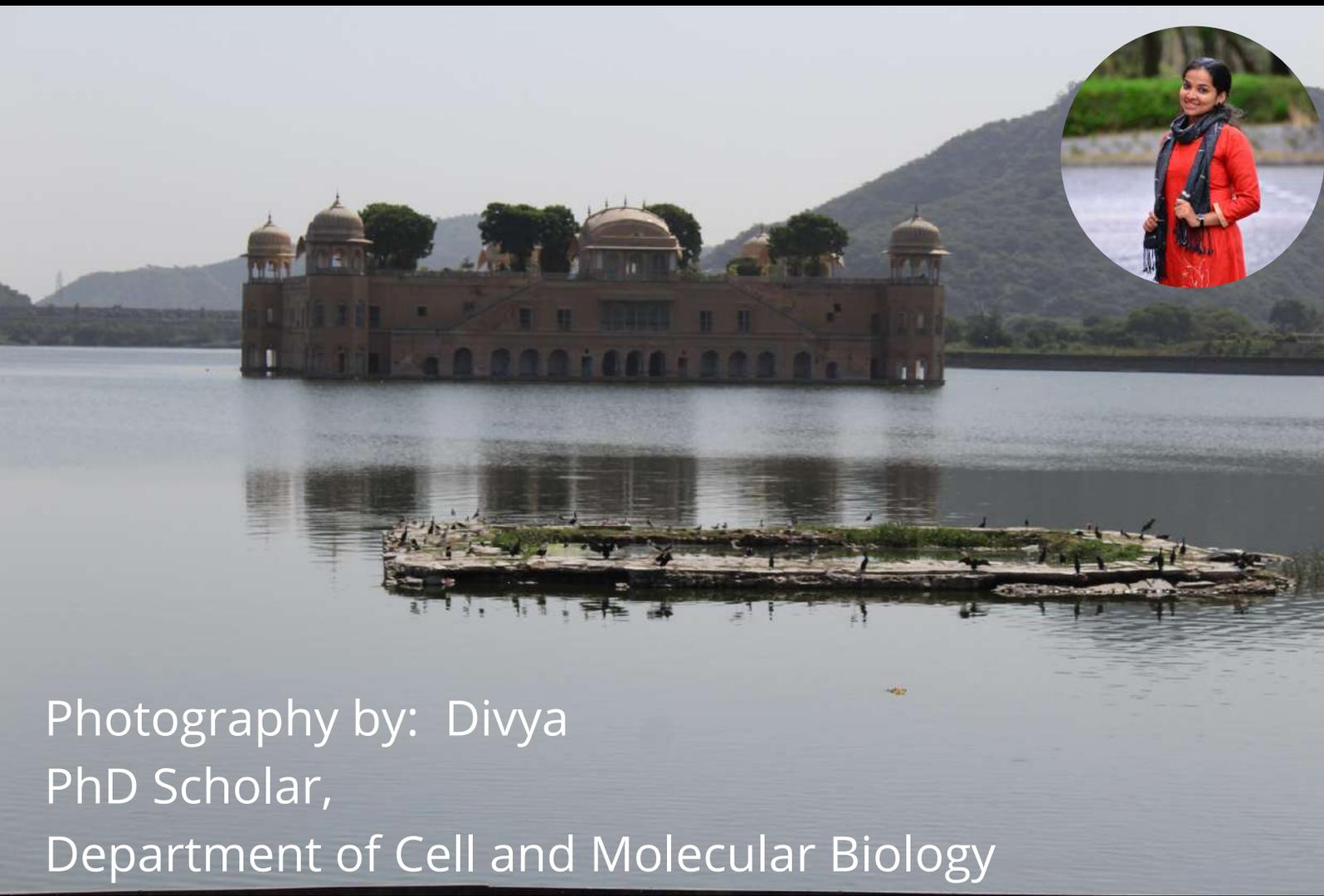
PhD Scholar, Department of Biophysics

*"EVERY SUNSET BRINGS IN HOPE THAT  
TOMORROW WILL BE BEAUTIFUL!"*



Mandala art by: Vaishnavi K.  
PhD Scholar, Department of Cell  
and Molecular Biology





Photography by: Divya  
PhD Scholar,  
Department of Cell and Molecular Biology



Photography by:  
Soundaryaa B.  
PhD Scholar,  
Department of Plant Sciences



Water colour painting by: Apoorva J.  
PhD Scholar, Department of Biotechnology

***ANSWERS FOR CROSSWORD***

- 1) HARALD ZUR **HAUSEN** 2) KARL **LANDSTEINER** 3) HAR GOBIND **KHORANA** 4) HANS ADOLF **KREBS** 5) **ROBERT KOCH**  
6) BARBARA **MCCLINTOCK** 7) ARTHUR **KORNBERG** 8) STANLEY **PRUSINER** 9) FRANCOISE BARRE-**SINOUSI** 10) JOHN JAMES  
RICKARD **MACLEOD** 11) ALEXANDER **FLEMING** 12) THOMAS HUNT **MORGAN** 13) ROBERT G **EDWARDS** 14) RONALD **ROSS**  
15) ALFRED **GILMAN** 16) HERMAN JOSEPH **MULLER**

Photography by: Sriharikrishnaa S

PhD Scholar, Department of Cell and Molecular Biology

CAPTURED USING: POCO M2 PRO.

EDITED BY: PANCHAMI

**"THE DIFFERENCE BETWEEN SCIENCE AND THE ARTS IS NOT THAT THEY ARE DIFFERENT SIDES OF THE SAME COIN, OR EVEN DIFFERENT PARTS OF THE SAME CONTINUUM, BUT RATHER, THEY ARE MANIFESTATIONS OF THE SAME THING. THE ARTS AND SCIENCES ARE AVATARS OF HUMAN CREATIVITY"**

**(MAE C. JAMISON)**

**VIVUS 7.3**

*Blend of Science, Creativity & Fun*