

**REPORT OF THE**  
**SCIENCE ACADEMIES' LECTURE WORKSHOP ON**  
**GENOMICS, TRANSCRIPTOMICS AND BEYOND**  
HELD AT DEPARTMENT OF BIOSCIENCES, MANGALORE UNIVERSITY  
ON 9-10 NOVEMBER 2017

**A brief report of the workshop:**

This lecture-cum-demonstration workshop ran under the theme: **Genomics, Transcriptomics and Beyond**. The current era in science may very aptly be called the OMICS era with giant strides being made in Genomics, Transcriptomics, Proteomics and Metabolomics that provide a very holistic view of a cell, organism by way of genes, RNAs, proteins and metabolites. This can also be considered as high dimensional biology with the integration of all of these components into what is called systems biology. Recent advances in sequencing of entire genomes, transcriptomes, proteomes and metabolomes have wide ranging implications with current technologies such as gene editing, CRISPR/Cas9 forecasting exciting times ahead.

It is only apt that Mangalore University which has been in existence since 37 years and is offering 8 M.Sc. programmes in Life sciences should host this workshop. The Science Academies Education Program of the three science academies of the country sponsored and organized this workshop.

The **Convenor was Academy Fellow Prof. Dr. N. B. Ramachandra** and the Local Coordinator was Prof. Dr. Monika Sadananda. This Lecture Workshop aimed at reaching out to students and faculty of Life sciences from the city of Mangalore, and the districts of Dakshina Kannada and Udupi with a view to engage minds in understanding recent concepts in Genomics, Transcriptomics and related topics. Out of the life science departments and institutions we corresponded with, students and faculty of Alva's College, Moodabidri and Department of Biosciences, Mangalore University responded by registering. In all we had 138 participants.

Prof. Dr. N. B. Ramachandra was accompanied by Academy Fellow Prof. Dr. H.A Ranganath, Prof. Dr. Cletus D'Souza, Emeritus Professor, Department of Studies in Biochemistry, University of Mysore and Dr. Upendra Nongthomba, Department of Molecular Reproduction, Development and Genetics, Indian Institute of Science, Bengaluru who together delivered a well-thought-out schedule with a series of lectures on the genomics and transcriptomics. The hosts encouraged the participants to make good use of this opportunity to interact with the professors and researchers during the workshop and to delve into scientific themes that relate to genomics and transcriptomics.

**Day 1:**

The Workshop began with a brief Welcome session wherein Prof. Ramachandra spoke about the Workshop and Prof. Ranganath spoke about the Academy. The first lecture was on **Flow of genetic information through the lens of OMICS** by **Prof. H. A. Ranganath**, who gave

the participants a panoramic view of how the study of genetics began, how gene function was understood in earlier times including Mendelian genetics and how much water has flown under the bridge of genetics since then with recent advances in gene structure, histones. More significantly he taught how genotype is related to phenotype. He also introduced concepts of epigenome, transcriptome and metabolome and the advancements in the field of proteomics. He also dwelt upon a new field of science called systems biology/computational biology.

This was followed by another talk on the **Recent understanding of genomic variations** by Convenor of the Workshop, **Prof. N. B. Ramachandra** which took us on a journey of genomics, and what makes organisms different, how much variation there is among groups of plants, simpler and multicellular fauna. He spoke of the genetic components of our genome, how variations come into the genome and how it can be used as a tool for instance to study human migration, expansion and adaptation. Using suitable examples he explained about SNPs, Microsatellites, Indels, and CNVs. Finally he dwelt upon how genomes evolved. He challenged the participants to contemplate the scenario of genomics today and the bioethics of genome editing.

The third talk of the day was by **Prof. Cletus D'Souza** who spoke on **Regulation of gene expression by noncoding RNA**. He introduced the entire pallet of the non coding RNA family, with particular reference to those that play an important role in transcription, and termination of transcription. He also spoke at length on tmRNA and its molecular biology. He went on to explain in detail how guide RNAs direct editing illustrating his talk with examples from pro- and eukaryotic model organisms.

The fourth talk of the day was by **Dr. Upendra Nongthomba** who spoke on **Functional genomics using Drosophila and Zebrafish** with a lot of information from his own experiments – the methods that are used and the results that he and his group have got over the last few years. He demonstrated how the Drosophila is still a valuable model for genetics and gene expression studies and linking of genotype to phenotype. He also explained the advantages of using the Zebra fish as a model organism, particularly for gene expression during development. He specifically explained the technique of Morpholino for rescue of retinal gene expression.

All the talks were of 45 minutes to 1 hour duration followed by 15 minutes interaction with the participants.

## **Day 2:**

The day began with a test your learning session for the participants.

This was followed by **Prof. Cletus D'Souza's** second talk on **miRNA**, antisense RNA, RNAi. He also dwelt on how siRNAs silencing RNA function. He explained the entire biochemistry behind the Dicer enzyme and how the RNA-induced silencing complex is formed. Using illustrations, he went into the applications using technologies such as agroinfiltration, micro-bombardment.

**Prof. Ramachandra's** second talk was on **Genomic medicine** where he used specific examples of disease-causing genes to illustrate how genomics is already playing a major role in diagnosis of genetic disorders and how it may help in pre-marital counselling of

predisposed individuals. He specifically highlighted the impact of BRCA1 and 2 being implicated in breast cancer risk. He also talked about use of genomic medicine to cure rare genetic disorders.

**Dr. Upendra Nongthomba's** second lecture was a detailed overview on **Genomic editing with CRISPR-Cas 9** technology. He explained Cas family of proteins in bacteria and the mechanism of CRISPR-Cas 9 technology, which is being used as a technique in gene editing in studies being carried out in various organisms and the applications of this technology.

**Prof. H. A. Ranganath's** second talk continued the topics discussed in his first talk on **Flow of genetic information through the lens of OMICS - II**, where he spoke of how biology is entering a new era which is very much inter- and trans-disciplinary in nature.

The Workshop ended with a **question-answer/interaction/discussion session** with all the Faculty and the participants. Participants were given the opportunity to engage in interactive session with the speakers and were also able to clarify their doubts. Participants expressed the opinion that some hands-on or demonstrations would have been value addition.

#### **Feedback:**

Feedback forms were distributed and collected on the final day. All were of the opinion that the workshop had benefited them, that they learnt a lot, that the speakers were very knowledgeable and that they considered the workshop to be **good** or **excellent**. They also opined that the lectures provided valuable knowledge, were easily understandable, gave good information on molecular genetics and that the videos helped better understanding.

**Number of participants (students and teachers) who attended the workshop = 138**

#### **Details:**

|                              |      |
|------------------------------|------|
| 1. Faculty                   | – 16 |
| 2. PhD students              | – 03 |
| 3. M.Sc. Biosciences         | – 31 |
| 4. M.Sc. Biotechnology       | – 33 |
| 5. M.Sc. Microbiology        | – 48 |
| 6. Alva's College Moodabidri | – 07 |

Total = 138

#### **Registration Folder:**

The registration folder contained a notepad, programme brochure and a pen

#### **Posters:**

Highlight of this Lecture Workshop was preparation of posters related to the theme by participants. Students were invited to hang posters Some of the posters were entitled Regulation of gene expression by miRNA, RNA sequencing, Nextgen sequencing platforms, Personalized medicine, Sanger's sequencing, Nextgen genome editing, etc.