The three day Lecture workshop on ‘Frontier Lectures in Chemistry’ sponsored by the Three Science academies of the country was held at V.V. Pura College of Science, K. R.Road, Bangalore -04 from 26 -28 February, 2009. The theme of the Lecture workshop was ‘Use of Analytical techniques in the study of structures of molecules.

The Lecture programme was inaugurated by Prof. P. Balaram, Director, Indian Institute of Science, Bangalore on 26-02-09 at 10am. He explained the importance of Mass Spectrometry in medical field and in particular in the identification of cells responsible for sickle cell anemia. Prof. Balaram forecasted that Mass Spectrometry in future would become one of the prime analytical tools in hospitals for distinguishing between normal and diseased red blood cells. In the inaugural session of lecture workshop programme, Dr. K.Mahadev, a well known Orthopedic surgeon and currently serving as the secretary of Vokkaligara sangha which manages a chain of general and professional educational institutions in Bangalore, expressed his concern for the pathetic situation in the enrollment of students to basic Sciences in colleges. He went on to say that he would go all out to help in nurturing basic Sciences by setting up a ‘Science Centre’ under the aegis of Vokkaligara sangha in Bangalore.

The inaugural lecture was followed by a lecture by Prof. T.N. Guru Row, Chairman, SSCU, Indian Institute of Science, Bangalore, on single crystal structure relation to chemical activity. He explained the development of x-ray diffraction studies and how the
modern technology has revolutionized the single crystal structure studies and its application in understanding the potency of a drug. He appealed to young participants to take up research as their future career and offered to make use of the facilities available at solid state and structural chemistry unit, which is the best in the country, in their research investigations.

In the afternoon session on 26-02-09 Prof. K.J.Rao, a well known structural chemist spoke on the application of extended x-ray absorption spectroscopy in the study of organomercury compounds, palladium nanoparticles, photo system involved in the cleavage of water, ferroelectric materials, nonogold, metallic glasses etc. The fourth lecture and the last for 26-02-09, was by professor S. Vasudevan of the Department of Inorganic and Physical Chemistry, Indian Institute of Science, Bangalore. He explained the properties of various types of magnetic materials and in his lecture, Prof. Vasudevan dealt in detail about the mechanism of ‘Super exchange’ phenomena taking oxides of 3d transition metals as examples.

The second day’s proceedings started at 10.00am on 27-02-09 by a lecture on ‘Techniques to analyse Biomolecules’ by Professor Parthasarathy Ajitkumar from Microbiology and Cell Biology department, Indian Institute of Science, Bangalore. He explained the application of chromatographic techniques – ion exchange chromatography, Reverse and size – exclusion gel chromatography, pulsed Field Electrophoresis, Field Inversion Gel Electrophoresis in separating and analyzing Biomolecules. This lecture was followed by a lecture by Prof. S. Ramakrishnan of Inorganic and Physical Chemistry department, Indian Institute of Science. He spoke on the applications of NMR Spectroscopy for ‘Microstructural analysis of polymers’ to distinguish Isotactic, syndiotactic and Atactic types of polymers. Prof. Ramakrishnan also discussed the use of simulated NMR Spectra in the analysis of meso and racemic components in the mixtures obtained from free radical, anionic and coordination polymerization processes.
The afternoon session on 27-02-09 started with a Lecture on ‘Molecular shape and Liquid crystallinity’ by professor B.K. Sadashiva from Raman Research Institute. He highlighted the importance of liquid crystals in day-to-day activity ie in digital watches, mobile phones, Televisionsets, etc. Prof. Sadashive spoke at length on the new type of liquid crystals ‘Banana shape liquid crystals’ made by his team at Raman Research Institute. He also explained the exotic colour and texture of a variety of liquid crystals. The second day’s lecture series ended with a lecture by INSA Scientist professor KRK. Easwaran, Currently working in the Molecular Biophysics department, Indian Institute of Science, Bangalore. Prof. Easwaran very lucidly explained the properties of polarized light and the use of polarized light in optical rotatory dispersion (ORD) and Circular dichroism (CD) techniques in the assignment of absolute configurations of isomers of chiral compounds.

On 28th Feb 2009, in the First lecture Dr.Anil Kumar, of NMR Research Centre, Indian Institute of Science, Bangalore, spoke on the NMR Techniques and its applications to the structural analysis of Molecules. Besides explaining fundamental concepts in NMR technique he gave a very stimulating talk on the application of NMR with special emphasis on the structure of Biomolecules and the applications of 2D NMR and 3D NMR in magnetic Resonance imaging. He explained the applications of Functional Magnetic resonance imaging in the Diagnostic studies of human organs functioning.

Dr. N. Chandra Bhas of JNCASR, Bangalore, gave a very stimulating talk on the applications of Raman Spectroscopy in structural analysis. Dr. Chandra Bhas started from fundamentals of Raman spectroscopy and went on to show how different types of molecular vibrations reveal themselves the structure of the entire molecule. He demonstrated that how amide group vibrations in proteins can be used to distinguish α-helical β-sheets and random coils in biomolecules. He also emphasized the importance of resonance Raman and surface enhanced Raman methods. (SERS). In SERS method he demonstrated how Biomolecules adsorbed on roughed silver metal surface show high sensitivity to the groups interacting with the surface atoms.
Dr. Shiva Prasad of JNCASR spoke on the use of XPS in surface Analysis. In his talk he showed excellent pictures of surface atoms which need a special techniques to probe the monolayer of surface atoms. He pointed out that such surfaces have high surface to volume ratio which is responsible for its high reactivity. Catalytic nature of surfaces which is easily exploited in industries is attributed to the nature of surfaces atoms.

Dr. Shiwaprasad lecture contained the theoretical basis of XPS as well as its applications in the analysis of surfaces on micro and macro molecular dimensions.

The three day Lecture workshop programme concluded with the valedictory address by Prof. H.A.Ranganath Director, National Assesment and Accreditation Council. He explained the availability of financial support from the Science academies to students as well as teachers under ‘Science Academies Education programme’. He stressed upon the role of basic sciences in the development of many applied branches of study in physical and Biological Sciences. Another Guest for the valedictory function was professor M.V. Rajeev Gowda. Professor at Indian Institute of Management, Bangalore. He spoke on the role of youth in the development of technology in a developing country like India. The valedictory programme ended with vote of thanks by professor B.S.Sheshadri.

Thus in the workshop, the students were exposed to a plethora of topics dealt by a gamut of scientists – eight from the Indian Institute of Science, two from the Jawaharlal Nehru Center for Advanced Scientific Research, and one from the Raman Research Institute. It has helped teachers and students in improving their communication skills, knowing about the advantages of improved analytical techniques, in understanding microlevel structure of materials. On the whole the workshop gave an insight into the tremendous progress that has taken place in different areas of chemistry. It is hoped that the lecture workshop would have rekindled interest in many of the students to pursue higher studies in basic sciences. It is expected that few sparks from the present generation would result in a glow in the science horizon in the country in the years ahead.

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