A Refresher Course on ‘Advances in Biophysics’ for postgraduate college teachers was held at the Centre for Cellular and Molecular Biology, Hyderabad for a two-week period during 25 May – 8 June 2007.

Biophysics is an interdisciplinary science that uses concepts and methods from physical sciences and engineering to elucidate the workings of biological processes at molecular, cellular, and organismal level. The scale encompasses solving of protein structure or measuring the kinetics of interactions on one hand, to application of models and experimental techniques derived from physical sciences to larger systems such as tissues or organs on the other. The systems and methodologies used by biophysicists thus span a large number of disciplines, such as biology, chemistry, computer science, mathematics, medicine, physics, physiology, and neuroscience.

Biophysics often does not have separate departments of its own in colleges, and is primarily taught by biologists who have specialised in other areas of life sciences. Given the interdisciplinary nature of the subject, teaching Biophysics to undergraduate and postgraduate students remains a challenging task. With the advent of new techniques to unravel intracellular processes at a very small and fast space-time scales, it becomes necessary for the teachers to acquaint themselves with the rapid developments taking place in the area.

The goal of this Refresher Course was to expose the biology teachers (at the under and post graduate level) to the recent advancements in Biophysics, so that they are able to transfer some of the excitement in biophysical theory and techniques through their teaching. The programme of the Refresher Course has been designed to introduce the teacher-participants to the multi-faceted nature of Biophysics with lectures, demonstrations, and laboratory sessions.

This Refresher Course was organised under the Science Education Panel of the Indian Academy of Sciences, Bangalore (IAS) with the support of the Indian National Science Academy (INSA) and the National Academy of Sciences India (NASI). The Course was organised at the Centre for Cellular & Molecular Biology (CCMB), a national laboratory under the CSIR with highly developed infrastructure, involved in multi-disciplinary research with a strong emphasis on biophysical studies. All faculty and techniques taught in this Course existed in CCMB. We started with the hope that the exposure to these advancements in this Course would add to the teaching and laboratory skills of the participants.
1. **About Selection and Participants:**

We received 59 applications, and finally selected 31. The geographical distributions of the participants are shown in Table I. The three primary criteria for selection were - (i) age below 45, (ii) all India representation, and (iii) Teaching biophysics as one of the subjects. Of the 31 teacher participants selected, 15 were males and 16 females. The age ranged from 22 to 45 years.

*Table I: Geographical distribution of the Participants:*

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<th>Kerala</th>
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<th>Chattisgarh</th>
<th>Orissa</th>
<th>Rajasthan</th>
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2. **Accommodation, Food and Other Programmes**

All out-station participants were housed in CCMB guest house on twin-share basis from May 24 to June 9, 2007. The only local participant also stayed in the CCMB guest house as she was finding it difficult to travel everyday. Breakfast, special lunch and dinner were arranged by the CCMB Canteen. Tea, coffee, biscuits, and snacks were given 2 times a day (11AM, 4PM) in between the sessions. Special high tea was organised twice - after the inaugural session and before the concluding session. A whole-day city tour was organised on June 3rd (Sunday), and a Special Dinner was organised on the same evening where the participants met all those who helped in the organisation, the faculty members with their families. The other fellows of the three Academies in CCMB were also invited.

Given the background of the teacher-participants, we decided to organise a scientific book exhibition-cum-sale at CCMB Central Court on June 7, 2007, so that they could utilise the book grant given by the IAS for purchasing books of their choice.

3. **Material given during Registration and later:**

Given the nature of the topic, we planned to give sufficient reading material related to the course to the participants. We gave the participants a bag with copies of "Resonance", IAS flyers about journals and Science Education Panels, one past issue of Current Science, the annual report of CCMB, copies of the Hindi science magazine "Jigyasa" brought out by CCMB, a hand-out on CCMB facilities, Programme List, one note book and a pen. We also gave a Workbook entirely designed, printed, photocopied, and spiral-bound at CCMB. This Workbook contained material given by the faculty related to their teaching subject. Few Resource persons gave additional material during their lectures also. On request from the participants, at the end of the course, we gave a CD having information and photos of all the
important instruments/facilities that CCMB has along with a copy of the Group Photograph taken on the first day of the Course. The Participation Certificates, signed by Prof. Mukunda, the Course Directors (Dr. Ch. Mohan Rao and Dr. Sondatta Sinha), were presented to the participants by Prof. D. Balasubramanian, President, IAS, in the Concluding Session.

4. The Programme:

Much thought went into designing this course – it was laid out in terms of techniques used to study biological systems at different levels of organisation. The resource persons were all from CCMB of who five are fellows of the IAS. The course was divided into six modules to study structure, function of biological macromolecules, and intracellular localisation and processes.

(i) Spectroscopy (Light, Ultraviolet, and Fluorescence spectroscopy)
(ii) High resolution Microscopy (Electron Microscopy, Confocal Microscopy, etc.)
(iii) Nuclear Magnetic Resonance Spectroscopy and Imaging.
(iv) X-Ray Crystallography
(v) Proteomics
(vi) Comparative protein modelling using Bioinformatics tools, and Computational systems biology.

The lectures were planned keeping in mind the background of the participants, and aimed to enhance the value of teaching the subject. The first few lectures were general introduction to the biological systems of study. Then in each module, the morning two sessions were devoted to theory lectures on the topic, and the two afternoon sessions were for laboratory demonstration of the relevant biophysical techniques. All laboratory sessions were done in the respective scientists' laboratories with the assistance of their own laboratory personnel including graduate students. Learning from students was a great experience for these teachers, and they found all very helpful in clarifying their doubts and answering to their questions.

There were four special lectures, generally delivered in the evenings, on current topics of interest, such as Nanotechnology, Stem cells, Quantum dots, and Emerging trends in Biology. All were very much appreciated by the participants and they participated actively in discussions. Three scientific documentary films were also screened. The participants were encouraged to meet any scientist/facility in CCMB and discuss their problems.

The Refresher Course started on May 25th morning with Dr. Ch. Mohan Rao informing the Participants about the different programmes in the Education Initiative of the
IAS. Dr. Ram Rup Sarkar presented a short account of the selection criteria and scientific/demographic statistics of the selected participants. Dr. Lalji Singh, Director, CCMB welcomed the participants, and gave the inaugural talk.

The formal lectures of the Refresher Course ended at 6PM on June 8th. The Concluding session ended with a special lecture by Prof. D. Balasubramanian, himself a Biophysicist, who, along with a simplified lecture on Quantum Dots for biologists, also talked about the changing face of Biophysics. He also gave away the Participation Certificates. Several participants gave their comments about the Course, which were positive and very encouraging to the organisers. The Course was closed with thanking all those who made the course a success.

The participants’ feedback was obtained about the course. The general feeling was that the experience has given them tremendous benefit, as now they understand what they teach much better after seeing the techniques and understanding the concepts behind them. The good thing about choosing younger participants was that they were very eager to learn and had lot of energy to work almost continuously for two weeks. They were quite interactive and were impressed by the faculty who made it a point to answer all their questions and interact a lot with them during off hours. As the organisers of this Refresher Course we have continuously strived for making it not only interesting and useful for their teaching, but also inculcate the value of scientific research in them. With the stream of emails that we are still receiving makes us believe that we may have been successful to some extent. We thank the Academies for supporting this activity.

Acknowledgements:

Prof. N. Mukunda Chairman of the Education Panel and Mr. G. Madhavan Executive Secretary of the Indian Academy of Sciences has been a constant source of support in this endeavour. The organisers thank Prof. D. Balasubramanian, President, IAS, for gracing the concluding sessions and giving the certificates to the teacher-participants. The full support from Dr. Lalji Singh, Director, CCMB, for conducting the Course is gratefully acknowledged.

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