

tion, denaturation and gelation in protein solution as studied by SANS.

The concluding session was held to provide a feedback. Most participants felt that it was a well-organized symposium; they appreciated that parallel sessions were avoided which enabled a broad exposure to all the major fields of neutron scattering for everyone.

Researchers from universities and other academic institutions utilize the National

Facility for Neutron Beam Research at BARC regularly. Several research projects have been carried out under the aegis of UGC–DAE–CSR. In addition, the Facility has been extensively used by BARC for basic research in condensed matter science. The international symposium enabled useful scientific discussions among the national and international researchers, and was of immense benefit to the above research and development ac-

tivities at BARC. In particular, informal discussions included possibilities of our participation in international collaborations with some of the most advanced research centres and in a proposed Asia–Oceania Neutron Scattering Association.

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## MEETING REPORT

### Marine biology to marine biotechnology: A leap forward\*

India has a long coastline of approximately 4667 km, offering scope for fisheries and aquaculture. Mumbai, being the economical hub associated with research and development has potential to develop into a marine biotechnology research centre.

The national conference on marine biology and biotechnology held recently, had more than 200 participants. There were in all 24 speakers who delivered informative lectures.

The Chief Guest A. D. Sawant (University of Mumbai) in his talk emphasized the need for building up infrastructure for development of marine biotechnology and stressed the need for application of research at college and university-level.

Joe Baker (Department of Primary Industries and Fisheries, Australia) gave a keynote address titled 'Towards 2020 – A vision of the enormous potential of marine biotechnology for the social, environmental and economic benefit of India'. Baker brought forth many opportunities for the efficient development and use of marine biotechnologies. His talk aimed to stimulate thought on the enormous potential of marine biotechnologies for food, nutraceuticals, fibre, biofuels, bioactive substances, bioplastics, bioremediation and for enhancement of the ser-

vices traditionally provided by the oceans.

In the session on 'Marine Ecology and Microbiology' Anna Godhe (University of Gotenberg, Sweden) gave an account of the application of molecular genetic studies to understand phytoplankton distribution and ecology. Ann Sofi Rehnstam-Holm (University of Gotenberg, Sweden) threw light on 'Human pathogens in the coastal environment'. B. B. Nayak (CIFE, Mumbai) gave a lecture on 'Viable nonculturable bacteria in marine environment'. He elaborated on the significance of these bacteria in spreading diseases.

The next session was on 'Fishery and Aquaculture'. Indrani Karunsagar (UNESCO Centre for Marine Biotechnology, Mangalore) in her speech on 'Bacteriophage therapy and its application in aquaculture', shed light on various microflora associated with larval stages of shrimp that could affect the health and development of the larvae. M. K. Sajeewan (FSI, Mumbai) briefed about the application of marine resources for the production of a wide range of products and also the application of biotechnology in fisheries, such as brood stock development, germplasm conservation, management of aquatic animals, etc. K. V. Rajendran (CIFE, Mumbai) dealt with 'Molecular diagnostics for shrimp viruses', as shrimp aquaculture has witnessed spectacular growth and has become a central economic engine for the global food-production sector. Deepak Apte (BNHS, Mumbai) deliberated on 'Conserving giant clams through establishment

of conservation reserve in Lakshadweep'. He discussed about Project Giant Clam, which emphasizes on three aspects, i.e. research, community education and livelihood issues.

Baker contemplated on 'Ecosystem change vs climate change' for the Brainstorming session. He elaborately discussed about global warming and its drastic effects on the ecosystem. He presented different types of ecosystems and also on how the climate change, invasive species, over explosion, and pollution have an effect on different ecosystems.

Rakesh Kumar (NEERI, Mumbai) dealt with the impact of climate change on marine resources. India, with its long coastline and a large population supported through fisheries-related resources, will be at great risk due to climate change. He deliberated on the various threats hovering over the marine resources due to climate change. Yasuwo Fukuyo (University of Tokyo, Asian Natural Environment Science, Japan) elaborated on 'Harmful algal blooms and molecular biotechnology for their research'. Several tonnes of unicellular microalgae species produce highly potent toxins and they are called toxic microalgae. He gave an overview of probes to identify these harmful algal species which are usually more specific than morphological identification and labour-saving methods.

Arvind Lali (UICT, Mumbai) emphasized the use of biofuels such as bioethanol and biodiesel from renewable sources, which holds special promise. Use of algal systems for production of hydrogen or algal oil has been projected as the fu-

\*A report on National Conference on 'Marine Biology to Marine Biotechnology: Current Status, Challenges and Opportunities' organized by the Department of Zoology and Department of Botany, D. G. Ruparel College, Mumbai during 18–20 January 2008. The conference was funded by UGC, DST and CSIR.

ture of the energy industry. Ajit Pandit (ABPS Infrastructure Advisory Ltd, Mumbai) spoke on 'Harnessing bioenergy: Market development perspective'. India's energy consumption, which depends heavily on coal and oil, has been growing fast. He was of the view that algal resources as an alternative source of bioenergy can be explored.

H. M. Kamat (Anama Energies, Pune) spoke on 'Concept of small co-generation plants using biomass and biogas'. He stressed the need to set up industries in landfill areas in cities to generate power from biowaste. B. A. Chopade (IBB, University of Pune) discussed the discovery of a novel potent biosurfactant/bioemulsifier-producing marine microorganism which would facilitate application-oriented outlook at the surfactant industry.

C. Raghukumar (NIO, Goa) provided an overall picture of bioremediation of industrial pollutants. She presented results of white-rot basidiomycetous fungi and their lignin-degrading enzymes laccase, manganese peroxidase and lignin peroxidases, which are used in the biological treatment of coloured industrial effluents and other xenobiotics with success. C. G. Naik (NIO, Goa) focused on 'Marine natural products: A potential source of bioactive compounds'. Debashis Mitra (NCCS, Pune) pondered upon the identification of a novel anti-HIV-1 molecule from a marine bivalve. He discussed about marine bivalves available along the Indian coastline, which were screened for anti-HIV activity.

The conference included interaction of industry, corporates, scientists and par-

ticipants, that played a vital role in communicating the latest findings in marine biotechnology to leaders in the industry and Government. Shrikumar Suryanarayan (Biocon Ltd, India) and Gopal Dasika (Reliance Life Sciences, India) gave an overview of the 'Career opportunities of biotechnology in India'.

The talks were followed by a panel discussion on the topic 'Biotechnology: Lab to industry – A missing link . . .', for exchanging view amongst scientists, corporates and participants. The panel included Joe Baker, Arvind Lali, Gopal Dasika, S. Suryanarayan, S. V. Chiplunkar (ACTREC, Navi Mumbai) and B. A. Chopade. In the panel discussion the following views were discussed: Science and technology have a close connection and teachers have an important role to play in building the careers of the students. Biotechnology is a highly interdisciplinary area and any student of biological sciences can make a career in biotechnology. Need for uniform standards in admissions to universities. Also, industries should have training centres to fulfil their expectations.

The third day of the conference got initiated with a session on 'Molecular Biology and Bioinformatics'. Annamma Anil (UICT, Mumbai) threw light on the 'Role of structure in biology – Structural bioinformatics'. Aparna Chaudhary (CIFE, Mumbai) spoke on 'Control of shrimp viral diseases using RNA interference'. Narsingh Thakur (NIO, Goa) deliberated on 'Significance of molecular biological tools in the discovery of marine natural products'. He spoke on recent progress of novel molecular technolo-

gies, which offer a unique opportunity to establish metabolites of marine origin as drug leads.

The session on 'Open Space' organized during the conference envisioned to keep the participants abreast of the latest developments in the industry and personality development to enhance career growth. R. Vishwakarma (Nicholas Piramal Research Centre, Mumbai) spoke on 'Natural products as sources of new chemical entities: Experience at Nicholas Piramal Research Centre'. Bhushan Lawande (Lawandes's Management School) spoke on 'Influencing skills impact on interpersonal behavior'.

The papers presented by participants in Contributing sessions included parallel sessions of both poster and oral presentations. The presentation and the subsequent discussions with the audience at large highlighted various areas of marine biotechnology.

A pre-conference workshop on 'Immunoassays for screening natural products for their immunomodulatory activity' was organized by the Department of Zoology, The D. G. Ruparel College, Mumbai in collaboration with Immunology Department of Advanced Centre for Treatment, Research and Education in Cancer (ACTREC) on 17 January 2008, under the guidance of S. V. Chiplunkar (Chiplunkar Laboratory, Mumbai).

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