who has made a major contribution to the study of the evolution of the chemical composition of stars, and Roddam Narasimha, an internationally renowned Indian engineer and physicist, whose work in fluid dynamics has increased our understanding of turbulence.

Beatriz Barbuy, professor at the Institute of Astronomy, Geophysics and Atmospheric Sciences at the University of São Paulo, Brazil, and Vice-President of the International Astronomical Union is being honoured for her contributions to astrophysics and, in particular, for enhancing our understanding of the evolution of the chemical composition of stars.

K. R. Srinivasan (Director and Abdus Salam Honorary Professor, Abdus Salam International Centre for Theoretical Physics, Trieste) writes, 'Roddam Narasimha's scientific accomplishments in engineering sciences and his intellectual influence have both been enormous. The focus of his research has been fluid mechanics. In particular, the three areas to which he has made lasting and salutary contributions are: transition between laminar and turbulent states, turbulent shear flows, and the shock structure. His work on the effects of surface curvature and nonlinear vibration of strings established him as an independent research worker of high calibre. The paper on vibration is a class act in which one can see the stirrings of modern ideas of nonlinear dynamics and chaos – for instance, Arnold tongues. Narasimha did venture into chaos much later. He has made salient contributions to a number of problems on flow control, transonic and supersonic flows, wind energy and rural technology, standard atmosphere for tropics, monsoon dynamics, inversion layer very near the ground, reliability and maintenance of air fleet, and civil aviation; all these subjects are richer today because of his outstanding work. His work on atmospheric phenomena is trend-setting and has brought new rigour into that area of research. All his papers are written with exemplary lucidity. Narasimha fostered an excellent school of engineering sciences in India, from which have emerged many young people who have established themselves all over the world.'

MEETING REPORT

Extremophiles 2008*

About 200 delegates from 33 countries participated and presented their work in an international conference on extremophiles, the microbes from extreme habitats. The conference encompassed latest research developments in a range of areas concerning extremophiles: molecular ecology, metagenomics, physiology, genetics, protein structure and function, and biotechnology. The deliberations in the conference aimed at: (1) The current and future prospectives on various aspects of extremophiles. (2) To understand molecular mechanisms for adaptation strategies of the extremophiles. (3) Understanding recent trends in extremophile research. (4) Exploration of newer habitats and developing new tools for isolation, metagenomics and phylogeny. (5) Setting priorities for future research.

Garo Antranikian (President, International Society for Extremophiles (ISE)) introduced the aims and the activities of ISE. Brian O'Connell (Rector, University of Western Cape) delivered the opening plenary lecture on 'Science education and research in South Africa: needs and challenges in a new nation'. He emphasized that most of the adaptive capabilities are contributed by Africans intellectual power. O'Connell sketched various parameters of social and economic developments and compared the trends between developing and developed nations. He further emphasized that for a long time Africa has been identified with ignorance and anti-intellectualism, leaving the issue of higher education unattended and unrecognized.

Seven oral sessions were conducted every day, with three sessions running in parallel. The sessions focussed on proteins and enzymes, microbiology and microbial ecology, adaptations to extremophily, genes and nucleic acids, and applications of extremophiles. Patrick Forterre (Pasteur Institute, Paris, France) proposed a third archaeal phylum, Thaumarchaea. He also challenged a hyperthermophile to be a last common ancestor of archaea. Aharon Oren (The Hebrew University of Jerusalem, Israel) spoke on the environmental genomics of the Dead Sea using metagenomic analysis. He highlighted the amplification of 16S rRNA genes from the environmental samples showing only 89–93% identity with cultivated Halobacteriaceae. His group is trying to obtain metagenomic information on preserved Dead Sea biomass collected during the 1992 microbial bloom. Yoshizumi Ishino (Department of Generic Resources Technology, Kyushu University, Japan) explained the contribution of proteins from hyperthermophilic archaea to structural and functional analysis of DNA replication/repair apparatus. He has analysed the complexes that appear at the elongation process of DNA replication, using electron microscopic single-particle analysis. Haung Li (State Key Laboratory of Microbial Resources, China) reported about the Sac10b family of archaea. Proteins of the Sac10b family are highly conserved among archaea, but their physiological functions are unclear. He speculated that the proteins of this family may have diverged in function during the course of evolution and hyperthermophilic members of the protein family may be involved in the adaptation of the organisms to growth at high temperature. S. C. Carry (University of Waikato, New Zealand) examined the microbial diversity of thermophilic communities in hot mineral soils of Antarctica, using automated rRNA intergenic spacers analysis

*A report on 'Extremophiles 2008', an international conference organized by the University of the Western Cape and University of Cape Town, Cape Town, South Africa in collaboration with the International Society for Extremophiles during 7–11 September 2008 at Lord Charles, Somerset West.

(ARISA) and 16S rRNA clone libraries. DasSarma (University of Maryland Biotechnology Institute, Baltimore, USA) presented the genomic analysis of extremely halophilic archaea, *Halobacterium* sp. NRC-1 to understand gene regulation operating in this organism to survive in response to extreme conditions. Among 13 general transcriptional factors (GTFs) examined, one pair of GTFs, TbpD and TfbA, together has been implicated in the transcription of 10% of the genome, indicating a new paradigm in archaeal gene regulation. Peter Bergguist (Biomolecular Frontiers CoRE, Australia) presented the *in vitro* evolution of biocatalysts from extremophiles for biotechnological exploitation and explained the approaches; Degenerate Oligonucleotide Gene Shuffling and Random Drift Mutagenesis techniques to mimic *in vivo* natural evolution.

Stephen Pointing (School of Biological Sciences, University of Hong Kong) spoke on microbial colonization of lithic niches in the arid and hyper-arid deserts. He focused on the ubiquity of the cyanobacterium, *Chroococcidiopsis* in endilithic, chasmolithic and hypolithic niches, the transition from multi-domain communities to bacteria-only communities. Odd Brakstad (Norwegian University of Science and Technology, Norway) stated that 16S rDNA microarray may have potential in rapid screening for studies on microbial communities in oil reservoirs. Based on this technique, he has developed 18 specific oligonucleotides to improve the diagnostic results, representing important microbial groups in oil reservoirs; sulphate-reducing prokaryotes, methanogens and *ε-proteobacteria*.

Ana Casanueva (University of Watern Cape, South Africa) analysed the dispersion of nanoarchael 16S rRNA gene sequences in a large range of environmental conditions, including hyperthermophilic and mesophilic ones. Adams Michael and co-workers (University of Georgia, Athens) have isolated 1202 proteins from large-scale fractionation of *Pyrococcus furiosus*. Of these, 325 proteins are proposed to form 133 heteromeric protein complexes, based on the co-fractionation of proteins encoded by adjacent genes. They found more than 80 of these potential multiprotein complexes to be uncharacterized or novel. They are also analysing the current mass spectroscopic data using a six-frame translation approach to further define the genome and identify unique genes. The work of Nitin Baliga (Institute for Systems Biology, USA) was highly appreciated. He has developed the systems approach for mining extreme potential through predictive modelling.

B. Franzetti and co-workers (Institute de Biologie Structurale, Grenoble, France) reported on the identification of several macromolecular assemblies of the 20S proteasome and a novel family of giant peptidases called TET. They have also analysed the 3D structure and the properties of TET complexes, and suggested that they represent a novel type of destruction pathway. Karl Payne (Centre for Extremophile Research, University of Bath, UK) identified 2-oxoacid dehydrogenase multienzyme complexes in thermophilic archaea. They are recombinant, expressing the complex component enzymes from *Sulfolobus solfataricus*, *Aeropyrum pernix* and *Pyrobaculum aerophilum*. Further, the *S. solfataricus* E1$\alpha\beta$ component, which determines complex specificity, was active only with acetoin; not with 2-oxoacid substrates. I. Brown (University of York, UK) dwelt on α-amylase from *Pyrococcus furiosus* as a potential candidate for industrial food sterilization processes. Industrial canning trials with water have confirmed its application.

S. G. Burton and co-workers (University of Cape Town, South Africa) have found that a thermostable nitrilase superfamily amidase can be applied under high temperature conditions as a biocatalyst for D-selective amide hydrolysis. The amidase has high thermal stability up to 60°C and preference for low molecular weight aliphatic amides. Thomm Michael (University of Regenburg, Germany) discussed the structure–function relationship in archael and eukaryotic RNA polymerase. He also suggested that mutational analysis of subunit P revealed the role of a highly conserved zinc-ribbon motif of the subunit in open complex formation. Amaraja Joshi (Agharkar Research Institute, Pune) discussed the production of exopolysaccharide by an alkaliphilic bacterial strain of *Vagococcus carniphilus* MCM B-1018 isolated from the alkaline Lonar Lake, India.

About 160 posters were displayed in two sessions. The posters were on aspects related to ecology, diversity and phylogeny of extremophilic bacteria and archaea from a range of extreme environments, adaptation to extremophily, physiology and metabolism, cloning and over-expression of proteins and enzymes, structure–function relationship of enzymes, biotechnological applications of enzymes, and genomics and proteomics. Natasha Davids (University of Cape Town) presented her work on deep-sea actinomycetes strains having the ability to degrade Crystal Violet. Boehmwad Fraddy (Fundacion Biociencia, Chile) described the compatible solutes from extreme halophiles isolated from Atacama Desert core. Chan Yuki (University of Hong Kong) presented an interesting poster on the hypolithic microbial communities from desert locations worldwide. Ali Makhdoumi Kakhki (University of Tehran, Iran) explored the Aran-o-Bidgole Salt Lake, in the central desert of Iran, as a new source for extremely halophilic prokaryotes and characterized about 800 extremely halophilic organisms from nine different sites.

Seven Indian scientists also presented their work. S. Pal (Jadavpur University) dealt with chromium toxicity and bioremediation, while P. Sharma's (Punjab University, Chandigadh) work was on thermophiles. S. P. Singh (Saurashtra University) presented a paper on the diversity, molecular phylogeny and biocatalytic potential of haloalkaliphilic bacteria from coastal Gujarat. The enzymes highlighted in the report displayed unique features for biotechnological applications and could provide a model to study protein folding and stability. Jignasha Thumar presented a paper on the diversity and potential of halophilic actinomycetes, while D. Kshirsagar (Agharkar Research Institute) highlighted pigmented archea and halotolerant bacteria.

In a nutshell, the conference provided ample opportunity to understand recent trends in research on extremophilic microorganisms. Investigations from all over the world on basic and applied aspects of extremophilic microbes from varied habitats revealed the significance and pace of research on these microbes.

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