



INDIAN ACADEMY OF SCIENCES BENGALURU

PROGRAMME FOR INVITED TEACHERS

2 JULY 2015 (THURSDAY)

1. Interaction with Teachers

(1100 – 1230 hrs) Academy Auditorium

1230 Lunch

2. Lectures in Physics, Chemistry and Biology

(1400-1715 hrs) Indian Institute of Science, Faculty Hall

(Convened by Professor E Arunan, Indian Institute of Science, Bengaluru)

1400: Welcome: E Arunan

Indian Institute of Science, Bengaluru

1405: Statistical mechanics of non-equilibrium systems

Chandan Dasgupta, Indian Institute of Science, Bengaluru

**1450: Morphological potpourri and spiegelmeric structures in
4(R/S)-(OH/NH₂)-D/L- prolylpolypeptides**

K N Ganesh, Indian Institute of Science Education and Research, Pune

1535-1600 Tea break

1600: Rescuing nature from growth and equity

Ullas Karanth, (Science-Asia Wildlife Conservation Society, Bengaluru)

1645: Discussion

ABSTRACTS

Statistical mechanics of non-equilibrium systems

Chandan Dasgupta, Indian Institute of Science, Bengaluru

Collective properties of macroscopic systems that are not in equilibrium are of interest in a variety of contexts. A system may be driven out of equilibrium by a sudden change in one of the external thermodynamic variables, by coupling the system to an external time-dependent field, or by creating gradients and fluxes by external means. There are also systems that are intrinsically out of equilibrium - well-known examples of such systems are granular materials and "active" or "self-propelled" matter. Theoretical studies of the macroscopic properties of such systems require the development of methods that provide a statistical description of the dynamics. The basic notions of the statistical mechanics of time-dependent processes will be explained using simple examples. A survey of interesting problems in the area of non-equilibrium statistical mechanics will be provided, along with an introduction to analytic and numerical methods commonly used in theoretical studies of such problems.

Morphological potpourri and spiegelmeric structures in 4(R/S)-(OH/NH₂)-D/L- prolylpolypeptides

K N Ganesh, Indian Institute of Science Education and Research, Pune

We have examined the crucial structural role of 4R/S-(OH/NH₂) substituents on D/L-prolines in dictating the secondary structure of derived polypeptide sequences. 4R/S-substituted L-polypeptides show stable PPII conformation in water, while the 4S-(OH/NH₂)prolylpolypeptides in trifluoroethanol exhibit -structure, which is hitherto unknown in any polyproline peptides. The D-prolyl analogues show mirror (german: spiegel) image CD profiles. The molecular origin of the seassorted structures through intra/inter H-bond rearrangement in 4(R/S)-substituted prolylpolypeptides will be discussed. Conjugation with fluorophores has been done to assign the parallel/antiparallel nature of -structure, and conjugation with long chain hydrocarbons lead to a variety of nanoassemblies ranging from rods and wires to vesicles depending on the stereochemistry of the substituent and the chirality of parent proline. The results add a new dimension to rational engineering of peptide nanomaterials through control of substitution on proline ring in polypeptides.

Rescuing nature from growth and equity

Ullas Karanth, Science-Asia Wildlife Conservation Society, Bengaluru

The importance of restoring extensive natural landscapes with full complement of wild species is now well-recognized as an integral part of any development process hoping to maintain planet earth in a state conducive to human existence in the long run. Such natural diversity of plants and animals includes many species that can be wisely harvested for human uses, tolerates human impacts or even thrives under them. However, there are also animal and plant communities that are ecologically fragile in the face of human impacts or come into serious conflict with human interests, leading to their rapid extirpation. These species and ecological communities pose serious challenges to conservation even within the mere 4% area that now we earmark for their protection. The adverse impacts have origins in the 'rural poor' as well as the 'urban industrial' sectors. Advocates of any one of these two sectors, typically, tend to ignore or downplay threats from the other sector. Conservation practice, as opposed to conservation theory, however, has to deal with complexities on ground while trying to recover fragile nature. This presentation is a case study of a substantial recovery of tiger populations, recognized as an almost impossible conservation challenge. It documents a nature conservation strategy, which blends sound ecological science with pragmatic social and conservation interventions leading to reasonable outcomes for both humans and tigers. The broader implications of the case study for reconciling conservation with development in India are briefly discussed.

All are welcome