In this issue

TRNOESY

Nuclear Magnetic Resonance (NMR) has grown, during the last two decades, into an extremely powerful technique for studying structure, dynamics and interactions of biological macromolecules in aqueous solutions; thanks to the discovery of two-dimensional NMR in the early seventies, which allowed display of interactions between nuclei in a molecule onto a plane. Among the variety of 2D NMR techniques which have been developed over the years, nuclear Overhauser effect (nOe) based NOESY occupies a central place. It displays correlations between protons which are closeby in space and the intensities of the correlations are roughly proportional to the inverse sixth powers of the respective interproton distances. Quantitative interpretation of these pairwise correlations forms the basis of the accepted protocols for molecular structure determination today. Proteins and nucleic acid segments in the molecular weight range of 5–10 kDa are being investigated fairly routinely using these protocols. For larger systems the procedures are still evolving and are more demanding in terms of spectrometer and sample requirements.

In addition to the knowledge of the three-dimensional structures of the individual molecules, a similar knowledge about their complexes is crucial for understanding many of the biological functions. The difficulties and the complexities increase manifold, the moment one goes from isolated molecules to molecular complexes. Moreover, a protein molecule of functional interest may sometimes be too large for a detailed structure characterization with the presently established protocols. In such situations, 'transferred nOe' provides an elegant part solution. When the ligand for a protein macromolecule is small and is exchanging rapidly between its free and bound forms, the nOe correlations observed reflect on the interactions in the bound form of the ligand, even though this may be a minor component in the solution. A NOESY spectrum displaying such 'transferred nOe' correlations is referred to as a TRNOESY spectrum. This technique has been successfully used by Maity and Jarori (**page 906**) to determine the conformation of ATP-Mg bound to a specific site on a large protein, namely, bovine serum albumin (BSA). They observe that, on protein binding, the sugar ring in the ATP molecule undergoes a substantial geometrical distortion. This is a reflection on the extent to which the three-dimensional structure of a protein can, in general, influence the conformation of a ligand bound to it by non-covalent forces.

R. V. Hosur

General relativity

This issue carries a Research Account by C. V. Vishveshwara entitled 'On the black hole trail . . . : A personal journey' (**page 824**). This was delivered at the IAGRG (Indian Association for General Relativity and Gravitation) annual meeting as the Vaidya – Raychaudhuri Endowment Award Lecture. As is well known in the community, Prof. C. V. Vishveshwara's Ph D thesis made a seminal contribution to the physics of black holes by settling the question of the stability of the Schwarzsschild (i.e. nonrotating) black hole against small perturbations. This article provides some fascinating background to that work in terms of circumstances and personalities involved in General Relativity in the late sixties and early seventies. It then goes on to describe later work by the author and his colleagues in areas such as quasinormal modes, gyroscopic precession, ultracompact objects, etc. and place it in the overall context of other developments.

R. Nityananda

Understanding the oceans

Biology, geology, oceanography and chemistry intersect in the special section (**page 801–905**) on the Joint Global Ocean Flux Study (JGOFS), which is a core project of the International Geosphere Biosphere Programme. The focus of the articles in this issue is the Arabian Sea which exhibits remarkable seasonal variations in biological productivity. Physical processes, most importantly monsoon-driven circulation, modulate biological events, which in turn affect CO_2 air–sea exchange fluxes and carbon cycling in the ocean. Understanding these events requires a marvellous interplay of physical, biological and geochemical studies, many of which are detailed in the special section. Painstaking observations in this area hold out the promise of future development of predictive models which may allow global scale predictions of the 'response of oceanic biogeochemical processes to anthropogenic perturbations, in particular those related to climate change'.

Lipid clusters

Studying cluster formations in diverse systems is a fashionable activity nowadays. Armed with ideas of fractal dimensions and scaling laws, Lahiri *et al.* (**page 915**) investigate the aggregation of phospholipid vesicles using straightforward microscopic methods. The demonstration

that addition of the cytoskeletal protein, spectrin, stabilizes cluster formation is of relevance in future studies of vesicular assembly.

Folklore and contraception

The Adivasi tribes in Bihar reportedly use the Banjauri plant (*Vicoa indica*) as a contraceptive, with a powdered concoction being consumed by women. Following up on this practice, Rao *et al.* demonstrate the antifertility effect of dried Banjauri powder on female bonnet monkeys (**page 918**). The claims of folklore are investigated by modern scientific methods, providing a promising lead for future development of an active principle as an oral contraceptive. Three pure sesquiterpene lactones from this plant, vicolides A, B, C have been characterized many years ago, with vicolide B having antifertility activity in rats. Whether new, as yet uncharacterized molecules are responsible for the observed effects and their mode of action should provide fruitful avenues for investigations in future.

P. Balaram