

Seminar

Probing ‘invisible’ protein conformations using the magnetic resonances of methyl protons

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Proteins are inherently dynamic molecules that can be visualized as an ensemble of inter-converting conformers.^[1] Transiently sampled conformers are often found to be functionally important for processes like catalysis, substrate recognition and binding but are practically ‘invisible’ due to their low populations and short lifetimes. However, Nuclear Magnetic Resonance (NMR) techniques in the solution state have been developed to manipulate the visible magnetization in order to structurally characterize such states.^[2] In this context, I will describe experiments developed by us that measure relative shifts in methyl proton resonance frequencies of different coherence orders caused by transient excursions of the protein to a minor conformer.^[3] Using this information along with that obtained from existing methyl proton Carr-Purcell-Meiboom-Gill (CPMG) experiments^[4,5], it is possible to reconstruct the methyl NMR spectrum of the minor conformer, from which the structure can be subsequently determined. Additionally, we find that these experiments extend the timescales amenable to study using CPMG to include faster processes than before.

References:

- [1] Frauenfelder, H, Sligar, S G, and Wolynes, P G. *Science* 254.5038 (1991):1598-1603
- [2] Sekhar, A and Kay, L E. *PNAS* 110.32 (2013): 12867-12874
- [3] Gopalan, A B and Vallurupalli, P. *JBNMR* (2018) :1-16
- [4] Yuwen, T, Vallurupalli, P, and Kay, L E. *Angew Chemie Int Ed* 55.38 (2016): 11490-11494
- [5] Tugarinov, V and Kay, L E. *JACS* 129.30 (2007): 9514-9521

Monday, Apr 9th 2018

4:00 PM (Tea/Coffee at 3:30 PM)

Seminar Hall, TIFR-H