

Seminar

Controlling biochemical function via environmentally-modulated protein/protein interactions: Using biophysics to turn Nature's switches into our tools

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Environmental cues regulate many biological processes, coordinating cellular pathways to respond to changing conditions. Such regulation is often initiated by sensory protein domains which expand their chemical repertoire by using small molecule ligands to convert environmentally-triggered changes into altered protein/protein interactions. Several families of these domains have evolved with remarkable diversity in their inputs and outputs. Using a combination of biophysics, biochemistry and synthetic chemistry, we seek to gain insight into the mechanistic controls of such environmental sensing domains for both fundamental understanding and subsequent artificial control.

Here I will discuss examples of our work that show how a family of protein domains convert changes in environmental stimuli – blue light or small molecule cofactors – into control of a wide range of output functions. Harnessing the powerful combination of several biophysical and biochemical approaches, my group has demonstrated how this control is triggered by changes in the occupancy or configuration of bound cofactors, leading to conformational changes in the surrounding protein that alter subsequent protein/protein interactions. By using parallel studies of diverse systems, from the human hypoxia inducible factor (HIF) system to plant & bacterial photosensors, we have both gained insights into shared signaling mechanisms and developed methods to artificially regulate such proteins. Taken together, our work provides an integrated view of a fascinating class of natural switches and suggests routes by which these can be manipulated to achieve desired therapeutic and/or technological outcomes.

Thursday, Oct 12th 2017

11:30 AM (Tea/Coffee at 11:15 AM)

Auditorium, TIFR-H (FReT-B)