



THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY  
Division of Life Science

## ***LIFS Seminar Series***

### **“Transcriptional coordination of carbon/nitrogen metabolism in cyanobacteria”**

delivered by

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#### **Abstract**

The coordination of carbon and nitrogen metabolisms is essential for bacteria to adapt to nutritional variations in the environment, but the underlying mechanism remains poorly understood. Upon nitrogen starvation, the cyanobacterium *Anabaena* initiates the heterocyst differentiation, which is tightly controlled by two master regulators: NtcA and HetR. Accumulation of 2-oxoglutarate (2-OG) in cyanobacteria constitutes the signal of nitrogen starvation. We solved three crystal structures of NtcA. All structures assemble as homodimers, with each subunit composed of an N-terminal effector-binding domain and a C-terminal DNA-binding domain connected by a long helix (C-helix). The 2-OG binds to the effector-binding domain at a pocket similar to that used by cAMP in catabolite activator protein, but with a different pattern. Comparative structural analysis reveals a putative signal transmission route upon 2-OG binding. We also solved the 2.80 Å crystal structure of HetR complexed with a 21-bp palindromic DNA, 5'-gegaggggtetaacccctcat. Each monomer of HetR consists of three domains: an N-terminal DNA-binding domain, a middle flap domain and a C-terminal hood domain. Two monomers cross each other to form an extensively entangled dimer, with the two helix-turn-helix motifs gripping the palindromic DNA. Structural analyses and DNA-binding assays indicated that the central 5'-gggn5ccc motif at the major grooves is indispensable for recognition by HetR. Moreover, we determined the crystal structure of the hood domains of HetR in complex with the inhibitory peptide PatS-6. Structural comparisons enable us to propose a putative mechanism of HetR inactivation by PatS-6.

**Date** : 27 April 2018 (Friday)  
**Time** : 4:00 p.m.  
**Venue** : Padma & Hari Harilela Lecture Theatre (LT-C)  
HKUST, Clear Water Bay, Kowloon

**(Host faculty: Prof. Qinglu Zeng)**

*All are Welcome!*