



Dr. Morgan Beeby

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Date: Monday, August 31st, 2015

Time: 11:00 am – 12:00 pm

Venue: C016, Lab 1, Level C

"Mechanism and evolution of gearing in a molecular motor"

Abstract:

Although it is known that diverse bacterial flagellar motors produce different torques, their mechanism of 'gearing' is unclear. To understand this, we combined genetic analyses with electron cryo-tomography to determine in situ structures of bacterial flagellar motors that produce different torques. Our results locate the torque-generating stator complexes for the first time, revealing that diverse motors position wider rings of additional stator complexes facilitated by diverse yet homologous scaffold structures. We identify the components and assembly pathways of these structures and their requirement for stator complex incorporation into the motor. These novel scaffolds are widespread, suggesting that different bacteria have tailored motor torques to specific environments, demonstrating evolution of differential mechanical output in a proteinaceous nanomachine. Our results quantitatively account for differences in motor torques, complete assignment of locations of the major components of the flagellar motor, and provide crucial constraints for understanding the mechanisms of torque generation and evolution. Given time availability I will also discuss deeper evolutionary origins of the bacterial flagellar motor and its relationship to the rotary ATPase family.

