1SAP-02 Molecular machinery regulating photomovement of Euglena
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Euglena tumble and change their swimming direction in response to an abrupt increase or decrease in light intensity, called step-up or step-down photophobic responses, respectively. Iseki et al. successfully isolated the photosensoring receptor, named PAC, responsible for step-up photophobic responses from a photosensing organelle, the paraphlagellar body (PFB), in Euglena gracilis and found that it is a flavoprotein that has adenylyl cyclase activity regulated by blue light. We recently revealed how PFB is constructed from PAC using cutting edge cryo-EM techniques, such as CEMOVIS. From the view of structural biology, we draw ever closer to understanding the mechanism behind how Euglena senses light, leading to a change of swimming direction.

1SAP-03 Plasmid segregation driven by the tubulin-like GTpase TubZ
Ikuko Hayashi (Yokohama City University)

Segregation of low-copy-number plasmids relies on partitioning systems that contain plasmid-encoded cytoskeletal proteins. Tubulin/FisZ-like GTpase TubZ was identified as a partitioning factor of the pXO1-like plasmids in virulent Bacillus. TubZ exhibits high GTpase activity and assembles into polymers both in vivo and in vitro, and its activation is suggested to be regulated by the DNA-binding protein TubR and the centromeric DNA site. However, the molecular mechanism of plasmid segregation by TubZ assembly is not well understood. Based on our recent progress in structural and biochemical studies, I would like to discuss the molecular recognition mechanism of TubR as an adaptor between the TubZ filament and DNA.

1SAP-04 Role of toxin in Staphylococcus aureus colony spreading
Chikara Kaito, Kazuhisa Sekimizu (Grad. Sch. Phar., Univ. Tokyo)

*S. aureus*, a human pathogen, spreads on soft agar plates. We call the phenomenon “colony spreading”. High virulence *S. aureus* strains produce higher amount of toxins and exhibit higher colony-spreading abilities than low virulence strains. Deletion of a toxin encoding-gene diminished the colony spreading. The toxin is present in both culture supernatant and dissolved for more than thirty minutes in concentrated organic solvents. We propose an approach to avoid the drug discovery. The most reliable approach is to determine the structure of the complex by soaking the ligand in apo-crystals, but many lead compounds must be dissolved in concentrated organic solvents such as DMSO. Therefore, to date, it has been impossible to produce crystals of complexes by soaking in apo-crystals, because crystals dissolve immediately upon soaking in concentrated organic solvents. We propose an approach to avoid the damage by growing protein crystals in a hydrogel. The crystals did not dissolve for more than thirty minutes in concentrated organic solvents. Their diffraction data were suitable for structure analysis.

1SAP-05 Swimming dynamics and energetics of the spirochete Leptospira
Shuichi Nakamura (Grad. Sch. Eng., Tohoku Univ.)

*Leptospira* are spirochetes and pathogenic species cause a zoonotic disease. *Leptospira* have a right-handed and short-pitch helical cell body, which is called protoplasmic cylinder. When a cell swims in liquid, the anterior and the posterior cell ends are transformed into a left-handed and long-pitch helix (spiral), and a half circle (hook), respectively. The spiral end rotates counterclockwise and the protoplasmic cylinder rotates clockwise to generate thrust. The hook end also rotates for force balance during swimming. We have been analyzing the motion of *Leptospira* to elucidate its propulsion mechanism. In the symposium, I will present the swimming dynamics and energetics of *Leptospira* motility, which have been revealed by our recent research.

1SAP-06 Mechanical basis for the bacterial swimming and gliding
Hirofumi Wada (Dep. Phys. Ritsumeikan Univ.)

Flagella are primary functional components for many bacteria to propel themselves in fluids. However, there are other bacteria that are motile but do not rely on flagella or other conventional motility apparatuses. These examples provide us a unique opportunity to study novel generic mechanisms to achieve directed motions at small scales. In this talk, I will present two such examples: one is Spiroplasma, a tiny helical bacterium that can swim in fluids, and Flavobacterium johnsoniae, a rod-like bacterium that can glide fast on a solid surface. For each case, a mathematical model is developed based on recent experimental observations. In both cases, the model shows that the bacterial morphology is closely connected to its motility under a given physical environment.