



Contribution ID: 306

Type: **Invited Speaker**

Discovery of biological self-assembling systems that have potential for incorporation into nanodevices and sensors

Sunday 27 November 2016 15:55 (20 minutes)

Elongating filaments systems, such as actin, are polymerizing motors that drive movement in many biological processes. The actin filament is astonishingly well conserved across a diverse set of eukaryotic species. It has essentially remained unchanged in the billion years that separate yeast, Arabidopsis and man. In contrast, bacterial actin-like proteins have diverged to the extreme, many of which are not readily identified from sequence-based homology searches. My laboratory is particularly interested in understanding how the force generated from these varied polymerization system is integrated into different biological processes. Once understood, then these machineries have potential for exploitation in nanodevices. Finally, I will describe the non-physiological, yet curious, case the kinase domain of PAK4, which spontaneously forms crystals inside mammalian cells. We are exploiting this phenomenon to create sensors within mammalian cells.

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Session Classification: Heron 2