1SCP-01 Cell competition that regulates epithelial maintenance in Drosophila
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Cell-cell interactions in multicellular organisms play crucial roles during normal development and homeostasis. “Cell competition” is a form of cell-cell interactions in which cells with higher fitness survive and proliferate at the expense of neighboring cells with lower fitness. In Drosophila imaginal epithelia, clones of cells mutant for apico-basal polarity genes are eliminated by cell competition. To dissect the mechanism of this non-autonomous regulation of cell competition, we developed a “non-cell autonomous” genetic screen system. We isolated elimination-defective (eld) mutants that failed to eliminate neighboring polarity-deficient cells. The mechanism by which eld genes regulate the cell-elimination will be discussed.

1SCP-02 Scaling of Dorsal-Ventral Patterning by Embryo Size-Dependent Degradation of Chordin
Hidehiko Inomata, Tatsuo Shibata, Yoshiki Sasai (CDB, RIKEN)

During early Xenopus development, a BMP gradient controls the dorsal-ventral pattern. Ventralizing signals such as BMP4 is secreted from the ventral region, while secreted BMP inhibitors such as Chordin emanate from the organizer on the dorsal side and counteract the ventralizing signals. Several studies have shown that a morphogenetic field exhibits a strong tendency of self-regulation. For instance, when a blastula embryo is bisected across the D-V axis, the dorsal half develops into a well-proportioned half-size embryo (Scaling).

Here we demonstrate that the robust formation of the graded DV pattern requires dynamic Chordin degradation linked with an axis-wide and size-sensitive feedback control involving the Chordin-proteinase inhibitor Sizzled.

1SCP-03 Universality of circadian rhythms under low temperature conditions
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One of the key characteristics of all circadian rhythms is that the free-running period remains stable for a relatively broad range of ambient temperatures, referred to as “temperature compensation” of the period. Interestingly, outside of the range of temperature compensation, circadian clocks stop running and are arrested at a certain phase. Although essentially identical results have been found in various organisms, it remains unclear if temperature stimuli affect the circadian clock directly or indirectly through such as metabolic changes. In this presentation, we will focus on why circadian rhythms cannot be observed at low temperature conditions. We will furthermore address the conservation of type of bifurcation among species.

1SCP-04 Contribution of a visual pigment absorption spectrum to depth perception in the jumping spider
Takashi Nagata (Dept Evol Stud Biol Sys, Sokendai-Hayama)

Absorption spectra of visual pigments are adaptively tuned to optimize informational capacity in most visual systems. Our recent investigation of the visual pigments in a jumping spider revealed that the absorption spectrum of a pigment causes defocus in a part of the retina. Although defocus generally reduces visual acuity, the amount of defocus can theoretically provide a quantitative indication of the distance of an object. We will present behavioral evidence strongly suggesting a novel mechanism for depth perception in the spider based on the amount of image defocus. Our finding provides an example that a relationship of molecular properties and in vivo conditions are crucial for the functional role of the molecule.

1SCP-05 Optically detected magnetic resonance spectroscopy of nitrogen-vacancy centers for subnanoscopic measurement in vivo
Ryuji Igarashi1, Yuta Kumiya1, Takuma Sugii2, Fuminori Sugihara2, Hidehito Tachie1, Yousuke Yoshinari2, Yoshio Harada2, Masahiro Shirakawa1 (1Department of Molecular Engineering, Graduate School of Engineering, Kyoto University, 2Institute for Integrated Cell-Material Sciences (WPI-iCeMS), Kyoto University, 3Immunology Frontier Research Center (WPI-IFReC), Osaka University)

Recent developments of fluorescence imaging techniques have enabled us to investigate the localization and dynamics of biological substances at a spatial resolution beyond the diffraction limit. However, such techniques cannot provide precise quantitative information about subnanoscopic dynamics of tissues, cells and biomolecules. Here we show a potential method for the subnano-scale resolved measurement of nitrogen-vacancy centers (NVs) in nanodiamonds. This method is based on the property of NVs that the fluorescence intensity sensitively depends on the ground state spin configuration which is affected by Zeeman interaction with external magnetic field. Using this method, we observed a revolving motion of a nanodiamond in an intestine of Caenorhabditis elegans.

1SCP-06 HOW DO SPONGE CELLS BUILD UP THE HIERARCHICAL SPICULOUS SKELETON?
Noriko Funayama (Department of Biophysics, Graduate School of Science, Kyoto Univ.)

Spiculose skeleton construction is one of the most elegantly engineered self-organization in the organisms. It is fascinating to study how are the hierarchical spiculous skeleton is built up step by step by sponge cells which cannot see the final blueprint of the skeleton. Responses to physiological forces should be involved in these steps. By setting up a time-lapse imaging system and molecular biological tools, we found that spiculus skeleton construction is a dynamic event: mature spicules are carried by specific types of cells, one end of the spicules is raised up, fixed to the substratum, and then, additional tiers are building up by connecting additional spicules to the held-up spicules. I will talk and discuss about our current understanding of these processes.