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Modelling of a moving net observed in a plant endoplasmic reticulum

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An endoplasmic reticulum (ER) is a tubular organelle observed in cells of eukaryote including the plants and animals. Interacting with flow of actin cytoskeleton, the net-like pattern organized by ER in plant cells is continuously moving.

For the understanding of this system, we constructed a mathematical model based on a partial differential equation (PDE). By combining two spatially distributed structures, an arbitral periodic pattern by PDE and an actin mesh dependent perturbation, we successfully obtained the dynamics of the system.

In this model, it was found that the filamentous actin distribution was not necessarily needed and static perturbations were sufficient to move the pattern. Then the pattern periodicities were disturbed when the dynamics of system could be observed. Therefore, we inferred that, though it might seem paradoxical, the capacity to maintain the order and the symmetry of pattern generate the dynamics.

This theory is considered to explain one of the basic elements to generate a dynamic pattern, therefore, further discussions are needed to define the minimal conditions for giving the motility. We will comparative investigate the following points (1) pattern property effected by the perturbations and (2) distribution manners and types of perturbation. Then the periodicity and the motilities of pattern will be analyzed quantitatively.

Primary authors: Dr NAKAMASU, Akiko (Kumamoto University); Dr HIGAKI, Takumi (Kumamoto University)

Presenter: Dr NAKAMASU, Akiko (Kumamoto University)

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