



**Title of Project : Toward an integrative understanding of functional zones in organelles**

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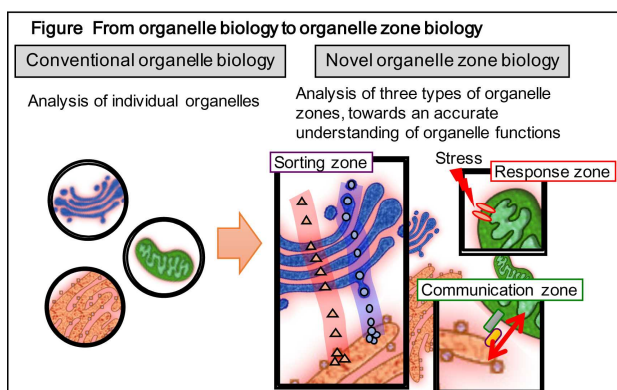
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**【Purpose of the Research Project】**

Organelles are small, specialized structures in cells, which play specific roles to regulate various cellular events. The recent rapid development of imaging techniques have clarified the details of organelle dynamics, demonstrating that (1) various functional regions are dynamically formed within organelles, (2) organelle functions are made possible by the comprehensible actions of these functional regions. We named these local functional organelle regions as “zones”. By analyzing organelle zones, we will shift organellar research towards organellar zone research.

Therefore, our aim is to identify novel functions and roles of organelles by elucidating the nature of various organelle zones and the interactions between them.



**【Content of the Research Project】**

We will study three organelle zones, namely, the “response zone”, “communication zone”, and “sorting zone”. The “response zone” is a specific functional region that appears in organelles in response to various stressors. The “communication zone” is a contact region that enables the exchange of various molecules between different organelles, such as the mitochondria-associated endoplasmic reticulum (ER) membranes (MAM), which is a contact site between ER and mitochondria. The “sorting zone” is a region within the ER and Golgi apparatus, in which macromolecules are specifically modified and sorted to their appropriate destinations. The function of the Golgi apparatus has been considered to be to modify

macromolecules within a series of compartments (*cis*, *medial*, and *trans*) and to determine its destination at the *trans*-Golgi network. However, the ER and Golgi apparatus consist of several different sorting zones, in which macromolecules are modified and are sorted towards their final destination. We will hence analyze the nature of these sorting zones, such as the “sugar chain-modifying sorting zone”.

In this project, we will identify molecules required for these organelle zones, elucidate the molecular mechanisms of zone formation, analyze these organelle zones spatiotemporally, and investigate their biological roles. Furthermore, we will elucidate the organic linkage between each organelle zone that regulates various cellular events, and investigate diseases that occur due to defects in these organelle zones.

**【Expected Research Achievements and Scientific Significance】**

By conducting our study with the novel concept of “organelle zones”, we hope to elucidate the molecular machinery of organelle responses and organelle communication in various cellular situations. We also hope to elucidate the molecules and mechanisms of the sorting machinery in the ER and Golgi apparatus. By clarifying the nature of these organelle zones, we aim to create a paradigm shift from organelle biology to organelle zone biology. Our project should hence develop a new style of cell biology.

**【Key Words】**

organelle, super-resolution microscope, cell biology

**【Term of Project】** FY2017-2021

**【Budget Allocation】** 1,214,600 Thousand Yen

**【Homepage Address and Other Contact Information】**

<http://www.organellezone.org>