Title of Project : The plant cell wall as information-processing system

Kazuhiko Nishitani
(Tohoku University, Graduate School of Life Sciences, Professor)

【Purpose of the Research Project】

Although plants do not have a central nervous system like animals, individual plant cells have acquired highly autonomous capabilities in terms of information-processing. This autonomous cell system mediates whole-plant regulation and function. The cellular information-processing system constitutes the fundamental basis of major plant processes including growth, defense, and adaptation to the environment. However, the molecular mechanisms underlying plant information-processing systems are largely unknown. This research project specifically focuses on the cell wall, or apoplast, to gain insight into the information-processing system (Fig. 1), and attempts to dissect the molecular basis for plant-specific signal perception, processing, and responses. The project hypothesis is that, in addition to transcriptional regulation in the nucleus, apoplastic information-processing plays a critical role in regulating whole-plant function.

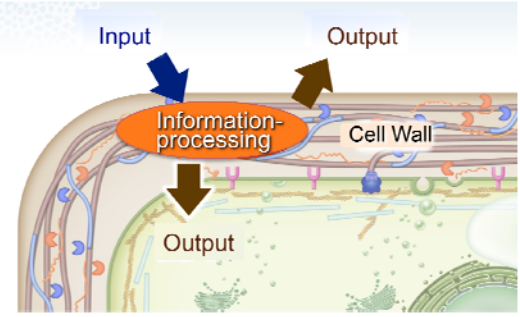

Fig. 1. Information-processing in the cell wall

The goal of this project is to explore the new area of apoplastic information-processing, which evolved independently in land plants. This work will establish a new approach to elucidating the still unknown high-order functions in land plants.

【Content of the Research Project】

This research consortium consists of three working groups (**A01**–**A03**) and nine principal investigators, whose original contributions to a wide spectrum of research fields in plant sciences have been outstanding. The tasks of each group are related but discrete: **A01** will elucidate the molecular mechanism(s) by which the cell wall space is constructed; **A02** will dissect cell wall function in terms of information-processing; and **A03** will determine how the cell wall functions as an interfacial zone in cell-to-cell and cell-to-environment interactions. The interaction between the three working groups is depicted in Fig. 2.

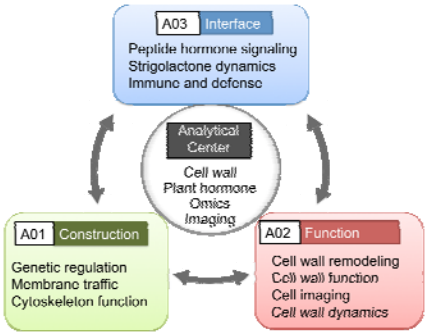

Fig. 2. Research groups and areas of focus

【Expected Research Achievements and Scientific Significance】

This project will pioneer novel approaches to understanding information-processing regulatory systems in plants, which are distinct from conventional transcription-based systems. Because plant cell walls comprise the largest fraction of the earth's biomass, their molecular dissection will enable a better understanding of global carbon resources. The project will contribute directly to human welfare and the development of science and technology.

【Key Word】

Plant cell wall: Plant extracellular super-structure, which is central to the regulation of plant growth and differentiation, immune defense, and response to the environment.

【Term of Project】 FY2012–2016
【Budget Allocation】 1,154,900 Thousand Yen

【Homepage Address and Other Contact Information】

http://www.plantcellwall.jp/
nishitan@m.tohoku.ac.jp