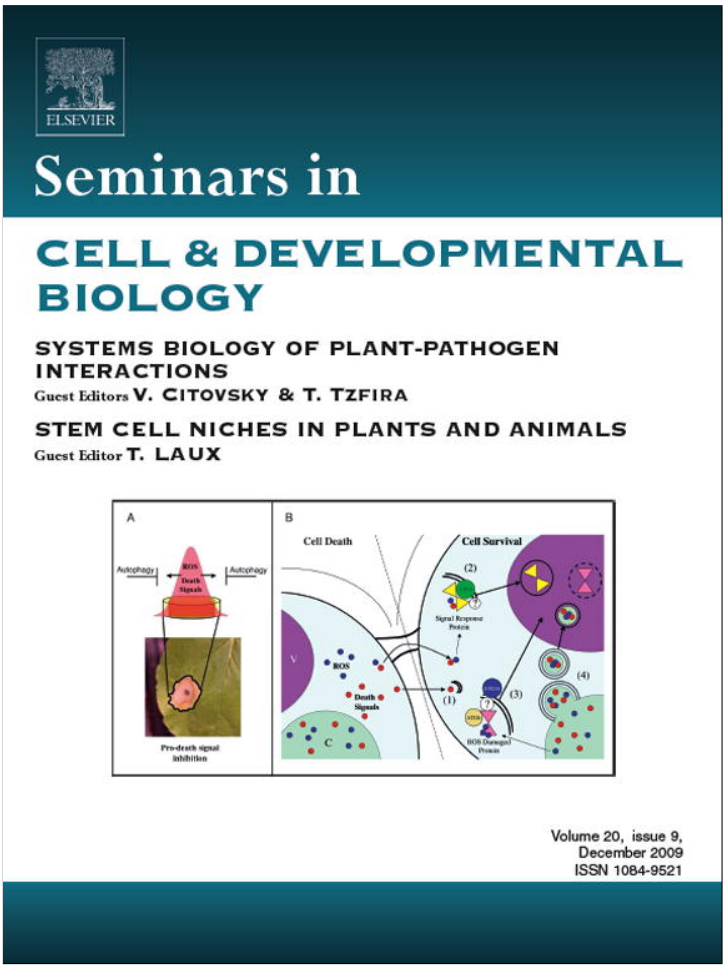

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Editorial

Systems biology of plant–pathogen interactions

Plant–pathogen interactions, besides their obvious importance for agriculture and economy, represent a very useful conceptual and experimental tool for dissection of many basic biological systems of the host cells and organisms. For example, plant interactions with viruses and bacteria have been instrumental in studies of such diverse and fundamental cellular processes as cell–cell recognition [1], intercellular transport [2–6], macromolecular transport across membranes [7,8], nuclear and intranuclear transport [6,9,10], chromatin targeting [11], DNA repair and integration [12,13], programmed cell death [14,15], RNA silencing [14,16–18], and many more. This is possible mainly because pathogens most often insinuate into and adapt the host cellular pathways for their own needs. This Special Edition presents eight reviews that focus on eight aspects of interactions between plant pathogens and different biological systems of the host. Each article is contributed by leaders in their respective fields. We begin the issue with the story of how pathogens are specifically recognized by the plant resistance (R) system, with a focus on the nucleotide-binding domain leucine-rich repeat (NB-LRR) class of R proteins. Another plant innate system for recognition of the invading pathogen, termed pathogen-associated molecular pattern (PAMP)-triggered immunity (PTI), is reviewed next, focusing on pattern recognition receptors (PRRs) and illuminating similarities between plant and animal innate immune systems which most likely have arisen by converging evolution.

The following review describes another major response system of the host, RNA silencing; a special emphasis is made on the strategy of plant viruses to disable this defense by producing their own factors that act as RNA silencing suppressors. The programmed cell death (PCD) system of plant cells and its involvement in the response to viral infection is discussed in the next article, that proposes that the PCD signals may originate from the chloroplast, which itself may be consumed by autophagy. The autophagosomal degradation story is followed by the article focusing on the major proteolytic degradation system of the cell, the ubiquitin/26S proteasome, and its involvement in interactions with diverse pathogens; an emphasis is made on how some pathogens can subvert this normally defensive system to facilitate their infection. Taking aim at the host defenses is the subject of the next review article, which focuses on bacterial effector proteins that translocate into the host cell and suppress diverse host cellular systems.

The issue closes with two articles that focus on plant cell walls and on intercellular connections, the plasmodesmata, that span cell walls and plasma membranes. The first review discusses the defensive aspect of the cell wall, describing how it represents not only a physical battier for invading pathogens, but also a sophisticated anti-pathogen system that deploys an array of inhibitors targeting cell wall-degrading enzymes secreted by the pathogen. The final manuscript of the issue focuses on plasmodesmata as gateways for viruses, allowing them to move between cells in circiumvention of the cell wall barriers; for this movement, plant viruses have evolved specialized cell-to-cell movement proteins (MPs), and this paper proposes a molecular mechanism by which MPs increase plasmodesmal permeability and traffic, together with the viral genomes, between cells.

We would like to thank all our colleagues who elected to share their knowledge and ideas in this Special Edition. We hope that the readers will find the reviews not only interesting, but also stimulating and useful for their own research in diverse areas of plant biology and microbiology.

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