

Editorial overview: Cell organelles: Organelle communication: new means and new views

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Current Opinion in Cell Biology 2015, 35:v–vi

For a complete overview see the [Issue](#)

<http://dx.doi.org/10.1016/j.ceb.2015.07.008>

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One of the hallmarks of eukaryotic cells is the presence of membrane-bound organelles that enable the creation of biochemically distinct environments within the cellular milieu. The presence of organelles has enabled a diversification of functions that is extremely beneficial to the cell. However, it also creates a severe problem; communication in between membrane bound entities must occur to enable coordination of cellular functions. The central tasks of organelles necessitate constant communication and transport of molecules with other organelles. Such communication could occur through signaling pathways, vesicular transport, or by virtue of membrane contact sites.

Contact sites occur when membranes of one organelle are actively tethered to come into close proximity to membranes of another organelle. In recent years it is starting to be appreciated that many contact sites exist within the cell and that their presence is essential for coordinated function of the various cellular activities as well as for the transport of lipids and ions. Discovering new contact sites, understanding the molecular machineries creating and regulating these contact sites, and appreciating their diverse roles has been one of the frontiers of cell biology in the last years and is one of the main focuses of this issue. [De Matteis and Rega](#) review the intriguing endoplasmic reticulum (ER)/Golgi contact sites; [Kornmann *et al.*](#) review the yeast ER/mitochondria tethering complex, the ERMES; [Emr *et al.*](#) review the contacts created between the ER and plasma membrane (PM); [Westermann](#) focuses on mitochondria/PM contacts, and [Ungermann](#) on the newly found vCLAMP contacts connecting the vacuoles (yeast lysosomes) to mitochondria. Some of the reviews focus on lipid trafficking at contact sites. [Block and Jouhet](#) look at this process in ER/chloroplast membranes; [Siniossoglou *et al.*](#) review recent advances regarding the nature and functional relevance of interactions between lipid droplets and other organelles such as ER. [Yang *et al.*](#) review cholesterol transport in contact sites in general.

Recent years have also seen an increased appreciation of trafficking routes that are relatively less explored in the field. Some of the routes, while understudied in cell biology, have been shown to bear prominent medical significance. In fact, despite the intensive interests in medical fields, the basic cell biological understanding of these routes is unproportionally lacking. In this issue, some of the trafficking pathways are highlighted. [Goldenring](#) reviews the molecular components that constitute recycling endosomes, which serve as an elaborate and dynamic membrane network for cargo sorting and recycling. [Deretic *et al.*](#) provide their insights on unconventional secretion, with emphasis on the influence of autophagy on the

transport of select cargos to the plasma membrane. The term, 'secretory autophagy', used by the authors, highlights the role of autophagy beyond cytosolic digestion. Recently, exosomes draw tremendous interest as they emerge as a novel and highly effective mode of cell-cell communication. Raposo *et al.* contribute a timely review on the biogenesis and secretion of exosomes, and discuss their roles in cell-cell communication and implications in a wide range of diseases such as cancer and neurodegeneration.

In addition to the trafficking pathways mentioned above, this issue also places an emphasis on signaling. Membrane trafficking and signal transduction are intimately connected in cells. While membrane trafficking is tightly controlled by signaling, intracellular compartments also serve as the sites to regulate, integrate, or even initiate diverse signals in order to control many aspects of cell physiology. In this issue, von Zastrow *et al.* highlight the role of endosomes on signal transduction in mammalian

cells, while Ferguson discusses lysosome-based signaling and its implication in human diseases. Zambryski *et al.* show how organelles such as the ER and mitochondria control inter-cellular signaling through plasmodesmata and Aitchison *et al.* discuss how signaling influences peroxisomal dynamics.

Finally, this issue also includes refreshing perspectives on two unique organelles. Hu *et al.* review the recent progress on the primary cilium, with emphasis on previously understudied transition fibers that mediate selective ciliary cargo transport. Prekeris *et al.* offer their insights on midbodies, which were previously thought to be junk left after cytokinesis, but recently emerge as an important cell-fate regulator.

Clearly, the recent Nobel Prize did not leave us with only details to fill in. The intricacy and beauty of eukaryotic membrane systems await our exploration for many years to come.