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NATURE REVIEWS MOLECULAR CELL BIOLOGY

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Extraordinary advances in a plethora of techniques have enabled us to scrutinize cells like never before. Most eukaryotic cells boast an exquisite organization of dynamic membrane-enclosed organelles with distinct structures and functions but, until recently, the application of some technologies to further probe organellar milieu was impeded by lipid bilayers. A combination of traditional cell-biological techniques and large-scale proteomics efforts, however, is now enabling researchers to characterize organelles functionally and, on page 702, John R. Yates III, Annalyn Gilchrist, Kathryn E. Howell and John J. M. Bergeron outline the state-of-the-art proteomics techniques that are being used to analyse organelle constituents.

The metabolic functions of one such organelle, the peroxisome, are diverse, but the basic principles of how peroxisomes import matrix and membrane proteins are surprisingly similar among different species, with the peroxisomal protein-import machinery accommodating folded, even oligomeric, proteins. Synthesizing results from recent work on essential components of the peroxisomal protein-import machinery, Ralf Erdmann and Wolfgang Schliebs present a model for the import process, which involves the transient formation of a translocation pore (page 738).

During apoptosis, the cellular architecture is dismantled almost as orderly as it is put together — simple lysosomal rupture, for example, does not occur. Rather, destructive enzymes are controllably unleashed from various organelles and subcellular structures. Some contribute to the actual death process, others are called on for the clean-up operation. Cell-autonomous nucleases and ‘waste management’ nucleases, which degrade DNA during apoptosis, carry out both of these processes, and are discussed by Kumiko Samejima and William C. Earnshaw on page 677.



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