IN BRIEF

MITOSIS

Coordinating ciliary dynamics and cell proliferation

Primary cilia assemble when cells exit the cell cycle and disassemble in proliferating cells to liberate centrioles required for mitotic spindle assembly. Previous studies have shown that Aurora A kinase, a key regulator of cell proliferation, activates histone deacetylase 6 (HDAC6) to deacetylate polymerized tubulin and hence induce the disassembly of cilia. This study reports a key role for Polo-like kinase 1 (PLK1) in the pathway linking ciliary dynamics and cell cycle regulation. It shows that the cell cycle regulator CDK1 phosphorylates the centriolar protein PCM1 before mitotic entry; phosphorylated PCM1 in turn recruits PLK1 to the pericentriolar matrix. PLK1 interacts with and activates HDAC6, thereby inducing cilia disassembly and centriole release. Constitutively active, but not wild-type, PLK1 promotes the disassembly of cilia in the absence of Aurora A activity, which suggests that Aurora A is required to activate PLK1 after recruitment to the pericentriolar matrix.

ORIGINAL RESEARCH PAPER Wang, G. *et al.* PCM1 recruits Plk1 to pericentriolar matrix to promote primary cilia disassembly before mitotic entry. *J. Cell Sci.* 23 Jan 2013 (doi:10.1242/jcs.114918)

DEVELOPMENT

Mitotic cell rounding as a morphogenetic switch

Epithelial invagination converts flat sheets of cells into three-dimensional structures — an essential process during animal development. A major mechanism of invagination is apical constriction driven by actomyosin contraction. This study reveals that invagination also requires cell rounding, which occurs when cells enter mitosis. Live imaging of the *Drosophila melanogaster* tracheal placode showed that the transition from an initial slow phase of invagination to a second faster phase was impaired for mutants in which cells fail to enter mitosis. Interestingly, this acceleration was not affected by treatment with a microtubule inhibitor that arrests the cell cycle after cell rounding. Thus, cell rounding, but not cell division, is required for this morphogenetic switch. Furthermore, the authors show that cell rounding functions in conjunction with epidermal growth factor receptor (EGFR)-induced myosin II contractility in surrounding cells.

ORIGINAL RESEARCH PAPER Kondo, T. & Hayashi, S. Mitotic cell rounding accelerates epithelial invagination. *Nature* 13 Jan 2013 (doi:10.1038/nature11792)

TECHNOLOGY

Proteomics gets more selective

Ting and colleagues describe a technique that allows spatio-temporal information to be captured by mass spectrometry (MS). The authors used engineered ascorbate peroxidase as a targetable genetic tag to label proteins in live cells. Ascorbate peroxidase biotinylates nearby proteins when biotin-phenol and H_2O_2 are added to tagged cells, allowing them to be captured for MS with streptavidin beads. The authors fused ascorbate peroxidase to a peptide that targeted it to the mitochondrial matrix. This enabled them to identify 495 proteins within the human mitochondrial matrix, 94% of which had previously been associated with mitochondria, and they performed various experiments to verify their results. As well as presenting a technique that can be used to map the proteome of whole organelles from living cells, this paper identifies 31 proteins with a novel mitochondrial matrix association.

ORIGINAL RESEARCH PAPER Rhee, H.-W. *et al.* Proteomic mapping of mitochondria in living cells via spatially restricted enzymatic tagging. *Science* 31 January 2013 (doi:10.1126/science.1230593)