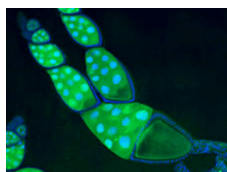


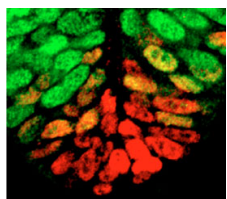
### A diaphanous vision of morphogenesis

The changes in cell shape and migration that occur during morphogenesis require coordinated regulation of cell-cell adhesion and of the actomyosin skeleton. Diaphanous-related formins – regulators of actin nucleation and elongation – play essential roles in cytokinesis but also regulate cell adhesion, polarity and microtubules. Might they, therefore, be involved in morphogenesis? On p. 1005, Homem and Peifer report that *Drosophila* Diaphanous (Dia) coordinates cell adhesion and actomyosin contractility during morphogenesis. They show that Dia has a dynamic pattern of expression during fly embryogenesis that is consistent with a role in regulating cell shape changes. Using constitutively active Dia, they reveal that Dia regulates myosin levels and activity at adherens junctions during cell shape change. Finally, by reducing Dia function, they show that Dia stabilizes adherens junctions and inhibits the formation of cell protrusions. The researchers conclude that, by regulating both actin and myosin, Dia organizes the actomyosin network at adhesion junctions, thereby coordinating cell shape changes and cell-cell adhesion during morphogenesis.



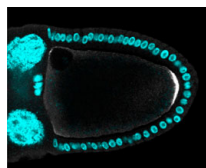
### HSPGs blocked for early BMP signalling

Heparan sulphate proteoglycans (HSPGs), which contain a core protein decorated with polysaccharide chains of glycosaminoglycan (GAG) disaccharide units, modulate the activity of many developmentally important growth factors. In *Drosophila* embryos, for example, they regulate Hedgehog (Hh) and Wingless (Wg) signalling. Now, surprisingly, Bornemann and co-workers reveal that HSPGs play no role in BMP signalling in early fly embryos despite their well-known role in BMP signalling in larval imaginal discs (see p. 1039). HSPGs are absent during the first 3 hours of embryonic development when the BMP gradient (which controls dorsoventral patterning) is established, they report. This is because early HSPG synthesis is prevented by a translational block of GAG synthesis that involves developmentally regulated internal ribosome entry sites (IRESs); this block is lifted when Hh and Wg signalling starts. IRES-like features are conserved in the transcripts of GAG synthesis enzymes from diverse organisms, the researchers note. Thus, translational control of HSPG synthesis might be an evolutionarily conserved way to modulate growth factor signalling.



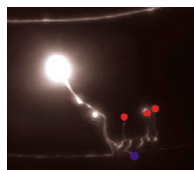
### Illuminating Shh distribution and localisation

During vertebrate nervous system development, a gradient of sonic hedgehog (Shh) ligand secreted by the notochord specifies ventral cell identities in the adjacent neural tube. To visualize Shh signal distribution during this process, Chamberlain and colleagues have engineered mice in which the *Shh* locus produces bioactive, fluorescently labelled Shh (see p. 1097). Using these mice, the researchers show that Shh ligand produced by the notochord forms a dynamic gradient that spreads through the neural target field as the ventral pattern emerges, and that Shh associates with the apically localized basal body – an organelle that sits at the base of cilia – of neural progenitors during this process. Other experiments indicate that the profile of the Shh gradient depends on negative feedback from the neural target cells and on Shh lipidation and that Shh might move from the notochord into the neural target field along microtubules. Together, these results provide important new insights into Shh signal distribution and transduction during neural tube patterning.



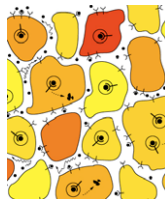
### Oskar: anchoring germ plasm via endocytosis

The intracellular localization of RNAs and proteins often determines cell fates. In developing *Drosophila* oocytes, the posterior pole localization of *oskar* (*osk*) RNA (which requires a polarized microtubule array) and Osk protein directs the assembly and anchoring of the germ plasm at the posterior cortex. The germ plasm is where the factors required for germline and abdomen formation (for example, the RNA helicase Vasa) accumulate. Now, on p. 1107, Tanaka and Nakamura report that the endocytic pathway acts downstream of Osk in *Drosophila* germ plasm assembly. By screening for mutants in which Vasa accumulation was disrupted, they discover that germ plasm assembly requires the endocytic pathway protein Rabenosyn-5 (Rbsn-5). *rbsn-5* mutant oocytes fail to maintain microtubule polarity, which secondarily disrupts *osk* RNA localization. However, anteriorly misexpressed Osk recruits Rbsn-5 and other endosomal proteins. The researchers suggest that Osk localization at the posterior pole stimulates endosomal cycling, which promotes the F-actin reorganization that anchors the germ plasm components to the oocyte cortex.



### Worming into nerve regeneration

Palliative care is often the only option for people with CNS injuries – too little is known about the regeneration of adult axons to cure such damage. However, on p. 1129, Gabel and colleagues describe how *C. elegans* can provide insights into neural regeneration. Using femtosecond laser ablation to cut the axons of specific neurons in adult worms, the researchers show that, as in mammals, neurons in the head rarely regenerate after injury but those in the body reliably regrow. Next, they show that axonal regeneration in the worm's AVM mechanosensory neuron involves exploratory axonal outgrowth and pruning of unwanted axons. By contrast, the initial development of this neuron involves the stereotyped projection of a pioneer axon. Finally, by examining AVM regeneration in worms that lack various axonal guidance molecules, the researchers show that neural wiring during development and rewiring during regeneration have different molecular requirements. Thus, they suggest, *C. elegans* could be used in genetic screens for new molecules involved in the regeneration of adult neurons.



### Morphogen gradients: how precise?

Morphogens provide the positional information that is used to form patterns of distinct cell types in developing tissues. But can morphogen gradients alone determine these precise patterns or do they establish a relatively coarse pattern that is refined later? A recent study of the Bicoid gradient in fly embryos supports the first theory. However, for the Decapentaplegic (Dpp) morphogen gradient in developing *Drosophila* wing discs, Bollenbach and colleagues now suggest that the second scenario is more appropriate (see p. 1137). These researchers have developed a theoretical description of Dpp gradient formation and have also measured Dpp gradients, Dpp signalling activity and the activation of the Dpp target gene *spalt* (which controls vein pattern) in developing wing discs. These approaches indicate that the Dpp gradient positions the Spalt boundary to an accuracy of about three cells in the discs. Because the final vein pattern is more precise than this, the researchers suggest that downstream events must refine the positional information provided by the Dpp gradient.

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