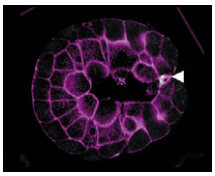
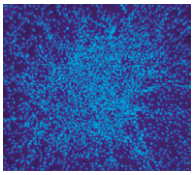
New In(R)oads into growth control

Different animal species have characteristic sizes. A mouse does not grow to the size of a horse, for example, because during development, environmental cues (particularly nutrient availability) act together with genetic cues to regulate cell growth and proliferation. The insulin receptor (InR) signalling pathway cell autonomously controls cellular responses to nutrient availability. Now, on p. 2617, Milán and colleagues report that *calderón*, which encodes a new organic cation transporter of the major facilitator superfamily, is a downstream effector of InR in developing *Drosophila* tissues. The researchers show that *calderón* mutant flies are smaller than wild-type flies and developmentally delayed, a phenotype that resembles that caused by mutations in the InR pathway. Genetic experiments indicate that the expression of *calderón* is positively regulated by InR downstream effectors, including TOR (target of rapamycin), and that *calderón* is required for TOR-mediated growth induction. Thus, the authors conclude, *calderón* is required for the cell-autonomous, insulin-mediated control of cell growth and proliferation during *Drosophila* development.



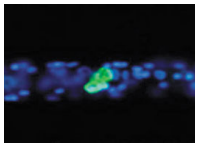
Germ-cell specification the ascidian way

The germ line is specified in many animal embryos by maternal RNAs and proteins that are localized in a region of the egg called the germ plasm. The equivalent region in ascidian embryos seems to be the postplasm at the posterior pole but this region also contains somatic-cell determinants. On p. 2683, Shirae-Kurabayashi et al. propose that sea squirt postplasm regulates both germ- and somatic-cell differentiation through an asymmetric cell division that segregates the two types of determinants. Using *CiVH*, a homologue of the *Drosophila* germline-specific gene *vasa*, and other postplasm components as markers, the researchers show that the postplasm-containing blastomeres, the B7.6 cells, divide asymmetrically to form two distinct daughter cells: B8.11 and B8.12. The postplasmic components mainly segregate into the B8.11 cells, which later associate with the gut wall, but *CiVH* RNA and protein segregate into the B8.12 cells, which are incorporated into the gonad. This redistribution of specific maternal molecules into the B8.12 cells, the researchers suggest, drives germ-cell specification in ascidians.



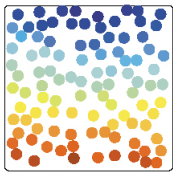
Vasculogenesis and haematopoiesis: an early separation

It is widely thought that haemangioblasts are precursors for both blood cells and vascular endothelial cells. However, haematopoiesis and angiogenesis have not been analysed in detail in mouse embryos before embryonic day (E) 7.0 when haemangioblasts appear. Furuta and co-workers now report that the angioblast lineage diverges from mesoderm before, and independently of, haemangioblast formation (see p. 2771). Using in-vitro culture to evaluate vasculogenesis and haematopoiesis in cells taken from early mouse embryos, the researchers show that endothelial progenitors are present by E5.50 but stroma-dependent haematopoietic progenitors are not seen until E6.75; colony-forming units (the precursors of macrophages, erythrocytes and megakaryocytes) appear at E7.50. At this time, vasculogenic and haematopoietic precursors both express the transcription factor Oct3/4, which maintains the pluripotency of embryonic stem cells, but expression of CD31 (platelet endothelial cell adhesion molecule 1) divides them into angioblast (Oct3/4+, CD31–) and haemangioblast (Oct3/4+, CD31+) lineages. Thus, the authors conclude, there are distinct pathways for vasculogenesis and haematopoiesis that are independent of haemangioblasts.



Chromatin-remodelling complexity in development

Chromatin remodelling regulates gene expression during development. Exactly how is not clear but a study of vulval development in *Caenorhabditis elegans* provides some important new clues (see p. 2695). Andersen, Lu and Horvitz report that a nucleosome remodelling factor (NURF)-like complex promotes the expression of vulval cell fates by antagonizing the action of synthetic multivulva (synMuv) genes, which repress gene transcription through chromatin remodelling. Simultaneous loss-of-function mutations in two synMuv genes – these include genes that encode chromatin-remodelling proteins and homologues of well-known transcription repressors such as Rb – produce worms with ectopic vulvae, indicating that synMuv proteins normally suppress vulval cell fates. The researchers show that ISW-1 (an orthologue of the *Drosophila* ATP-dependent chromatin remodelling enzyme ISWI) probably acts with NURF-1 (an orthologue of *Drosophila* NURF301) to promote the synMuv phenotype during vulval development. These results suggest that cell fate might be precisely regulated during development through the antagonistic chromatin-remodelling activities of transcriptional repressor complexes and NURF-like complexes.



Neural map making revisited

To transmit unbroken images, retinal axons must terminate on their target brain region in the correct relative positions to form a retinotopic map. On p. 2705, David Willshaw presents a new computationally generated model for retinotopic map formation using data from mouse EphA receptor knockin and knockout experiments. Neural map formation is thought to involve two steps: an activity-independent step, which uses position-specific molecular labels to establish a crude map of where retinal axons should migrate, and an activity-dependent mechanism, which refines the map. From his analysis of experimental data, Willshaw concludes that the guiding principle behind retinotopic mapping is that axons carrying similar amounts of Eph receptor terminate near each other on their target and activity-based mechanisms only function later in development. He shows that the 30-year-old marker induction model (in which fixed retinal labels induce labels on tectal cells) can simulate EphA receptor knockin and knockout experiments. Finally, he proposes a refined model – the 'retinal induction model' – in which the retinal and tectal labels are Ephs and ephrin ligands, respectively.

Shared ground rules for epithelial morphogenesis

Epithelial morphogenesis during development and wound healing depends on coordinated changes in cell shape. Carl-Philipp Heisenberg and co-workers now describe a conserved mechanism that underlies the critical cell-shape changes that occur at the epithelial margin during both epiboly in zebrafish embryos and dorsal closure in *Drosophila* embryos (see p. 2671). They show that during epiboly (the movement of the outer epithelium over the yolk cell surface), the localized recruitment of actin and myosin 2 within the yolk syncytial layer drives cell-shape changes in the overlying, tightly attached marginal epithelial cells. This recruitment requires Msn1, a zebrafish orthologue of the *Drosophila* Ste20-like kinase Misshapen. Similarly, *Drosophila* Misshapen, which when mutated disrupts dorsal closure, is needed for the recruitment of actin and myosin 2, and for the subsequent constriction of epidermal marginal cells during dorsal closure; in this case, though, the marginal cells actively constrict rather than respond to changes in an underlying cell layer. Thus, a largely conserved mechanism underlies epithelial morphogenesis in both *Drosophila* and zebrafish.

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