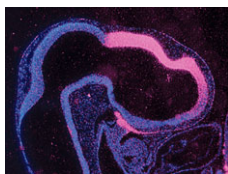


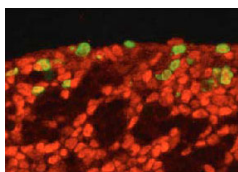
Novel neuronal migration mode branches out

Many migrating neurons and growing axons reach their correct targets during brain development by adjusting the growth of their leading process in response to guidance cues. Now, though, Martini and co-workers propose that the dynamic regulation of leading process branching may represent a novel guidance mechanism for migrating neurons (see p. 41). The researchers use time-lapse videomicroscopy to analyse the dynamic behaviour of individual neurons migrating tangentially in mouse telencephalic slices. Cortical interneurons (and other populations of GABAergic neurons) consistently form branched processes during their migration, they report, and respond to chemoattractant signals by generating branches that are better aligned with the source of the signal rather than by re-orientating existing branches. In addition, guidance cues influence the angle at which new branches emerge, and inhibition of branching with a ROCK inhibitor (Rho/ROCK signalling regulates the actin cytoskeleton) blocks chemotaxis. Thus, the researchers suggest, the directional migration of neurons that have branched leading processes may be achieved by stabilising the most suitable branch.



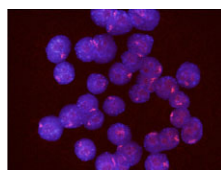
Facing brain's role in craniofacial patterning

Evolutionary changes in brain organisation may partly explain why different species have different faces, suggest Diane Hu and Ralph Marcucio, who have been studying upper jaw development (see p. 107). The growth of this part of the facial skeleton, which is formed from neural crest-derived cells, is controlled by Sonic hedgehog (SHH) signals from the frontonasal ectodermal zone (FEZ). Variations in the FEZ (the establishment of which requires *Shh* expression in the developing forebrain) underlie the divergent facial morphogenesis of birds and mammals. The researchers now report that activation of the SHH pathway in chick brains superimposes a mammalian-like morphology onto the chick's upper jaw and splits its single FEZ into right and left domains that resemble those of mice. The expression of several other signals (including *Fgf8*) in the brain and in the nasal pit is also altered in the SHH-treated chicks, note Hu and Marcucio. Thus, they suggest, the brain establishes multiple signalling centres within the developing upper jaw that regulate craniofacial morphogenesis.



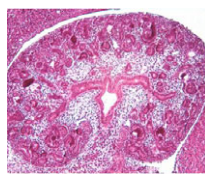
SRY functions briefly with effect

Early mammalian embryos of both sexes have bipotential gonads. In female embryos, supporting cell precursors in these structures differentiate into granulosa cells and an ovary is formed. In male embryos, transient expression of the Y-linked sex-determining gene *Sry* in the supporting cells promotes Sertoli cell differentiation and testis development. But when does *Sry* expression switch these cells from the female to the male pathway? By examining gonad development in a mouse line that carries a heat-shock-inducible *Sry* transgene, Hiramatsu and colleagues show, on p. 129, that *Sry* has to be expressed during a 6-hour time window immediately after its expression normally begins in XY gonads to induce testis development in XX gonads. *Sry* action during this unexpectedly short period, they report, is essential for the switch between female- and male-specific FGF9/WNT4 signalling patterns. These results provide new insights into gonadal sex determination and also define for the first time the critical time window in which a master gene that determines organ fate has to act.



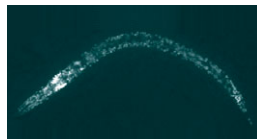
A-repeat view of X-inactivation

During early development, the inactivation of one X chromosome in female mammals ensures equivalent X-linked gene expression in male (XY) and female (XX) embryos. X-inactivation is triggered by the association of non-coding *Xist* (X-inactive specific transcript) RNA with one X chromosome. In ES cells, the conserved A-repeat of the *Xist* RNA is then required to silence that chromosome. Now, on p. 139, Hoki and colleagues report that the A-repeat is also required for X-inactivation during mouse embryogenesis. Surprisingly, however, a lack of *Xist* RNA, rather than defective silencing by the mutated RNA, causes the failure of imprinted X-inactivation (the inactivation of the paternal X in the extraembryonic tissues) in embryos carrying a paternally transmitted A-repeat-deleted *Xist* allele. Furthermore, the normally silent paternal copy of *Tsix* (a negative regulator of *Xist*) is ectopically activated in these A-repeat-deleted embryos. The researchers suggest, therefore, that the genomic region encoding the A-repeat is required for the appropriate transcriptional regulation of the *Xist/Tsix* loci and subsequent X-inactivation in mouse embryos.



Wnt7b signalling sets the renal cortico-medullary axis

Mammalian kidneys contain a cortex where blood filtration occurs and a medullary region where elongated tubular epithelia concentrate the urine. This organisation is crucial for renal function, but what regulates the formation of the cortico-medullary axis? One key regulator in the developing mouse kidney, suggest Jing Yu, Andrew McMahon and colleagues, is *Wnt7b* (see p. 161). In the absence of *Wnt7b*, they report, cortical epithelial development is normal but the medullary zone fails to form and urine is not concentrated normally. Their analysis of cell division planes in the collecting duct epithelium of the emerging medullary zone in normal and *Wnt7b* mutant mice reveals that *Wnt7b* regulation of the cell cleavage plane contributes to the establishment of a cortico-medullary axis. Finally, they show that *Wnt7b* mediates axis establishment by activating the canonical Wnt signalling pathway in the interstitial mesenchyme. Together, these results indicate that *Wnt7b* plays a pivotal role in the development of the tissue architecture that is required for normal kidney function.



A taste of neuronal specification

The nervous system consists of strikingly diverse cell types, which can be classified by first grouping together neurons with shared features, and then subdividing these groups according to specific characteristics. But is the specification of neuronal types and subtypes linked and, if so, how? On p. 147, Oliver Hobert and colleagues reveal that, in *C. elegans*, the transcription factor CHE-1, which specifies the two ASE taste receptor neurons, is also required for their subsequent subtype specialisation into ASEL and ASER. By analysing the promoter regions of four genes differentially expressed in ASEL and ASER, the authors show that the cis-regulatory regions of several of these genes act as repressors or co-activators of CHE-1. In addition, the affinity of CHE-1 for its targets plays a role in restricting its activity to ASEL or ASER, and thus in controlling neuronal subtype specification. The cis-regulatory mechanisms involved are surprisingly diverse, and future work should shed light on the upstream events that lead to their differential activity.

Jane Bradbury