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FLORAL SCENT

## Extending encounters

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It has been known for hundreds of years that floral scent is related to pollination, but Alexander Haverkamp and colleagues from the Max Planck Institute for Chemical Ecology in Jena have now shown that it is not a simple case of attraction. The researchers studied wild tobacco, *Nicotiana attenuate*, which is pollinated by the hawkmoth *Manduca sexta* and whose flowers emit a fairly simple scent dominated by benzyl acetone (BA). Using RNAi, the researchers silenced the production of BA to compare emitting and non-emitting plants.

Somewhat surprisingly, odourless flowers were not 'invisible' to the moths, which showed no preference for visiting either type of flower both in tent and wind-tunnel tests. However, the odoured plants were pollinated more efficiently than those emitting no BA. Closer investigation revealed that the hawkmoths remained on scented flowers for longer and were more persistent at attempting to insert their proboscis into the bloom.

The researchers identified cells on the very tips of the proboscis as responsible for sensing BA and showed that the behaviour of the moth was affected only once the proboscis had entered the flower. Rather than being a long-range signal (which could also attract nectar thieves, herbivores and female moths looking for sites to lay their eggs), BA is a local signal indicating the presence of ample nectar and so encouraging the moth to remain longer on the flower, thereby increasing the likelihood of pollination. *CS*

MERISTEM DEVELOPMENT

## Ratchet block

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Some plants live fast and die after only a few weeks, while several species of trees (such as the bristlecone pine) can survive for thousands of years. One of the problems faced by these long-lifespan individuals is the accumulation of deleterious somatic mutations in the absence of recombination (an effect known as Muller's ratchet), which leads ultimately to death. Agata Burian from the University of Bern and colleagues now show that plants use developmental strategies to delay this outcome.

Tracking cells by time-lapse imaging in *Arabidopsis* and tomato indicated that precursors to the axillary meristem (from which the lateral organs develop) are specified early and their mitotic activity is then inhibited. Cell lineage analysis revealed that between only seven and nine divisions are needed to form the axillary meristem from apical meristem — which is fewer than the number needed to produce fully differentiated cells. Extrapolating these results to trees, a computer model predicted that mutations occurring in meristematic stem cells would only affect a subset of branches, increasing genetic heterogeneity.

Considering a single tree as a clonal population of competing reiterative branches, such a distribution of mutations would slow down Muller's ratchet and enable a longer lifespan of the whole organism. Although longevity experiments are difficult to achieve, deep sequencing of old tree sectors could confirm this hypothesis experimentally. *GT*

AUXIN SIGNALLING

## Grass on acid

*Plant Cell* http://doi.org/bhng (2016)

The acid growth theory, present in many textbooks, proposes that auxin induces the efflux of protons from plant cells into the surrounding apoplast by a non-transcriptional mechanism. The resulting local acidification activates hydrolases and expansins that loosen the plant cell wall and thereby allow the cells to elongate, a typical auxin response. David Pacheco-Villalobos from the University of Lausanne and colleagues use new genetic tools to show that this may not be true in roots.

To untangle cell division and elongation, which are both affected by auxin, the authors used two mutants of the model grass *Brachypodium* that have higher auxin content and elongation in roots, but normal meristematic activity. Root transcriptomes revealed that auxin signalling genes are largely buffered against auxin level variations, but cell wall remodelling factors are upregulated, and a chemical analysis indicated reduced abundance or complexity of cell wall arabinogalactans. Despite high auxin levels, proton excretion was stable. Furthermore, in both *Brachypodium* and *Arabidopsis*, growing roots in an acidic medium did not modify root cell expansion, whereas artificially activating the proton pump inhibited cell elongation.

Despite possible timescale differences, these new results reinforce previous observations that apoplastic acidification is not linked to cell expansion in roots, and that the auxin effect is mostly transcriptional. This study also highlights the fact that the universality of old theories needs to be reassessed with modern molecular and genetic tools. *GT*

GORILLA BEHAVIOUR

## Audible enjoyment

*PLoS ONE* **11,** e0144197 (2016)

Western lowland gorillas 'sing' and 'hum' while consuming preferred foodstuffs, report Eva Maria Luef and colleagues, who investigated the vocalizations of two free-ranging groups of *Gorilla gorilla gorilla* at Mondika Research Centre in the Republic of Congo. Luef *et al.* provide the first detailed analysis of wild gorilla vocalizations. Although other gorilla species have been found to vocalize during other activities, western lowland gorillas seem to do so only while they eat.

Over the course of the study, the two gorilla groups followed by the researchers fed on 41 different plant species and 2 insect species, producing calls while consuming 18 of the plant species and both insect species. Seeds of *Gilbertiodendron dewevrei* and *Annonidium mannii* fruits were preferred by both groups, but calls were most frequently associated with aquatic vegetation and seeds. Calls were most frequently associated with the two plant species *G. dewevrei* and *Pteleopsis hylodendron* — recordings of these 'songs' accompany the paper online. They also found that males more often produced calls than females, and adults called more than juveniles.

The low volume of the calls makes it unlikely that they are produced for long-distance communication or food advertising, note the authors. Instead, the vocalizations could just notify others that the individual is eating, or, as in other gorilla subspecies, to convey well-being. *LNE*

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