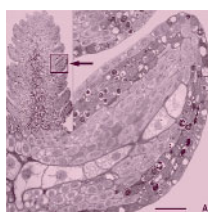


One-sided responses to local temperature changes

Which factor plays the major role in bringing perennials out of dormancy in the spring? Data obtained by **Gričar *et al.* (Ljubljana, Slovenia and Hamburg, Germany, pp. 943–951)** address this challenging question with respect to *Picea abies* (Norway spruce). About 30 days before the normal spring reactivation of cambial activity, they applied a heating coil to a length of mature stem, raising its surface temperature to 23–25 °C. Within 10 days, the width of the cambium had increased from 4–5 layers of cells to 7–8 layers of cells, caused by divisions on the phloem side. There was also some

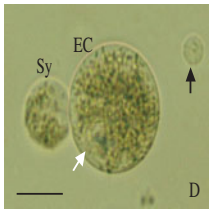
differentiation of new phloem sieve cells. Within 20 days, new cambial divisions were also visible on the xylem side with some differentiation of early-wood tracheids. There was no evidence of vertical transmission of any signal; cambium above and below the heated zone remained dormant. The asymmetry of the cambial reactivation in the heated tree raises interesting questions about how it is brought about. Was this differential development across the cambium caused by the temperature gradient generated by the heating coil or was some other factor involved? At present, the answer remains uncertain. However, what is clear is that temperature is a major factor in this species in bringing about renewal of cambial growth overall. But what about the cessation of growth later in the year? The authors applied a cooling coil (9–11 °C) to another tree at a time of high cambial activity in the summer. No effects of this were seen for 30 days. By this time, cambial activity was reduced and there were only five layers of cambial cells. Late-wood started to form, although there were fewer layers of this than would normally develop in control trees. Interestingly, in the 30 days of the experiment, cooling had no effect on the development of phloem, again indicating subtly different effects on the differentiation of xylem and phloem from the cambium.



Endophyte enters end-zone

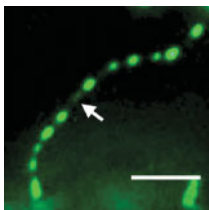
Mistletoe (*Viscum album*) is relatively common in the area of the UK in which I live. Indeed, there are several specimens within a few minutes' walk from my office. In other parts of the world, this group is represented by numerous species; here we focus on dwarf mistletoes in the genus *Arceuthobium*. Several members of this genus provide a very unusual illustration of the highly intimate relationship that often develops between host and parasite, as described by **David Lye (Sidney, British Columbia, pp. 953–963)**. Thus, when *A. americanum* parasitizes *Pinus contorta*, isophasic growth occurs,

i.e. the growth of host and endophyte become synchronized to a large extent. This does not occur when the same mistletoe parasitizes *Picea glauca*, even though the latter parasitism is also successful. Lye has investigated the parasitism of *Pseudotsuga menziesii* (Douglas fir) by *A. douglasii* in which isophasic growth also occurs, focusing on facets of host and endophyte growth and especially the growth of the endophyte in host apical buds. From his very full account, several notable features emerge. Firstly, the endophytic strands of the parasite were distributed within the host in predictable patterns. Secondly, and unexpectedly, the parasite was present in the dormant buds of the host, suggesting that it had grown into them as they developed. Thirdly, within some of the dormant buds, the endophyte had actually grown into preformed leaves. Thus, the endophyte grows much further into host tissues than previously thought. The author sums up succinctly: 'Throughout the undifferentiated areas where the host prepares for the next year's longitudinal growth the filaments of the parasite are already present'. It is therefore ready to gear its growth to the new growth of the host and to establish its own emergent shoots. It is certainly a most remarkable phenomenon and it will be fascinating to know how it is controlled.



How to suck eggs

Mention of *in vitro* fertilization often leads us to think of ‘test-tube babies’. Since its inception in 1978 this technique has indeed helped tens of thousands of subfertile couples to have children. It has also been used in studies of fertilization and, in non-human mammals, for genetic manipulation by inserting an exogenous gene into the newly fertilized egg or zygote. However, it will surprise many people that IVF has also been achieved for plants and has been used as a tool to study fertilization processes. Genetic manipulation of zygotes created both by IVF and by isolation after *in vivo* fertilization has been successful in plants. Further, IVF techniques also have a potential for creating new hybrids by allowing gametes to interact directly, bypassing stigmatic or stylar barriers to fertilization. Unfortunately, the range of species from which egg cells and/or zygotes have been isolated is small but this has now been extended to *Alstroemeria aurea* by **Hoshino *et al.* (Sapporo, Japan, pp. 1139–1144)**. Their aim has been to use IVF to achieve interspecific hybridization in this genus, widely used as ornamentals. The initial approach to isolation of egg cells and zygotes was to dissect out of the ovules (with or without prior pollination, depending on whether zygotes were required), incubate the ovules in a solution of cell-wall degrading enzymes, followed by microdissection with hand-made glass needles. It was found that excision of the chalazal region of the ovule strongly promoted helpful enzymic digestion of the sporophytic tissue surrounding the embryo sac. A further innovation was the use of a specially designed computer-controlled micropump, connected by fine-bore tubes to microcapillaries into which egg cells or zygotes could be sucked after removal from the ovules. Egg cells and zygotes isolated in this way were viable as indicated by vital staining, raising hopes for the use of these techniques in breeding improved strains of *Alstroemeria* species.



Fission inhibition fails to save cells

One of the ongoing topics for discussion in cell biology concerns the comparison of programmed cell death (PCD) in plants with that in animals. Some authors are firmly of the opinion that many aspects of plant PCD resemble closely apoptosis in animals, while others have been more cautious. Proponents of both sides of the debate are able to point to evidence that supports their view. Thus, for example, it has previously been shown that expression in plants of the mammalian apoptosis regulator BAX induces PCD in those plants, even though plants do not apparently possess a BAX homologue. However, **Yoshinaga *et al.* (Tokyo and Iwate, Japan, pp. 1145–1149)** now present evidence that supports the more cautious view. Various aspects of mitochondrial physiology are intimately involved in animal cell apoptosis, including fission and/or fragmentation of the organelle, loss of membrane integrity and efflux of cytochrome *c*. Inhibition of mitochondrial fission by various means (including down-regulation of proteins promoting mitochondrial fission and over-expression of proteins promoting mitochondrial elongation) actually inhibits apoptosis. Previous observations had indicated that mitochondrial fission and fragmentation occur in PCD induced by BAX or by reactive oxygen species (ROS) in *Arabidopsis thaliana*, suggesting another similarity with animal apoptosis. To test this idea further, the authors inhibited mitochondrial fission by the over-expression of DRP3B (K56A), a dominant-negative mutant form of the gene DRP3B, which in its wild-type state promotes mitochondrial fission. The expression of the dominant-negative mutant gene led to mitochondrial morphology similar to a string of sausages, indicating an inhibition of mitochondrial fission. However, PCD, whether induced by BAX or by ROS or by other factors, was not inhibited. In plants then, mitochondrial fission is probably a consequence of PCD and not part of the causative cascade.

Professor J. A. Bryant
University of Exeter, UK
E-mail j.a.bryant@exeter.ac.uk