

THE QUEST FOR FLORIGEN: ARE WE THERE YET?

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The induction of flowering is a central event in the life cycle of plants. When timed correctly, it helps ensure reproductive success, and therefore has adaptive value. Because of its importance, flowering is under the control of a complex genetic circuitry that integrates environmental and endogenous signals, such as photoperiod, temperature and hormonal status (reviewed in Srikanth & Schmid, 2011). Based on grafting experiments, it has been long proposed that photoperiod is perceived in leaves where it leads to the induction of a flower-forming substance, or ‘florigen’. The florigen is then transmitted to the shoot apex where it induces the transition to flowering. Genetic analyses in *Arabidopsis thaliana* have identified mutations in a number of genes such as *CONSTANS (CO)* and *FLOWERING LOCUS T (FT)* that control flowering in response to inductive photoperiod. Whereas accumulation of the CO protein appears to be at the core of measuring photoperiod, recent data suggested that the FLOWERING LOCUS T (FT) protein constitutes a mobile signal that transmits the information to induced flowering from the leaves to the shoot apex.

Our results indicate that movement of the FT protein from the phloem companion cells to the shoot meristem is both necessary and sufficient to induce flowering in *Arabidopsis thaliana* (Mathieu et al, 2007). However, the molecular mechanism by which FT regulates flowering at the shoot apex remains unclear. More recently we have become interested the function of floral repressors that counteract the activation of *FT* expression by CO. In particular we could show that the A-class homeotic protein APETALA2 (AP2) and related transcription factors such as SCHLAFMÜTZE (SMZ) control expression of numerous flowering time and flower development genes, including *FT* (Mathieu et al., 2009; Yant et al., 2010). The molecular mechanisms that regulate *FT* expression and the relative contribution of *FT* mRNA versus protein movement to the floral transition will be discussed.

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