Certain plants, such as biennials or winter annuals, require relatively long periods of cold exposure during winter to initiate flowering the following spring. Cold exposure renders the meristem of such cold-requiring species competent to flower. This acquisition of competence to flower is known as vernalization. Before competence is achieved, plants must measure exposure to a sufficient number of days of cold to represent a complete winter; this ensures flowering only occurs when spring has arrived, rather than during a temporary warming in the middle of winter. Our studies have revealed that, in Arabidopsis, vernalization-mediated meristem competence is a function of the expression level of the MADS-box gene FLOWERING LOCUS C (FLC). FLC is a repressor of flowering. Exposure to prolonged cold causes epigenetic silencing of FLC, thus rendering the shoot apical meristem competent to flower. During cold exposure, chromatin-remodeling complexes catalyze covalent modification of histones of FLC chromatin resulting in silencing of expression. Studies in other groups of plants reveal that the vernalization requirement is based on components different than those in Arabidopsis, but to date all vernalization pathways are “overlaid” on a conserved flowering pathway that is often involved in photoperiod sensing.