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Determining the spatial and temporal requirement of the *dunce* cAMP-phosphodiesterase in behavior

One of the first genes identified as affecting learning in *Drosophila* was the *dunce* cAMP-phosphodiesterase (PDE). Molecular lesions and transgenic rescue firmly identified the *dunce*-PDE as the cause for decreased learning in mutant flies (Dauwalder and Davis, 1995). Despite the critical function of the *dunce* products in memory formation, little is known of the spatial and temporal requirements of *dunce* gene product in memory formation. The *dunce* transcript implicated in memory formation has been cloned into the responding element of the GAL4 / UAS two-part transcription control system (Brand and Perrimon, 1993; McGuire et al., 2003) and transgenic flies have been generated. To allow for temporal control of gene expression we use neuronal GAL4 expression (*elav*-GAL4) with the temperature sensitive GAL80 repressor. The responder element is UAS-*dunce*-PDE. Flies with all three transgenes in a wild-type background allow us to turn on *dunce*-PDE expression with a temperature shift from 18 to 25 °C. These flies are tested in a spatial learning paradigm termed the heat-box in which flies must associate spatial position with a high-temperature negative reinforcer.