Learning relative value in Drosophila.

Maria Villar[1], Miguel Delgado[1], Pedro Jacob[2], Scott Waddell[2], and Emmanuel Perisse*[1,2]

[1]Institut de Génomique Fonctionnelle – IGF, CNRS, INSERM, Univ. Montpellier, Montpellier, France. : UMR5203, U1191 – France

[2]University of Oxford, Centre for Neural Circuits and Behaviour – United Kingdom

Abstract

Animals use memories of past experience to make appropriate decisions. We previously showed that flies can memorize information that correlates to the intensity of electric shock to make appropriate value-based decisions using specific mushroom body (MB) intrinsic circuits. Surprisingly, we found that during learning rewarding dopaminergic (DA) neurons are required to assign relative value (better or worse than) signals to odours associated with different intensities of electric-shock punishment. Using *in vivo* neuronal silencing during learning, we found specific subsets of rewarding and punishment DA neurons targeting the MB that are specifically required for relative aversive value coding. MB output neurons (MBONs) with dendrites within the MB zones targeted by the necessary DA neurons are also necessary for relative aversive value coding. *In vivo* calcium imaging during learning revealed that learning induces shock intensity-dependent persistent depression of the conditioned-odour drive to the relevant MBONs promoting appropriate avoidance behaviour. As anatomical connections exist between MBON and DA neurons targeting the MB, we therefore propose that memories of relative aversive value are written within the DA-MB-MBON network and compared *via* recurrent MBON-DA neuron recurrent circuits.

*Speaker