that over-expression of tau in neurones causes neurodegeneration in this model without forming filamentous aggregates (Williams, Tyrer and Shepherd 2000). We are now using *Drosophila* to analyse how tau abnormalities cause neurodegeneration. By selectively co-expressing human 0N3R tau and a Green Fluorescent Protein marker of transport vesicles we have examined the consequences of tau over-expression on axonal transport in vivo. The results show that over-expression of tau disrupts axonal transport causing vesicle aggregation and a reduction of mobile vesicles without affecting the vesicle velocity. Disruption of axonal transport is associated with loss of locomotor function in larvae and adults. All these effects occur in the absence of neurone death. The data show that tau abnormalities significantly disrupt neuronal function before classical pathological hallmarks are evident. To investigate the mechanism by which tau overexpression mediates these effects, we are currently over-expressing the tau kinase Glycogen Synthase Kinase 3 beta (GSK-3β) in this system. These studies shed light on the importance of tau containing pathological hallmarks in tauopathies and also demonstrate the usefulness of *Drosophila* as model organisms in these types of studies.

A9.7–Nicotinic acetylcholine receptor ligands from the Egyptian Milkweed, *Asclepias sinaica*

S. Elbanna, S. Zalat, Zoology, Suez Canal University, Egypt; Bhupinder Khambay, Rothamsted Research; Ian R. Mellor, Ian R. Duce, Francis Gilbert, Life and Environmental Sciences, Nottingham

We have used whole-cell patch-clamp of TE671 human muscle cells to identify ligands of muscle type nicotinic acetylcholine receptors (nAChR) from the milkweed, *Asclepias sinaica*. The plant is toxic to mammals and insects, and the bug, *Spilostethus pandurus* (Hemiptera: lygaeidae), sequesters toxins from the plant for its own protection. It is possible that neuroactive components of the milkweed may be useful as lead structures for pesticides or pharmaceutics, as well as playing a role in chemical ecology.

A methanol extract of the aerial parts of the plant induced whole-cell currents when applied to TE671 cells. The crude extract was fractionated into petroleum ether (F_1), diethylether (F_2), ethylacetate (F_3), chloroform (F_4) or methanol (F_5). No active compounds were found in F_1, F_2 or F_4. F_3 contained three components when analysed by HPLC (I–III). F_3-I was inactive. F_3-II and F_3-III were antagonists of nAChR. This antagonism was non-competitive and voltage (V_H)-dependent, indicating that they are open channel blockers at nAChR. The methanol fraction (F_5) contained six components (I–VI). Only F_5-III and F_5-VI were active at nAChR. F_5-III antagonized responses of nAChR to ACh in a V_H-independent and ACh concentration-dependent manner. F_5-VI evoked mimicked acetylcholine when applied alone to TE671 cells.

In summary, *A. sinaica* contains both nAChR agonists and antagonists in its aerial parts. Given that other nAChR ligands are pesticides (e.g. imidacloprid) or anthelmintics (e.g. levamisole, pyrantel), the components described here may be have similar uses. S.E. was supported by a British Council studentship.

A9.8–Role of sensory inputs in aimed leg movements of a locust

K.L. Page and T. Matheson, Zoology, University of Cambridge, Cambridge, U.K.

Locusts respond to tactile stimulation of their wings with repetitive scratching movements of their hind legs that are accurately directed towards the site of stimulation. We have sought to understand the role of sensory inputs from the hindwings and legs in controlling this targeting. The likelihood of eliciting a scratch is dependent on the region of the wing being stimulated. This regional sensitivity can be explained by the distribution patterns of three types of sensilla on the hindwing. Basiconic sensilla comprising both chemosensory and mechanosensory afferents are evenly distributed over the wing surface, whereas purely mechanosensory sensilla are restricted to the wing veins. The longest mechanosensory sensilla are present solely along the anal vein (A1), which defines the dorsal fold of each wing, and is the most effective site in eliciting a scratch. The long hairs stand upright, making them ideal for detecting tactile stimulation from above. A sexual dimorphism in the number of mechanosensory sensilla may partly explain sex differences in scratching behaviour.

Ablation of a hindleg proprioceptor (the femoral chordotonal organ) was used to remove a key source of information encoding leg position. Locusts were unable to fully compensate for the absence of proprioceptive feedback caused by the ablation, thus the targeting accuracy of both anterior and posteriorly directed scratches was markedly reduced.

These findings may help us to understand better the roles of exteroceptive and proprioceptive sensory inputs that must be integrated to produce accurate targeting.

A9.9–Effects of temperature on crustacean behaviour and neurophysiology

J.S. Young; L.S. Peck* and T. Matheson; Zoology, University of Cambridge, and *British Antarctic Survey, Cambridge, U.K.

The effect of temperature on the neuronal control of behaviour was assessed for four marine crustacean spe-