SASHA N. ZILL, SUMAIYA CHAUDHRY, DAVID NEFF, and REYNE SPYCHALSKI, Department of Anatomy and Pathology, Marshall University, Huntington, WV, 25755, Chemistry, Forensic Science Center, Marshall University, Huntington, WV, 25755. **Common mechanisms of force detection and control in insects.**

Information from sense organs that detect forces may be particularly important in neural control of muscles as modular groups (synergists). We have performed comparative studies to characterize force detection in insects using physiological studies in stick insects and cockroaches to gain insight into comparable mechanisms in fruit flies (Drosophila), in which new and powerful genetic tools have been developed. Campaniform sensilla are mechanoreceptors that encode forces as cuticular strains. Previous studies have shown they can reinforce muscle synergies. Receptors fulfill similar functions in different species but the effects of individual groups are determined by the specific forces they encode. Whole mount and dissected preparations were studied using confocal and light microscopy. Sense organs and leg muscles were labeled using diI diffusion from the thorax. Activities in peripheral nerves and muscles were recorded extracellularly. Many receptors are homologous but the structure and responses of the femoral group (fCS) and mobility of the trochanter-femur joint are species specific. In cockroaches and stick insects, sensitivities to forces in the joint plane are correlated with effects on muscle synergies. In Drosophila, the fCS are located on the ventral femur, suggesting that they should be sensitive to forces in the joint plane. We are currently testing motor effects using neurophysiological recordings from larger Calliphorid flies. There are clear homologies in some groups of force receptors. Legs of flies combine elements found in cockroaches and stick insects. Sensory feedback can have similar effects in activation of muscle synergies in flies.