Progress towards a universal CRISPR/Cas9-depedent strategy to create genetically encoded tools for neuroethological studies in insects

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In genetically tractable model animal species such as the fruit fly *Drosophila melanogaster*, the use of genetic and transgenic approaches is now the ‘gold standard’ for investigators studying the neuronal underpinnings of behavior. Specifically, the development of genetically encoded tools for observing and manipulating the activity of specific neuronal populations in vivo has become instrumental for studying the circuits underlying behavior. Yet, the use of these techniques has been largely restricted to genetically tractable model animal species, which has limited their utility for studying behavior from comparative and phylogenetically diverse perspectives. Recent progress in developing CRISPR/Cas9 approaches for genome editing has provided a convenient technique that can be utilized for the integration of transgenes in non-model organisms. We have thus set out to develop a simple and modular protocol for implementing CRISPR/Cas9 based strategies to express genetically encoded transgenic tools for in vivo visualization and manipulation of neuronal activity in brains of non-model animal species, including those without sequenced genomes. Here, I will report our progress on proof-of-principle studies to express the neuronal activity reporter GCaMP in defined neuronal populations of the bumble bee, *Bombus impatiens*, the honey bee, *Apis mellifera*, and the American grasshopper, *Schistocerca americana*, as well as plans for broad implementation of our approach in other insects.