**Abstract**

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*Social communication in a complex environment*

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*Drosophila melanogaster* is extensively used in studies of the neural basis of social communication, due to the genetic toolkit available in this system. In nature, flies such as *D*. *melanogaster* aggregate, feed, and fight over food patches; however, the neurobiology of fly social behavior is typically studied using isolated pairs of flies in homogenous environments. There is, therefore, a gap between these experimental settings and the natural environments to which this nervous system has adapted. We will address this problem by using computational tools for the detailed tracking of multiple flies over extended periods of time.

**First,** we will develop a novel experimental setup and computational tools for monitoring and tracking multiple flies in a circular arena that contains a food patch.

**Second,** we will collect multiple datasets, each comprising eight males and eight females; these individuals will be monitored and tracked for 4 hours. We will quantify how social communication among flies is affected by social and non-social cues, from moment to moment.

**Third,** we will use optogenetic stimulation to determine the role sexually dimorphic cells play in social communication, by manipulating a single fly in each experiment.

This study will require a close collaboration between two laboratories, one in Israel and the other in the USA. The Israeli partner will build the novel experimental setup and collect the data, while the US partner will develop the tracking tools; both partners will analyze the data. The partners have previously engaged in a successful collaboration and co-authored a publication.

**We anticipate that the proposed study will make a significant contribution to our understanding of the neurobiology of social communication and provide a basis to facilitate future work that aims to understand how brains communicate in the environment in which they adapted.**