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Title: Tools for studying object vision in the Northern Tree Shrew

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Abstract: The macaque monkey has classically provided a key model for visual processing, due to its amenability to psychophysical tasks and well-delineated visual hierarchy. More recently, the rodent has emerged as a new model for visual processing, due to the availability of molecular and genetic tools. An ideal model system would satisfy both needs: amenability to complex psychophysical tasks and tractability for molecularly-based recording and perturbation techniques. Towards this goal, we have embarked on an effort to establish the northern tree shrew as a model organism for study of high-level object vision. A diurnal animal, the tree shrew has high visual acuity (>10x that of rodents), a cone-dominant retina, and a columnar-organized visual cortex. Moreover, tree shrew cortex is lissencephalic, enabling increased optical access for imaging neural circuit dynamics compared to the macaque. Due to its small size (~150-200 grams) and relatively short reproductive and developmental cycles (6 weeks gestation, 4-6 months from birth to adulthood, 1-6 offspring per litter), the tree shrew offers experimental and genetic accessibility similar to rodents. We have built a high-throughput, low-cost, automated behavioral apparatus allowing visual behaviors in the tree shrew to be rapidly assayed. We report our initial results training tree shrews on figure-ground and object discrimination tasks. The animals readily learned to self-initiate trials and performed upwards of 1000 trials per day. Initial comparisons demonstrate that tree shrews learned significantly faster than mice or rats on the same tasks. Future work will incorporate head-fixed paradigms, electrophysiological, and optical recordings of neural activity during these tasks. This work is supported by HHMI and DP1-NS083063.