

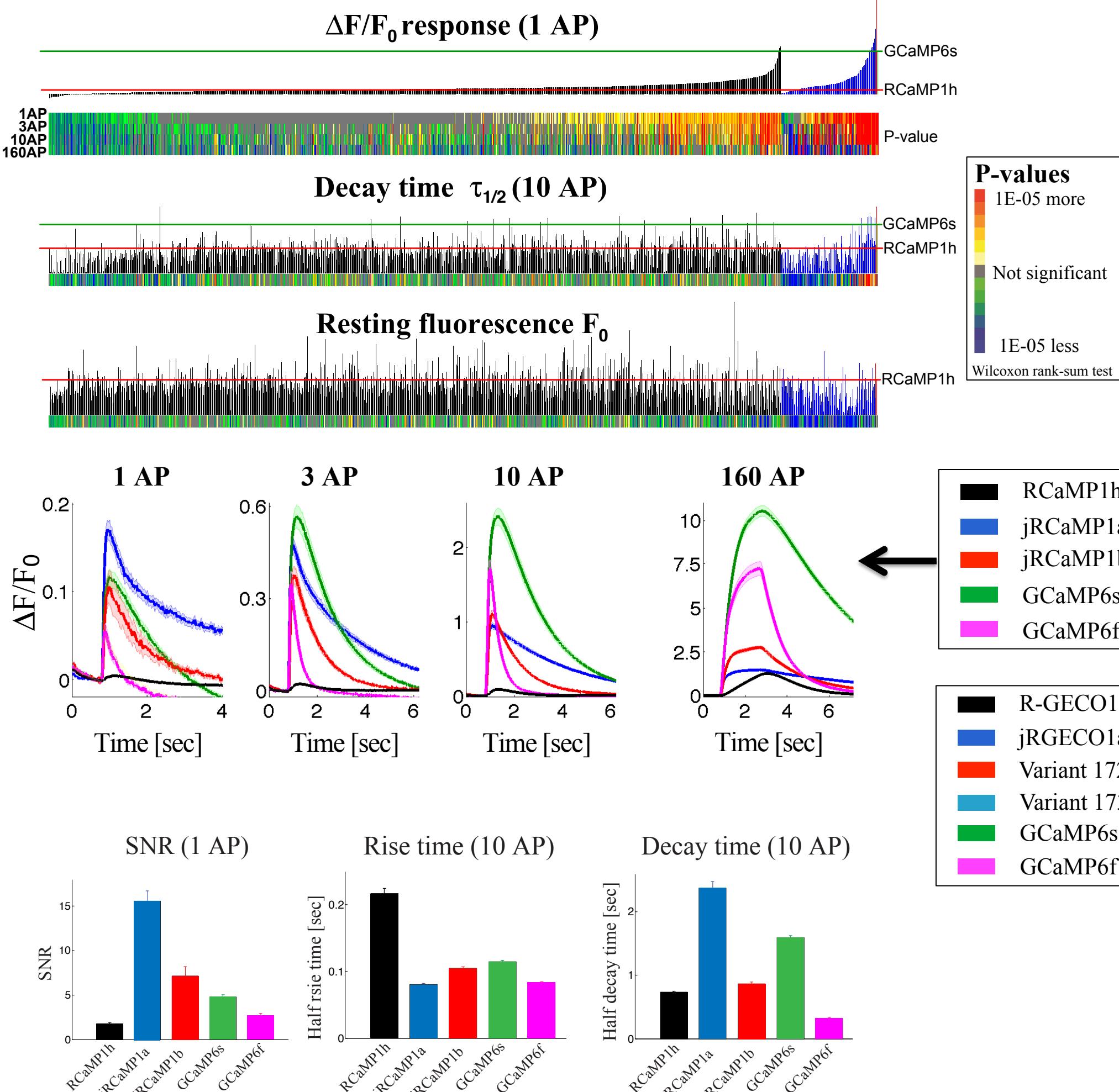
# Improved red protein indicators for *in vivo* calcium imaging

Hod Dana, Yi Sun, Jeremy P. Hasseman, Getahun Tsegaye, Graham T. Holt, Ben F. Fosque, Eric R. Schreiter, Stephan D. Brenowitz, Vivek Jayaraman, Loren L. Looger, Karel Svoboda, Douglas S. Kim  
Genetically-Encoded Neuronal Indicator and Effector Project

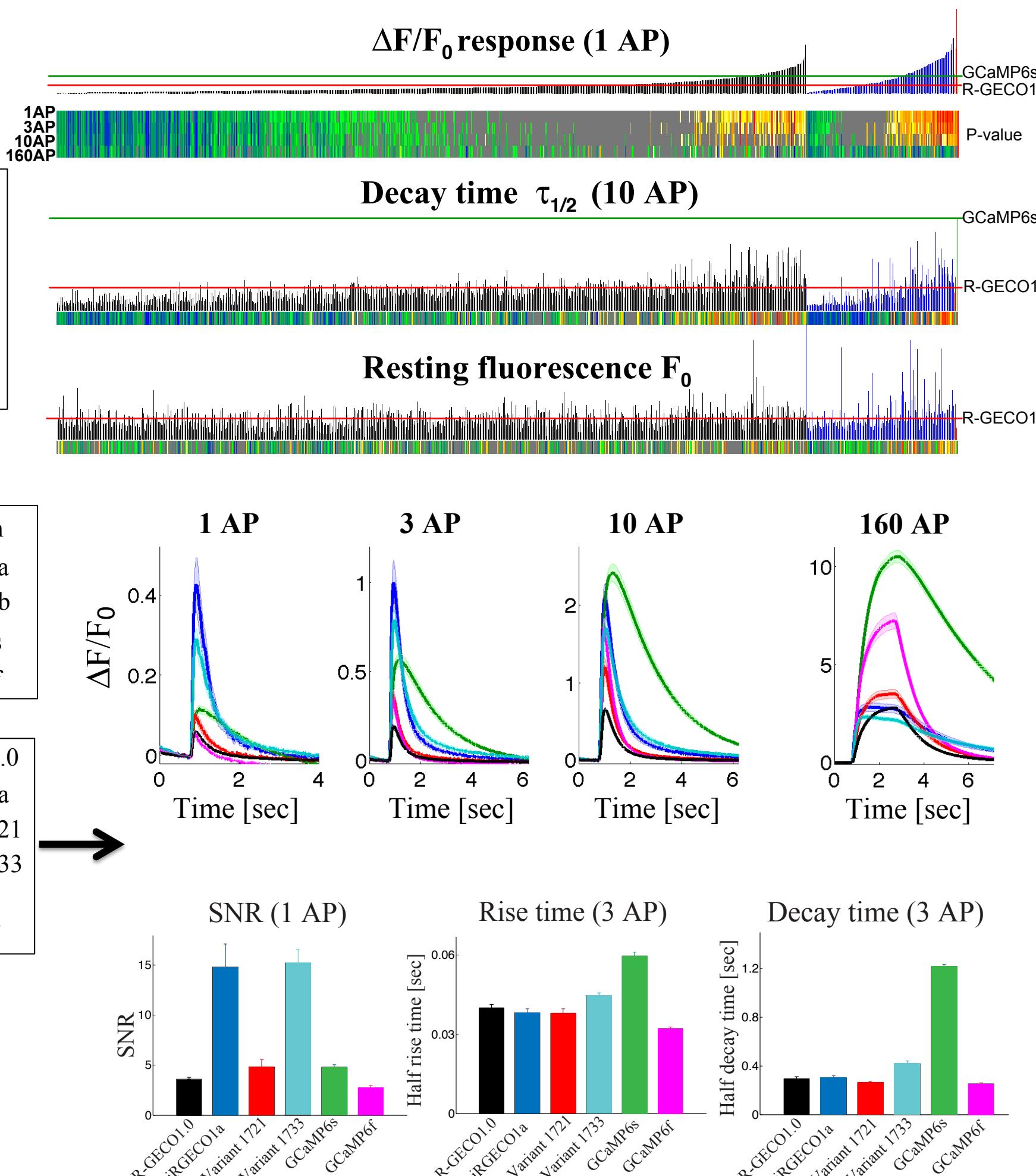
## Context

- Optical imaging of calcium dynamics using genetically-encoded calcium indicators (GECIs) is a powerful tool for systems neuroscience
- Current state-of-the-art GECIs emit green light (green GECIs)
- Red GECIs may be used for:
  - Deep tissue imaging
  - Dual-color imaging
  - Parallel use with light-sensitive ion channel (ChR2)
- Here we present high-sensitivity red GECIs based on RCaMP and R-GECO for *in vivo* imaging of neural activity.

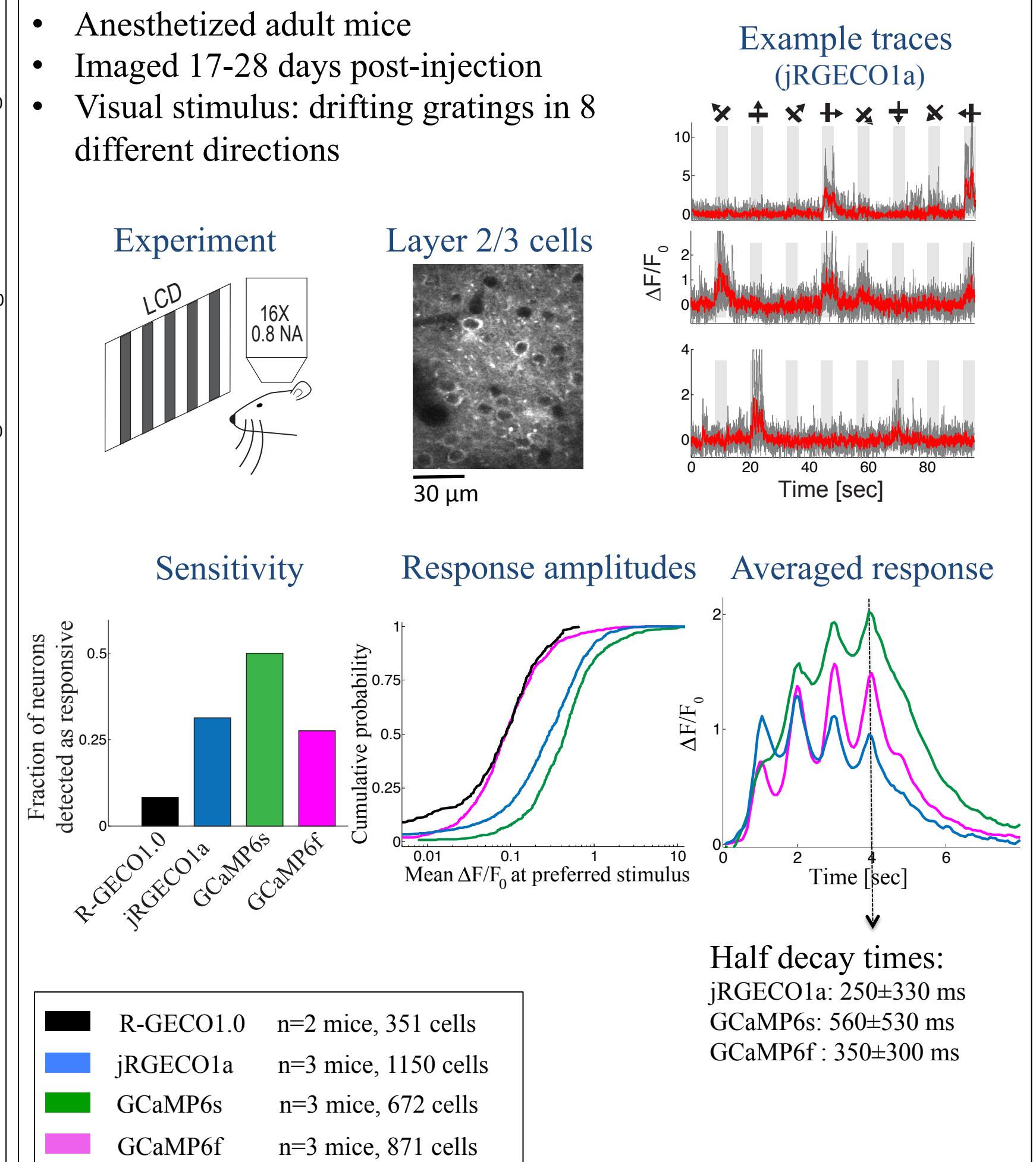
## RCaMP1h variants screened in cultured neurons



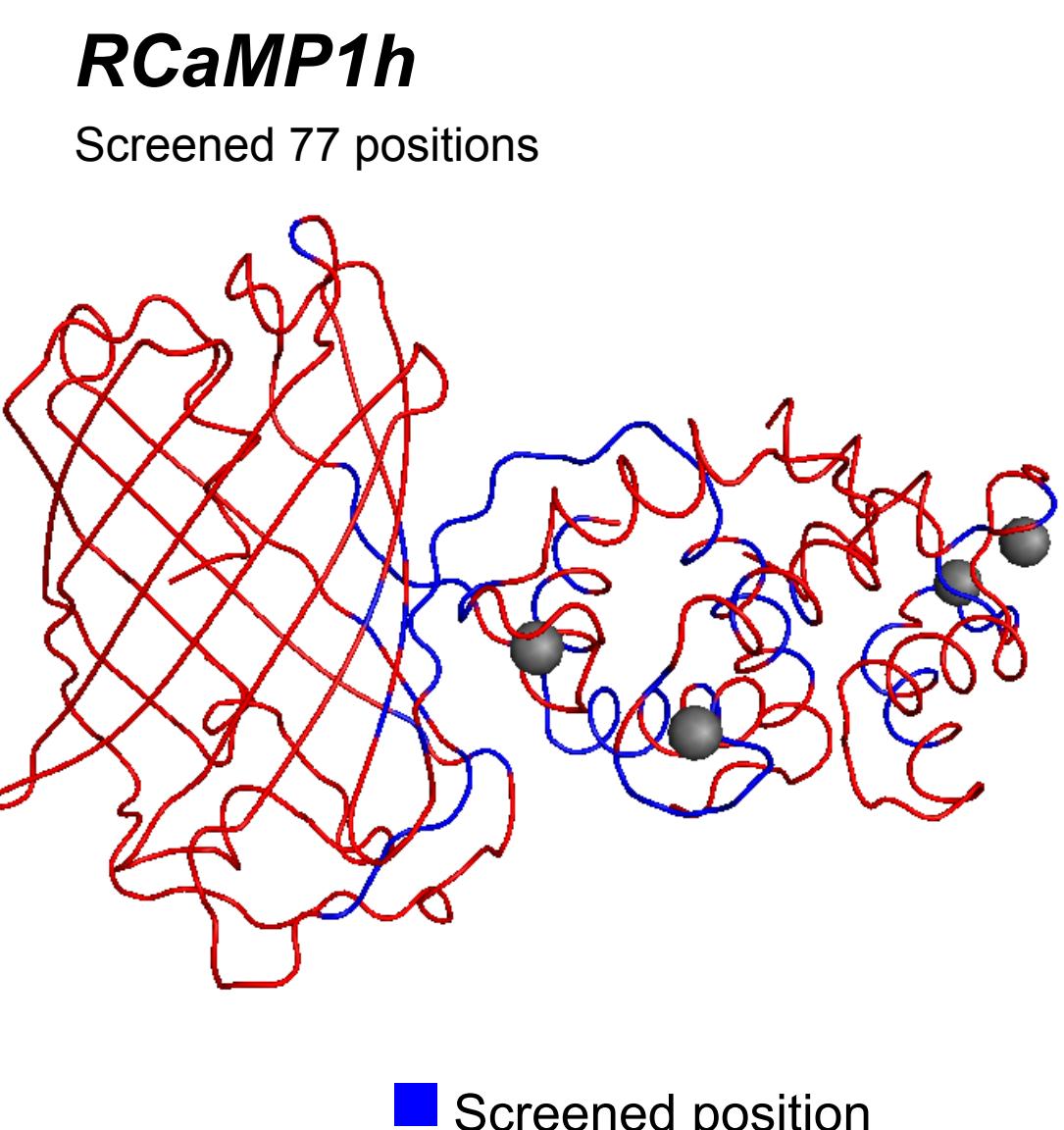
## R-GECO1.0 variants screened in cultured neurons



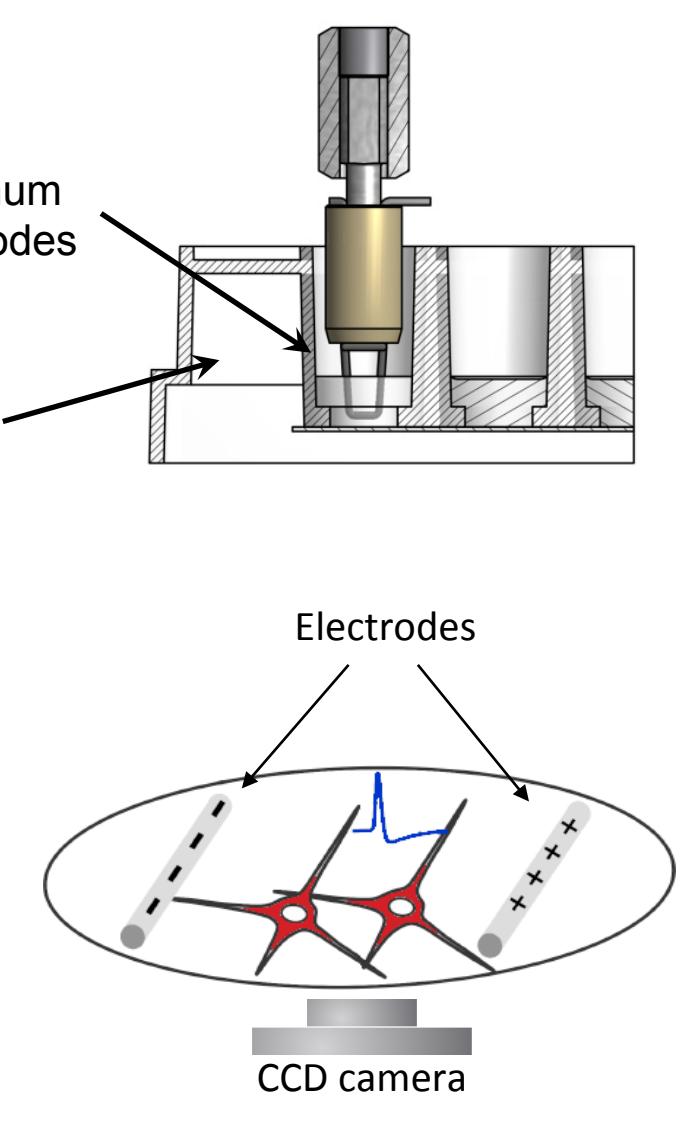
## In vivo functional imaging in V1



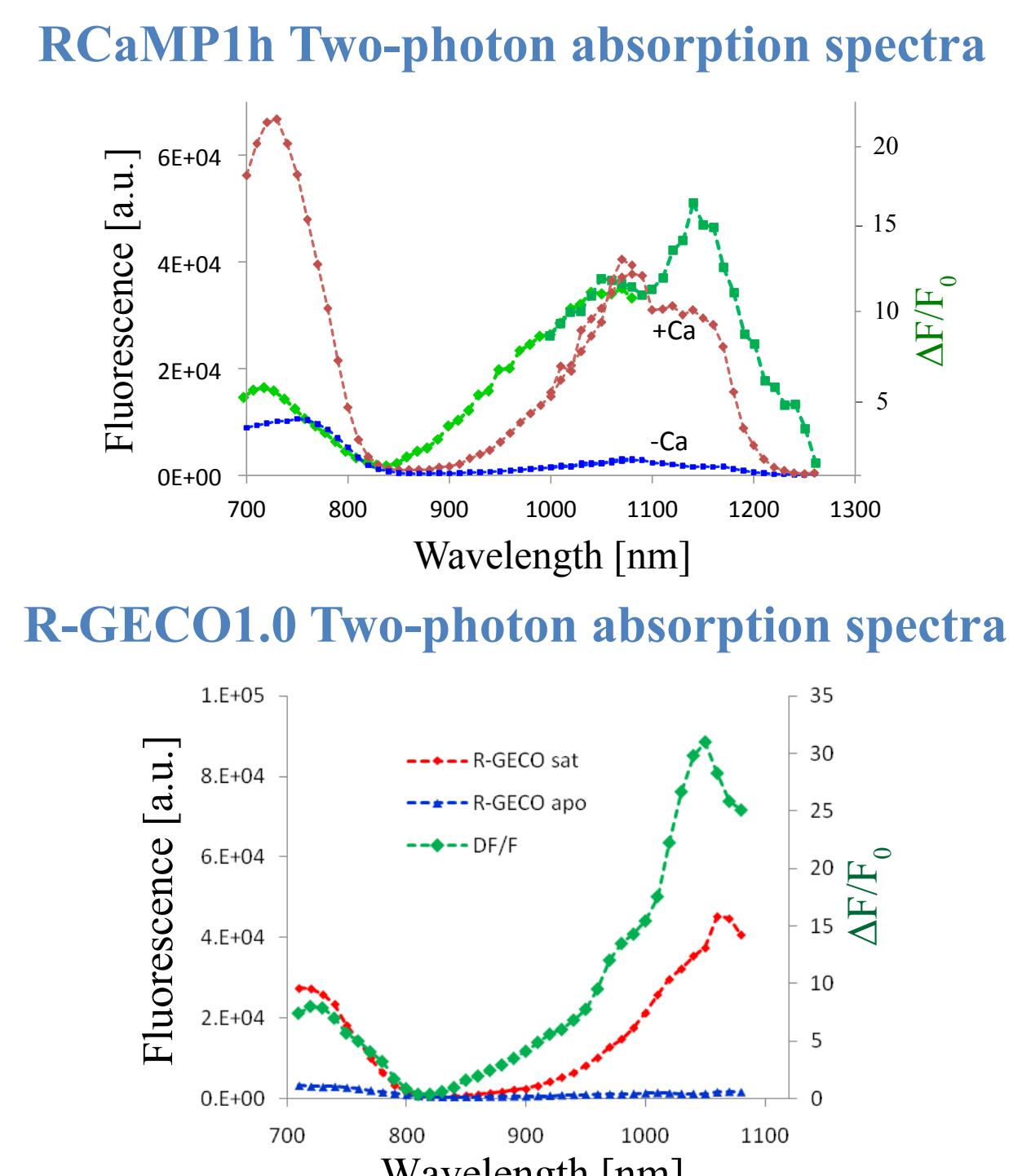
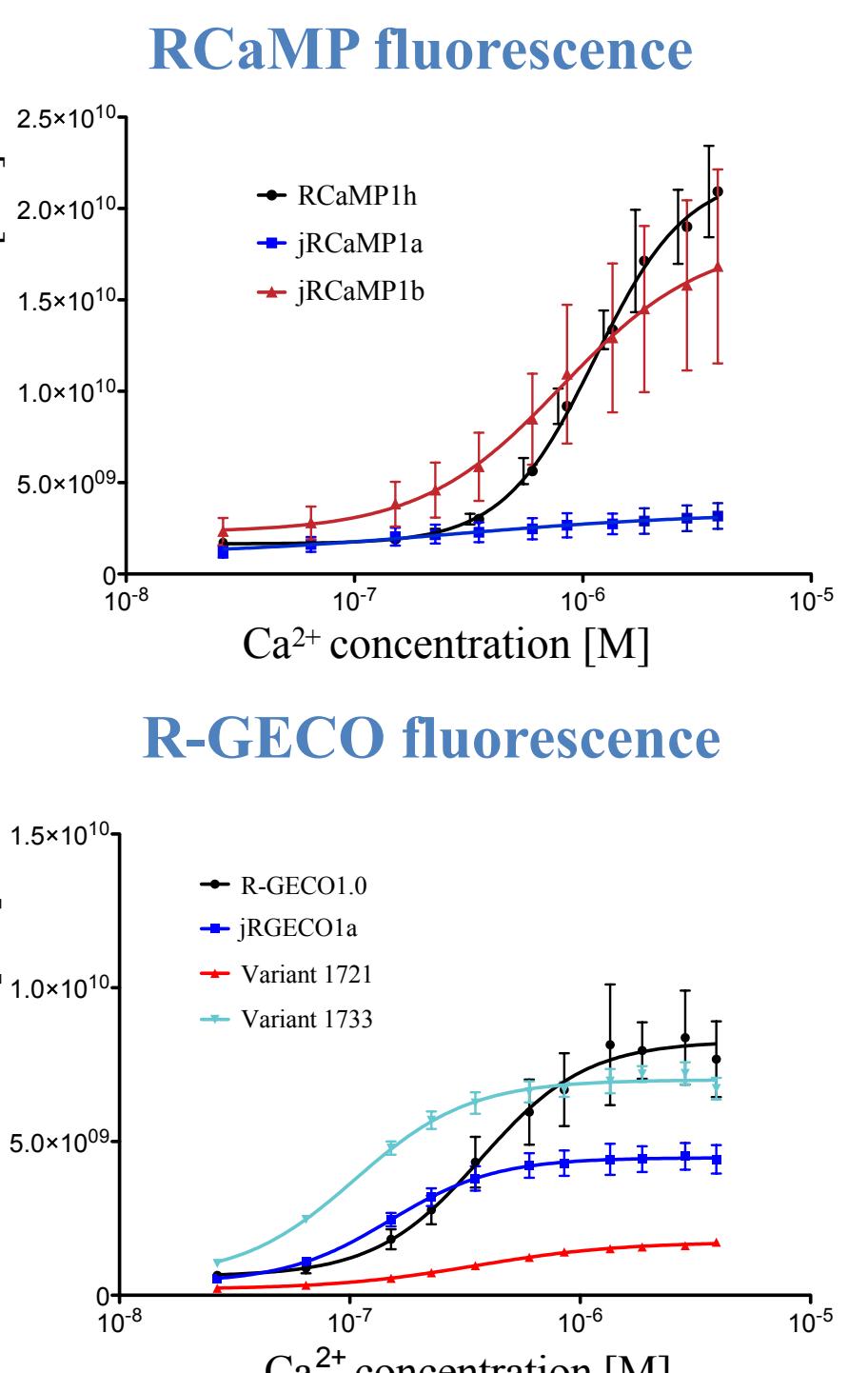
## High throughput GECI testing in neurons



## Imaging and stimulation system



## Purified protein measurements



## Conclusions

- New RCaMP and R-GECO variants have improved sensitivity and kinetics
- Sensitivity of jRGECO1a *in vivo* was similar to GCaMP6
- In vivo* testing of other Red GECI variants is in progress
- Reagents distributed through Addgene.org**