PNAS
www.pnas.org

**Supplementary Information for**

*Conserved Patterns of Functional Organization Between Cortex and Thalamus in Mice*

Andrew J. Miller-Hansen, S. Murray Sherman
Department of Neurobiology, University of Chicago, Chicago, IL 60637
**Corresponding author:** S. Murray Sherman
**Email:** msherman@bsd.uchicago.edu

**This PDF file includes:**

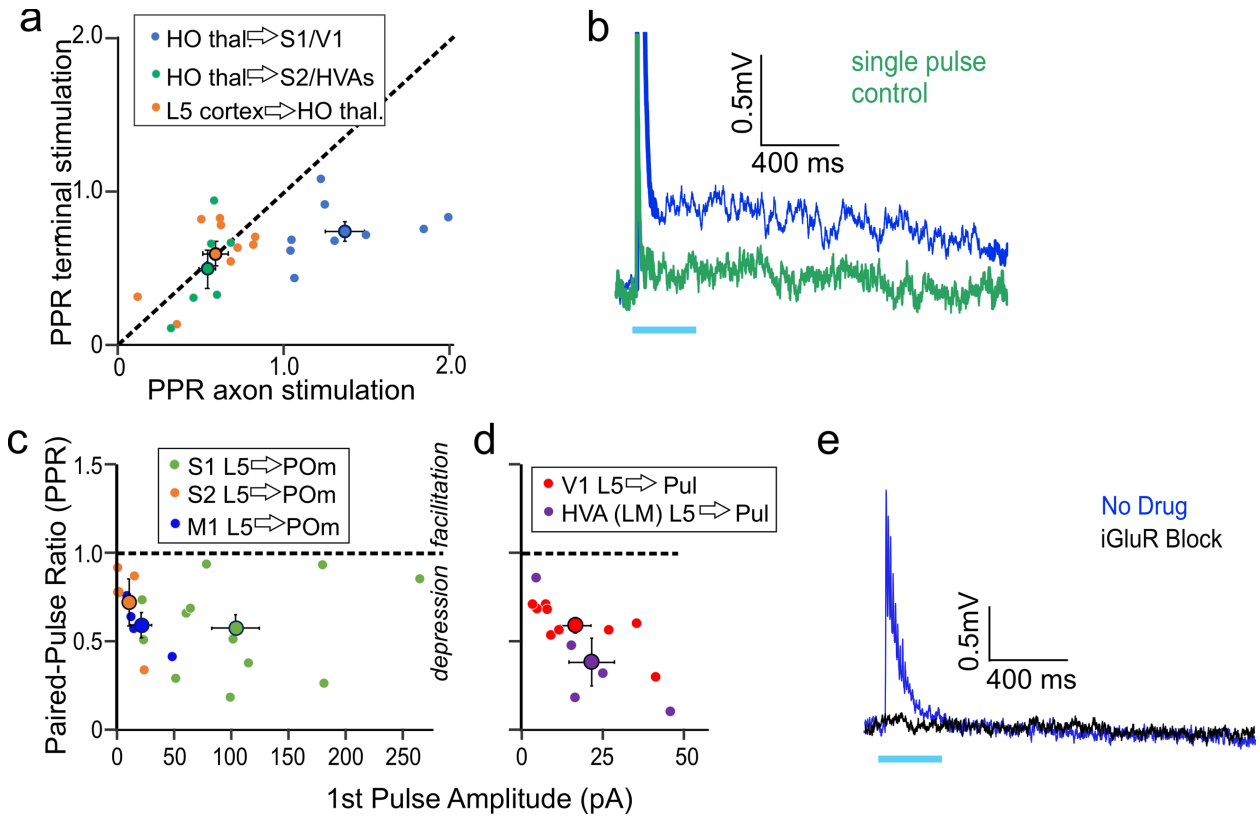


**Figure S1: Electrophysiology supplement**

(a) PPRs when data when axon stimulation and terminal stimulation were collected from the same cell. Larger dots represent the mean for each group with bars for SEM. On average, depressing responses (PPR<1) were not changed and fall along the unity line. However, facilitating (PPR>1) responses to axonal stimulation were changed to depression on average (blue dots represent data from recordings in S1 and V1).

(b) A representative example of an mGluR response to high-frequency stimulation in V1 cortex (blue trace). When the repetitive stimulation is replaced with a single pulse at the same intensity (green trace), the initial fast depolarization remains unaffected while the slow mGluR-dependent phase is abolished, consistent with the finding that repetitive stimulation is required for mGluR recruitment[30].

(c) The PPR and 1st EPSC amplitudes of POm → S1 cells' response to a series of 10Hz optogenetic stimulations of layer 5 of S1 (n=13), S2 (n=4), or M1 (n=4). Large dots represent the means of each group and error bars represent SEM.

(d) The PPR and 1st EPSC amplitude of Pul → V1 cells' response in a series of stimulations of layer 5 of V1 (n = 9) or HVA LM (n = 5). Large dots represent the means of each group and error bars represent SEM.

(e) A representative example of a HO thalamic cell's response to high frequency stimulation of a layer 5 axon or terminal. Depolarization is abolished with iGluR blockers alone.

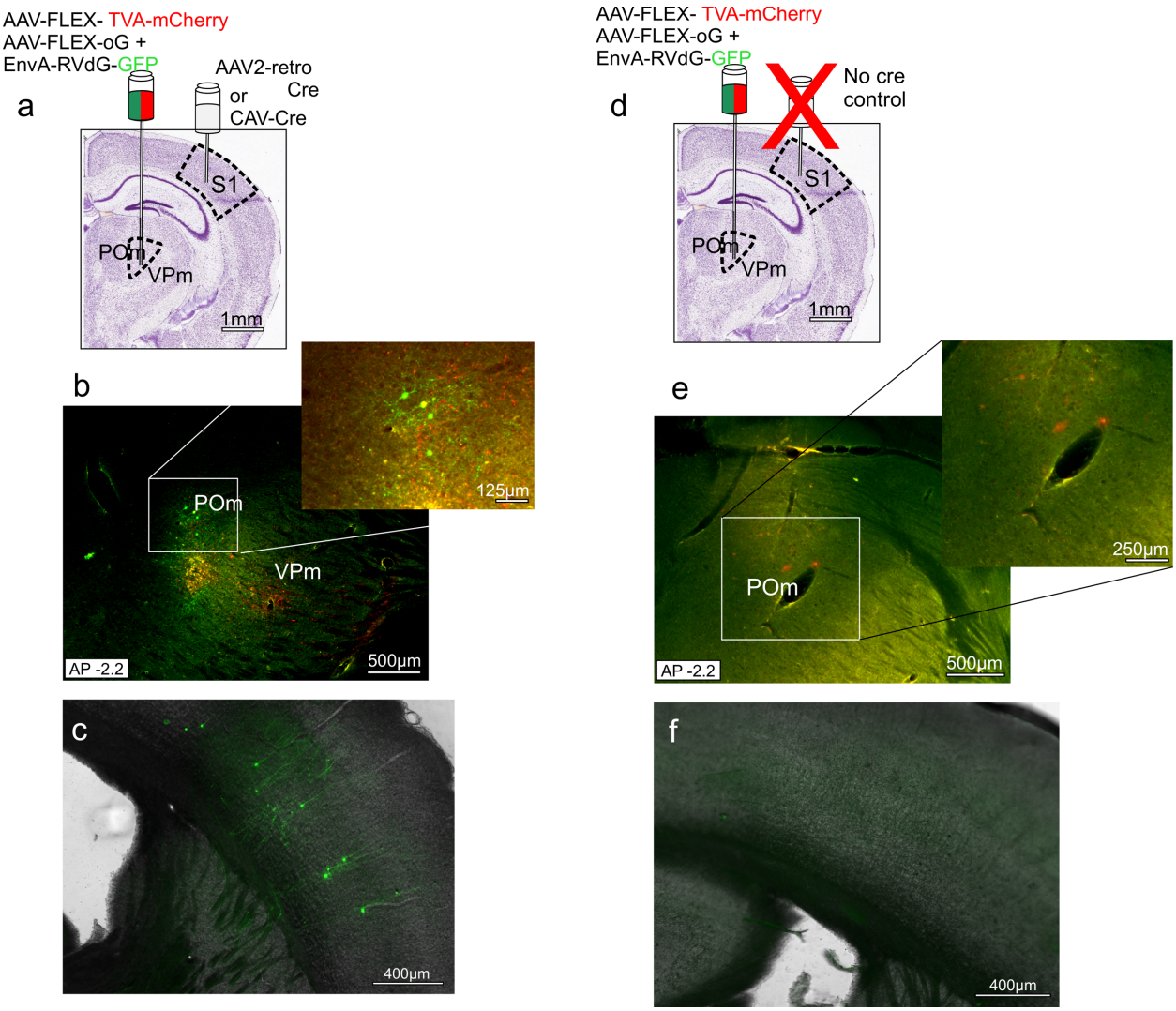


**Figure S2: G-deleted rabies labeling of pre-synaptic inputs to POm → S1 is dependent on cre recombinase**

(a) Experimental strategy for G-deleted rabies tracing of inputs to the POm → S1 pathway, with retrograde cre injection in S1, as in Fig. 2.
(b) Example starter cells in POm
(c) Example retrogradely labeled input cells in somatosensory cortex.
(d) Same as in (a), except without the virus delivering cre recombinase.
(e) Sparse labeling may be present in POm, but no double-labeled starter cells
(f) Pre-synaptic inputs to POm are not labeled.

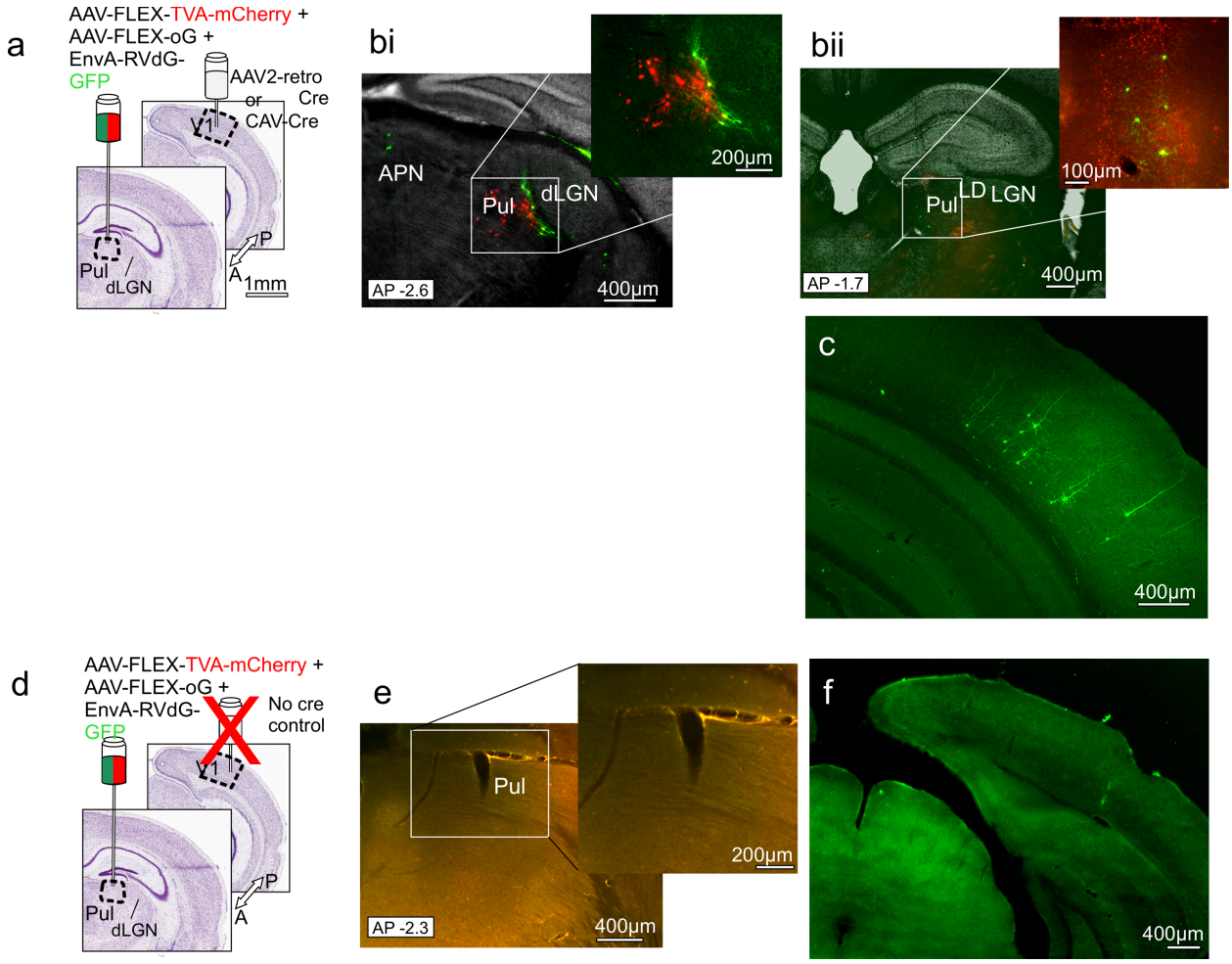


**Figure S3: G-deleted rabies labeling of pre-synaptic inputs to Pul → V1 is dependent on cre recombinase**

(a) Experimental strategy for G-deleted rabies tracing of inputs to the Pul → V1 pathway, with retrograde cre injection in V1, as in Fig. 3.
(b) Example starter cells in more caudal (bi) and rostral (bii) Pul of separate animals
(c) Example retrogradely labeled input cells in visual cortex.
(d) Same as in (a), except without the virus delivering cre recombinase.
(e) Sparse labeling may be present in Pul, but no double-labeled starter cells
(f) Pre-synaptic inputs to Pul are not labeled.

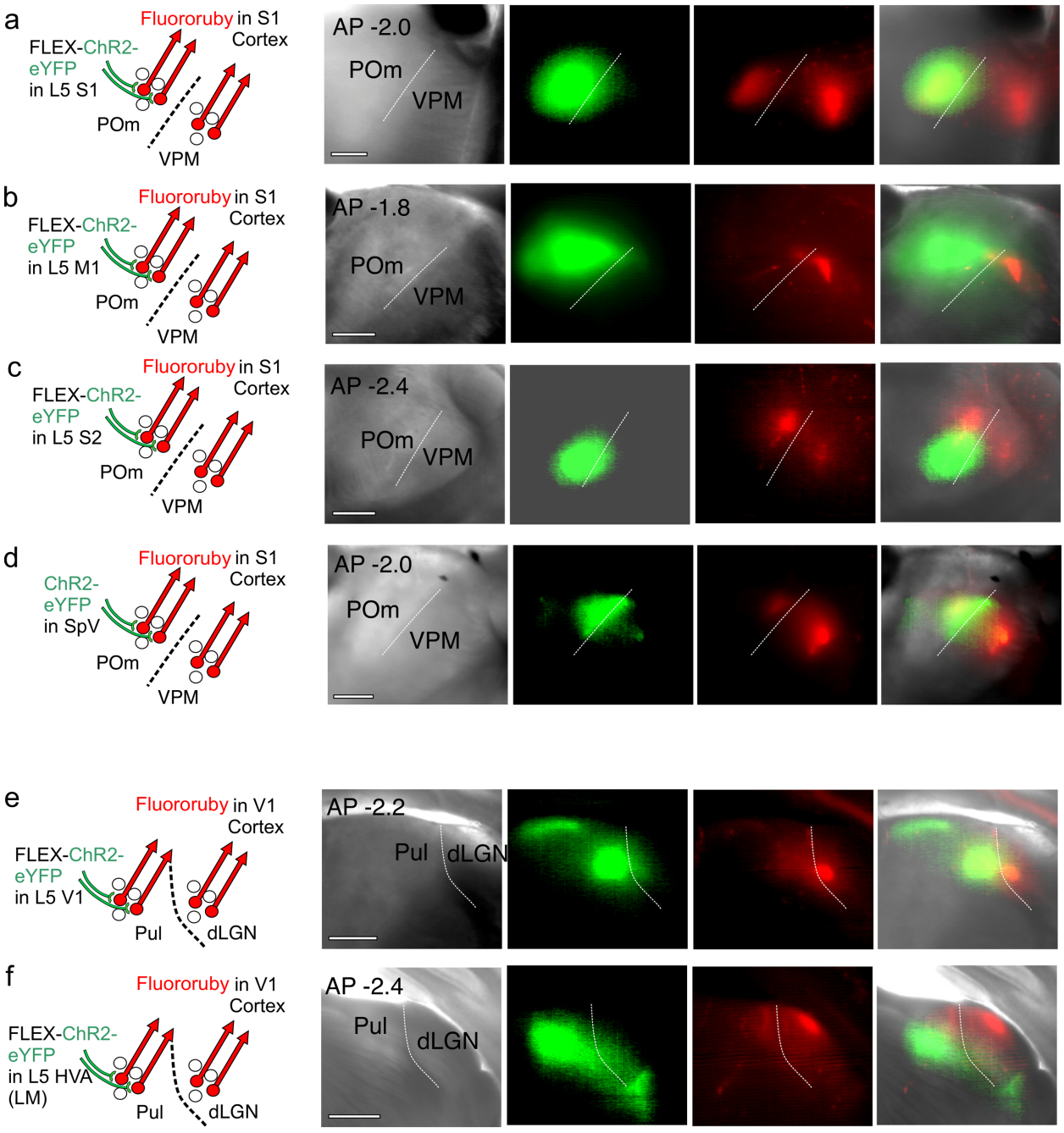


**Figure S4: Retrograde and anterograde labeling in thalamus**

(a) Experimental strategy from Fig. 4a (left), with close-up images of thalamus showing a typical pattern of overlap between retrogradely labeled cells (red) and ChR2-eYFP expressing axons. Note that at this magnification, retrograde labeling may seem sparse in HO thalamus, but fluororuby labeled cells are present and visible at higher magnification as in Figs. 4aii and 5aii.
(b) Same for Fig. 4b
(c) Same for Fig. 4c
(d) Same for Fig. 4d
(e) Same for Fig. 5a
(f) Same for Fig. 5b

**Table S1. Thalamocortical response properties by cortical area and layer**

| Cortical Area | Layer | n | 1st Pulse Ampl. Mean ± SE | PPR Mean ± SE |
|---|---|---|---|---|
| S1 pooled | all | 12 | 12.00 ± 1.60 | 1.27 ± 0.07 |
| S1 | 2/3 | 6 | 12.19 ± 1.74 | 1.36 ± 0.13 |
| | 4 | 1 | 19.14 | 1.29 |
| | 5 | 4 | 11.64 ± 3.53 | 1.09 ± 0.05 |
| | 6 | 1 | 5.13 | 1.38 |
| S2 pooled | all | 13 | 37.81 ± 7.23 | 0.64 ± 0.05 |
| S2 | 2/3 | 8 | 44.45 ± 10.6 | 0.63 ± 0.05 |
| | 4 | 2 | 36.27 ± 1.25 | 0.58 ± 0.23 |
| | 5 | 2 | 26.82 ± 15.8 | 0.62 ± 0.20 |
| | 6 | 1 | 9.67 | 0.89 |
| V1 pooled | all | 12 | 13.27 ± 2.35 | 1.30 ± 0.09 |
| V1 | 2/3 | 5 | 12.01 ± 3.85 | 1.26 ± 0.10 |
| | 4 | 1 | 8.81 | 1.13 |
| | 5 | 4 | 17.50 ± 4.87 | 1.51 ± 0.23 |
| | 6 | 2 | 10.18 ± 3.82 | 1.10 ± 0.09 |
| HVAs pooled | all | 16 | 38.76 ± 10.2 | 0.57 ± 0.05 |
| HVA (LM) | 2/3 | 4 | 61.29 ± 31.9 | 0.67 ± 0.10 |
| | 4 | 3 | 29.68 ± 6.82 | 0.37 ± 0.12 |
| | 5 | 2 | 10.82 ± 4.60 | 0.77 ± 0.07 |
| | 6 | 1 | 8.52 | 0.70 |
| HVA (AM) | 2/3 | 2 | 74.18 ± 46.5 | 0.54 ± 0.14 |
| | 4 | 1 | 19.40 | 0.49 |
| | 6 | 1 | 42.85 | 0.45 |
| HVA (AL) | 2/3 | 2 | 22.58 ± 0.29 | 0.55 ± 0.06 |