Inventory of Supplemental Information

Figure S1, Mice accurately perform the visual discrimination task, related to Figure 1. This figure provides additional details about the behavioral performance of mice across all conditions (food-restricted, sated, and sham-satiation) and across different mice used during the imaging of all brain areas.

Figure S2, No response bias to the FC across POR neurons in naïve, untrained mice, related to Figure 2. This figure provides a baseline characterization of postrhinal cortex (POR) and shows that there are visually responsive neurons with sharp orientation tuning in POR of naïve, untrained mice. Additionally, unlike in trained mice, there is no response bias to any of the presented visual cues in naïve mice.

Figure S3, Visually responsive neurons show high response reliability across days and are not modulated by licking, related to Figure 2. This figure compliments the data shown in Figure 1 with an example field-of-view and traces from primary visual cortex (V1), and characterizes the response stability of visually driven neurons across areas. Additionally, this figure shows the timecourse of the emergence of bias in the population mean across areas, and how this bias cannot be explained by licking confounds.

Figure S4, POR demonstrates a response bias to food-associated cues regardless of cue orientation, related to Figure 2. This figure compliments the data shown in Figures 2 and S2 showing that the response bias is specific to the FC used during training, regardless of FC orientation.

Figure S5, Projection-specific anterograde and retrograde tracing shows reciprocal connectivity between LA and POR, related to Figure 3. This figure provides further anatomical characterization of the reciprocal connectivity between LA and POR using retrograde/anterograde tracing from POR and collateral mapping of those LA neurons that project to POR ($LA^{\rightarrow POR}$). In addition, this figure identifies potential sources of sensory information and information about value/salience to $LA^{\rightarrow POR}$ neurons.

Figure S6, Longer cue response latencies in $LA^{\rightarrow POR}$ than V1 or POR neurons, related to Figure 4. This figure shows that the average response latency of $LA^{\rightarrow POR}$ axons is longer than that of V1 and POR neurons, and that this increased response latency is not correlated with hunger modulation.

Figure S7, Using a general linear model to dissociate task-related responses across areas, related to Figure 8. This figure compliments Figure 8 by showing the other two types of neurons identified in our general linear model (GLM): Visual offset cells and Lick-false alarm cells. This figure also contains the population mean linear filter for Lick-reward, Lick-false alarm, and Lick-motor cells and a characterization of all cells that fit into multiple categories (multiplexed cells).

Figure S8, A small number of neurons in each area were strongly suppressed by visual stimuli, related to Figure 8. This figure identifies the small subset of cells in all three areas that were suppressed by visual stimuli, and characterizes the responses properties of these neurons. These inhibited cells did not display the same bias or hunger-modulation as the excited cells in the same areas.

Supplemental Movie S1: Two-photon imaging of LA axons that project to POR. This video shows GCaMP6f expression in LA axons in retinotopically-identified POR. The video is spatially downsampled by 2, temporally downsampled to 1 Hz, and played at 10 frames per second.

Supplemental Experimental Procedures. All methods and analyses employed are described in detail.