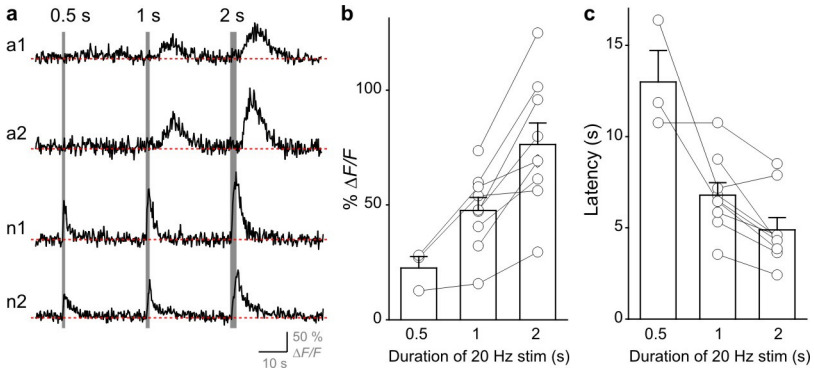
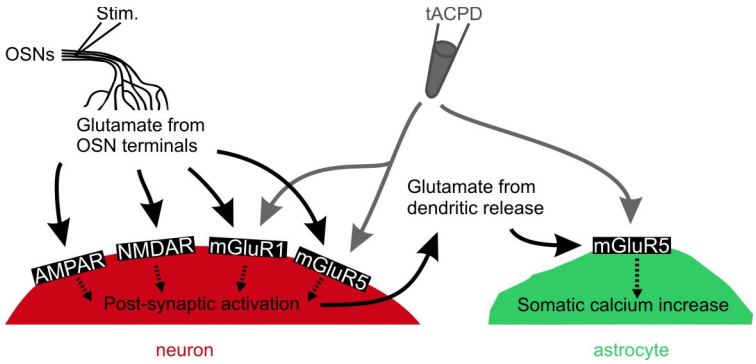


Supplementary Figure 1

Amplitude and onset of astrocytic Ca^{2+} increases are dependent on stimulus duration.

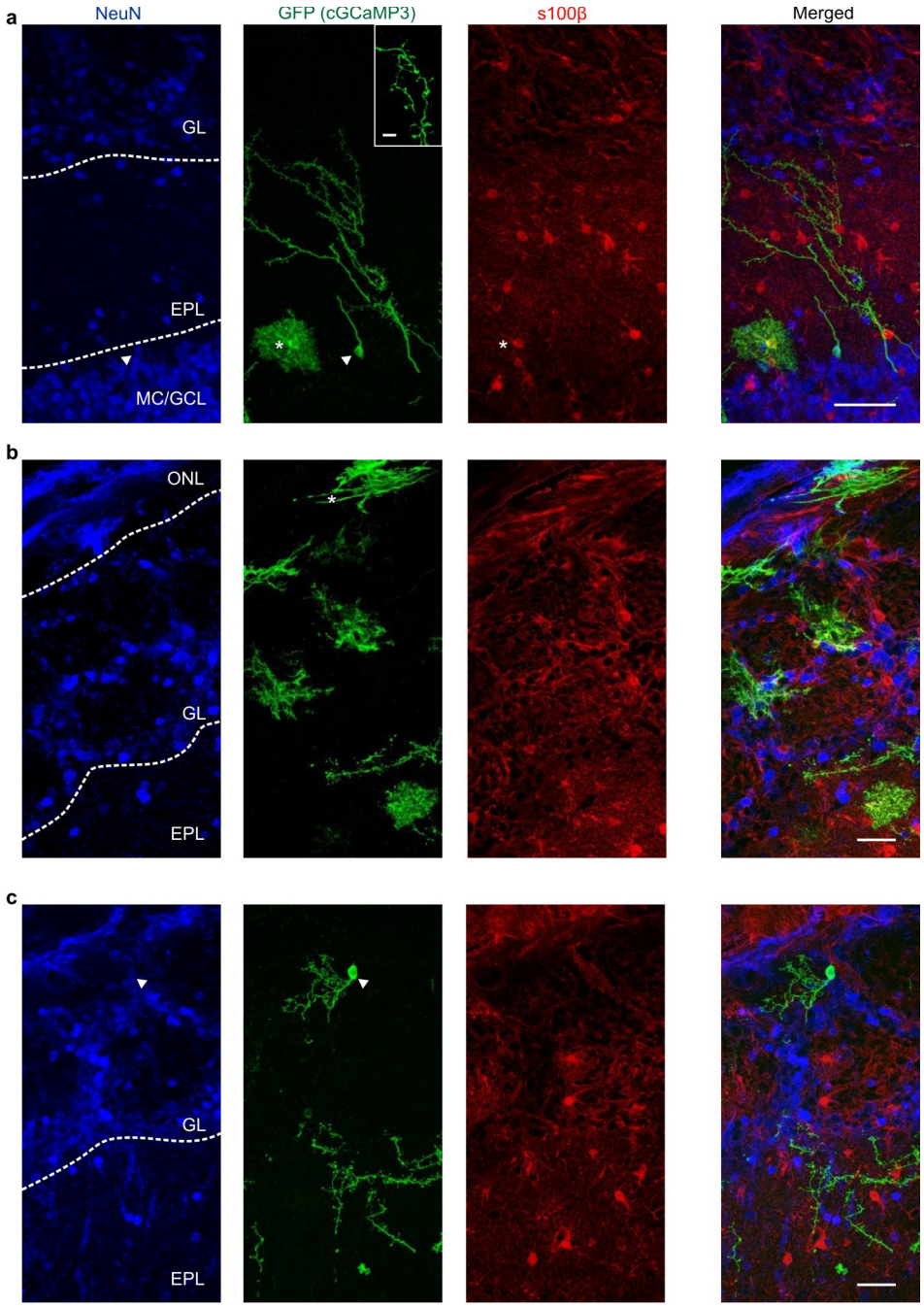
(a) Ca^{2+} responses to trains of OSN stimuli (0.5, 1 or 2 s) in 2 astrocytes (a1-2) and 2 neurons (n1-2). The shaded area indicates stimulus duration (each pulse 800 μA, 100 μs). **(b-c)** Summary bar graphs (n = 9 cells, 4 mice) showing amplitude and latency of OSN-induced Ca^{2+} transients in astrocytes induced with 20 Hz stimulus trains of various durations (700 - 800 μA, 100 μs). Lines connect data from individual cells (open circles).



Supplementary Figure 2

Proposed schema summarizing results of slice recordings from juvenile mice as shown in **Figures 1–4**.

Black arrows: Electrical stimulation of OSNs (Stim) releases glutamate from OSN terminals, which activate glomerular dendrites via AMPAR, NMDAR, and mGluRs (the presence of particular mGluRs on neurons is dependent on the cell subtype), triggering dendritic release of glutamate, which in turn causes calcium increases in astrocyte somata via the action of mGluR5. Grey arrows: the puff application of *t*-ACPD directly activates mGluRs on both neurons and astrocytes.



Supplementary Figure 3

The expression of GCaMP3 in *GLAST-CreERT2*; *R26-lsl-GCaMP3* mice is not specific for astrocytes in the adult olfactory bulb.

Horizontal sections of olfactory bulb from 3 month old uninjected (n = 2 mice, without the injection of 4-OHT) mice labeled for neurons (NeuN, left), the expression of GCaMP3 under the control of the GLAST promoter (GFP, left middle), and the astrocytic marker S100β (right middle). **(a)** In the EPL, GCaMP3-expressing granule cells and astrocytes (star) are visible. The dendrites of granule cells end at the base of

JG neurons. **Inset**: spines are clearly visible on granule cell dendrites (scale bar 5 μm). Granule cells expressing GCaMP3 express the neuronal marker NeuN (arrowheads). **(b)** Astrocytes are present throughout the olfactory bulb, in the ONL where they enwrap blood vessels (star), and in the GL and EPL. Note the differing morphology of astrocytes in these three layers. **(c)** JG neurons (arrowhead) also express GCaMP3. In the lower half of this image, spiny granule cell dendrites can be seen extending into the bottom of the GL. ONL: olfactory nerve layer; GL: glomerular layer; EPL: external plexiform layer; MC/GCL: mitral cell/granule cell layer. Scale bar 50 μm. All images are standard deviation projections of confocal image stacks.

Nature Neuroscience: doi:10.1038/nn.3906