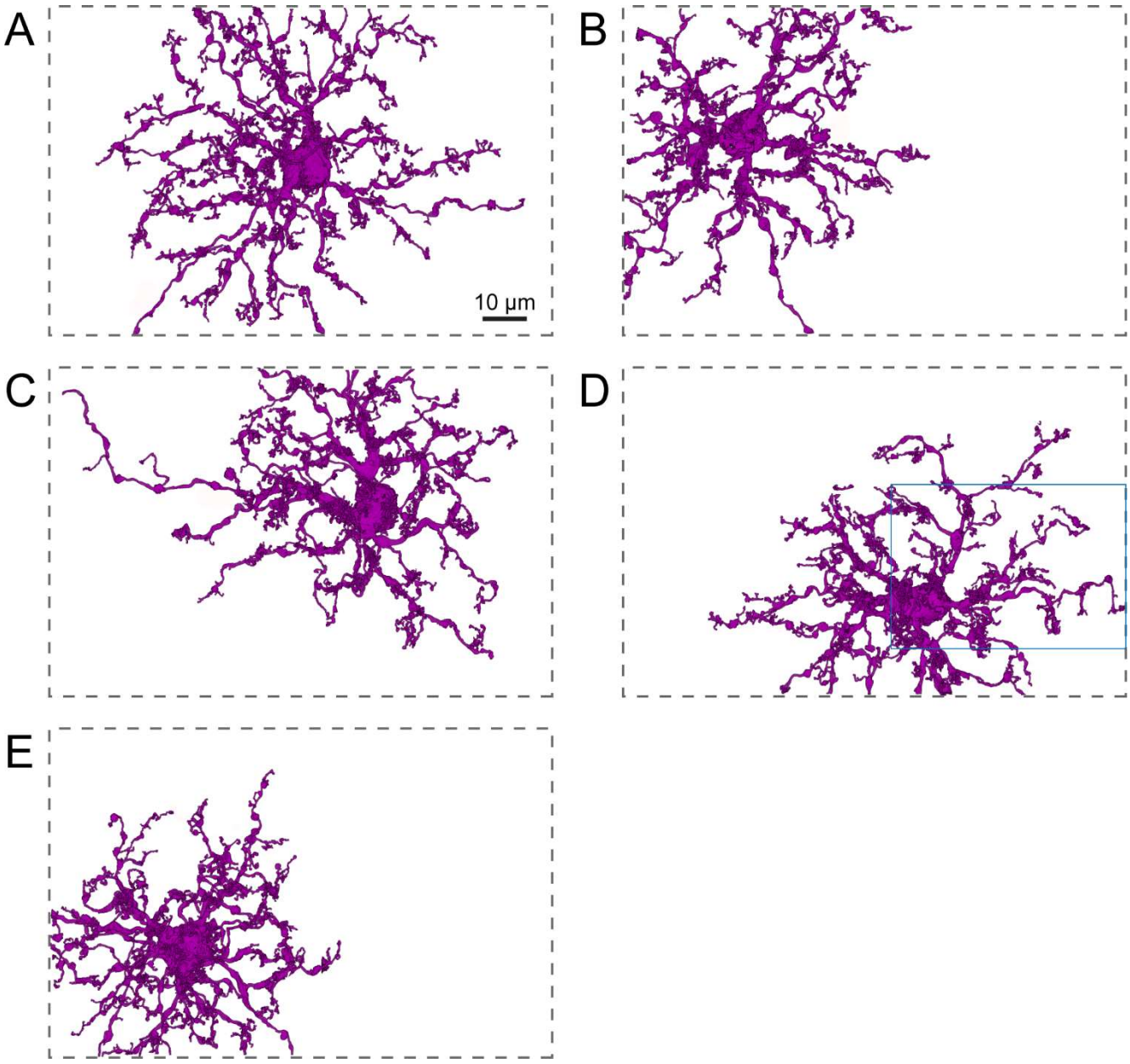

Figure S1. 3D renderings of the individual HCs, related to Figure 1
(A-E) Volume reconstructions of the five HCs (top view) shown in Fig. 1C. Blue rectangle in (D): location of the dendrite shown in Fig. 1E.

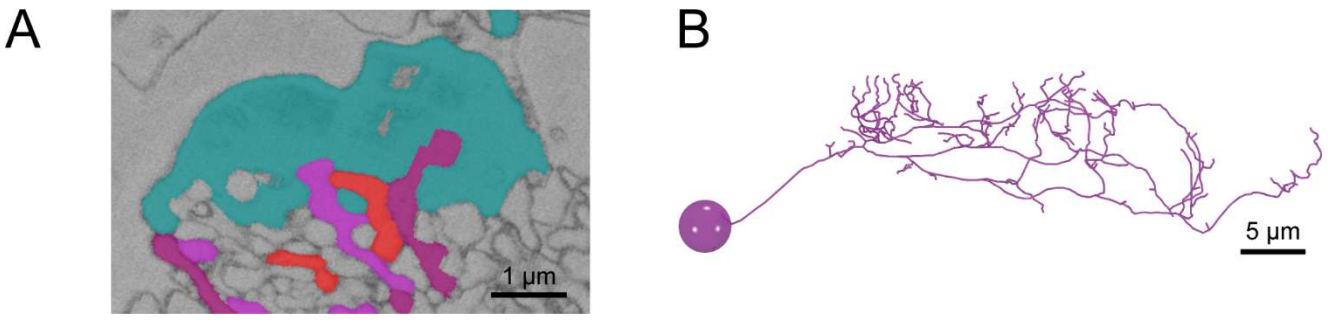

Figure S2. Horizontal cell-to-cone contacts, related to Figure 1
(A) EM slice showing a cone axon terminal (cyan) with invaginating contacts from an ON-CBC (red) and a HC (magenta). (B) Vertical view of the skeleton model of the HC branch from Figure 1E illustrating the increase of the number of dendritic tips towards the soma.

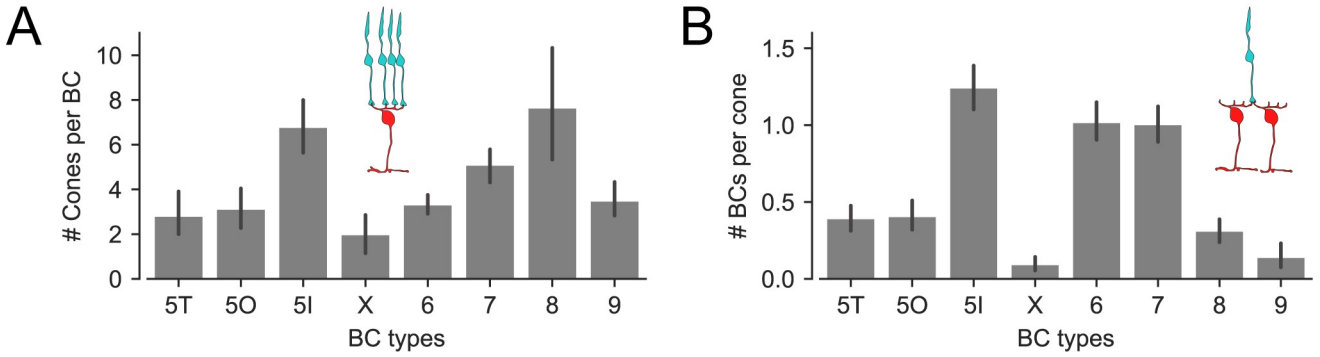

Figure S3. ON-CBC-cone contacts, related to Figure 1
(A) Contacted cones per BC for all CBC types. (B) BCs contacted per cone for all CBC types. Number of ON-BCs contacting each cone per type. Both redrawn using data from Behrens et al. 2016. Error bars show 95% CI.

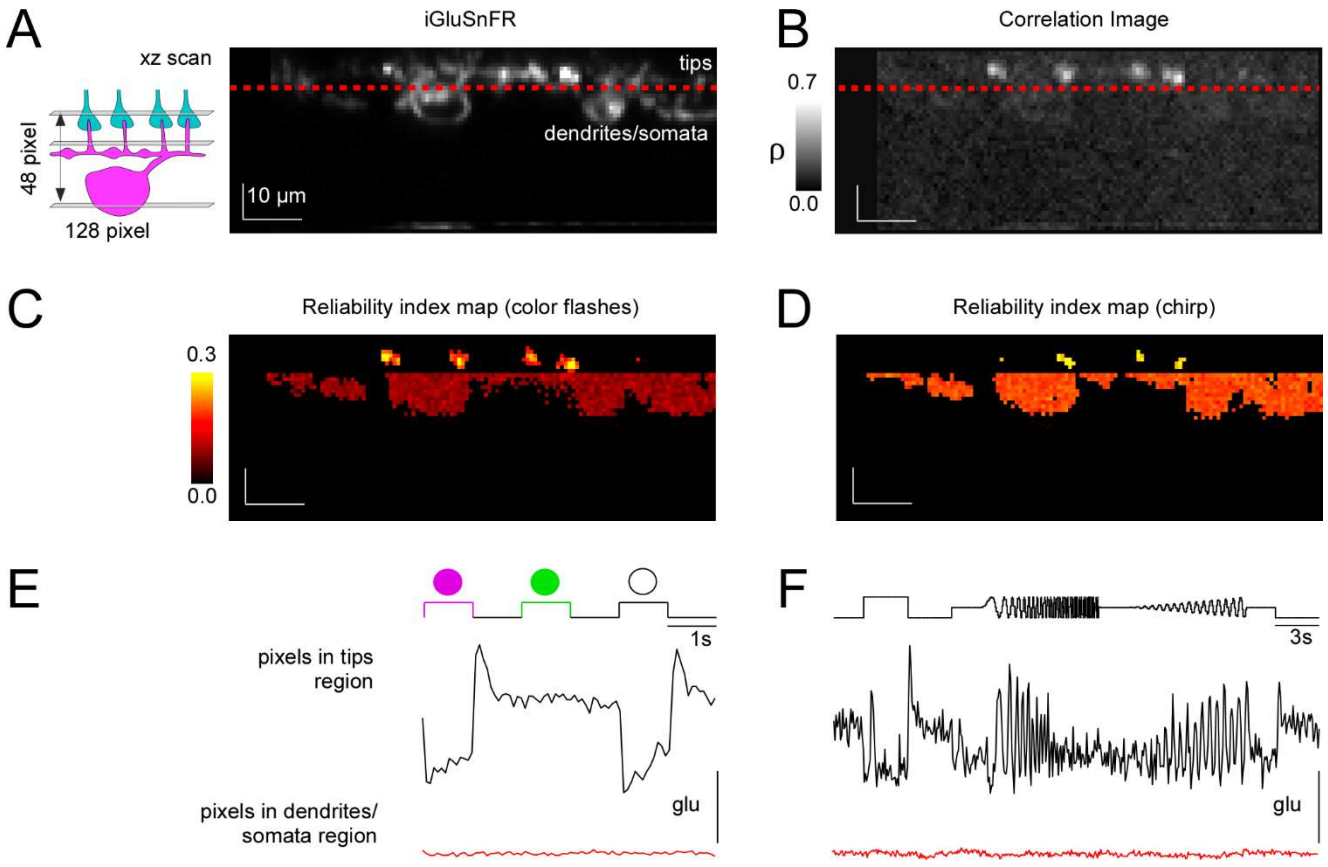

Figure S4. Glutamate imaging in the OPL using an electrically tunable lens for axial scanning, related to Figure 5
(A) Representative axial (x-z) scan field showing expression of iGluSnFR in HCs. Dashed line: location threshold set manually to separate HC tips (above) from HC primary dendrites/somata (below). (B) Correlation image showing hotspots of light-evoked activity at the tip level. (C) Reliability indices (for pixels responding to full-field UV-green-white flashes. Note that in the tip region (see location threshold in A), only pixels with Qi > 0.15 are shown. (D) Same as in C, but for local chirp stimulus and only pixels with Qi > 0.25 shown in the tip region. (E) Average responses to full-field UV-green-white flashes for pixels in the tip region (n = 66 pixels w/ Qi>0.15; black) and the dendrite/soma region (n = 730 pixels; red). (F) Same as in E, but for local chirp stimulus (n = 22 pixels w/ Qi > 0.25 in tip region; n = 684 pixels in dendrite/soma region).

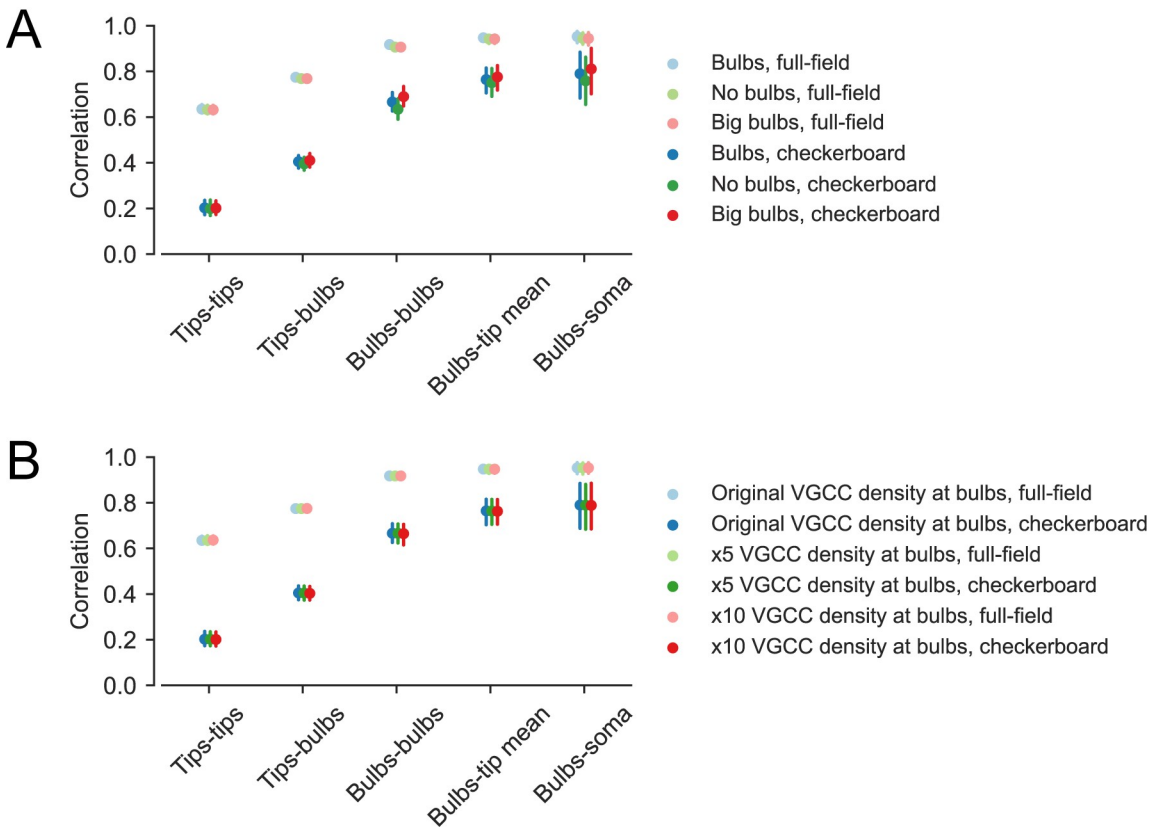

Figure S5. Influence of model parameters on signal correlation between HC compartments, related to Figure 6

(A) Influence of bulb diameter: Mean correlations between different tips, between tips and bulbs, between different bulbs, bulbs and the tip mean and bulbs and the soma for both stimuli and different bulb diameter conditions (bulbs: bulb diameter as extracted from the original morphology; no bulbs: diameter at bulb locations reduced to that of the surrounding dendrite; big bulbs: bulb diameter doubled). (B) Influence of voltage-gated Ca^{2+} channel (VGCC) density in bulbs: Mean correlations between different tips, between tips and bulbs, between different bulbs, bulbs and the tip mean and bulbs and the soma for both stimuli and different bulb diameter conditions (original: baseline model, VGCC density in bulbs corresponding to a conductance of 3e-4 S/cm²; x5: 5-times the original VGCC density in bulbs, 1.5e-3 S/cm²; x10; 10-times the original VGCC density in bulbs, 3e-3 S/cm²).

		Estimate	Std. error	z	p	
SCGN	Intercept	0.3801	0.2642	1.439	0.15	
	Rotation	-0.6906	0.2969	-2.326	0.02	*
GABARρ2	Intercept	1.7461	0.3653	4.779	1.76e-06	***
	Rotation	-1.3546	0.3564	-3.801	0.000144	***
SCGN + GABARρ2	Intercept	-0.5835	0.2889	-2.020	0.0434	*
	Rotation	-1.0652	0.3577	-2.978	0.0029	**

Table S1. Results of generalized linear mixed models of colocalization at bulbs, related to Figure 3
Negative fixed effect rotation means that rotating the HC channel by 90° versus SCGN and GABARρ2 channels reduces the number of bulbs showing colocalization. Significance codes: *** p < 0.001, ** p < 0.01, * p < 0.05.

HC	Membrane resistance	[Ω cm^2]		2,500
	Internal resistance	[Ω cm]		200
	L-type Ca^{2+} channels	[S/cm^2]	Soma and proximal dendrites	3e-4
			Distal dendrites	1e-3
	K^+ channels	[S/cm^2]	Soma and proximal dendrites	1e-5
			Distal dendrites	1e-5
Cone	Membrane resistance	[Ω cm^2]		1,200
	Internal resistance	[Ω cm]		200
	L-type Ca^{2+} channels	[S/cm^2]		8e-5
	Ca^{2+}-activated Cl^- channels	[S/cm^2]		5e-3
	Ca^{2+}-activated Cl^- channels, sensing Ca^{2+} in the cell center	[S/cm^2]		5e-3

Table S2. Parameters of the biophysical model, related to Figure 5 and STAR Methods