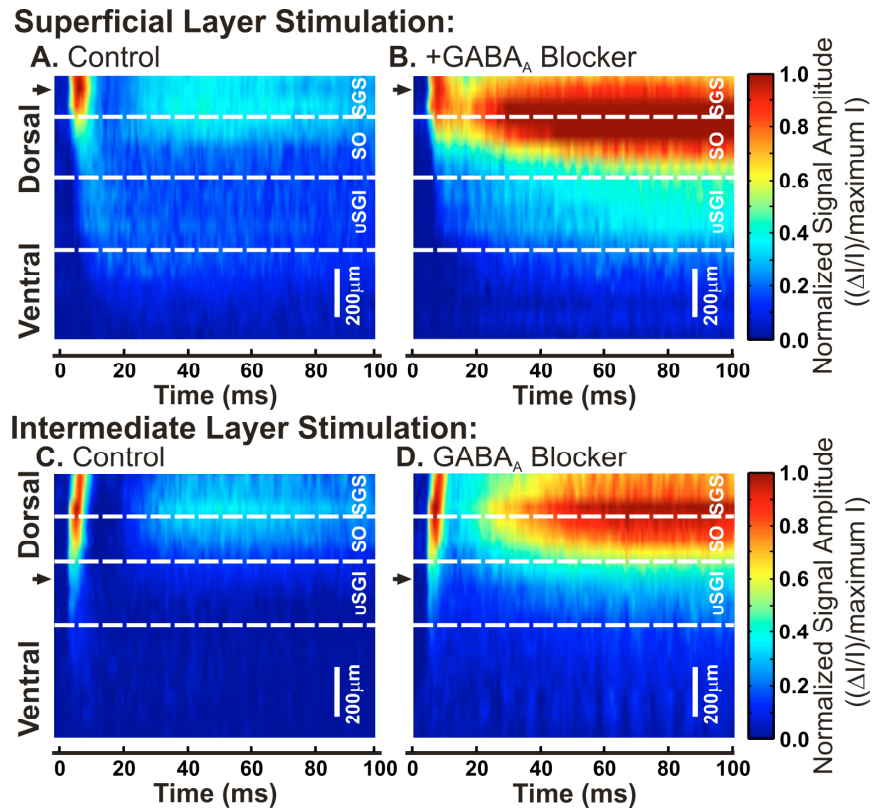




Supplemental Figure 1. Recent whole-cell patch experiments demonstrate that signal transmission from the superficial layers of SC to the intermediate and deep layers is enhanced by GABA_A receptor blockade. We reasoned that we should see an enhancement of the propagation of the optical signals if we added GABA_A receptor blockers to the bath solution. Since we also performed experiments in which we stimulated the SGI, we tested whether GABA_A receptor block would also enhance signal propagation from the SGI to the SGS.

Supplemental Figure 1A. shows a 3-dimensional color map of optical signals evoked with SGS stimulation (as in Figure 6A). The black arrows on the y-axis show the point of stimulation along the dorso-ventral axis of the SC. The white scale bar shows 200 μm . The dotted white lines demarcate the approximate boundaries of each lamina. Time in ms appears on the x-axis from 0 - 100 ms after onset of the electrical stimulation (time zero). SGS stimulation causes propagation into the SGI. B. shows the same type of 3-dimensional plots, after 50 μM GABA_A receptor blocker (bicuculline) was added. Signal amplitude is normalized to the maximum amplitude of dorsoventral responses from control, i.e. panel A. C-D. The same as in A-B, following SGI stimulation. The control color map for SGI stimulation, i.e. panel C, also appears in Figure 6D. These results demonstrate that signal transmission from the SGS

to the SGI is enhanced with GABA_A receptor blockade. The finding that the transmission from SGI to SGS was also enhanced with GABA_A receptor block suggests that this activity results from synaptic activity and not direct or antidromic activation.

Supplemental Videos 1 & 2. The spatiotemporal pattern of signal spread was sampled at 0.2 ms intervals over 800 ms (200 ms prior to electrical stimulation and 600 ms after stimulation). The data can be shown as a series of individual frames (Figure 8), or as videos. Supplemental Video 1 shows the data in Figure 8A. Supplemental Video 2 shows the data in Figure 8B. The schematic shows the orientation of the video frames.

Supplemental Video 1 shows an example of SGS stimulation from 0 - 50 ms, at 6 frames per second. This time includes the initial-spike (0 - 10 ms) and the beginning and peak of the after-depolarization (20 - 160 ms). The response to SGS stimulation initially spread in a radial pattern, with the excited region growing larger over time. The intralaminar spread within the SGS only slightly outpaced the interlaminar spread into the SO and SGI. The regions of highest signal intensity lay within the superficial layers, but signal can be seen propagating into the SGI and deep layers (see also Figure 8A).

Supplemental Video 2 shows an example of SGI stimulation from 0 - 50 ms, at 6 frames per second. SGI stimulation produced a strikingly different response pattern throughout the SC than that of SGS stimulation. The signal started at the point of stimulation and spread interlaminarly into the SGS at first. When excitation reached the SO and SGS, the spread altered course and signals began to propagate intralaminarly within the superficial laminae (see also Figure 8B). Interestingly, the signal at the site of stimulation within the SGI stayed localized while excitation filled the SO and SGS. Additionally, a small region of local inhibition can be seen at the site of stimulation (dark blue). This local inhibition likely represents an activation of inhibitory circuitry and is much stronger, if not distinctly different from that seen in the SGS. The distinct patterns of signal propagation seen in these videos indicate that stimulation in the different layers activates different sub-populations of SC circuitry.