Differentiating Feedback Projections from Intrinsic Connections

Although cells in V1 were retrogradely labeled in some of our experiments, the stained axonal fibers in V1 are mainly of FbkPrj rather than collaterals of V1 neurons, as indicated by the following:

Fifth, if the projections had originated from the cells that were stained in V1, we would have observed a spatially even rather than a clustered distribution of projections within V1. This argument is based on the dense, non-specific, short-range (0.5 mm long) intrinsic projections of V1 cells in layers 2/3 (Malach et al., 1993; Bosking et al., 1997; Stettler et al., 2002). Sixth, clustering of the axonal projections was obtained here within both the supragranular and the infragranular layers. If the projections had originated from the cells that were stained in the supragranular layers, we would have obtained a diffuse radial starburst pattern in the infragranular layers, similar to the pattern of intrinsic connections in V1 of New World monkeys (Figure 3F in Sincich and Blasdel, 2001). Seventh, previous reports indicate that close to the V1/V2 border, axonal FbkPrj tend to run via the gray matter rather than via the white matter (Salin and Bullier, 1995). Consistent with these reports, in many cases in our study axons could be traced within one slice from V2 via the gray matter to the site in V1 where they bifurcated and terminated, without encountering a cell body in between (see examples in Figures 1E and 3B). Last, the majority of cell bodies that we identified in V1 did not give rise to labeled dendrites, indicating that even in the four cases in which retrograde labeling did take place, its efficacy was not sufficient to label collateral processes of V1 neurons.

1 Additional reasons to support our interpretation are included in the Discussion.
Supplementary Figure Legends

**Supplementary Figure 1. Registration of the histological sections to the optically obtained cortical images**

In the background of (A)-(C) is the image of surface blood vessels obtained from the uppermost histological section. All images in (A)-(C) are spatially registered to the cortical image obtained by optical imaging using the local registration at the vicinity of the injection site. (B) The green and red contours mark the surface blood vessels. The red colored contours (blood vessels) were used for the local registration at the vicinity of the injection site. (C) The green and red contours mark the blood vessels schemed from the second to top-most section, and registered to the top-most section.

(D)-(F) present the same image in the background and the same colored contours as in (A)-(C) respectively. However: 1) all images in (D)-(F) are spatially registered to the optical images using the local registration at the vicinity of the feedback axon terminals in V1, and 2) the orange colored contours were used for the local registration at the vicinity of the feedback axon terminals in V1.

In the background of (G)-(I) is the image of surface blood vessels obtained using optical imaging with an illumination wavelength of 570 µm. The contours in (H) represent the surface blood vessels obtained from the uppermost histological section (see (B)), registered to the optical image locally at the vicinity of the injection site using the red colored contours. The contours in (I) represent the same surface blood vessels as in (H), registered to the optical image locally at the vicinity of the feedback axon terminals in V1 using the orange colored contours. The data here were obtained from monkey M5.

**Supplementary Figure 2. Retinotopy of owl monkey V1**

(A) and (B) depict horizontal and vertical strips respectively in the visual space, as mapped to V1 of monkey M1. The format of presentation is identical to that used in Figures 11 A and 11 B. Note that between the acquisition of the data for (A) and (B) the camera was moved more in a posterior direction.