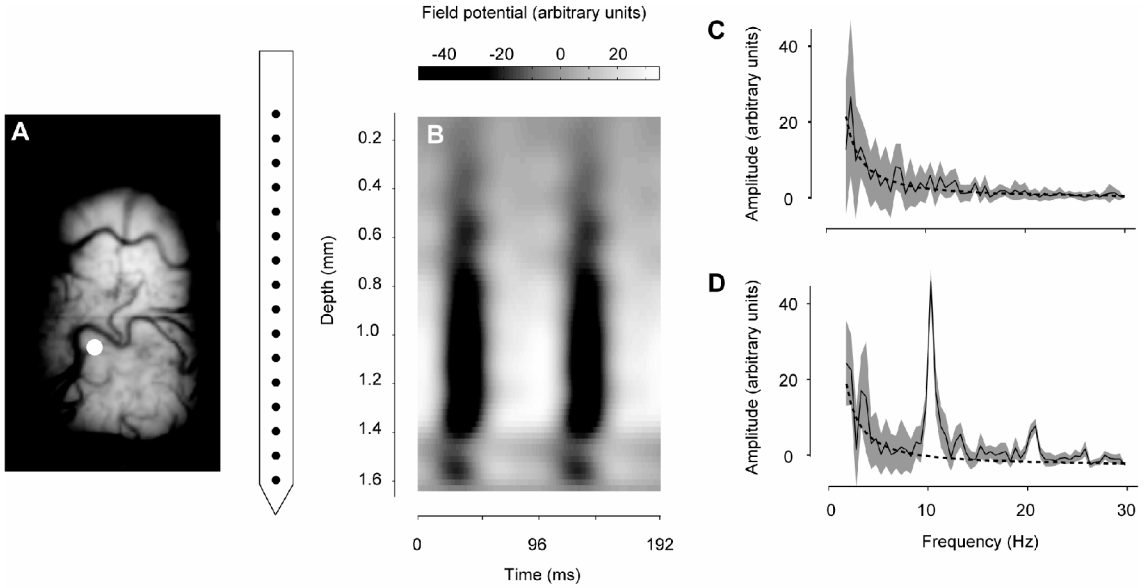
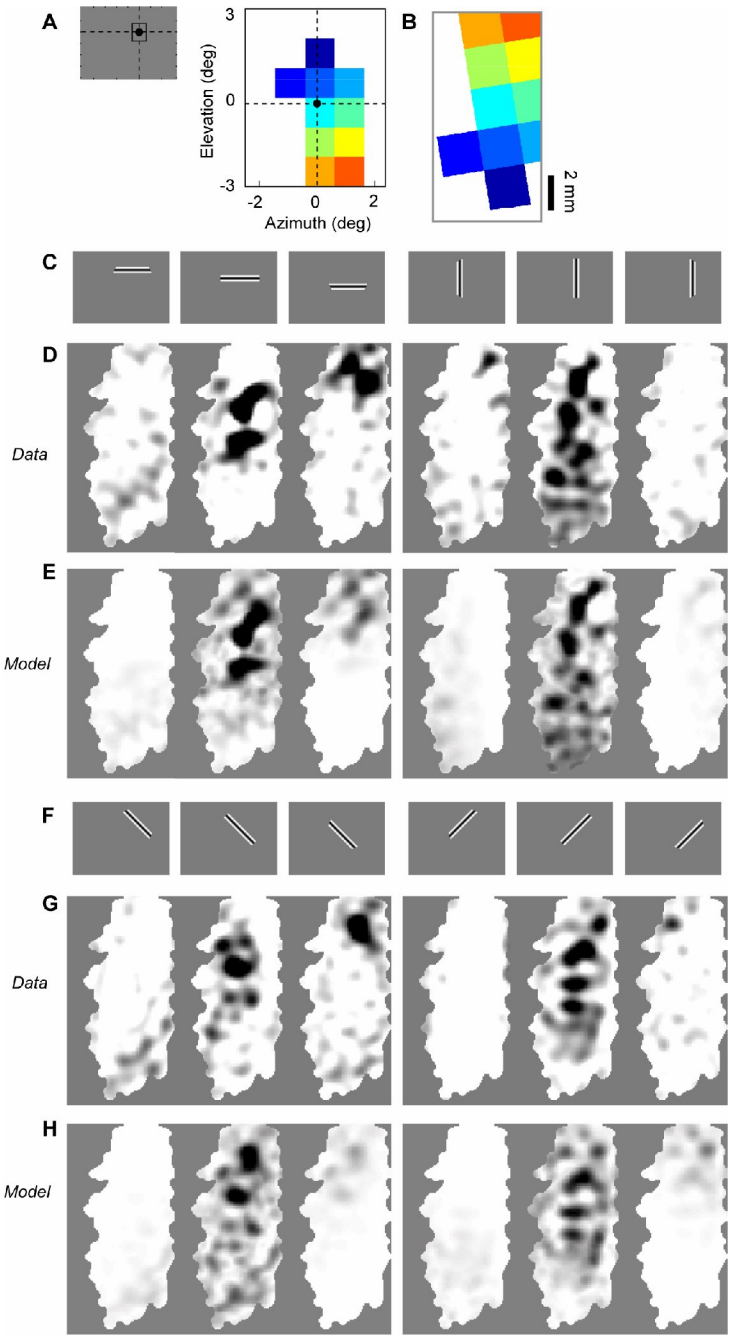
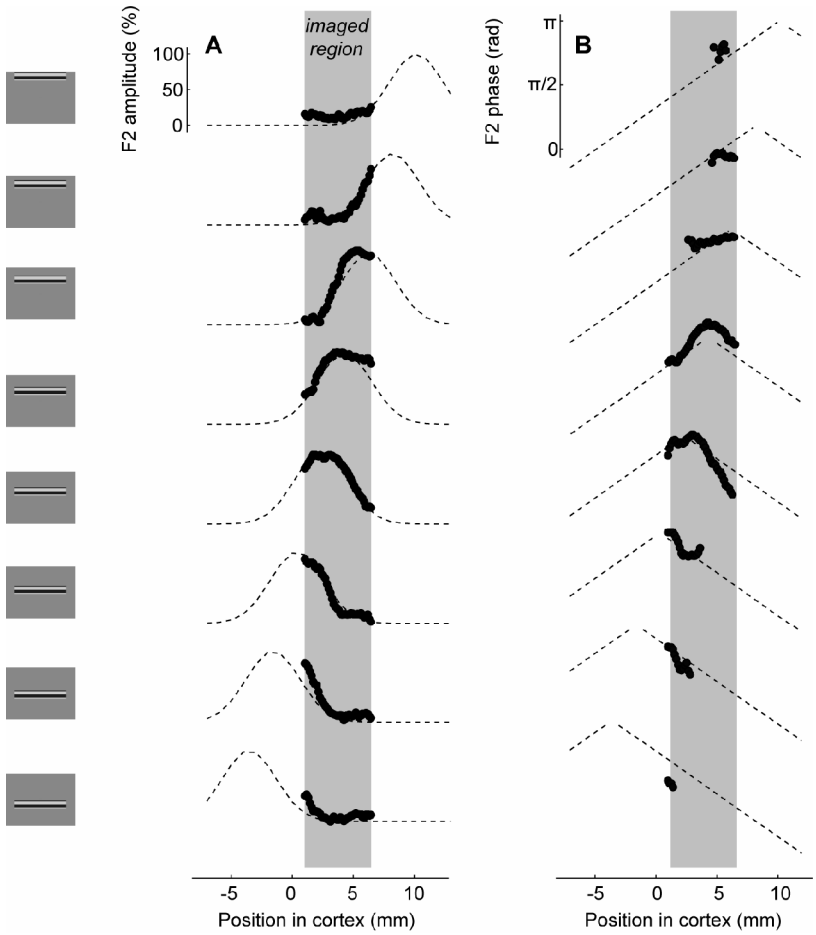
Supplemental Text and Figures



Supplementary Figure 1. Field Potential (FP) responses to flickering gratings. (A) A 16-channel polytrode (NeuroNexus, Inc) was inserted vertically into the cortex in the same area that was previously imaged. On the right, a schematic picture of the polytrode. (B) Cycle-average of the FP in response to a 5 Hz contrast-reversing grating. The FP oscillates at 10 Hz, twice the frequency of the stimulus. (C) Amplitude spectrum of the FP during the presentation of a blank stimulus. Black trace is the average amplitude (over 14 independent repeats) for the contact with the highest response to a grating (the one located at 1.1 mm depth in this example). The gray band is a confidence interval determined by bootstrapping over the independent repeats. Dotted curve indicates 1/fx fit to the amplitude spectrum of the noise (D) Same analysis as in C, but during the presentation of an oriented grating (60 deg), flickering at 5 Hz.



Supplementary Figure 2. Application of the retinotopy model to a novel stimulus. (A) The region of visual field covered by the patch of cortex. The gray rectangle (left) depicts the CRT monitor. (B) A map of retinotopy obtained from the 2nd harmonic responses to flickering gratings windowed in horizontal or vertical rectangles (as in Figure 4). The model explained 75.8% of the variance in this data set. Experiment 70-3-2/3. (C) In a control experiment, we used a stimulus composed of grating patches varying randomly in orientation and position. Some of these stimuli were vertical and horizontal, similar to those used to estimate the model in B. (D) The responses to these stimuli depends strongly on grating position and orientation. (E) The predictions of the model resemble the actual data. (F-H) As in C-E for additional stimuli in the control experiment. These stimuli were oblique, and thus are novel for the model. Though no similar stimuli appeared in the experiment used to obtain the model parameter, the model predictions resemble the actual responses. The model explained 51.3% of the variance in this novel data set. Experiment 70-3-8.



Supplementary Figure 3. Amplitude and phase of 2nd harmonic responses to individual stimuli. (A) Amplitude of responses as a function of stimulus position, for 8 stimulus positions (rows). These data are the same as those illustrated in Figure 5B, projected on one dimension of visual space. For each response, the corresponding Gaussian curve is shown, centered at the retinotopic location of the stimuli, as predicted by the model of retinotopy (Figure 4E,F). (B) The corresponding phases. The dotted lines are the predictions based on a traveling wave propagating at constant speed. Phases are shown only for data points with amplitude >20% (smaller responses have noisy phases) All of these responses can be aligned on the retinotopic position, and the results of this alignment are shown in Figure 6A,B. Once the alignment is done, the phases become less noisy even for locations that are up to 10 mm away from the stimulated region, providing even clearer support for the traveling wave hypothesis.