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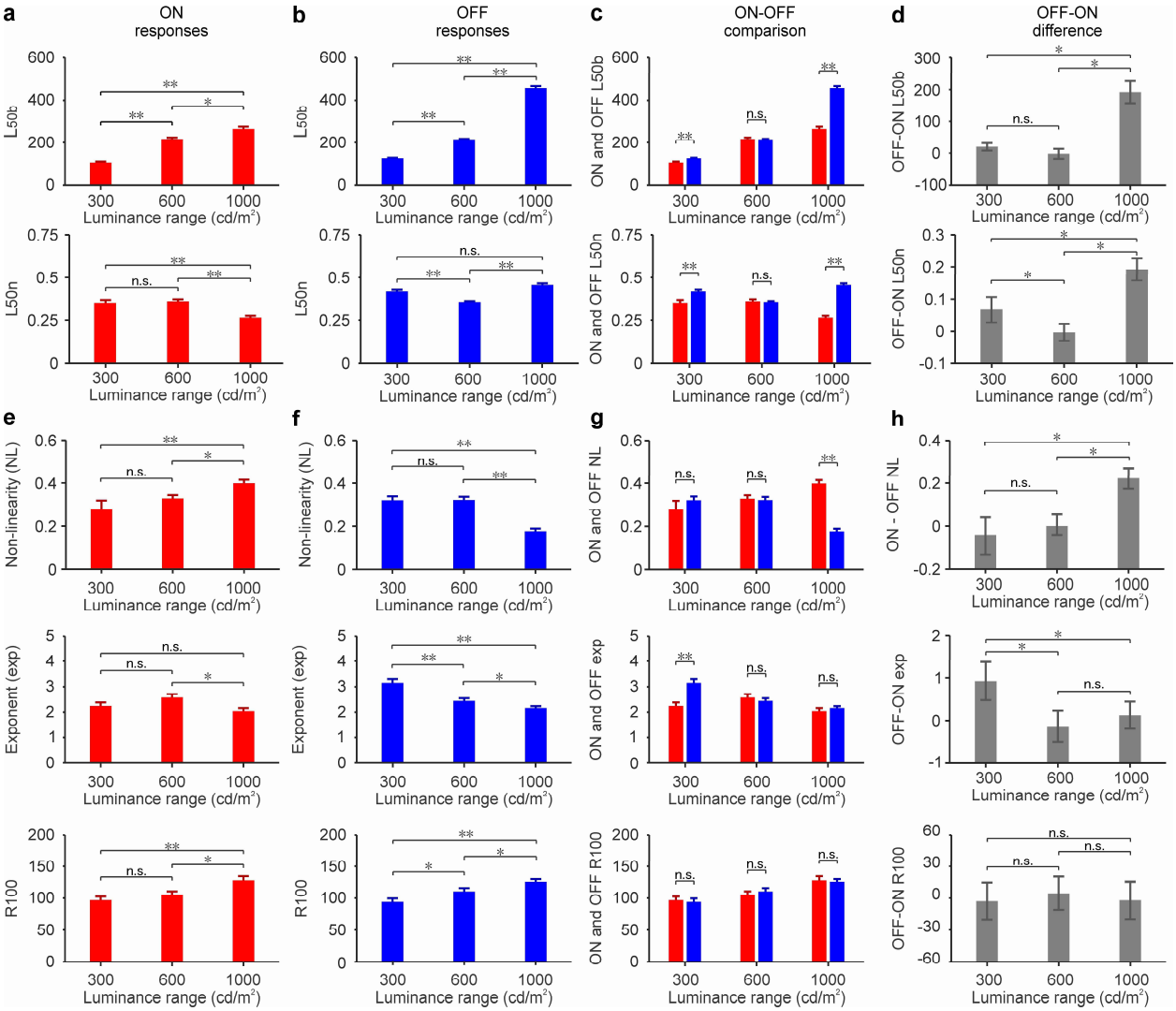
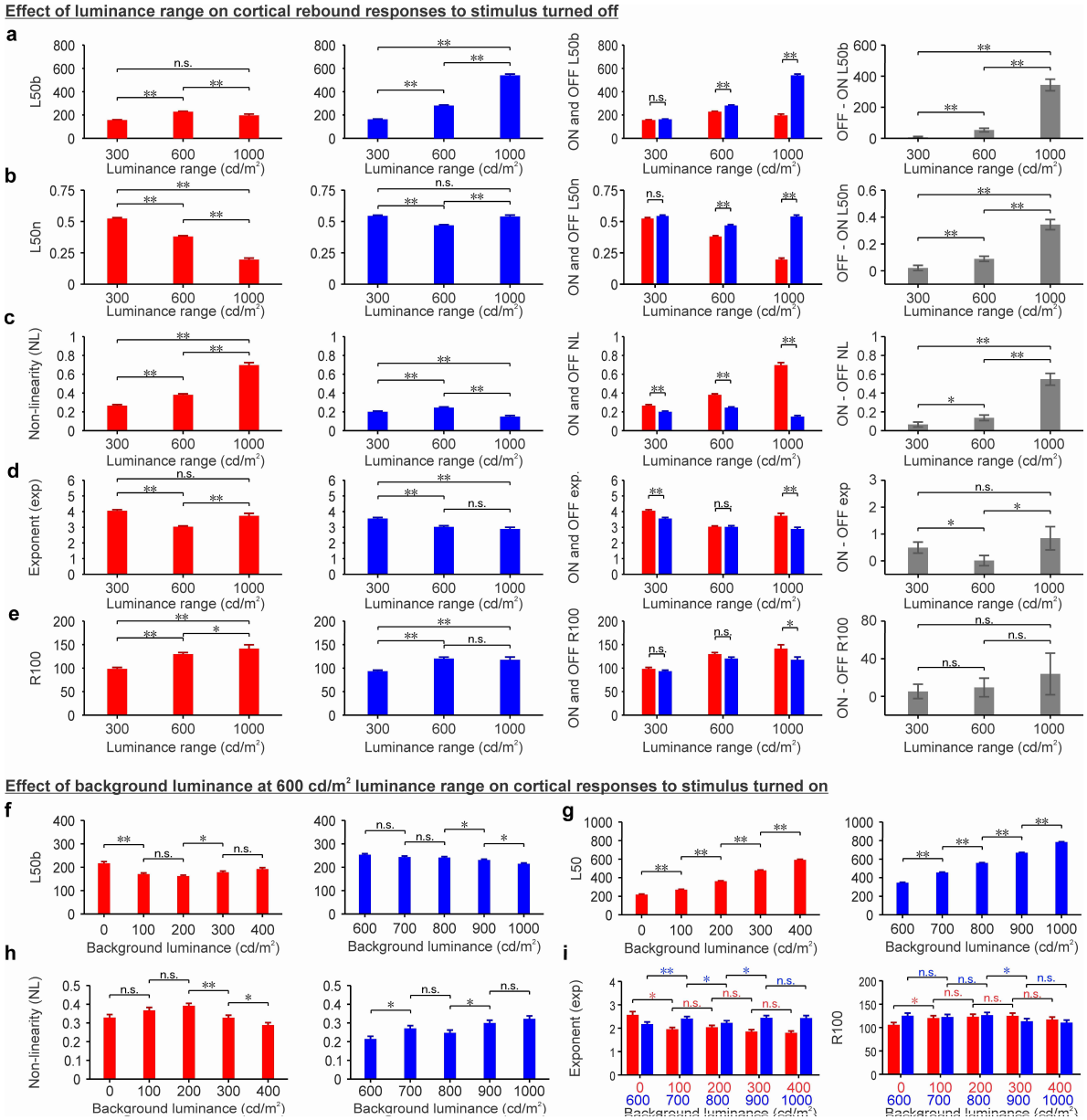
## Supplemental Information

# Image luminance changes contrast sensitivity in visual cortex

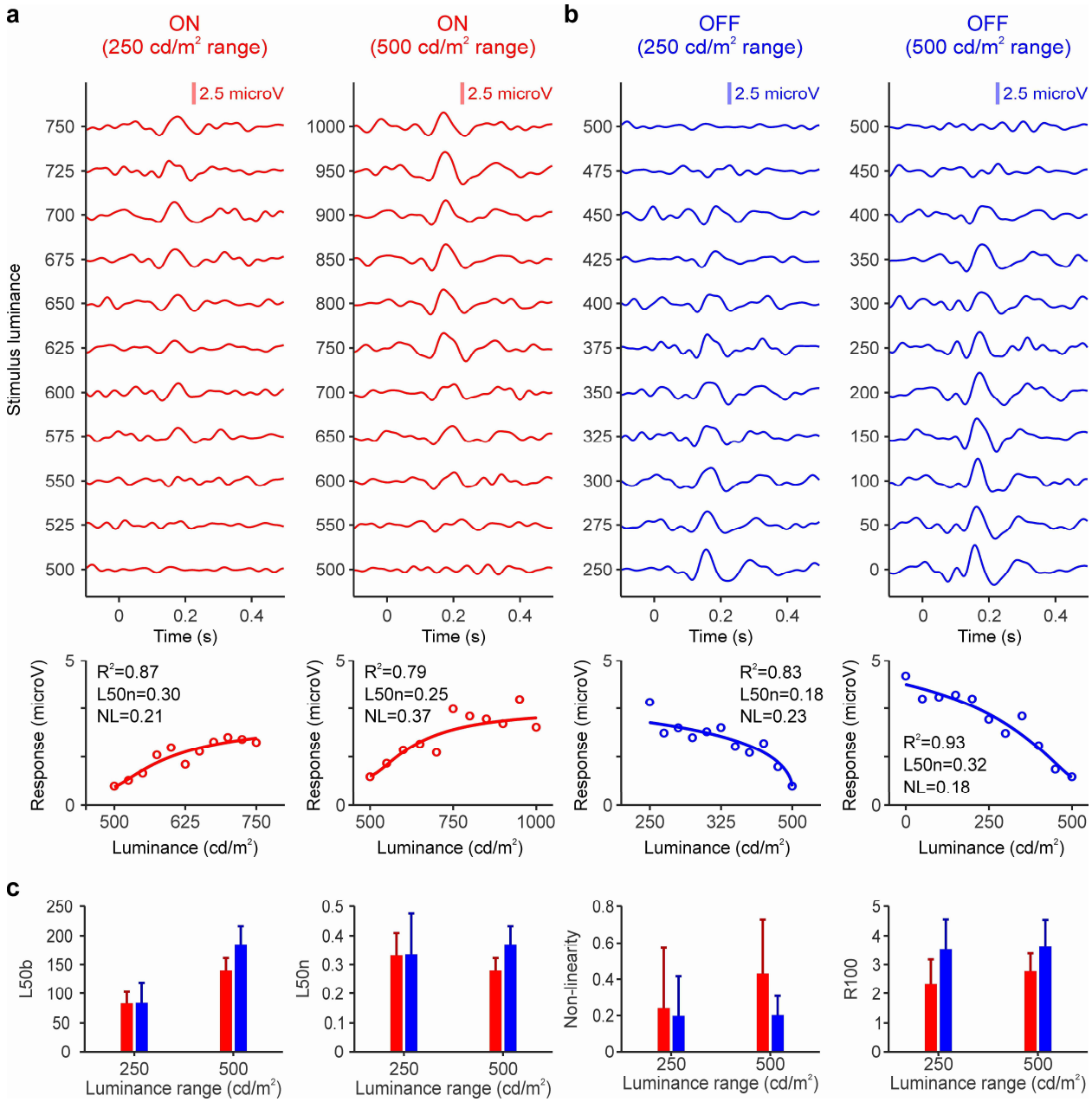
**Hamed Rahimi-Nasrabadi, Jianzhong Jin, Reece Mazade, Carmen Pons, Sohrab Najafian, and Jose-Manuel Alonso**




**Supplemental Figure 1. Effects of luminance range on cortical-response functions measured with backgrounds of 0 and 1000 cd/m² luminance.** Same as figure 3 but measured with a single background (0 cd/m² for ON responses and 1000 cd/m² for OFF responses; n: 81, 116, 110 cortical recording sites for ON and 123, 152, 217 cortical recording sites for OFF, listed from lowest to highest luminance range). Related to Figure 3.




**Supplemental Figure 2. Effects of luminance range on rebound responses and effects of background luminance on onset responses at 600 cd/m² luminance range. a-e.** Same as Figure 3 but showing effect of luminance range on rebound responses to stimulus turned off instead of onset responses to stimulus turned on (n: 524, 608, 88 cortical recording sites for ON and 539, 460, 162 cortical recording sites for OFF, listed from lowest to highest luminance range). Notice that red illustrates light stimuli and blue dark stimuli, not luminance increment and decrement. These results demonstrate that the effect of luminance range is better related to stimulus polarity (light or dark) than luminance changes over time (light increment or decrement). Dark stimuli are consistently associated with more linear contrast response functions than light stimuli. However, luminance decrements (dark stimuli turned on or light stimuli turned off) are only associated with more linear contrast responses functions than luminance increments (light stimuli turned on or dark stimuli turned off) at onset responses. **f-g.** Effect of background luminance on the average ON and OFF L50b (f) and L50 (g) measured at 600 cd/m² luminance range with onset responses (n: 116, 149, 149, 134, 137 cortical recording sites for ON and 176, 174, 154, 162, 152 cortical recording sites for OFF, listed from lowest to highest background luminance). The results are similar as for 300 cd/m² luminance range (Figure 4). **h-i.** Same as f-g for non-linearity index (h), exponent (i, left) and R100 (i, right), showing ON and OFF values superimposed in the same plot. Related to Figures 3 and 4.




**Supplemental Figure 3. Luminance response functions in human visual cortex. a-b.** Same as a-d from figure 5 but measured in a different human subject. **c.** Average and standard error of L50b, L50n, non-linearity and R100 from three human subjects obtained by bootstrap resampling (1,000 times for the two subjects illustrated in the paper and 2,000 times for a third subject with noisier recordings) and then selecting the luminance response functions with $R^2$ >0.8 (n: 2,492 and 2,486 for ON, 2,633 and 3,835 for OFF, listed from lowest to highest luminance range). Related to Figure 5.


**Supplemental Figure 4. Images processed with three different algorithms to simulate human luminance vision.** **a.** From left to right, original image, image processed with Matlab image adjustment (IMADJUST), contrast-limited adaptive histogram-equalization (CLAHE), and the ONOFF algorithm. **b-g.** Same for other example images. The images processed with the ONOFF algorithm reproduce more closely human perception, particularly when the images have bright sky patches. Original images from (van Hateren and van der Schaaf, 1998). Related to Figure 7.