Supplemental Data

Rat Olfactory Bulb Mitral Cells Receive Sparse Glomerular Inputs
Antoniu L. Fantana, Edward R. Soucy, and Markus Meister

Figure S1. Response prediction under varying signal detection thresholds

We varied the thresholds for detecting an odor response among glomeruli (A) or among mitral cells (C), and evaluated the resulting predictions for the responsivity of mitral cells (B and D), using the methods of Figure 6 and an integration radius of 880 µm.

(A) Left: Sample intrinsic image of an odor response. (i) The same image clipped with the threshold value obtained from ROC analysis in Figure 5; most bona fide glomerular responses are detected properly with this threshold. (ii) Same image clipped with the threshold that would be required to match the observed number of effective odors in mitral cells; in this case many obvious responses in glomeruli get suppressed.

(B) The predicted number of effective odors for a mitral cell, plotted against the detection threshold for glomerular signals. Open circle: threshold value derived from ROC analysis in Figure 5; all thresholds are normalized to this value. Closed circle: threshold that would be required to match the observed number of effective odors in mitral cells (mean of “actual” distribution in Figure 6B). This exceeds by more than 3-fold the reasonable value from ROC analysis (open circle).

(C) A sample mitral cell recording. The firing patterns were analyzed as in Figure 3B, and different thresholds applied. (i) Gray bars denote odor responses that exceed the threshold value chosen by ROC analysis in Figure 4; the sole bona fide response in this segment is detected correctly at this threshold. (ii) odor responses that exceed the threshold required to match the...
predicted number of effective odors in Figure 6; this accepts many firing patterns as responses that are indistinguishable from air control stimuli.

(D) The number of effective odors for a mitral cell, plotted against the detection threshold for mitral cell responses. Open circle: detection threshold derived from ROC analysis (Figure 4); all thresholds are normalized to this value. Closed circle: detection threshold that would be required to match the predicted number of effective odors in mitral cells (mean of “predicted” distribution in Figure 6B). This is more than 3-fold lower than the reasonable value from ROC analysis (open circle).

**Figure S2. Mitral cell odor spectra and their component glomerular spectra**

We modeled the response of a mitral cell by a linear weighted sum of responses from 4 glomeruli (Figure 8, Equations 3 and 6). Top: For the 3 mitral cells from Figure 8i-iii, this illustrates the odor spectra of the 4 chosen glomeruli, each scaled by the corresponding connection strength, \( w_i \) in Equation 3. Bottom: The predicted spectrum of the mitral cell (sum of the 4 spectra at top) and the actual observed spectrum (2 repeats).

**Table 1. List of all odors.**

An alphabetic list of the 63 odors used in this report, along with the number of glomeruli activated per bulb (average of 6 bulbs). Some odors were used too infrequently for a reliable assessment of the number of glomeruli.
Table 2. Lookup table for odor axes in figures.

The first column lists the number that appears on the odor axis in various figures. The other 3 columns contain the corresponding odor. The 40 odors in List A were used in the vast majority of experiments performed, including Figures 5A, 8Biii, 8Biv. List B is for Figure 8Bii. List C is for Figures 7B, 7C, 8Bi.
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