Petersen (2007)

1. Multielectrode array: high temporal resolution, low spatial resolution. When mapping barrel with this technique, only give very crude map. Intrinsic optical imaging: high spatial resolution, but temporal resolution limited by BOLD signal, indirect, and only measure shallow layer signals. When mapping barrel gives good map. VSD imaging: high temporal and spatial resolution, can measure subthreshold potential, but only on the surface, and dominated by subthreshold activity (spike not obvious). VSD is used to measure activity of barrel cortex during quite wakefulness and active whisking with high temporal and spatial resolution. Calcium imaging: moderate temporal resolution and high spatial resolution, can measure spikes, but indirect and can’t measure subthreshold potential. This technique has the potential of revealing the computational principle of barrel cortex.

2. Expressing FGF8 protein can shift the position of barrel field, this proves that it’s genetically dependent. Lesion of follicles early in development prevent the formation of barrel corresponding to that whisker, so it’s also experience dependent.

3. When whisking in air trigeminal ganglion cell don’t spike much, but when contact an object it spikes vigorously. Activity in barrel cortex shows modulation before the stimulus during aperture discrimination task. Orientation map within one barrel in rat shows that it’s possible that barrel cortex use some predictive coding (deflection toward some whisker will probably also stimulate that whisker). Experience dependent map plasticity shows that the system tries to adapt to stimulus it receives.

4. It’s possible that this connection exists because those whiskers is close to each other on the face of mouse, and it will be beneficial to integrate them to represent object above the mouth of the mouse.


1. Figure 1. Visual auditory training group performs better both within session and across training period, although they are tested with only visual cue.

2. Incongruent auditory stimulus during training doesn’t improve training result, as shown in Figure 1. (c)

3. Figure 4 (a), with 0 beep, the subject can discriminate number of flashes with no problem. So the visual task itself is not ambiguous or too difficult.

4. Figure 4 (b), with 1 beep, subjects can still correctly respond to the number of flashes.

5. Auditory stimulus only biases the visual judgment when number of beeps is high, since one beep don’t affect the response of subjects much. Modality appropriateness hypothesis will assume that auditory information will always dominate in a specific task. In this case one beep should have biased their judgment toward lower number significantly.

General
1. For stimulus be usefully represented there much be selectivity, and being selective always entails information loss. In vision for example some retinal ganglion cell has center surround receptive field so they only respond to contrast but not constant background. Information about background is not encoded but contrast is of more relevance for the animal in most cases. In somatosensory pathway we have trigeminal ganglion cell that weakly respond to position of whisker but strongly to touch, that’s a loss of some information but touch is often of more relevance to the mouse.

2. In vision, the response to natural stimuli cannot always be explained by their response to center surround stimuli and oriented moving bars, but those are what we have been probing visual system with. Olfaction is difficult to understand because synthesizing different chemicals is difficult, and it's impossible to exhaust all possibility, and there’s no obvious way to extrapolate the response to one stimulus to anther.

3. Olfaction is hard to understand because there is not obvious natural representation of olfaction space, and it’s difficult to have diverse olfactory stimuli to probe the system with.

4. In visual processing LGN receive information from cortex that gives contextual information. So sensory processing is not purely feedforward. Attentional effect of binocular rivalry also shows that visual processing has feedback component. Sensory processing can also happen with multiple pathways that serve different function and mix in complicated ways. For example in mouse somatosensory pathway we have lemniscal and paralemniscal pathways, parallel but different.