

## **Thalamocortical Transformations of Temporal Stimulation Patterns in the Rat Vibrissa System**

**R. M. Webber and G. B. Stanley, Harvard University**

Rats and other rodents use their vibrissae to actively explore the external environment, producing patterns of vibrissa deflections reflecting the interaction between the vibrissae movement and the textural properties of surfaces. The peripheral representations of the stimulus are transformed by the dynamics of the thalamocortical circuitry, producing representations that eventually give rise to the sensory percept. We previously showed that the response of cortical neurons to temporal patterns of vibrissa deflection was predictable from the time course of suppression following an excitatory stimulus. What was not clear, however, was if the observed response patterns were generated through intra-cortical connections or partially inherited from thalamic projections. To address this question, we recorded single unit activity in the ventral posterior medial nucleus (VPM) of the thalamus in anesthetized Sprague-Dawley rats. A subset of VPM neurons increased their response to the third deflection in a three deflection pattern when the first deflection was moved closer in time to the second two deflections, similar to our previous finding of “lifting of suppression” in the cortex. Some VPM neurons also responded to a bi-directional periodic stimulus with a steady-state response that was larger in one direction than the other, consistent with cortical findings. Most of the temporal responses in VPM were predictable from the measured time course of suppression following a deflection, and the response of a VPM neuron to the three deflection stimulus was a good indicator of the steady-state response to a periodic stimulus. Taken together, these findings suggest that many of the response properties previously observed in the cortex originate at the level of the thalamus, and thalamocortical transformations further refine them for higher level processing.

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