Neurons in primary visual cortex show dramatic changes in filtering properties when high-order correlations are present


**SUMMARY**

V1 is widely considered to act primarily as a feedforward bank of filters followed by modulatory feedback, and multiple subunits to the basic LN structure. Alternatively, there might be fundamental qualitative differences between the computations performed by real cortical neurons and those performed by these models.

**METHODS**

**Physiological**

- Recording in macaque V1 and V2
- Trains of random noise
- Triangular stimuli (bars, gratings, random noise) from natural scenes

**Analytical**

- Standard RF mapping: cross-correlate a random binary stimulus and map RF
- Time course of sensitivity in ON and OFF subregions

**RESULTS: WIDESPREAD AND MARKED SENSITIVITY TO HIGH-ORDER CORRELATIONS**

**Spatial analysis**

- RF maps of V1 neurons (examples from 16 layer 2/3 neurons)
- RF maps of linear-nonlinear (LN) model neurons in the presence of HOC's
- RF maps of linear-nonlinear (LN) model neurons in the presence of HOC's
- RF maps of linear-nonlinear (LN) model neurons in the presence of HOC's

**Temporal analysis**

- Response time course in RF subregions
- RF maps in response to interleaved stimulus presentation
- Alterations in RF maps do not require prolonged adaptation

**CONCLUSIONS**

- V1 neurons exhibit behavior that challenges feedforward models
- High correlations are highly significant, including changes induced by "invisible" correlations (the wye stimulus)