SIMPLE CELLS AND OTHER CELLS IN STRIATE CORTEX OF ALERT MONKEYS.
((D.M. Snodderly, I. Kagan, and M. Gur)) Schepens Eye Research Institute, Boston MA; Biomedical Engineering, Technion, Haifa, Israel.
Purpose. Simple cells have been distinguished from complex cells on the basis of: 1) the degree of separation of increment- and decrement-responsive subfields and 2) their relative modulation in response to a drifting sine-wave grating. We have compared these two measures. **Methods.** Increment- and decrement-responsive subfields were mapped with light and dark bars while compensating for fixational drifts. Responses contaminated by saccadic movements were excluded. A separation index was constructed that ranged from zero for completely separated subfields to 1 for subfields exactly superimposed. Response modulation was recorded with drifting sine-wave gratings limited by a rectangular window. Relative modulation during stimulation with the optimal configuration was calculated as the ratio of the fundamental frequency to the DC component. Cells were also tested with square-wave counterphase flicker of a stationary grating. **Results.** The separation index was bimodally distributed and clearly distinguished simple cells from other cells. Simple cells constituted less than 20% of our population, and were predominantly localized to magnocellular-dominated layers. The relative modulation index was unimodally distributed and did not separate simple cells from other cells. This merging of the different populations was due to the fact that many cells with superimposed increment and decrement-responsive subfields showed strong modulation at the fundamental temporal frequency of the drifting grating even though they showed frequency doubling with counterphase flicker. The more stringent the correction for eye movements, the stronger the modulation became. **Conclusions.** While the behavior of simple cells in alert monkeys is predictable from the literature, the behavior of other cells is not. We suggest that the other cells are drawn from multiple populations, including complex cells with a high DC response, as well as a previously unrecognized group we call duplex cells. The duplex cells have small receptive fields with superimposed increment and decrement-responsive subfields and a strong fundamental response to drifting gratings whose spatial extent is appropriately limited. Duplex cells have both linear and nonlinear components and are well suited to analyzing small stimulus features. CR: N. Support: NIH EY12243; Technion Fund for Research