

“DUPLEX”, NOT SIMPLE, CELLS ARE THE MAJOR CELL TYPE IN STRIATE CORTEX OF ALERT MONKEYS. M. Gur^{1,2*}, I. Kagan¹ and D.M. Snodderly²

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Much theorizing on functional processing in primary visual cortex is based on simple cells, the major cell type found in anesthetized and paralyzed cats. The role usually ascribed to complex cells is to generalize over position and contrast polarity and perform accessory functions such as gain control, normalization, and cross-orientation inhibition. We report that in primate cortex the major cell type is not simple cell but rather a type we call “duplex”. Extracellular responses of V1 neurons in parafoveal region of monkeys performing a fixation task were recorded. Activation regions (AR) were mapped with increment and decrement drifting bars and flashes. The AR widths of duplex cells were quite restricted in space and most cells had completely or partially overlapping increment and decrement ARs, similar to complex cells. Unlike complex cells, however, drifting gratings did not generate unmodulated elevation of the cells firing rate but rather, similar to simple cells, a significant modulation at the stimulus temporal frequency. The dependence of the harmonic content of the responses on the gratings spatial frequency and width implies a combination of linear and non-linear properties which may derive from interplay of inputs from “increment” and “decrement” subunits, suppressive interactions between them, and an inhibitory surround. The cells’ relatively small ARs allow precise localization of a stimulus in space. We suggest that these cells represent the basic functional unit in the primate primary visual cortex.