Visual Cortex

Vision Science Lectures in Ophthalmology

Curtis Baker
receptive fields of retinal ganglion cells

KSJ, Fig 26-7
retina-LG N-cortex
V1 neurons: orientation selectivity

KSJ,
Fig 27-11
V1 neurons: direction selectivity
neurons as stimulus filters

simple cell receptive field

optimal grating

wrong spatial frequency

wrong orientation
near and far cells

KSJ, Fig 28-14
ocular dominance columns

KSJ, Fig 27-16
Population responses: optical imaging

Stimulus Generator

Data Collection and Analysis

Real-time Video Processor

CCD Camera

Illuminator

(courtesy of Chang’an Zhan)
orientation columns

KSJ, Fig 27-14
cytochrome compartments

KSJ, Fig 28-1
cytochrome oxidase blobs

- input from LGN koniocellular layers
- in centers of ocular dominance columns
- receptive fields: non-oriented, colour-opponent
Glickstein M  “The discovery of the visual cortex”
Scientific American, pp 118-127, Sept 1988
retinotopic map in V1
retinotopic maps from fMRI

Sereno et al, 1995
field sign maps

Sereno et al, 1995
extrastriate visual areas

larger receptive fields, less retinotopy

functional specializations

single units: Zeki, V4 vs MT/V5

brain imaging: stimuli that selectively activate
(e.g., motion/flicker -> MT/V5)
lesion effects

experimental approach (Mishkin & Ungeleider):
primates: lesion brain areas, test perception

temporal cortex (ventral):
object recognition, memory (“what”)

parietal cortex (dorsal):
spatial localization (“where”)

KSJ, Fig 25-11
dorsal & ventral streams: many extrastriate areas
dorsal and ventral streams: neurophysiology

KSJ, Fig 25-12
effects of damage

striate cortex (V1) -> blindness

V2 -> "quadrant" blindness

other extrastriate areas -> selective losses, e.g.:

MT / V5 -> motion-blindness

FFA (fusiform face area) -> prosopagnosia

fusiform cortex ("colour area" ?) -> achromatopsia