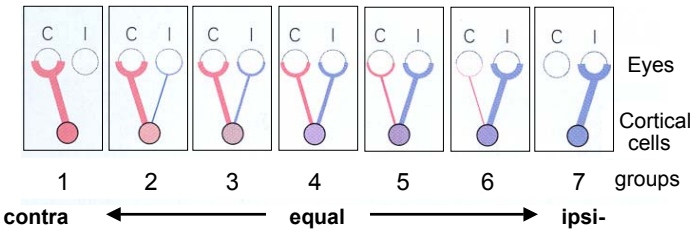
## Categories of ocular dominance




$$od = \frac{\text{Response}_{ipsi}}{\text{Response}_{ipsi} + \text{Response}_{contra}}$$

od = 1, ipsilateral only

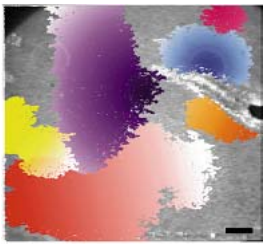
od = 0, contralateral only

od = 0~1, binocular

## Source of activity during OD development

1. Before eye-opening (before birth)

- spontaneous retinal wave



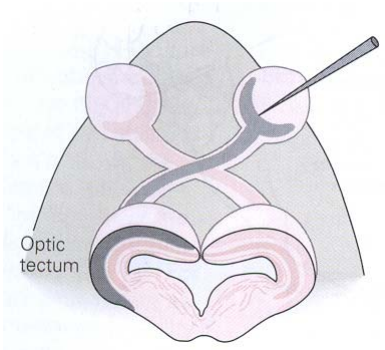
2. After eye-opening

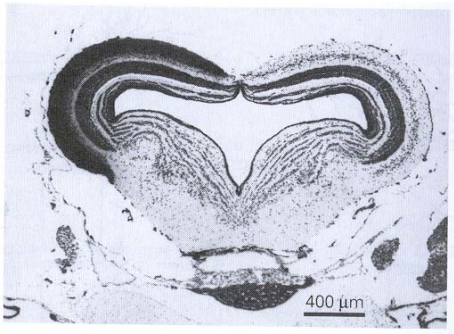
- visually driven activity

## Test the competition hypothesis

Three-eyed frog experiment ((Constantine-Paton and Law)

A. normal frog

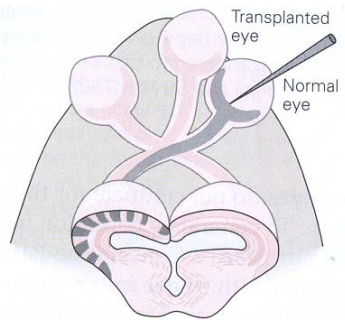


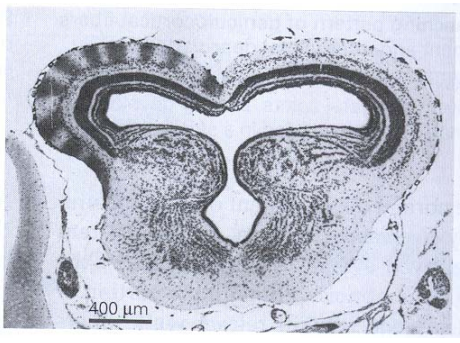




## Test the competition hypothesis

Three-eyed frog experiment

B. three-eyed frog



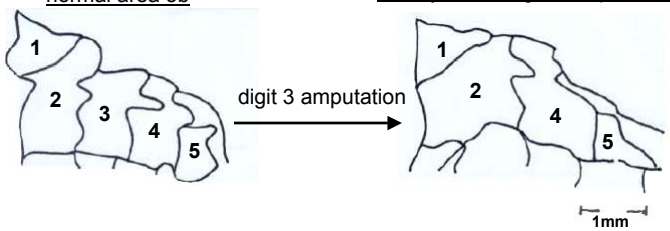



# Lesion-induced adult cortical reorganization

Somatosensory cortex area 3b

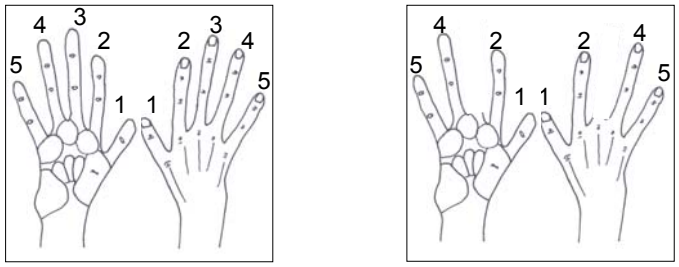
normal area 3b

62 days after digit 3 amputation




normal monkey hand

digit 3 amputated

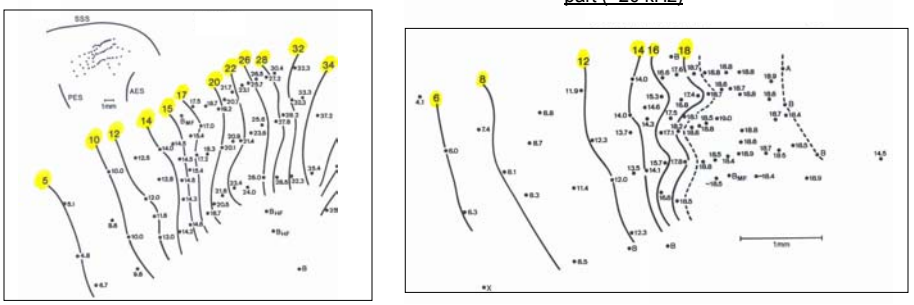



# Lesion-induced adult cortical reorganization

Primary auditory cortex (A1)

normal cat A1

2.5 month after cochlear lesion of the high frequency part (>20 kHz)



-- partial destruction of the cochlear leads to reorganization of the tonotopic map.

Neurons in the deprived cortex respond to tone frequencies adjacent to the frequency range damaged by the lesion.

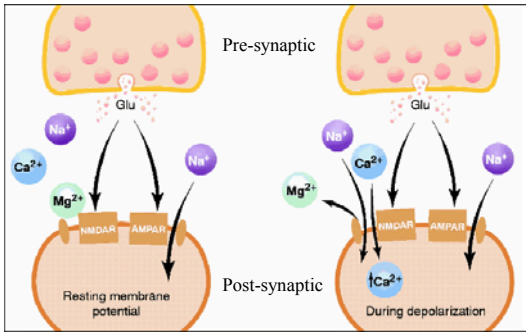
# Molecular mechanism of cortical plasticity

## 1. NMDA receptor - coincidence detector

- ligand dependent (requires binding of Glu)

- voltage dependent (requires depolarization of the postsynaptic cell to remove $Mg^{2+}$ from the channel pore)

Pre and post fires asynchronously  Pre and post fires synchronously




trigger LTP, strengthen synapse