DEVELOPMENT OF VISUAL SYSTEM (p.1)

1. **Infant Vision**

Infant eyes approach full size sooner than the rest of the head does

Vision is an extremely important sense for the infant (along with touch, smell & taste)

At 2 days old, infant prefers to look at "faces" vs. other patterned Stimuli (see Fig. 6.34)

Infant may get "stuck" on attending to a very "attractive" visual display for hours; after brain develops more (>6mo.) infant can voluntarily change to another stimulus at will

2. **Effects of Visual Experience on Visual Development**

Visual system can mature to a certain point (prenatal) without visual experience, but after that the sensory receptors and neurons must have visual stimulation to maintain & fine-tune their connections (and maintain the cells alive)

a. Monocular Visual Deprivation

How could this happen? Experimentally – an eye patch (e.g. 3 weeks)
In real life – a *cataract* on lens

Cells in the visual cortex contralateral to the deprived eye receive only infrequent & random activity, and their synapses become unresponsive to input from that deprived eye

The subject becomes almost totally "blind" to input from that eye

b. Binocular Visual Deprivation

How could this happen? Experimentally – patch over both eyes or rear S in complete dark
In real life – *cataract* on both lenses

For a short period of time (e.g. three weeks post natal in cat) ✍
Cells remain normally responsive to visual input from both eyes

For a longer period of time (e.g. 3-4 months post natal in cat) ✍
cells remain responsive to visual input, but cortical neurons become sluggish and show a weak response, lose their response to lines of specific orientation

2. **Effect of Visual Experience (or Lack Thereof)** (cont.)

So why the differences between monocular vs. binocular visual deprivation? Why is deprivation in **one eye** so much worse than deprivation in **both eyes**?

And what about **short vs. long period** of deprivation? And what About **when** this deprivation occurs (just post-natal or long after Birth)? What does this imply?

So, what does this imply about doing/when to do cataract removal surgery in humans?

3. **Uncorrelated Visual Stimulation of Both Eyes**

"Uncorrelated" means that both eyes are being stimulated, but not at the same time and not by corresponding visual fields (not by the same views of the world)

experimental procedures – alternating patching over one eye
- wearing a prism over one eye

in real life – person with *strabismus* (eyes pointing in different directions)

Results – often have normal vision in each eye except there is **no longer the detection of stereoscopic depth perception**

i.e. all of the binocular cells have become re-wired, and are now responsive to just the R or the L eye

can no longer detect binocular retinal disparity cues necessary for 3-D vision

In the case of strabismus, if one eye is more properly aligned and one eye is quite deviant ✍ *"strabismic amblyopia"* occurs

Which might almost be like monocular visual deprivation effects

4. **<u>Early Exposure to Limited Visual Patterns</u>**

e.g. expose kitten to just horizontal or to just vertical lines ✍ rewires feature detector cells (sees just horizontal lines or just vertical lines)

e.g. expose kitten to a "motionless" world (lived in world lit by strobe light "flashes") ✍ kitten was "motion blind"

e.g. extreme case – S is blind from birth
areas of cortex that would have responded to visual input now respond instead to touch or sound