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. **Early Exposure to Limited Visual Patterns**
   e.g. expose kitten to just horizontal or to just vertical lines \(\Rightarrow\) rewire 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”) \(\Rightarrow\) 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