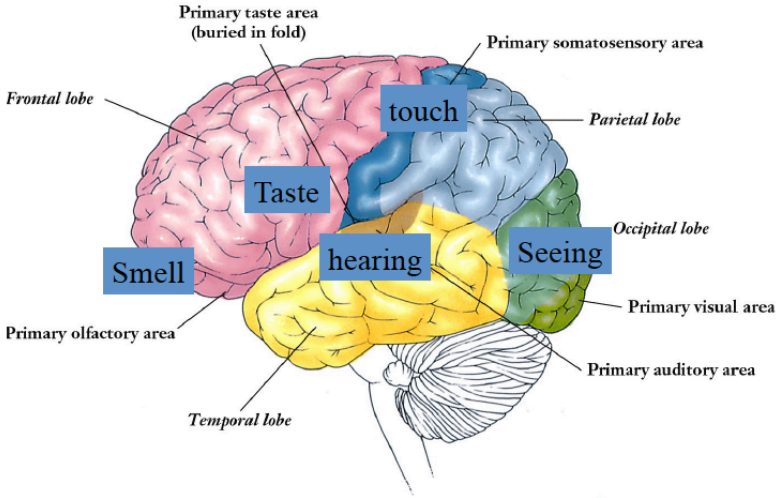
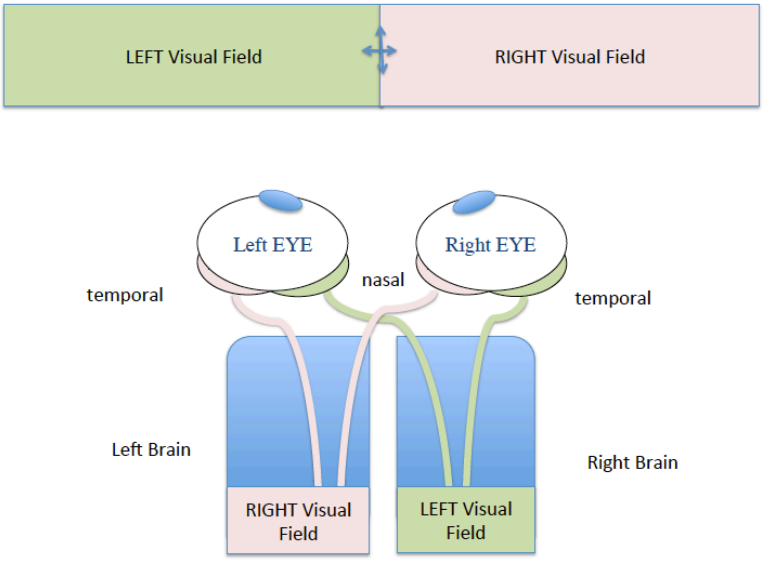
SENSATION & PERCEPTION: Early Stages of Visual Perception & Brain Organization

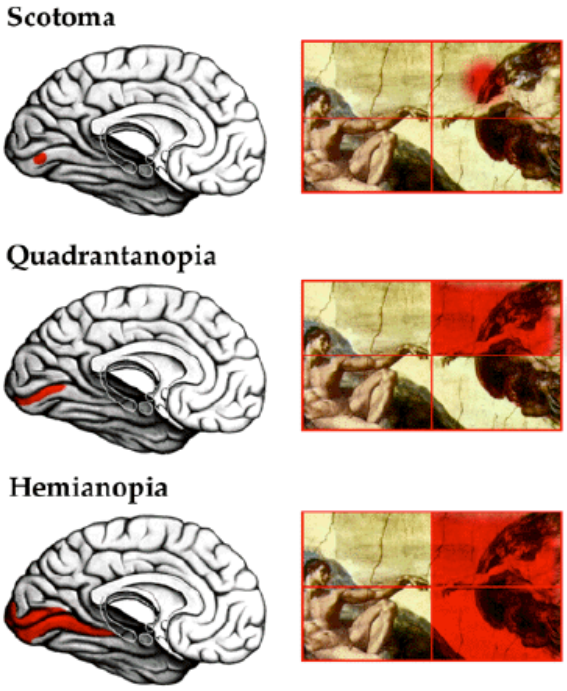
1. Senses: How many? Five, but we sense other things as well
   a. See, hear, feel/touch, taste, smell
   b. Sensors: Pain, pressure, balance, electroreception (catfish: detect movement of creatures like worms)
2. Senses & Steps to Perception
   a. Cortex sensation becomes perception - Thalamus: relay station - Neurons & neuronal fibers: wiring - Transducer: sensor = Energy
3. Senses & Specialization
   a. Each sense has its own specialized receptors
   b. Their specialized sensory neurons (transport)
   c. Own brain area where information from sense projects to
   d. Four lobes
      i. Frontal lobe: thought, planning movement
      ii. Parietal lobe: touch, spatial relations
      iii. Temporal: hearing, memory
      iv. Occipital lobe: vision



4. Brain: gray matter and white matter
   a. Outer: dark gray, inside: white
   b. Nucleus makes it gray; Myelin sheath makes it white
   c. Corpus callosum: white matter b/ c myelinated
5. Vision: Eye and Retina
   a. Ophthalotrope
   b. Eye dominance testing: use hands, close one eye but still see: dominant eyee
   c. Visual/visible spectrum 400 - 700 nanometers (wavelength)
      i. Between ultraviolet and infrared: visible light
   d. Projection of light and objects: the eye does the sames
   e. The eye: fovea (point of focus, highest spatial resolution - see detail best), retina (cones & rods), lens (glasses), iris, cornea, pupil, blind spot, optic nerve
6. Spatial Frequency (space repetition)
   a. Babies: see low spatial frequencies (less detail)
      i. More details = high SF
   b. The spatial frequency of the iris is like a fingerprint
   c. Senses are already developed at birth except vision
   d. Need for glasses
      i. Myopia (need - lenses): nearsighted
         1. Eye is too long; projects before retina = clear near, but not far
      ii. Hyperopia (need + lenses): farsighted
         1. Eye is too short; projects behind retina = clear far, but not near

7. Retina
    a. Light goes through different layers
    b. Ganglion cell layer (form optic nerve)
    c. Bipolar cell layer
    d. Photoreceptors
        i. Rods located in periphery of retina
        ii. Cones locate in the center of retina
8. Distribution of different kinds of cones on retina: red, green, blue
    a. Cones & colorblindness: can't distinguish blue & yellow, green & red
        i. Cerebral achromatopsia (Different from cortical colorblindness): caused by damage to cerebral cortex, often a stroke; only see black & white
        ii. Cones
            1. Photopic, daylight, color vision
        iii. Rods
            1. Scotopic, important at night, "colorblind"
            2. No rods in the fovea
    b. Dark adaptation: rods and cones function both in isolation & tandem to adjust visual system = changes in sensitivity
9. Lose depth perception if one eye is covered
    a. The blind spot and **filling in**: the brain makes up the information
10. Brain plasticity: half-brain
11. Visual issues: **Scotoma** (hole in right visual field - left brain, upper visual field), **quadrantanopia** (r ight visual field, upper field), hemianopia (all of right)
12. Calcarine sulcus and upper and lower visual field representation
    a. Calcarine sulcus: where primary visual cortex (V1) is concentrated





EMOTION: Emotion in Infancy (Topic 3)

Background: Cognitive & emotional capabilities of infants & toddlers

1. What can babies do?
   a. Signaling (attachment behaviors), person perception (face & voice), imitation, turn-taking & reciprocity (eagerness to engage), join-attention (toy showing), emotion understanding & regulation (empathy, social referencing, attachment)
   b. Methodology: Preferential looking
      i. Infant presented w/ two stimuli; preference determined by looking time
      ii. Infant habituated to one stimulus (happy face), shown different stimulus (scared face) = attentional recovery measured
      iii. Does not tell ability to discriminate
2. Face Recognition
   a. Fantz: Early investigations on perception of schematic faces
   b. Hard to know whether infants attending to complexity, symmetry, external contour
   c. Wilcox: When factors carefully controlled, infant preference for faces does not emerge until 4-5 months

Scrambled

Schematic

   d. BUT
      i. Maurer & Barrera: 2-month olds discriminate amongst three configurations; show preference for A
      ii. Morton & Johnson: 10-week olds discriminate b/w facial & non-facial configurations; little evidence of recognition via learning processes at 5 weeks

   e. Turati
      i. Up-down symmetry: presence of patterning in upper than in lower part of configuration
      ii. Congruency: existence of congruent spatial relation b/w spatial disposition of inner features and shape of outer contour
      iii. Non-nativist hypothesis: newborns preference for faces may be b/c of non-specific perceptual biases present shortly after birth, as preferences for at least two general structural properties contained in typical facelike patterns are evident in the case of configurations that do not look like faces
   f. Real faces
      i. Although it is amazing infants can discriminate schematic faces, schematic faces only symbolize real faces
      ii. Properties of real faces: hard to control
   g. Field: Neonates w/ mean age of 45 hrs showed reliable preference for mother's face than stranger's
3. Imitation
   a. Piagetian framework: true imitation only emerges at the end of second year; considered to be constrained by self-differentiation & behavioral mastery

i. Infant must achieve muscular control; see itself in the act of imitation before imitating novel behaviors or engage in deferred imitation

4. Turn Taking and Reciprocity
   a. Schaffer: Conversations b/w 1-2 year olds & mothers - vocal exchanges occur very smoothly & have appearance of discourse
      i. Others shown smooth temporally sensitive turn-taking in vocal & physical interaction b/w very young infants & caregivers
   b. Motivational structure of interactions turns on sharing emotional exchanges and genuine pleasure in company of the other, depending on the extent to which the other is responsive & interested in infant
5. Emotion Understanding & Regulation
   a. Psychological accounts of infant development (except psychoanalysis) give emotional a minor role (but changing)
   b. Research since 1970s: infants emotionally prepared & have emotional sensitivity in social contexts
   c. Emotions: potentially powerful driving force; motivate social & cognitive transformation
   d. Early emotion expression & recognition
      i. Common misconception: infants do not have structured emotional repertoire
      ii. Hiatt, Campos, & Emde (1979): put infants in situations that should elicit joy, fear, surprise; found infants' emotional responses were appropriate; anger (biscuit removal at 7 months, arm restraint at 1 month)
      iii. Caron, Caron, & Myers (1982): habituated infants to one emotion expression, found that infants were sensitive to a new emotional expression
      iv. General Conclusions
         1. Infants have structured emotional responses
         2. Infants: emotionally sensitive
         3. Almost impossible to interpret w/o certainty but such responses & sensitivities makes sense within adult framework for understanding people as emotional beings
      v. Empathic arousal: infants cry in response to cries of other infants, suggesting basic form of emotional contagion
         1. Havilland & Lelwica (1987): 10 wk old infants & mother with face-to-face paradigm; maternal displays happy, sad, angry; infants responded appropriately to each display (appropriately doesn't mean identically)
         2. Important findings b/c suggest infants are socially aware emotional agents, not just affective mirrors

COGNITIVE PROCESSES: Short term memory and working memory

1. What is Memory?
    a. Stored knowledge, or active processes?
    b. Types of memory
        i. Iconic and echoic: literal copies of sensory events
        ii. Short-term memory: "buffer" for the temporary maintenance of information
        iii. Long-term memory: facts, episodes, procedures
2. Iconic & Echoic Memory
    a. Literal copies of visual (iconic) & auditory events (auditory)
    b. Unlimited capacity
    c. Very short duration
        i. Iconic (50-500 msec), echoic (8-10 sec - much longer b/c we talk)
    d. Sperling (1960: found subjects could report 3-4 items if asked to recall all of them (whole report) but any 3-4 if only asked to report a single row (partial report)

	Short term memory	**Long term memory**
Capacity	Limited (7+/-2)	Unlimited
Rate of forgetting	Decays w/in 30 sec if not rehearsed	Forgetting due to interference rather than decay
Type of code	Phonological	Semantic

3. STM & LTM: Different memory systems
    a. Serial-position effects in short-term recall
        i. Primary: information transferred to LTM
        ii. Recency: information "dumped" from short-term buffer
    b. Coding differences
        i. STM: worse for phonologically confusable information (things that sound the same but different)
        ii. LTM: worse for semantically confusable material (meaning)
    c. Neuropsychological evidence
        i. HM: surgery on hippocampus to treat epilepsy
            1. No further acquisition of new information BUT existing memory retained
        ii. Are STM and LTM separate brain systems?
4. Working Memory
    a. Working memory system consists of
        i. Central Executive & Episodic Buffer (translates to LTM)
        ii. "Slave" systems: phonological loop, visuo-spatial scratch pad
    b. Phonological loop
        i. Phonological influences in short-term memory tasks due to operation of phonological loop
        ii. Information rehearsed in speech code
        iii. Memory span depends on how long it takes to repeat information
            1. Word length, speech rate

c. But change too fast, implies too much change in the past
   i. Dickens & Flynn (2001): interactions b/w biology & env magnify environmental effects
   ii. Maybe tests are just bad: Implies that over 25 years a 60-fold increase in genius IQ

5. X factor?

Env	Subcategory	Contributions	Limits
Physical	Heterosis: genetic effect resulting from mating between members of genetically distinct subpopulations	- Avoids inbreeding, can improve fitness - Has been occurring in human populations through the breakup of small, relatively isolated communities due to urbanization and greater population mobility - Mingroni (2007): could explain the Flynn effect	- Modeling suggests this is plausible in principle, but it lacks empirical evidence - But Lynn (2009) asks why isn't Flynn effect stronger in the US than EU, which has fewer immigrants
	Nutrition: We are taller than we used to be, by 1 cm per decade due to better nutrition & health, head size also increasing	- Small correlation b/w height and IQ (.2) so maybe improved nutrition helps brain too	- But no long term effect of mother's starvation; short of chronic, severe malnutrition, no relationship b/w nutrition and IQ has been found - Chronic malnutrition affects attention, impossibility, distractibility - Poorer people would have highest nutrition gains, but Flynn showed they don't show the greatest iQ gains - Not much nutritional change in developed countries since 1950
Social	Schooling: We stay at school longer now	- Winship & Korenman's analysis of Norwegian data for 13 & 18 year olds: estimated 2.7 more IQ points per year of school - Schooling: more important than age	- But g-loaded tests are the ones that change most - Little increase on content tests - British children increased on RPM but not vocabulary test - Dutch data: increase at all educational levels
	Testing practices: We get a lot of practice taking tests but content tests have not increased	Even children who take the very same test a second time usually gain only 5-6 points	Cannot fully explain Flynn effect

Env	Subcategory	Contributions	Limits
Social (cont.)	Child-rearing practices: Maybe we pay more attention to children now: smaller families, but no effect of family size	- Related: does early intervention help? US Head Start: confers many advantages, but not long term increases in IQ Abecedarian program: increase of only 5 IQ points	Too small to account for Flynn effect
	Visual environment complexity: we deal with a much more visual/spatial world; every generation has had to deal with more technology (movies, TV, video games)	- Greenfield: children had better spatial skills than their parents - Raven's: picks up pattern analysis ability - Exposure to different perspectives encourages this	Environmental complexity is a common explanation for Flynn effect, but Flynn shows that similarity subtest of WISC shows largest gain
Validity of IQ tests	Flynn's explanation: Suggested uncertainty about what IQ tests measure, maybe an abstract problem solving ability with no practical importance	- Suggests that environmental changes resulting from modernization mean that much larger proportion of people are more accustomed to manipulating abstract concepts i.e.) What do a dog & rabbit have in common? a. Today might say they are both mammals (an abstract answer) b. A century ago might have said that humans catch rabbits with dogs (concrete answer) c. Wearing "scientific spectacles"	

INTELLIGENCE: Group Differences in Mental Abilities

1. Can intelligence be trained?
    a. There is now a brain training industry