

## Exam 2 study guide

Exam 2 will cover the last part of chapter 4 and chapters 5, 6 and 7 from Goldstein, along with the related topics I covered in lectures.

**Important:** There are a couple of topics in the book that you are **not** responsible for (either this exam or for the final). They are:

Chapter 5, Pages 114 – 117, 'Perceptual Intelligence'

Chapter 6, Pages 132 – 135, 'Feature Integration Theory and Binding'

As for exam 1, I suggest you read the book and quiz yourself with the key terms at the end of each chapter. The following is a list of topics that we talked about in class. Beware – it is not necessarily all inclusive. It is only an outline of the topics we've covered so far.

Please feel free to email me questions any time. I'll get back to you as soon as I can.  
(gboynton@u.washington.edu)

### Chapter 4: Starting w/ page 77 (Key terms are on page 91)

Parallel pathways

Magnocellular projects to dorsal pathway

Parvocellular projects to ventral pathway

Ungerleider & Mishkin: ventral is 'what', dorsal is 'where' pathway.

Evidence from lesion studies

Milner and Goodale: ventral is 'perception', dorsal is 'action' pathway.

Evidence from patient studies

Higher visual areas:

IT in monkeys, ventral lateral occipital lobe: object and face perception

FFA: Fusiform face area: damage leads to prosopagnosia

PPA: Parahippocampal place area

### Chapter 5: Object (and Face) Perception (review the key terms on page 118 of the book)

The challenge of object perception

The inverse problem – many stimuli can project to the same image

Objects occlude each other

Lightness changes caused by shadows are not part of the object

Structuralism

Perceptions are created by combining elements called sensations.

What it can't explain: seeing things that aren't 'there' like illusory contours, apparent motion, regularity in patterns

Gestalt laws of perceptual organization (grouping) – whole different from sum of parts

Pragnanz

Similarity

Good Continuation

Proximity

Common Fate

Common Region

Uniform Connectedness

Synchrony

Meaningfulness or Familiarity

Rules of Figure-Ground Segregation: the figure tends to be:

Lower in the display

Symmetric

Convex

Relatively small in area

- Oriented vertically and horizontally
- Object Perception
  - Hard because input is variable and there are many possible objects
  - Competing theories
    - Structural description models – Biederman's RGC model (Geons)
    - Image description models – we learn 3D shape from many viewpoints
  - Object Perception in the brain
    - Neurons respond to what you consciously see.
      - Sheinberg & Logothetis monkey experiment,
      - Grill-Spector et al. fMRI experiment
- Face Perception
  - The brain is always trying to see faces
    - Pareidolia, the hollow face illusion
  - Face adaptation – evidence of neurons tuned to
    - Width of faces, gender, ethnicity, expression
  - Prosopagnosia – ventral stream damage leads to inability to see faces

### **Chapter 6: Attention (review the key terms on page 139 of the book)**

- Why is attention necessary?
  - To deal with limited capacity of conscious experience
  - To help decide where to move our eyes next.
- Factors that determine where we move our eyes to:
  - Bottom up factors: saliency
  - Top down factors: Task, goals, and attention
- Types of attention
  - Spatial attention
    - Attention to a region of space
    - Exogenous vs. endogenous cues
  - Feature-based attention
    - Attention to orientation, color, motion
- Eye movements help us 'paint' a picture of a scene.
  - We're unaware of many changes – change blindness, gorilla demonstration.
- Attention affects behavioral performance (Posner cueing task)
- Attention affects appearance (Carrasco's exogenous cueing task)
- Attention affects neuronal responses
  - Spatial attention increases neuronal responses in V1 and V4
    - fMRI (left-right) spatial attention experiment
  - Feature-based attention
    - fMRI: attention to a color in one location causes bigger responses to that color everywhere.
    - Monkey electrophysiology experiments:
      - MT and V4: what happens when attention is directed to one of two stimuli in receptive field?
- Attentional effects increase from V1 through higher visual areas.
- The Parietal lobe and attention – Balint's syndrome and simultanagnosia
- Visual Awareness
  - Patient D.F. Ventral stream damage and Blindsight patient G.Y.:
    - Vision without awareness.
  - A second visual pathway bypassing awareness
    - (Retina, Superior Colliculus Pulvinar)
  - Damage to (usually right) parietal lobe and anosognosia
    - Opposite of D.F. and G.Y. – awareness without vision.

### **Chapter 7: Color Vision (pages 141-145, Key terms are on page 165)**

- Physical properties of color (spectral distribution of wavelengths)
  - Light entering eye = Light spectral composition X surface reflectance properties
- Psychological properties of color (hue, saturation, brightness)
  - The color circle and color solid
- Color mixtures
  - Additive vs. subtractive

Relationship between physical and psychological properties of color

Cone spectral sensitivities

Principle of Univariance

Trichromacy theory (Young – Helmholtz)

Metameric matching – 3 lights can match any other color

Types of color deficiency: Rod monochromat, Protanope, Deuteranope,

Tritanope

Achromatopsia (cortical cause of color blindness)

Opponent Process theory (Hering)

Color opposites and afterimages

**Red-Green axis obtained by subtracting M from L cone responses**

Blue-Yellow axis by subtracting S from L+M cone responses.

Other factors influencing color perception

Color and lightness constancy

Other color illusions.