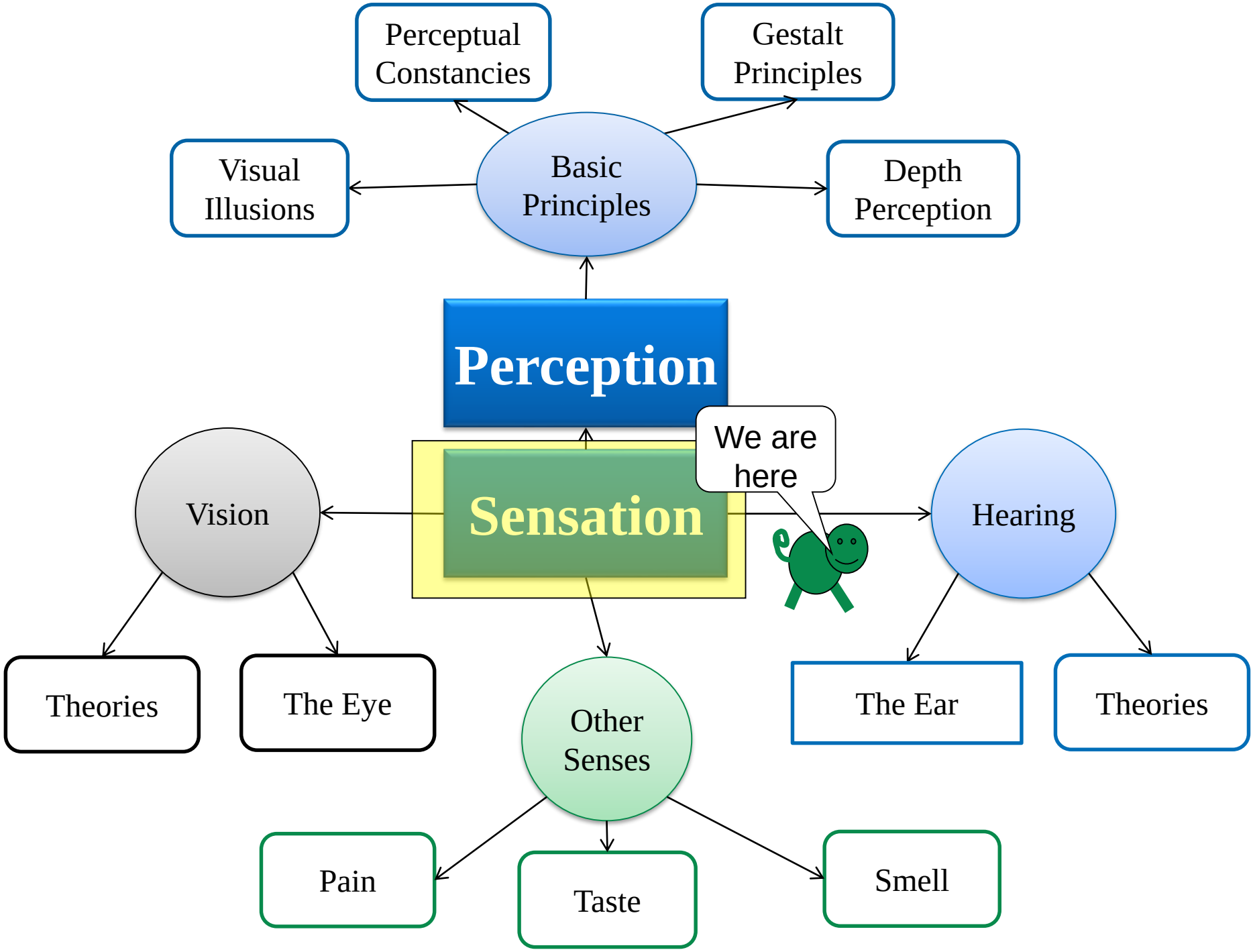
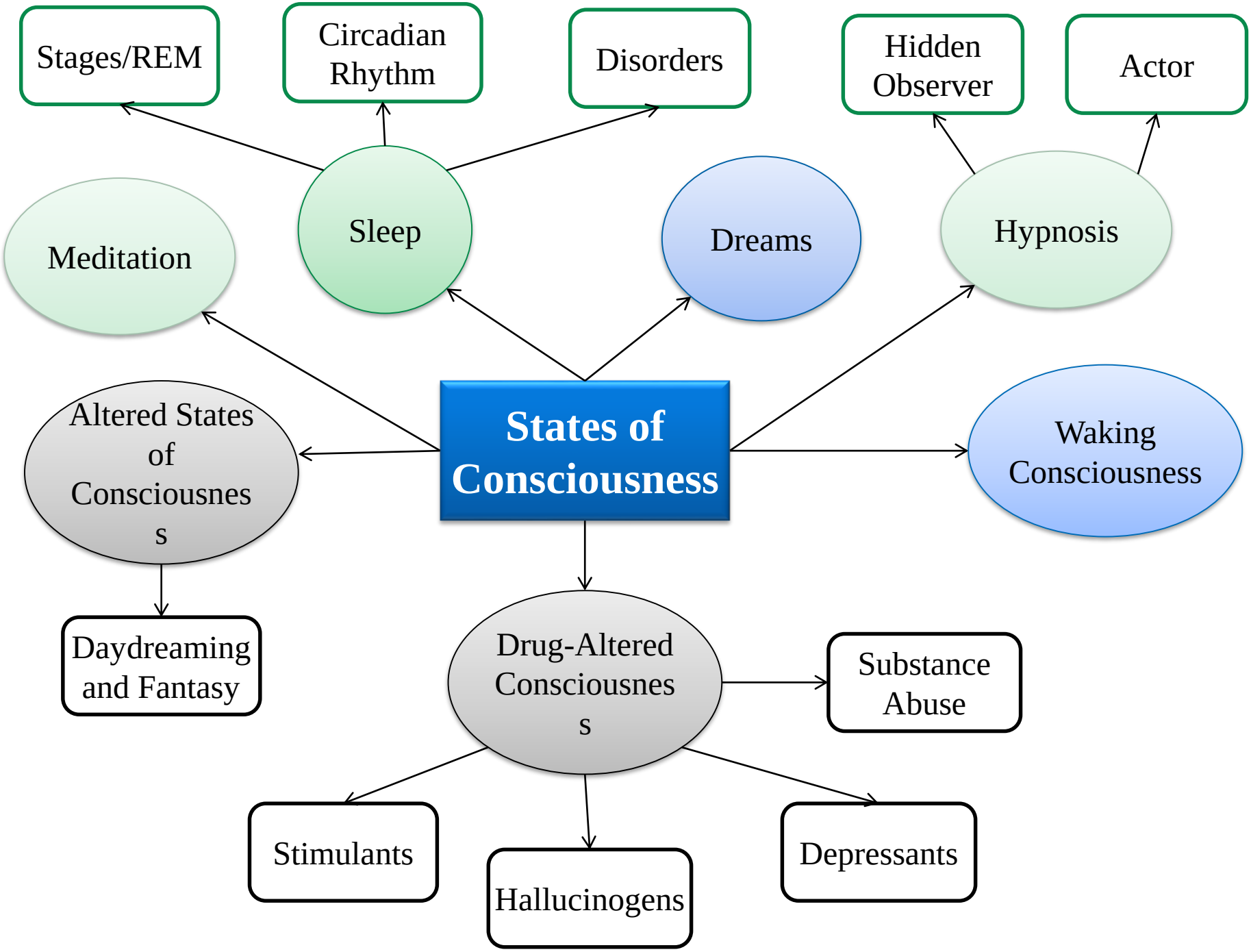
# WHS AP Psychology

## Unit 4: Sensation, Perception and States of Consciousness

Essential Task 4-1:

Discuss basic principles of *sensation/bottom up processing* with specific attention to *sensory transduction*, *absolute threshold*, *difference threshold (Weber's Law)*, *signal detection*, and *sensory adaptation*.


Perceptual Constancies
Gestalt Principles
Visual Illusions
Basic Principles
Depth Perception
Perception
Sensation
We are here
Vision
Hearing
Theories
The Eye
Other Senses
The Ear
Theories
Pain
Taste
Smell


States of Consciousness
Sleep
Stages/REM
Circadian Rhythm
Disorders
Dreams
Meditation
Hypnosis
Hidden Observer
Actor
Altered States of Consciousness
Daydreaming and Fantasy
Waking Consciousness
Drug-Altered Consciousness
Substance Abuse
Stimulants
Hallucinogens
Depressants

# Essential Task 4-:

Outline

- *Sensation/bottom-up processing*
- *Perception/top-down processing*
- *Transduction*
- *Absolute threshold*
- *Difference threshold*
  - *Weber's Law*
- *Signal detection*
- *Sensory adaptation*

# Sensation Perception 6-8%

# Sensation vs. Perception

Outline

- Sensation
  - The experience of sensory stimulation (sight, hearing, touch, taste, smell)
  - Detecting physical energy from “outside”
- Perception
  - The mental process of creating meaningful patterns from raw sensory information

# What do you see vs. what do you perceive?

Outline

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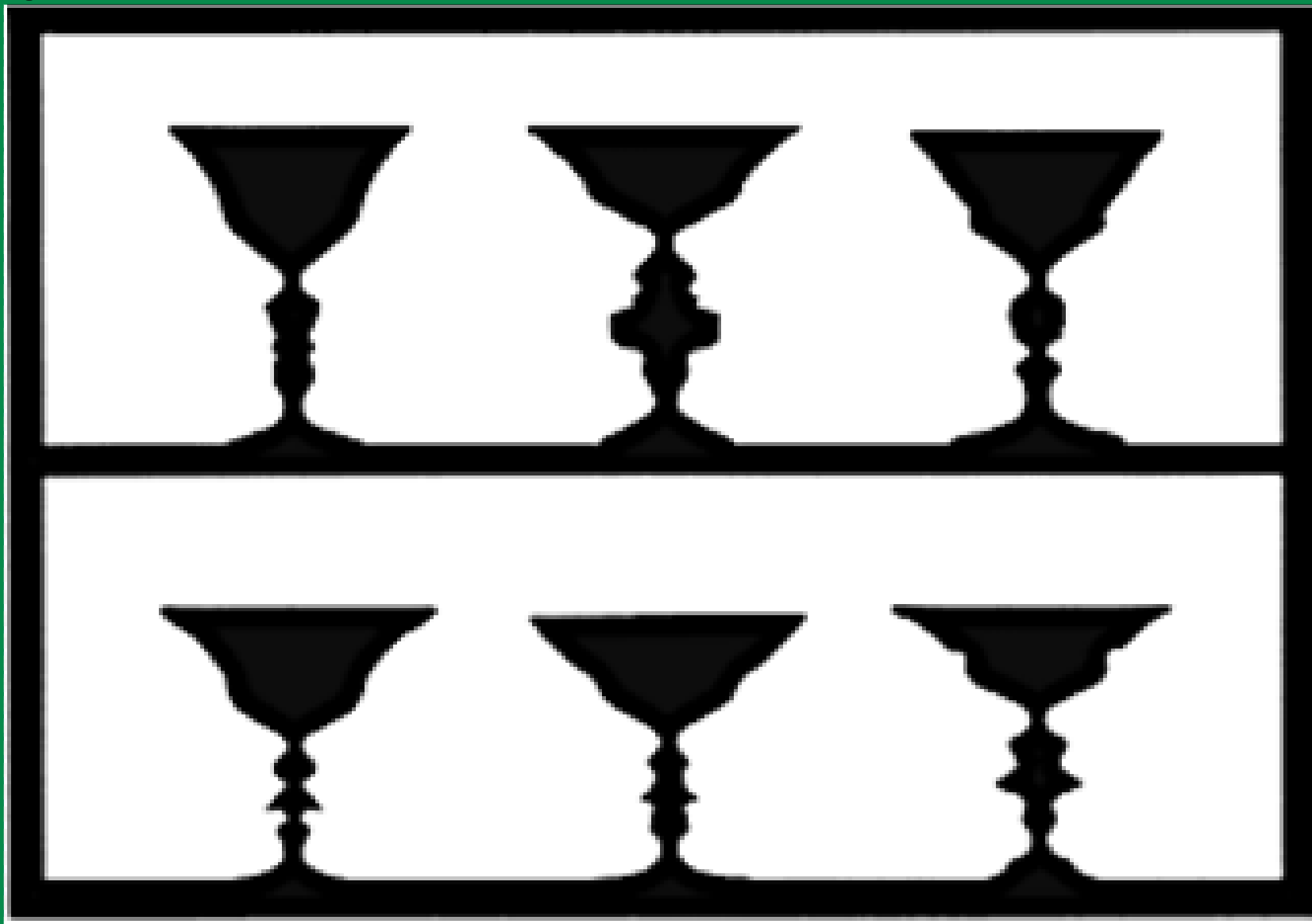
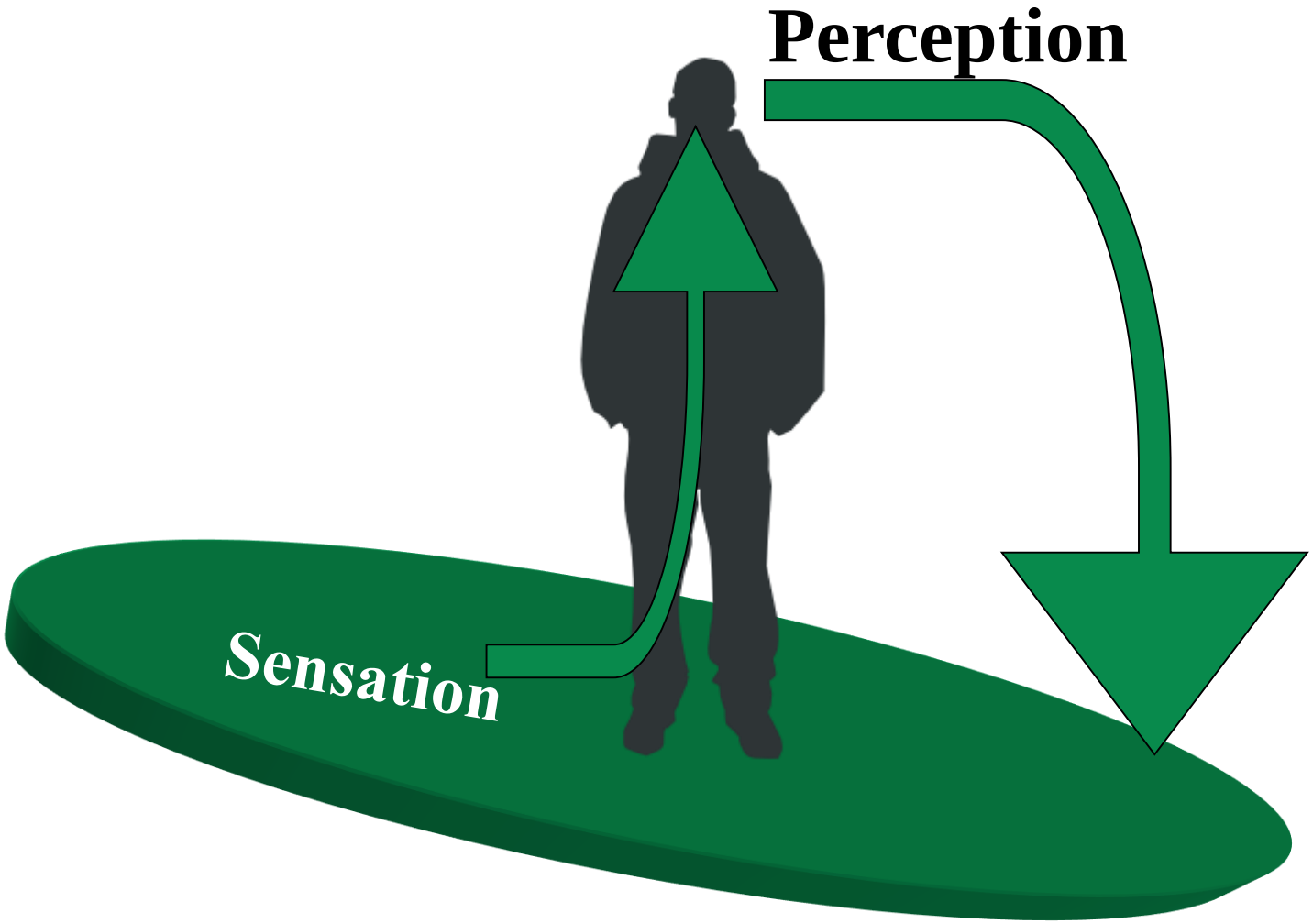
Outline



# II. Bottom Up vs. Top Down Processing (analyzing information)

Outline



# Bottom-up Processing (sensation)

Works with the details and moves out to the whole.

Stimulus -> perception

- Inductive reasoning
- Based upon current knowledge / potentially biased

Example:

Since 100% of biological life forms depends on liquid water to exist on earth, therefore life forms in other planets require liquid water.


B737-800 photo:Henk Boom jr.

# Top-Down Processing (perception)

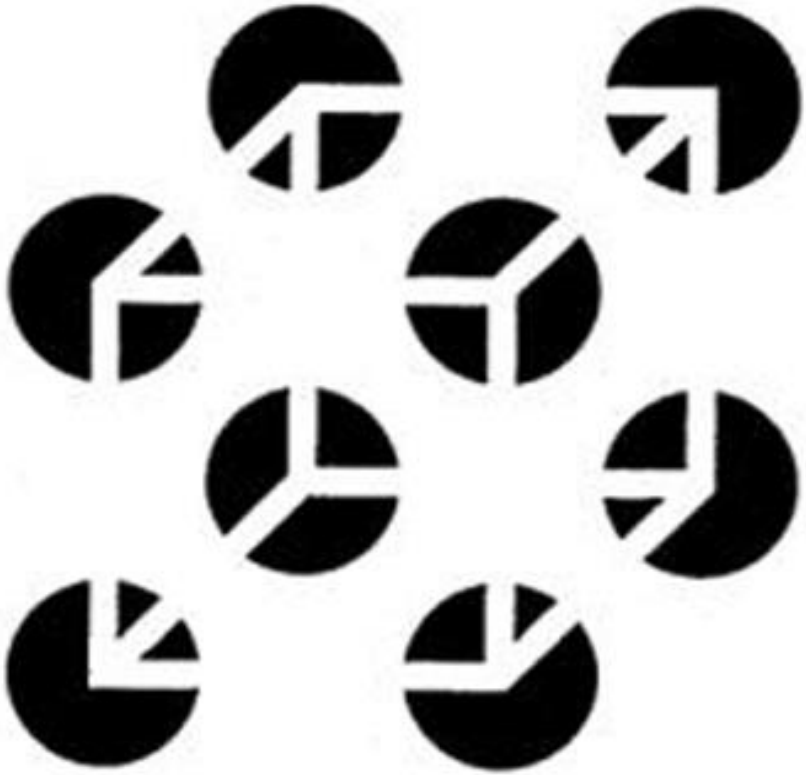
Outline

Information processing is guided by higher-level mental processes as we construct perceptions, drawing on our prior experiences and expectations.

Background knowledge -> Perception


We look at the whole to find a pattern to make meaning in the details.

# Top-Down Processing



What do you see as a whole?

# Example of Top-Down Processing

Outline

- Aoccdrnig to rscheearch at Cmabrigde Uinervtisy, it deosn't mttaer in waht oredr the ltteers in a wrod are, the olny iprmoetnt tihng is taht the frist and lsat ltteer be at the rghit pclae. The rset can be a total mses and you can sitll raed it wouthit a porbelm. Tihs is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe.

# Stroop Effect: Tell me what colors you see below

Red

Green

Purple

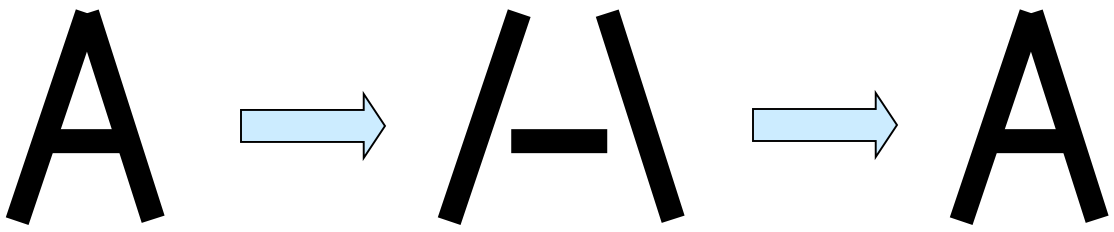
Red

Black

# Bottom-up Processing

Outline

Analysis of the stimulus begins with the sense receptors and works up to the level of the brain and mind.



Letter “A” is really a black blotch broken down into features by the brain that we perceive as an “A.”

# Perception without Sensation?

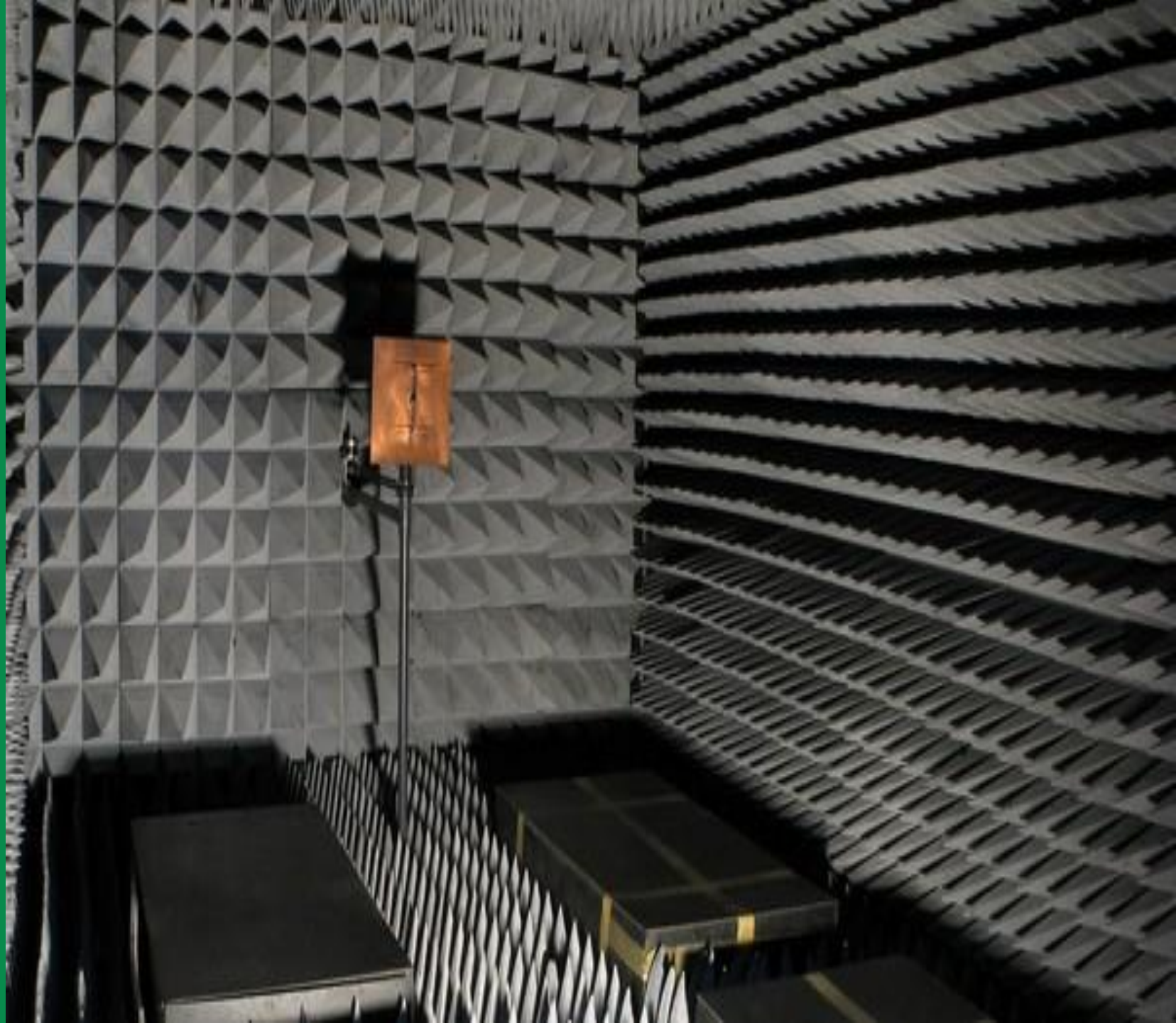
Phantom limb is the sensation or pain that an amputated or missing limb is still attached.

- Even though your limb might be gone, your neural connection is still present—allowing one to still experience the limb

# Perception without Sensation?

- sensory deprivation can result in extreme anxiety, hallucinations, bizarre thoughts, and depression. result of the brain amplifying neural noise in order to look for the missing visual signals
- Psychotic hallucinations

:):



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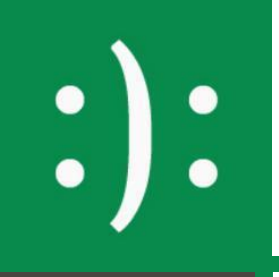


# Sensation without Perception?

- Prosopagnosia (face-blindness)
- Inability to recognize faces
- They see eyes, nose, ears, and mouth, but they are unable to put those them together
- Sensation is present but perception is not!

https://www.youtube.com/watch?v=q8cXus7SNQY

# Attention

- **Selective Attention**
  - Your conscious awareness focuses on a particular stimulus
- **Inattentional Blindness**
  - Failing to see visible objects when our attention is directed elsewhere
  - https://www.youtube.com/watch?v=Ahg6qcgoay4

  **(basketball)**
  - https://www.youtube.com/watch?v=GZGY0wPAnus

  **(misdirection)**
  - https://www.youtube.com/watch?v=ubNF9QNEQLA

  **(who done it?)**

# Change & Choice blindness

**Change Blindness**

- observers fail to notice changes in their visual field (environment).
  - https://www.youtube.com/watch?v=diGV83xZwhQ
  - https://www.youtube.com/watch?v=VkrrVozZR2c

**Choice blindness**

- refers to a short-term memory phenomenon that causes people to be unable to accurately recall choices made.
  - https://www.youtube.com/watch?v=wRqyw-EwgTk

# Cocktail Party Effect

- phenomenon of the brain's ability to focus one's auditory attention (an effect of selective attention in the brain) on a particular stimulus while filtering out a range of other stimuli

# III. Transduction

1) Receptor cells

- Specialized cells that respond to a particular type of energy

2) Transduction

- external energy is converted to neural signals.
- Conversion of one form of energy into another. Transforming stimulus energy (sight, sound) into neural impulse.
- then sent to the thalamus, which sends them to other parts of the brain
- exception: smell

# The Basic Process

Outline

- Receptor cells
  - Specialized cells that respond to a particular type of energy
- Transduction
  - external energy is converted to neural signals.
- Doctrine of specific nerve energies
  - One-to-one relationship between stimulation of a specific nerve and the resulting sensory experience
  - For example, applying pressure with your finger to your eye results in a visual experience (flash of lights)

# IV. Absolute Threshold

Outline

- Minimum stimulation needed to register a particular stimulus 50% of the time
  - Smallest detectable **LEVEL** of a stimulus.

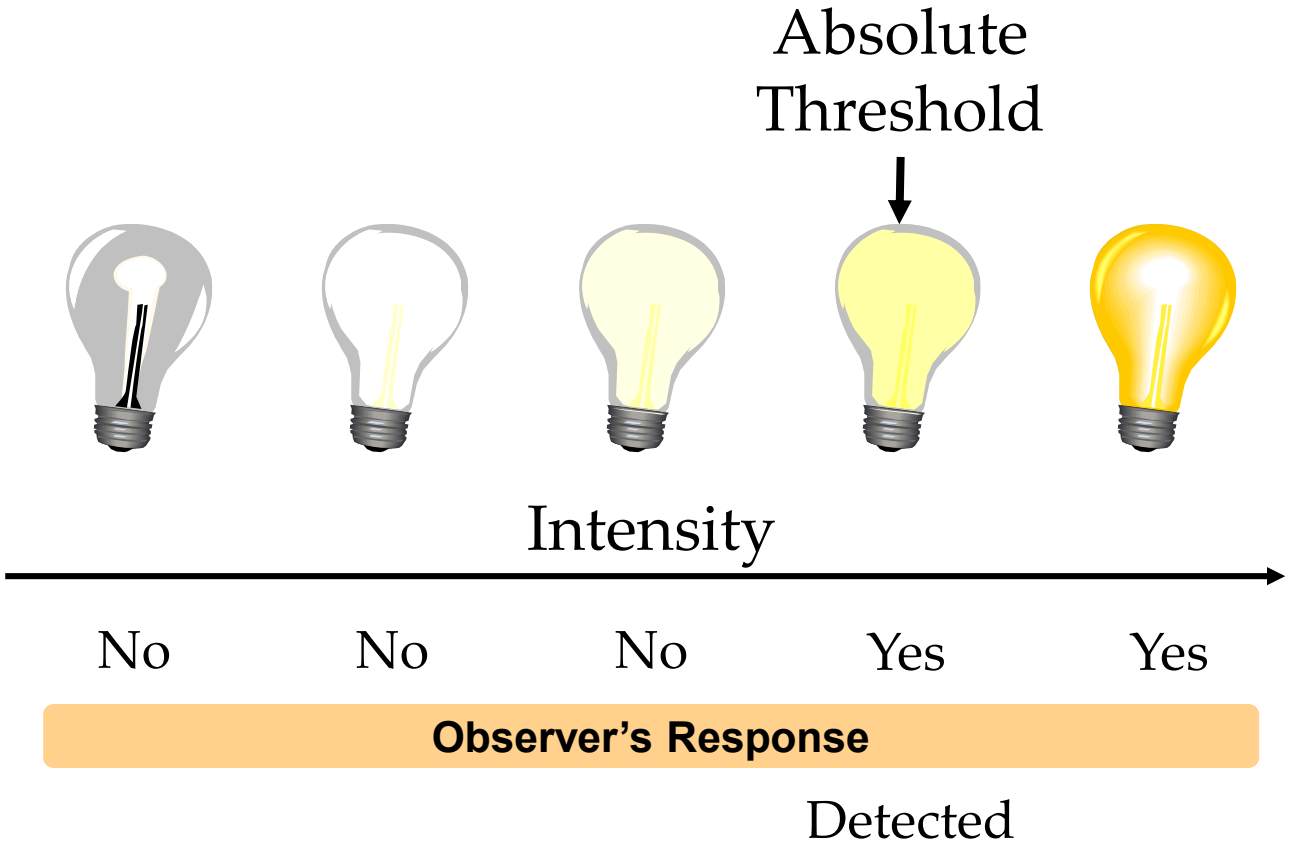
# Absolute Thresholds

Outline

- Taste: 1 gram (.0356 ounce) of table salt in 500 liters (529 quarts) of water
- Smell: 1 drop of perfume diffused throughout a three-room apartment
- Touch: the wing of a bee falling on your cheek from a height of 1cm (.39 inch)
- Hearing: the tick of a watch from 6 meters (20 feet) in very quiet conditions
- Vision: a candle flame seen from 50km (30 miles) on a clear, dark night

# Detection must be 50% of time.

Outline



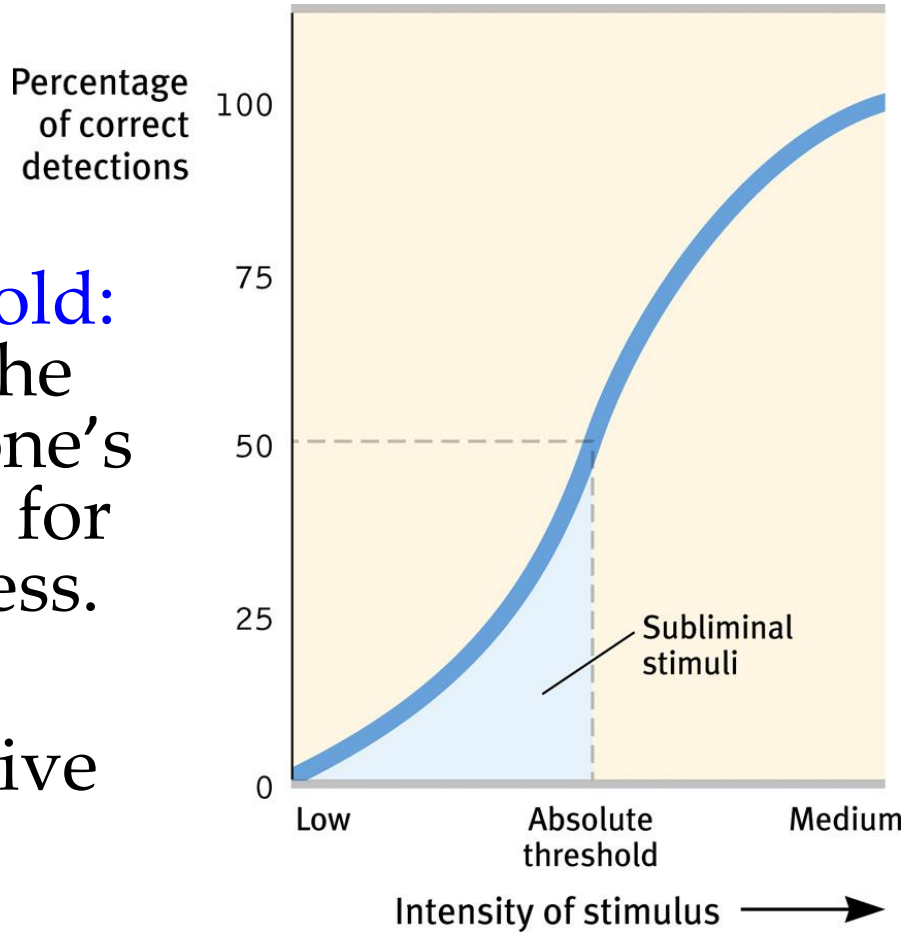

**Tell when you (the observer) detect the light.**

# Subliminal Threshold

Outline

Subliminal Threshold: When energy of the stimulus is below one's absolute threshold for conscious awareness.

What do we perceive then?



# V. Difference threshold

Outline

- Minimum difference between two stimuli required for detection 50% of the time, also called *just noticeable difference (JND).*
- The smallest detectable **CHANGE** in stimulus

*Example:*

- 1 once is added on 10 ounce weight

vs

- 1 ounce is added to 100 ounce weight

# VI. Weber's Law

Outline

Two stimuli must differ by a constant minimum percentage/proportion (rather than a constant amount), to be perceived as different.

More than just sensation it has to do with scales.

Weber fraction: $k = \delta I/I$.

https://www.youtube.com/watch?v=wVhiezByMSU

| Stimulus | Constant (k) |
|---|---|
| Light | 8% |
| Weight | 2% |
| Tone | 3% |

# VII. Signal Detection Theory (SDT)

Outline

Predicts how and when we detect the presence of a faint stimulus (signal) amid background noise (other stimulation). SDT assumes that there is no single absolute threshold and detection depends on:

- Person's experience
- Expectations
- Motivation
- Level of fatigue

# Examples of Signal Detection

- Important vs. Irrelevant
  - Baby crying for new parents
  - Driving a new car – hear an odd noise

# VIII. Sensory adaptation

Outline

- An adjustment of the senses to the level of stimulation they are receiving
  - Ever forgotten you are wearing a watch?
  - Ever gotten used to a smell? How does your car smell?
  - Adopting to hot or cold water
  - Eyes adjusting in a darkroom

Outline

Input (sensation) → Processing (perception) → Output

Experience, motivation, and expectations (fond campfire memories, expectations of warmth and camaraderie)

Top-down processing

Transmission to brain → Organization and interpretation → Behavior, thoughts, and emotions (move nearer, warm hands, feel comforted)

Bottom-up processing

Transduction: Encode physical energy as neural signals

Detection via receptor cells (flicker, crackle, smoky smell)

# Sensory Habituation

- After a frequent and repeated exposure of the stimuli leads to reduced response
- Reduced response to something that used to elicit a strong response
  - Response to drugs (tolerance)
  - Not being able to hear traffic noise or subway