

# Sensation & Perception

How do we construct our representations of the external world?

To represent the world, we must detect physical energy (a stimulus) from the environment and convert it into neural signals. This is a process called **sensation**.

When we give meaning by selecting, organizing, and interpreting our sensations, the process is called **perception**.

# Sensation vs. Perception

- Sensation
  - The experience of sensory stimulation
- Perception
  - The process of creating meaningful patterns from raw sensory information







# Bottom-up Processing

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.”



# Top-Down Processing

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

**THE CAT**

# Example of Top-Down Processing

- According to research at Cambridge University, it doesn't matter in what order the letters in a word are, the only important thing is that the first and last letter be at the right place. The rest can be a total mess and you can still read it without a problem. This is because the human mind does not read every letter by itself, but the word as a whole.

# The Basic Process

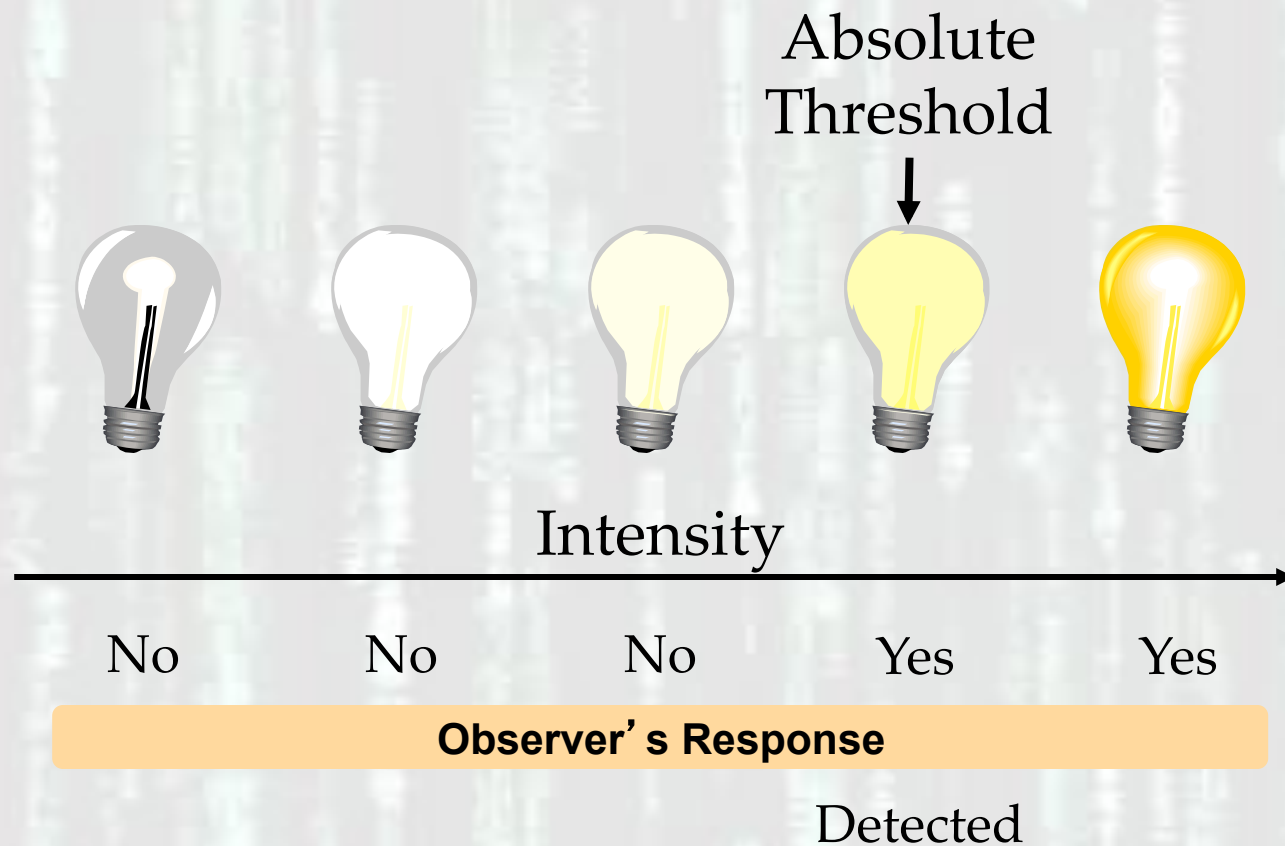
- Receptor cells
  - Specialized cells that respond to a particular type of energy
- Doctrine of specific nerve energies
  - One-to-one relationship between stimulation of a specific nerve and the resulting sensory experience
  - For example, applying pressure with your finger to your eye results in a visual experience



# Sensory Thresholds

- Absolute threshold
  - The minimum amount of energy that can be detected 50% of the time

# Detection



Tell when you (the observer) detect the light.

# Absolute Thresholds

- 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

# Sensory Thresholds

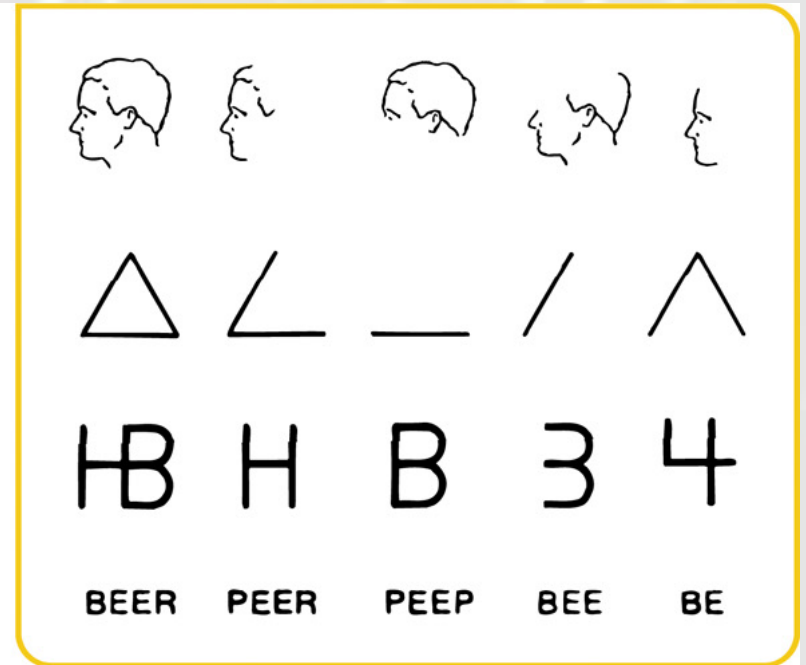
- Sensory adaptation
  - An adjustment of the senses to the level of stimulation they are receiving
  - Ever forgotten you are wearing a watch?
  - Ever gotten used to a smell?
  - Then why don't things disappear from your vision?



Our perceptions are organized by meanings that our minds impose.



(a)



(b)

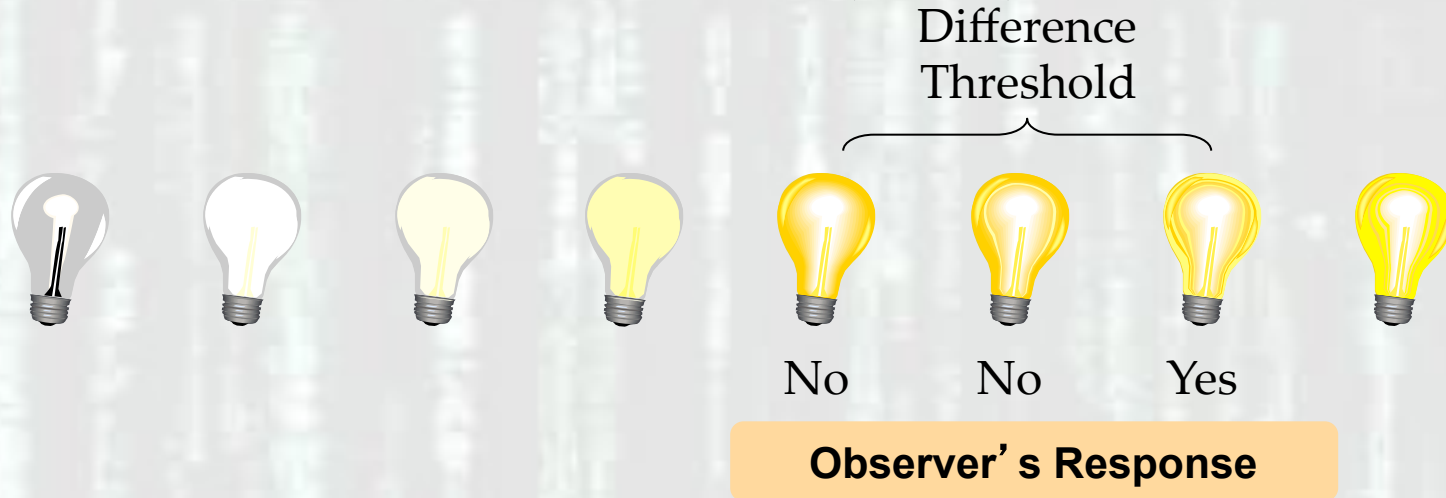
We perceive the world not as it is,  
but as it is useful for us.

# Sensory Thresholds

- Difference threshold
  - The smallest change in stimulation that can be detected 50% of the time
  - Also called the *just noticeable difference (jnd)*

# Difference Threshold

**Difference Threshold:** Minimum difference between two stimuli required for detection 50% of the time, also called just noticeable difference (JND).



Tell when you (observer) detect a difference in the light.

# Weber's Law

Two stimuli must differ by a constant minimum percentage (rather than a constant amount), to be perceived as different. Weber fraction:  $k = \delta I/I$ .

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



# Sensory Thresholds

- Weber's Law
  - States that the difference threshold is a constant proportion of the specific stimulus
  - Senses vary in their sensitivity to changes in stimulation
  - Envelop and coin demonstration.
  - More than just sensation it has to do with sales.

# Signal Detection Theory (SDT)

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



Carol Lee/ Tony Stone Images

**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)

