

Lecture 3

Learning about repeated events

Thursday

4/8/2022

If you continuously hear

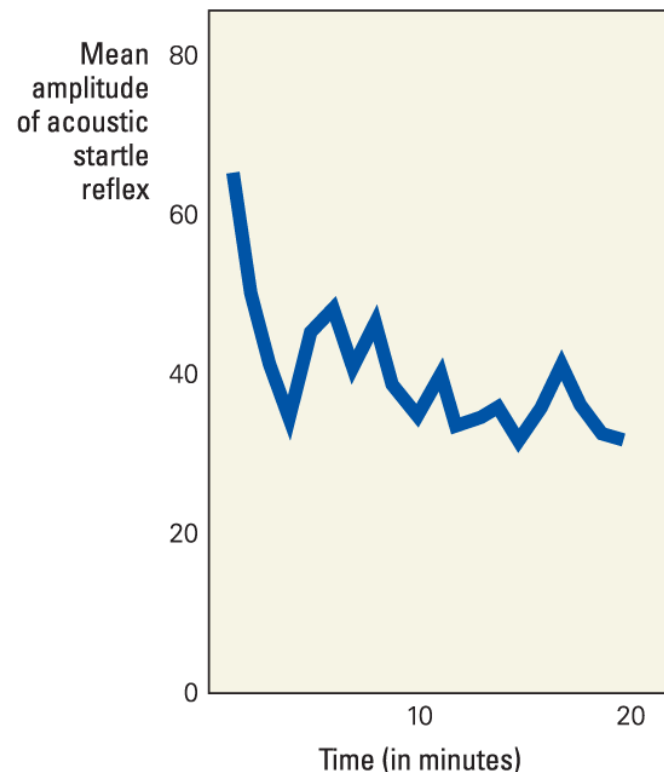
- Clouds thundering
- Fire alarm at a distance (far)
- AC or cooler or fan sound
- New ring tone
- Your mom calling you.....
- Can you feel your clothes?
- What behaviour do you exhibit?

- How long can you smell a flower?
 - How long does taste last in your mouth?
 - How long can you feel a tight watch around your wrist?
 - Do you become used to the darkness in a room?
 - Can you feel the temperature of the room after 15-20mins of entering it? (or swimming pool)
-
- What kind of behaviour do you exhibit?

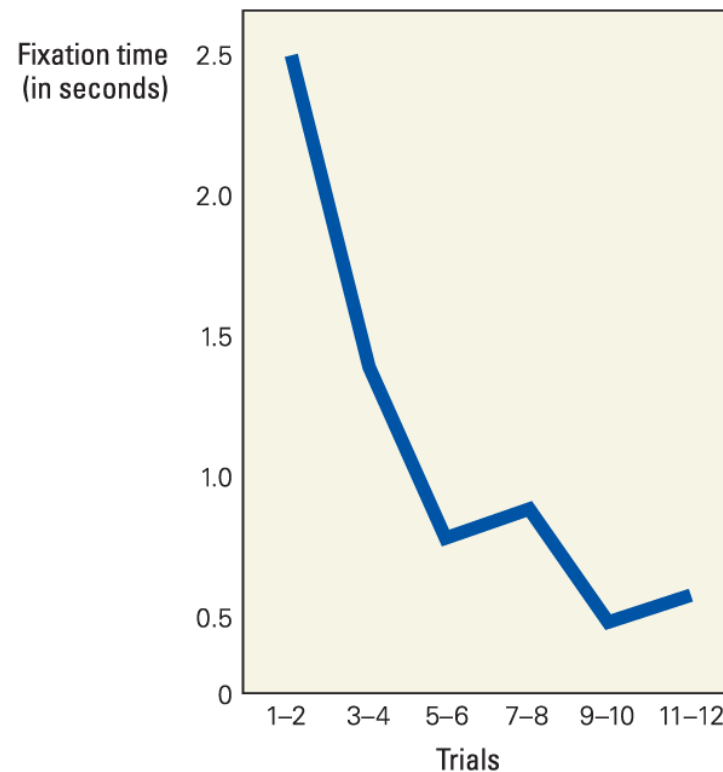
General Features of Habituation

In the laboratory, researchers examine simpler examples of habituation that they can describe in terms of a single, easily controlled stimulus and a single, easily measurable response

A Startle in rats



B Orienting response in infants



Acoustic startle reflex: a defensive response (such as jumping or freezing) to a startling stimulus (such as a loud noise)

Orienting response: an organism's innate reaction to a novel stimulus

- **Habituation**

- Novelty related startle in the beginning but gradually response to repeated (harmless) stimuli decreases
- The receptors respond to the stimuli but the signal is not relayed to higher cortical regions for processing.
- Stop noticing the signal but if you shift your attention to the stimulus you can perceive it
- If the stimulus reappears after an interval, the original response is recovered.
- It is a temporary lowering of response – decrease stimulus related arousal.

vs

- **Sensory Adaptation**

- Environmental stimuli is filtered out over time – response stimuli dies out (smells, taste, tactile)
- The receptors reduce or stop responding to the stimuli
- You cannot perceive the signal, we don't have much control over it
- No conscious control

- **Why do we habituate or adapt?**

- Helps to prevent being exhausted by repeatedly responding to unimportant stimuli
- E.g. Living near railway station or airport or noisy market

If you

- Feel an earthquake
- Hear fire alarm ringing above you (near)
- See a stray dog (for those who fear one)

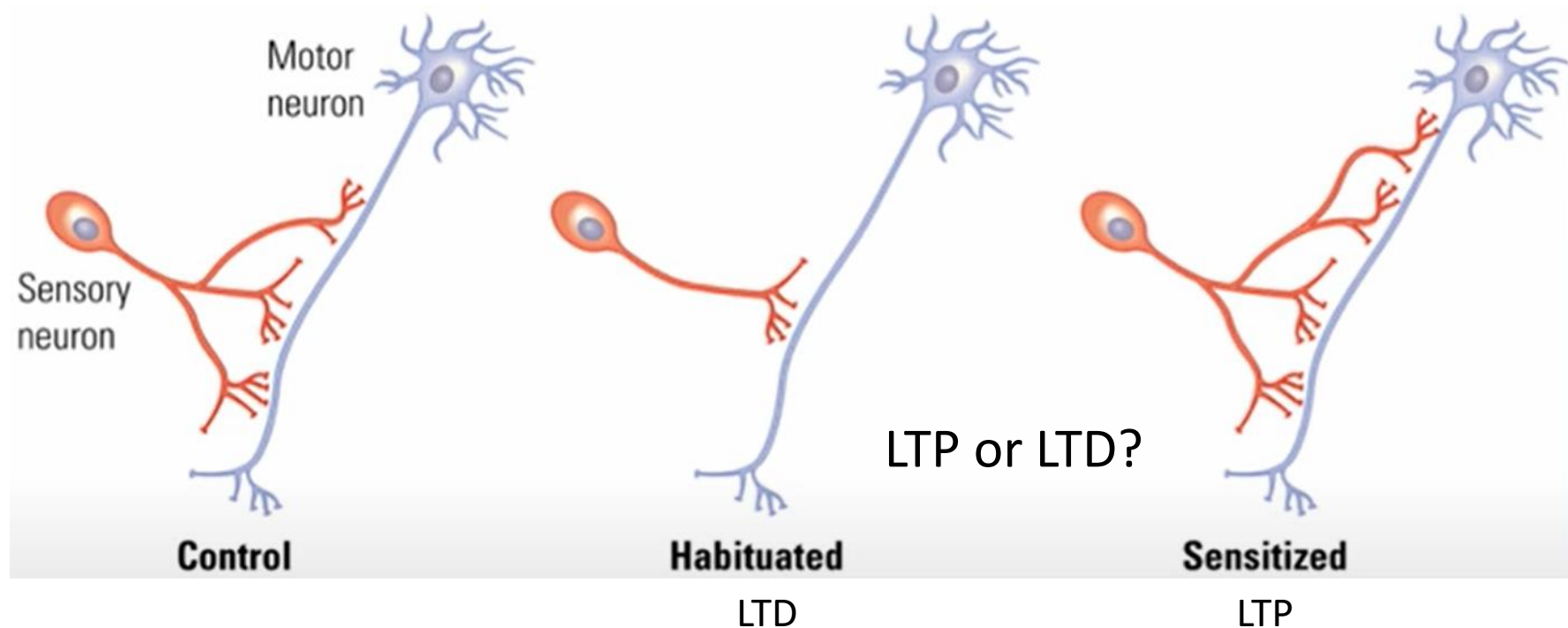
What behaviour do you exhibit?

Why?

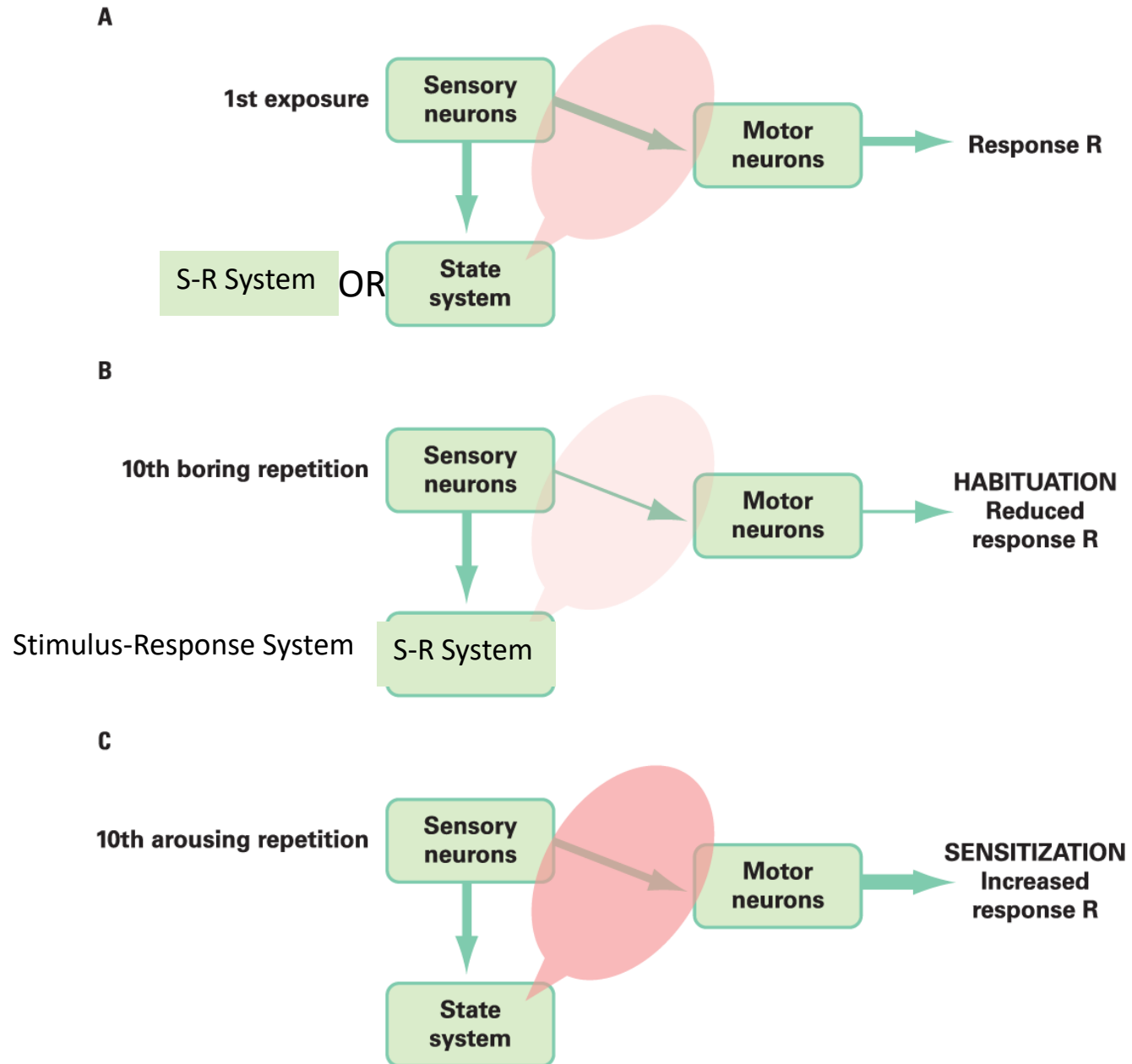
Unpleasant response or consequence in the past?

Sensitization

- Increased reaction/response to a stimulus after repeated exposure
- The receptors generate a greater response to the stimuli
- Increases stimulus-related arousal



Dual Process Theory



Habituation VS Sensitization

Which one?
Why?

- Past negative experience – sensitization
- Past neutral experience – habituation
- Illness/Health condition - sensitization

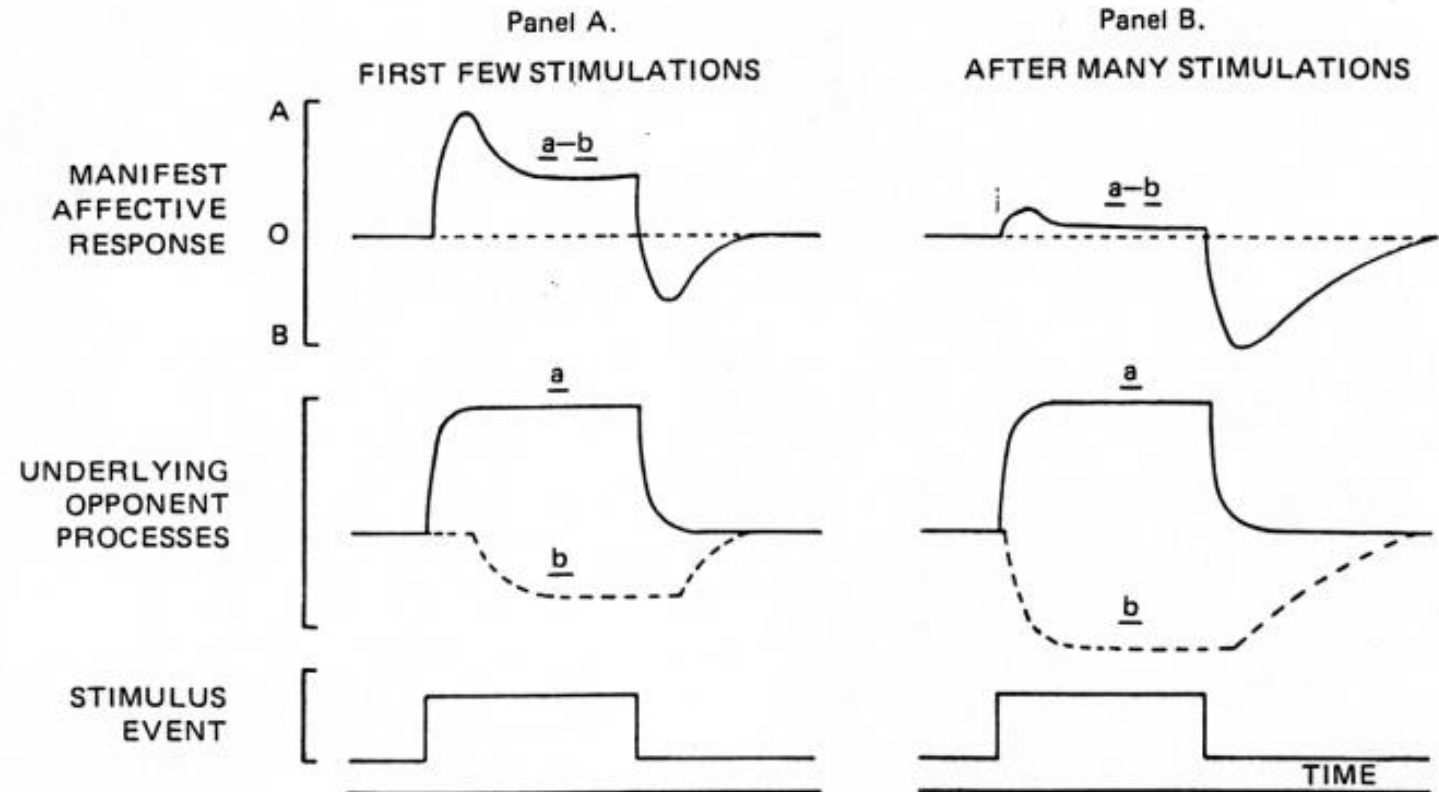
Opponent Process Theory

- Initial unpleasant experience can gradually turn to a pleasant experience or vice-versa

Addiction?

Similar mechanism

Sensitized → Habituated



Simple non-associative learning

- Habituation –
 - Specific to a stimulus
 - With repetition, response decreases
 - Can be localized in the brain
- Sensitization –
 - Similar stimuli can also trigger the behavioural response - can generalize to other situations or contexts
 - With repetition, response is sustained or increases
 - Not localized, involves many regions in the brain.

Complex Behavioural outcomes?

Habituation	Sensitization
Pros	Pros
Cons	Cons

At a behavioural level

- Habituation –
 - IIT campus was exciting for the first few days.....
 - Ignoring inflation
 - Apathy/Indifference towards politics
 - Indifference of police towards criminals (inhuman treatment)
- Sensitization – become more sensitive to people or context
 - Bullying
 - Domestic violence / Abuse/ Sexual harassment
 - Financial setback – more cautious with transactions

Visual Priming

2



RED

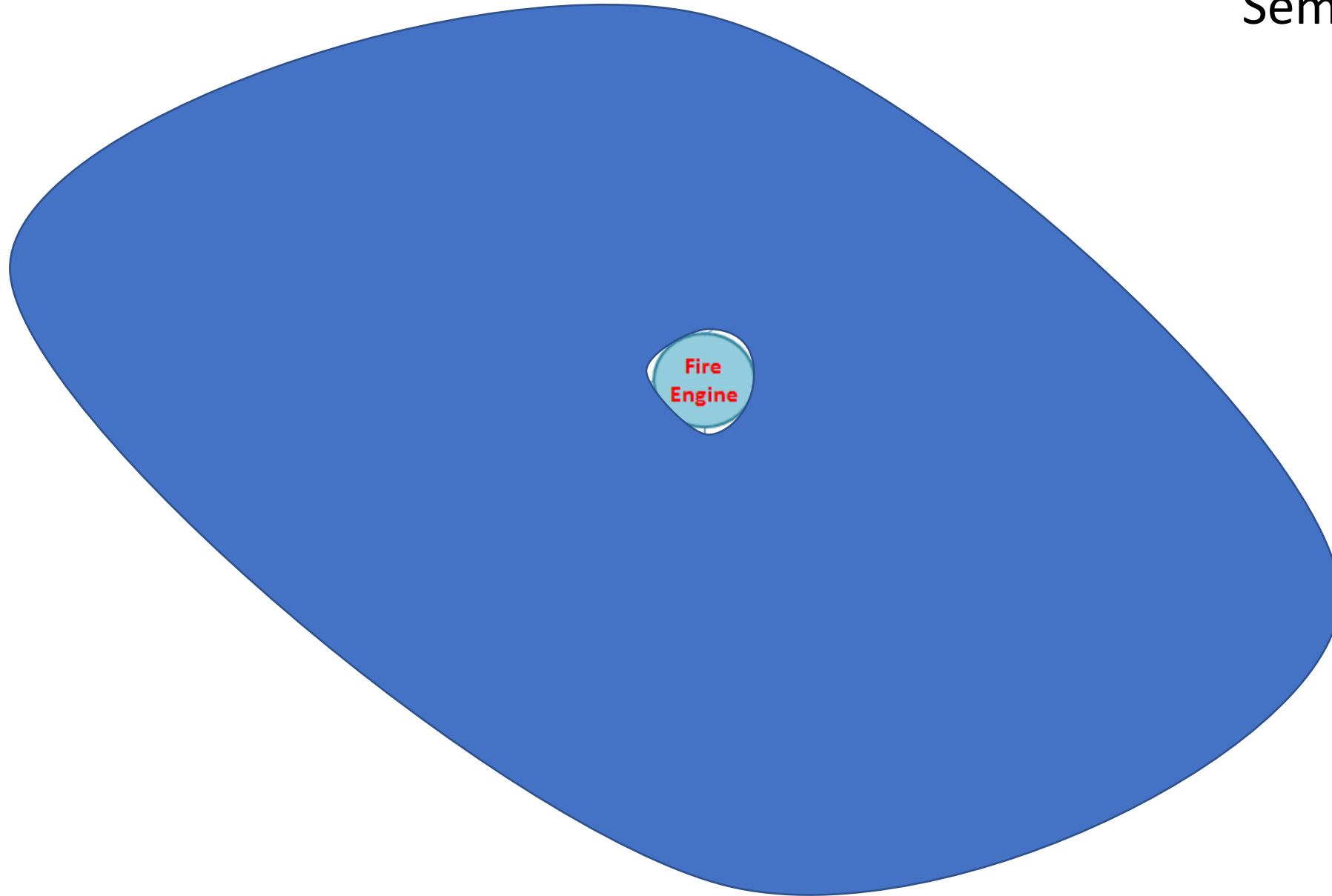
BLUE

ORANGE

YELLOW

GR_____

Semantic Priming



Priming

- **Priming:** a phenomenon in which prior exposure to a stimulus can improve the ability to recognize that stimulus later
- Priming can occur even in the absence of any feelings of familiarity or recognition that a stimulus was previously experienced
- Priming effects may persist much longer than recognition of past encounters

Familiarity to the stimulus or content is important for priming



You own a restaurant and a ordered too much French wine. A good way to psychologically prime your clients into buying this type of wine is to play French music in the background.

RESEARCH SUPPORT

Violent media increases the accessibility of aggressive thoughts and ideas, which in turn increases the likelihood of aggressive behavior. This is supported by research showing that exposure to violent media is associated with increased aggression in children and adults.

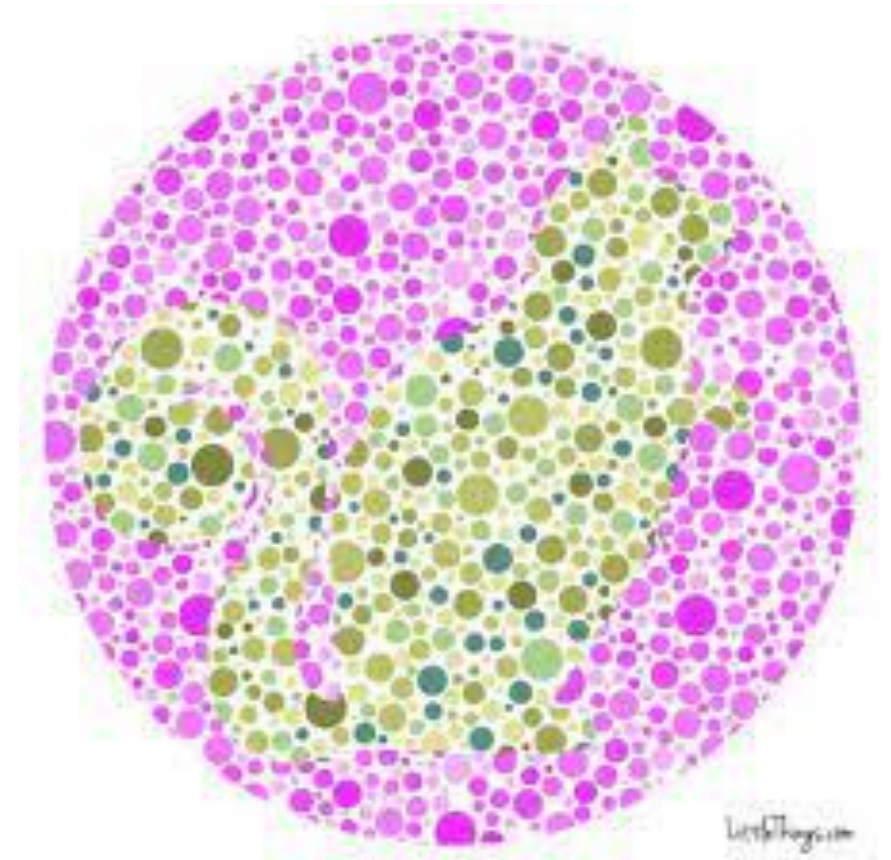
cognitive priming

refers to temporary increase in the accessibility of thoughts and ideas. for example, violent media activates thoughts or ideas about violence, which activate other aggressive thoughts through their association in memory pathways.




Perceptual Learning

- Learning in which repeated experiences with a set of stimuli make those stimuli easier to distinguish is called **perceptual learning**



☐

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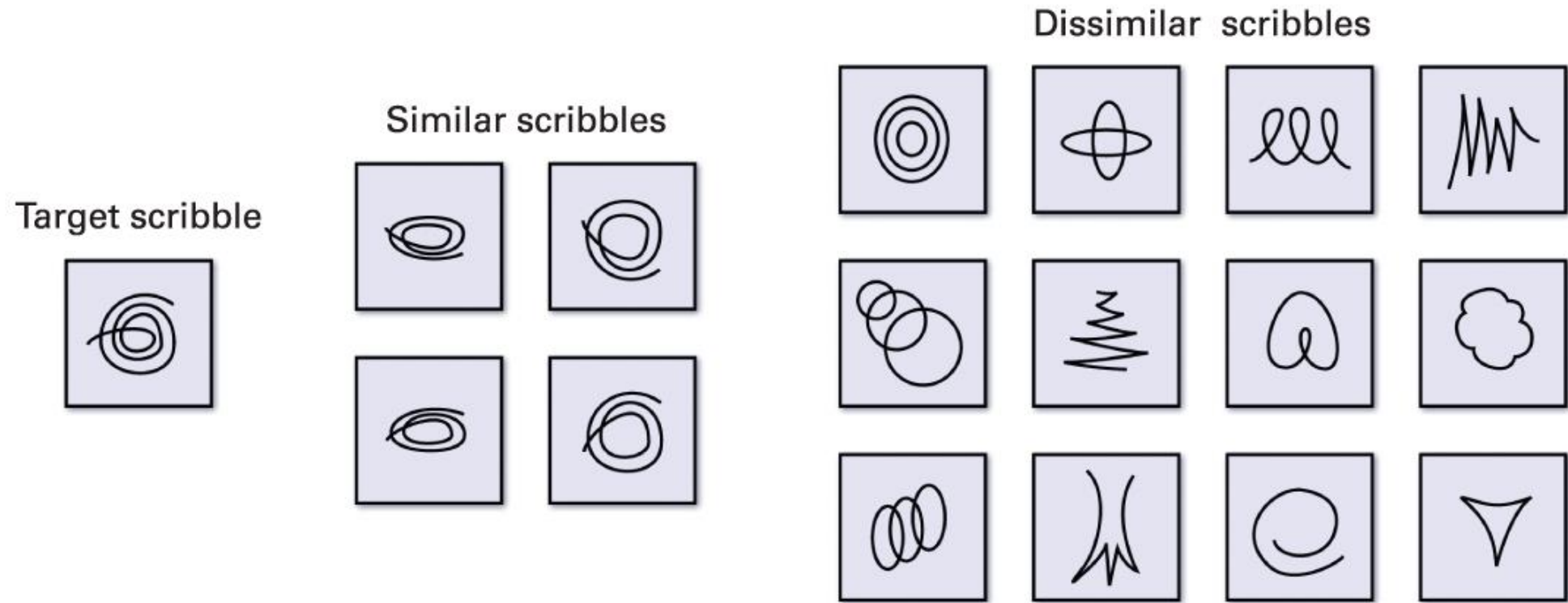


- Perceptual learning that happens without explicit training is sometimes called **statistical learning** because the percepts that individuals learn the most about are those that are experienced most frequently and consistently



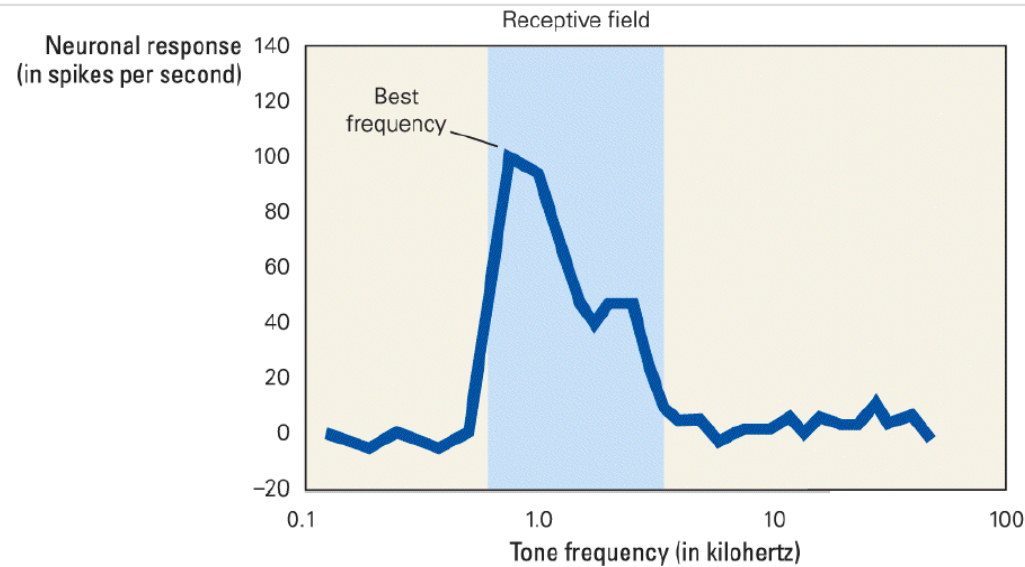
Identifying
sounds, smells,
visual, and tactile
information





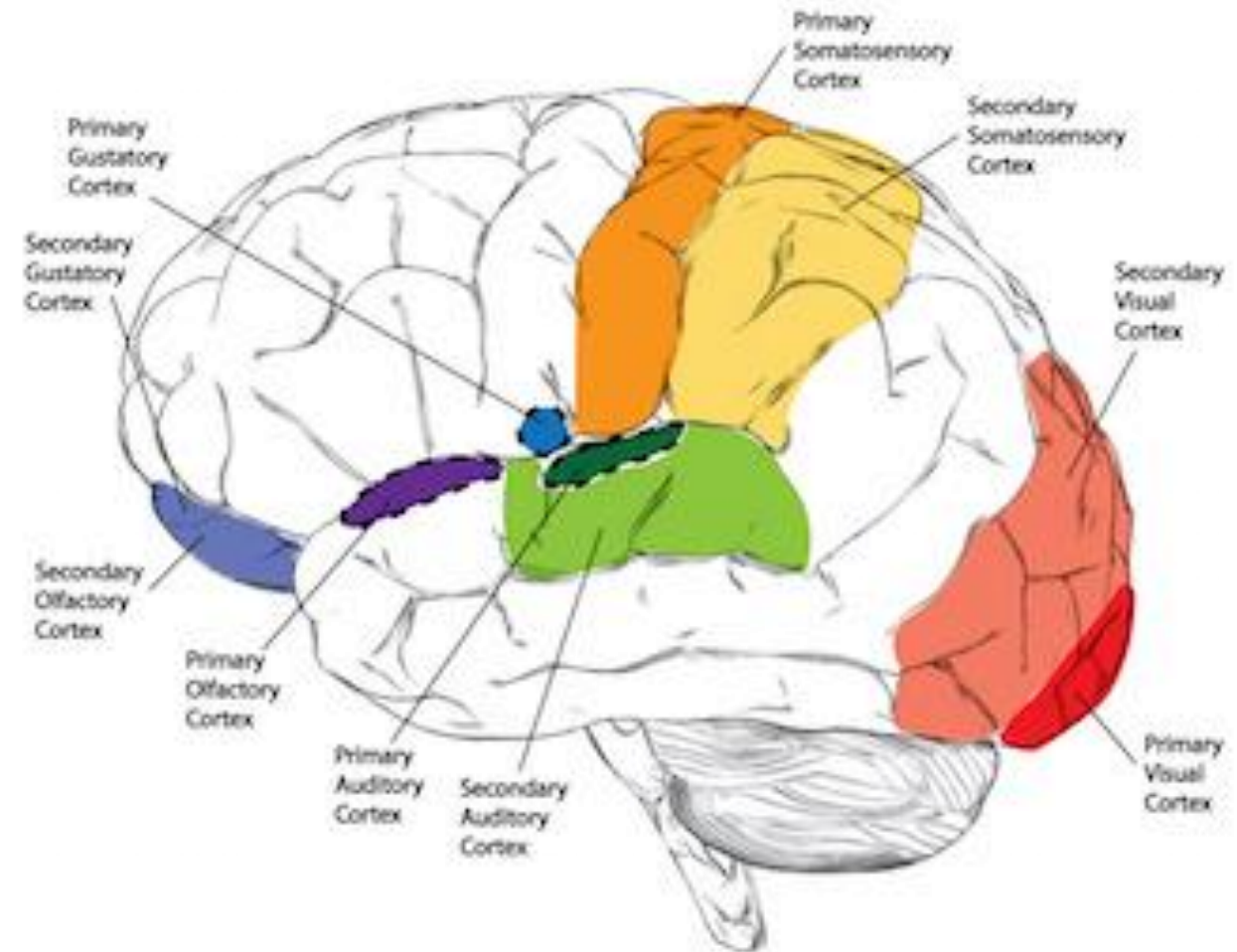
Response of a neuron

Similar response curves for other sensory neurons



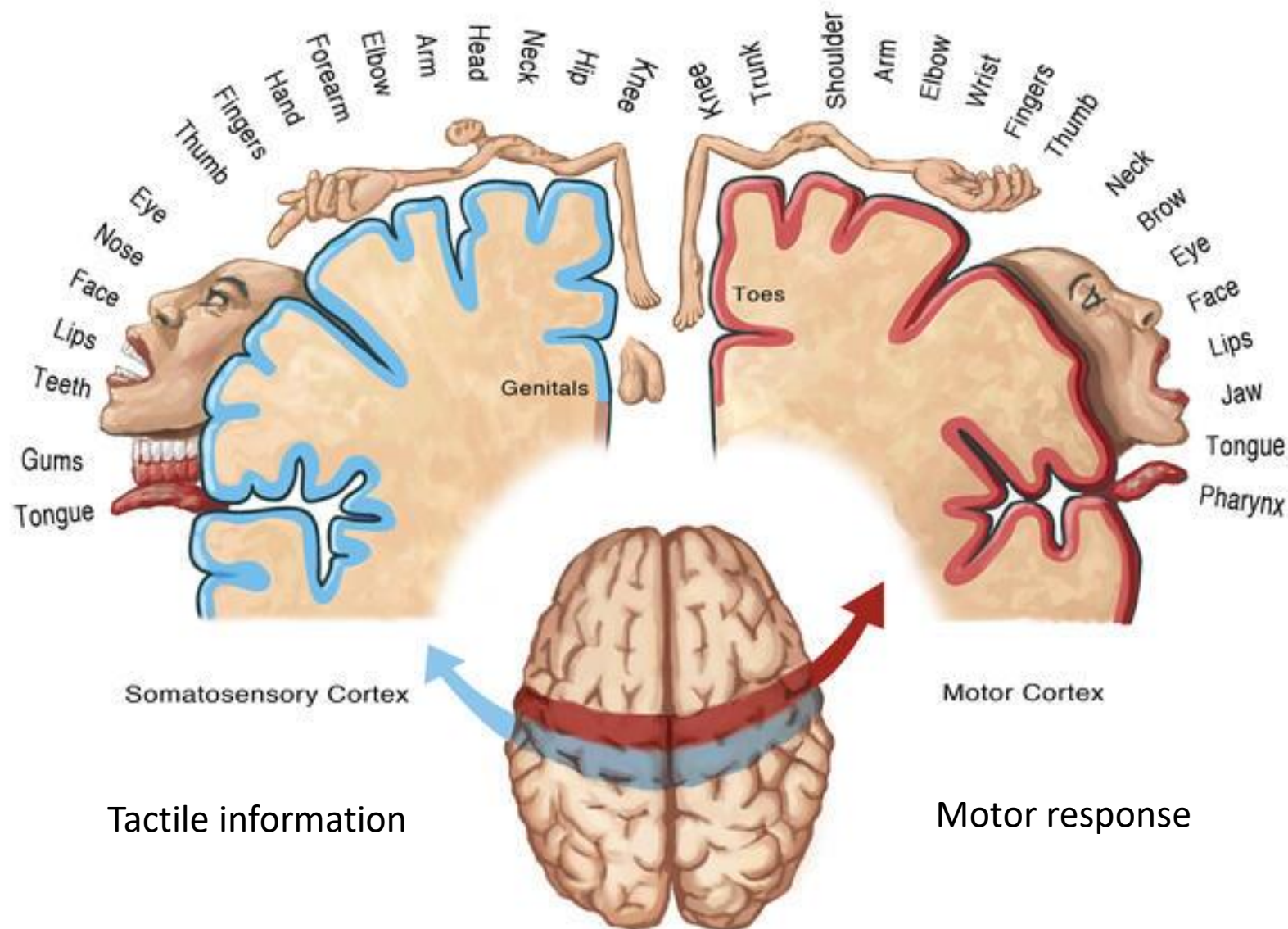
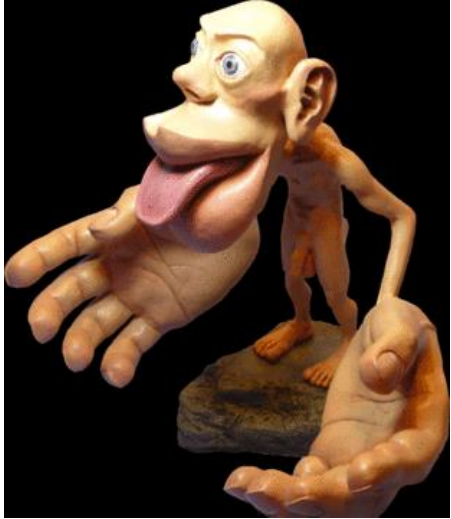
Gluck et al., *Learning and Memory*, 4e, © 2020 Worth Publishers

FIGURE 3.12 Receptive field of a neuron in the auditory cortex of a guinea pig Receptive fields are identified by measuring the amount of neural activity produced in response to different stimuli—in this case, to sounds ranging from 0.1 to 100 kilohertz (kHz). This neuron responds most to 0.9 kHz, but it also responds to a narrow range of similarly pitched sounds, and this range constitutes the neuron's receptive field.



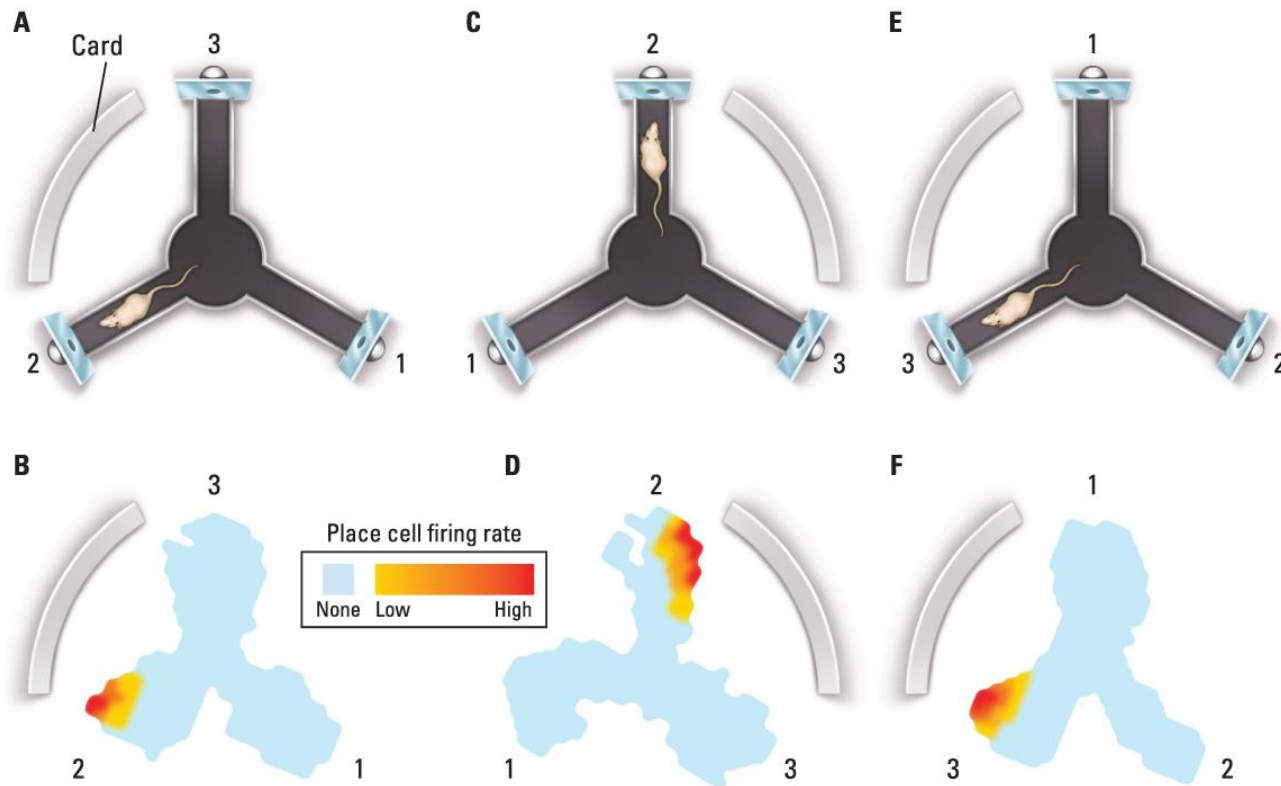
Homunculus – little man

Each hemisphere receives information from the opposite side of the body

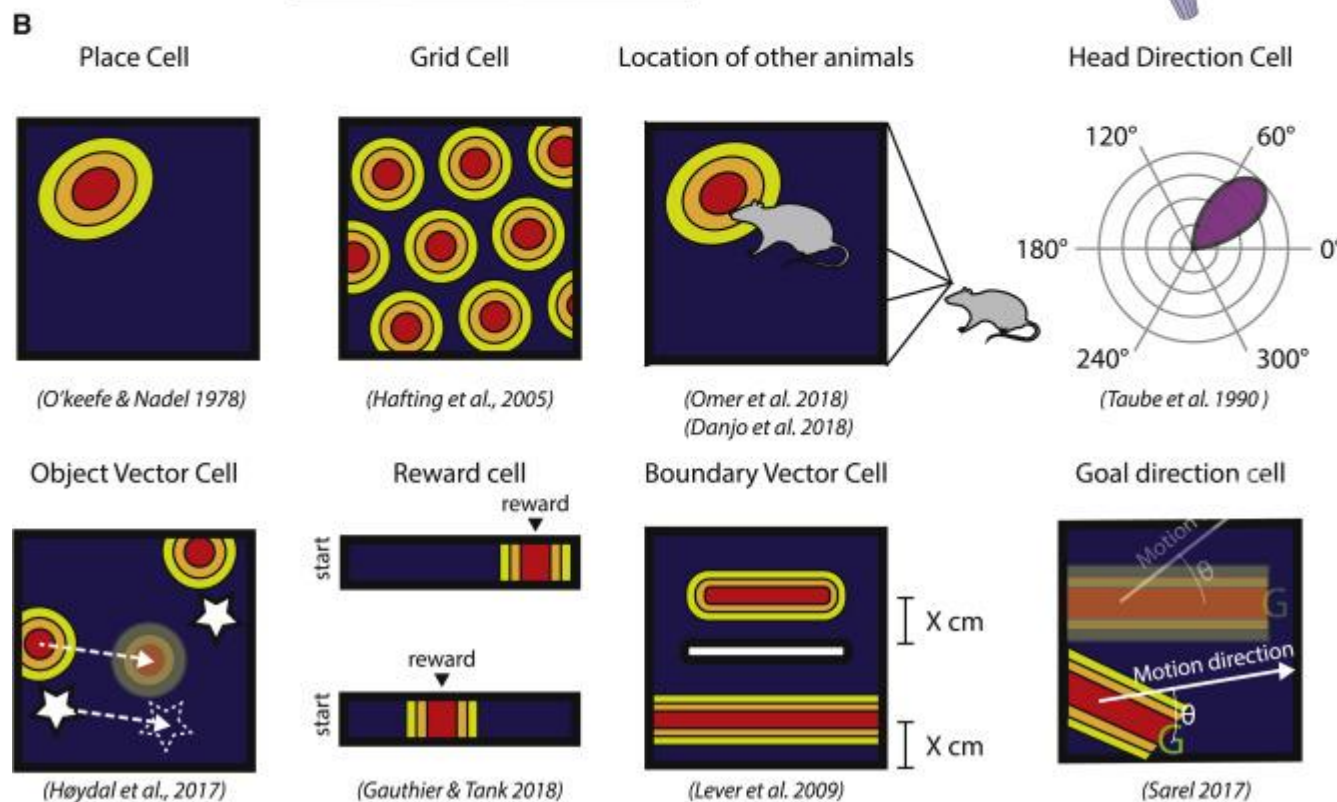
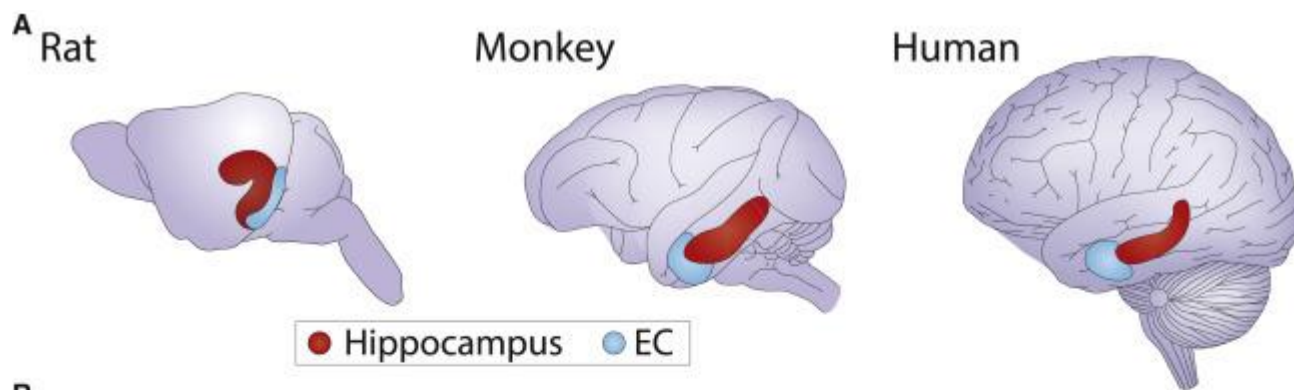


- Perceptual learning is similar to priming in that it leads to more effective processing on subsequent encounters with the stimuli
- Perceptual learning can happen even if the learner is not aware that her sensitivities to perceptual differences are increasing
- Current theories suggest that the seemingly different phenomena of habituation, sensitization, and perceptual learning depend on similar (or identical) learning mechanisms

Spatial Learning



Effects of a Visual
Landmark on the Place
Field of a Rat's Neuron



- John O'Keefe coined the term **place cells** to refer to neurons with such spatially tuned firing patterns
- Noble Prize 2014 – Human GPS

Examples of cell types with spatial tuning in the hippocampus and in Para-hippocampal cortices.

Grid cells fire in multiple spatial locations that form a triangular 'grid' of the environment

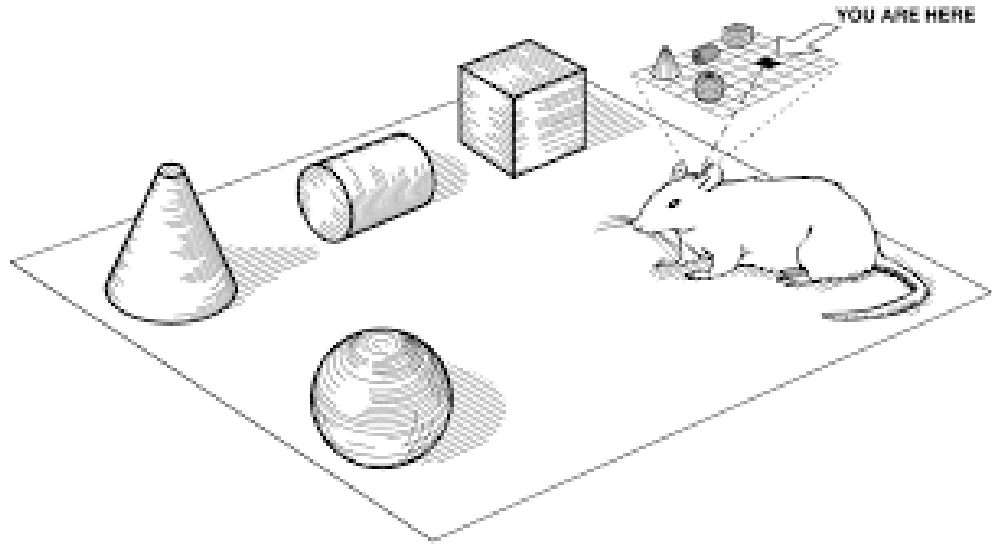
Head-direction cells fire throughout the environment but only when the animal is facing a specific direction.

Conjunctive cells fire in a triangular grid pattern only when the animal is facing a specific direction.

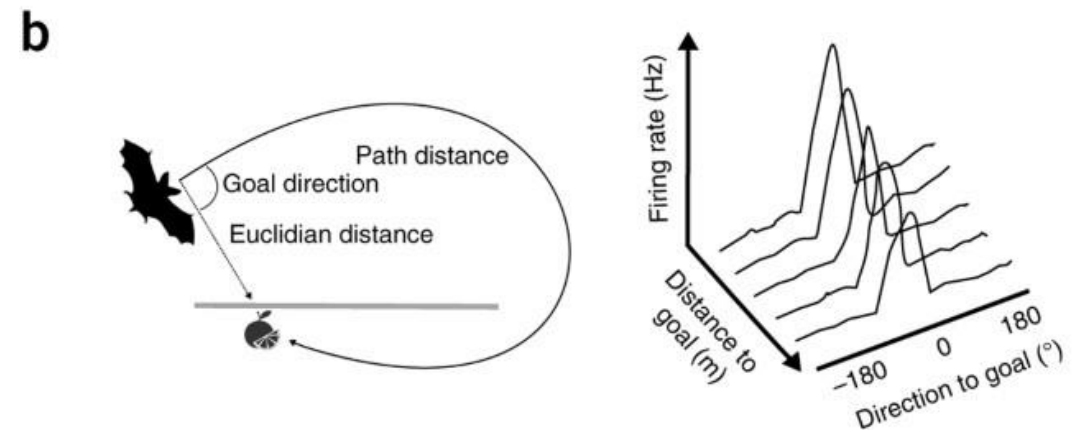
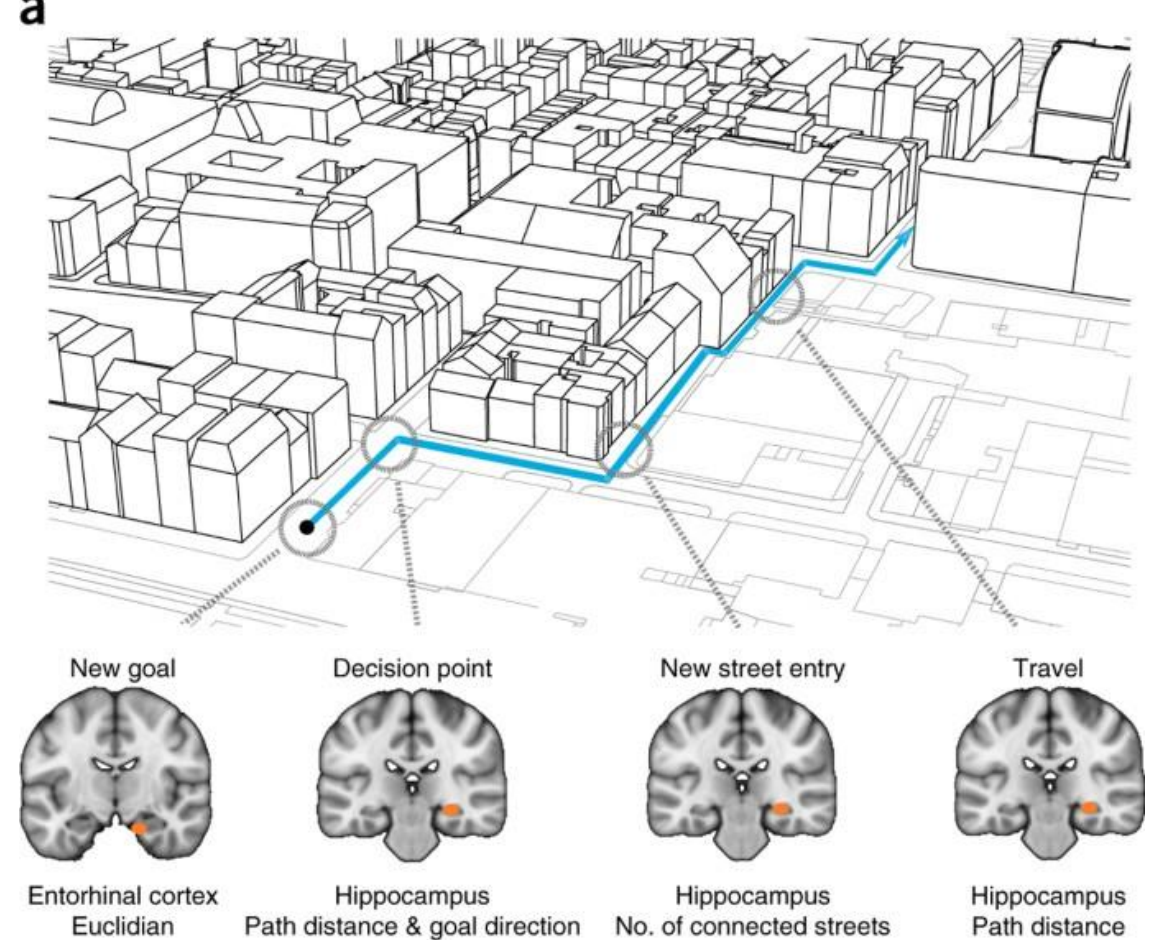
Boundary/border cells fire when the animal is located at a specific distance from a wall in the environment.

Place cells generally fire in a single or few locations within the environment, independent of the animal's head direction in the open field. These cells are found in the dentate gyrus, CA3, and CA1 of the hippocampus.

Spatial navigation – cognitive map



Map showing an example street journey in London. At various points in the journey, entorhinal cortex codes the Euclidean distance to the goal while the right posterior hippocampus codes path distance and an interaction between goal direction and path distance, as well as a more complex aspects of environment, such as how many other streets a given street is connected with



- So the hippocampus is processing spatial information and crucial for forming memories
- What exactly is it doing?

Learning and Memory Processes That Can Be Engaged by Repetition

Process	Example
Habituation	After repeated trips on airplanes, you no longer notice when babies start crying.
Sensitization	After repeated trips on airplanes, you start pulling out your hair when babies start crying.
Familiarization	Passing the same person on your walk every day leads to a feeling of familiarity when you see her.
Priming	You see a commercial for junk food and later crave junk food as a result, without recalling the commercial.
Perceptual learning	You work for a year at a coffee shop and learn to identify brands of coffee from their odors.
Spatial learning	You work at a coffee shop and become able to tell customers where to find specific brands of coffee.

→ Long term effects

- Higher stress / anxiety
- Sensitive to minor stressful events

- Is there a common underlying phenomenon in the types of learning discussed so far?

Repetition learning works in our subconscious, and these processes are almost always unnoticeable to the subject.

