

# **SENSATION & PERCEPTION**

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The Construction of Reality

# THE MACHINE VS. THE MIND

1958: The Perceptron. Frank Rosenblatt's 5-ton invention attempted to replicate perception but struggled with simple shapes. //

Today: Computer vision still falters on context, confusing objects that humans distinguish instantly.

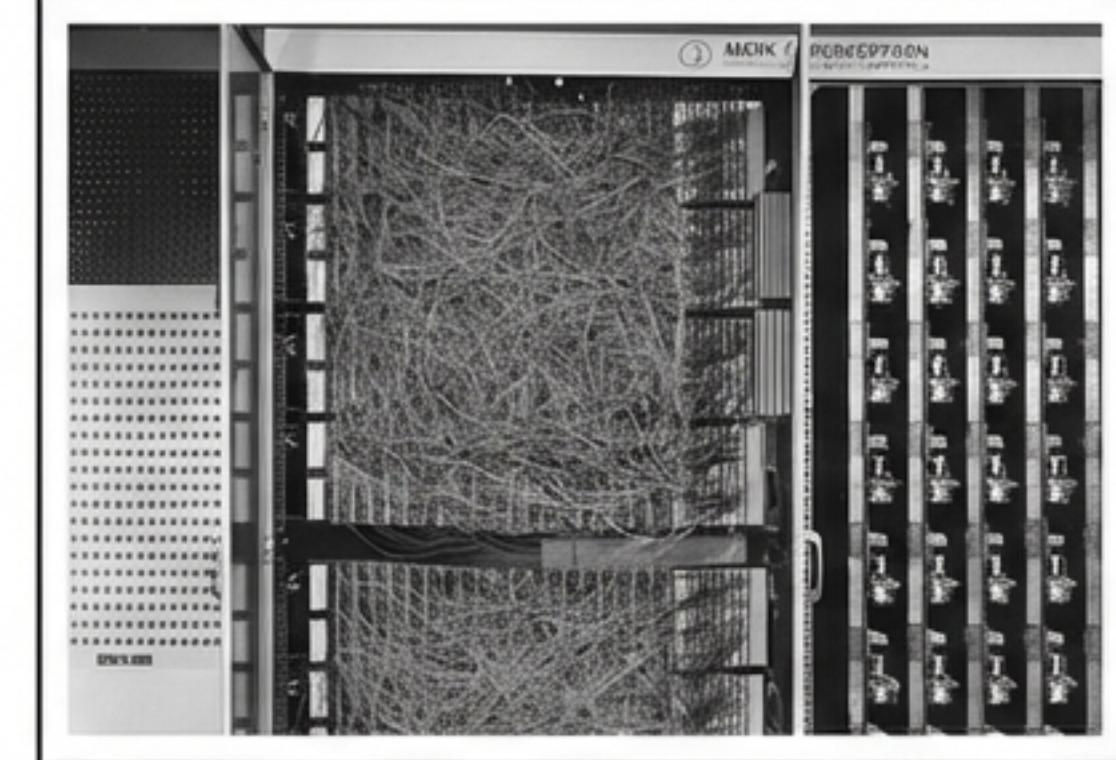
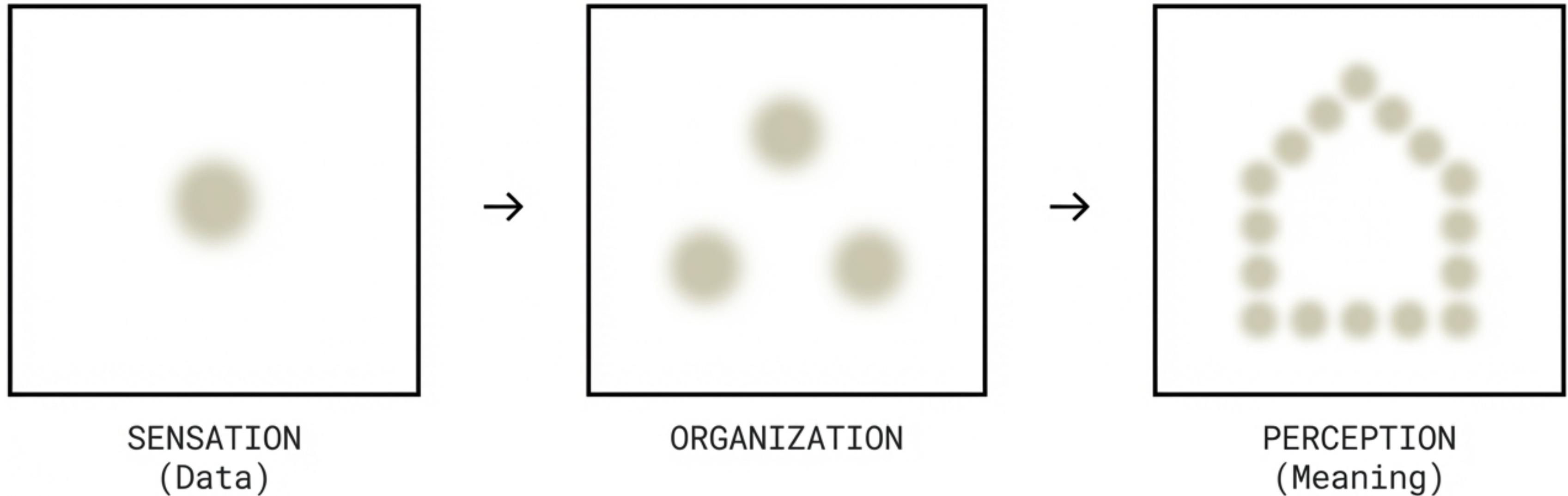


Exhibit A: Hardware



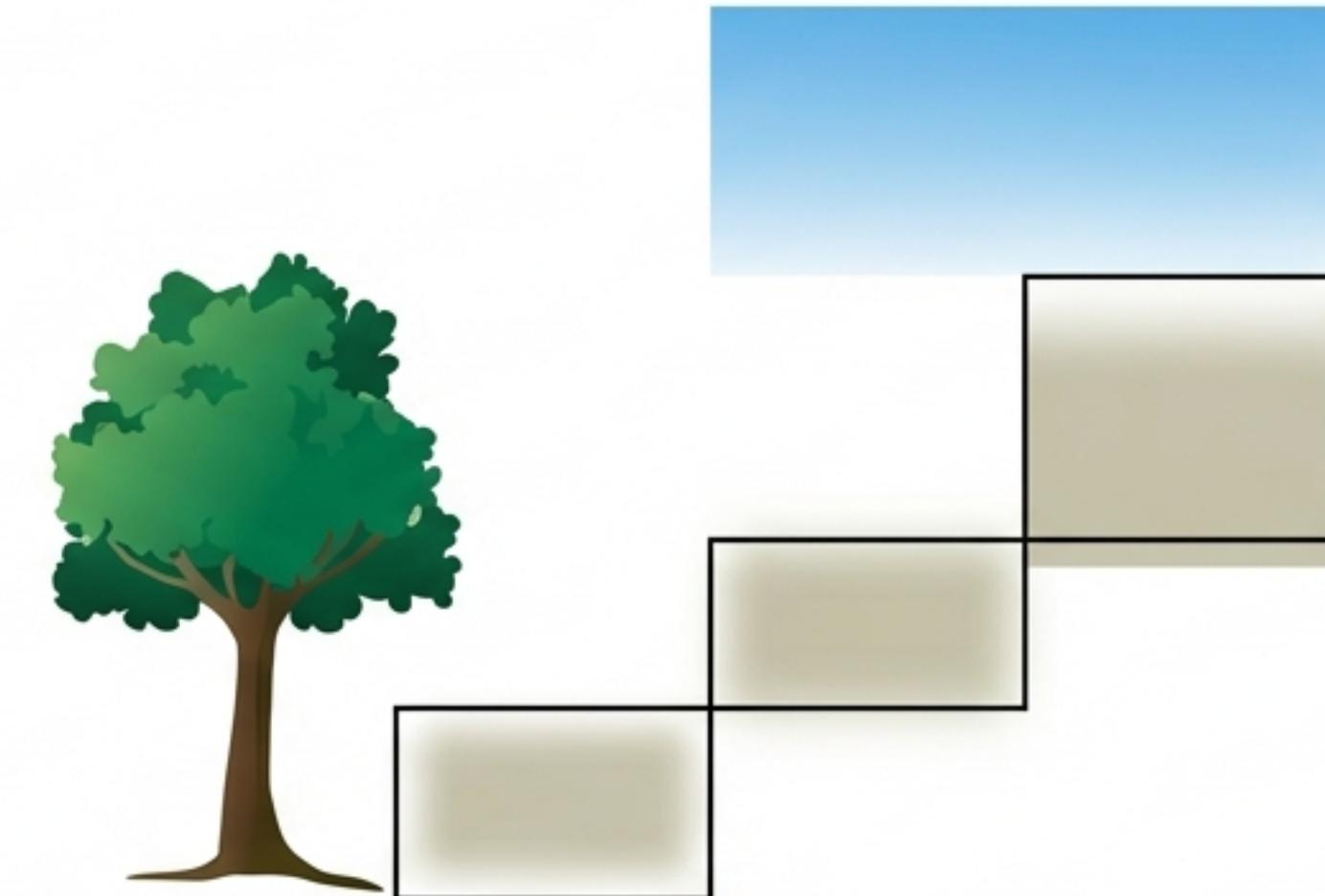
Exhibit B: Software Failure

# FROM DATA TO MEANING



Perception is a continuum. Is a dot just a dot? Or is it the corner of a house?

# THE PERCEPTUAL CYCLE: STEPS 1 & 2



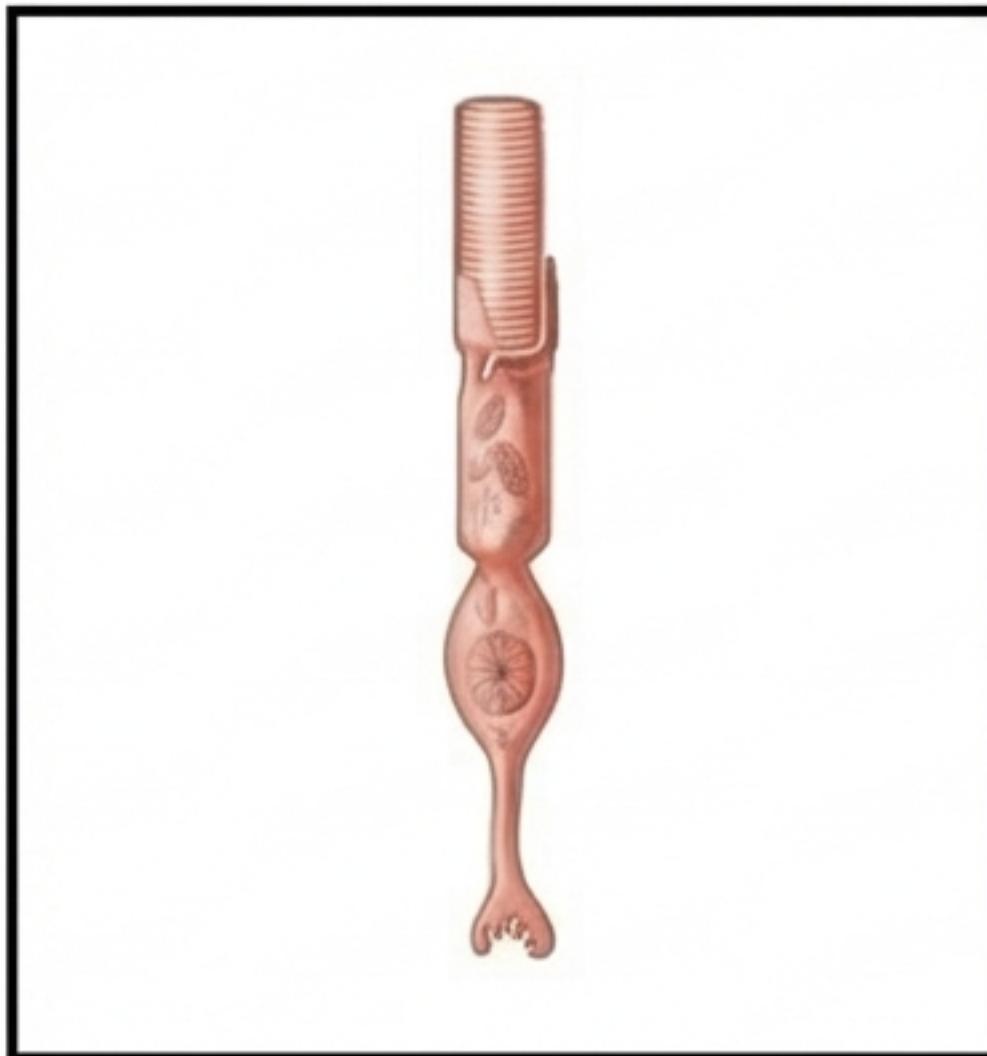
1. Distal Stimulus

## 2. PROXIMAL STIMULUS:

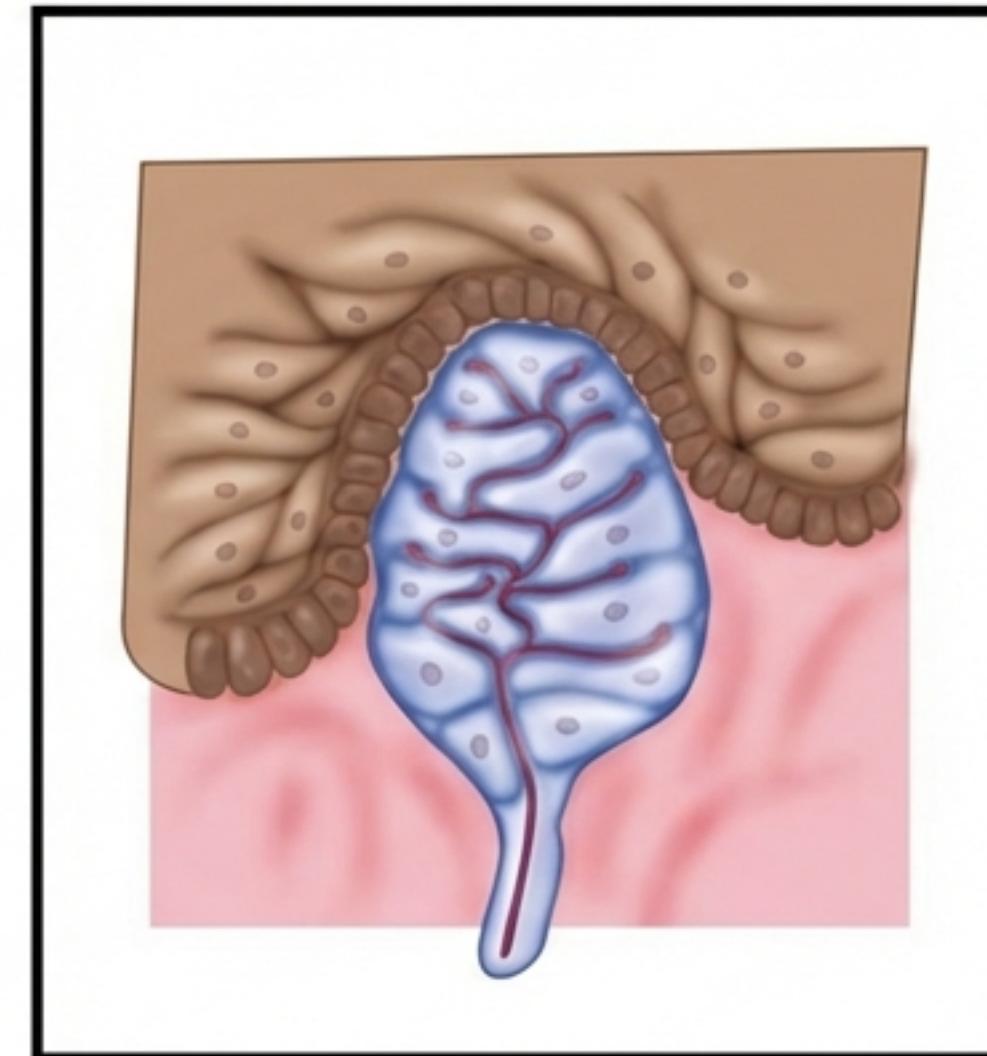
The representation of the object on the receptors.

# TRANSDUCTION: THE BRIDGE

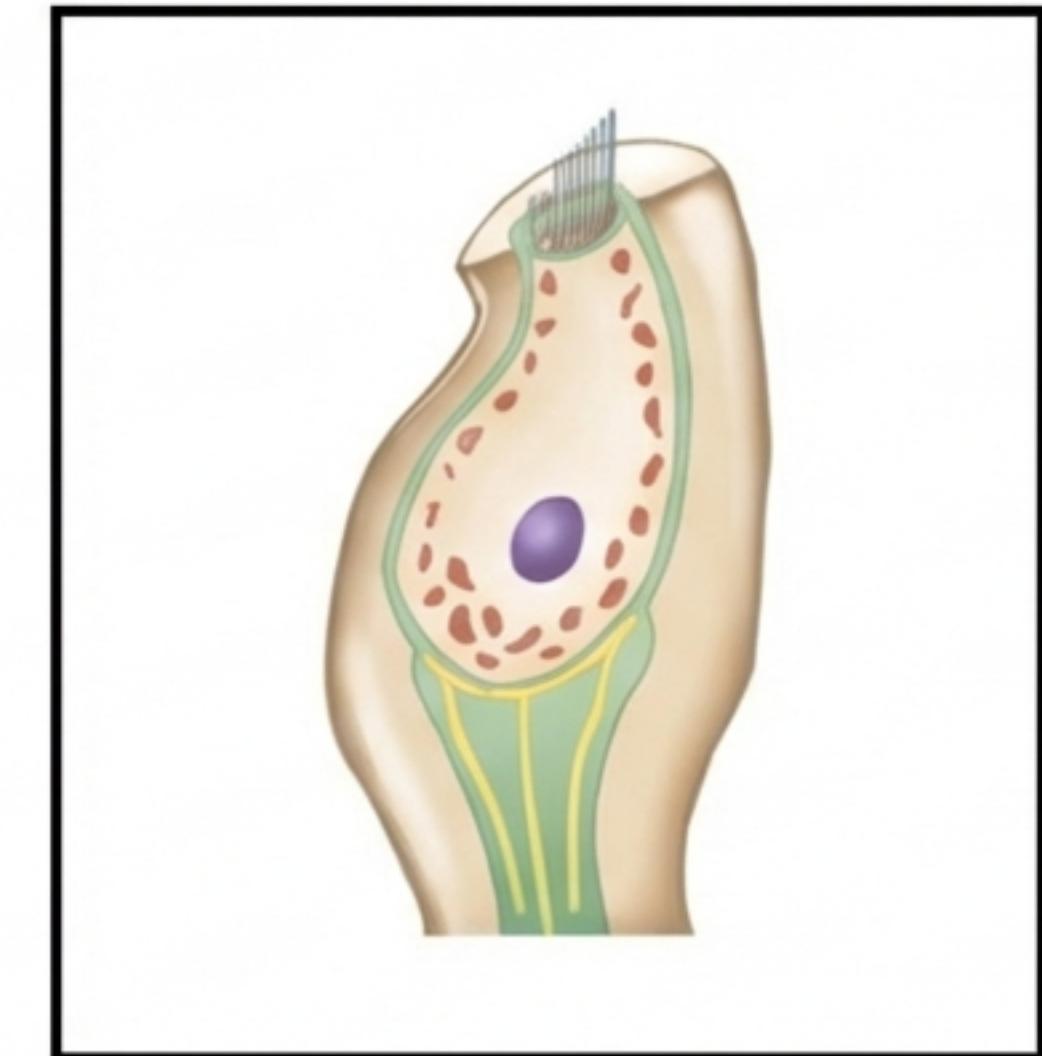
Step 3: Converting environmental energy into electrical signals.



VISION  
(Light Energy)



TOUCH  
(Mechanical Pressure)

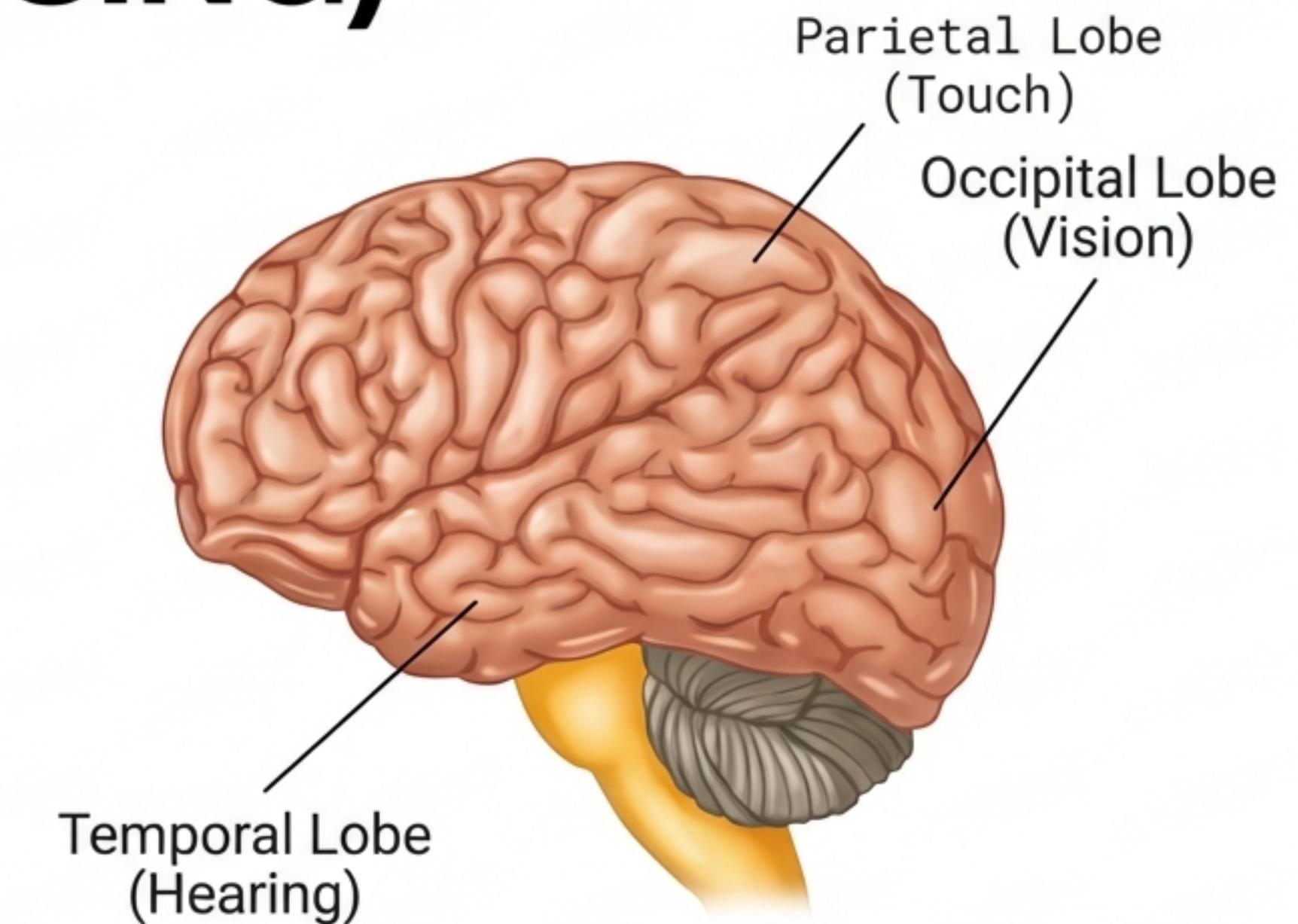


HEARING  
(Air Pressure Changes)

# THE COMPUTER (NEURAL PROCESSING)

## Step 4: Processing.

Signals are transmitted, reduced, and amplified.



# PERCEPTION VS. RECOGNITION

The Case of Dr. P (Visual Agnosia)



Dr. P saw the form  
(Perception) but could  
not identify the  
object (Recognition).

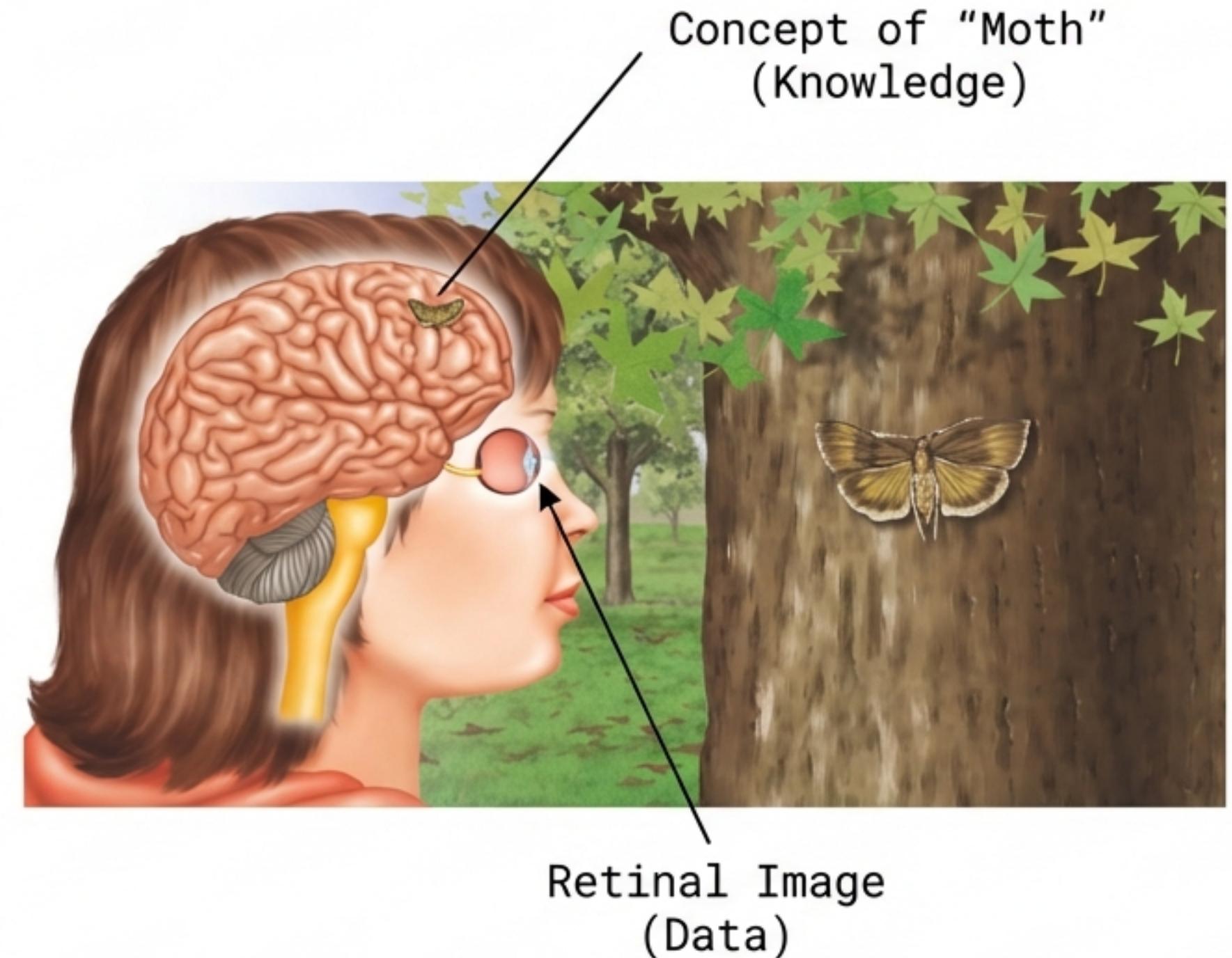
"A continuous surface unfolded on itself...  
with five out-pouchings." - Dr. P

# TOP-DOWN PROCESSING

Bottom-up processing  
relies on incoming  
data.

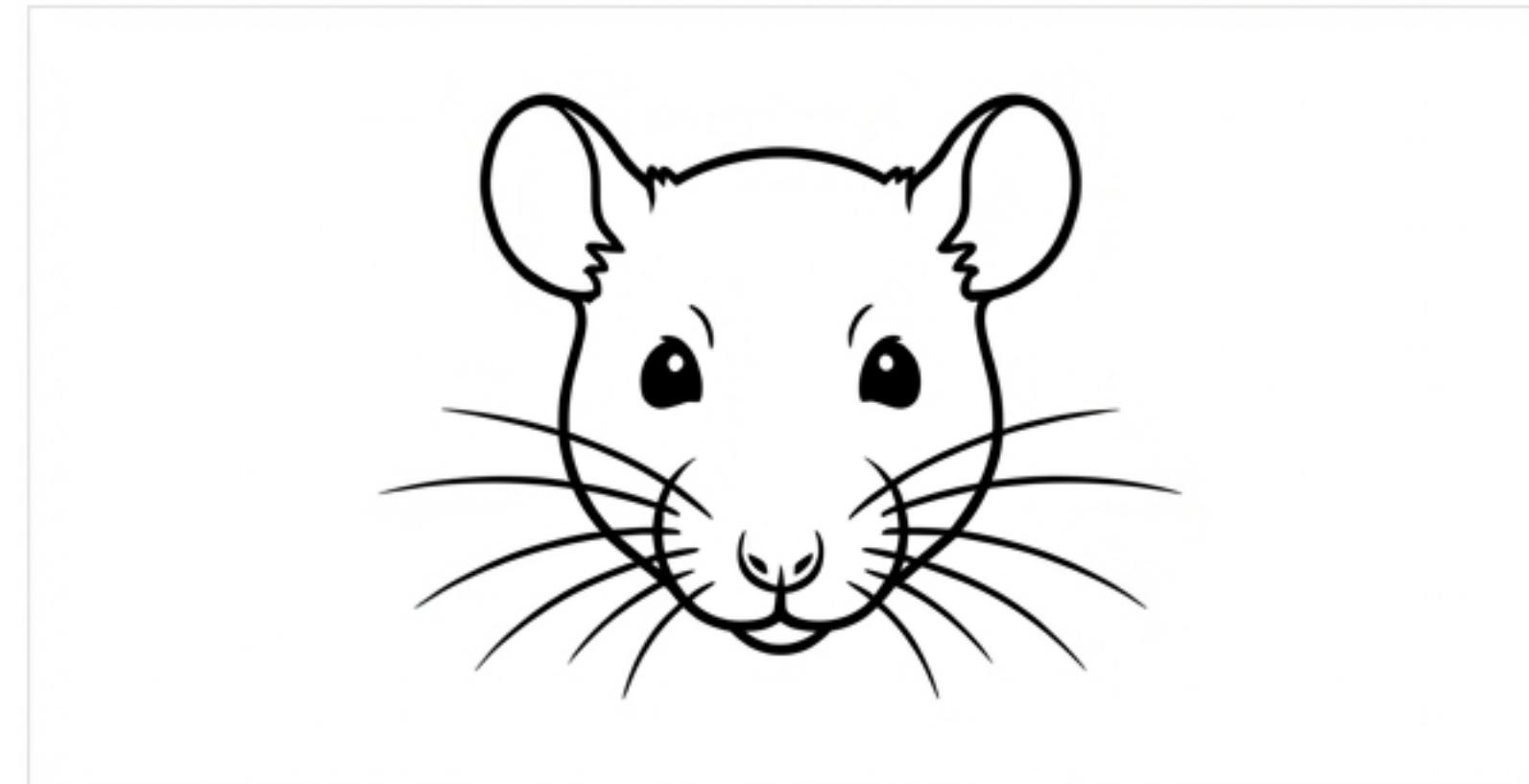
Top-down processing  
relies on previous  
knowledge.

We see what we expect  
to see.



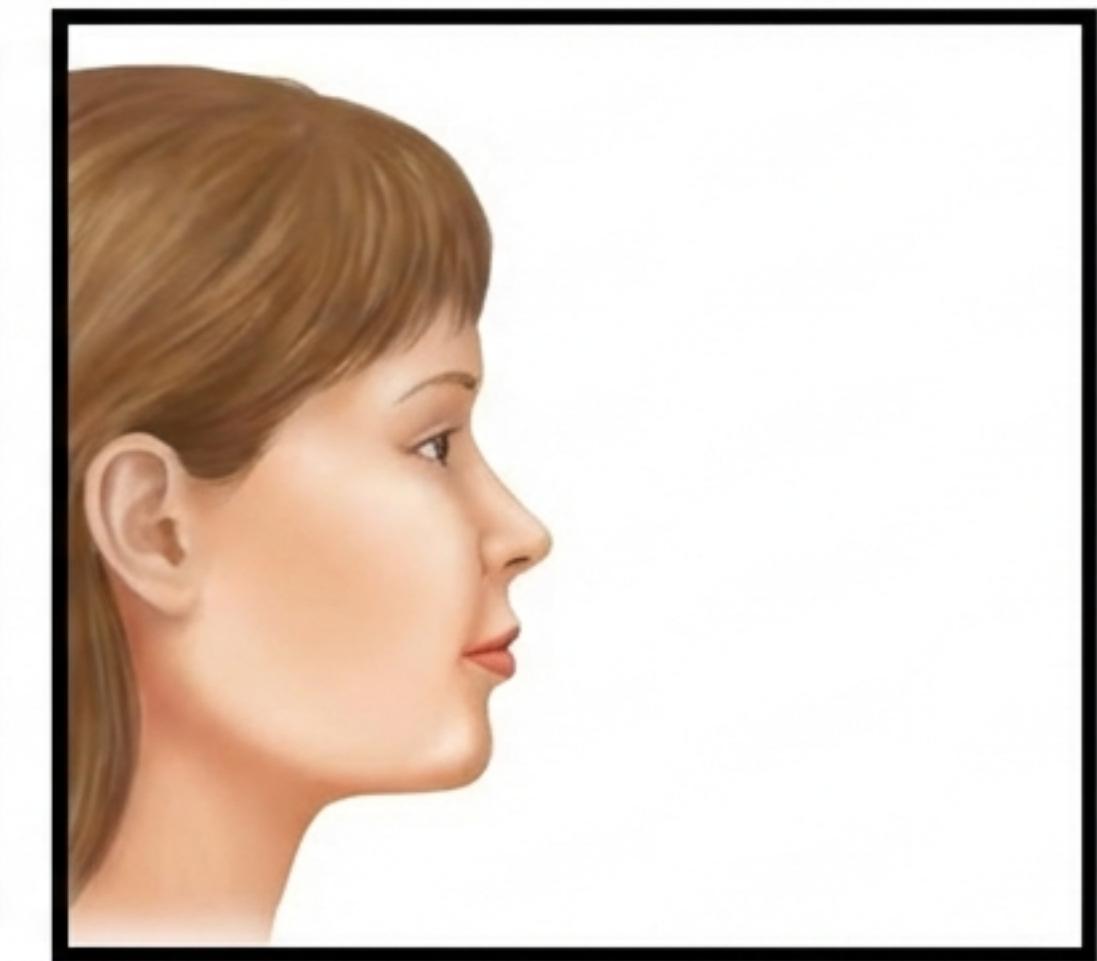
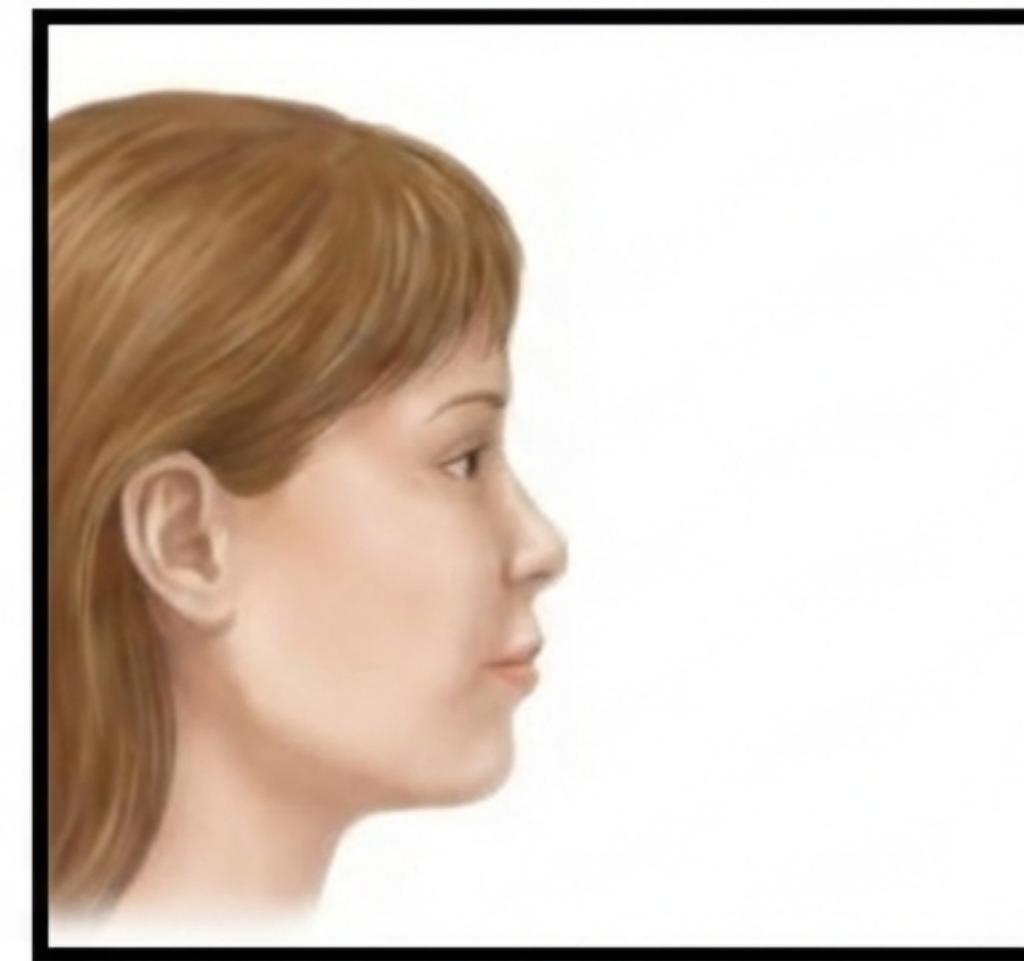
# PRIMING THE MIND

## The Rat-Man Demonstration



Knowledge primes perception.

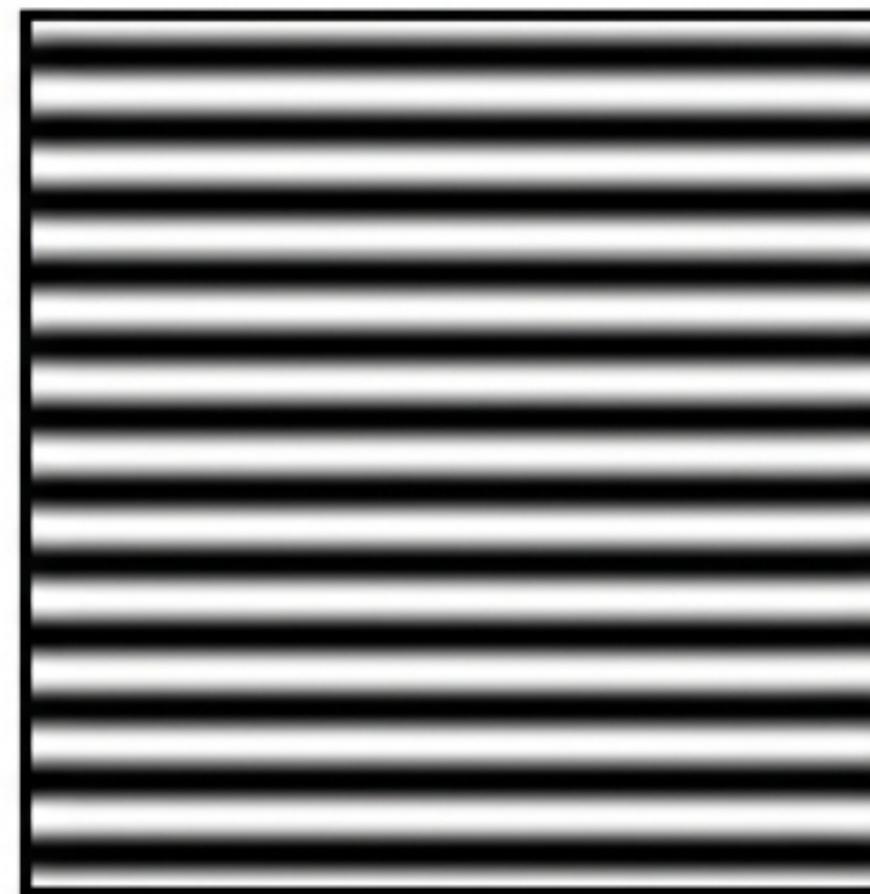
# FIGURE & GROUND



The brain struggles to decide: What is the object (Figure) and what is the background (Ground)?

# PSYCHOPHYSICS: MEASURING ACUITY

**The Oblique Effect:** Humans detect vertical and horizontal lines more easily than angled ones.



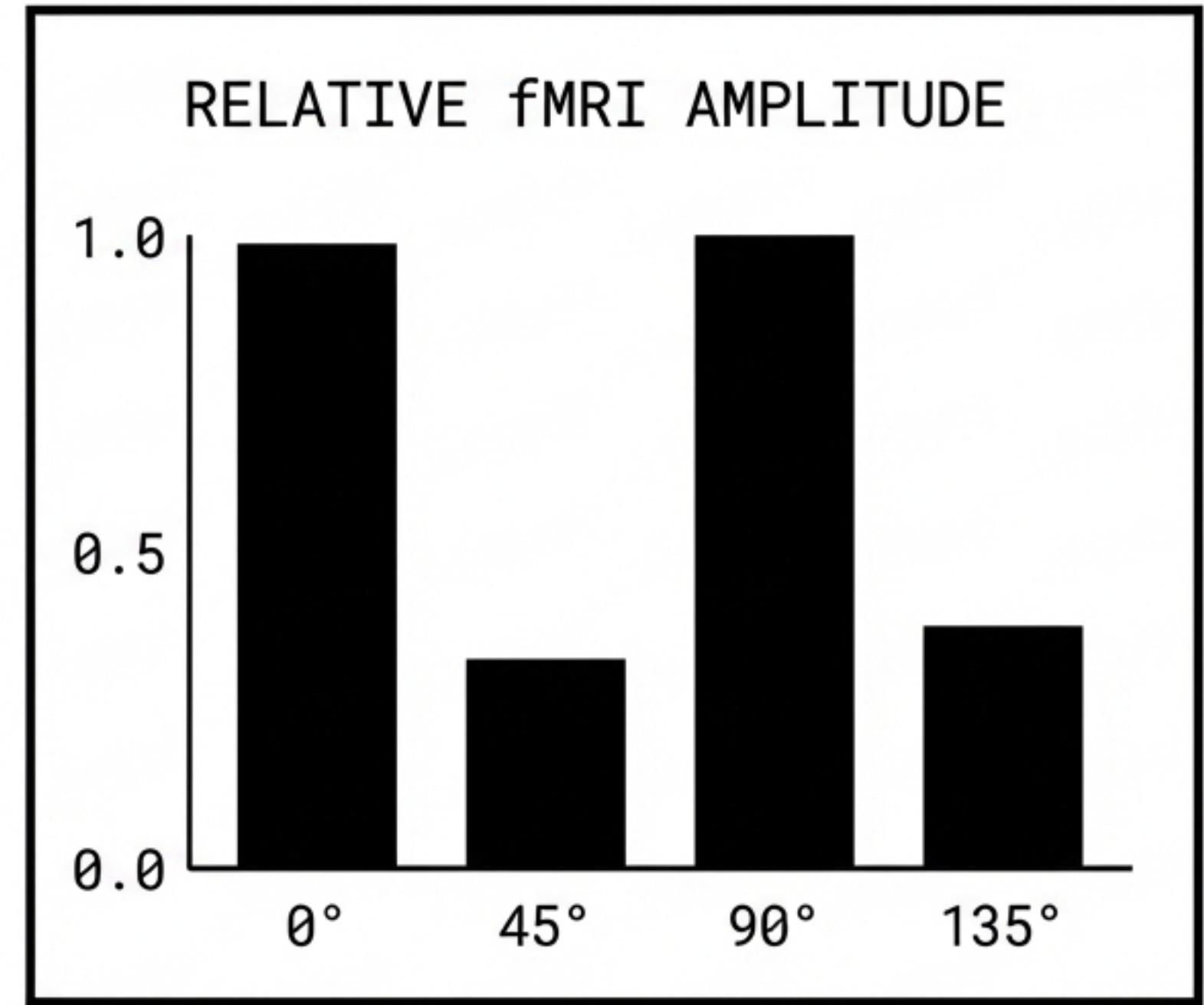
Stimulus A: High Visibility



Stimulus B: Low Visibility

# MEASURING PHYSIOLOGY

Optical brain imaging reveals that vertical orientations trigger larger brain responses.



Neural activity matches behavioral sensitivity.

# THRESHOLDS & ADAPTATION

Perception is time-dependent.



Time = 0 min (High Threshold)



Time = 20 min (Low Threshold)

# THE GIST OF THE SCENE

We categorize scenes instantly ('It is a harbor'), but details take time.



# ATTENTION & REACTION

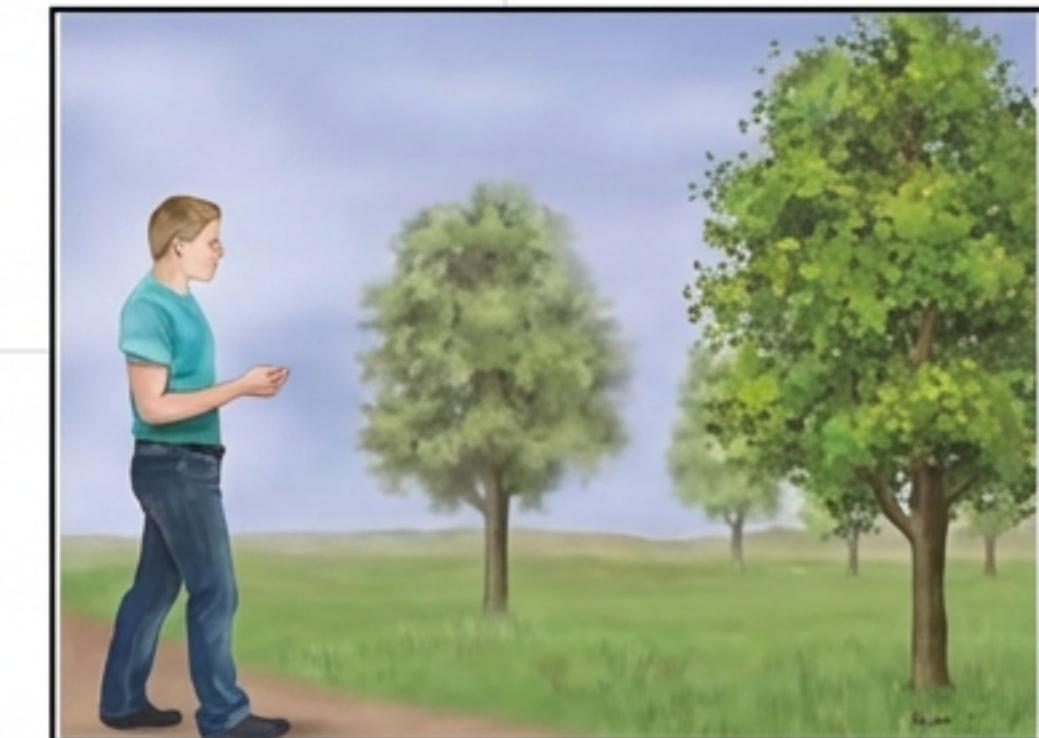
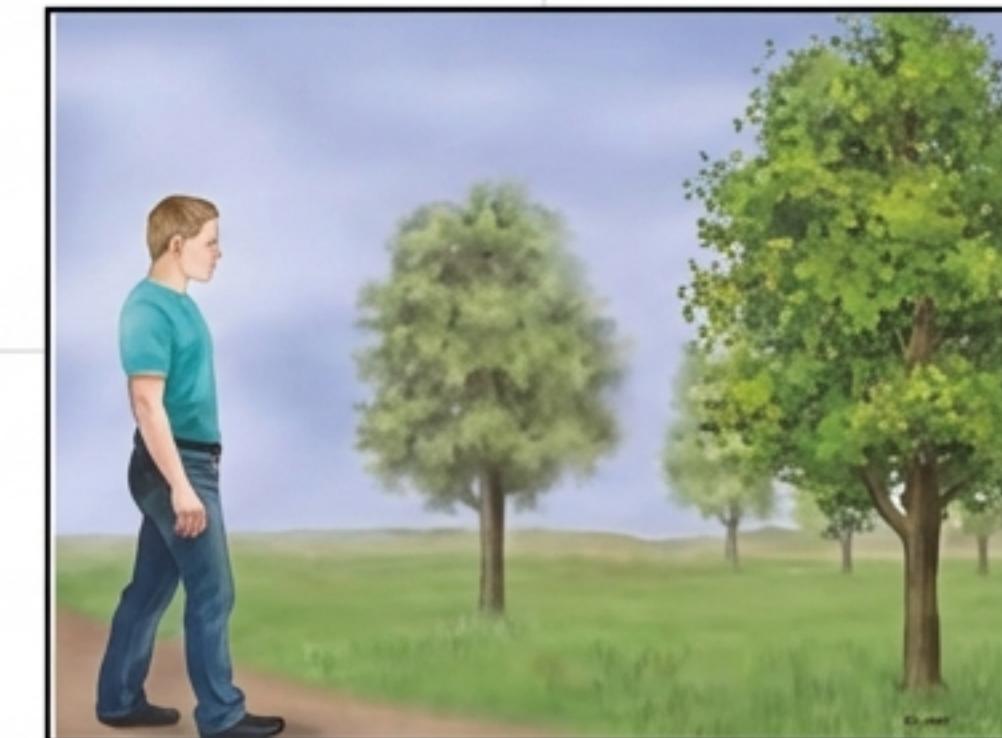
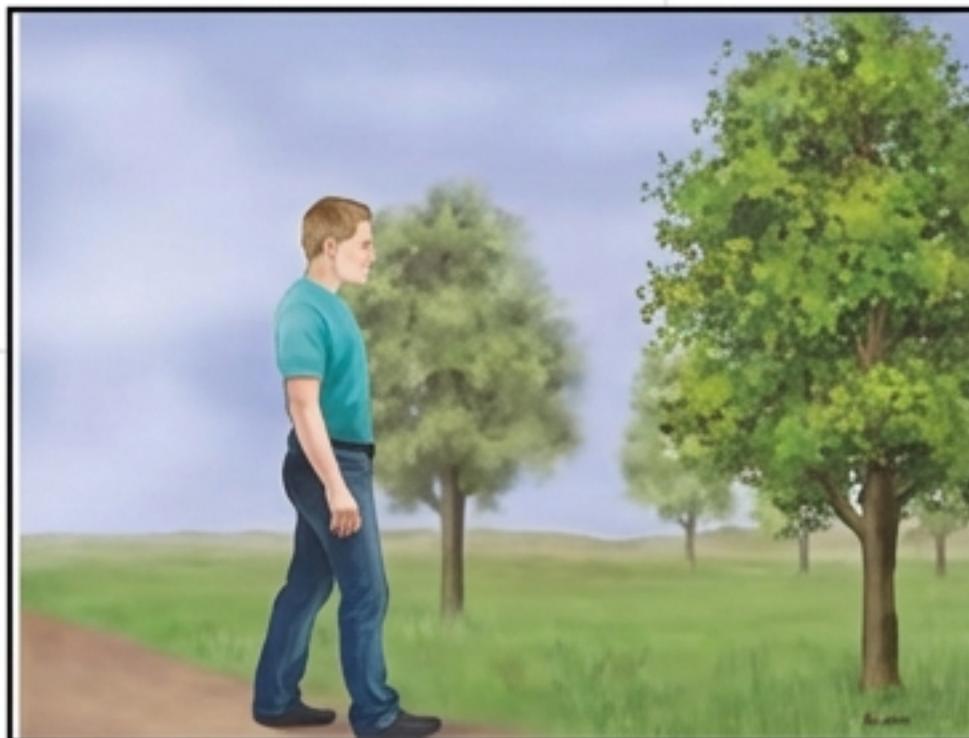
Roboto Mono Reaction times are faster when attention is focused on the target location.



Posner Cueing Task Schematic

# PERCEPTION IN MOTION

We move to perceive. As we approach, the proximal stimulus changes.



The Action-Perception Loop

# CASE STUDY: SOUND

## Physics vs. Perception

1. PHYSICAL DEFINITION: Pressure changes in the air (Waves).
2. FREQUENCY (Hz) -> Pitch.
3. AMPLITUDE (dB) -> Loudness.
4. PERCEPTUAL DEFINITION: The experience we have when we hear.

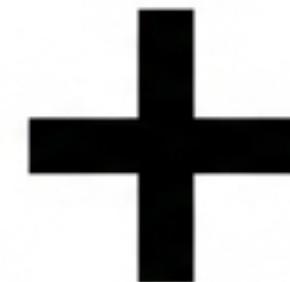
If a tree falls in the forest... Physically: YES. Perceptually: NO.

# INTENSITY VS. BRIGHTNESS

Perception is non-linear. Doubling the physical intensity does not double the perceived brightness.



Intensity = 10

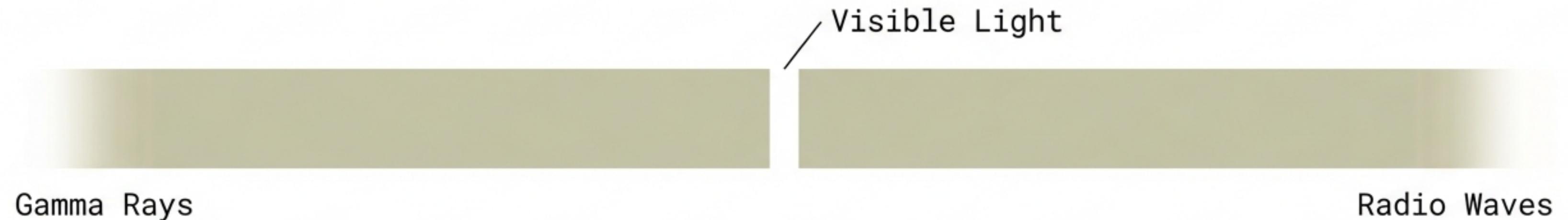


Intensity = 20

**Perceived Brightness  $\neq$  2x**

# THE LIMITS OF PERCEPTION

The Electromagnetic Spectrum. We see only a fraction of reality.



# THE ARCHITECTURE OF EXPERIENCE

1. Perception is a transformation, not a recording.
2. The brain constructs reality using data and knowledge.
3. We perceive to act.
4. What we see is only what we are tuned to see.

# VISUAL INDEX

Reference components and abstract elements.



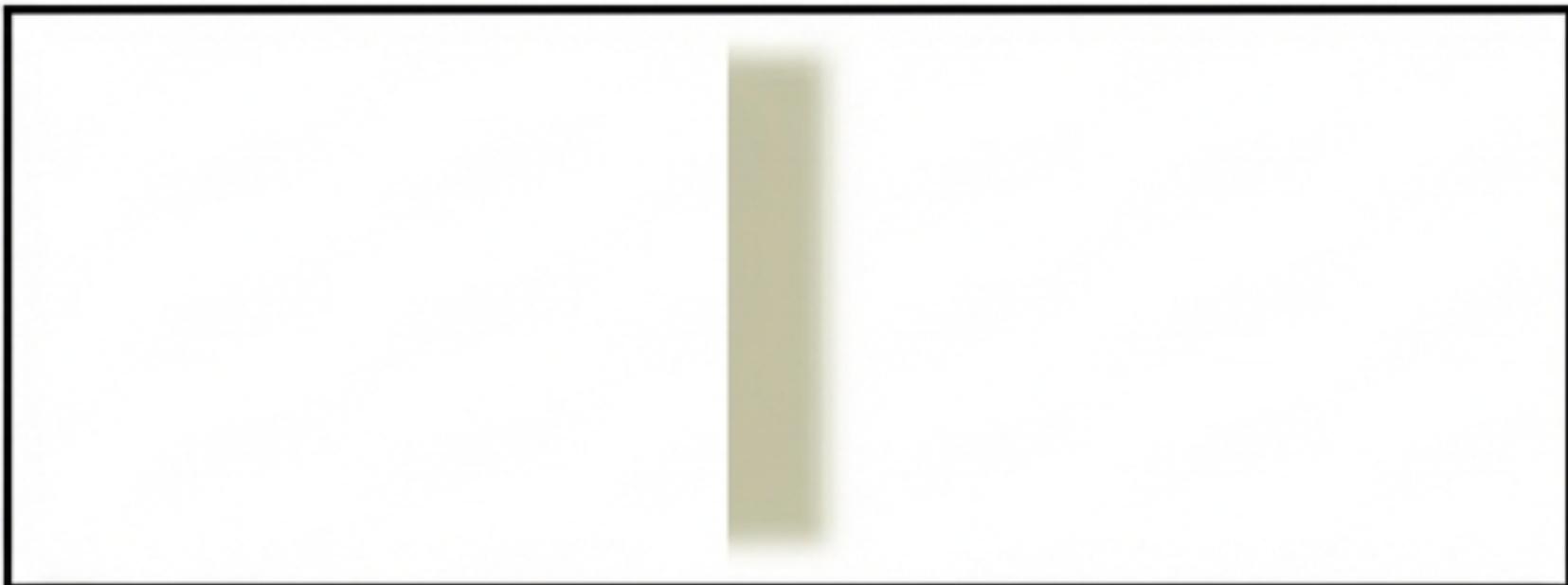
Dr. P.



Attention



Spectrum Segment 1



Spectrum Segment 2