

9.35 - Perception □

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What is perception, and why study it? □

Perception is the task of determining what is □
out there in the world from sensory input. □

Things in the world give off clues to their existence, and sensory organs detect these clues.

- Vision: photons reflect off objects and are absorbed by eye
- Hearing: objects cause vibrations in air, which travel and are absorbed by ear
- Touch: we bump into things, and stimulate receptors in skin
- Taste: we lick things; molecules in substances interact with taste receptors in tongue
- Smell: substances in world give off molecules which float through air and interact with receptors in nose

- □ Task of perception is to take input from sensory receptors and figure out what is out there in the world

Important point #1: □

Perception is (deceptively) hard □

- □ Perception is usually effortless, which disguises the difficulty of the problem
- □ 50-60% of brain is devoted to seeing □
- □ Another big chunk devoted to hearing □
- □ Eyes just measure light, don't interpret it for you - that's the job of the brain.

Important point #2: □
perceptual problems are usually *ill-posed* □

ill-posed means: not enough information □
to uniquely determine answer to problem □

Example: world is 3D. □

We generally perceive its 3D structure correctly. □

But input to perception is 2D. □

Important point #3:
perception is (unconscious) inference

- Information in sensory input does not
uniquely specify structure of world
- Brain has to make its best guess as to what
is out there - this is inference
- You are not aware of the inference (unlike
when you reason about a problem), hence
the term unconscious inference (due to
Helmholtz).

Example: illusory contours □

(Image removed due to copyright considerations.)

Important point #4: □

“Illusions” illustrate perceptual mechanisms □
at work, and can help us study them □

Example: illusory motion in depth from □
shadows □

(show movie) □

Example: another cool shadow effect

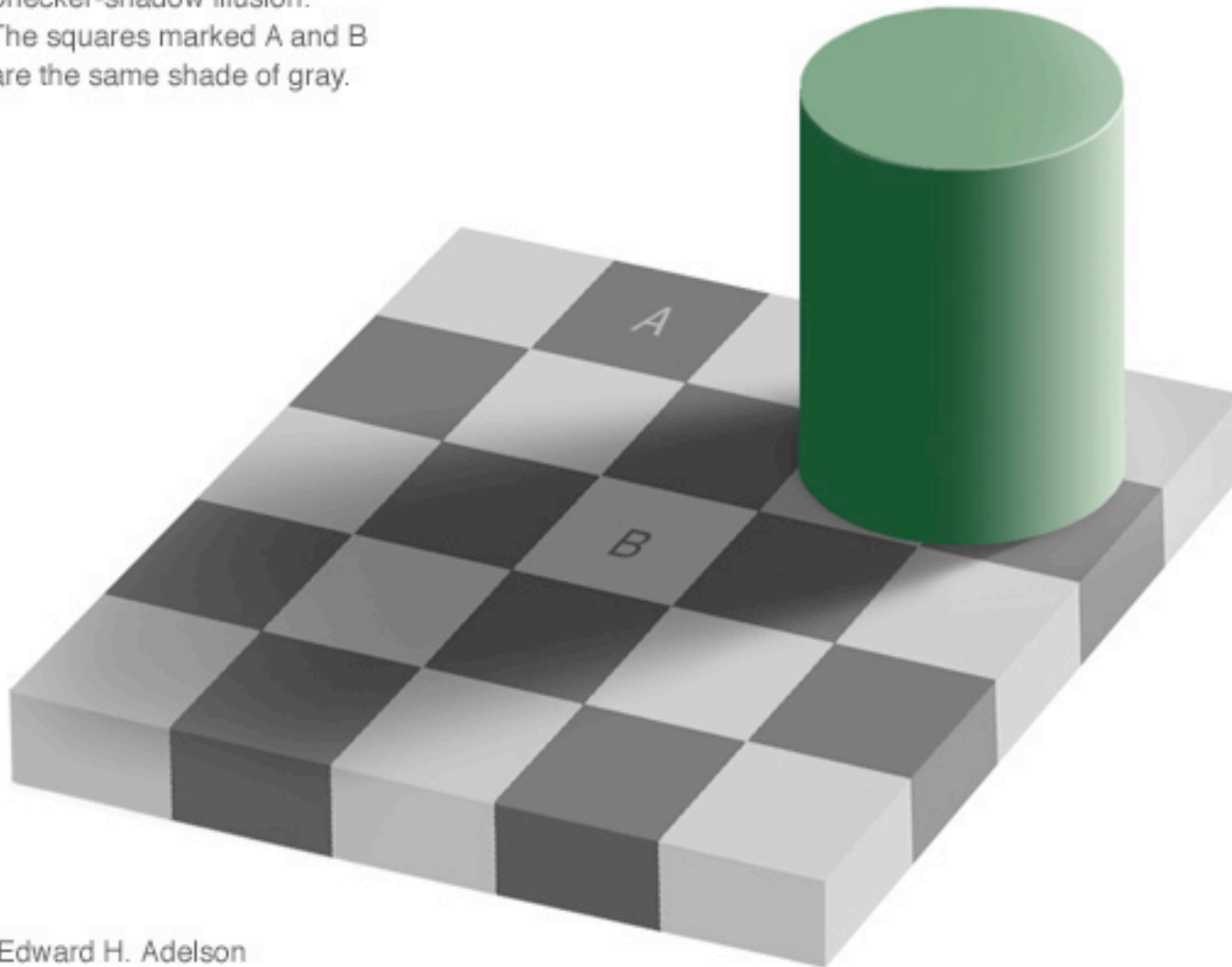
show movie

Example: lightness perception □

- □ As organisms, we want to infer what things in the world are made of, which is partially signaled by their pigmentation.
- □ Problem: light that reaches the eye depends not just on pigment of stuff in world, but also on amount of illumination.
- □ Visual system has to discount illuminant. □

The squares marked A and B are actually
identical. Why do they look different?

Checker-shadow illusion:
The squares marked A and B
are the same shade of gray.

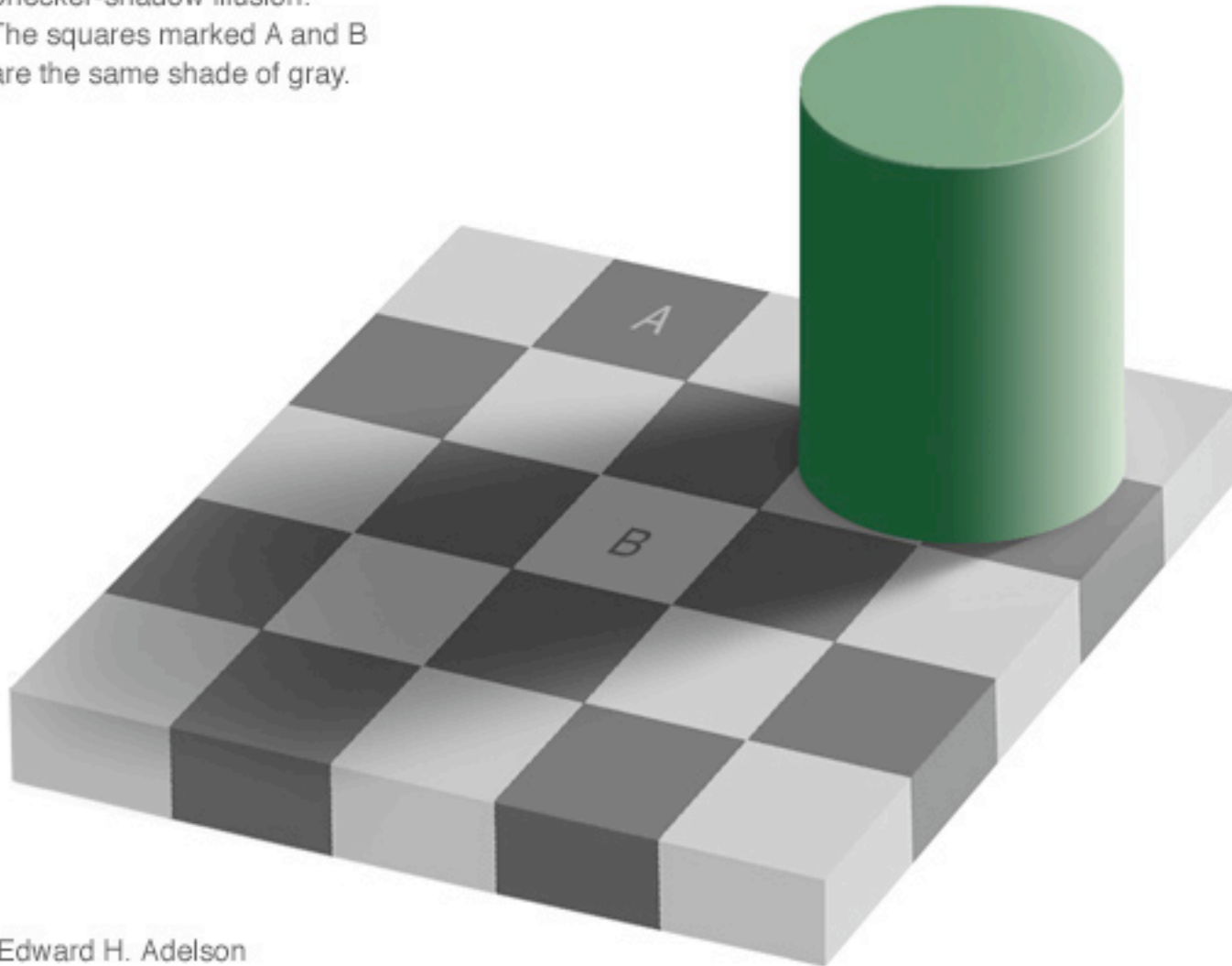


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Visual system thinks B is in shadow, so given □
same amount of light, B must be lighter. □

Checker-shadow illusion:
The squares marked A and B
are the same shade of gray.



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Example: moving diamond □

(Image removed due to copyright considerations.)

Brain interprets same motion differently □
depending on presence of occluders. □

Final example: multiple sounds at once □

- □ Vibrations caused by different sources in the world sum together at ear
- Brain gets a single signal that is the □ combination of individual sounds. □
- □ $X+Y = 32$, what are X and Y
- □ Another ill-posed problem
- □ Somehow, we can usually hear X and Y □

Summary □

- □ Perception is deceptively hard.
- □ Perceptual problems are usually ill-posed. □
- □ Perception is (unconscious) inference
- □ “Illusions” illustrate perceptual mechanisms at work.