Biology 70
Part II
Sensory Systems
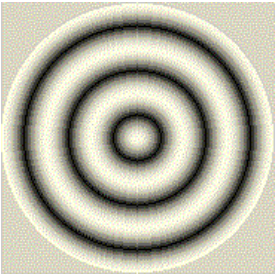***lecture 4***
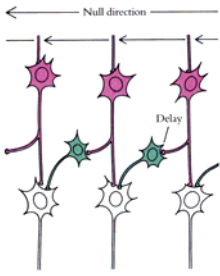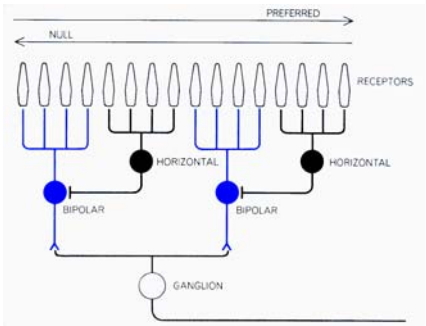
http://www.biology.ucsc.edu/classes/bio70/

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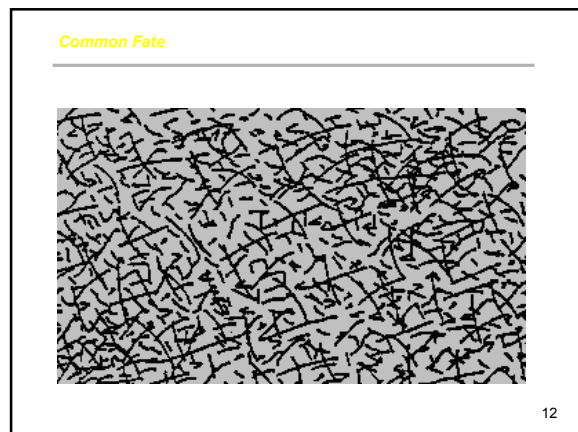
color

2

depth

3

motion

4

motion detector network
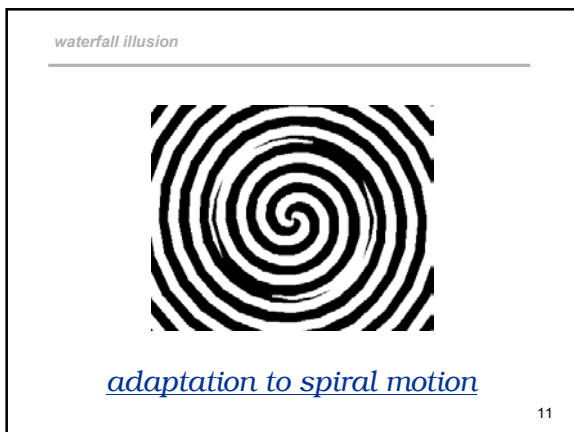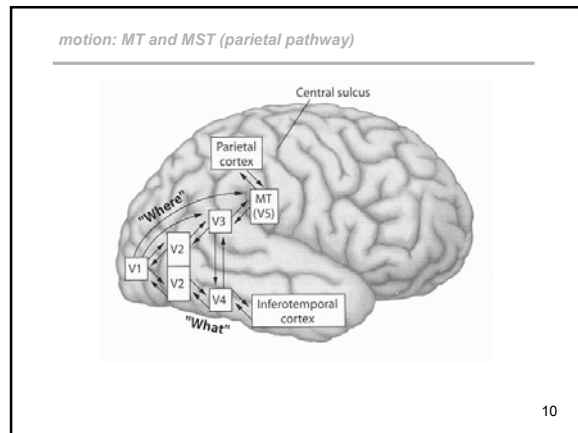

5

neuron selective for direction of motion

6

1

null direction

input neurons

delay interneurons

output neurons

excitation and inhibition cancel

7

null direction

excitation and inhibition cancel

nada

8

preferred direction

fires before inhibition

neurons fire

9

motion: MT and MST (parietal pathway)

Central sulcus

Parietal cortex

MT (V5)

"Where"

V3

V2

V1

V2

V4

Inferotemporal cortex

"What"

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waterfall illusion

adaptation to spiral motion

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Common Fate

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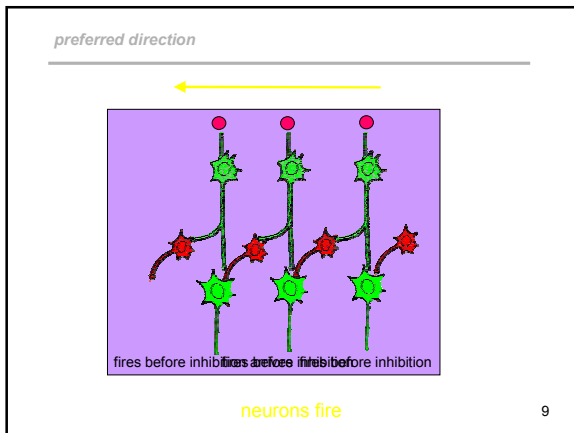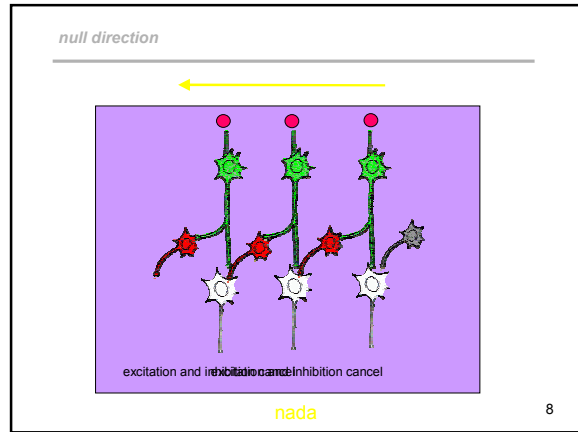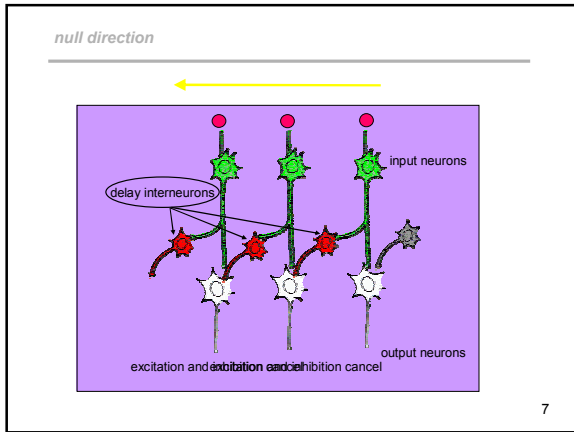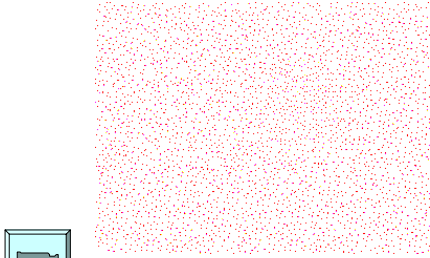
more common fate

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from lecture outline: TEMPORAL PHENOMENA

➤ 1. How might the cortex signal direction of motion?
➤ 2. What is the explanation of the waterfall effect?
➤ 3. What is "common fate" in regard to detecting form from motion?
➤ 4. What is the flicker-fusion rate?

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from lecture outline: DEPTH

5. In the real world what are clues which the brain uses to determine depth?
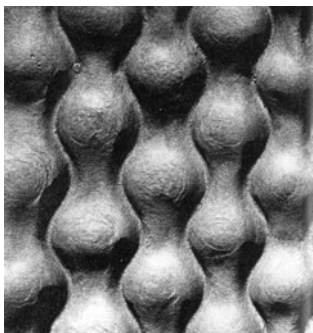6. What are Julsez patterns and what do they show about depth perception?

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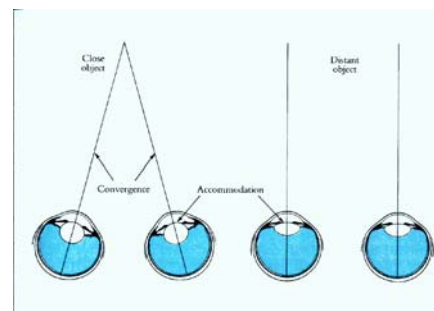*monocular clues :* **perspective, size, occlusion, and height in picture**

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depth, monocular clue: shadow

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depth, binocular clues: convergence and accommodation

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3

BAD JOKE !!

VAL AND DUNSTAN QUESTION THE MONKS OF THE SCRIPTORIUM, BUT ALL CAN ACCOUNT FOR THEMSELVES THE PREVIOUS NIGHT. AT DAY'S END, A WEARY CHIEF SCRIBE POURS OUT THE WINE--BADLY. VAL REMEMBERS THAT SIGHT IN ONLY ONE EYE PLAYS HAVOC WITH THE SENSE OF DEPTH.

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depth, binocular clue: disparity

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depth, binocular clue: disparity

21

disparity

from: *Perception, The World Transformed* (1979)
by L. Kaufman, Oxford (New York), p 208.

Figure 7-16. The images of two rods on the left retina are closer together than the corresponding images on the right retina. This difference in separation is the relative binocular disparity of the images. If the left and right eyes were to view such pictures, the observer would see two rods in depth.

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more disparity

Fig. 11.18. Binocular disparity. The square and circle are imaged quite close together on the right retina, but are imaged considerably farther apart on the left retina. If observer fixates on square, there must be a disparity in the retinal locations of the image of the circle.
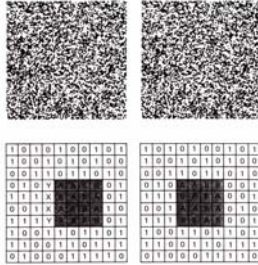
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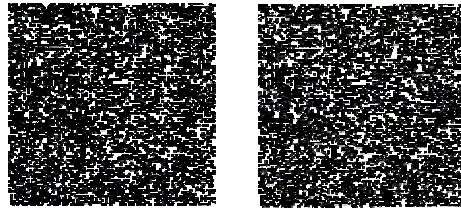*Julsez patterns: depth with disparity as only clue*

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construction of Julsez ppatterns

Figure 7-21. The random dot stereogram invented by Julesz. The two halves of the stereogram are identical except that a central portion of one half is shifted toward one side, as illustrated in the accompanying letter matrices.
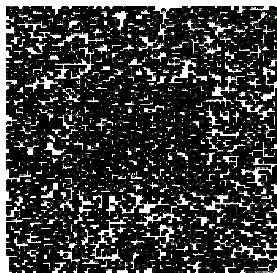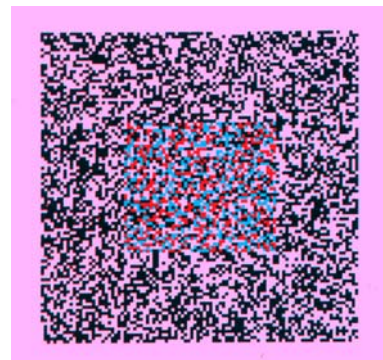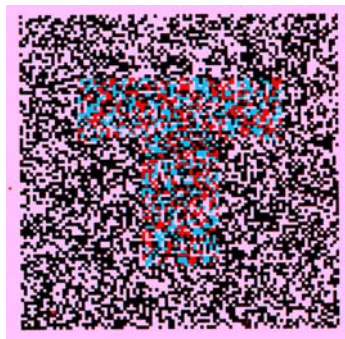
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construction of Julsez patterns

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views for differing eyes

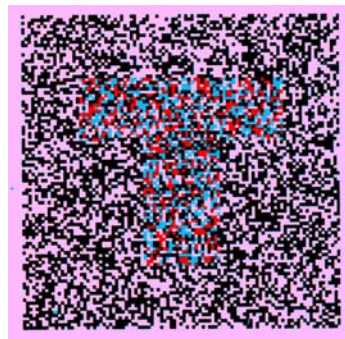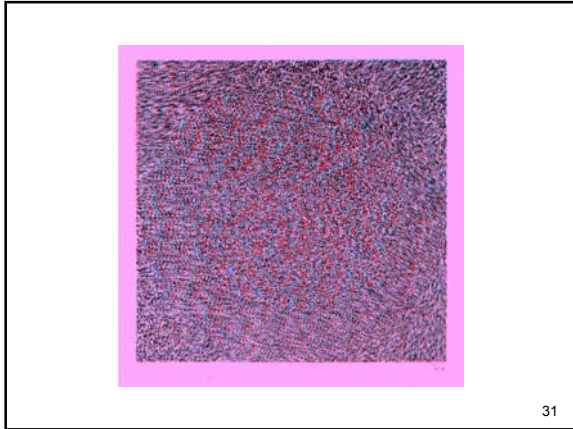27

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Biology 70, Lecture 4, Part I
Fall 2007

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5. In the real world what are clues which the brain uses to determine depth?

6. What are Julsez patterns and what do they show about depth perception?

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