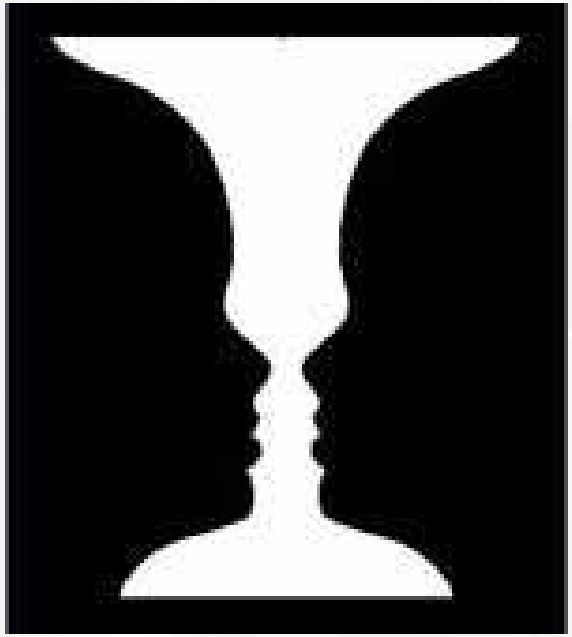
Major theme: *'Perception is an Inference'*

Perception is rarely ambiguous: the brain jumps to conclusions.

Bistable image: old/young woman

Major theme: *'Perception is an Inference'*

Perception is rarely ambiguous: the brain jumps to conclusions.



Bistable image: the 'face vase illusion'

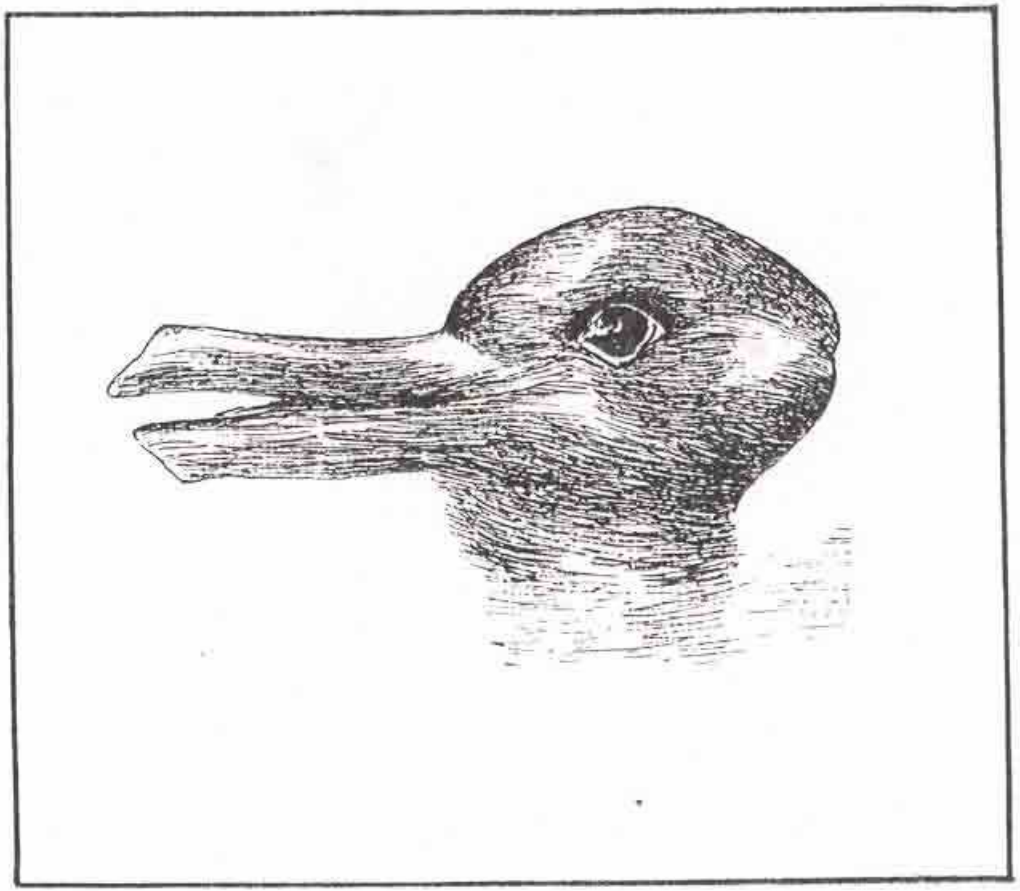


Fig. 20.—Do you see a duck or a rabbit, or either? (From Harper's Weekly, originally in Fliegende Blätter.)

Bistable image: the ‘rabbit duck figure’

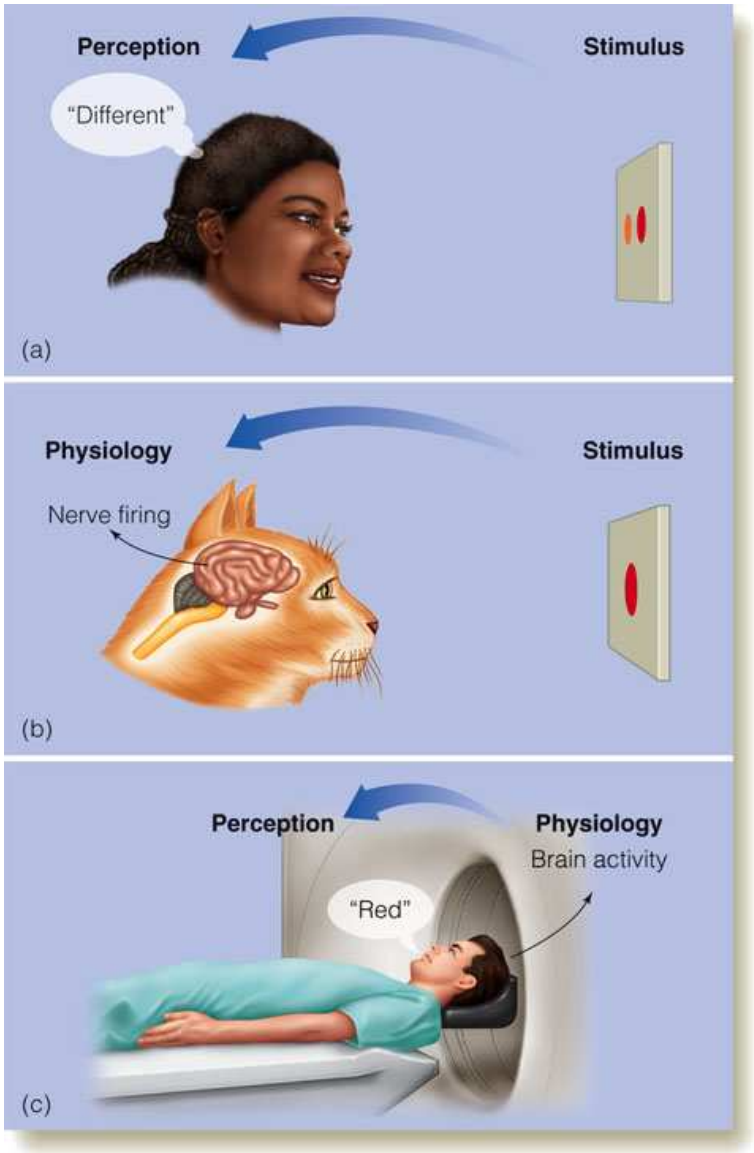
How to study perception scientifically

1) Observation: ‘phenomenology’

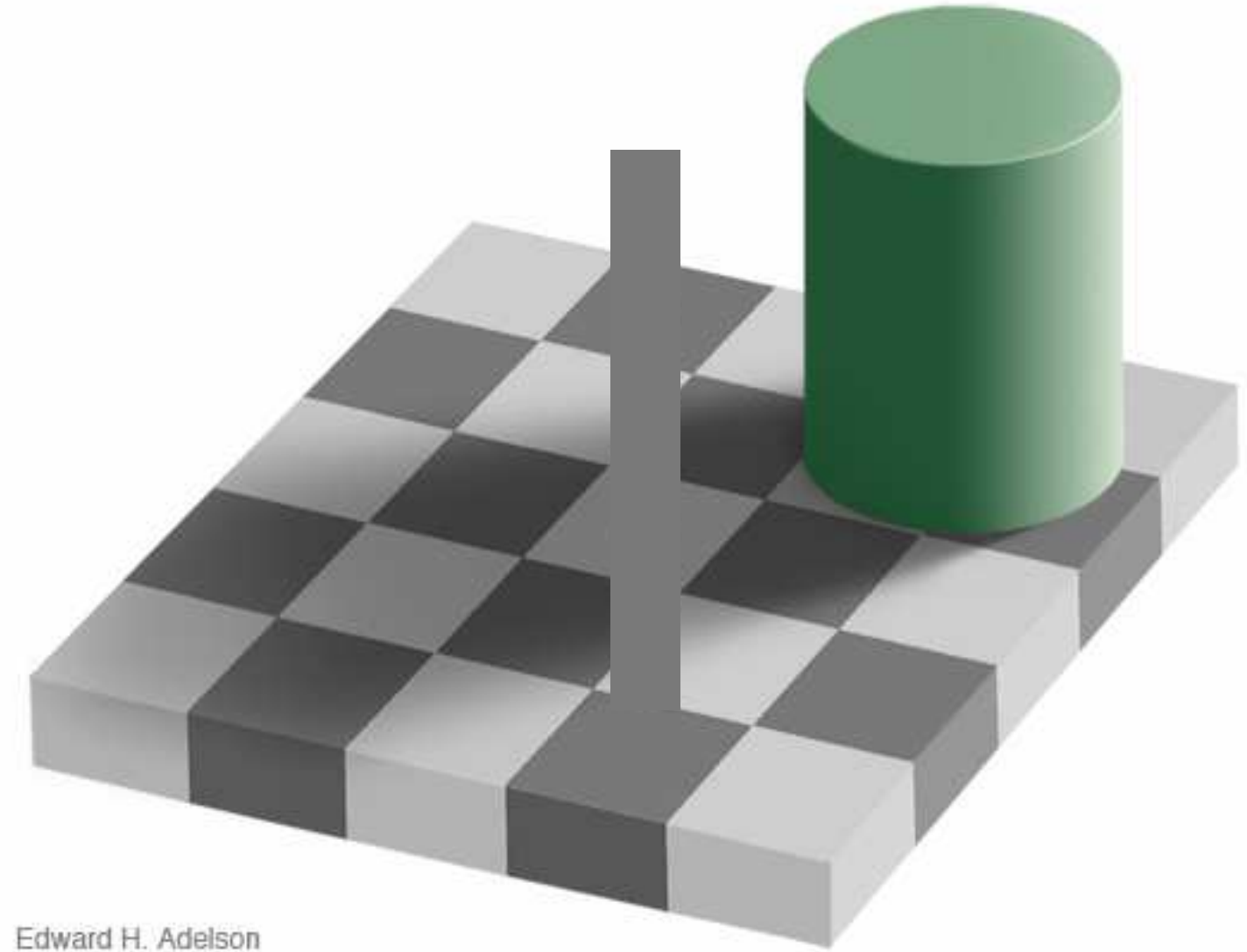
2) Behavioral measurements: ‘psychophysics’

3) Physiological (and behavioral) measurements in animals

4) Physiological measurements in humans

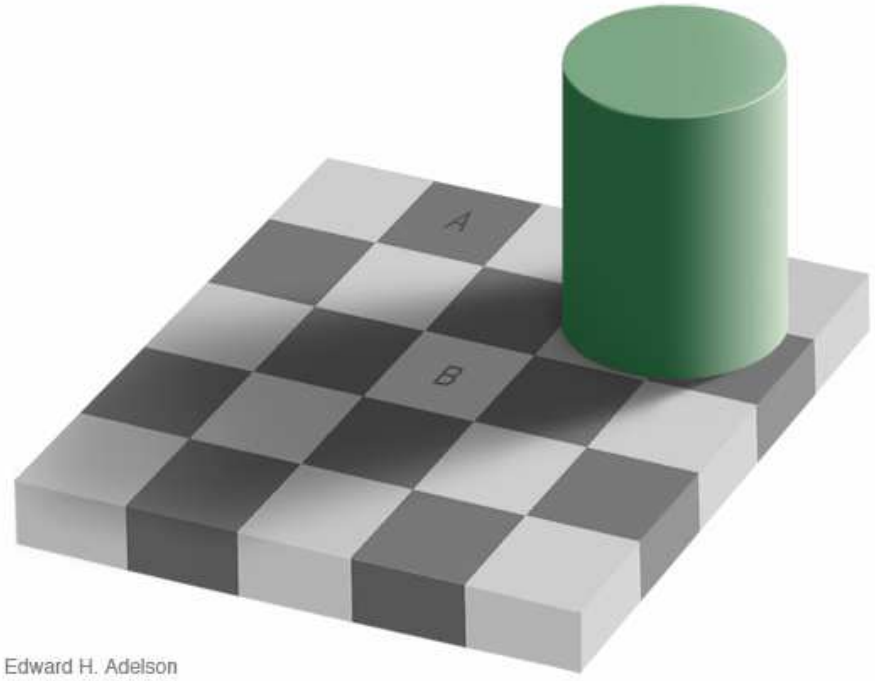


1) Observation: ‘phenomenology’



Edward H. Adelson

1) Observation: ‘phenomenology’



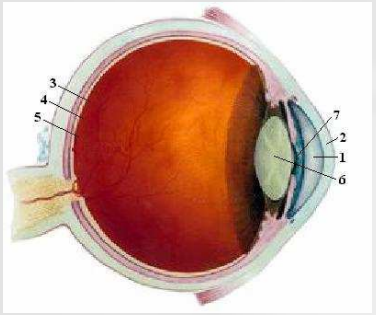
Physical world	→	**Sensation**	→	**Perception**
A is darker than B		A and B have equal luminance		A is darker than B

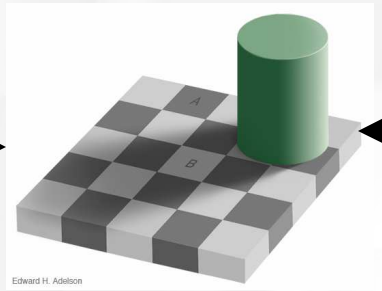
If this were a real object, would it still be an ‘illusion’?

Sensory input

Perception

Knowledge





‘bottom up’

‘top down’

A and B have equal luminance

A is darker than B

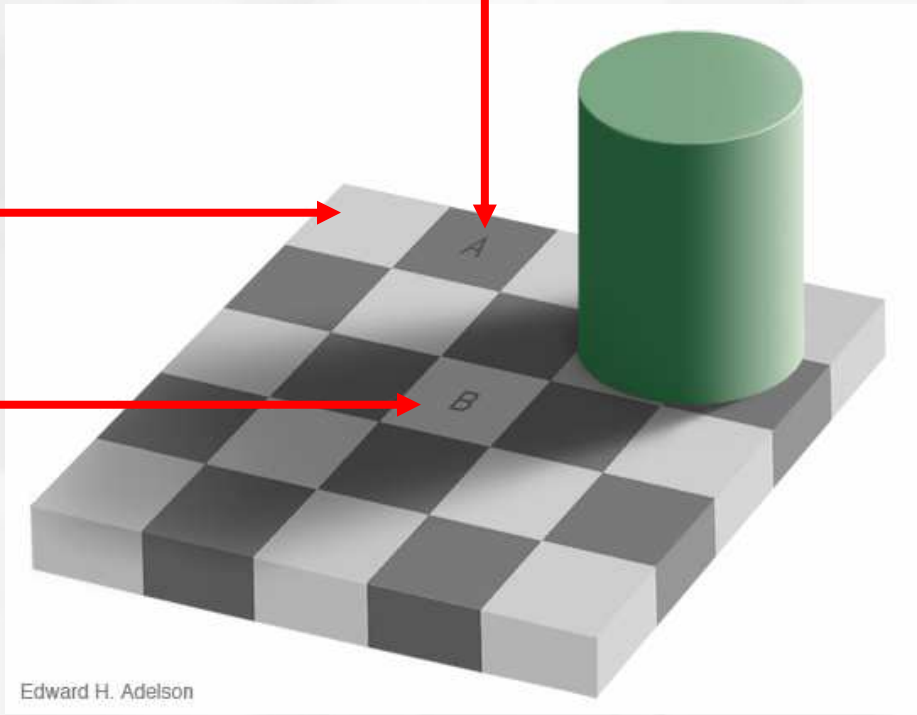
B is in the shadow, so it must be a more reflecting surface

How can we make a quantitative measurement of the strength of this illusion?

unshaded dark patch
(Y%)

unshaded
bright patch
(100%)

shaded
bright patch
(X%)



Is X < 100%?

does X = Y?

We use ‘psychophysics’!

2) Behavioral measurements: ‘psychophysics’

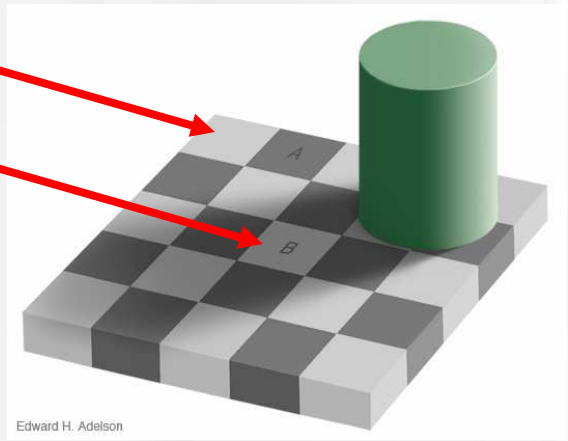
Psychophysics - Quantitative Methods

Method 1: Method of adjustment

- Intensity of shaded bright patch is adjusted continuously until it matches the intensity of the unshaded bright patch.

Unshaded bright patch

Shaded bright patch



2) Behavioral measurements: ‘psychophysics’

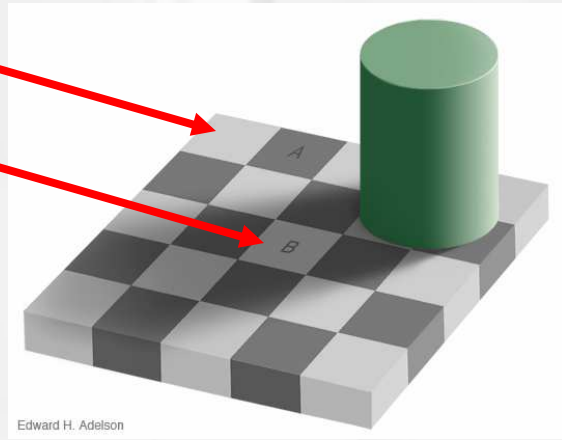
Psychophysics - Quantitative Methods

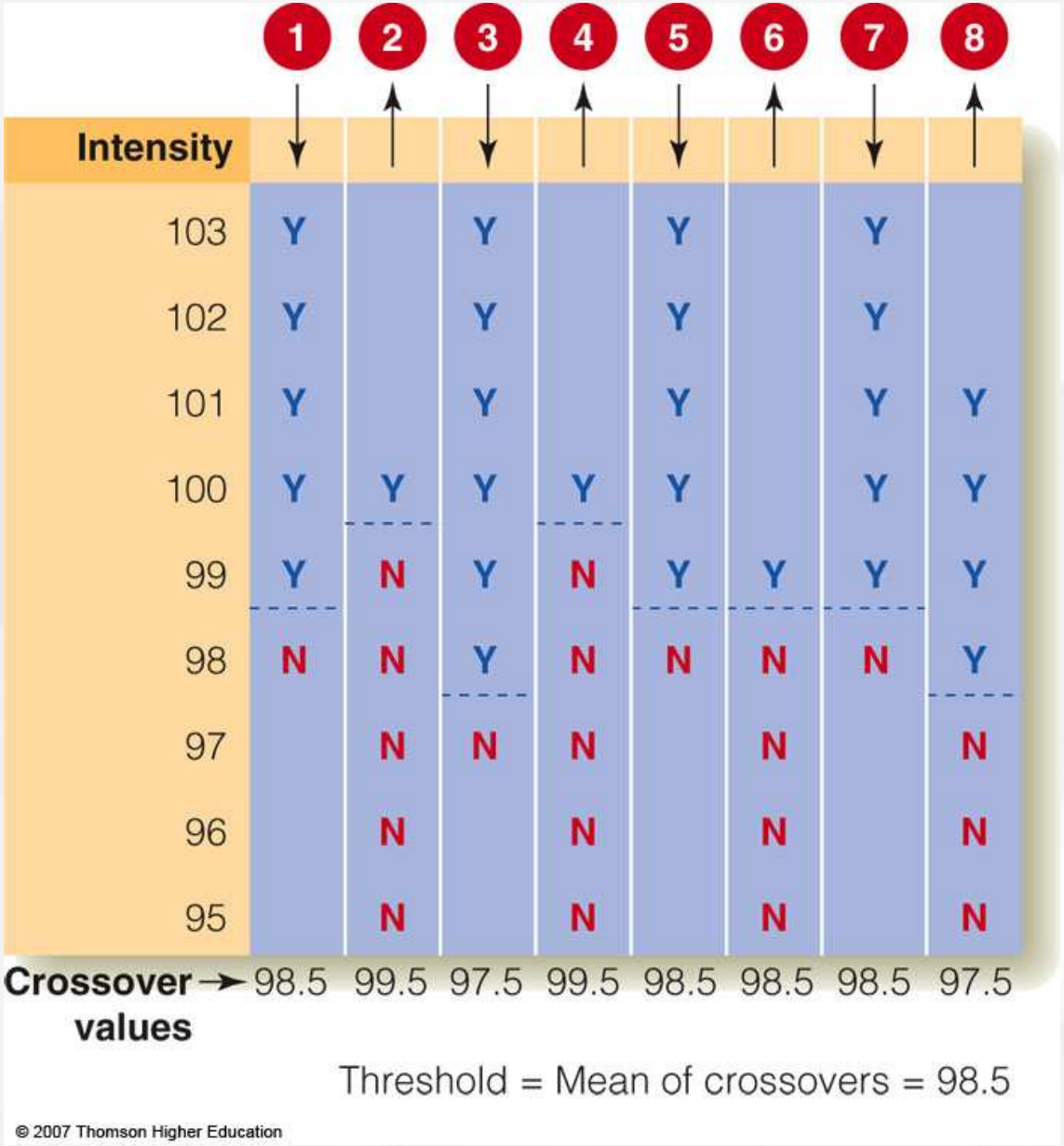
Method 2: Method of limits

- Stimuli of different intensities presented in ascending and descending order
- Observer determines whether the shaded bright patch is brighter or dimmer than the unshaded bright patch.
- Cross-over point is the threshold

Unshaded
bright patch

Shaded
bright patch



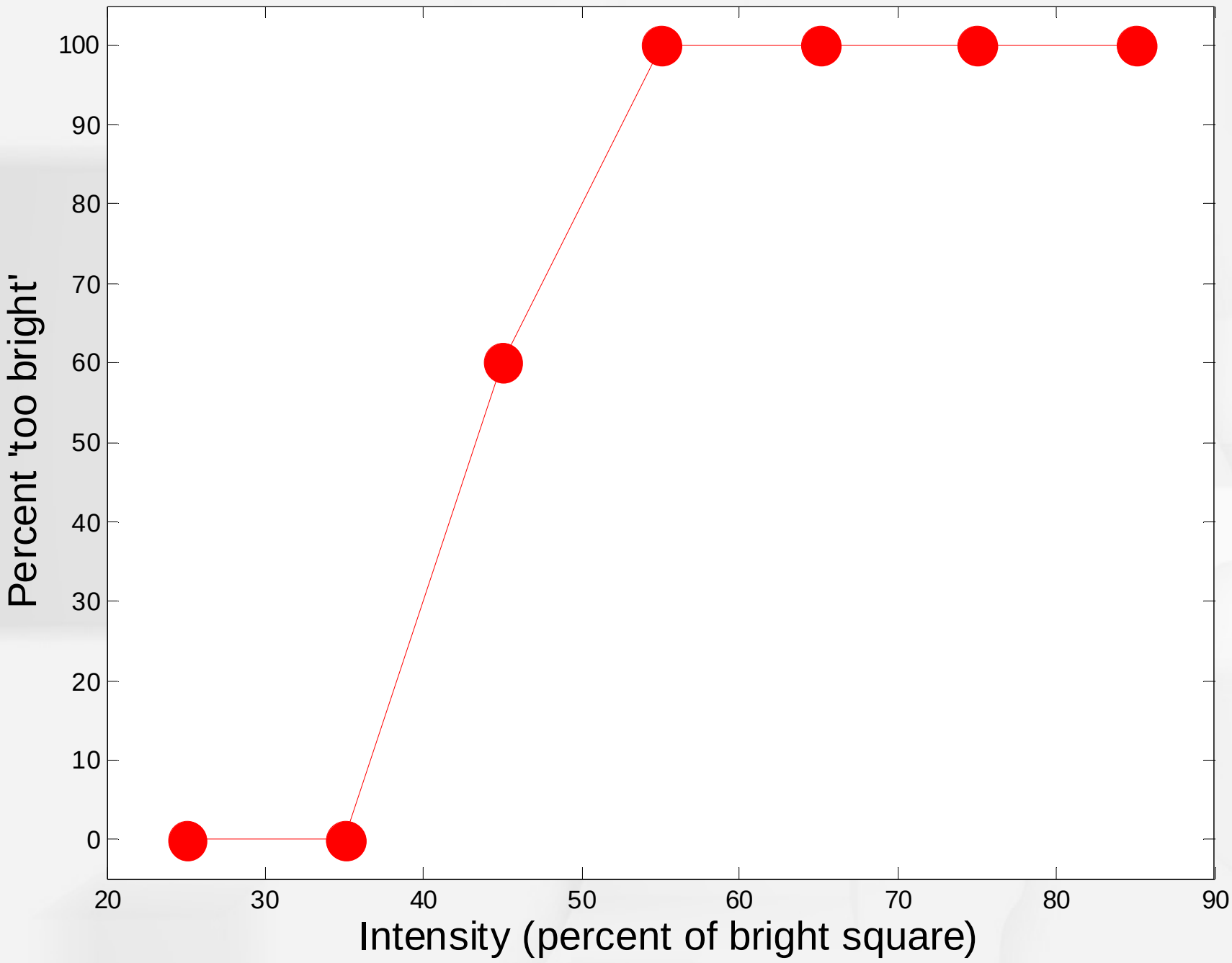


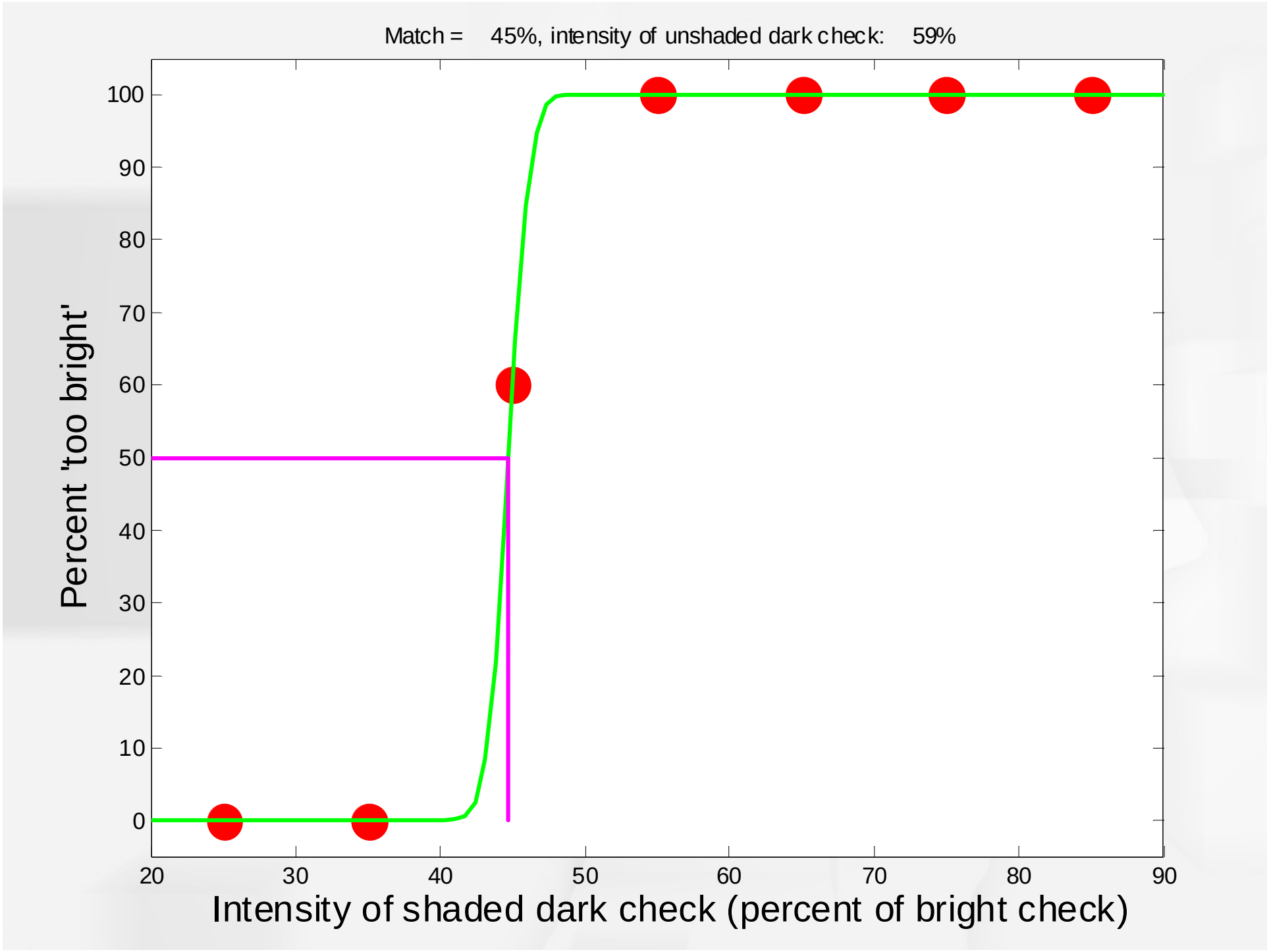
2) Behavioral measurements: ‘psychophysics’

Psychophysics - Quantitative Methods

Method 3: Method of constant stimuli

- 5 to 9 stimuli of different intensities are presented in random order
- Subject forced to choose which patch looks brighter.
- Multiple trials are presented
- A perceptual match is the intensity that results in in 50% of trials seen as brighter.


Percent 'too bright'
100
90
80
70
60
50
40
30
20
10
0
20
30
40
50
60
70
80
90
Intensity (percent of bright square)


Match = 45%, intensity of unshaded dark check: 59%
Percent 'too bright'
100
90
80
70
60
50
40
30
20
10
0
20
30
40
50
60
70
80
90
Intensity of shaded dark check (percent of bright check)

Thresholds: two types

ABSOLUTE THRESHOLD: The minimum intensity of stimulation (brightness of a light; loudness of a tone) required to produce a detectable sensory experience

DIFFERENCE THRESHOLD: The minimum *change* in intensity required to produce a detectable change in sensory experience (this is also known as a Just Noticeable Difference or JND)

Psychometric function for absolute threshold

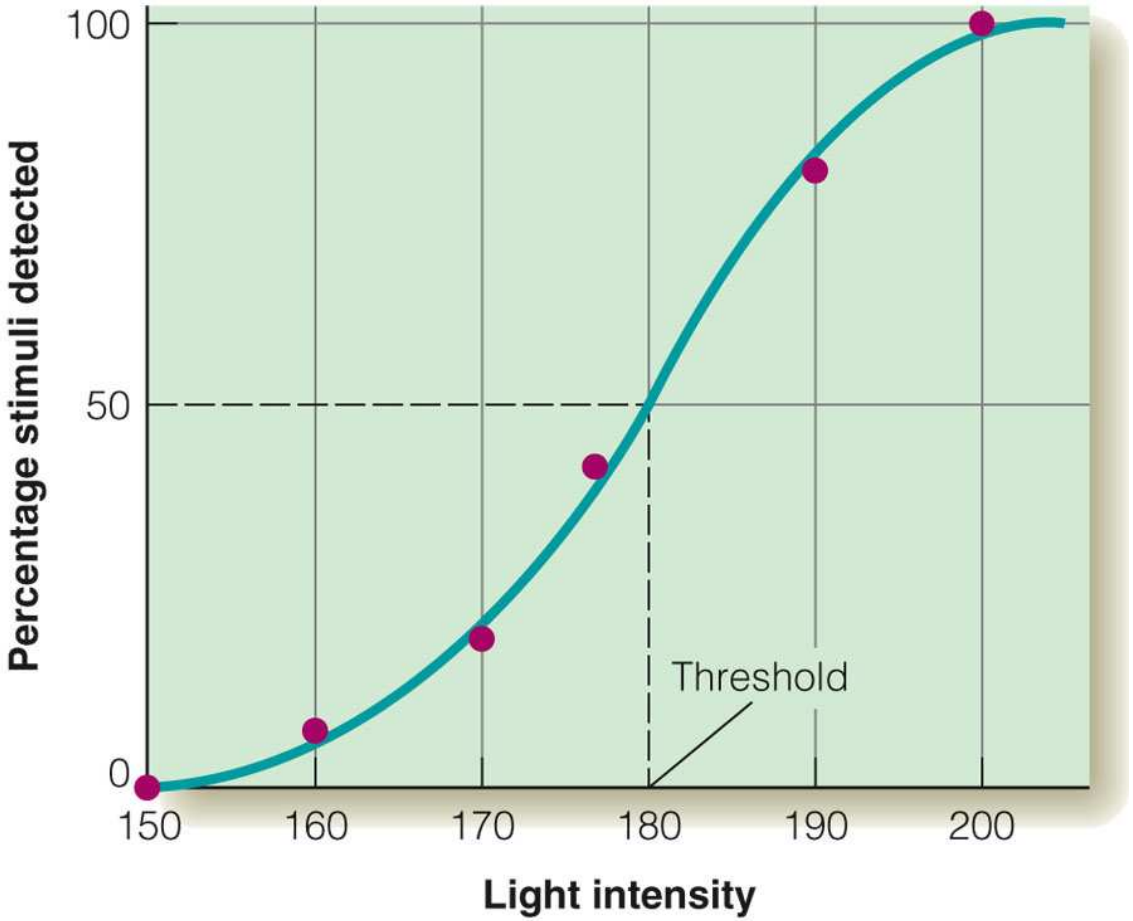


Figure 1.11 Results of a hypothetical experiment in which the threshold for seeing a light is measured by the method of constant stimuli. The threshold - the intensity at which the light is seen on half of its presentations - is 180 in this experiment.