

IF YOU READ THE BOOK BY
COLIN WARE
YOU'D BE HOME BY NOW

PERCEPTION FOR DESIGN

OUR PLAYGROUND

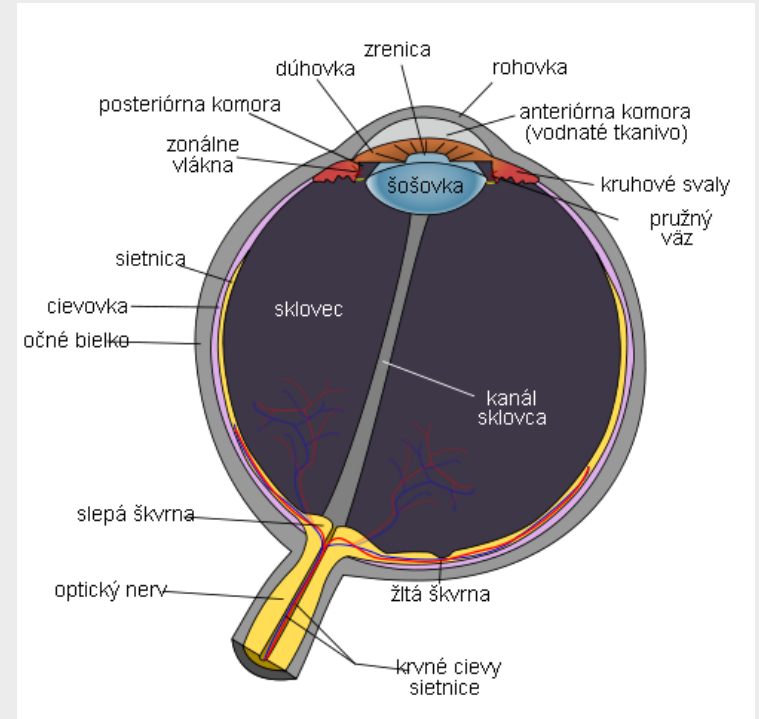
THE HUMAN VISUAL SYSTEM (HMV) IS:

POWERFUL:

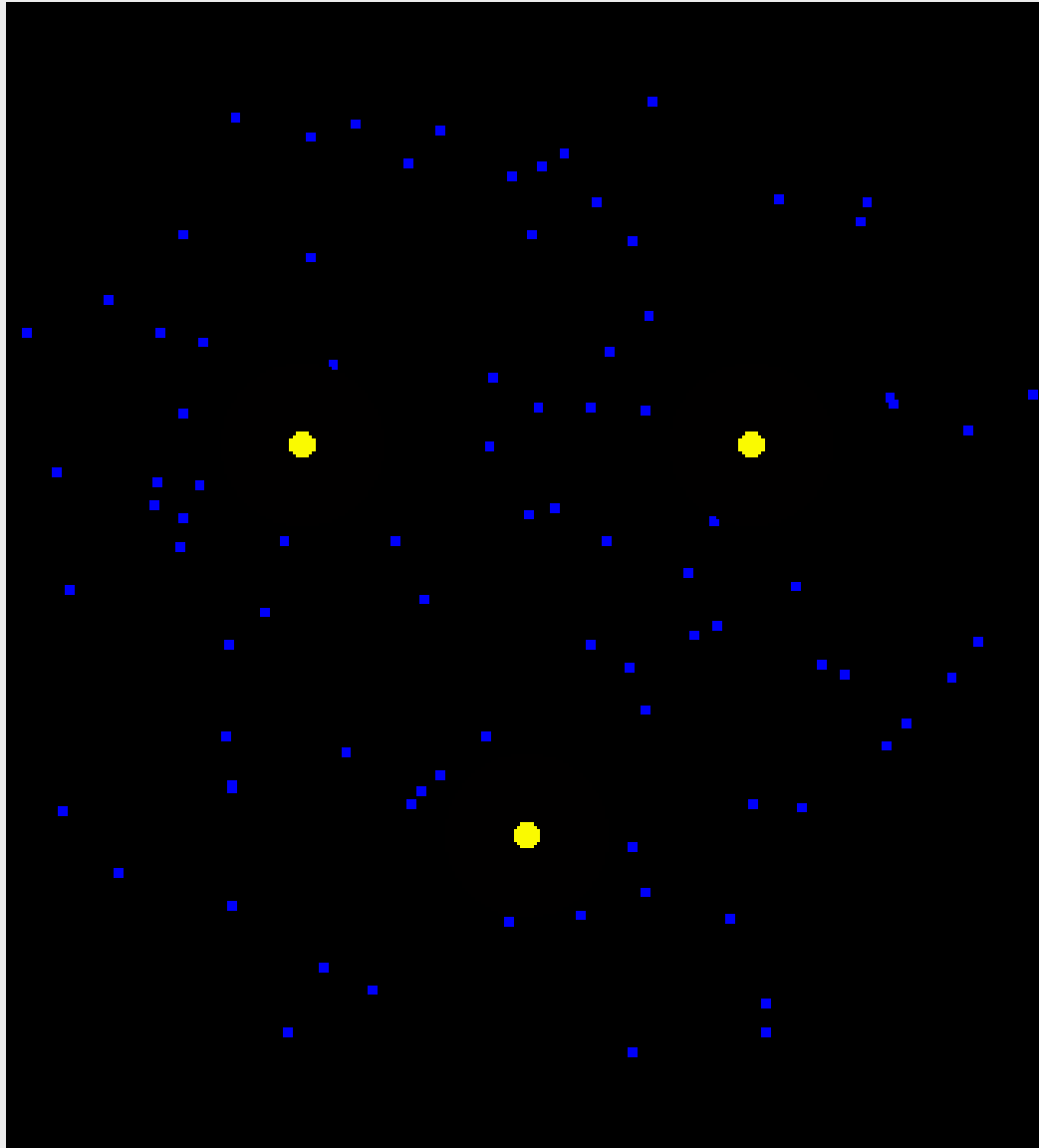
Parallel processing
Adaptable

LIMITED:

imprecise
Easy to fool



WATCH THE YELLOW DOT



IMPORTANT ASPECTS OF THE HMV

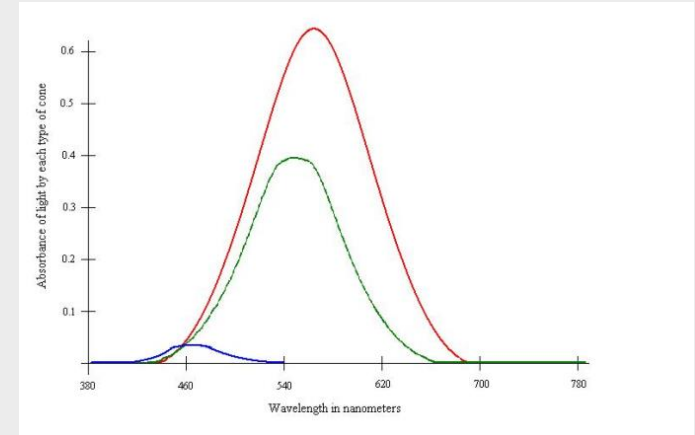
EYE

Fovea - centre of vision

Saccadic movements

Rods (light , dark)

Cones (blue, green, red)

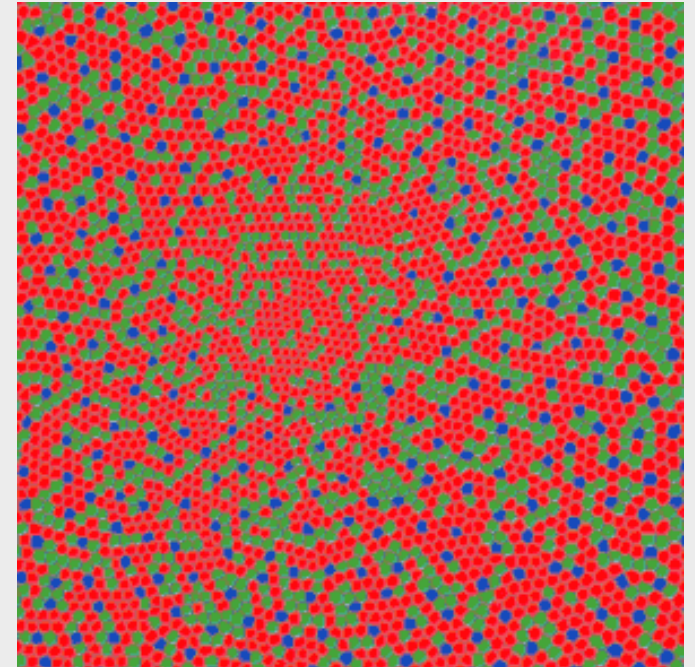


BRAIN

Inter-connected neurons

Synchronized firing

Inhibiting



ELEMENTS OF VISION

FEATURES (SENSORY)

Universal

Fast

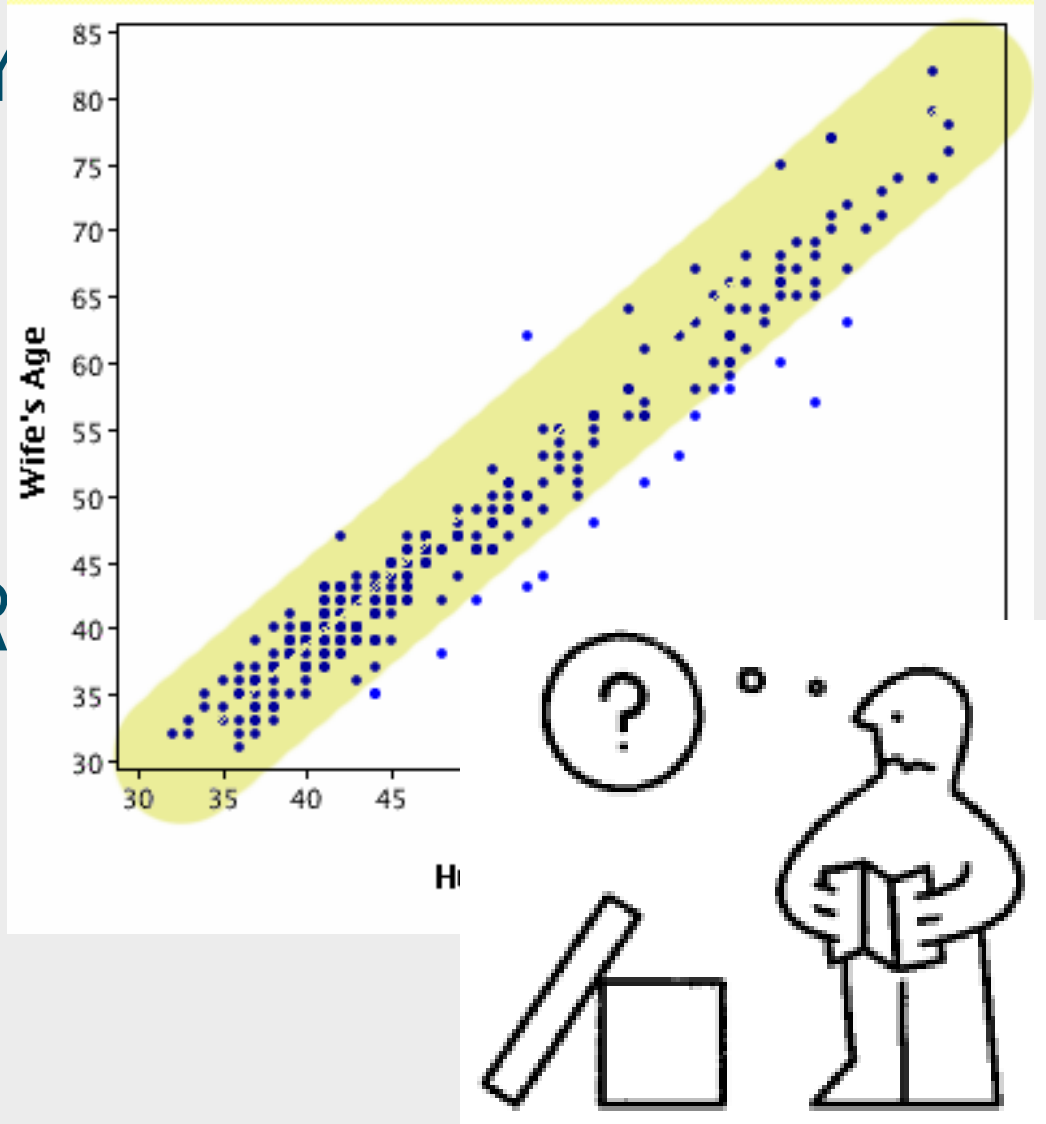
Simple

... but risky

SYMBOLS (ARBITRARY)

Embedded in culture

Hard to learn



VISUAL PERCEPTION HAS 3 STAGES

FEATURES

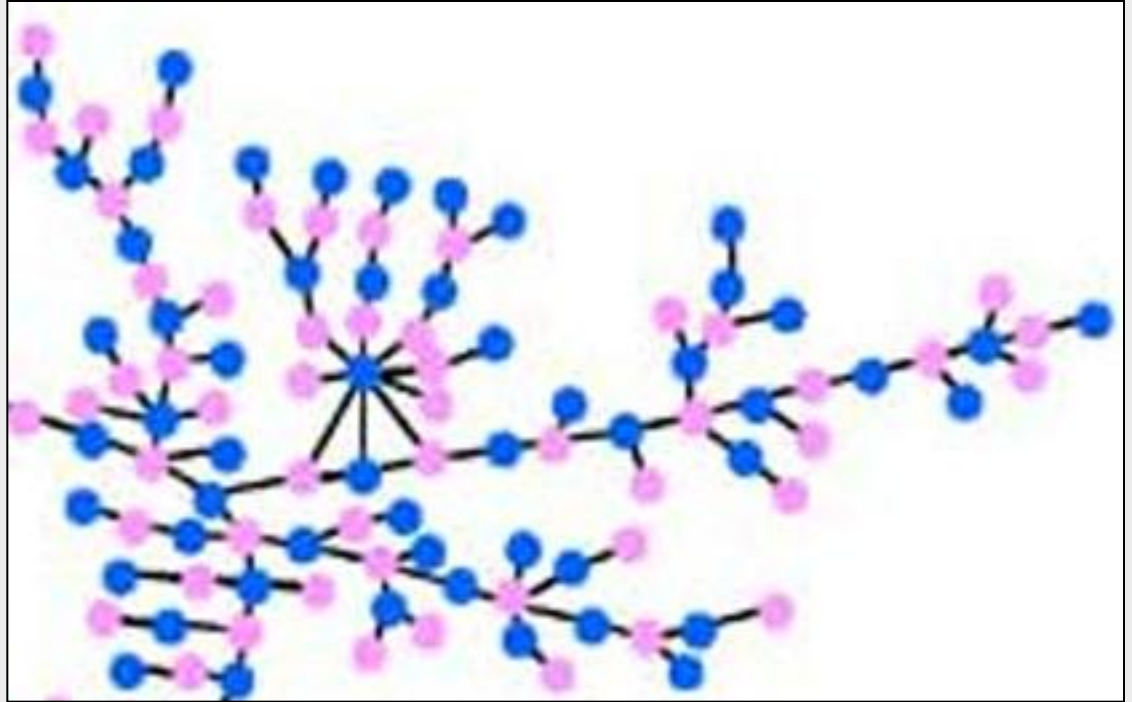
Dots, lines

PATTERNS

Connect the dots

ATTENTION

Look for ...



ASSOCIATED MEMORY STAGES

Iconic => Visual => Verbal (working memory)

VISUAL PERCEPTION, STAGE 1

FORM, COLOR, POSITION, MOTION, DEPTH OF FIELD

Perceived pre-attentively

PARALLEL PROCESSING

TIME-LIMITED (~0.2 SEC OF VISUAL BUFFER)

Iconic memory

Detect or forget

PREATTENTIVE PROCESSING

STAGE 1-2

SOME FEATURES OR PATTERNS TAKE LESS THAN 10MS PER ITEM TO PROCESS

WHAT ARE THESE FEATURES?

EXAMPLES....

PREATTENTIVE PROCESSING EXAMPLE 1

COUNT THE THREES

85689726984689762689764358922659865986554897689269898
02462996874026557627986789045679232769285460986772098
90834579802790759047098279085790847729087590827908754
98709856749068975786259845690243790472190790709811450
85689726984689762689764458922659865986554897689269898

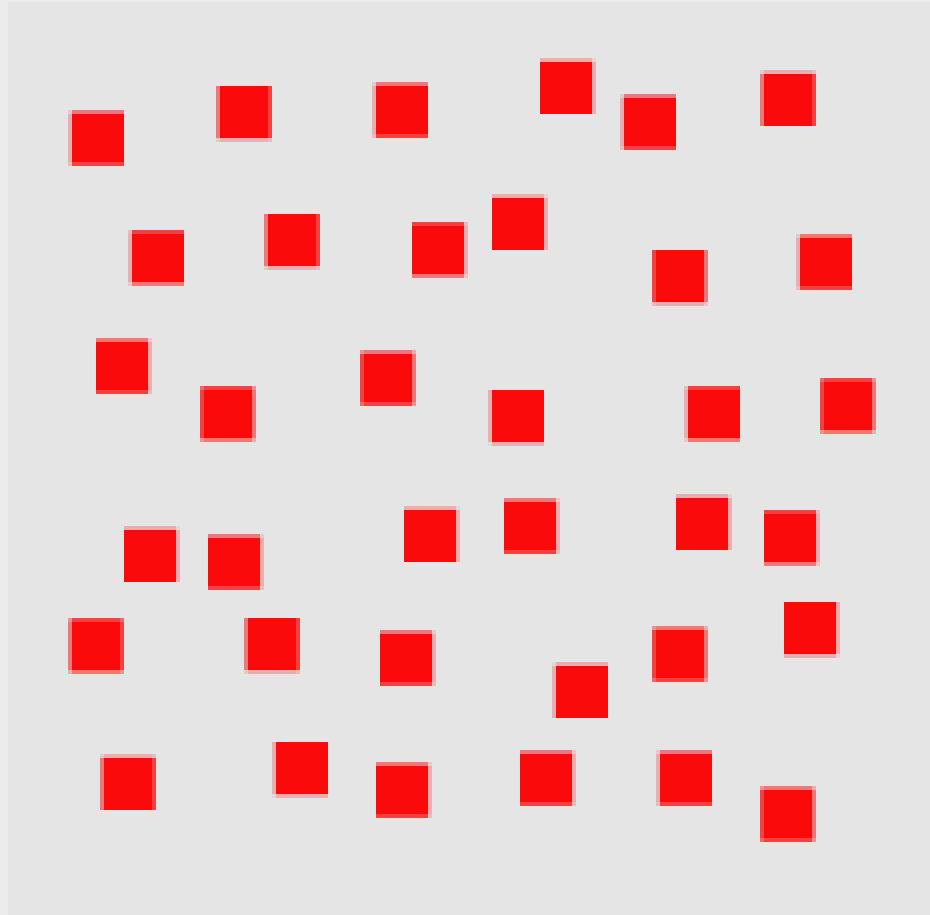
PREATTENTIVE PROCESSING EXAMPLE 1

COUNT THE THREES NOW

85689726984689762689764358922659865986554897689269898
02462996874026557627986789045679232769285460986772098
90834579802790759047098279085790847729087590827908754
98709856749068975786259845690243790472190790709811450
85689726984689762689764458922659865986554897689269898

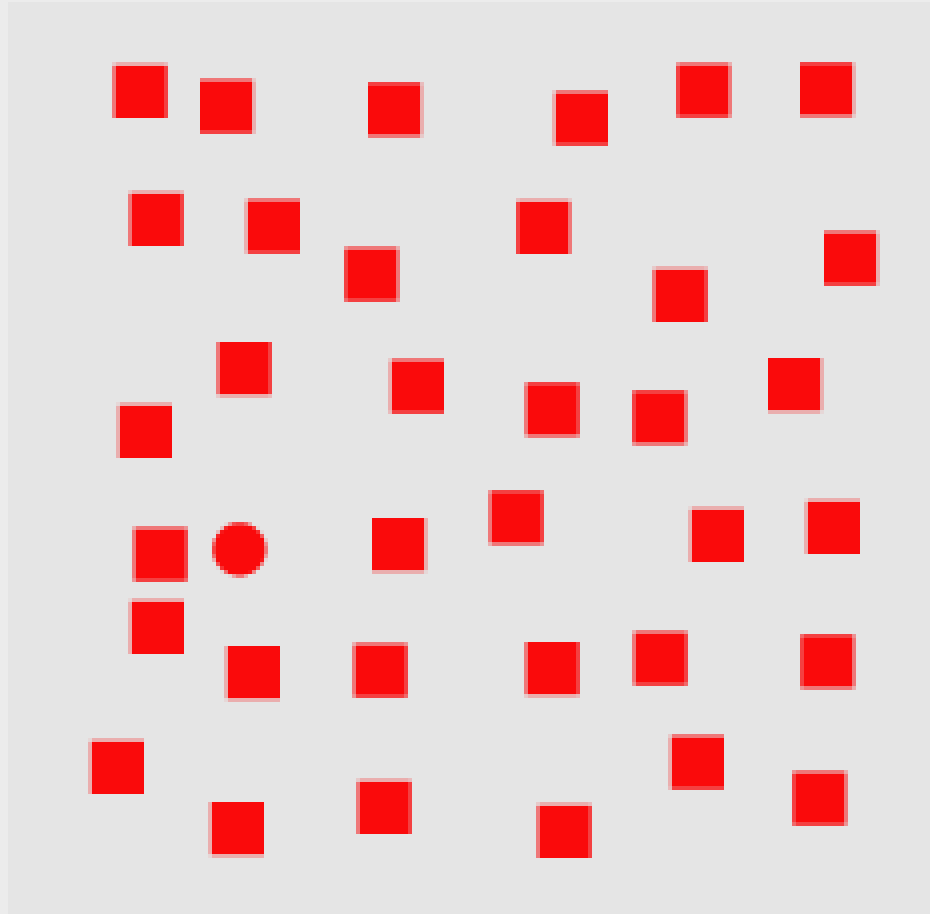
PREATTENTIVE PROCESSING, EXAMPLE 2

SPOT THE RED CIRCLE



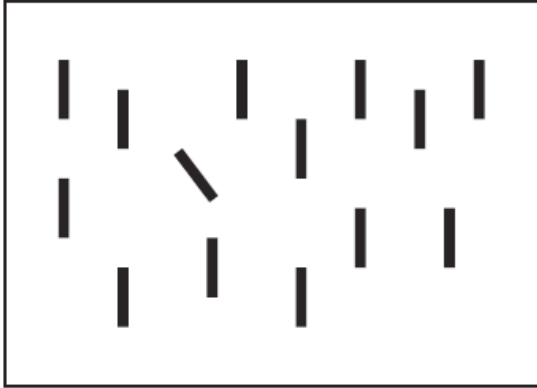
PREATTENTIVE PROCESSING, EXAMPLE 2

SPOT THE RED CIRCLE



DOMINANT PREATTENTIVE FEATURES

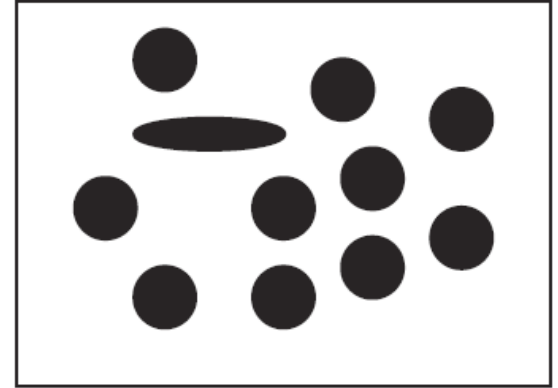
Orientation



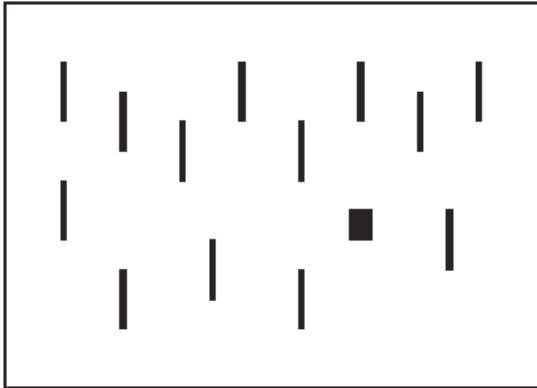
Curved/straight



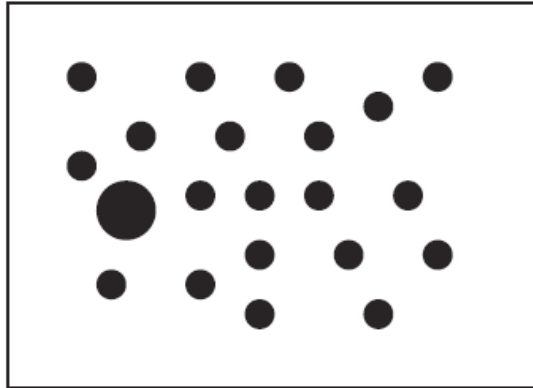
Shape



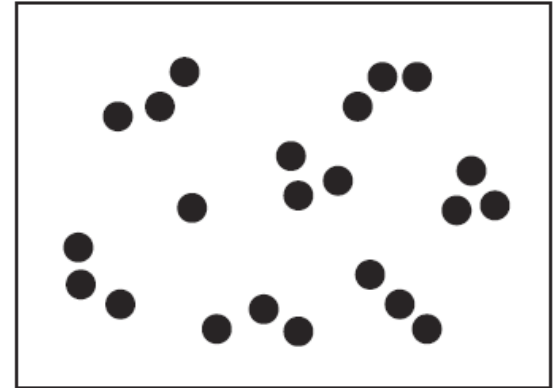
Shape



Size

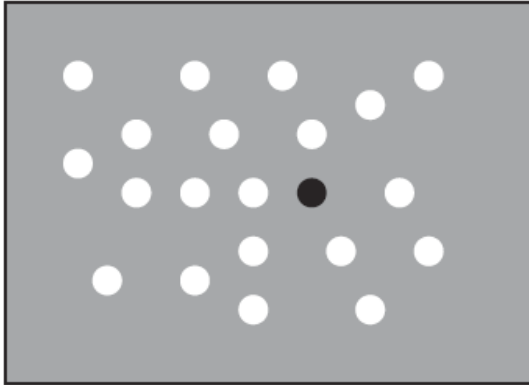


Number

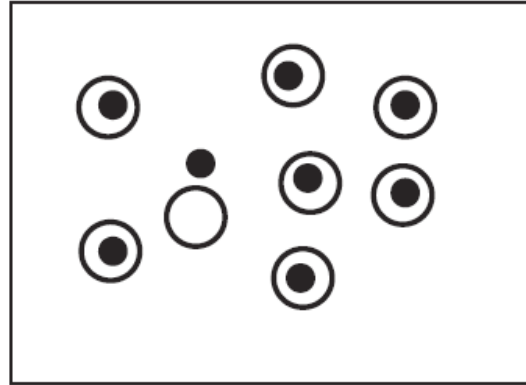


MORE PREATTENTIVE FEATURES

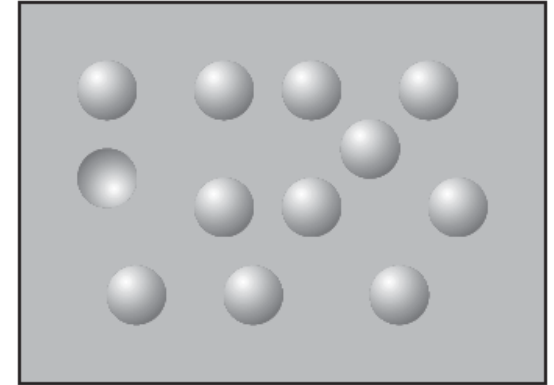
Gray/value



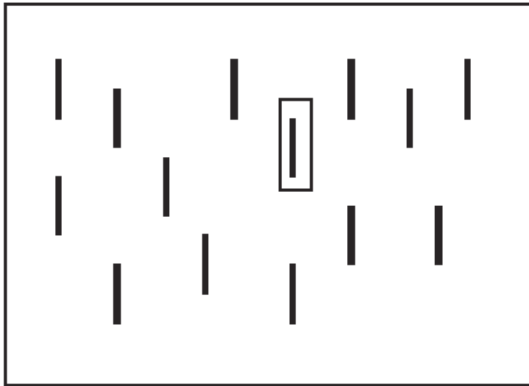
Enclosure



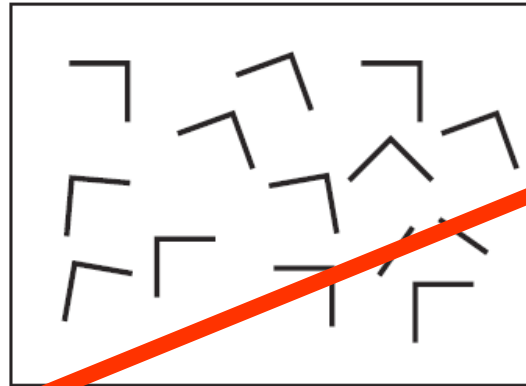
Convexity/concavity



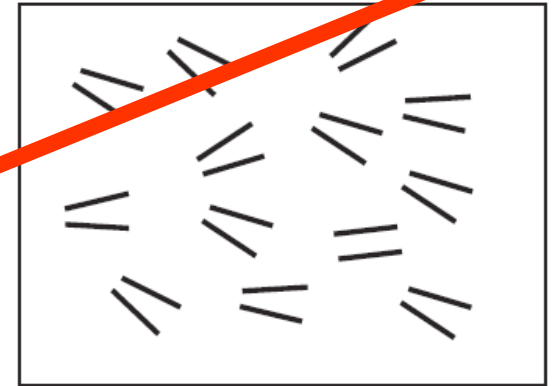
Addition



Juncture



Parallelism



BENEFITS OR PREATTENTIVE FEATURES

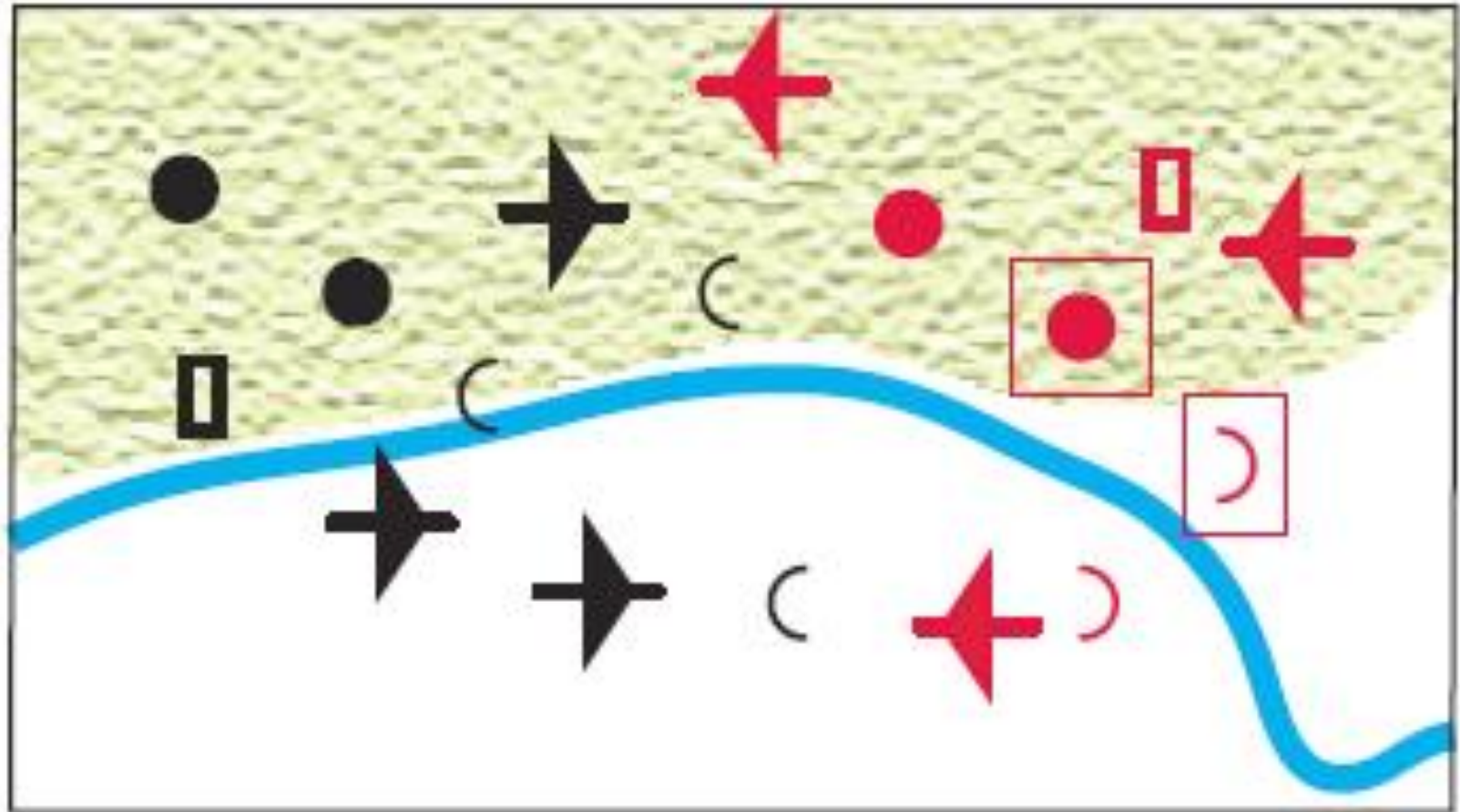
INFORMATION THAT "POPS-OUT"

$O(1)$ COMPLEXITY WITH NUMBER OF
DISTRACTORS

COMBINATION OF VARIOUS FEATURES TO
REPRESENT VARIOUS ATTRIBUTES
(SHAPE, COLOR, POSITION)

BENEFITS OR PREATTENTIVE FEATURES

EXAMPLE

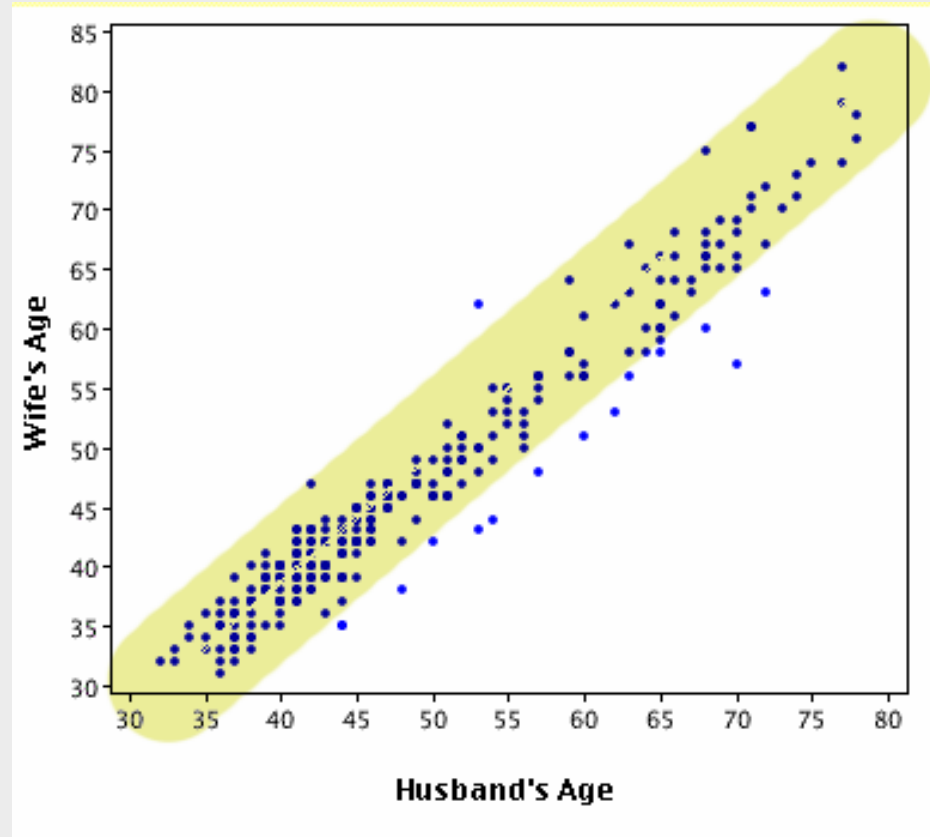


VISUAL PERCEPTION, STAGE 2

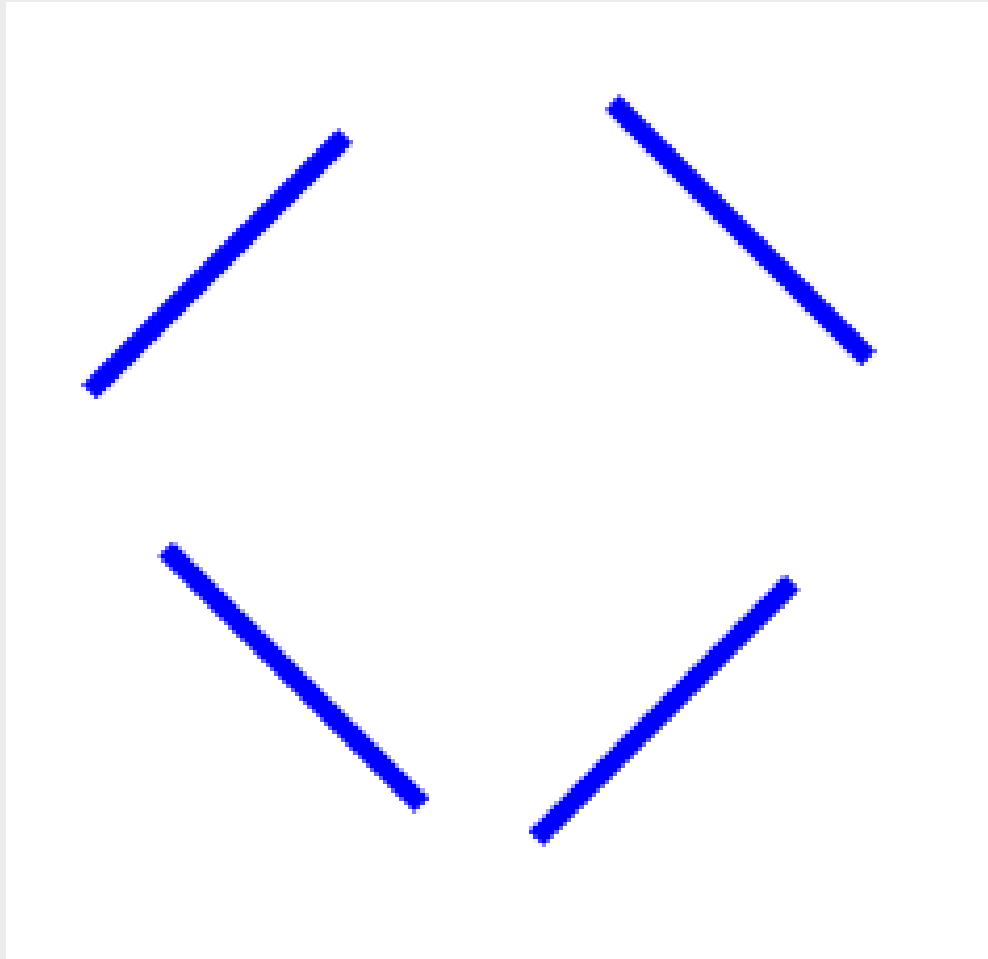
FROM FEATURES
TO PATTERNS

SERIAL PROCESSING

FROM VISUAL BUFFER
(ICONIC MEMORY)
TO
VISUAL MEMORY
(WORKING MEMORY)



CREATING PATTERNS



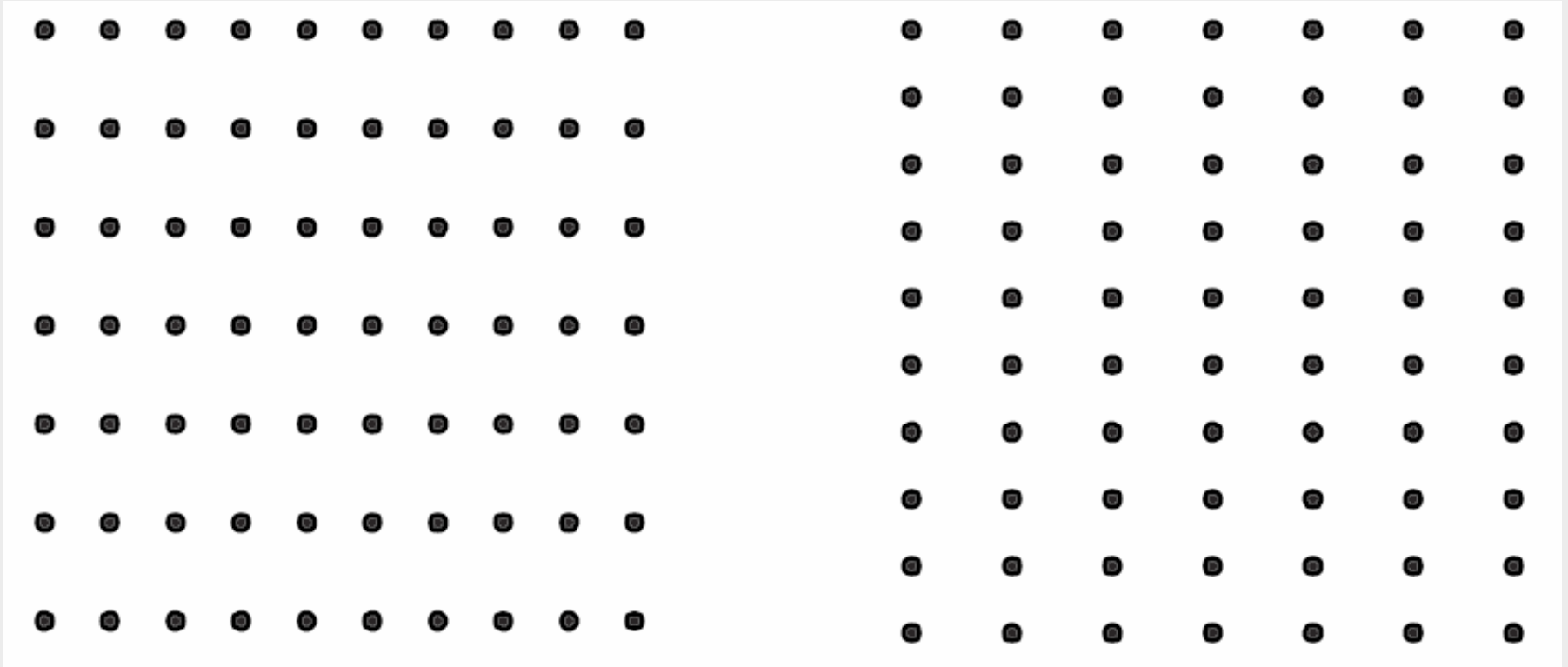
GESTALT LAWS

HUMAN MIND IS PARALLEL AND INTER-CONNECTED COMPARED TO SERIAL PROCESSING COMPUTERS.

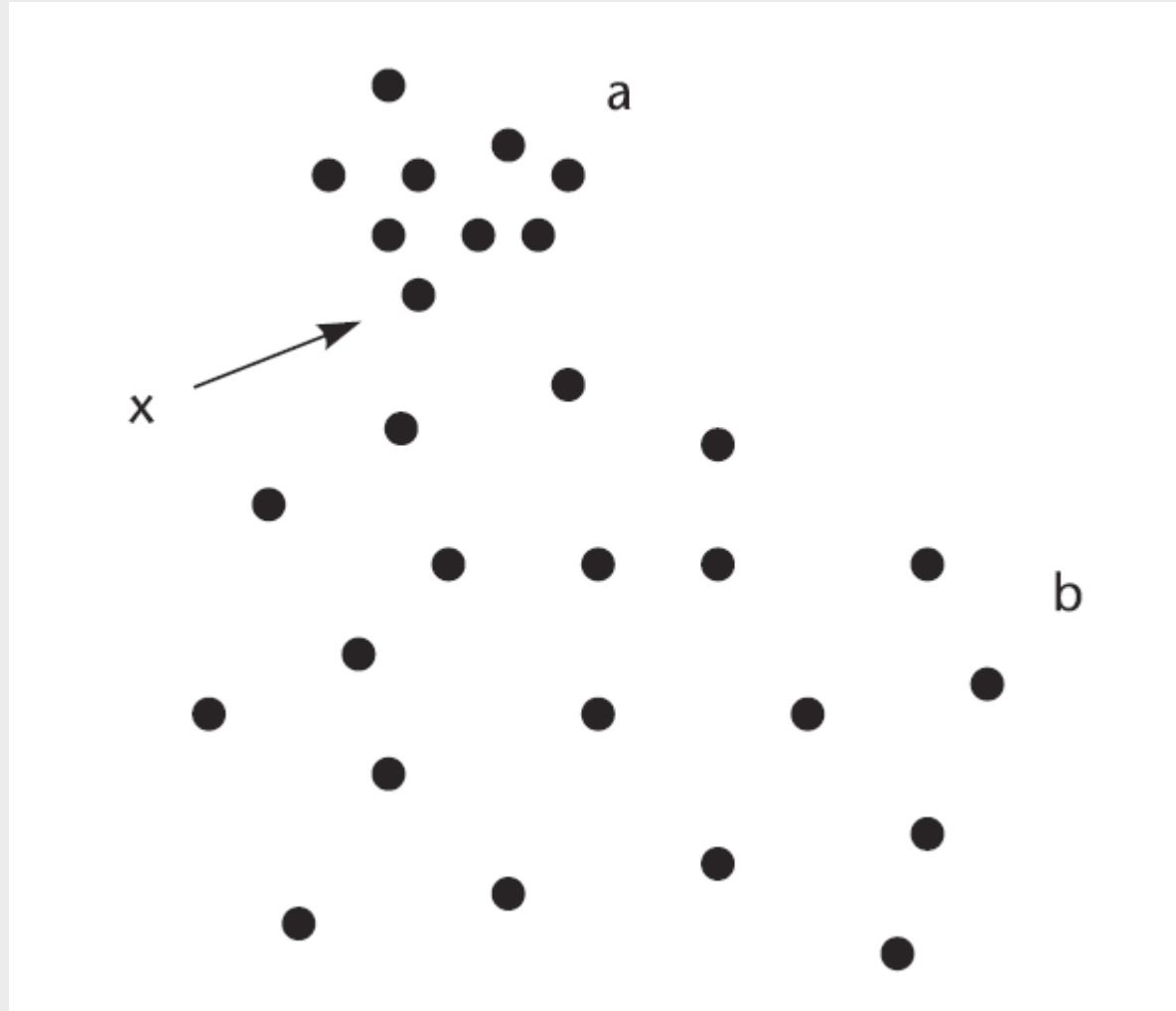
IMPORTANT FOR DESCRIBING VISUAL PERCEPTION

THEY ONLY DESCRIBE, NOT EXPLAIN 😞

GESTALT LAWS - PROXIMITY

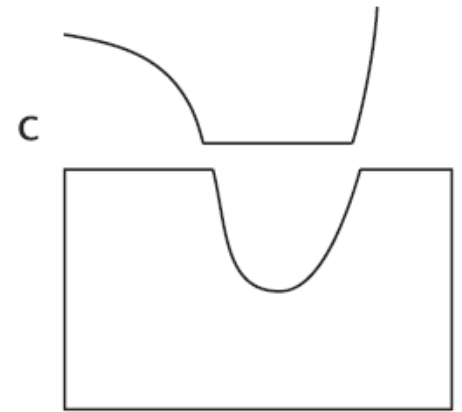
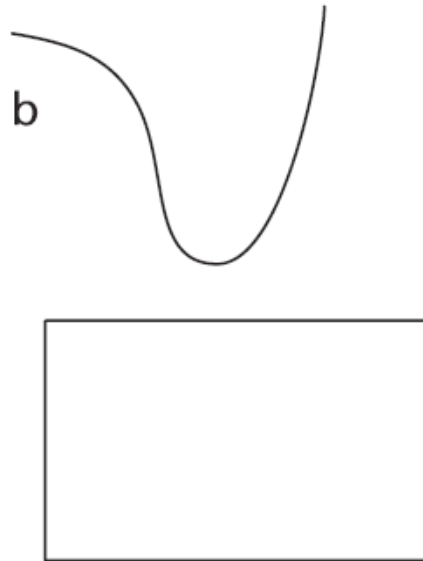
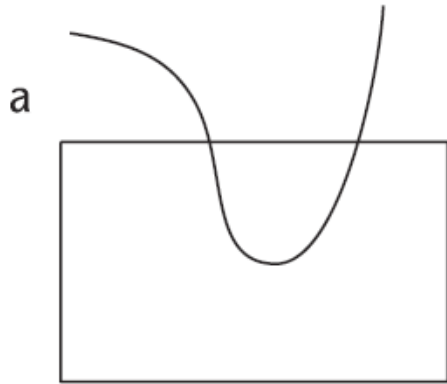


GESTALT LAWS - CONCENTRATION



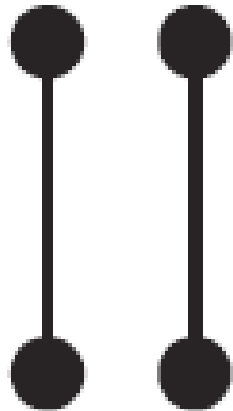
GESTALT LAWS - CONTINUITY

CONNECTING CONTOURS AND PURSUING
CONTINUITY IS HARD-WIRED IN OUR BRAINS

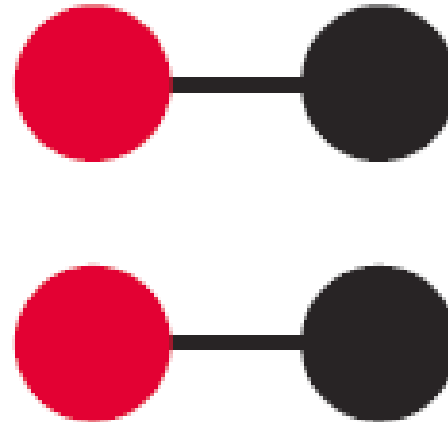


GESTALT LAWS - CONNECTIVITY

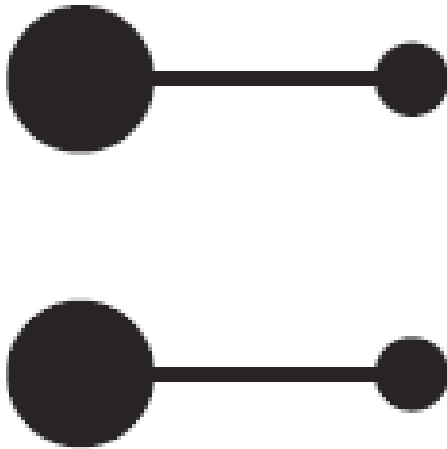
a



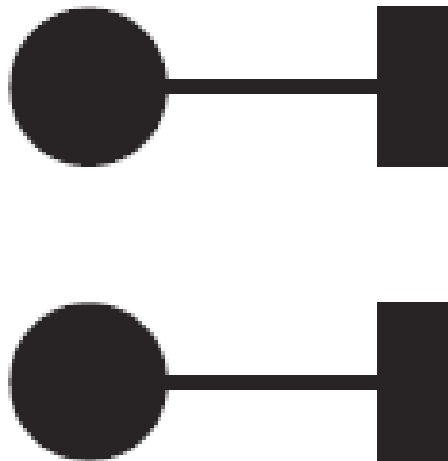
b



c

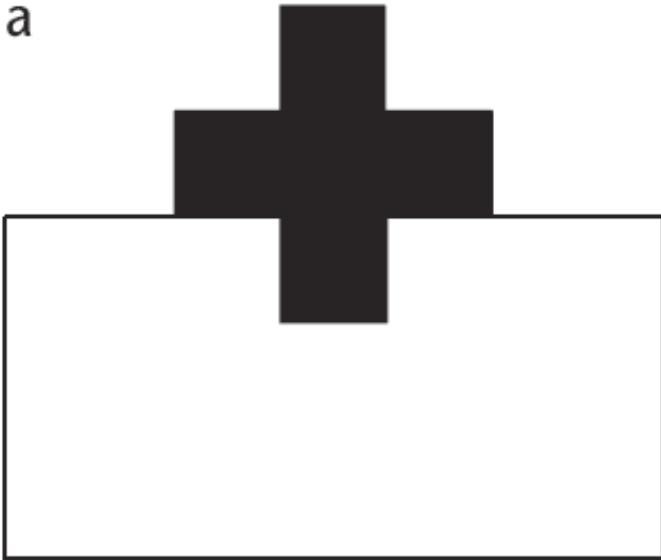


d

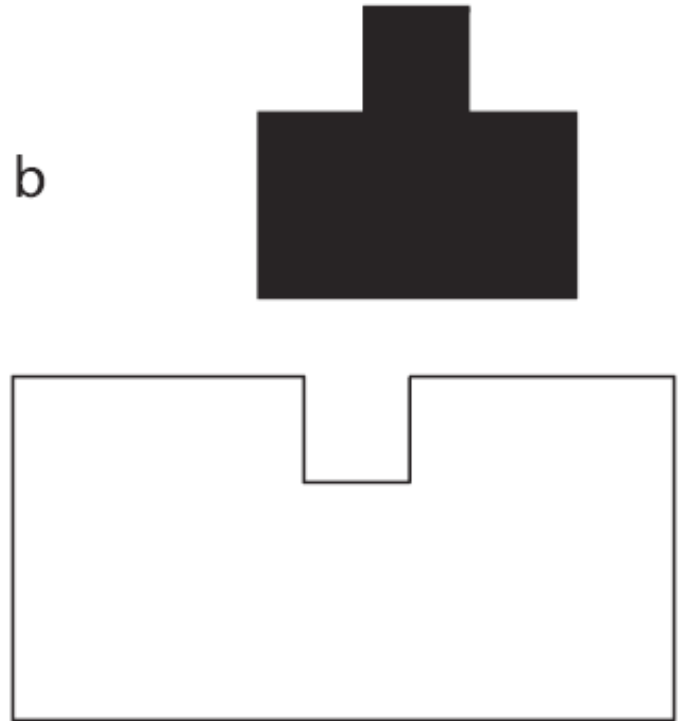


GESTALT LAWS - SYMMETRY

a



b



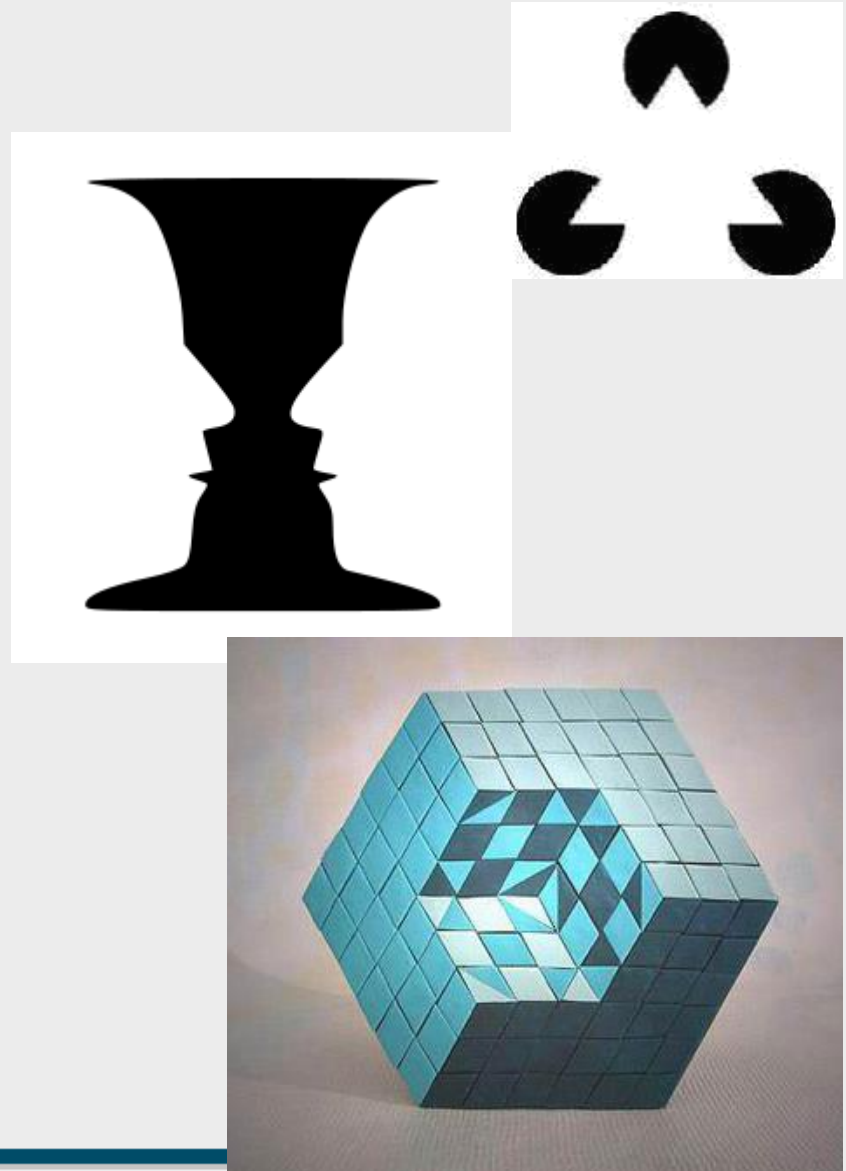
LEARNING FROM THE GESTALTS

WE CONNECT CONTOURS

MULTISTABILITY

WE EXPECT SYMMETRY

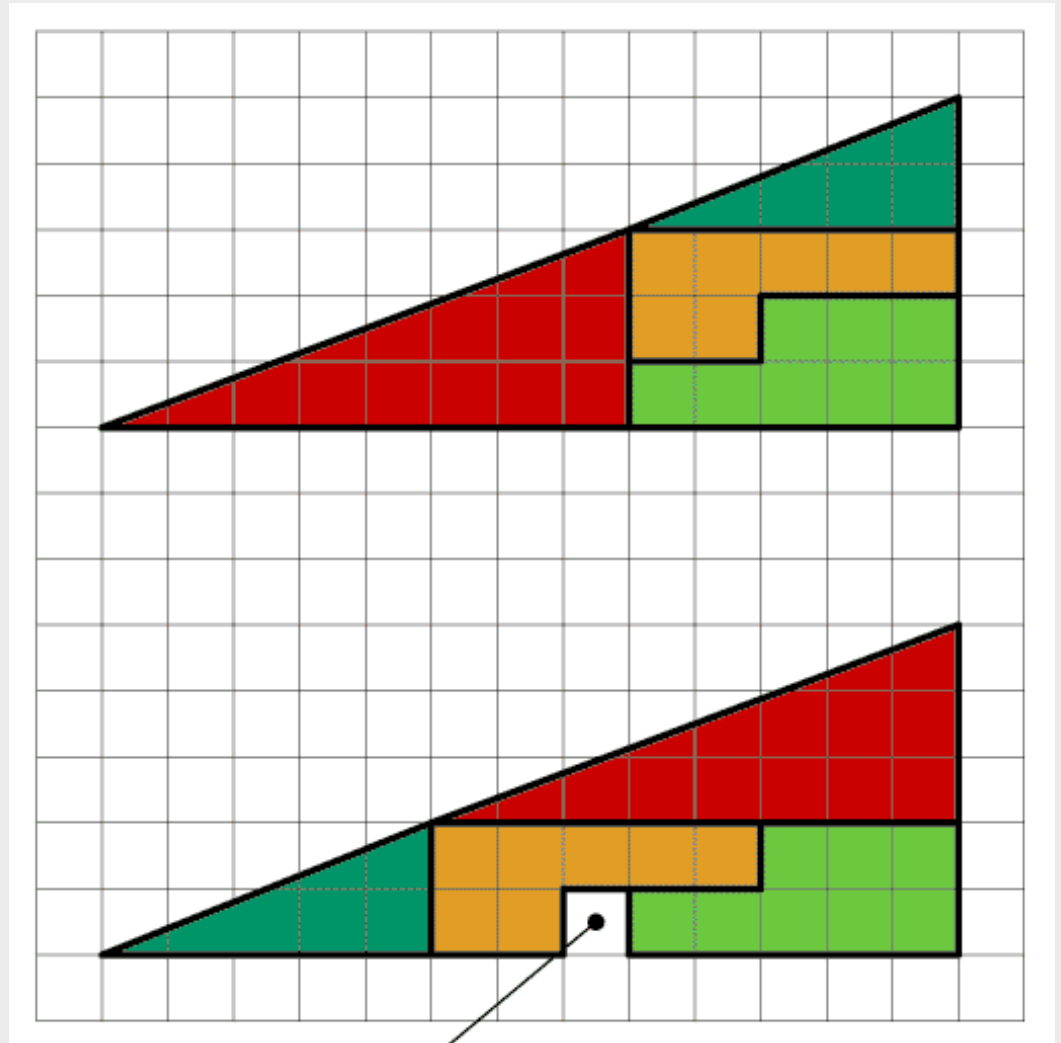
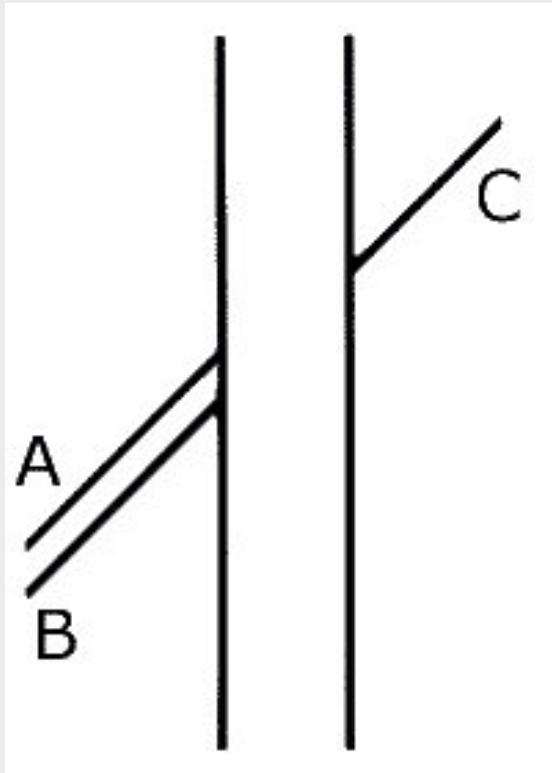
WE PERCEIVE DIFFERENT
LAYERS OF SIMILARITY



RISKS IN VISUALIZATION

LIMITS OF OUR PERCEPTION

ANGLES



MÜLLER-LYER ILLUSION

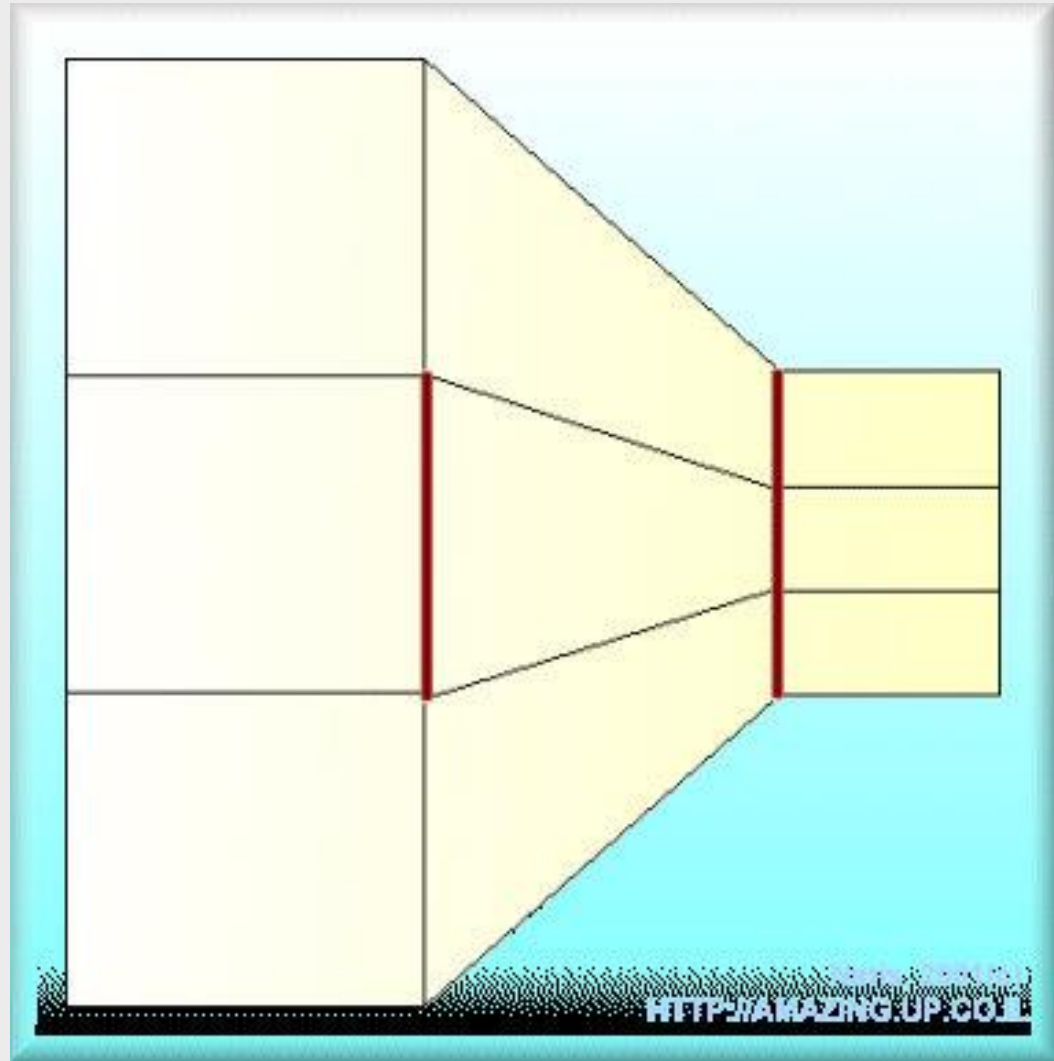
PERCEPTION OF LENGTH IN CONTEXT



PERSPECTIVE COMPENSATIONS

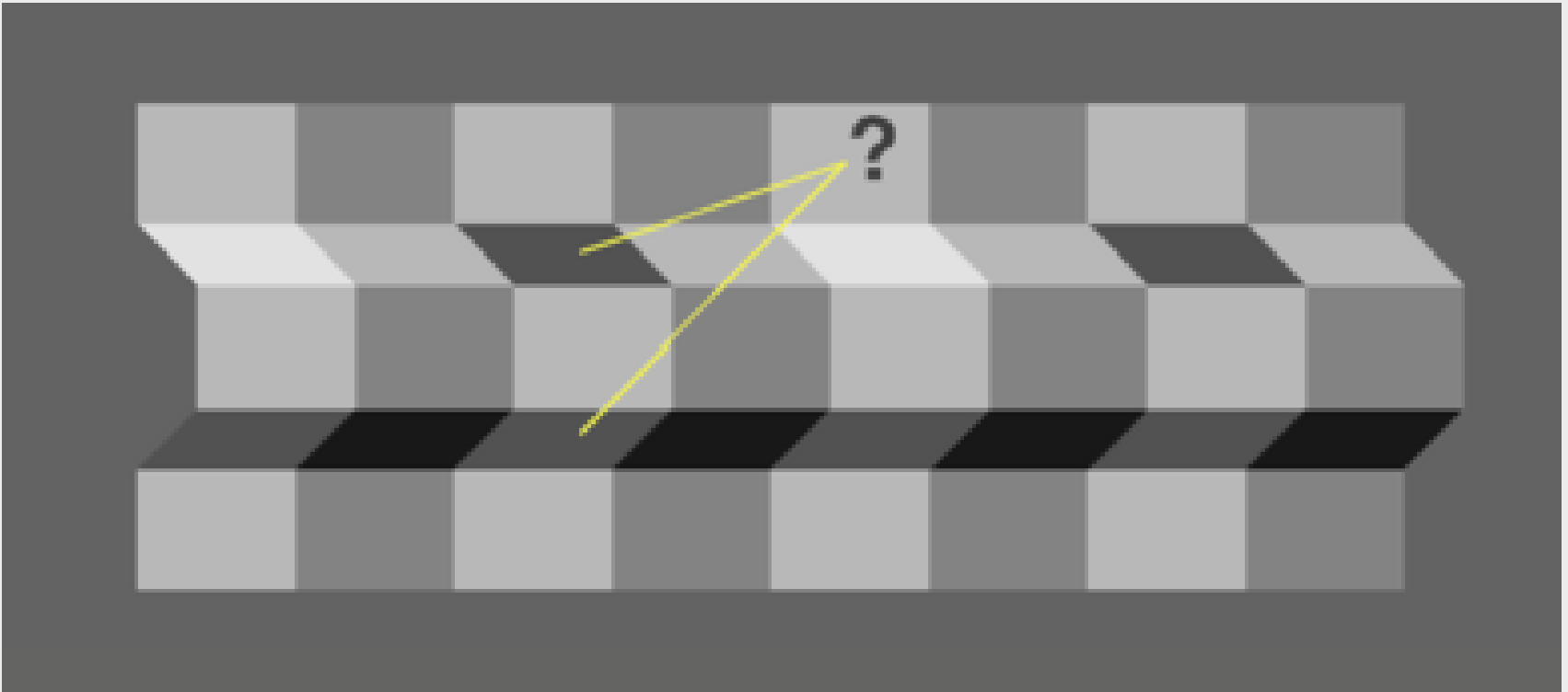
SPATIAL
COMPENSATION

WIDESCREEN
DEFORMATION

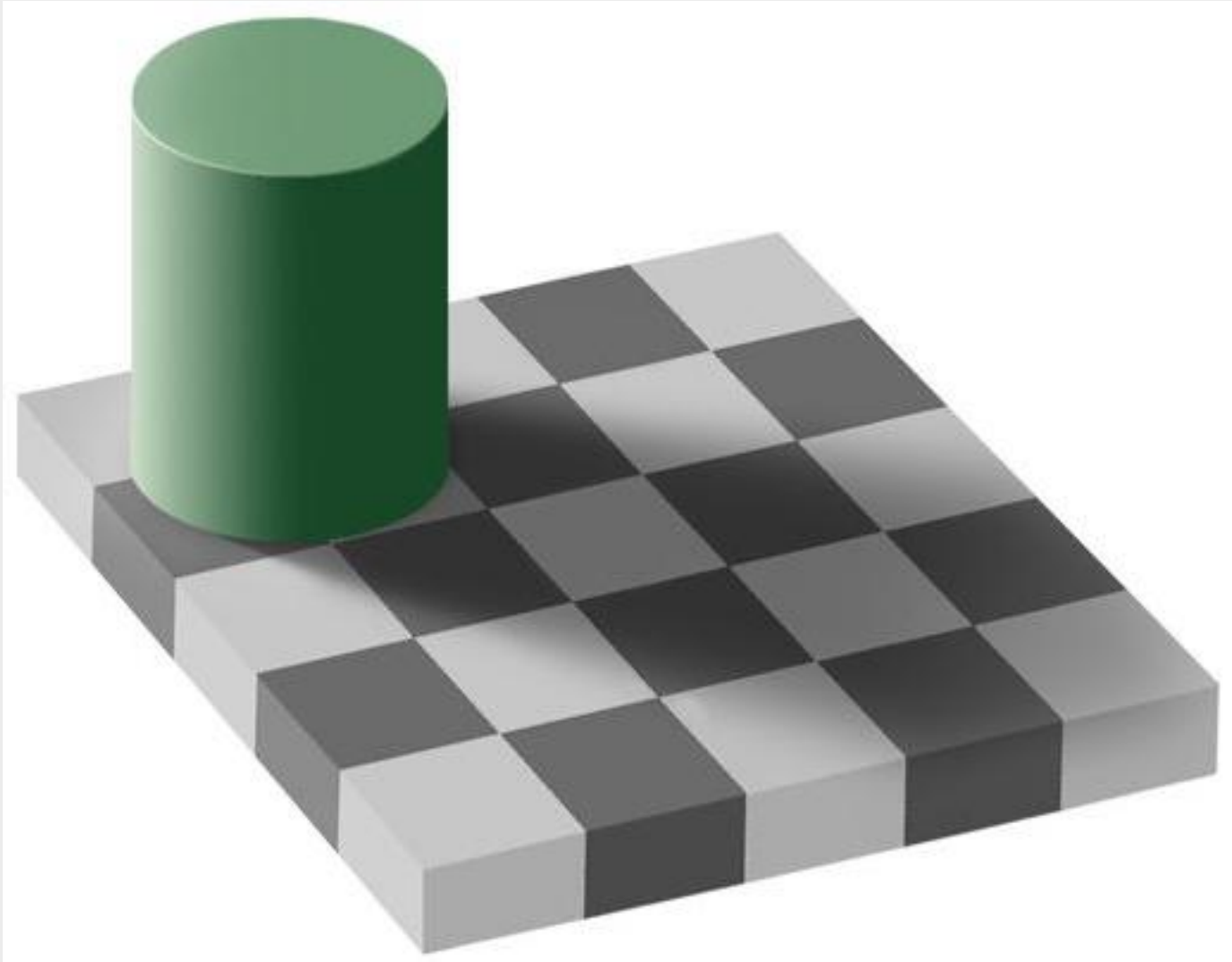


SPATIAL COLOR COMPENSATION

PERCEPTION OF COLOR IN CONTEXT



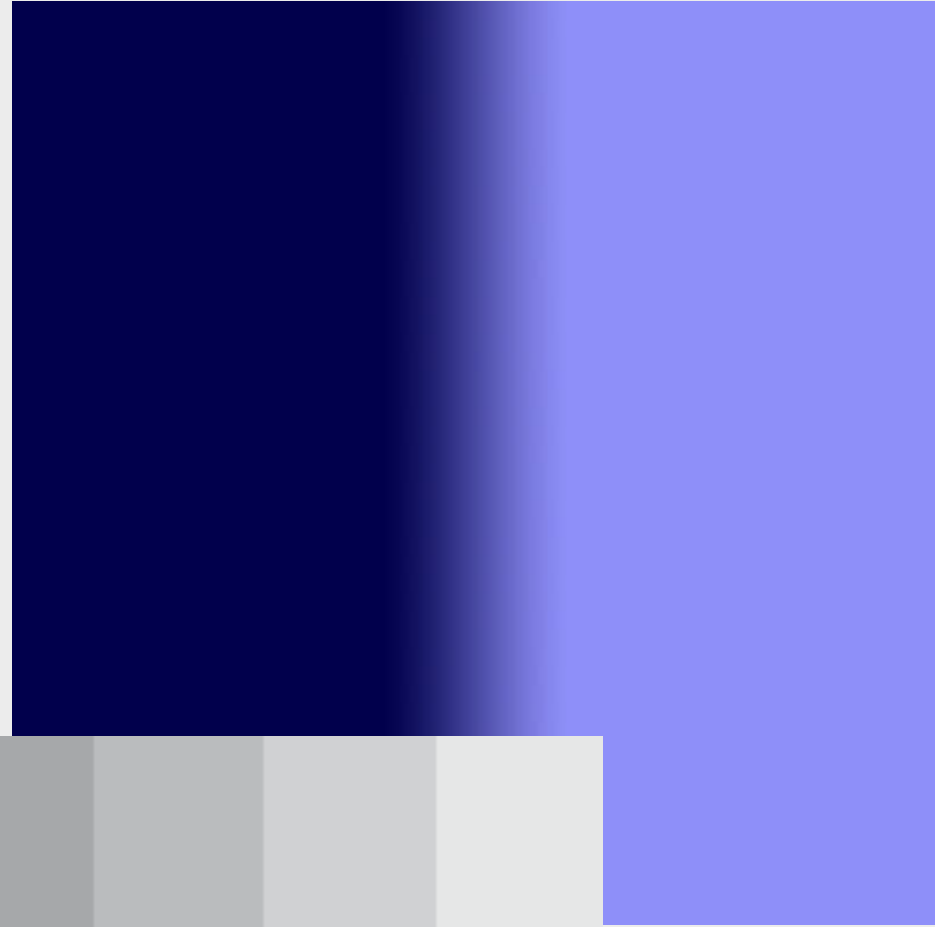
COLOR PERCEPTION IN CONTEXT



LATERAL INHIBITION

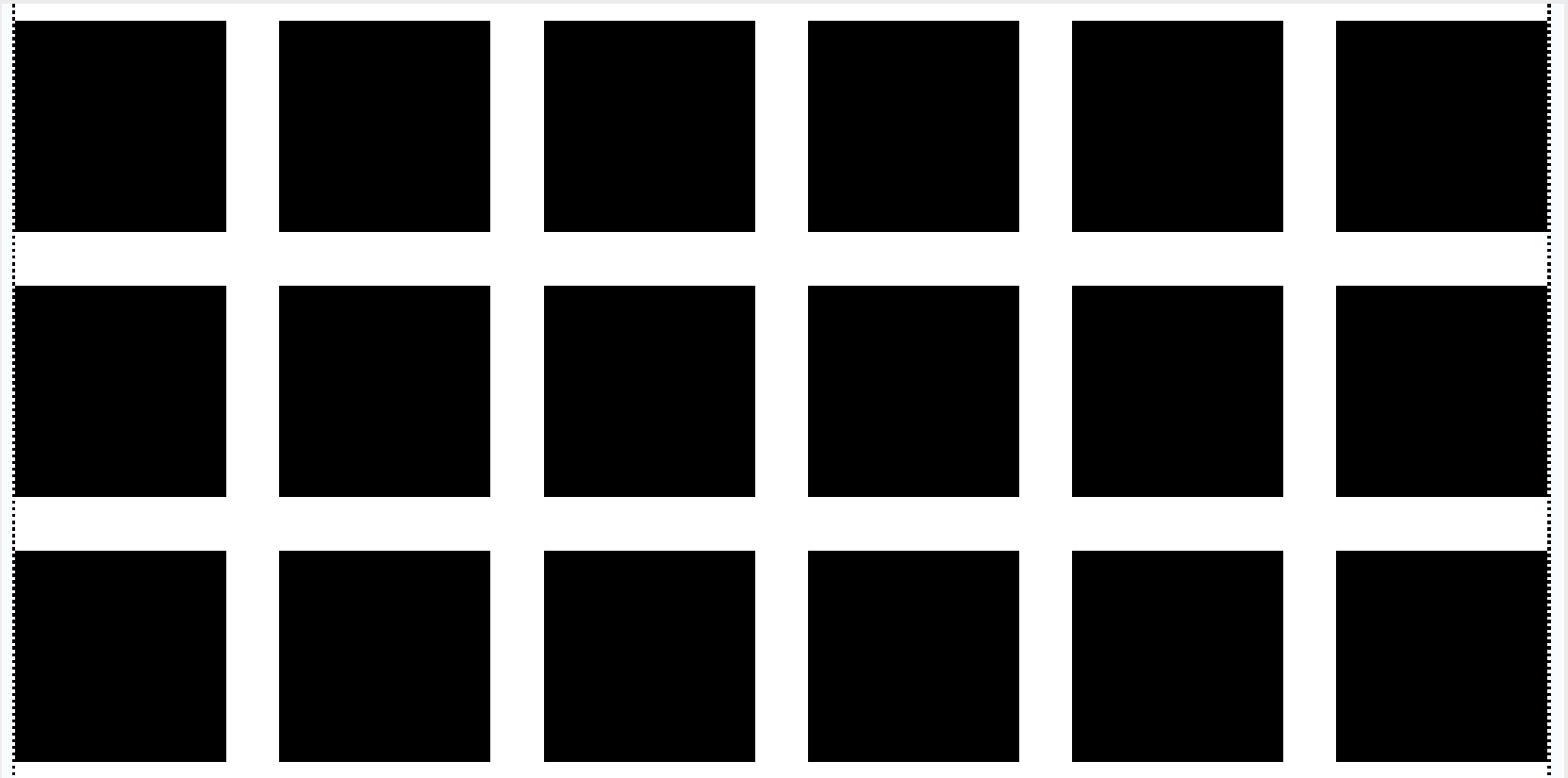
EDGE ENHANCEMENT
CREATES MACH BANDS

OR PRODUCES
CHEVREUL
ILLUSION



LATERAL INHIBITION – HERMANN GRID

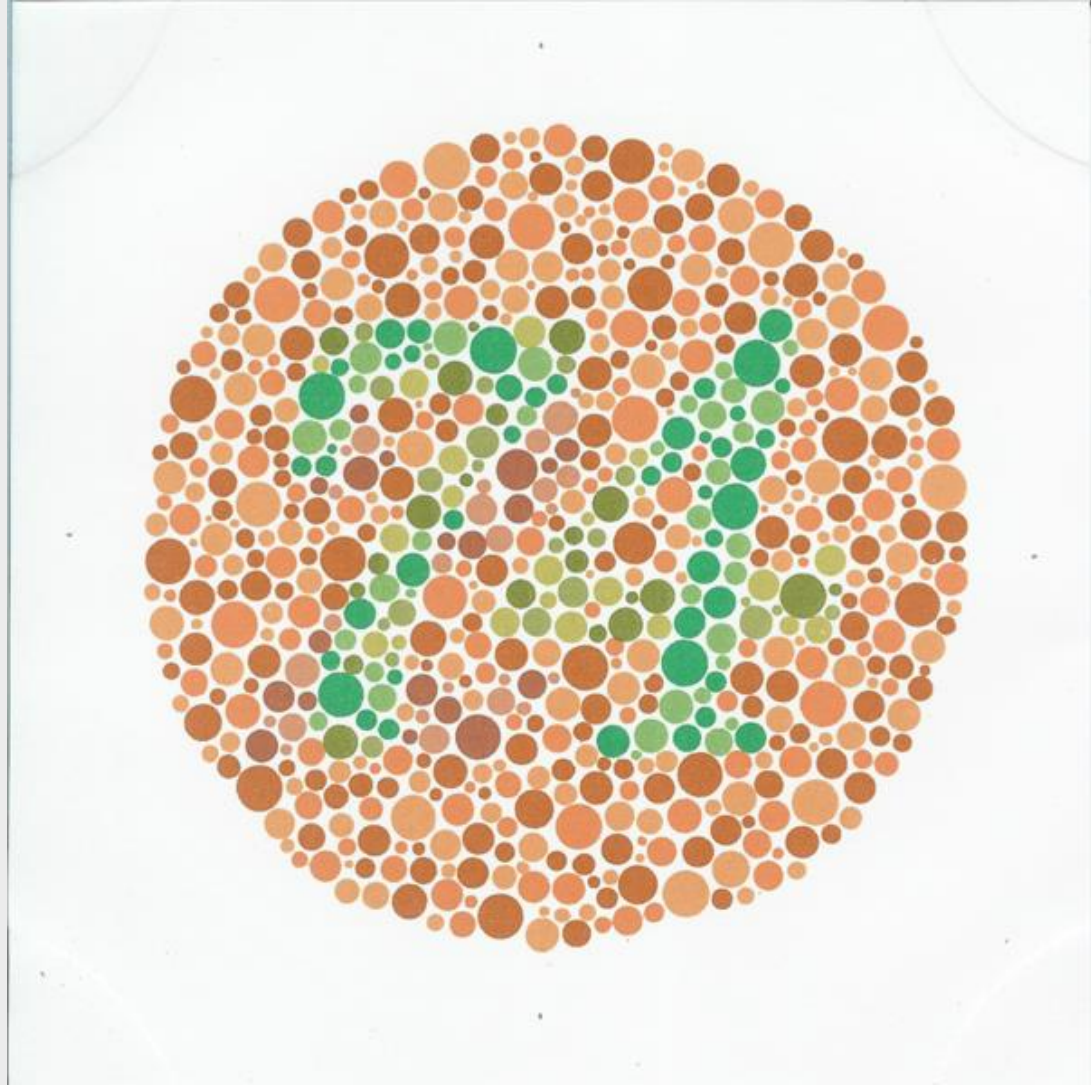
ACCUMULATED INHIBITION
CREATES DARK DOTS



OTHER COLOR RISKS

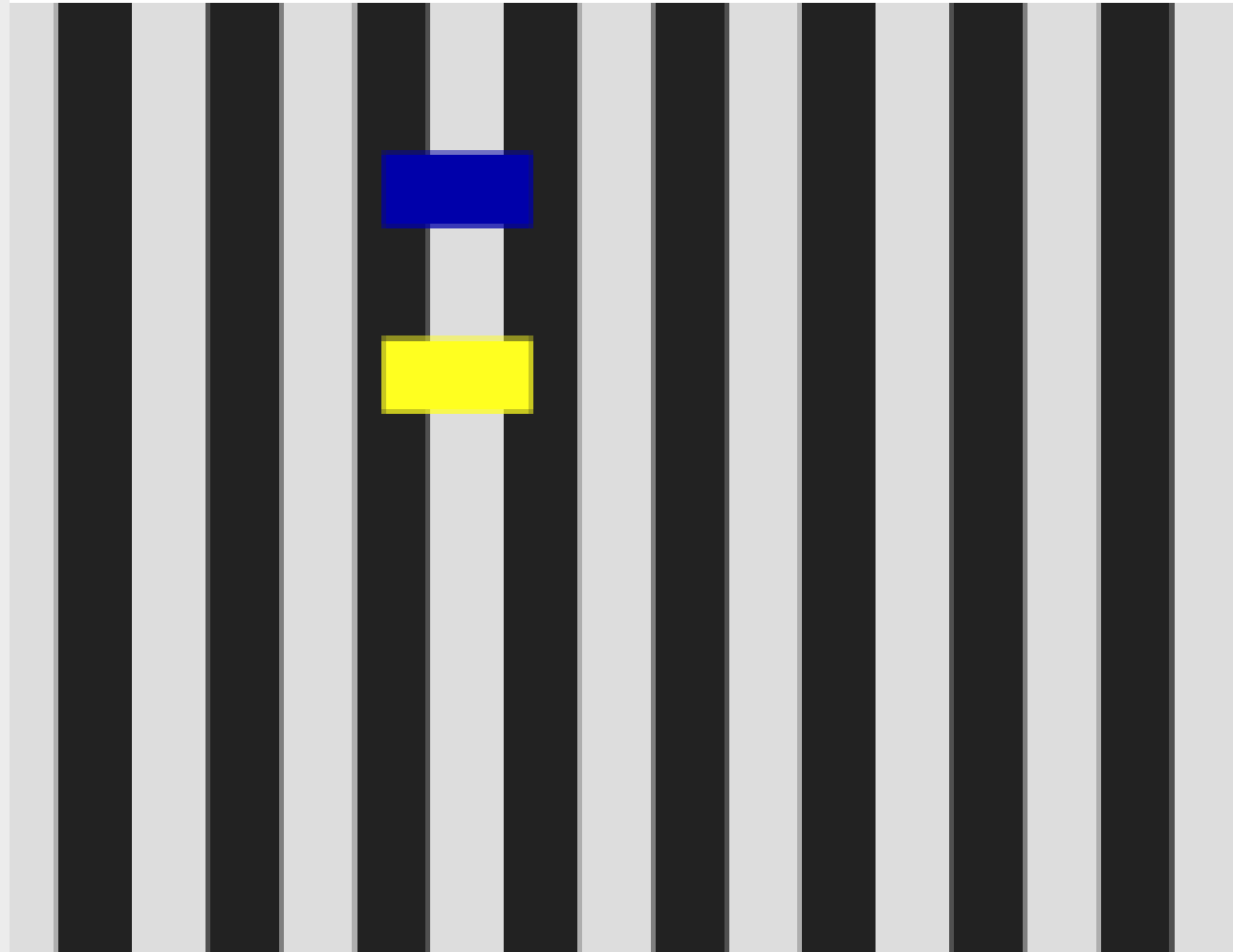
COLOR BLINDNESS
(UP TO 10% MALES)

CULTURAL OR
POLITICAL
BACKGROUND
TO COLORS



CONTRAST / LUMINANCE

ANSTIS



RISKS IN DYNAMIC VISUALIZATION

COUNT THE BASKETBALL PASSES



CHANGE BLINDNESS



CHANGE BLINDNESS



CHANGE BLINDNESS

CHANGE IS PERCEIVED THROUGH
COMPARING BEFORE AND AFTER IMAGES

IF WE ERASE THE VISUAL BUFFER
BETWEEN THESE TWO IMAGES,
THE COMPARISON MUST TAKE PLACE IN
VISUAL MEMORY.

So much for parallel processing...

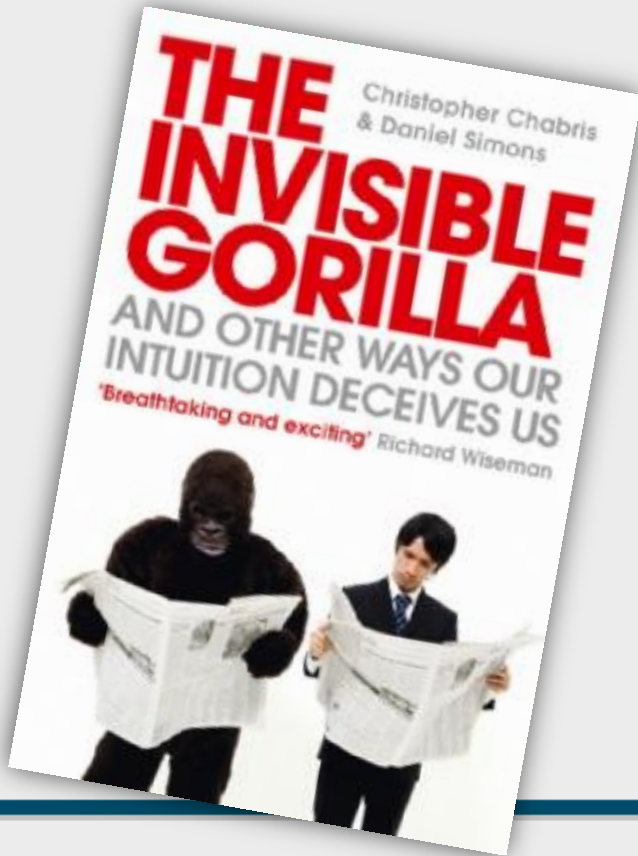
OTHER TYPES OF BLINDNESS

(In-)attentional blindness, slow change, etc.

BEST CHOICE FOR FURTHER INFORMATION

DAN SIMONS, VISCOG

The Invisible Gorilla
and other research in perception.



SUMMARY OF INFLUENCES

A. BIOLOGICAL

- color perception, motion after-effect ...

B. PSYCHOLOGICAL OR LEARNED

- spatial (color) compensations
- blindness, change blindness ...

C. CULTURAL

D. TECHNICAL

- aliasing, lighting condition, frame rate ...
-