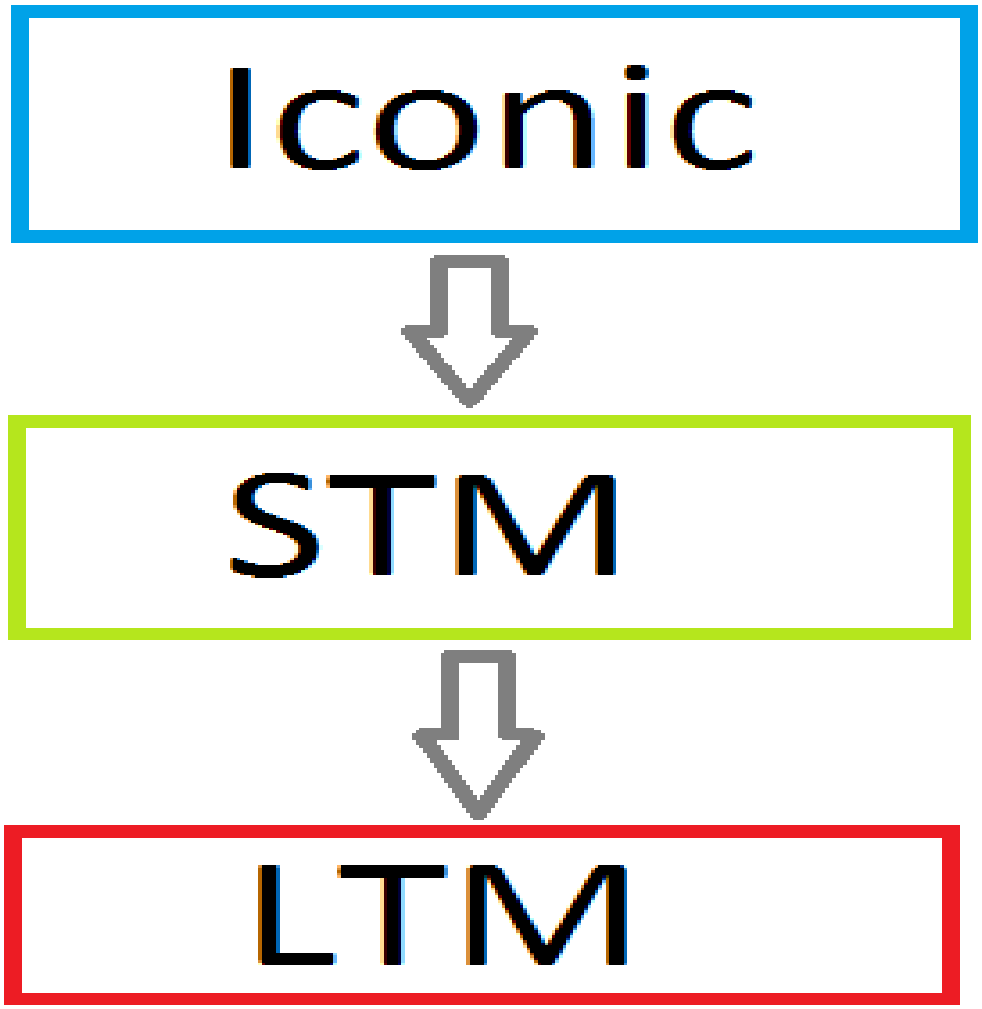
Visual Memory and Imagery

Visual Memory

- Iconic Memory
- Visual STM
- Visual LTM
- Memory Dynamics

Three Memory Systems



Classifying different memory systems

- Duration
- Content
- Loss
- Capacity

Iconic Memory

- Almost immediate (<1 seconds)
- Loss → Decay or Masking
- Change blindness
- Letter test

Change Blindness

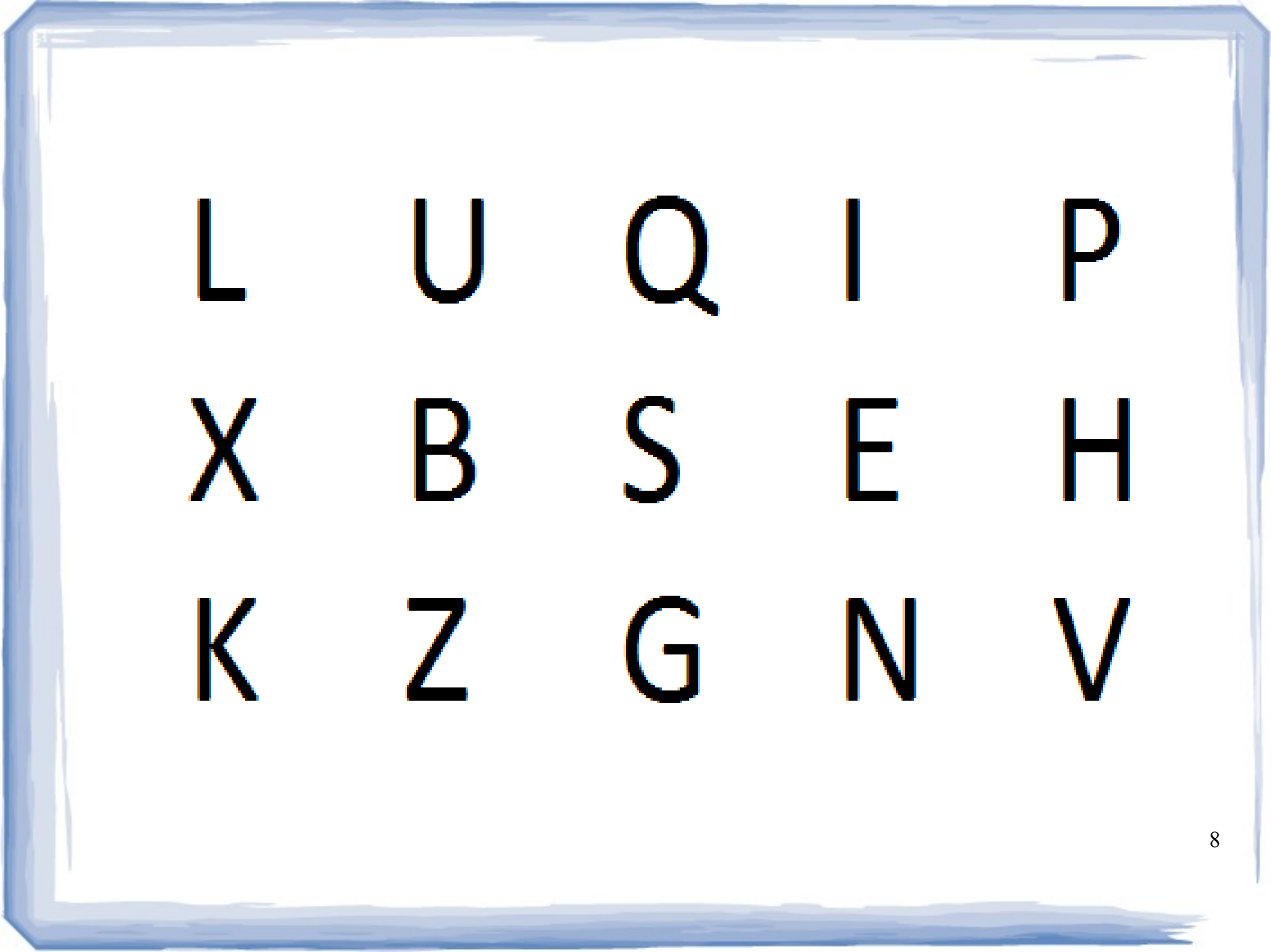
Letter Test

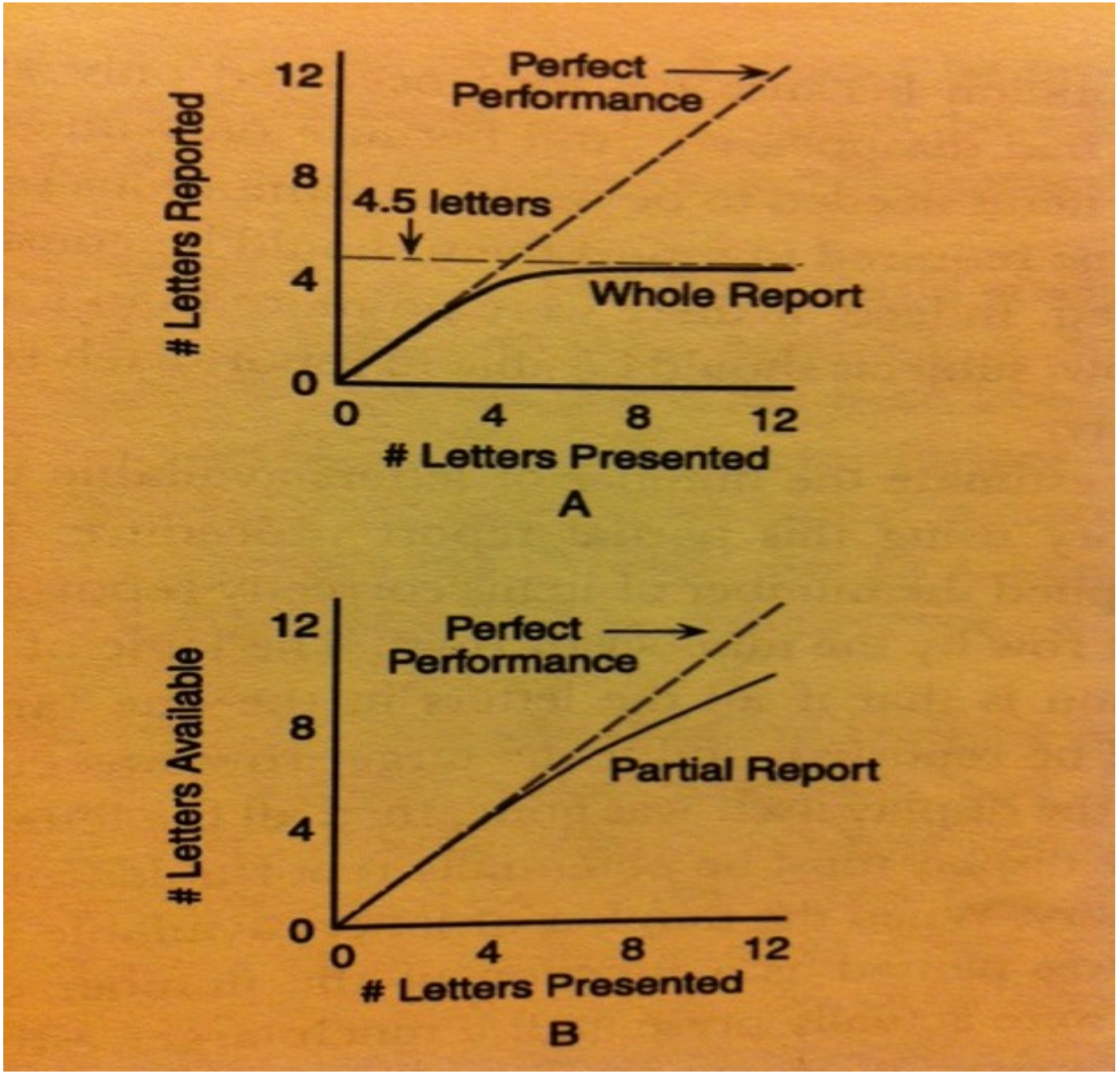
- George Sperling ~1950s
- Span of apprehension
- Presented with up to 20 letters for less than 100 ms.
- Later did Partial Report Procedure

Q T P R F

A V K L E

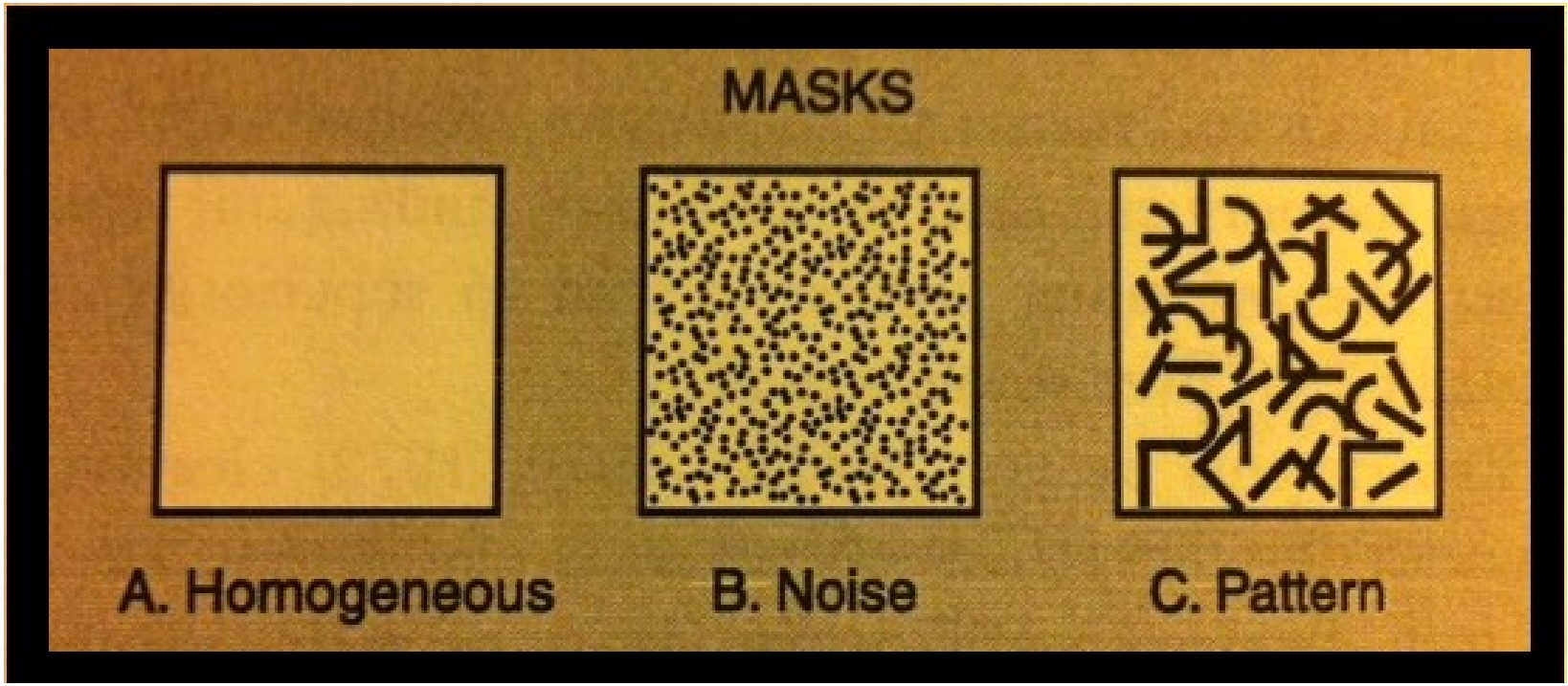
W C B M H


L U Q I P
X B S E H
K Z G N V

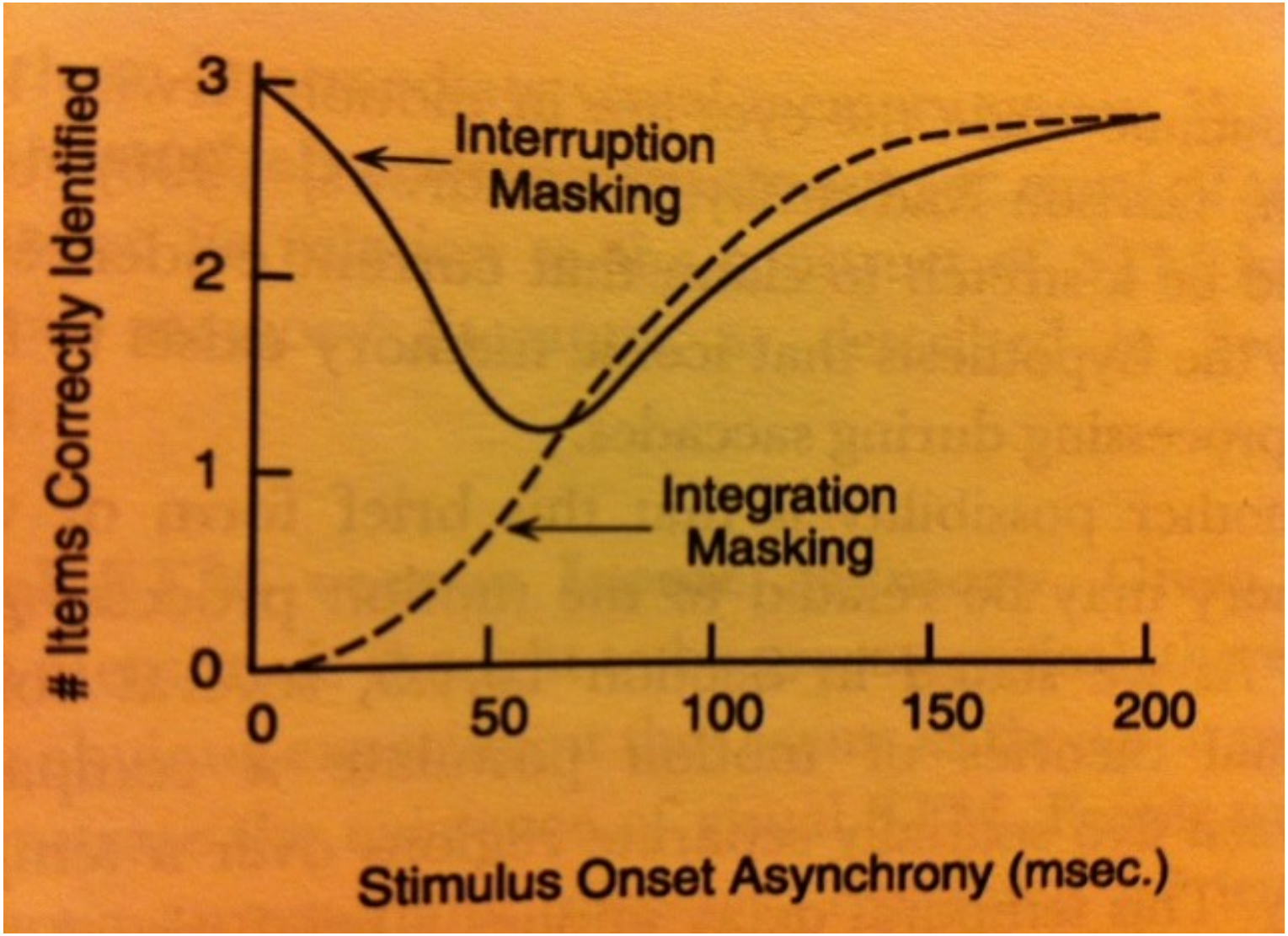

12
8
4
0
Letters Reported
Perfect
Performance
4.5 letters
Whole Report
0
4
8
12
Letters Presented
A
12
8
4
0
Letters Available
Perfect
Performance
Partial Report
0
4
8
12
Letters Presented
B

Masking

- Forward masking vs backward masking
- Homogeneous vs noise vs pattern



Interruption vs Integration



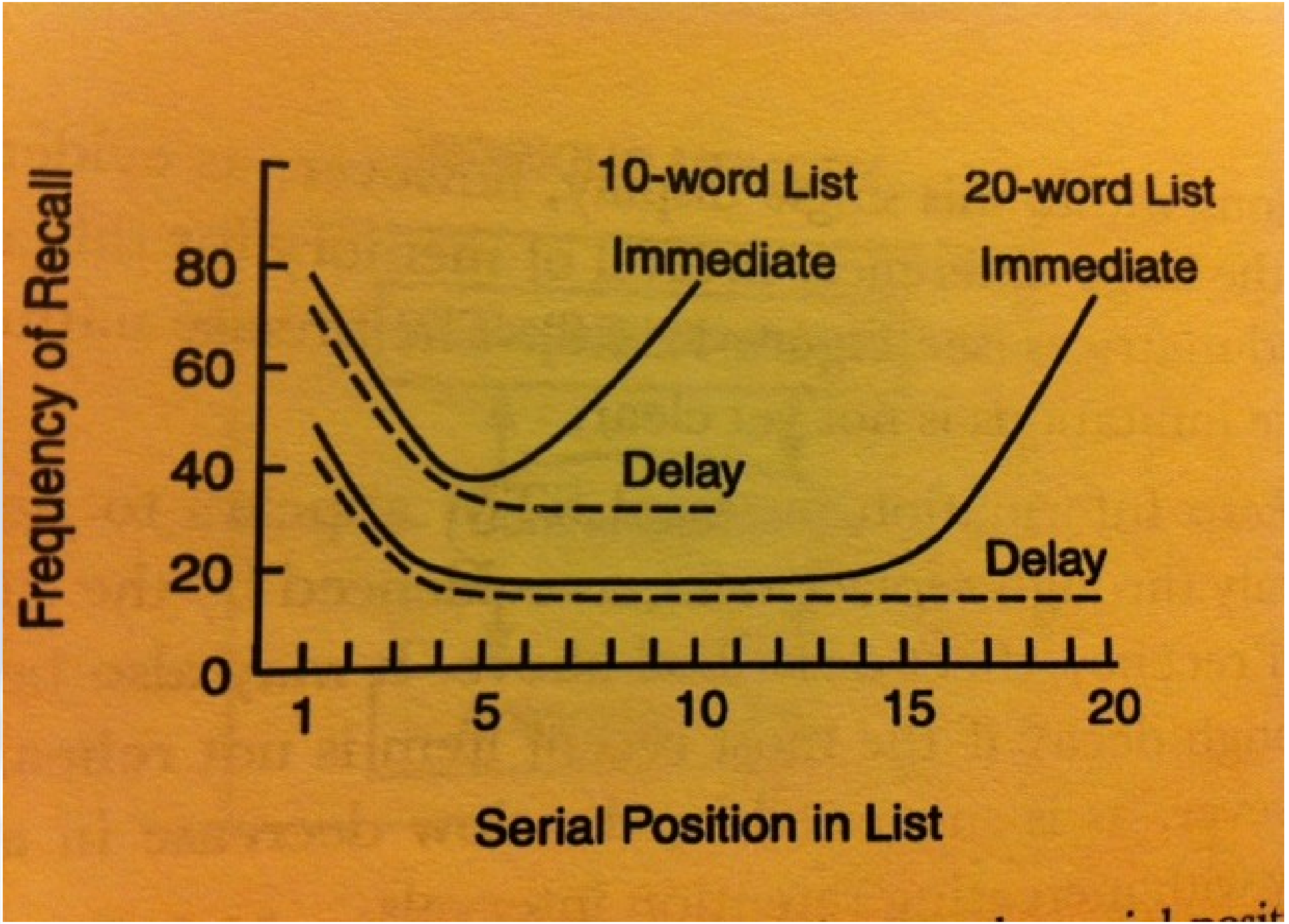
Visual STM

- Lasts up to 10 seconds
- Loss through replacement
- Random patterns test
- Serial position in list test
- Dots, dots, and more dots

Serial Position in List

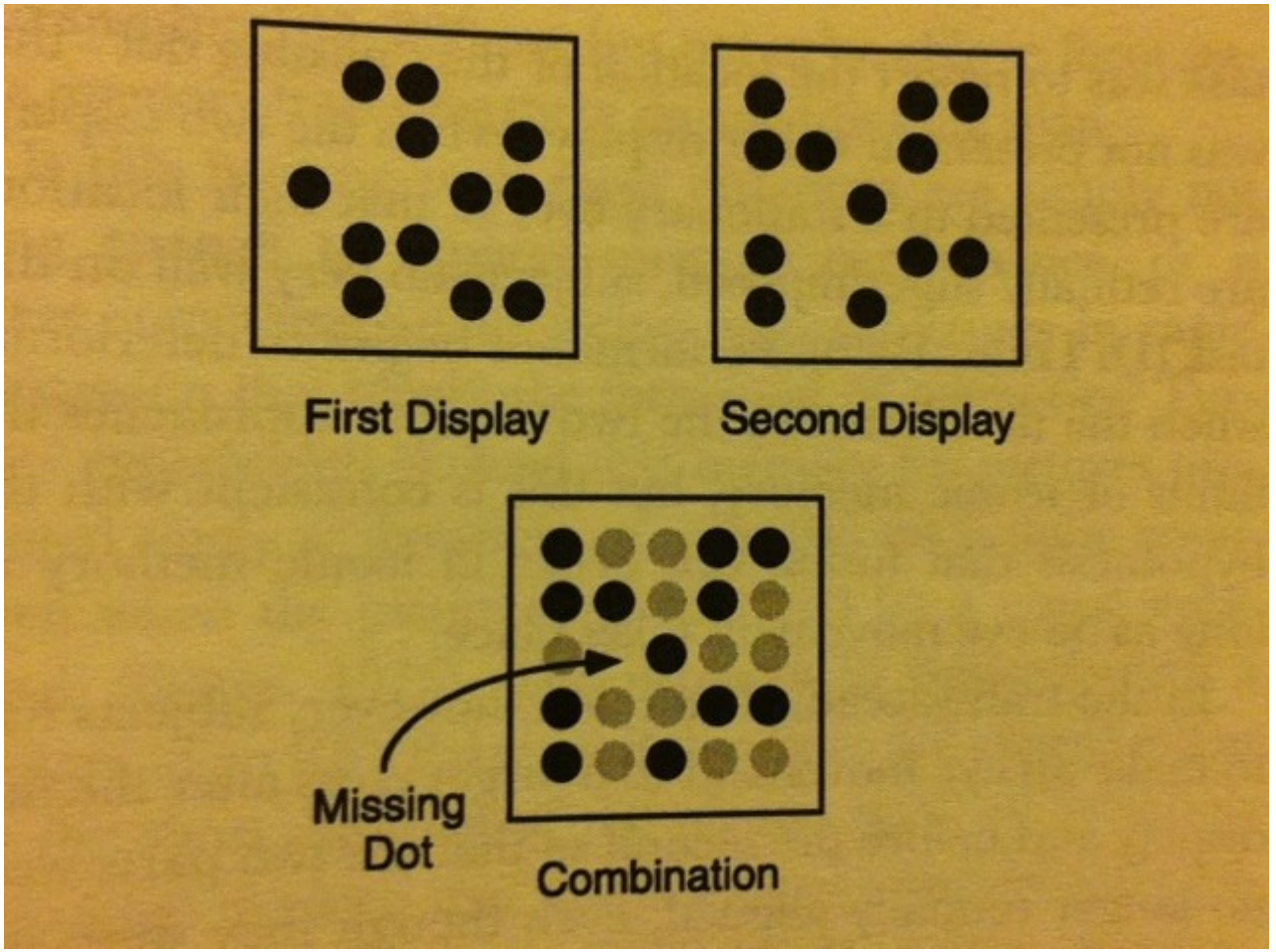
- Presented with list of letters
- After a delay (~20 seconds) asked to recall letters in any order.
- What is probability user recognizes letter in relation to position?

- W K L O Q N
  I E M J R B
  V F X T Z A


Frequency of Recall
80
60
40
20
0
10-word List
Immediate
Delay
20-word List
Immediate
Delay
1
5
10
15
20
Serial Position in List

Dots

- Irwin, Yantis, and Jonides (1983)



Games

- Telephone
- Number remembering

When does the memory become available?

- Rapid Serial Visual Presentation (RSVP)
- 16 photographs, 1 every 2s or 10 every second.
- Try to recognize if you have seen a picture
- Conceptual Masking

Visual LTM

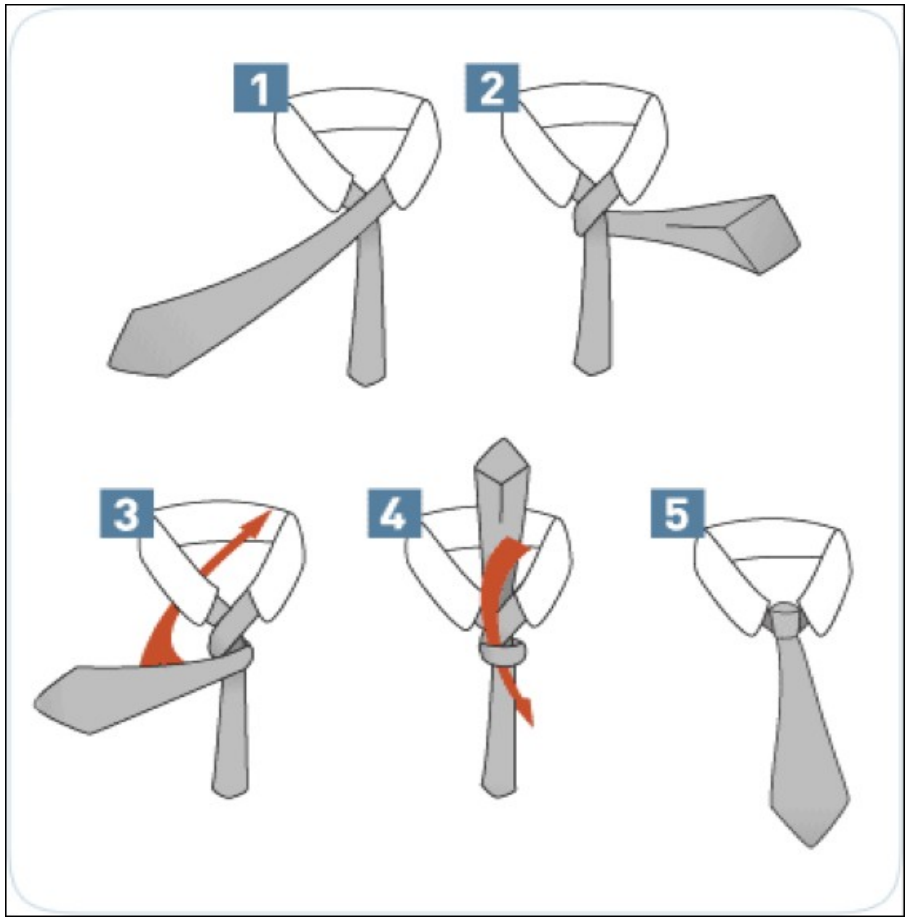
- Seems to be no limit
- Three types {Semantic, Procedural, Episodic}
- Recall vs Recognition
- Mnemonic devices
- Photographic memories

Three types of LTM

- Semantic – general knowledge of generic concepts
- Procedural – general knowledge of general skills
- Episodic – information about experiences

Visual Routines

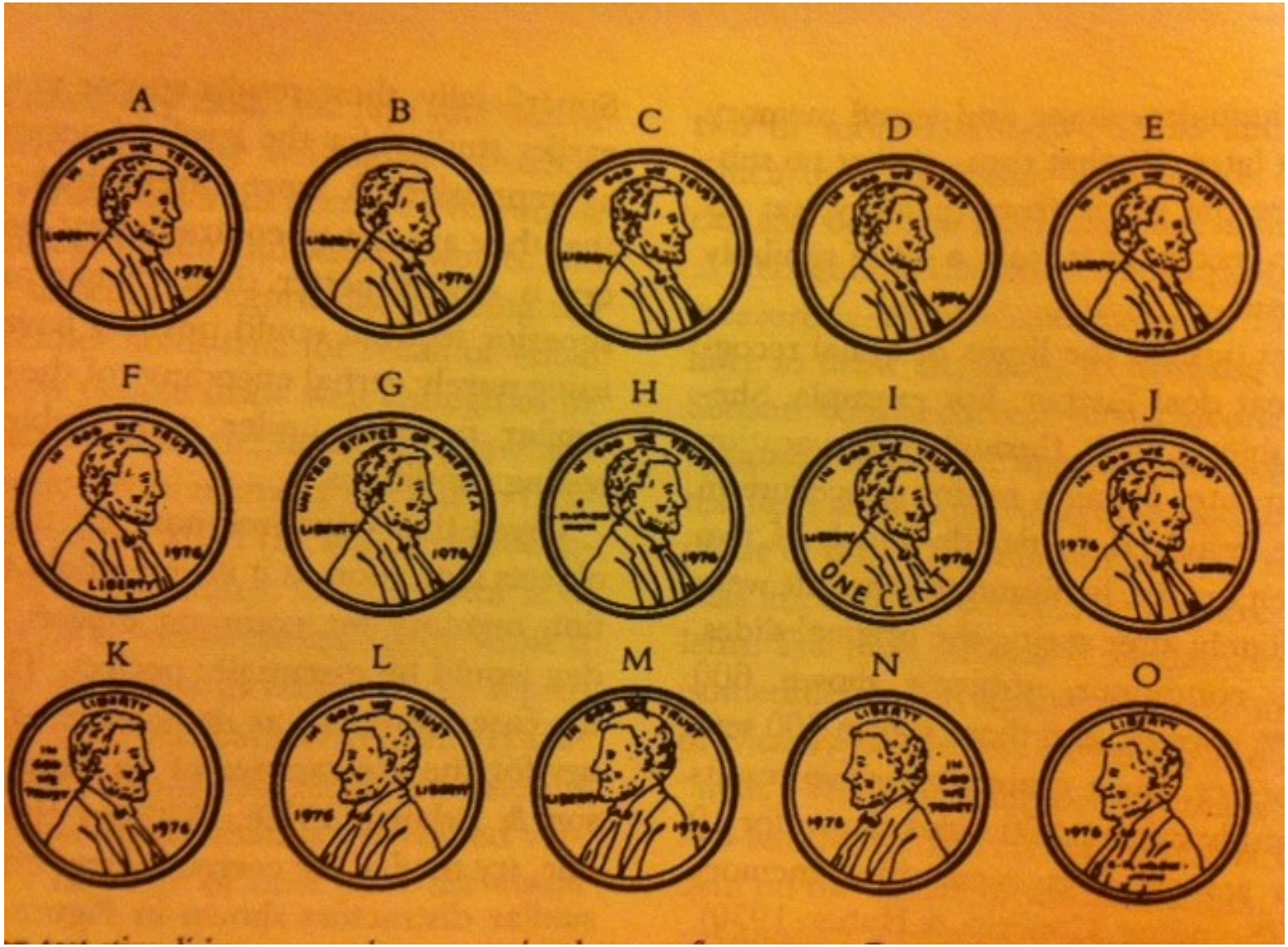
- Transforming images for variety of tasks



Recall vs Recognition

- “I forget a name, but I never forget a face”
- Recall test: reproduction of to be remembered words.
- Recognition test: given initial set of images, given image and determine if new or old.

Pennies



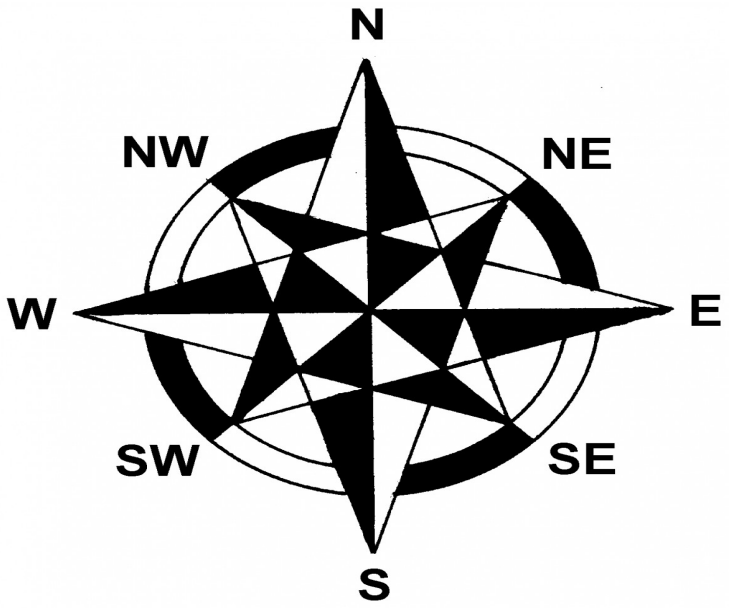
Pennies cont.

- Only 42% got it correct
- Despite seeing it often
- (Nickerson and Adams, 1979)
- 7% chance if at random

Mnemonic Device

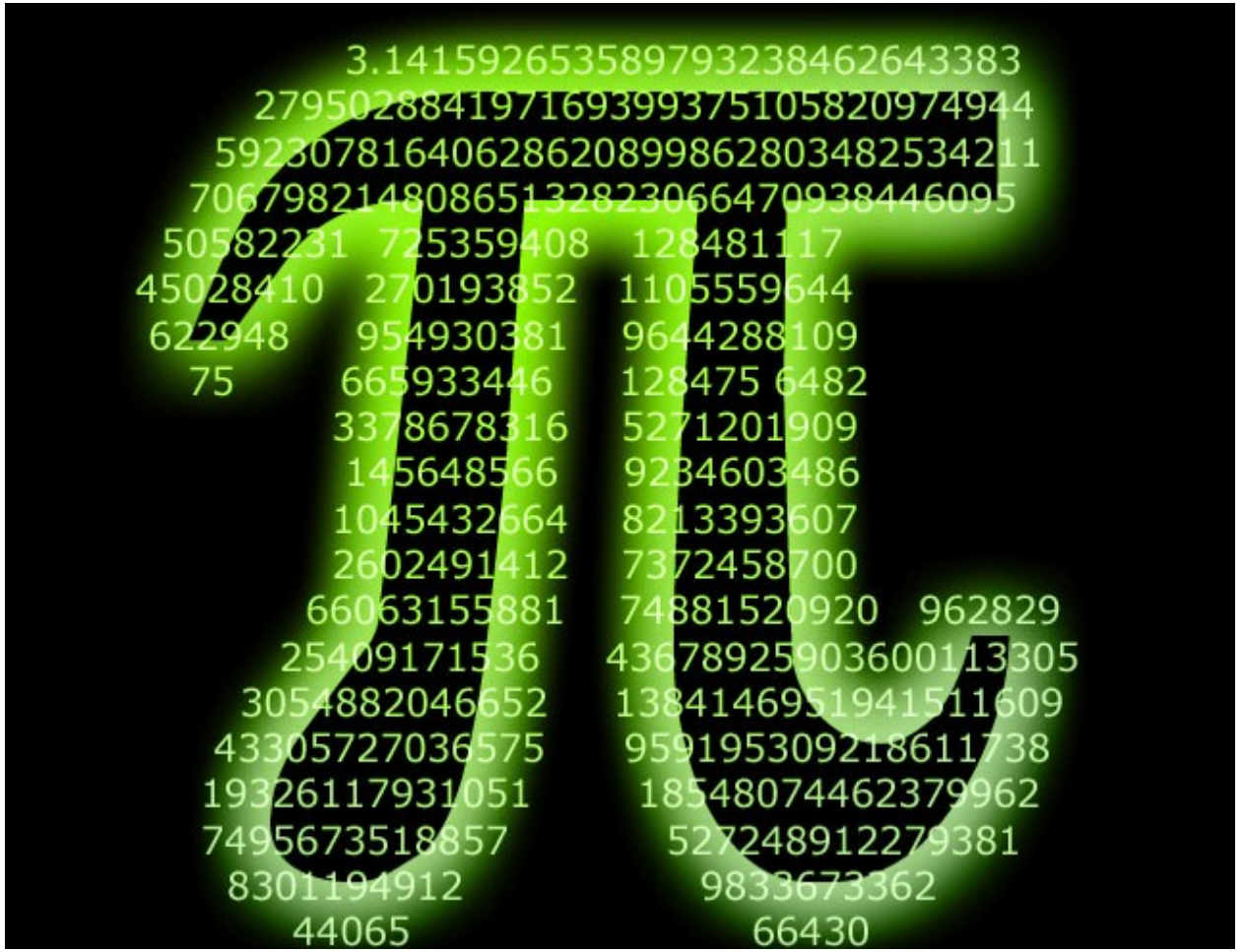
- PEMDAS

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$



Pi

- Chao Lu with 67,890 digits!



e=2.718281828450945...

- 2 (0) dollar bill, 7 president, president in the year 1828, 1828 again, 45-90-45 triangle

Dual Coding Theory

- Imageable words (book, hammer, computer)
- Nonimageable words (faith, life, freedom)
- Paibio (1969) proposed there are two separate storage systems in LTM
- One for verbal
- One for linguistic information

Objection to Dual Coding

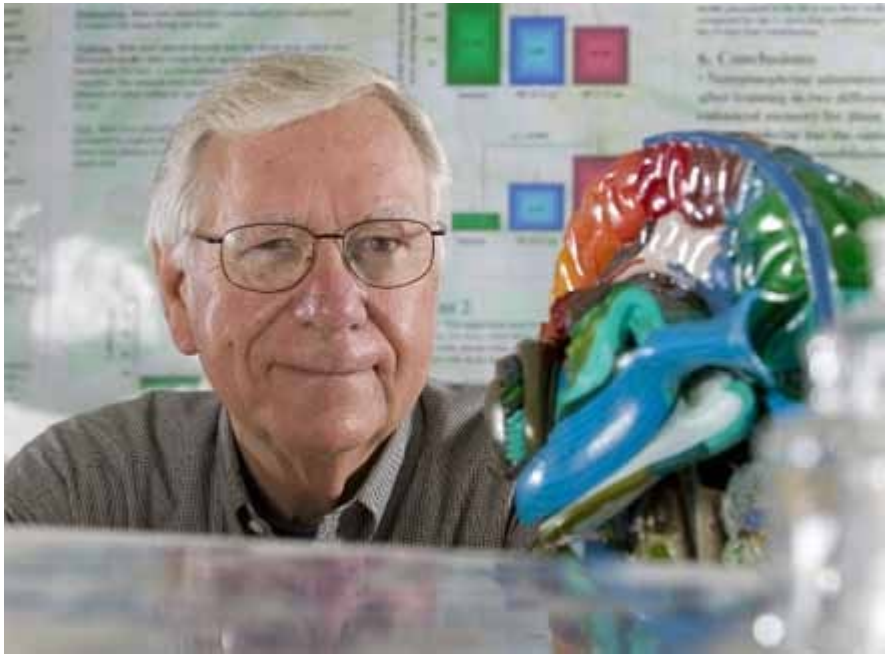
- (Dodson, Johnson, & Schooler, 1997; …)
- Half subjects asked to describe face in detail
- Other half doing mindless task (counting backwards by 3's from 605)

Photographic Memory

- Eidetic imagery
- 7% of children (Leask, Haber, & Haber, 1969)

Perfect LTM?

- 33 confirmed
- Not sure if genetic or molecular
- Recall any day instantly
- 99% accuracy!

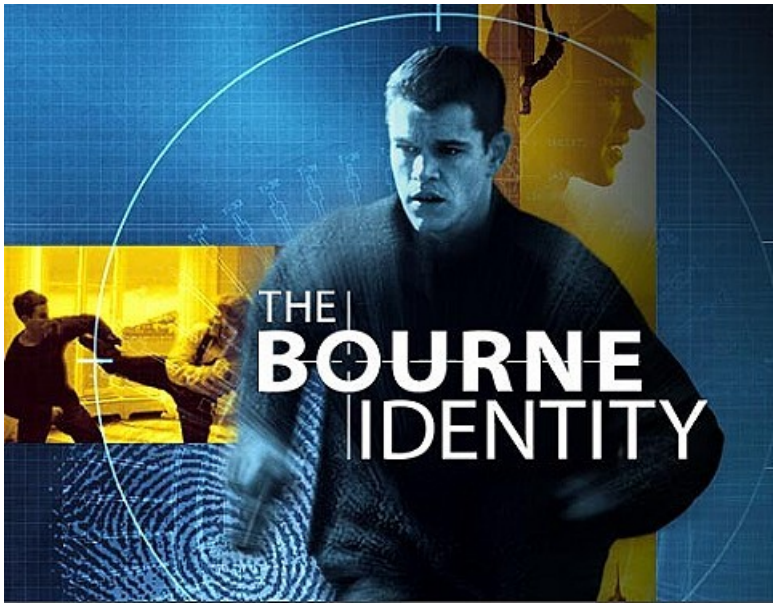


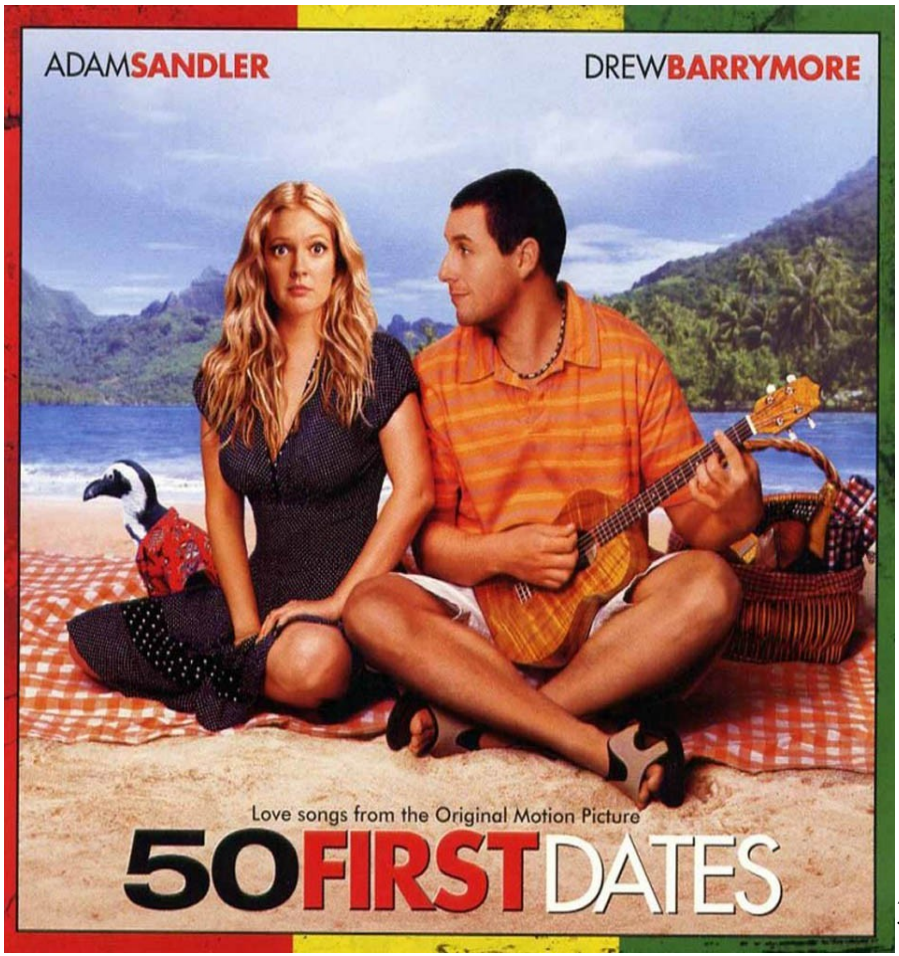
Mnemonists

- Strong ability to remember items
- S was studied by A. R. Luria (1968)
- 50 digits in 3 minutes, forever.
- When heard 2000 Hz said “It looks something like fireworks tinged with a pink-red hue. The strip of color feels rough and unpleasant and it has an ugly taste...”

Neuropsychology

- Amnesia
- Retrograde amnesia
- In media



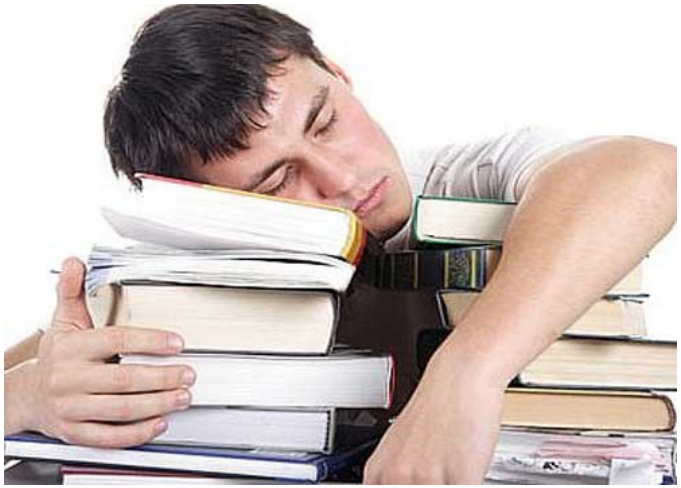


Sleep

- Tarnow's theory – LTM is stored in dream format
- Doesn't matter how we learned information.
- How does sleep affect our memory?

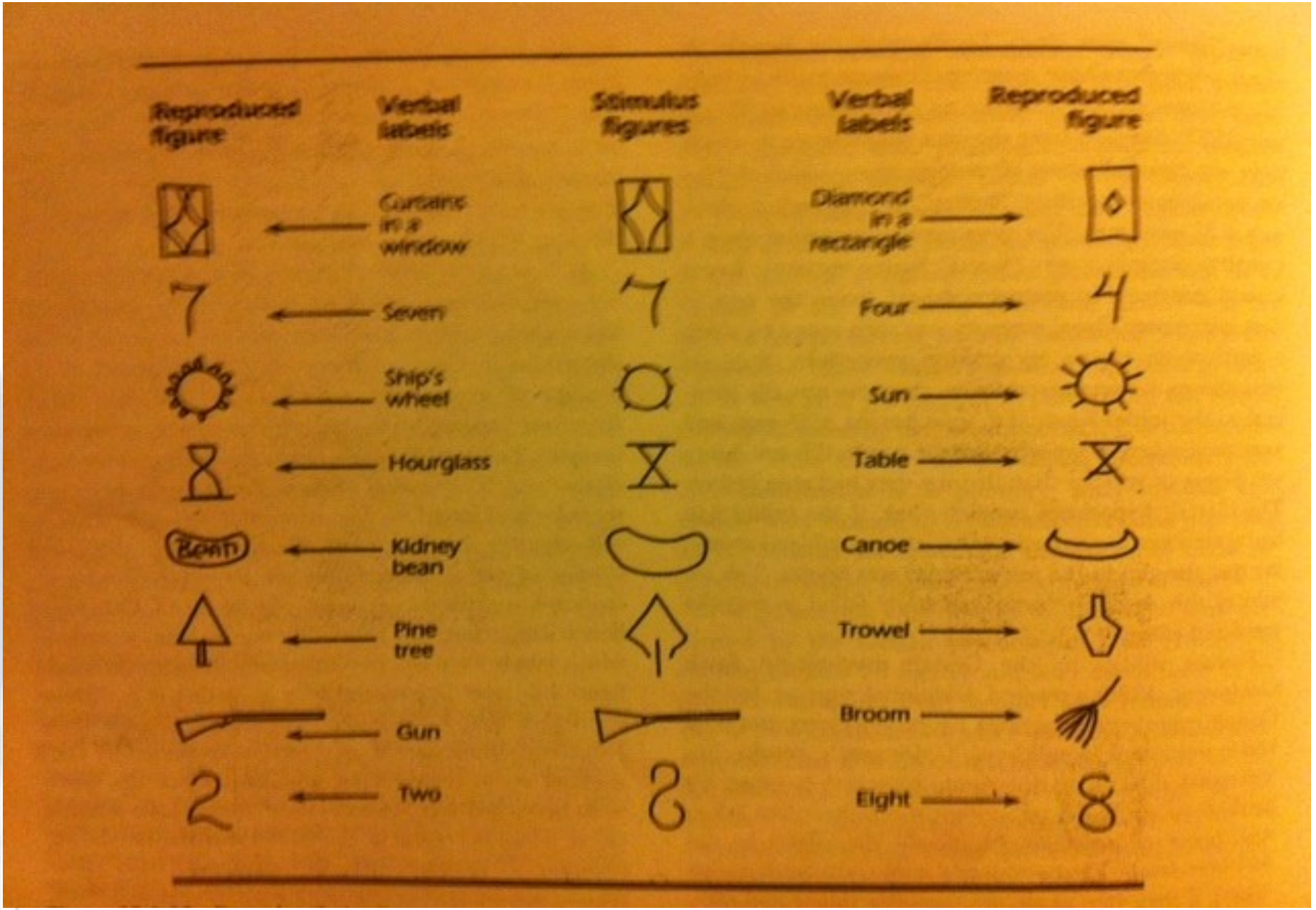
Sleep = better memory?

- Sleep benefits memory retention – Ebbinghaus 1885
- Payne & Holtz
- Given word pairs, some at 9am some at 9pm.
- Tested 30 minutes later, 12 hours, or 24 hours later

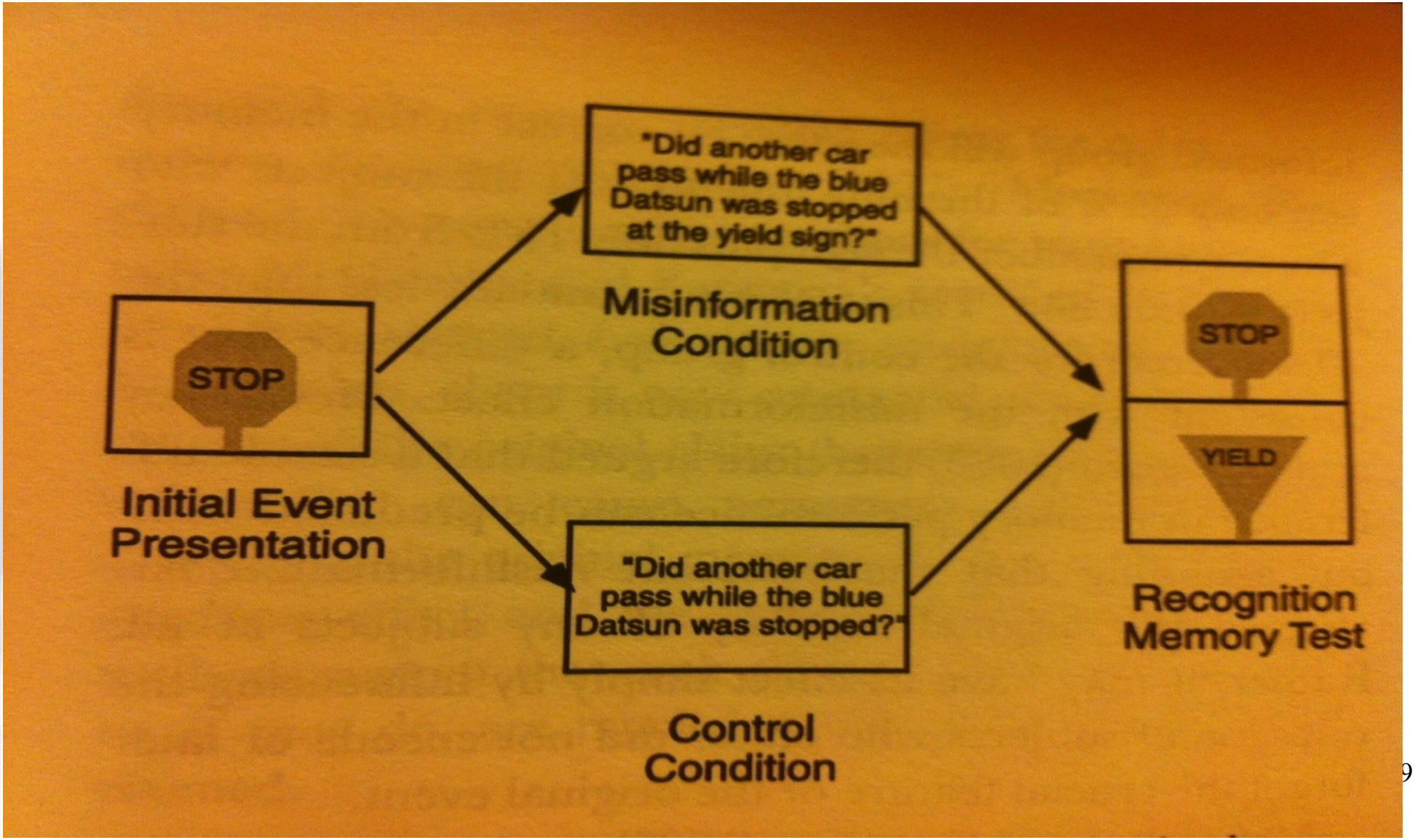


Memory Dynamics

- Misinformation effect
- Car crash case
- Representation momentum


Reproduced figure
Verbal labels
Stimulus figures
Verbal labels
Reproduced figure
Curtains in a window
Diamond in a rectangle
Seven
Four
Ship's wheel
Sun
Hourglass
Table
Kidney bean
Canoe
Pine tree
Trowel
Gun
Broom
Two
Eight

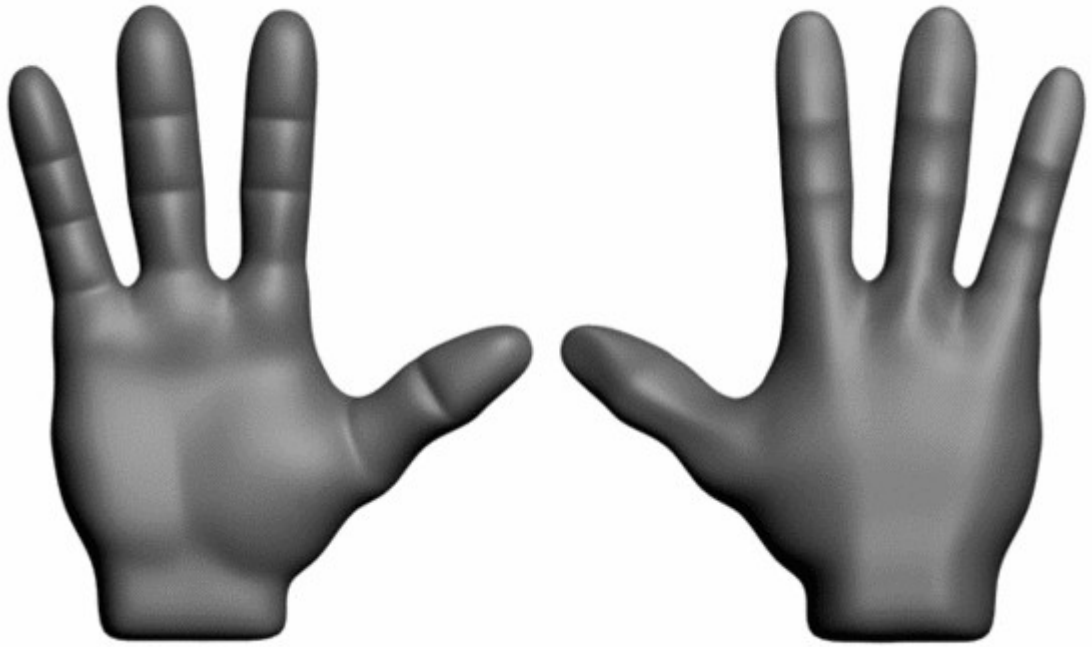
Cars


STOP
Initial Event Presentation
"Did another car pass while the blue Datsun was stopped at the yield sign?"
Misinformation Condition
"Did another car pass while the blue Datsun was stopped?"
Control Condition
STOP
YIELD
Recognition Memory Test

Misdirection

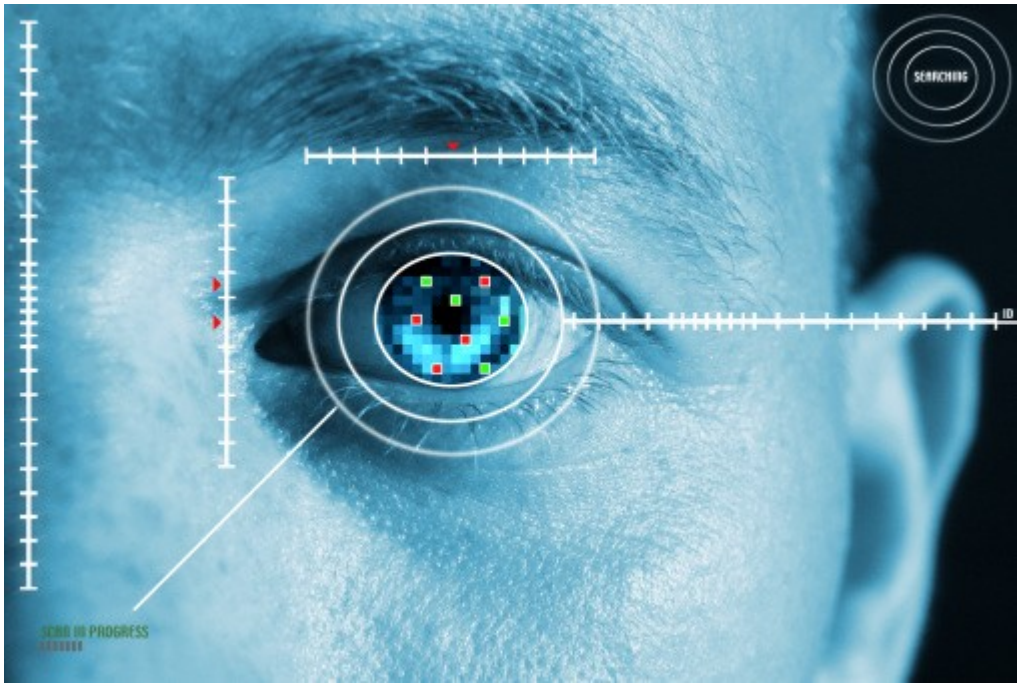
Misdirection?

- Did you notice there were only 4 fingers?



Visual Imagery

- Analog/propositional debate
- Mental transformations
- Reinterpreting images



Problems

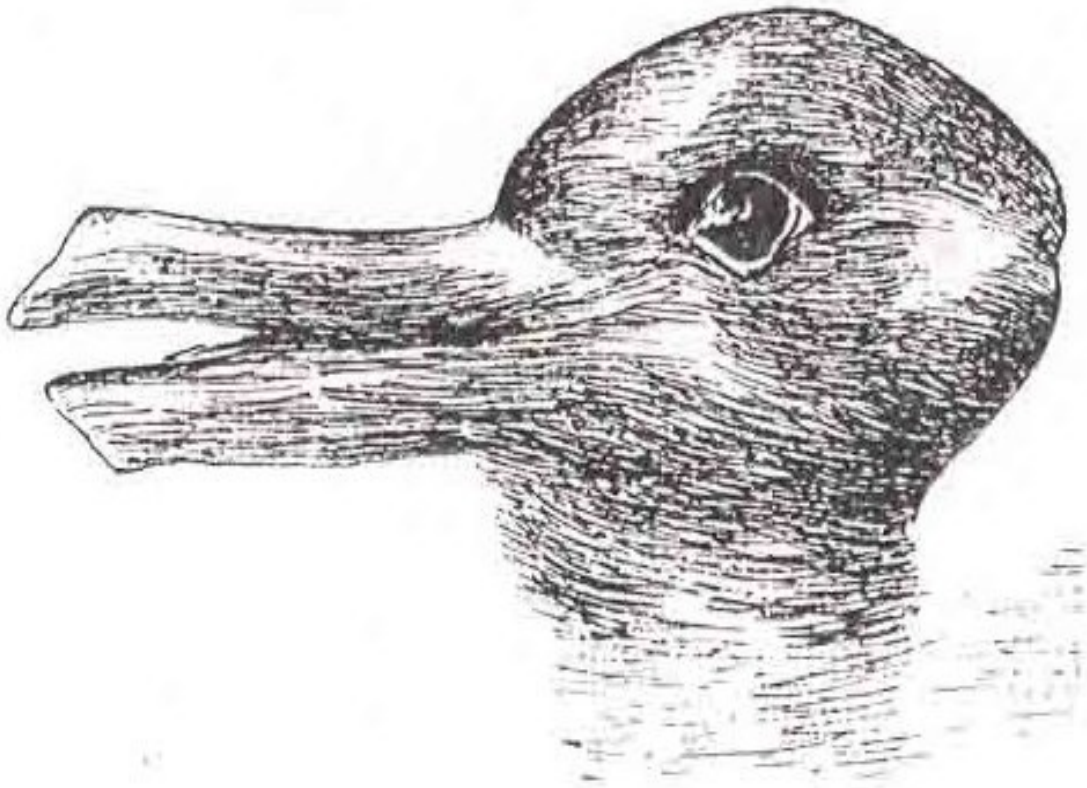
- Images are private
- Not directly accessible
- Thrown out → DEBATE

Analog Position

- Picture metaphor theory
- “The Mind's eye”
- Pictures in the head

Propositional Position

- Descriptions constructed of abstract propositions
- Duck/Rabbit



Not Analog?

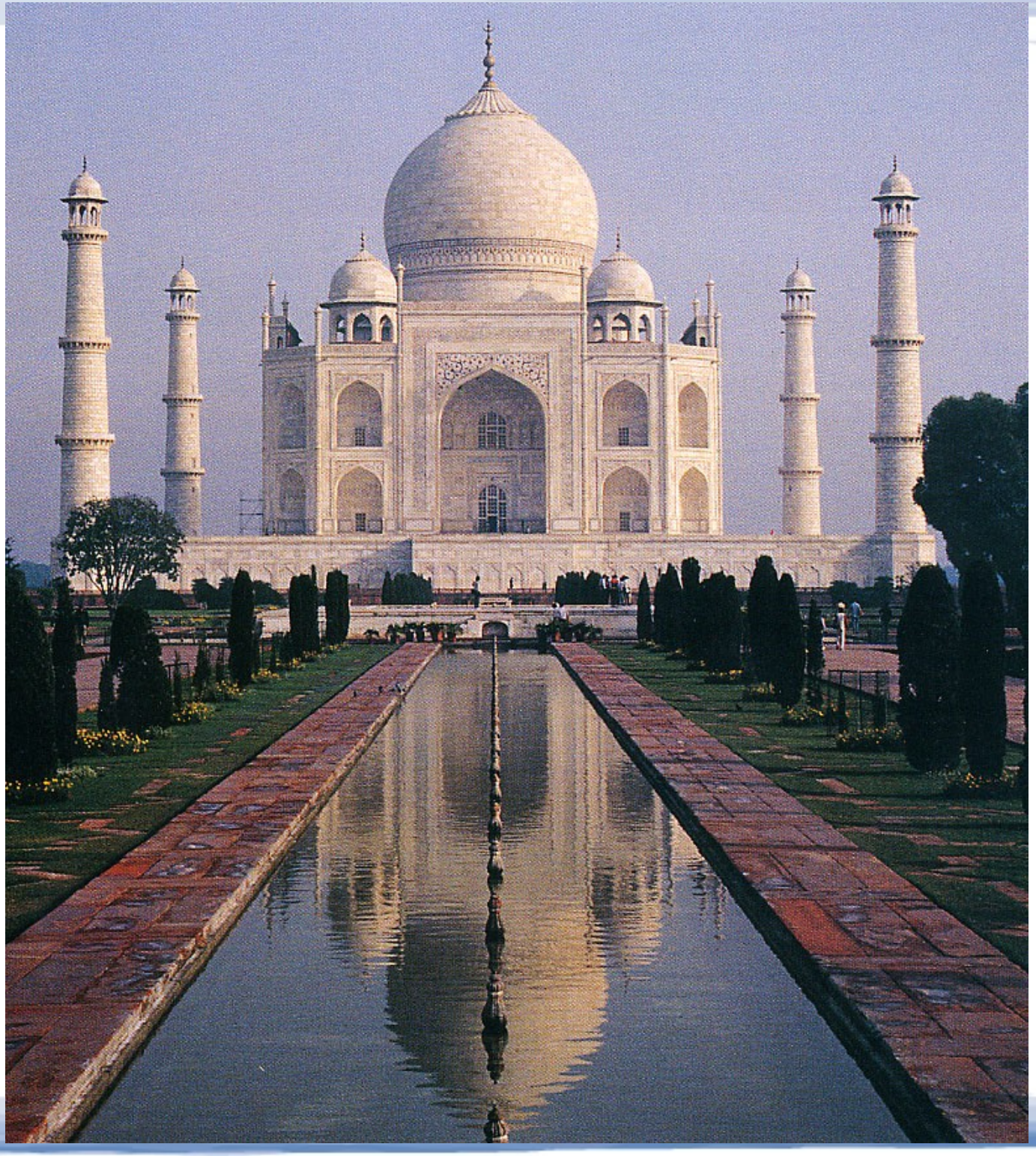
- Statue of Liberty
- Taj Mahal
- Back of the US $1 bill

Arguments against analog

- Arrows on the one dollar bill?
- How many posts on the Taj Mahal?
- How many spikes on the statue of liberty?

THE UNITED STATES OF AMERICA
ONE
IN GOD WE TRUST
ONE
ANNUIT COEPTIS
NOVUS ORDO SECLORUM
THE GREAT SEAL
OF THE UNITED STATES
ONE DOLLAR

E PLURIBUS
UNUM
483
www.shutterstock.com · 78312304



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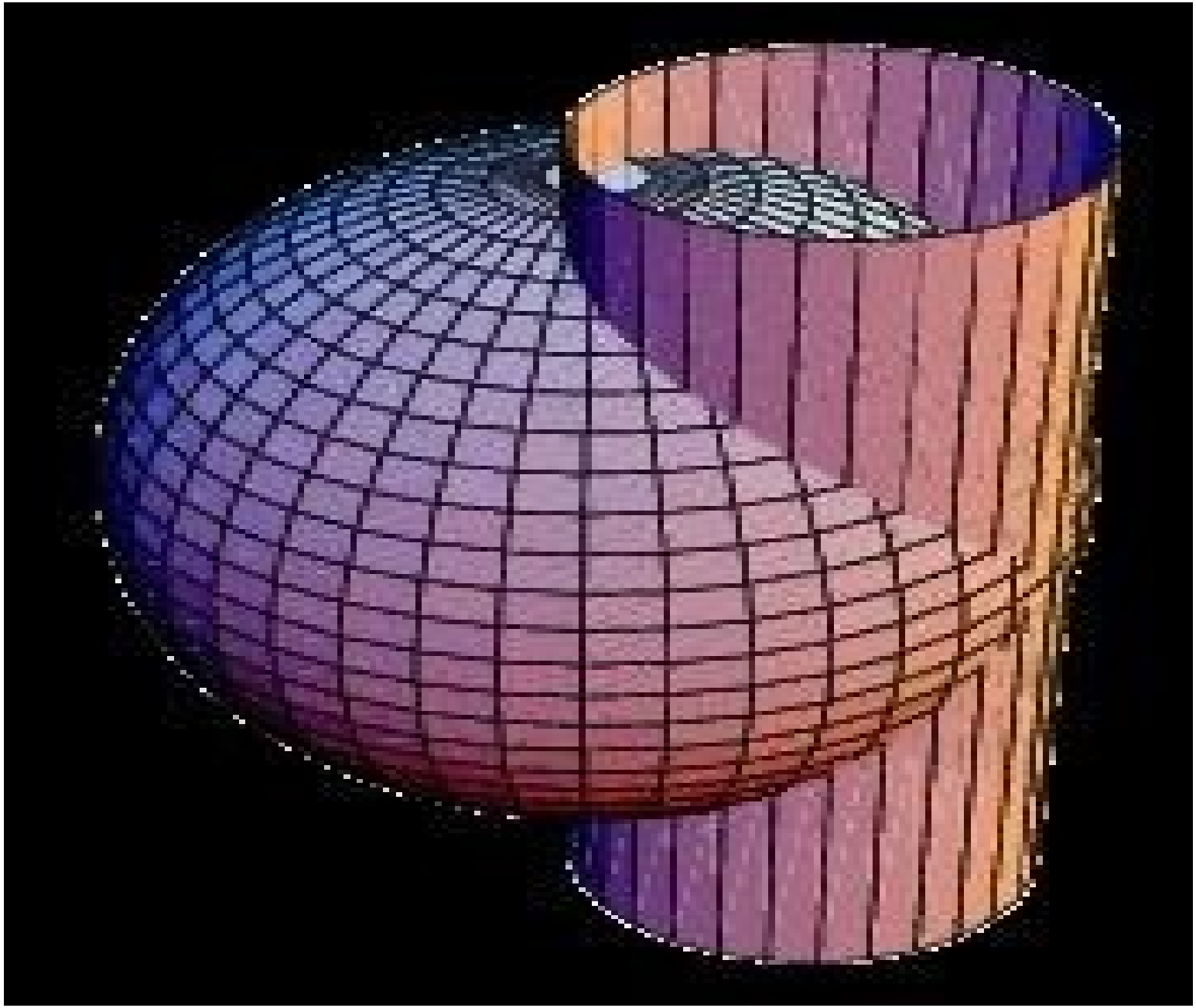
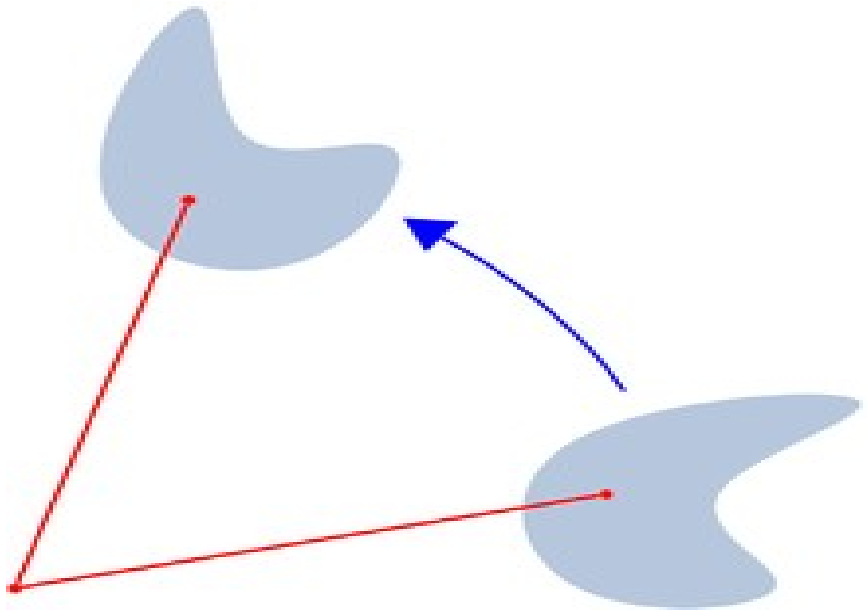


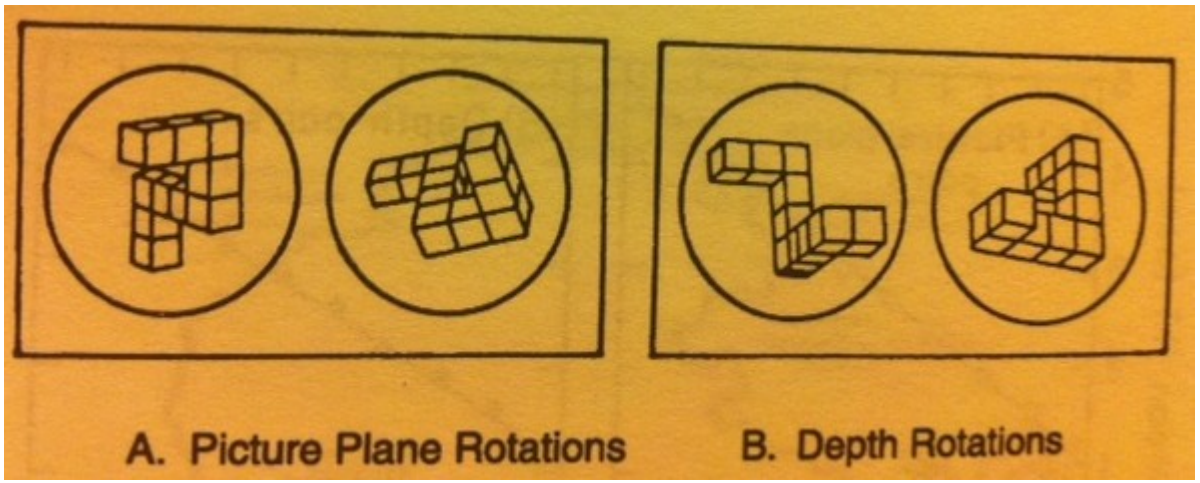
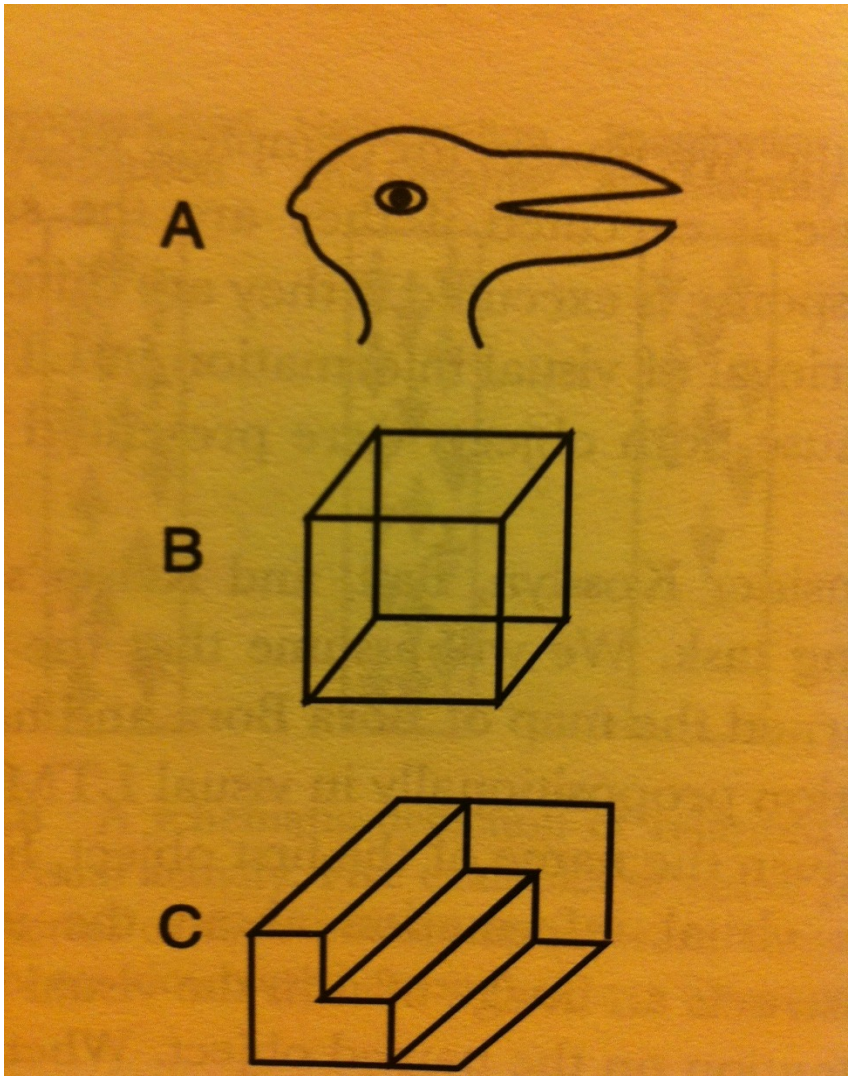
Mental Transformation

- If images picture like (analog), they should be able to be transformed continuously.
- Executed in a single step.



Shepard & Metzler

- Showed pairs of 3D cubes
- Either identical or mirror images
- Reaction time increased linearly with increasing angles



Reinterpreting Images