Recap

- Variable encoding model
- Drift diffusion model
- Contextual drift and time judgements

Associations and Cued Recall

PSYC 51.09: Human Memory
Spring 2021

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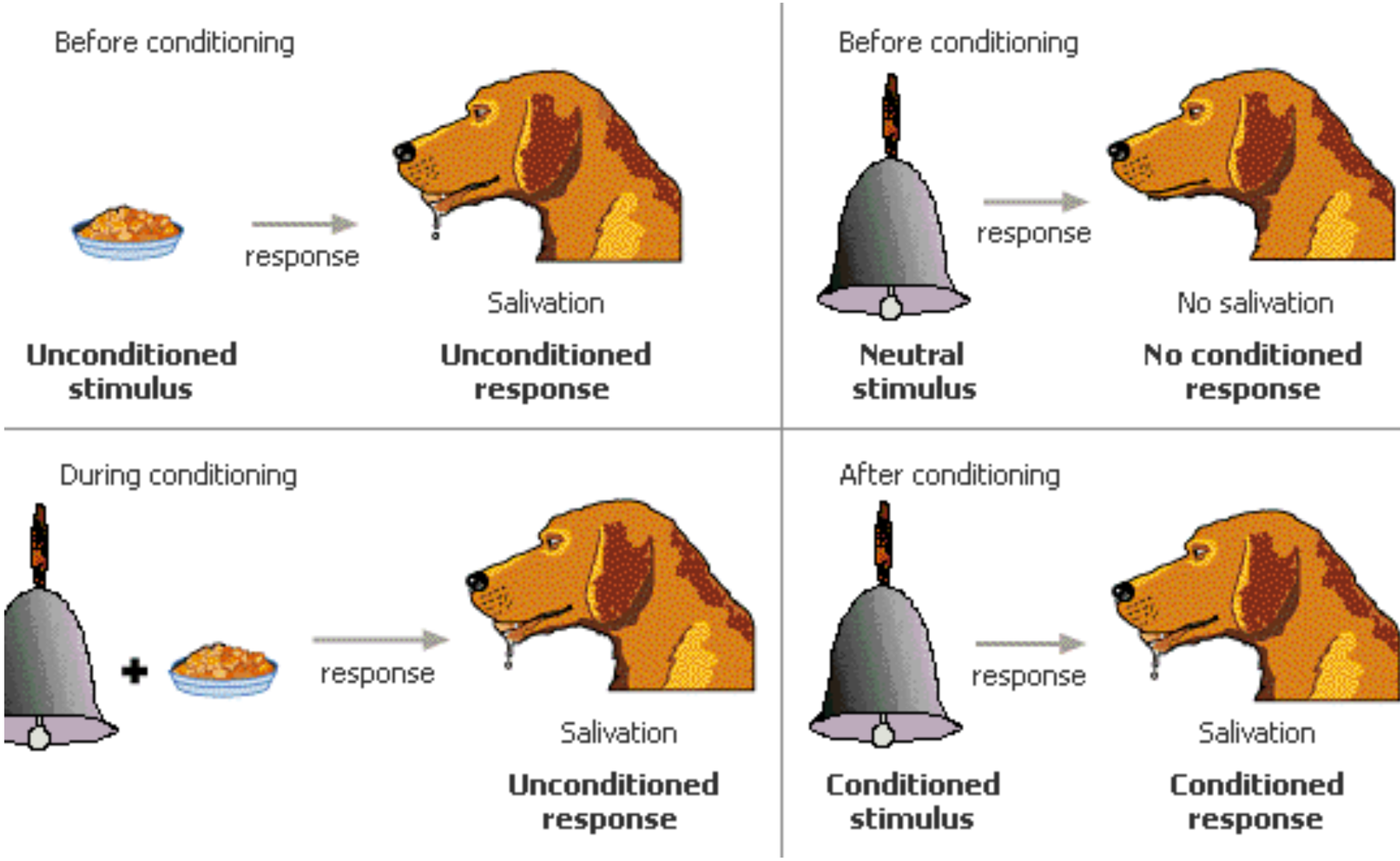
Pavlov's dog


Before conditioning
response
Salivation
Unconditioned stimulus
Unconditioned response
Before conditioning
response
No salivation
Neutral stimulus
No conditioned response
During conditioning
response
Salivation
Unconditioned response
After conditioning
response
Salivation
Conditioned stimulus
Conditioned response

Human variants

- Linking any two (or more) things: word + meaning, object + word, face + name, etc.

- You smell a familiar dish and think of home

- A song on the radio reminds you of a road trip

- Habits, addiction

- Post-traumatic stress disorder

- Linking experiences with contexts. Note: this means we tend to associate events that occurred nearby in time

Extending recognition memory

- **Associations:** forming links between items/ experiences, such that remembering one leads to thinking of the other(s)

- **Recall:** given a cue, recall the associated (linked) item/experience

Studying associations

- Chapter 4 (pre-midterm, plus a little post-midterm): key experimental findings related to associative memory

- Chapter 5 (post-midterm): models of associative memory

“Classic” view of associations

“Gestalt” view of associations

What is the role of context?

- How are associations stored in relation to their unique situational or temporal context?
- If you were thinking of farms before seeing the horse-house pair, do you make the association faster?
- If you're later reminded of farms, do you more easily recall the pairing?

Let’s learn some painting-artist pairings

- Form pairs of items: A_i-B_i
- I’ll show a painting (A_i)
- You guess the artist (B_i), then you’ll see the answer
- After we’ve learned a few paintings/artists, I’ll test your memory

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van Gogh

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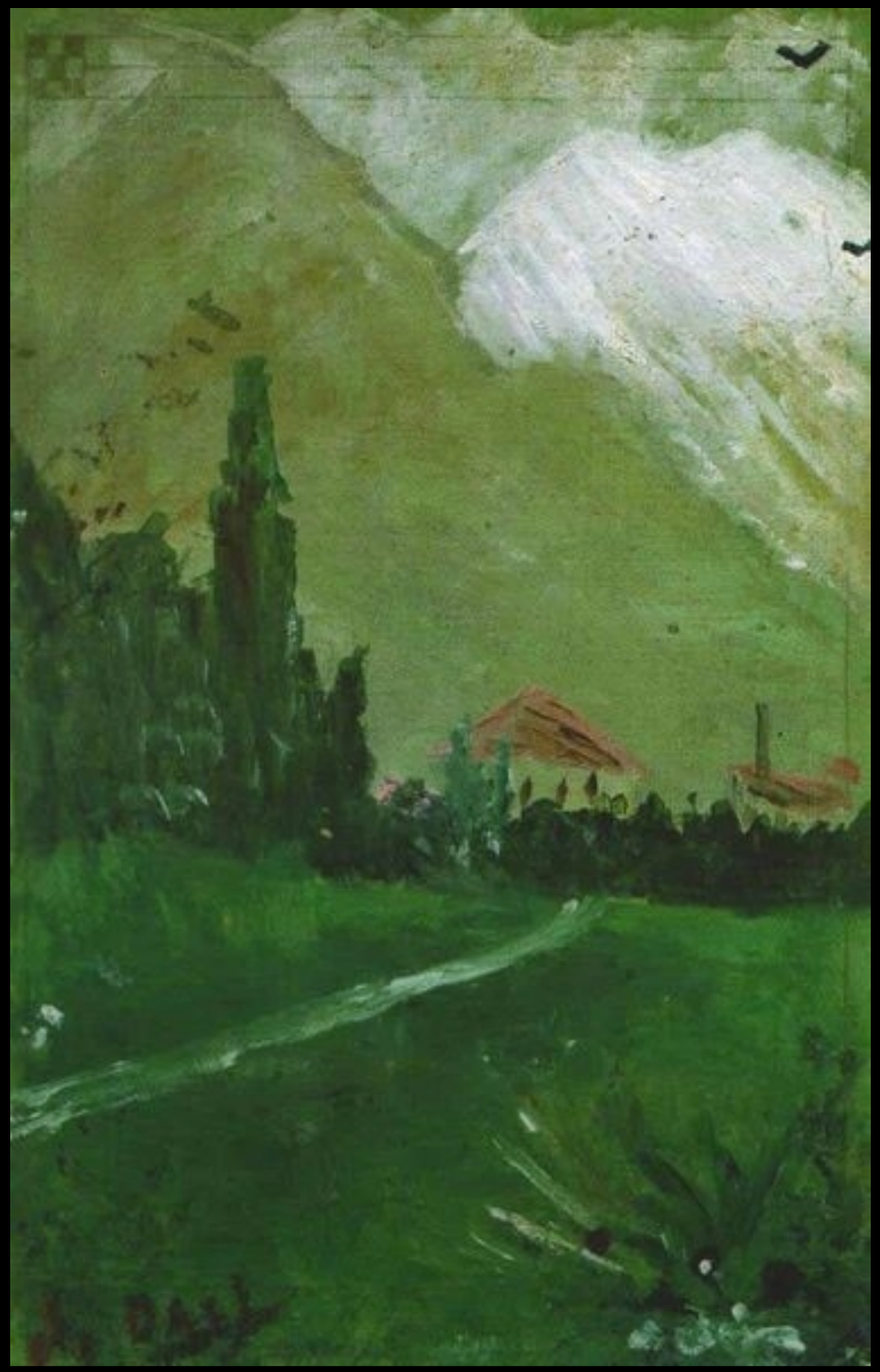
Monet



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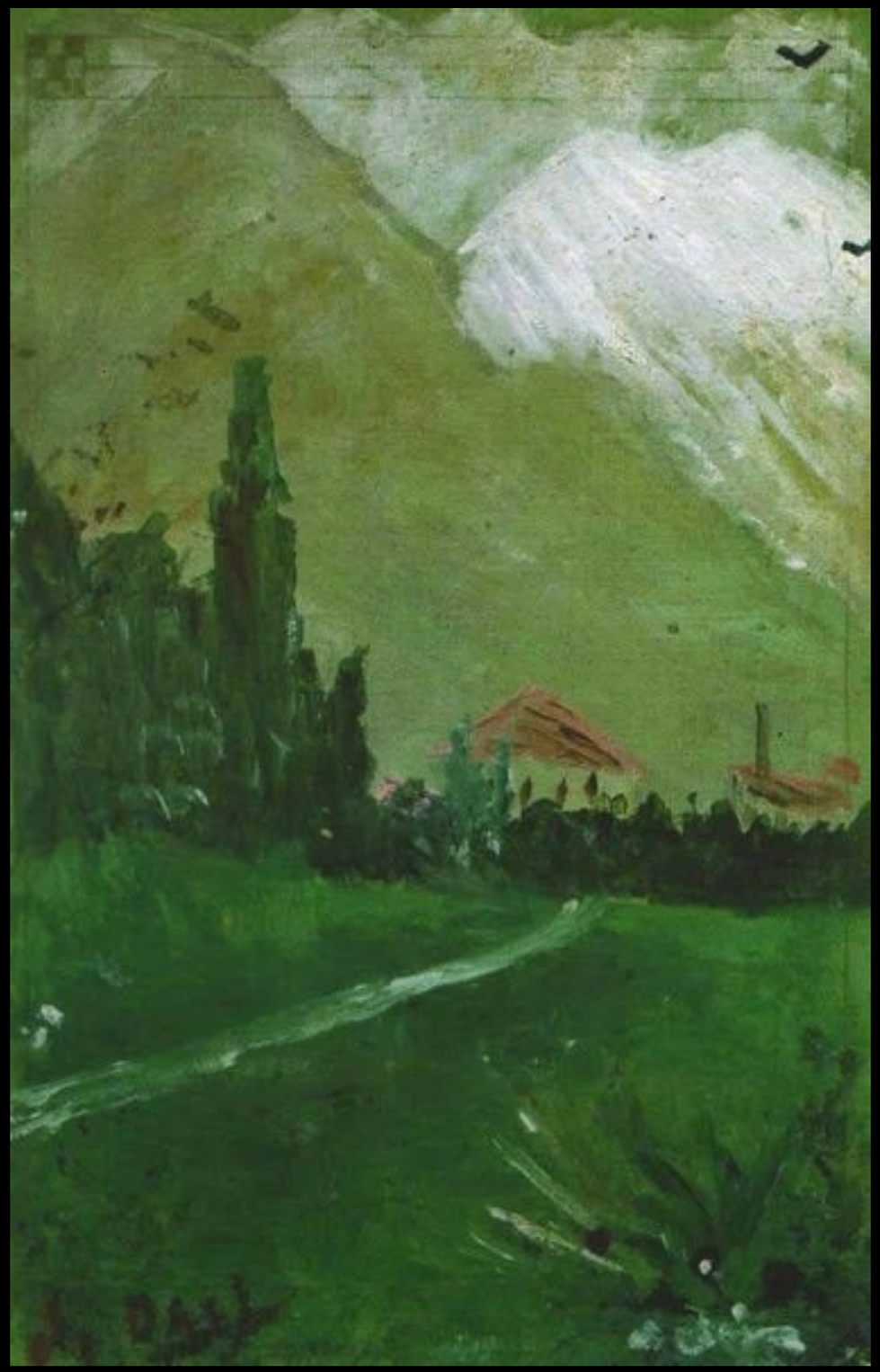

Dalí

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O’Keeffe

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Michelangelo


Campbell's
TOMATO SOUP
VEGETABLE SOUP
GREEN PEA SOUP
CLAM CHOWDER SOUP
BEEF SOUP
CREAM OF ASPARAGUS SOUP
CREAM OF CELERY SOUP
BEEF BROTH SOUP
CHICKEN GUMBO SOUP
PEPPER POT SOUP
CHICKEN SOUP
CONSOMMÉ SOUP
VEGETABLE BEEF SOUP
CHICKEN NOODLE SOUP
CREAM OF MUSHROOM SOUP
SCOTCH BROTH SOUP
BEAN SOUP
VEGETARIAN VEGETABLE SOUP
BLACK BEAN SOUP
BEEF NOODLE SOUP
CREAM OF CHICKEN SOUP
ONION SOUP
TURKEY NOODLE SOUP
MINESTRONE SOUP
CHICKEN VEGETABLE SOUP
CREAM OF VEGETABLE SOUP
TOMATO RICE SOUP
SPLIT PEA SOUP
CHEESE SOUP
VEGETABLE BEAN SOUP
CHILI BEEF SOUP
TURKEY VEGETABLE SOUP

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Campbell's
TOMATO SOUP
VEGETABLE SOUP
GREEN PEA SOUP
CLAM CHOWDER SOUP
BEEF SOUP
ASPARAGUS SOUP
CELERY SOUP
BEEF BROTH SOUP
CHICKEN GUMBO SOUP
PEPPER POT SOUP
CHICKEN SOUP
CONSOMMÉ SOUP
VEGETABLE BEEF SOUP
CHICKEN NOODLE SOUP
MUSHROOM SOUP
SCOTCH BROTH SOUP
BEAN SOUP
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TURKEY VEGETABLE SOUP

Warhol

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da Vinci

????

Picasso

CUED RECALL TEST

????

????

????

ASSOCIATIVE-RECOGNITION TEST

van Gogh

O’Keeffe


Campbell's
TOMATO SOUP
VEGETABLE SOUP
GREEN PEA SOUP
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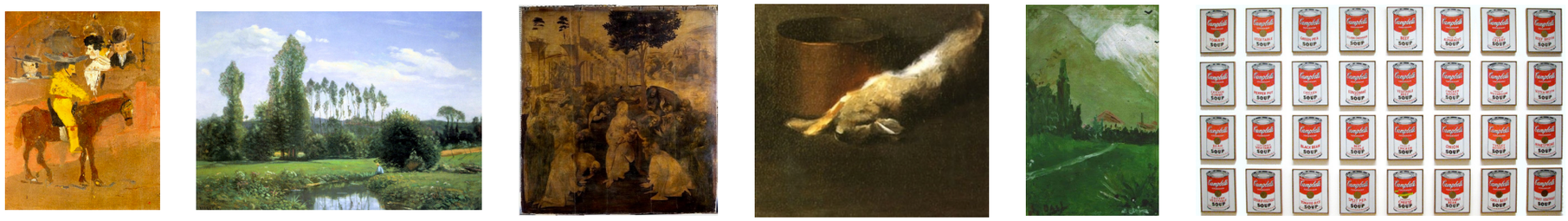
Pollock

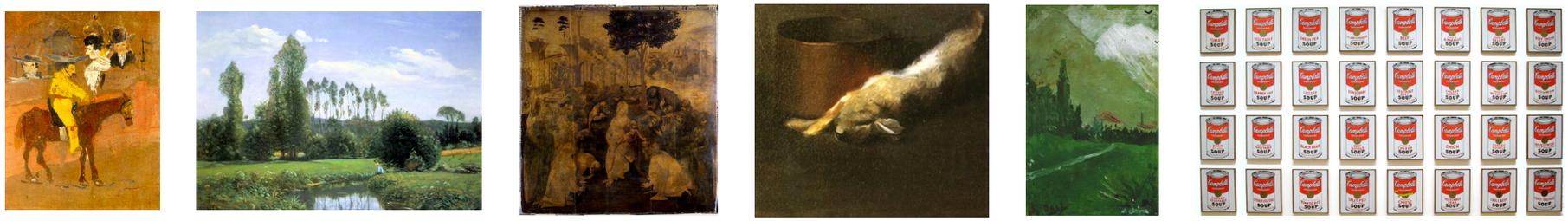
Paired associates



- Form pairs of items: A_i-B_i

- Study: present pairs (in random order)

Cued Recall

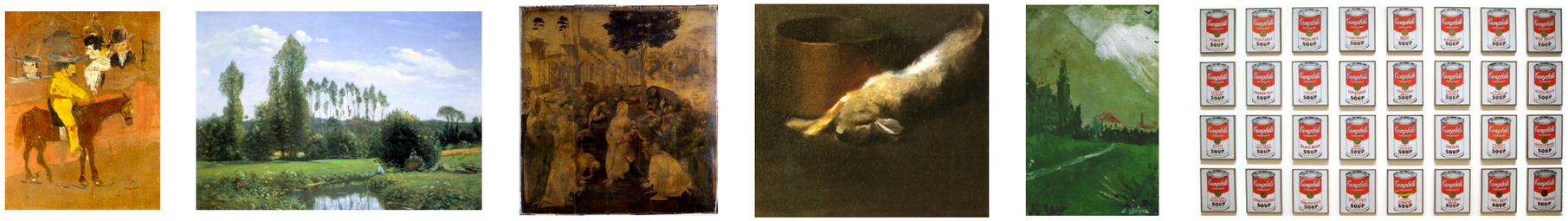


- Form pairs of items: A_i-B_i

- Study: present pairs (in random order)

- Test: present one item, ask for recall of the other

Associative-recognition



- Form pairs of items: A_i-B_i

- Study: present pairs (in random order)

- Test: present a pair of items, ask whether that pair was studied (yes or no)

Random word pairs: cued recall

- Form pairs of items: A_i-B_i:

PROSPECT – VELVET

SOLDIER – PIGEON

BANNER – TEMPER

ACCOUNT – HUNTER

- Study: present pairs for study in random order

- Test: present one item; ask for recall of the other:

ACCOUNT – ???

TEMPER – ???

SOLDIER – ???

PROSPECT – ???

Random word pairs: associative-recognition

- Study pairs:

  PROSPECT – VELVET

  SOLDIER – PIGEON

  BANNER – TEMPER

  ACCOUNT – HUNTER

- Test:

  ACCOUNT – TEMPER (Lure)

  SOLDIER – PIGEON (Target)

Study-test method

- Repeat study-test trials until all pairs are correctly recalled

Anticipation method

- Show first item in a pair (A_i)
- Give subject a few seconds to recall B_i
- Show B_i
- Cycle through all pairs repeatedly until a certain percentage of B_i items are correctly recalled

Terminology

- To-be-learned pairs: *paired associates*
- The task is called *cued recall* or *associative recognition* (or sometimes, *associative recall*)
- Hyphens: appear randomly (e.g. cued-recall, associative-recognition are also commonly used terms)

Indirect memory tests

- In cued-recall and associative-recognition tasks, participants are asked to remember previously learned associations

- We can also study associative memory *indirectly*—without asking participants to try to remember the studied pairs!

Say “yes” (thumbs up) if the letters form an English word, or “no” (thumbs down) if they don’t

EMPATHY

LARTHY

TEMPER

BANNER

GRINTHIAN

Indirect memory tests

- People respond faster if the previous test item had been paired with the current test item during the study phase (McKoon and Ratcliff, 1979)

Free-association

- Before we begin an experiment, we have *already* formed links between words from our pre-experiment life experiences

- People can judge words vs. non-words faster if the current test word is a semantic associate of the preceding test word (Meyer and Schvaneveldt, 1971)

- We can study which words are associated using the *free-association task*

Free association

demo...

Last name A–M: close your eyes

Last name N–Z side of the room:
write down the first word you think of in response to the cue word…

Dinner

Last name N–Z: close your eyes

Last name A–M:

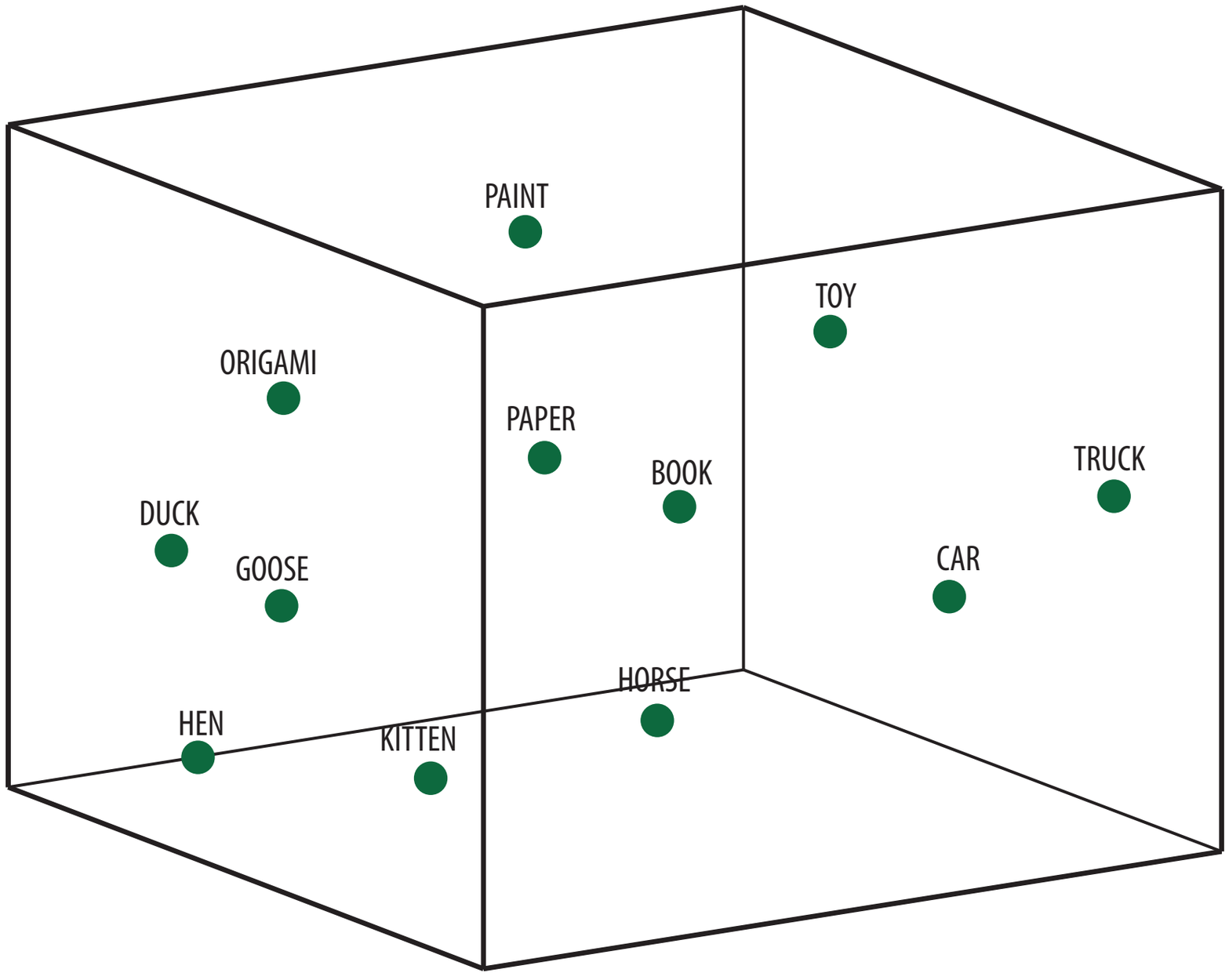
write down the first word you think of in response to the cue word…

Eat

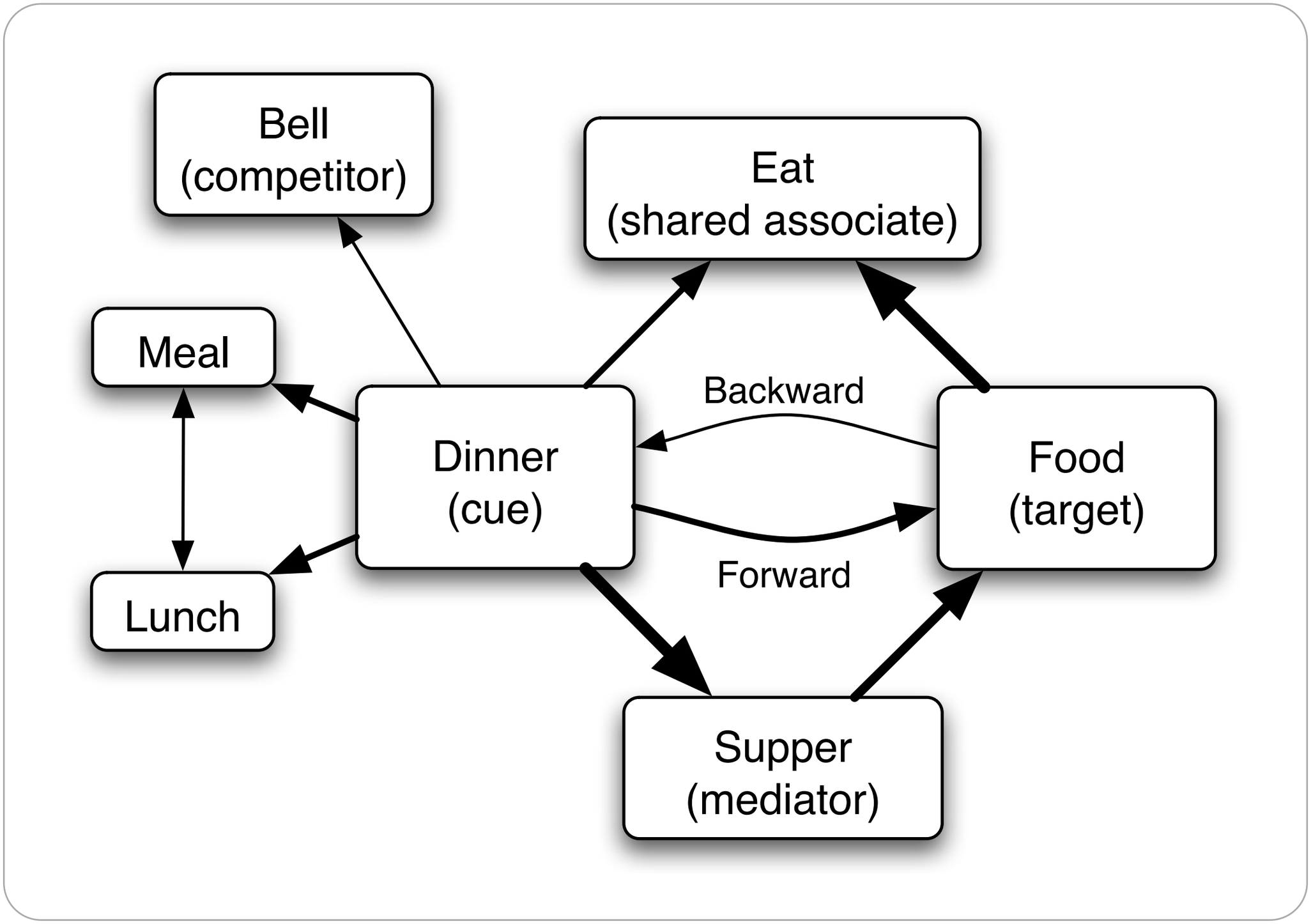
What’d you write down?

	dinner	supper	eat	lunch	food	meal
dinner	.00	.54	.11	.10	.09	.09
supper	.56	.00	.02	.03	.17	.01
eat	.00	.00	.00	.00	.40	.02
lunch	.27	.02	.08	.00	.21	.06
food	.00	.00	.41	.01	.00	.02
meal	.21	.06	.06	.06	.49	.00

Word Association Space



Word association terms



Memory hack: elaborative encoding

- To more effectively encode a pair of words, use any of the following:
  - Create a mental image in which the two words are interacting in some way
  - Create a phrase that links the two words
  - Think about a “mediating” word that is meaningfully related to both words

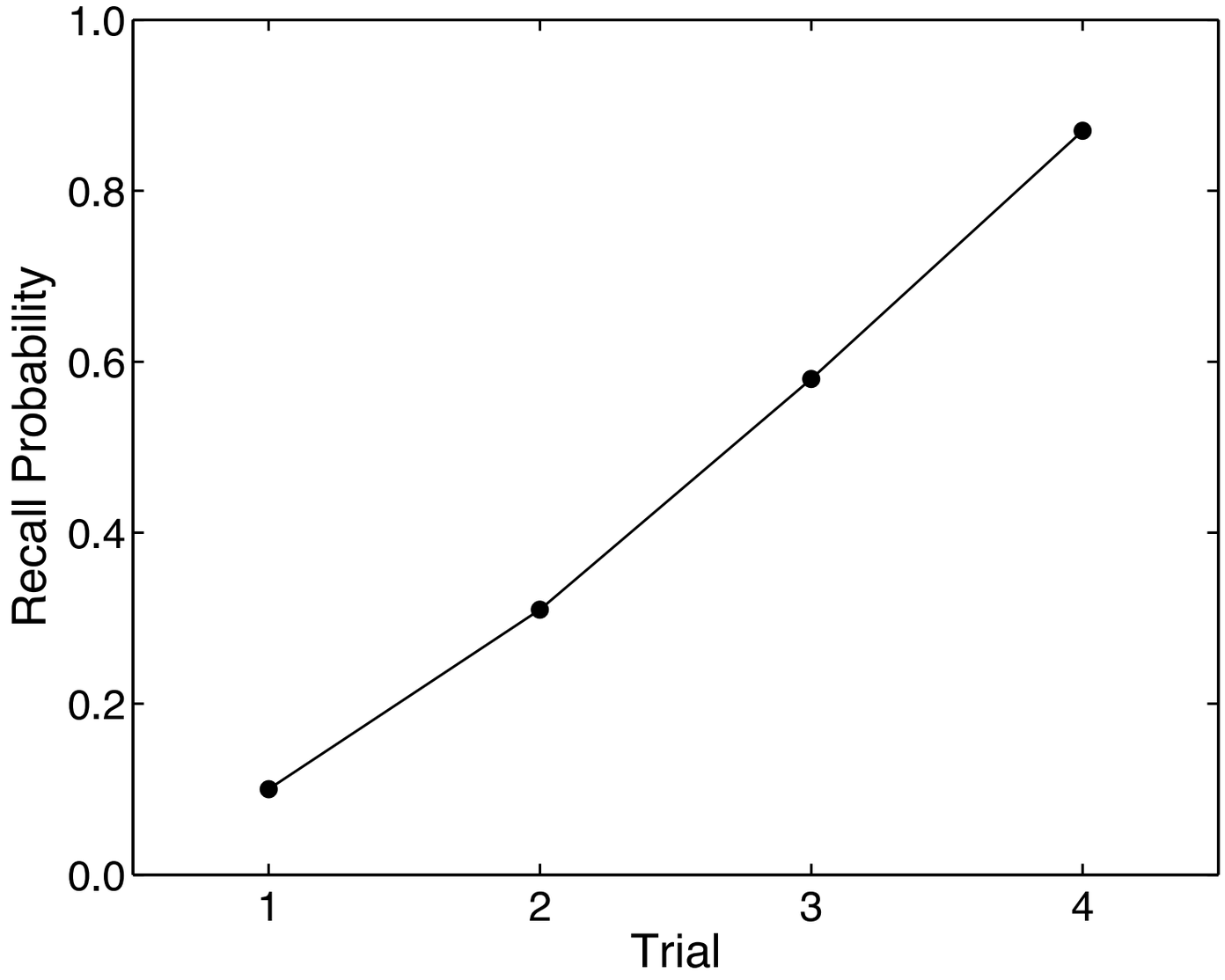
TREE – CRAYON

WINE – WING

CHAIR – CLAY

SUNSET – ZEBRA

Is associative learning incremental or all-or-none?



Learning to learn

- In general: the more experience you have learning some type of thing, the better you become at it

- Wallace, Turner, and Perkins (1957): **experienced participants** could learn (on average) 664/700 random word pairings after a *single study trial*

Another possibility

- Maybe learning is really all-or-none, and the apparent incremental learning is a consequence of averaging over different items

Rock's (1957) experiment

- Two groups:
  - *Control group*: study the same set of A-B pairs on each trial
  - *Experimental group*: if the participant can't remember the response for a given A_i, replace that pair with a new pair

Control Group: Standard Procedure

got it wrong

got it right

Trial 1	Trial 2	Trial 3
A_1-B_1	A_1-B_1	A_1-B_1
A_2-B_2	A_2-B_2	A_2-B_2
.	.	.
.	.	.
.	.	.
A_{12}-B_{12}	A_{12}-B_{12}	A_{12}-B_{12}

Experimental Group: Substitution Procedure

got it wrong

got it right

Trial 1	Trial 2	Trial 3
A_1-B_1	A_{13}-B_{13}	A_{13}-B_{13}
A_2-B_2	A_2-B_2	A_2-B_2
.	.	.
.	.	.
.	.	.
A_{12}-B_{12}	A_{14}-B_{14}	A_{15}-B_{15}

Results: evidence for "all or none" learning?

Group	# of Trials	# of errors
Experimental (Substitution)	4.75	17.2
Control	4.75	17.9

Rock, 1957

Problems for the "all-or-none" hypothesis

- What if the non-recalled pairs were harder to learn?
- Examples:
  - L-89 vs. C-33 or I-95
  - PONY – FOREHEAD vs. ROCK – SAND
- Williams (1961): new group studies words from the set that the experimental group ended up learning; they learned the pairs more quickly than the control group
- Subsequent attempts to control for difficulty: mixed results

Remember those pairs you studied using elaborative encoding? Time for a test…

??? – CRAYON

WINE – ???

CHAIR – ???

??? – ZEBRA