# Forgetting, retaining and retrieving memories

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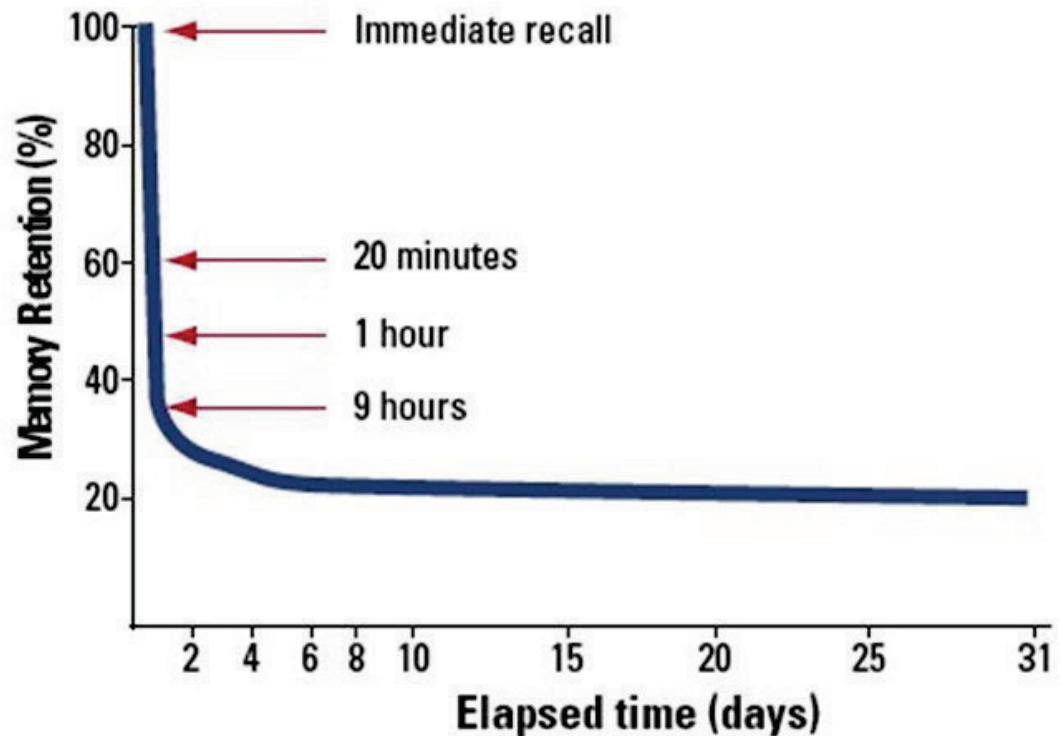
# WHAT WE FORGET, WHAT WE REMEMBER

# STORING EXPLICIT MEMORIES

- How would you design a test of how quickly people forget things they have learned?

- How would you control to ensure that prior knowledge doesn't impact upon the experiment?

# We rapidly forget

- Ebbinghaus' experiments (1880s)

- Time taken to learn 13 card syllables

- Memory retention measured as "savings in time taken to relearn"

# What we (can) remember

- What we repeat

- What we organise

- What we link to other ideas/ experiences

- What we practice remembering

- What is emotionally forceful
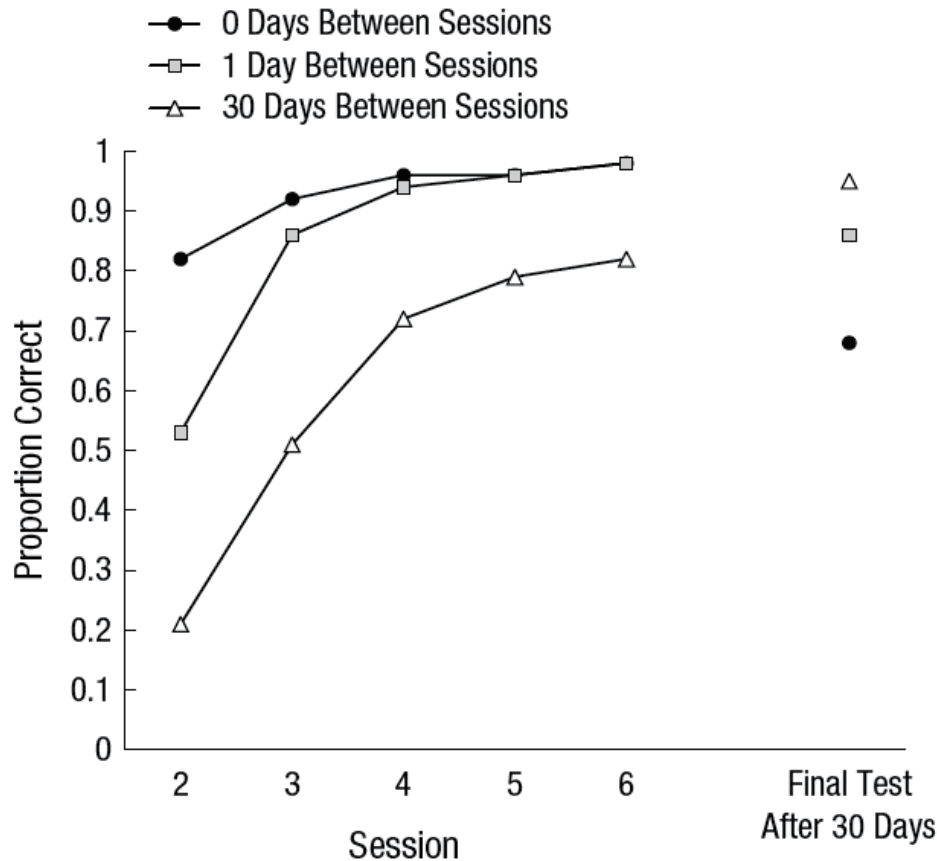
# Repetition to store in LTM



Fig. 10. Proportion of items answered correctly on an initial test administered in each of six practice sessions (prior to actual practice) and on the final test 30 days after the final practice session as a function of lag between sessions (0 days, 1 day, or 30 days) in Bahrick (1979).

- Repetition is a key process for storing in long term memory
  - All repetition has an effect
  - Spaced repetition has most impact

# Organising/linking to store in LTM

- ## Information is stored by linking to other information
  - Were this is meaningful, it creates a **schema**
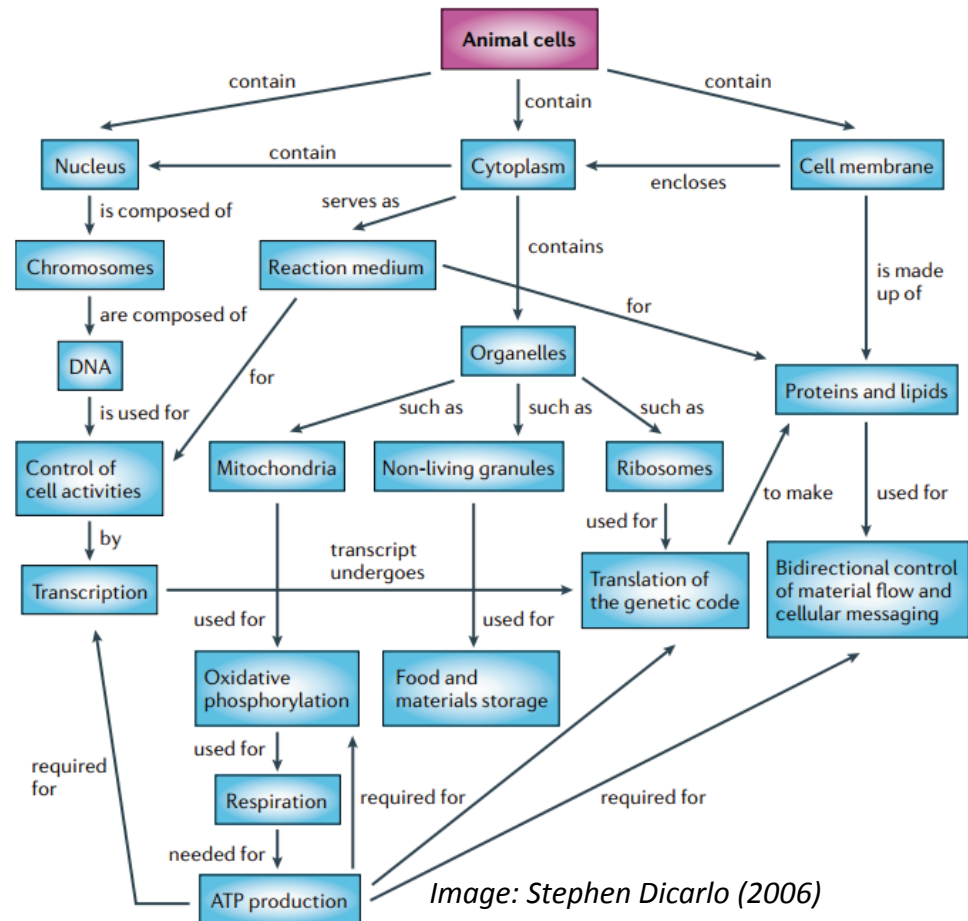  - Where it is meaningless it can serve as a **mnemonic**



*Image: Stephen Dicarlo (2006)*

*Nature Reviews Molecular Cell Biology* **7**, 290-296

# Organised ideas allow for rapid retention of new material

- Chase and Simon (1973)

- Experts retrieve more than novices, **but** only when board is set up in realistic positions

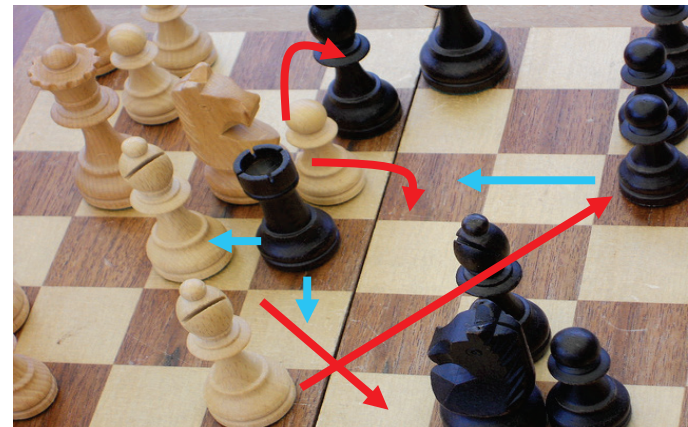- Information retained quickly when it can be integrated into prior schemas
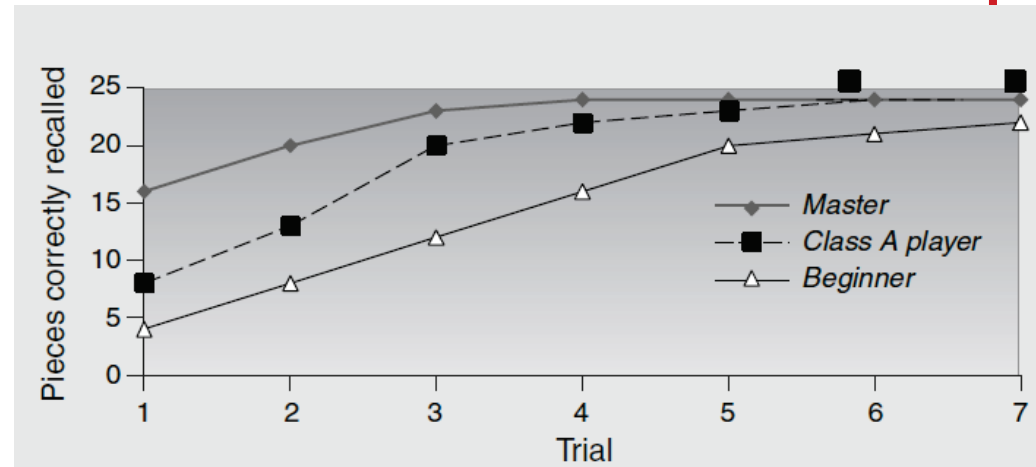




Image: © **Michael Coghlan** Flickr creative commons

- How would you design an experiment to test to what extent context impacted upon ability to recall/remember?

- How would you control to ensure that prior knowledge doesn't impact upon the experiment?

- How would you ensure control and experimental groups were comparable?

# Context dependent recall

- Divers learned words on land and underwater

- Words learned on land were better recalled on land and vice versa

Table 1. *Mean number of words recalled in Expt. I as a function of learning and recall environment*

| Learning environment | Recall environment | | | | |
| | Dry | | Wet | | |
| | Mean recall score | S.D. | Mean recall score | S.D. | Total |
| --- | --- | --- | --- | --- | --- |
| Dry | 13·5 | 5·8 | 8·6 | (3·0) | 22·1 |
| Wet | 8·4 | 3·3 | 11·4 | (5·0) | 19·8 |
| Total | 21·9 | — | 20·0 | — | — |

Godden and Baddeley (1975)

# RECALLING MEMORIES (WHEN NEEDED)

- Write down the things which were on your second shopping list last week (memory palace)

# Two types of remembering

- **Controlled recall**

  – Active process of spreading activation

  – Aided by deep processing of ideas

  – Requires attention

- **Spontaneous (cued) recall**

  – No active monitoring

  – Idea "pops into your mind"

  – Requires no attention

# Forward and backward-looking memories

- **Retrospective memories**
  - Remembering episodes and meanings

- **Prospective memories**
  - May include internal visualization enactment motor codes
  - visual codes
  - verbal codes

# Re/constructed memories

- Videos of car accidents (Loftus and Palmer, 1974)"How fast were they going when they _____ each other?"

    - •"How fast were the cars going when they... smashed into each other?"
    - hit each other?"

- •"Did you see any broken glass?"

## TABLE 1
### SPEED ESTIMATES FOR THE VERBS USED IN EXPERIMENT I

| Verb | Mean speed estimate |
| --- | --- |
| Smashed | 40.8 |
| Collided | 39.3 |
| Bumped | 38.1 |
| Hit | 34.0 |
| Contacted | 31.8 |

## TABLE 2
### DISTRIBUTION OF "YES" AND "NO" RESPONSES TO THE QUESTION, "DID YOU SEE ANY BROKEN GLASS?"

| Response | Verb condition | | |
| --- | --- | --- | --- |
| | Smashed | Hit | Control |
| Yes | 16 | 7 | 6 |
| No | 34 | 43 | 44 |

# Practiced recall

- "the results show that testing (and not studying) is the critical factor for promoting long-term recall". Karpicke, et al. (2008) *Science Vol.* 319, p. 966



**Fig. 2.** Proportion recalled on the final test 1 week after learning. Error bars represent standard errors of the mean.

- ST: Study and Test all items
- SnT: Study only non-acquired items, test all
- STn: Study all, test only non-acquired items
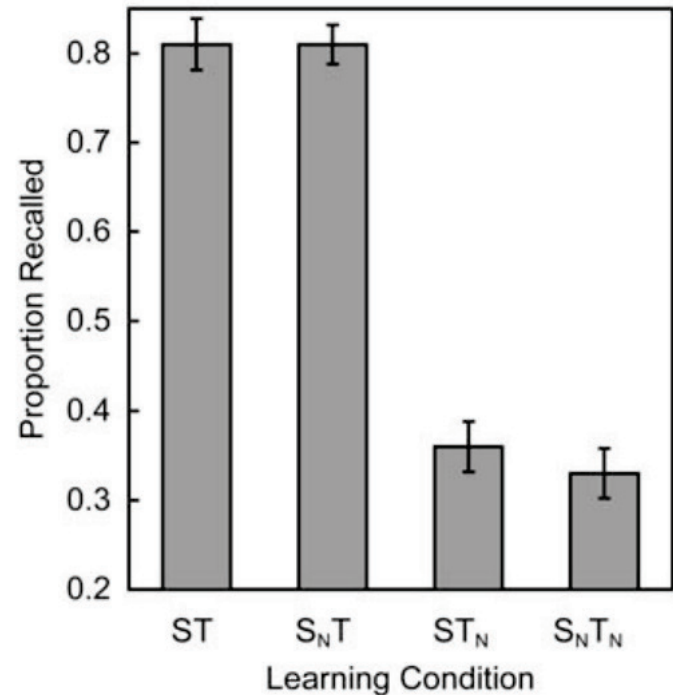- SnTn: Study and test only non-acquired items

# Recall and context

- Recall is poorer when tested in a context other than the context in which it was learned
  - Geographical context
  - Conceptual context
  - Emotional context

- Need to embed learning in multiple contexts in order to be able to recall as needed
  - Also helps to develop conceptual schemas