

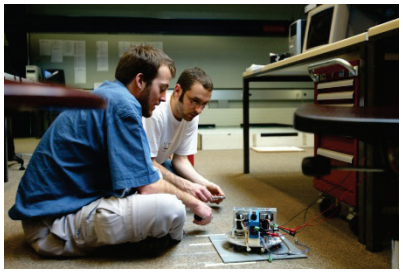

ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

Mental Processes and Memories

Roland Tormey

How People Learn I

Teaching Support Centre / Centre d'appui à l'enseignement
Email: roland.tormey@epfl.ch

Learning Aims

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- You will be able to
  - Identify the difference between System 1 (Intuitive) and System 2 (Attentional)
  - Identify the difference between implicit and explicit/ declarative memories
  - Identify the differences between episodic and semantic memories
  - Identify that skills are procedural memories, (either mental or physical)

System 1 (Intuition)

- Frederick's cognitive reflection test (2005)

Features of System 1

- Fast
- Uses heuristics
- As a result makes (predictable) mistakes
- Confident in it’s judgements

Problem solving heuristics

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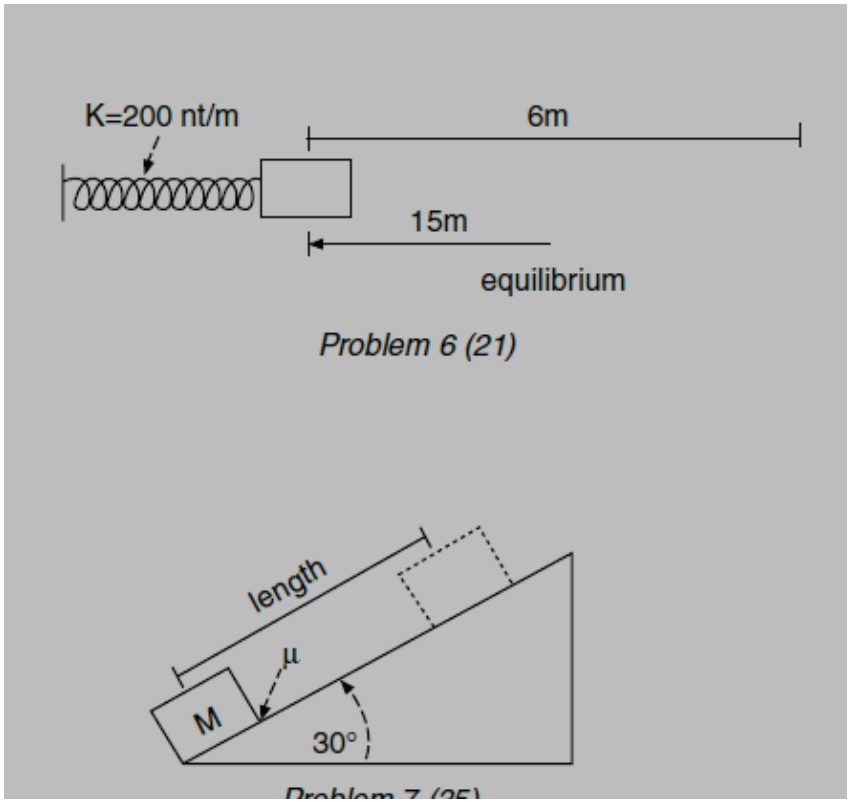
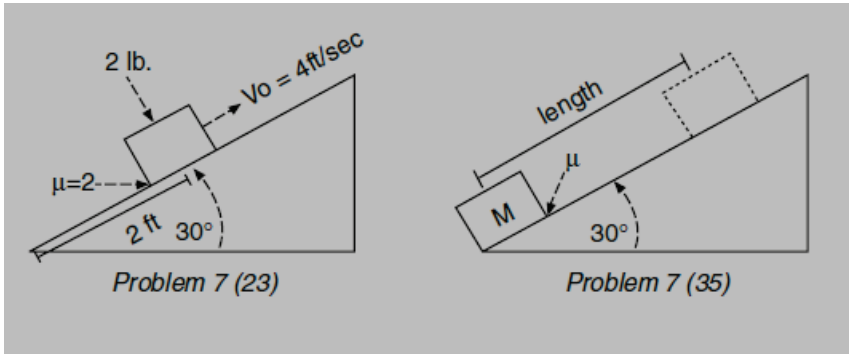
How Experts grouped problems



How Novices grouped problems



Problem solving heuristics

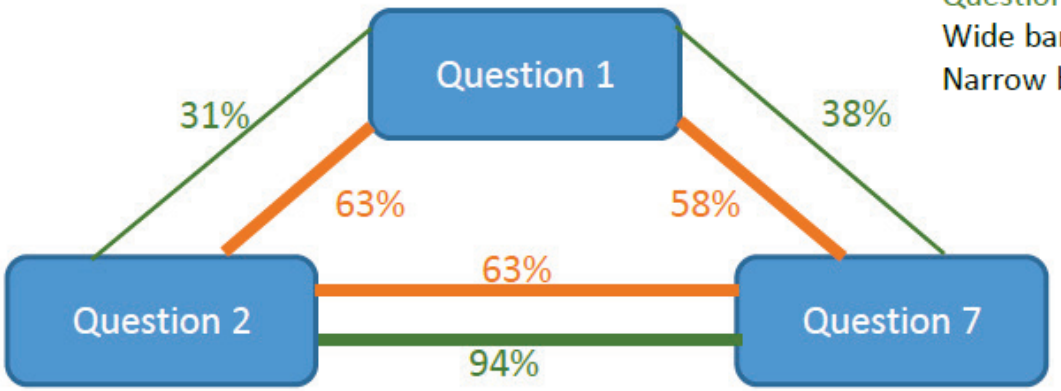
(1) Solve the following system of equations:

$$\begin{cases} x + y + 3 = 0 \\ x^2 + y - 4x - 3 = 0 \end{cases}$$

(7) Consider the system:

$$\begin{cases} Ax + y = A^2 \\ x + Ay = 1 \end{cases}$$

For what values of A does this system fail to have solutions, and for what values are there infinitely many solutions?



Key

Questions categorised together by novices represented in orange

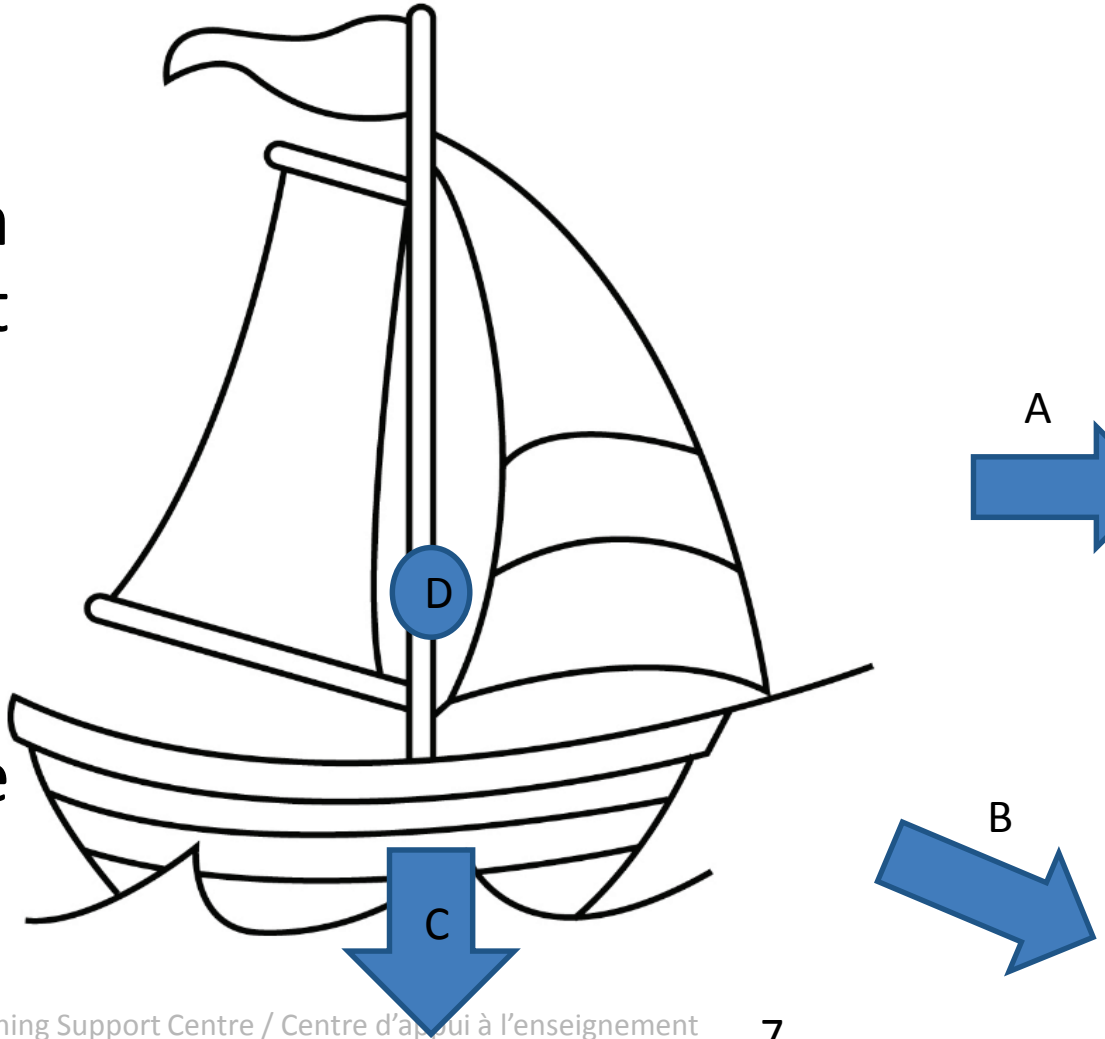
Questions categorised together by experts represented in green

Wide bar indicates > 50% categorised these questions together

Narrow bar indicates < 50% categorised these questions together

Problem solving heuristics (?)

- Boat being driven by the wind straight in NE direction, at constant speed of 6 km/h.
- What is the direction of the net force?



System 2 (Attention)

- **Example 1:**

Apples cost 32 cent and oranges 45 cent.

You have €3.97.

You buy 6 apples.

How many oranges can you buy?

- **Example 2:**

Search your memory to remember the names of the Big-5 personality factors

Features of System 2

- Slow
- Uses logic/ reason
- Provides post-hoc rationale for judgements
- The “Lazy Controller” (Kahneman, 2011)

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LONG TERM MEMORIES

What we remember long term...

Write a short paragraph on **when and how you learned to ride a bicycle (or ski, or roller skate…)**

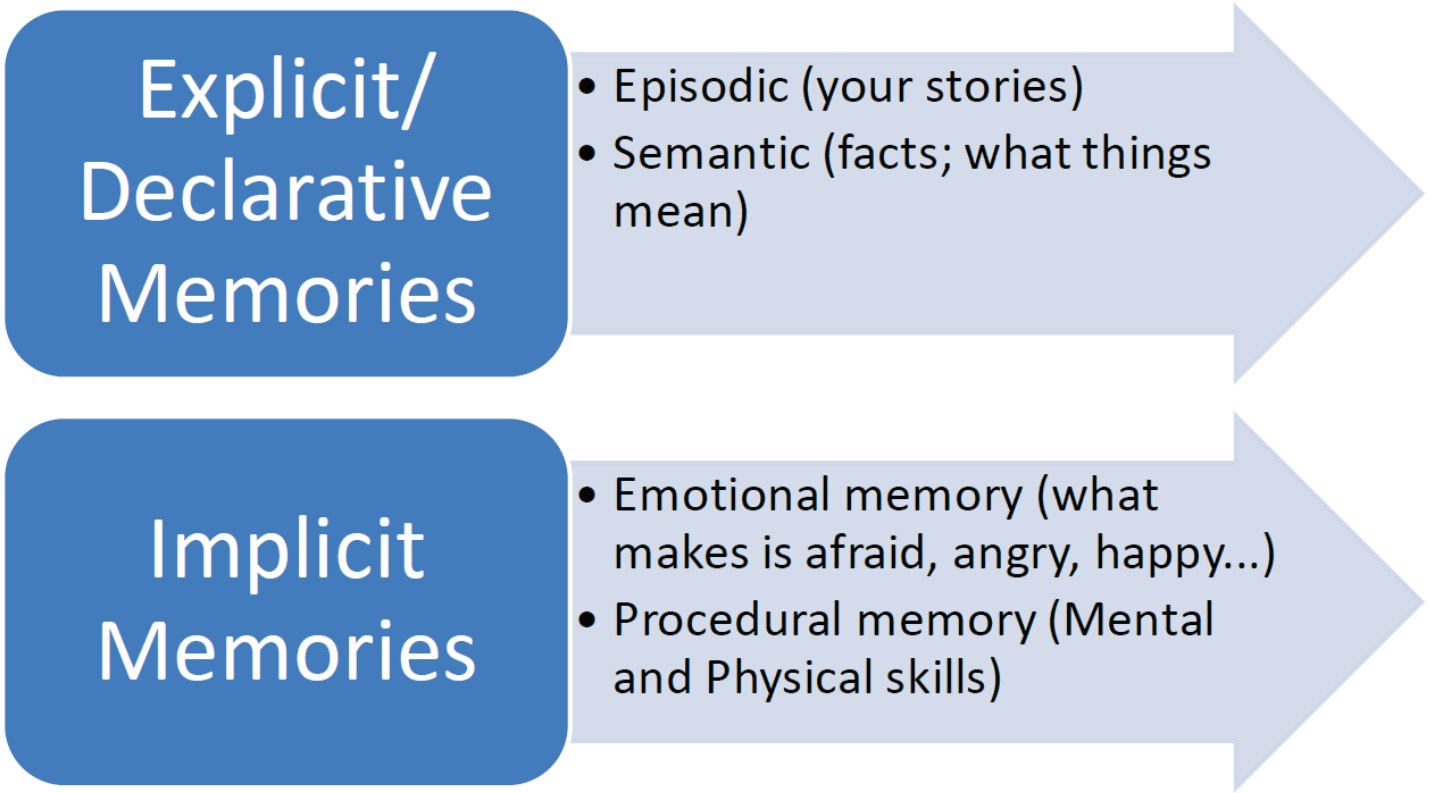
- Do you remember learning?
- What do you remember about it?
- What was your first bicycle like?
- What did you have to learn in order to stay up on the bike?
- Do you remember falling?

- Things you remember that you know you remember (**explicit memories**):
  - The stories of your own life that you remember (like learning to ride a bicycle) is called **Episodic memory**.
  - The memory of the names for different parts of the bike is called **semantic memory**.

Things you remember but don't know you remember **(Implicit memories):**

  - Learned skills like how to balance, steer and move forward is called **procedural memories.**
  - Feeling fear when you might fall off (even if you don't ever remember falling off) is called **emotional memory**

Mark in your text examples of:



Propositions, Schema, Models

- Facts, Propositions, Ideas
  - Discrete ideas
- Schema (Schemata)
  - Ideas organised and related to each other
- Mental Models
  - Sets of interrelated schema can be used to make predictions (if – then)

Prior Knowledge

- Activate prior knowledge
- Move to abstract
- Apply in multiple situations

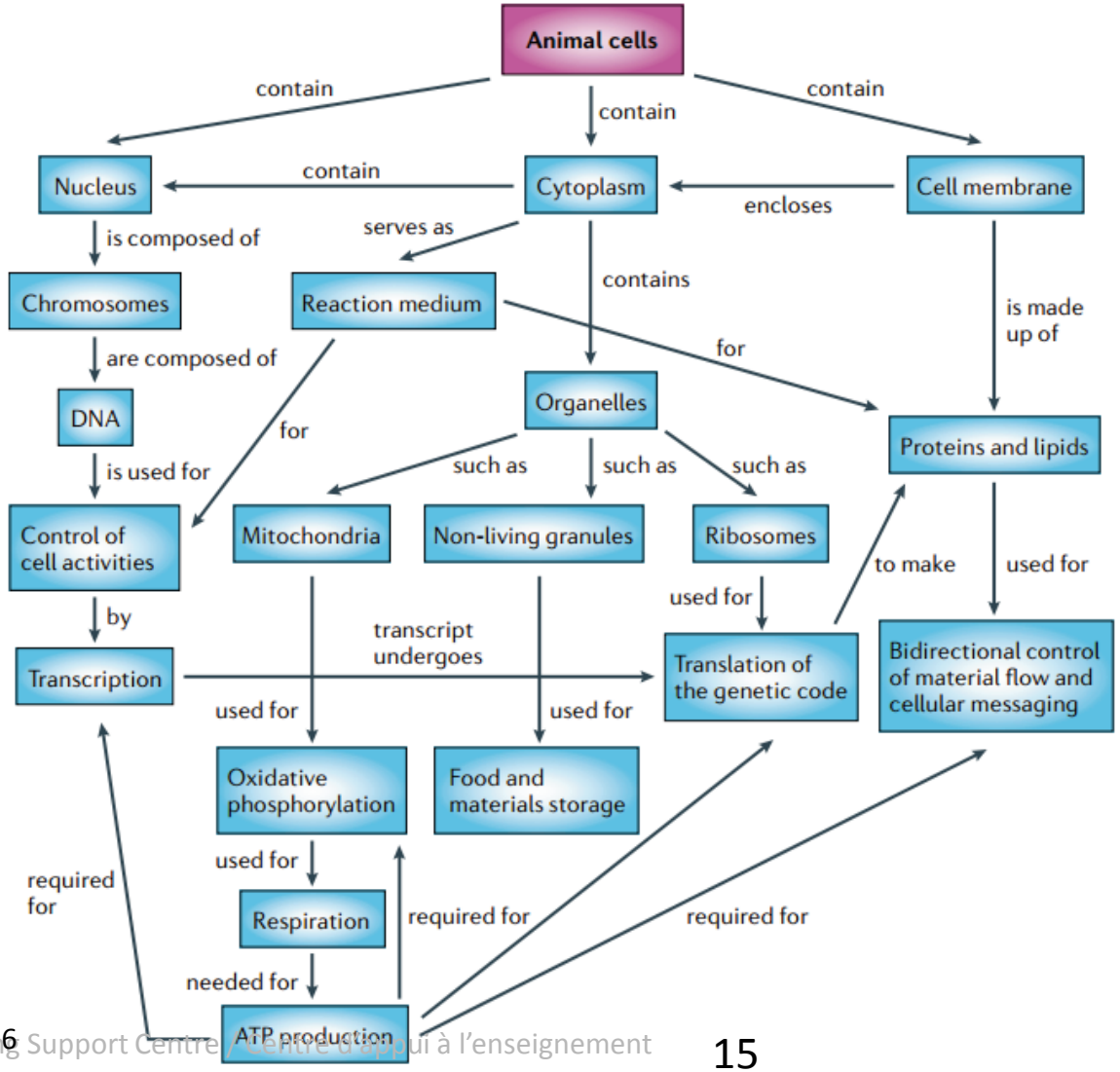


Image: Stephen Dicarlo (2006)

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

Summary

- Identify the difference between System 1 (Intuitive) and System 2 (Attentional)
- Identify the difference between implicit and explicit/ declarative memories
- Identify the differences between episodic and semantic memories
- Identify that skills are procedural memories, (either mental or physical)