Lecture 17 – Visual Cognition

Today's Learning Objectives:

1. List the parts of the cognitive system for vision.

2. Describe the aspects of visual processing important for data visualization and communication.

3. Define chunking and describe how memories are encoded in long-term member.

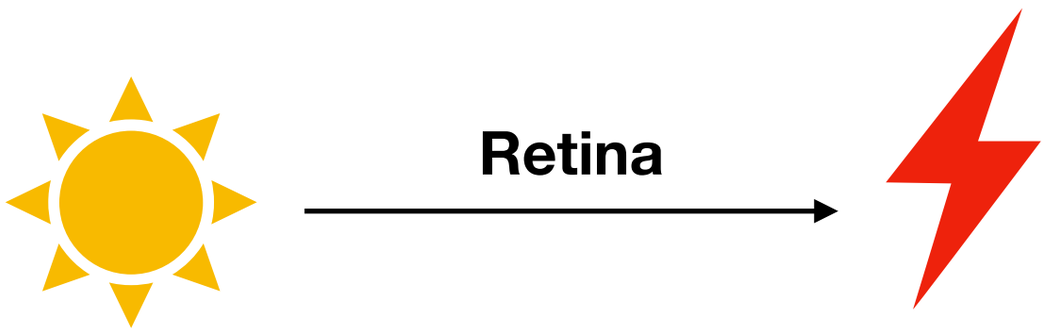
Next week: Data Viz Challenge #2

What is visual processing for?

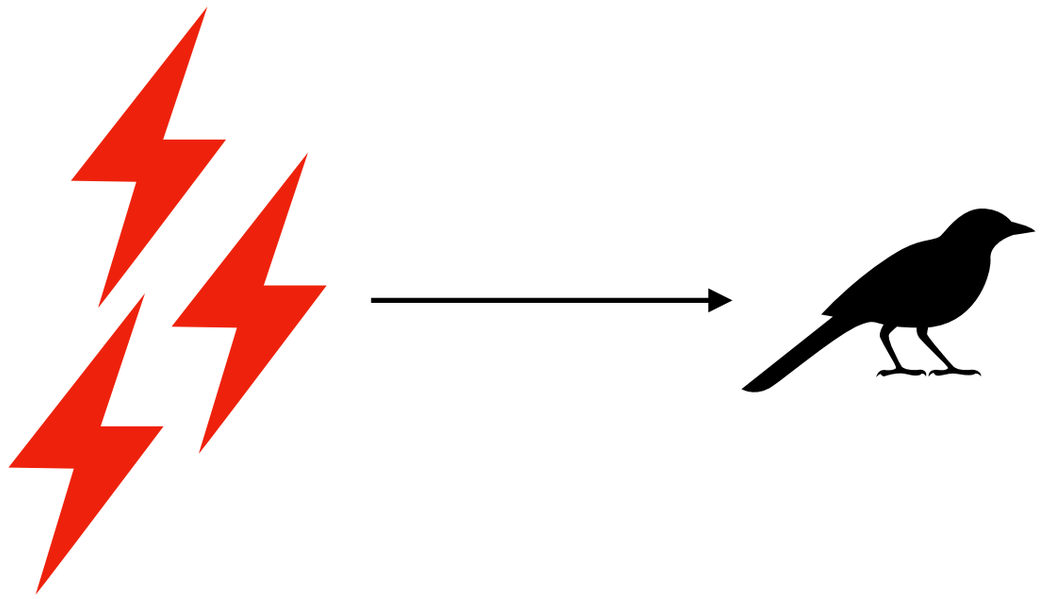
https://www.youtube.com/watch?v=VkrrVozZR2c

The Cognitive System

1. Encoding



2. Pattern Processing



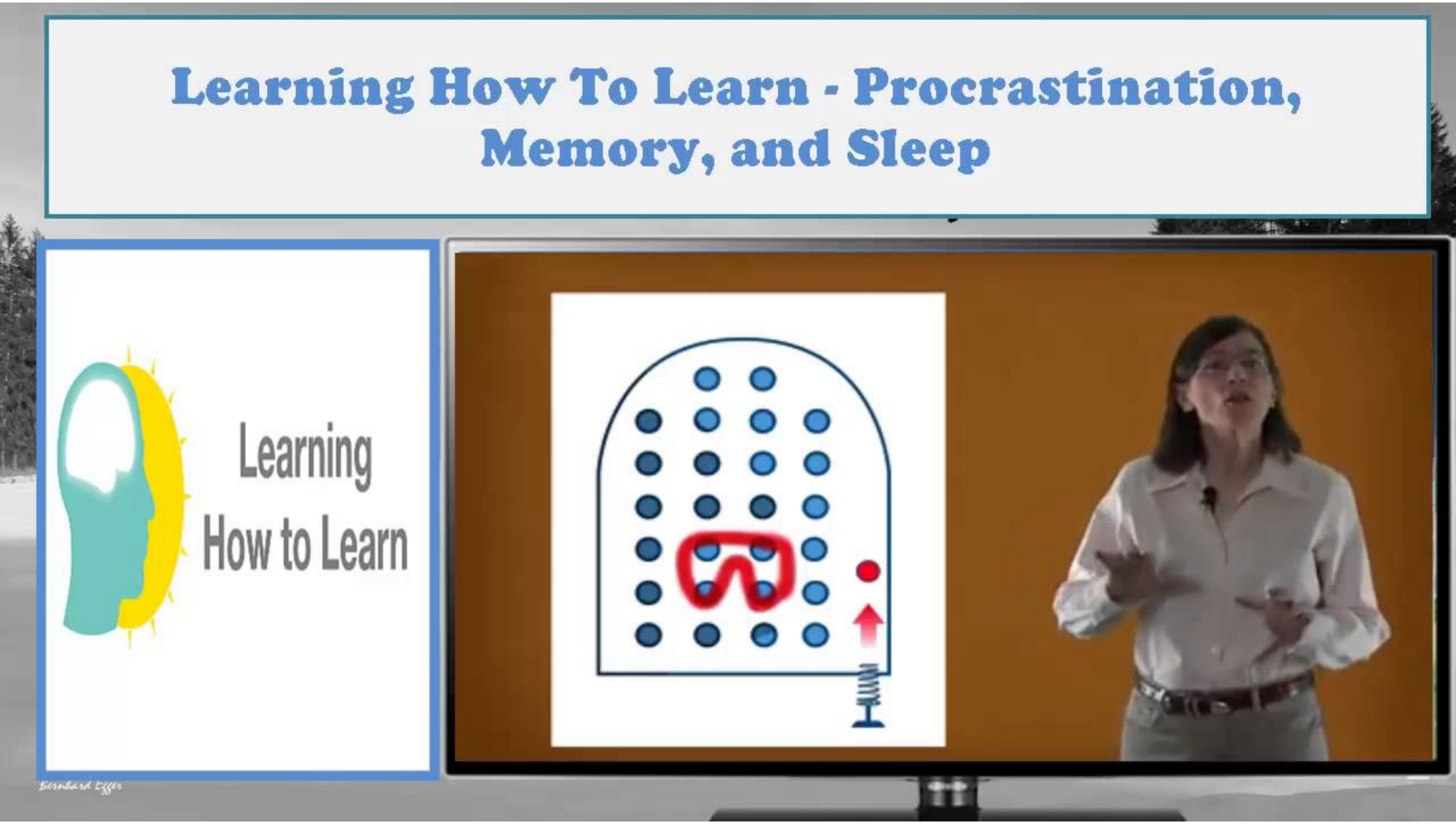
3. Visual Processing

visual memory

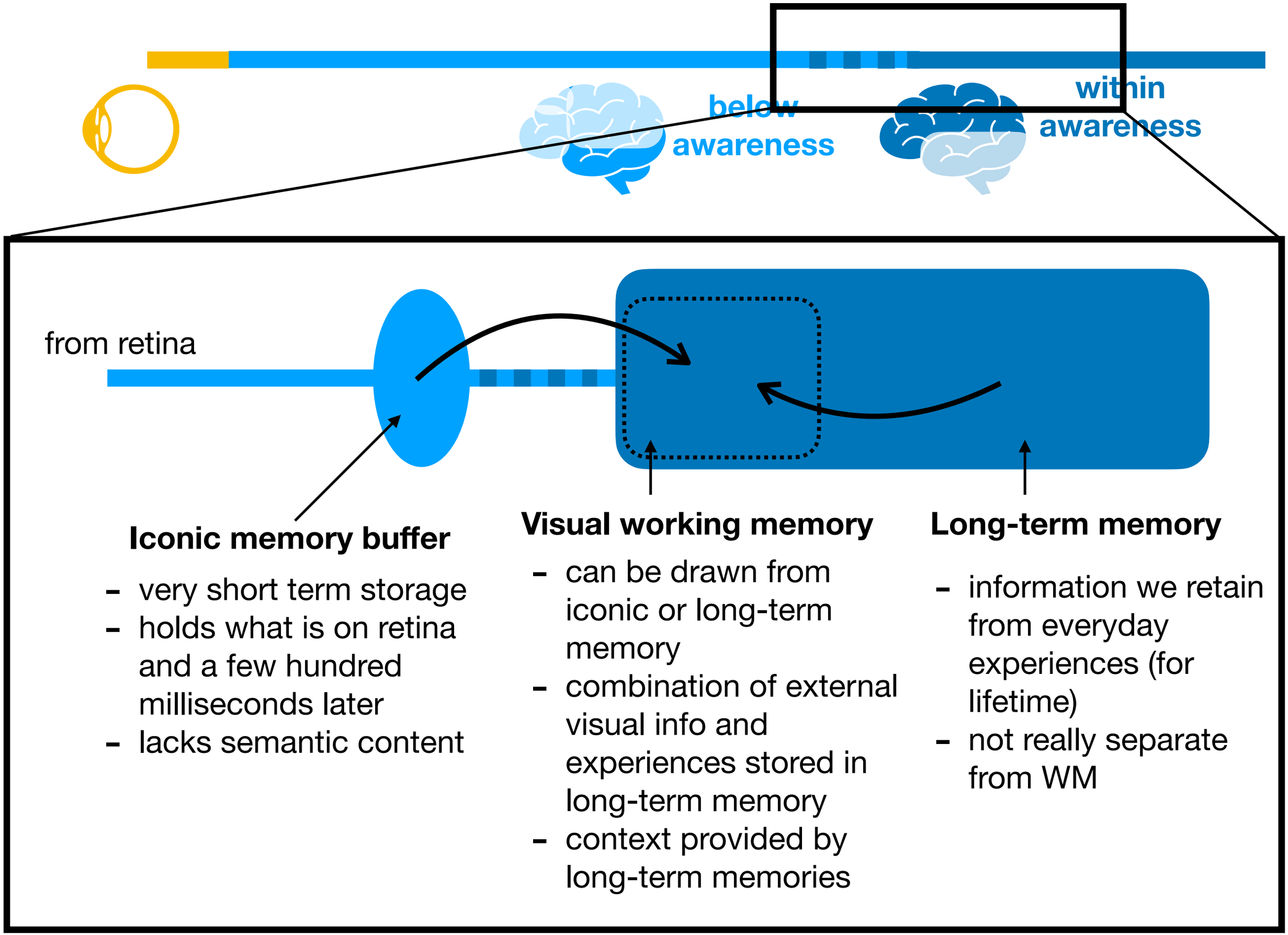
working memory

long-term memory

What is working memory?



Working memory



Iconic memory buffer

- very short term storage
- holds what is on retina and a few hundred milliseconds later
- lacks semantic content

Visual working memory

- can be drawn from iconic or long-term memory
- combination of external visual info and experiences stored in long-term memory
- context provided by long-term memories

Long-term memory

- information we retain from everyday experiences (for lifetime)
- not really separate from WM

Memory and Attention

- Visual Working Memory: very few available slots

Memory and Attention

- Visual Working Memory: very few available slots

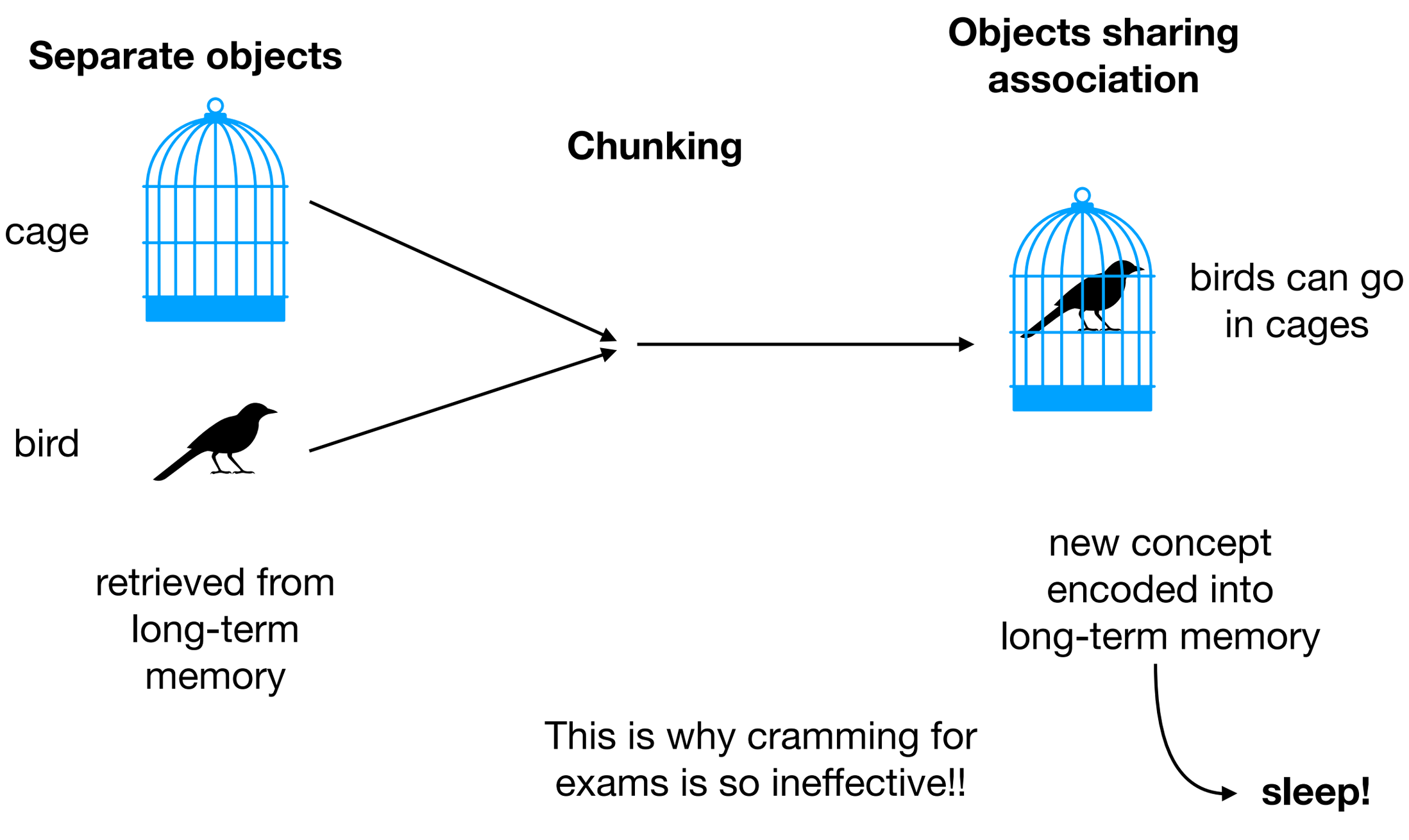
What color was the lamp? pink

- Attention helps guide how those slots are filled.
- Objects held in iconic memory a very short time (<400 ms).
- Eye movements help reset slots when needed.
- Gist helps construct layout and context, low detail (which can be filled in by eye movements when needed).

Memory and Attention

- Memory slots are not limited to objects, also concepts and other “chunks.”

  - A **chunk** is just about anything — it is an object, concept, group of objects, plan, etc.



What does this mean for data visualization?

1. **Attention is Queen.**

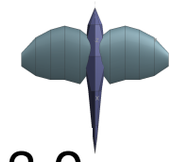
2. **Reduce demand on visual working memory.**

3. **Use single-object glyphs with multiple attributes to reduce pressure on working memory.**

4. **Priming helps free up memory and reduces processing.**

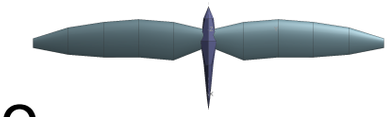
Before slide

Max CL/CD



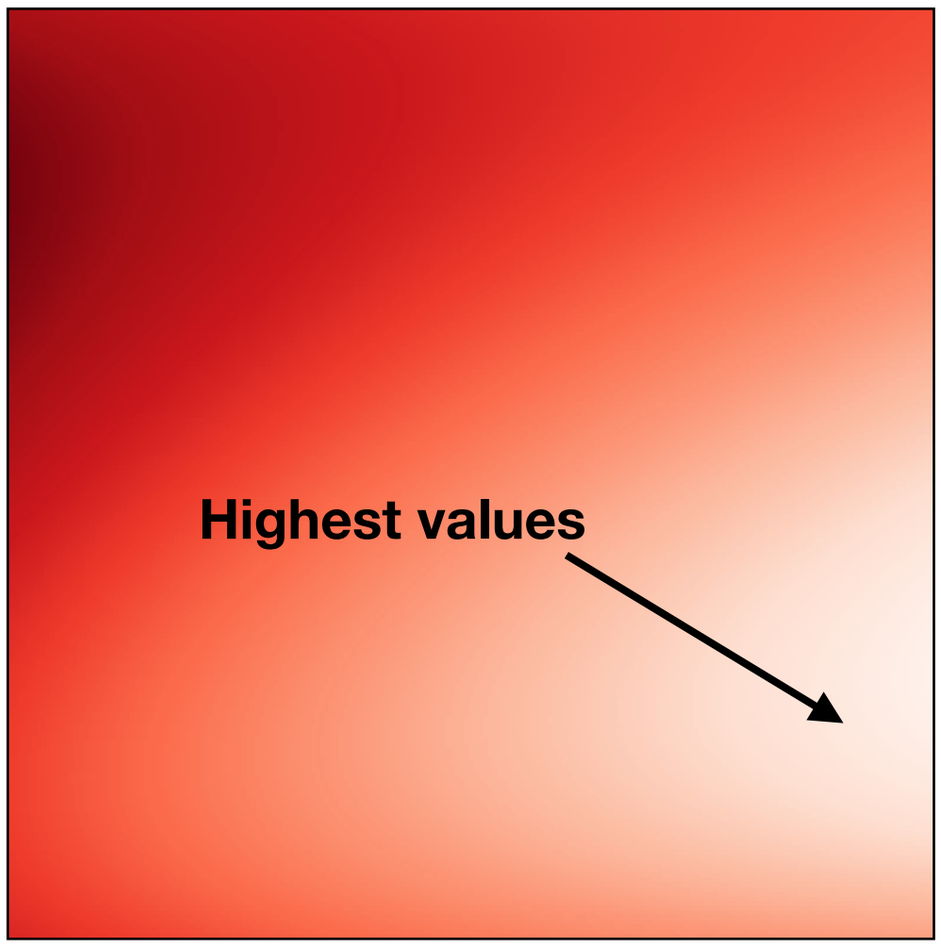
3.0

Aspect Ratio

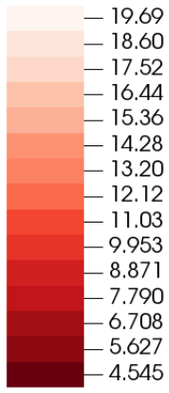


12.0

0.20



Camber



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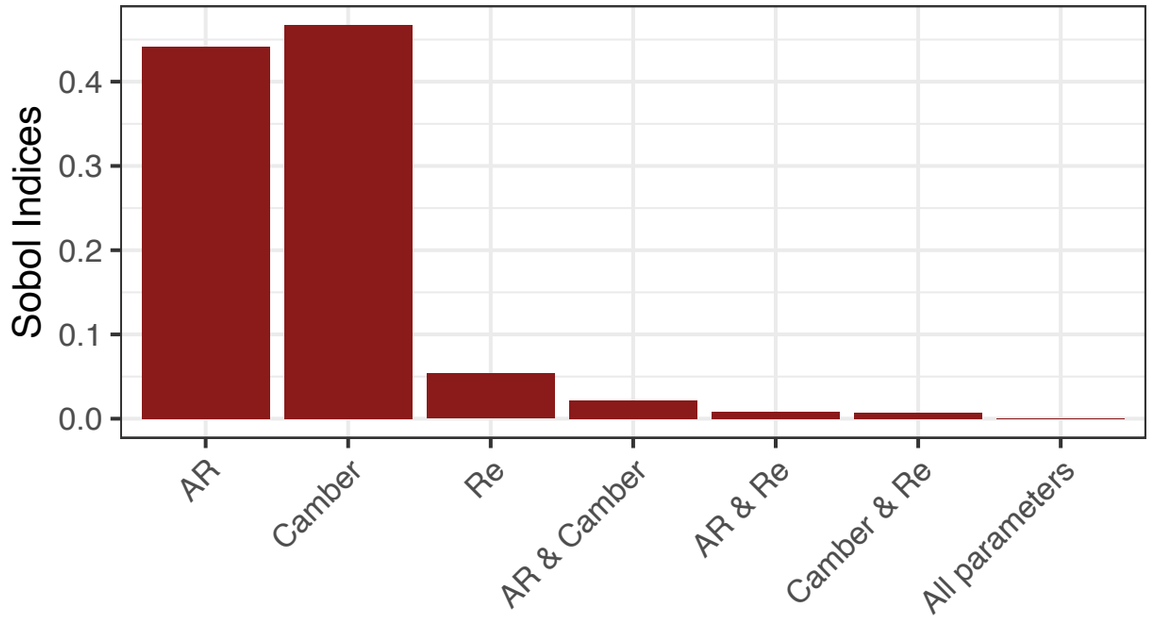


Both Aspect Ratio and Camber strongly influence max CL/CD

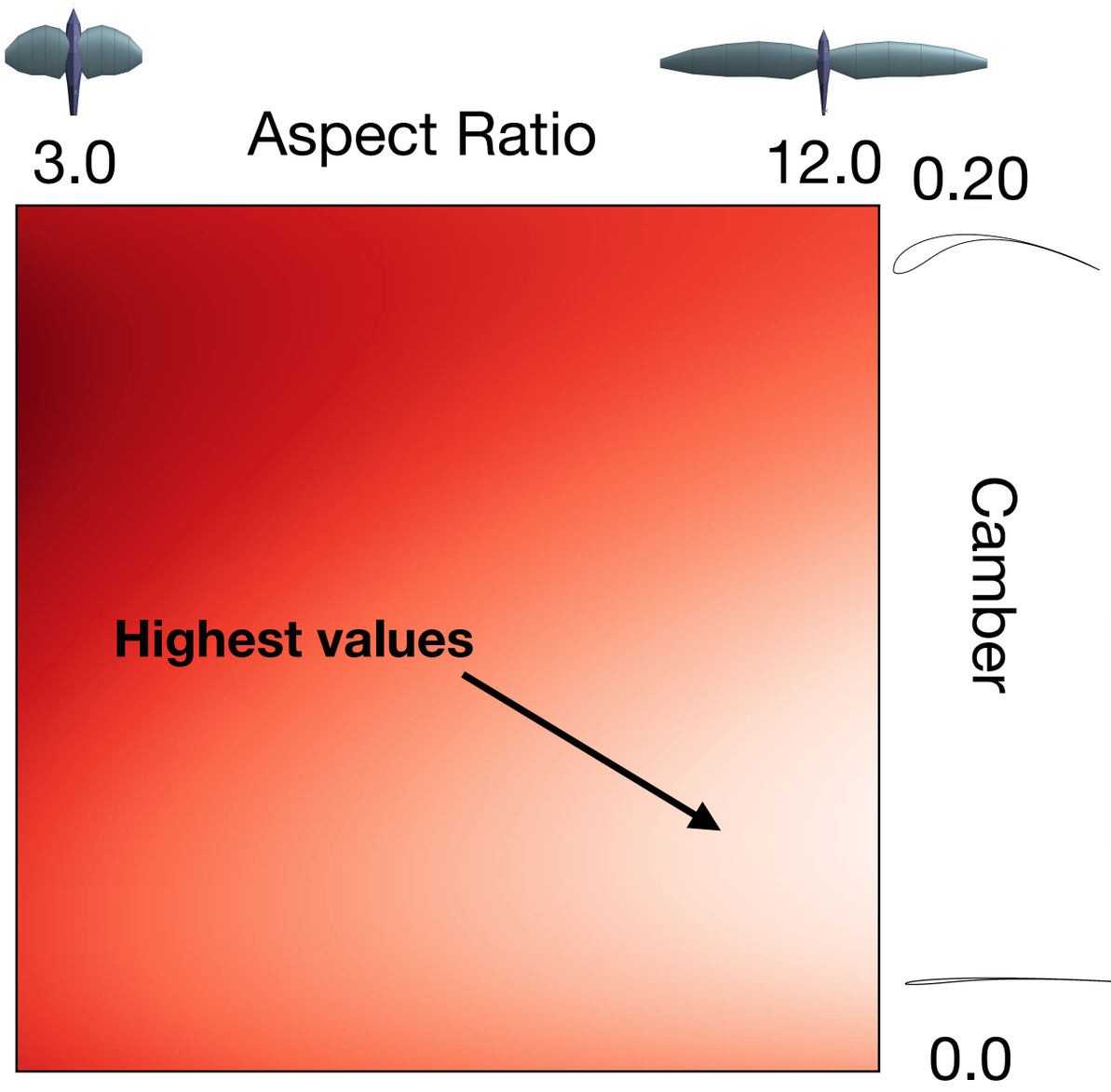
Highest values with low Camber and high Aspect Ratio

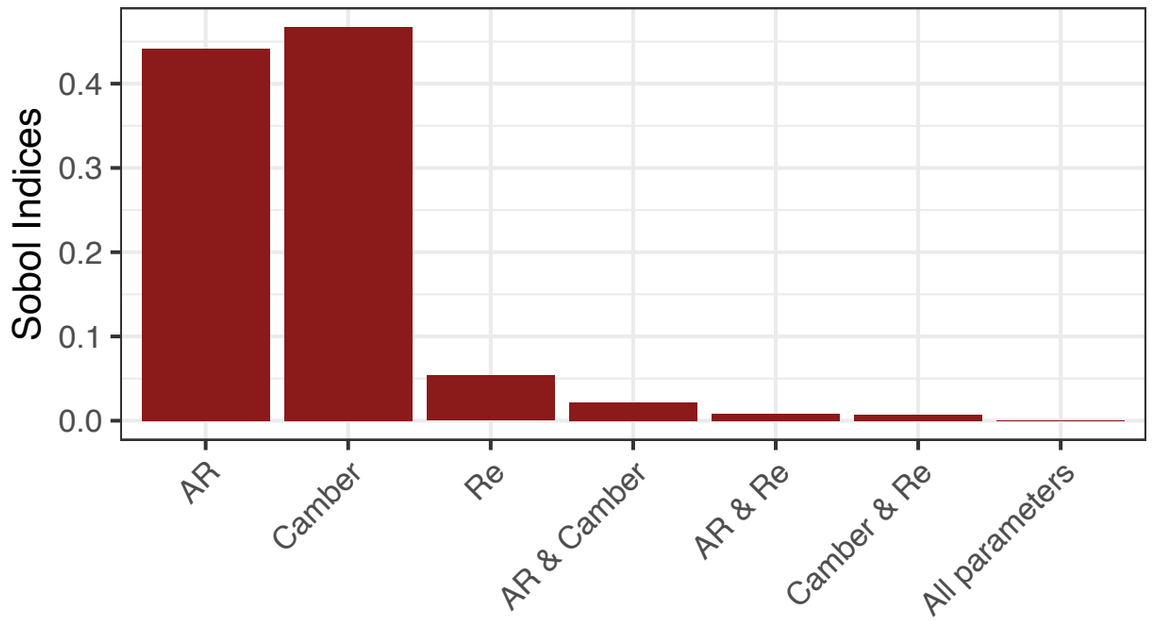
After slide

- Guiding attention
- Priming

- Multiple attributes
- Guiding attention

Max CL/CD





Both Aspect Ratio and Camber strongly influence max CLCD

Highest values with low Camber and high AR

Group work

- Use a presentation slide from a past presentation. Critique the slide's design and suggest improvements to the overall design.

- Assess the slide:
  - What is the main point of the slide?
  - How many working memory slots does the information demand?
  - How many working memory slots are necessary for the main point to be conveyed?

- Then, specifically work in design changes aimed at reducing the working memory required by an audience member by using the following features:

  1. Guiding attention
  2. Priming
  3. Multiple attributes

- Write up your changes in a before and after short presentation. Submit this as a PPT, KEY, or PDF document with notes on the changes you've made.