



# Attention & Memory

Image <https://www.piqsels.com/de/public-domain-photo-sdevi/download>



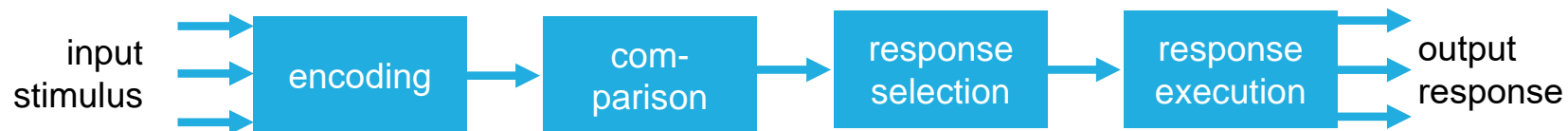
# Learning Goals

- Human Information Processing Model
- Attention
- Memory

# Human Information Processing

## Sequential four-stage process

- Encode stimulus received from the environment into an internal representation
- Compare the encoded stimulus with stored / memorized representation
- Formulate / select a response to received and encoded stimulus
- Act on the stimulus and execute the response

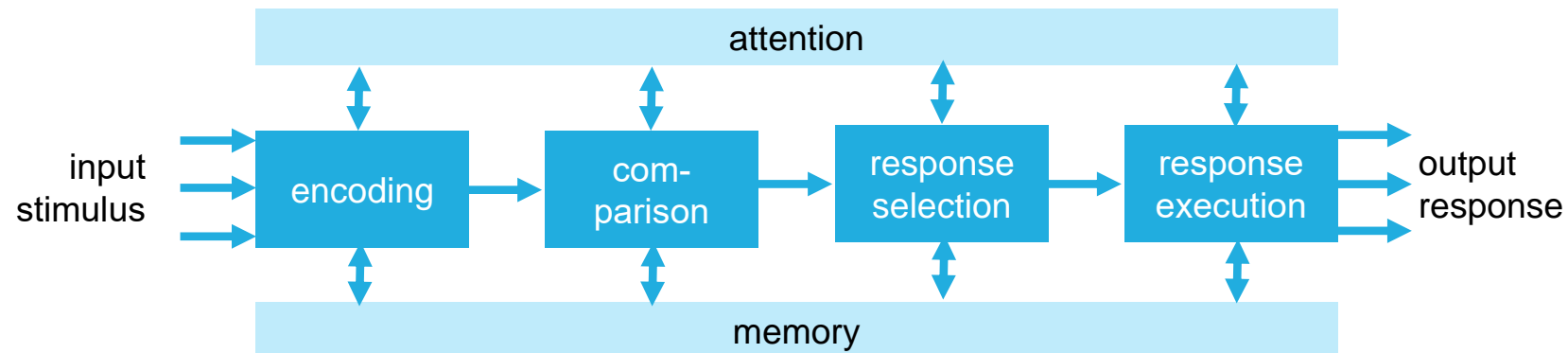


Lindsay, P.H. and Norman, D.A. (1977). Human Information Processing: An Introduction to Psychology, 2nd edition. New York: Academic Press. Source (text, image): <http://web.cs.dal.ca/~jamie/teach/NickGibbins/psych.html>

# Human Information Processing

## Extended four-stage process

- Attention and memory are relevant in all 4 stages



Barber, P (1988). Applied Cognitive Psychology. London: Methuen.  
Source (text, image): <http://web.cs.dal.ca/~jamie/teach/NickGibbins/psych.html>

# Input: Information transmission rates

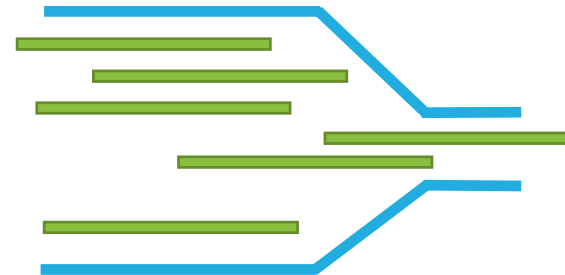
Sensory system	Bits per secons
Eyes	10,000,000
Skin	1,000,000
Ears	100,000
Smell	100,000
Taste	1,000

- Limited capacities for processing and saving information for cognition & memory
- No equal thresholds: inter- & intra-individual variance
- => Filtering attention & selecting information

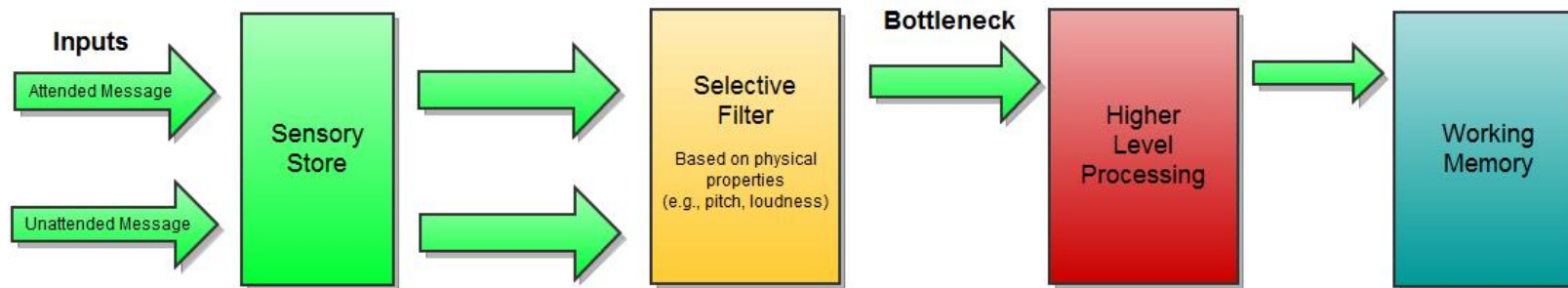
<https://www.britannica.com/science/information-theory/Physiology>

# Attention

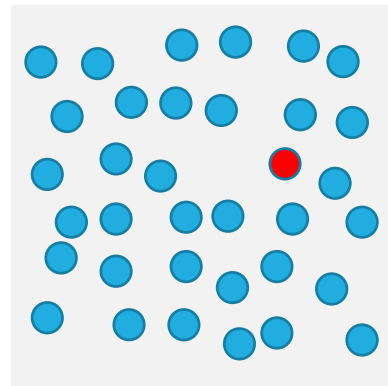
- = cognitive process of selectively concentrating on a sub-set of stimuli while ignoring other perceivable stimuli
- Broadbent's filter model of attention:
- all stimuli are processed initially for basic physical properties including
  - Color
  - Form
  - Motion (orientation response / reflex)
  - Pitch
  - Loudness
  - Direction (remember Cocktail Party Effect)



# Broadbent's filter model of attention



Preattentive processing



Conscious processing

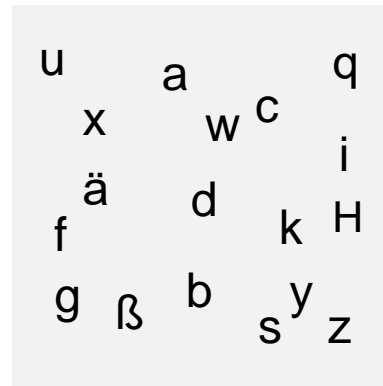
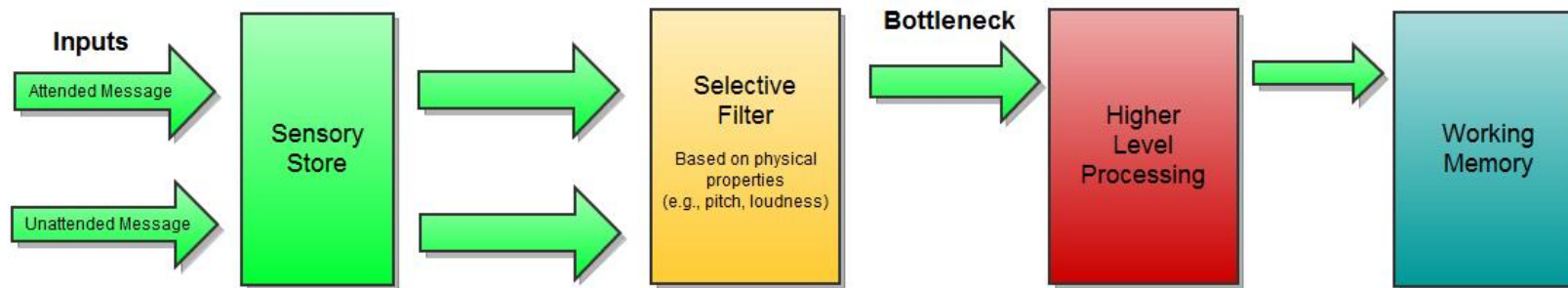
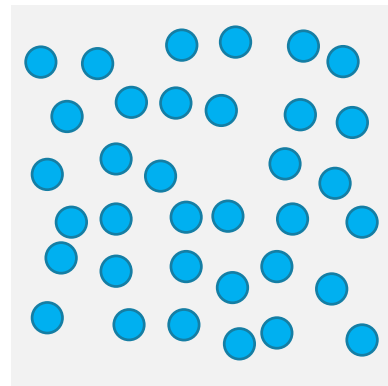


Image Sources [https://en.wikipedia.org/wiki/Broadbent%27s\\_filter\\_model\\_of\\_attention#/media/File:Broadbent\\_Filter\\_Model.jpg](https://en.wikipedia.org/wiki/Broadbent%27s_filter_model_of_attention#/media/File:Broadbent_Filter_Model.jpg) by Kyle.Farr

# Broadbent's filter model of attention



Preattentive processing



Conscious processing

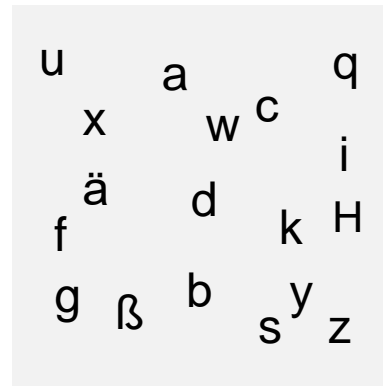
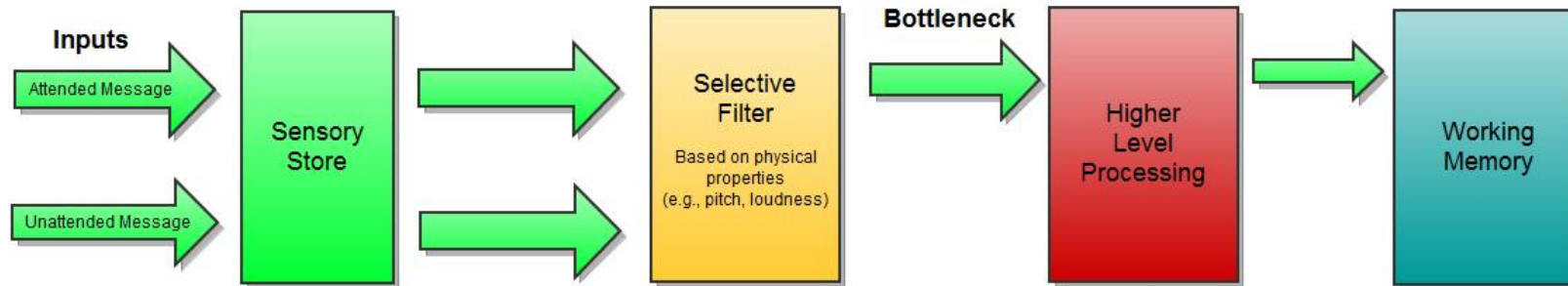


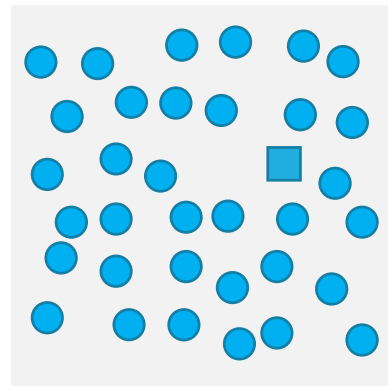
Image Sources [https://en.wikipedia.org/wiki/Broadbent%27s\\_filter\\_model\\_of\\_attention#/media/File:Broadbent\\_Filter\\_Model.jpg](https://en.wikipedia.org/wiki/Broadbent%27s_filter_model_of_attention#/media/File:Broadbent_Filter_Model.jpg) by Kyle.Farr



# Broadbent's filter model of attention



Preattentive processing



Conscious processing

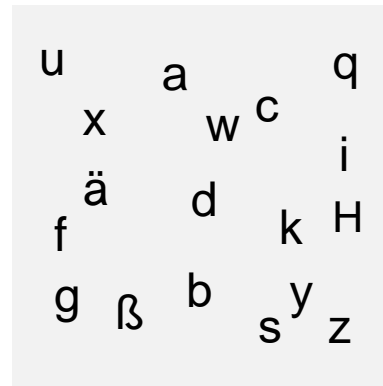


Image Sources [https://en.wikipedia.org/wiki/Broadbent%27s\\_filter\\_model\\_of\\_attention#/media/File:Broadbent\\_Filter\\_Model.jpg](https://en.wikipedia.org/wiki/Broadbent%27s_filter_model_of_attention#/media/File:Broadbent_Filter_Model.jpg) by Kyle.Farr



Image Source <https://www.pexels.com/de-de/foto/album-bilder-fotos-image-724644/>





# Memory

- Involves encoding and recalling knowledge and acting appropriately
- We don't remember everything - involves filtering and processing
- Context is important in affecting our memory
- We recognize things much better than being able to recall things
  - The rise of the GUI over command-based interfaces
- Better at remembering images than words
  - The use of icons rather than names

# Multi-Store Model for visual and oral perception

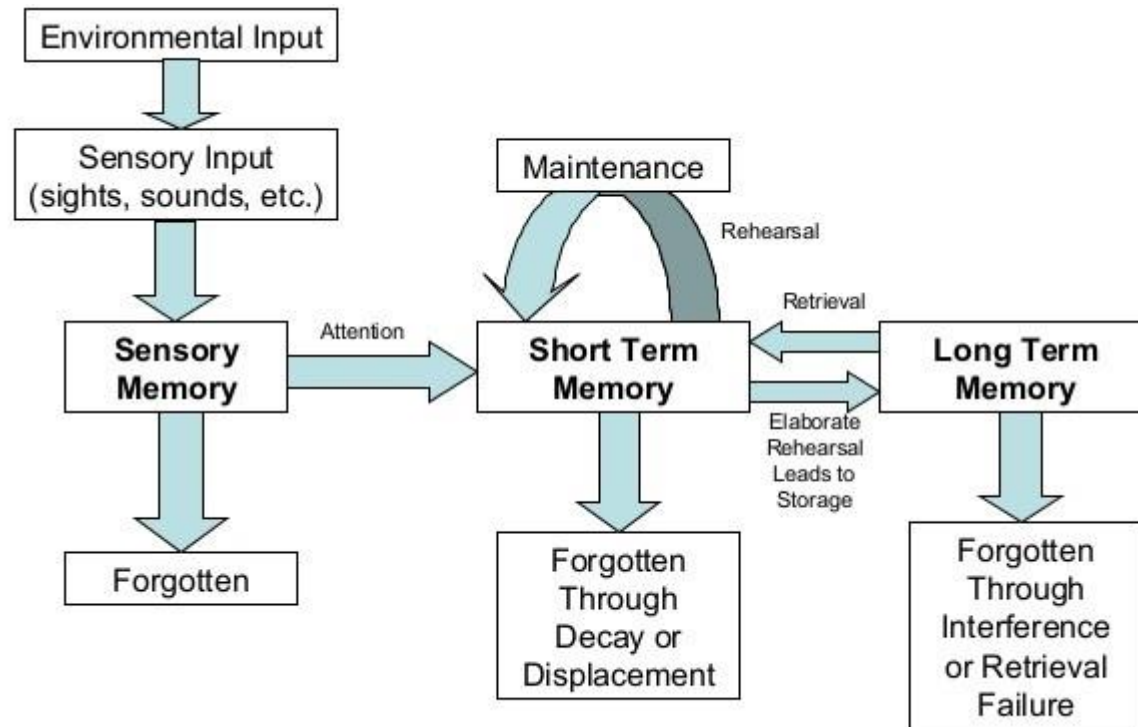
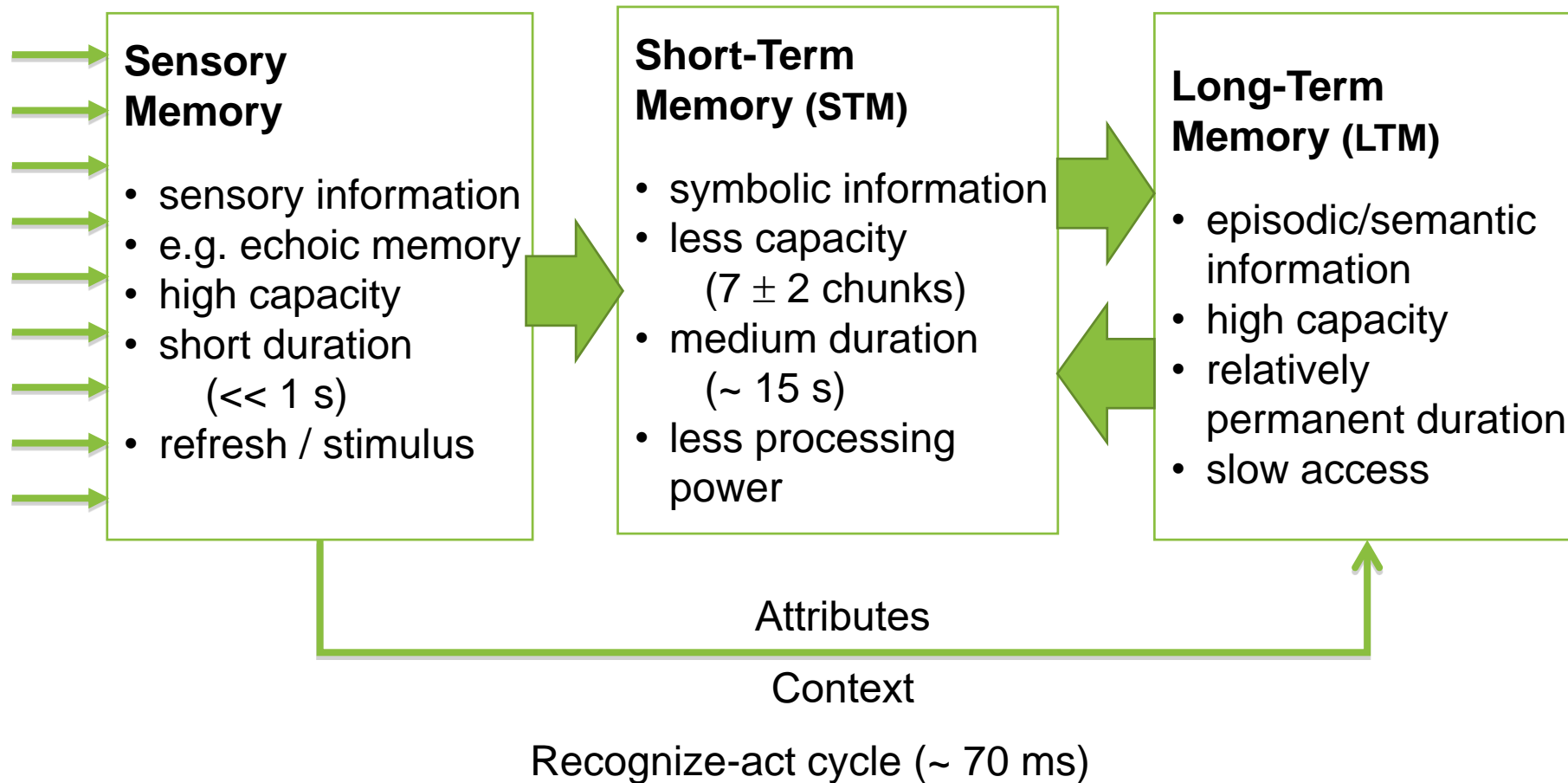


Image Source [https://en.wikipedia.org/wiki/Information\\_processing](https://en.wikipedia.org/wiki/Information_processing) adapted by Dkahng from Atkinson, R.C. and Shiffrin, R.M. (1968). 'Human memory: A Proposed System and its Control Processes'

# Multi-Store Model for visual and oral perception



# Memory: Short Term Memory (STM)

Mini exercise: watch & remember

Gesundbrunnen

Uooikpnjmn ztgtzgrt URK

782108673 876221 9912

Duobus litigantibus tertius  
gaudet

جامعة

человѣк

# Memory: Short Term Memory (STM)

## Mini exercise: recall

Gesundbrunnen

Uooikpnjmn ztgtzgrt URK

782108673 876221 9912

Duobus litigantibus tertius  
gaudet

جامعة

человѣк

# The problem with the classic '7±2'

- People's immediate memory capacity is very limited
- In general you can remember 5-9 chunks
- Chunks can be letters, numbers, words, sentences, images
- ...

221217891335

<http://www.well.com/user/smalin/miller.html> The Psychological Review, 1956, vol. 63, pp. 81-97



# The problem with the classic '7±2'

- People's immediate memory capacity is very limited
- In general you can remember 5-9 chunks
- Chunks can be letters, numbers, words, sentences, images  
...

2212 1789 13353

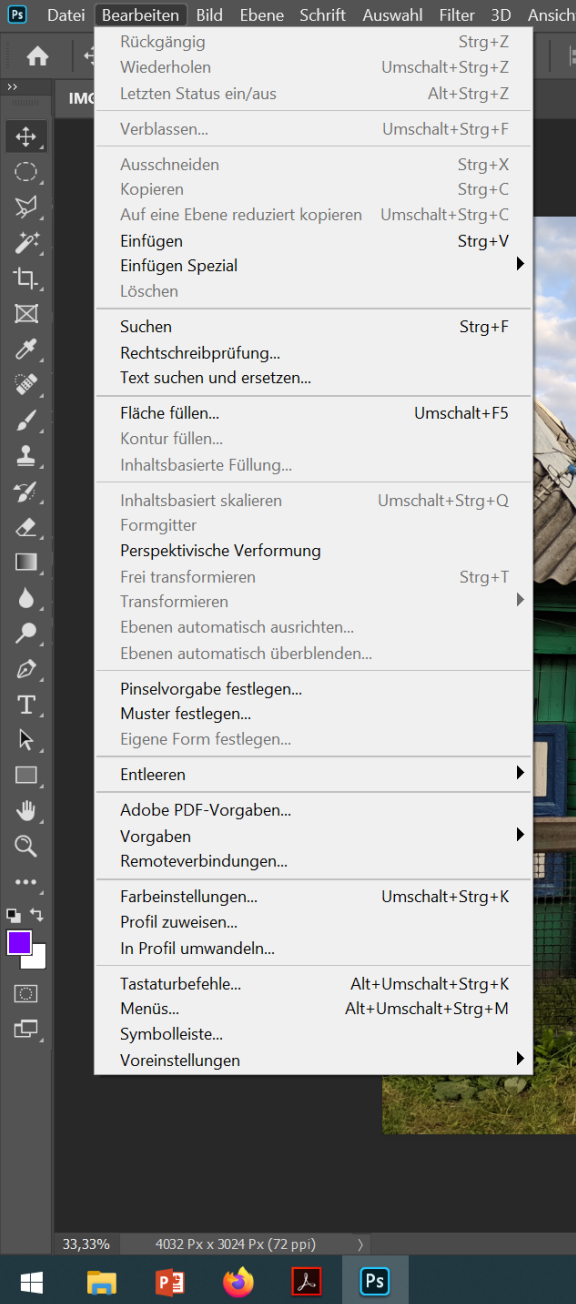


Beuth Hochschule für Technik Berlin  
Luxemburger Straße 10  
13353 Berlin  
Telefon: 030 4504-0  
E-Mail: [www\[at\]beuth-hochschule.de](mailto:www[at]beuth-hochschule.de)

Image Sources <https://pixabay.com/de/photos/frankreich-franz%C3%B6sische-revolution-63022/> &  
<https://www.needpix.com/photo/1867851/egyptian-girl-class-teenager-pretty-youth-smiling-children-female-cheerful>

# Wrong application of the theory

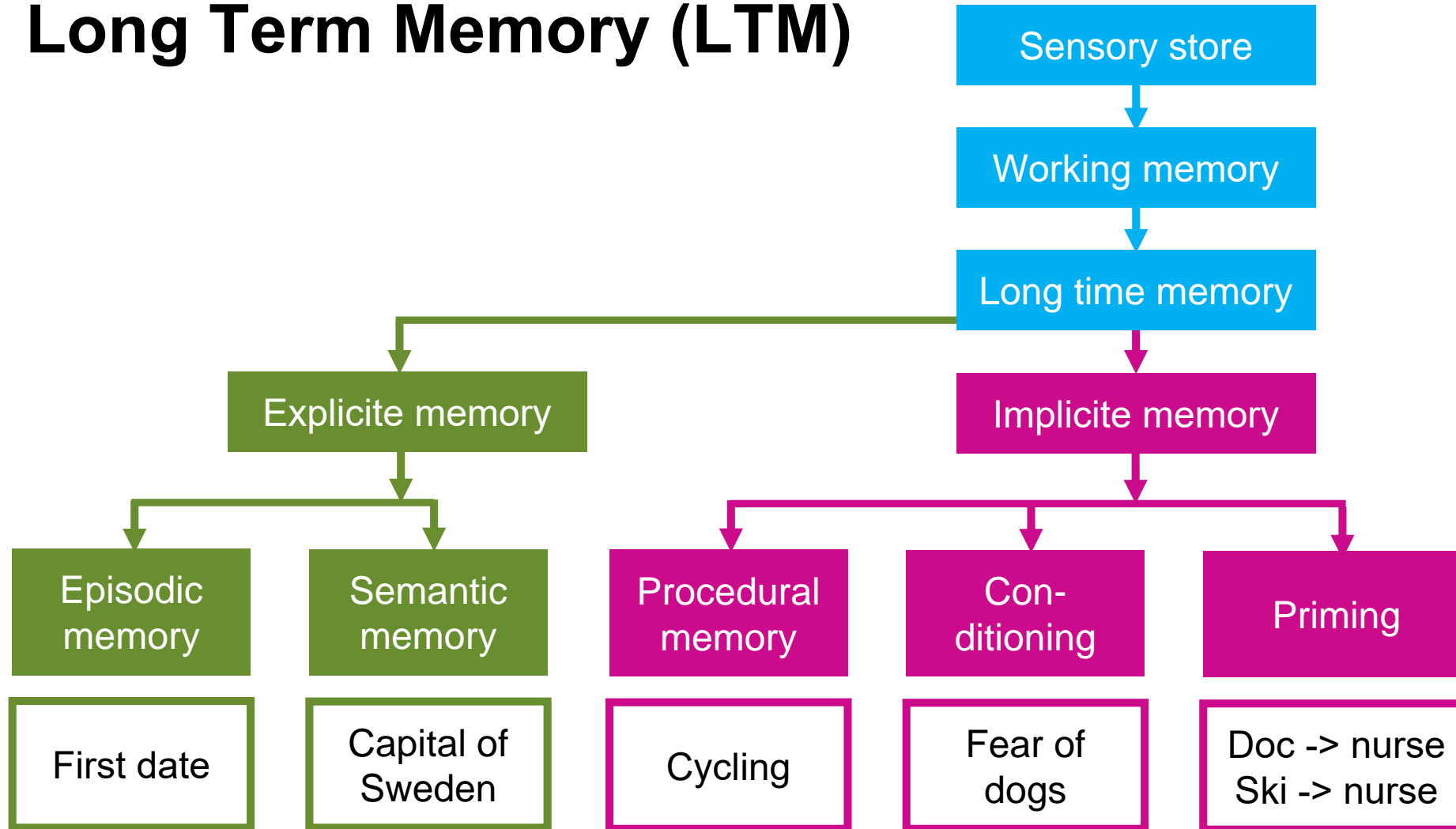
- Wrong interpretation
  - Present only 7 options on a menu
  - Display only 7 icons on a tool bar
  - Place only 7 items on a pull down menu
  - Place only 7 tabs on the top of a website page
- But why this is wrong?
  - Its about reading not recalling!
  - People can scan / read lists of bullets, tabs, menu items



# Resulting UI Guidelines

- Do not overload the STM
  - Use known symbols
  - Notes, menus, lists (WYSIWYG)
  - Grouping, chunks (complex super symbols)
  - Short, closed actions

# Long Term Memory (LTM)



# Long Term Memory (LTM)

- Loss of access instead of erasing (forgetting)
- Duration depends on the intensity and the quality of memorizing
- The following can train your LTM
  - Learning by repeated practicing
  - Active learning (learning by doing)
  - Illustrate and visualize words

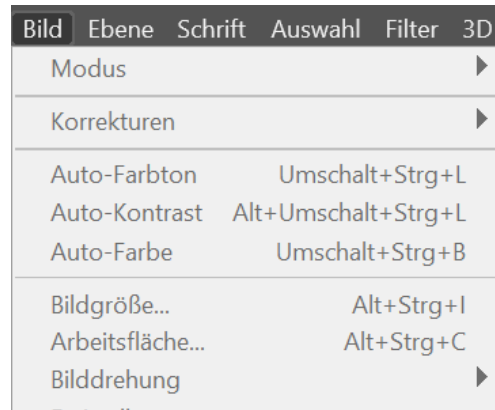
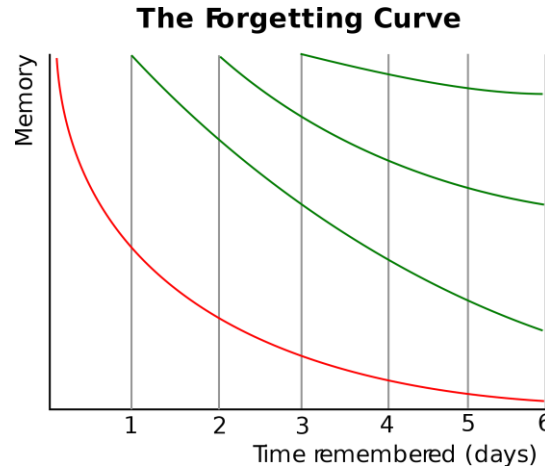


Image Source <https://de.wikipedia.org/wiki/Vergessenskurve#/media/Datei:ForgettingCurve.svg> by Icez

This file is licensed under the Creative Commons Attribution-Share Alike 4.0 (CC BY-SA)

license:

<https://creativecommons.org/licenses/by-sa/4.0>

Attribution: Katrin Wolf

For more content see: <https://hci-lecture.de>

