Katedra psychologie

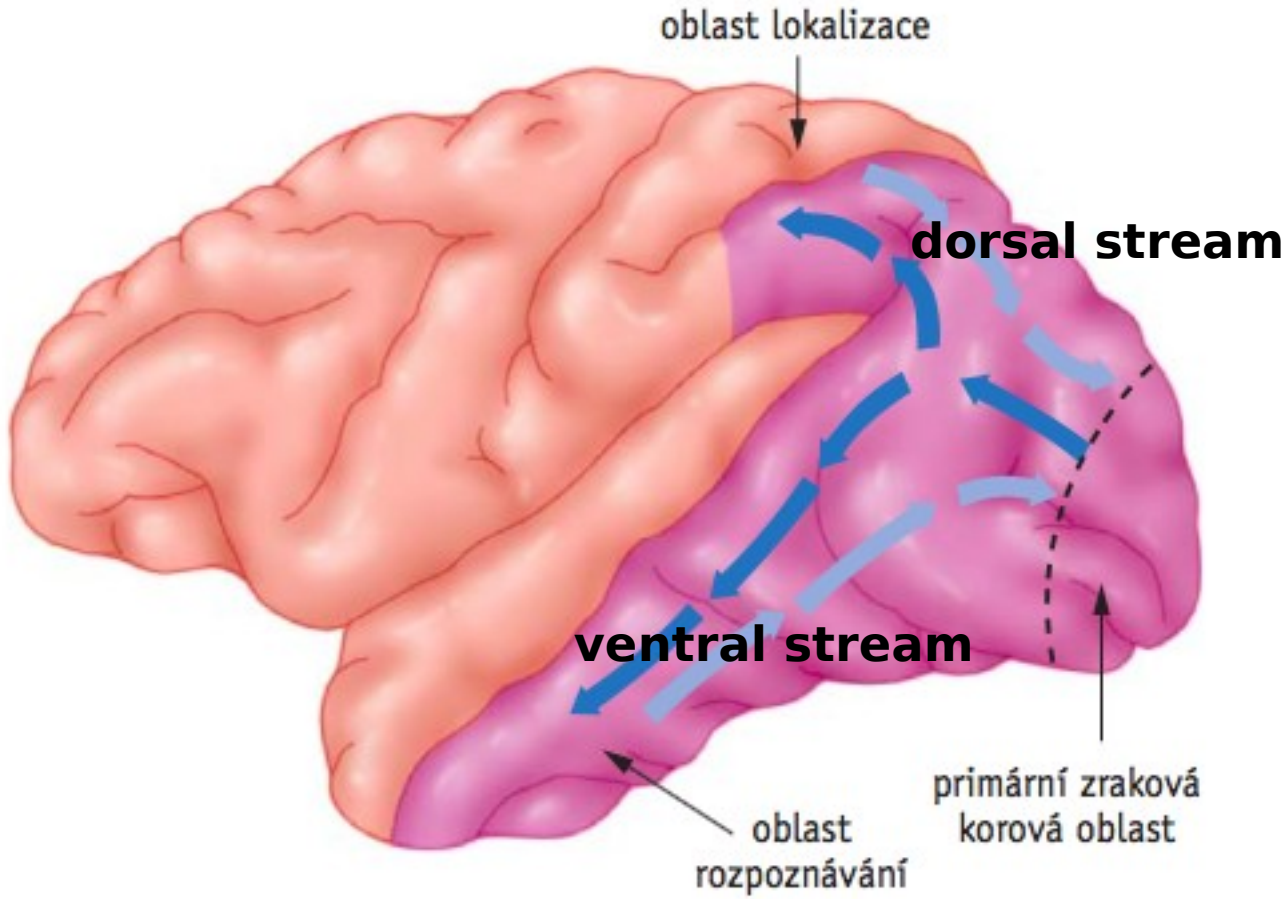
PERCEPTION

Jiří Lukavský

Perception – information input

- Sensation
- Perception
  - Automatic processes
  - Localization
  - Recognition

- David Milner & Melvyn A Goodale (1992)
  - Two-streams hypothesis



Function of perception

- Selection (but attention!)
- Localization
- Recognition
- Abstraction
- Percepctual stability

(Atkinsonová)

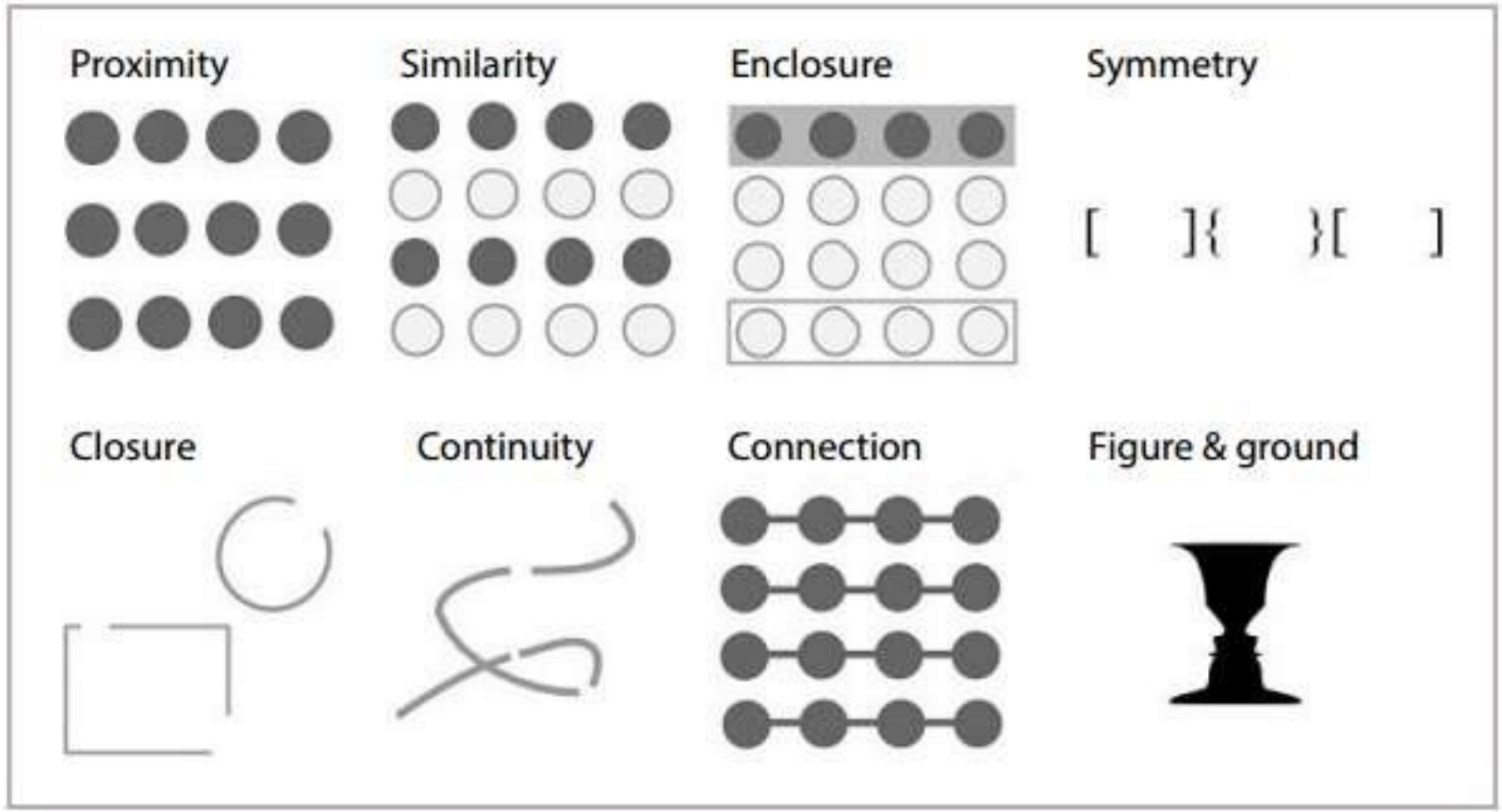
Lokalization

- Location in visual field/in 3D space

- Gestalt psychology
  - Figure vs background
  - Grouping objects
- Distance judgments

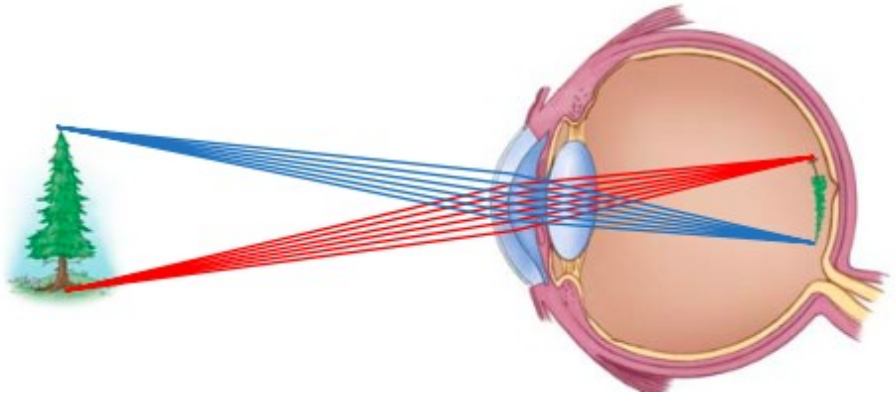
- Figure & background

- Gestalt laws



Distance judgments

- Monocular cues
- Binocular cues



Monocular cues

- Interposition
- Linear perspective
- Atmospheric perspective
- Relative size
- Relative height
- Texture gradient
- Motion paralax
- Shadow or Shading

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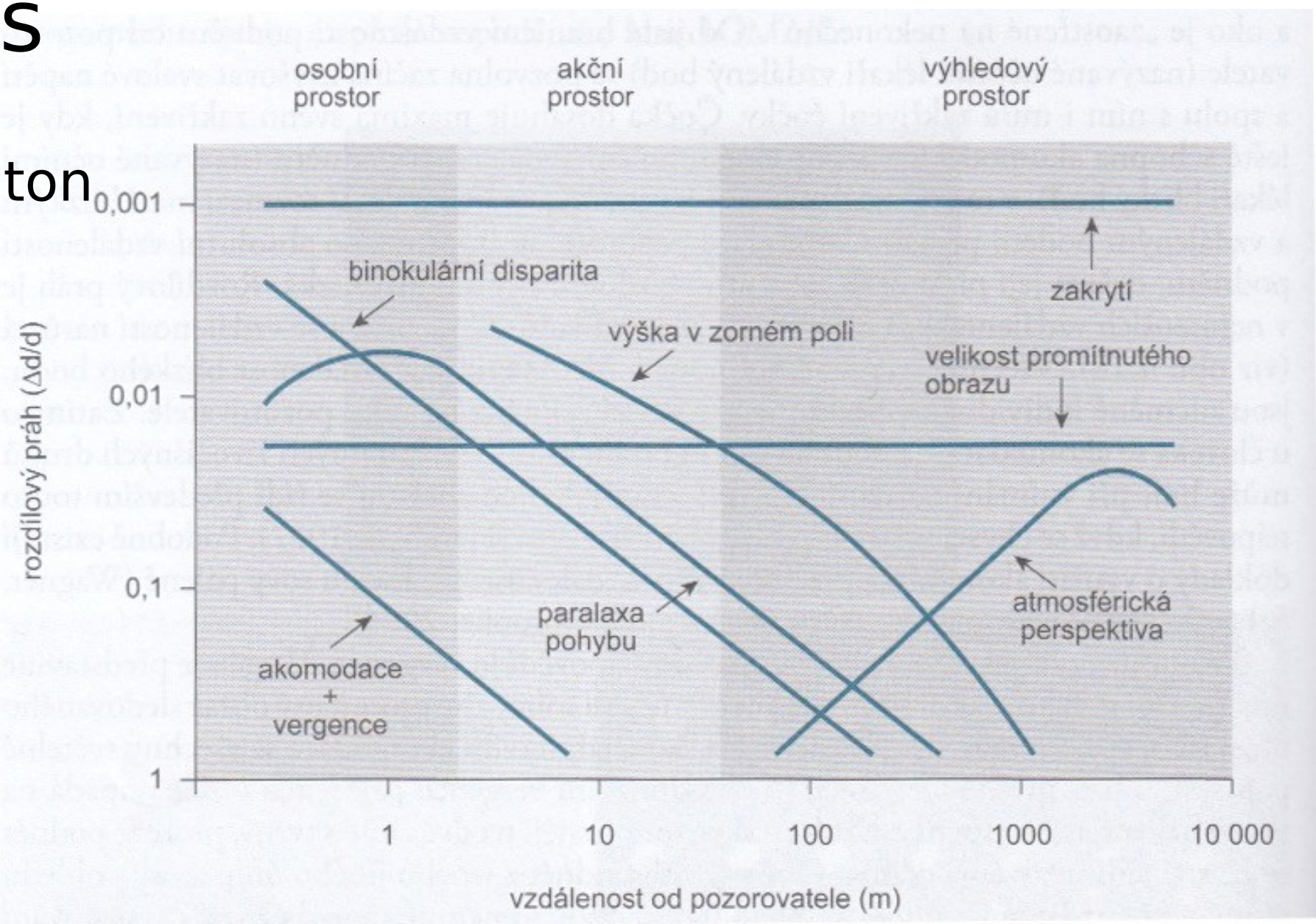
Binocular cues

- Binocular disparity
- Binocular convergence
- Accommodation

Using cues

- Cutting & Vishton (1995)



Perception of motion

- Biological motion
  - https://www.biomotionlab.ca/Demos/BMLwalker.html

Recognition - theories

- Pattern recognition (2D)
  - Template theory
  - Feature theory
- Object recognition (3D)
  - Marr (1982)
  - Biederman (1987)

Template theory

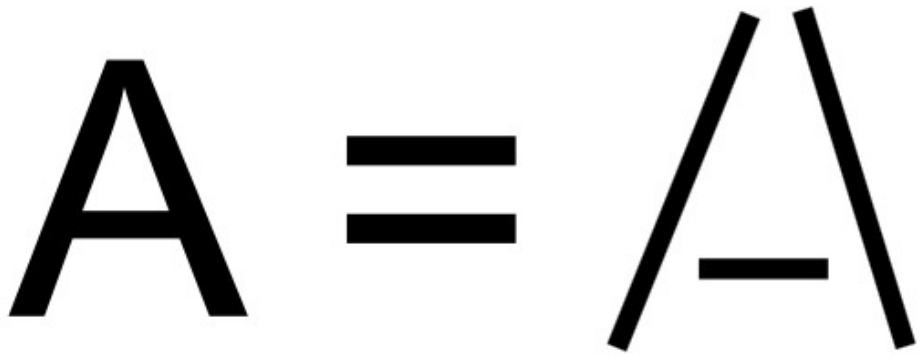
- Templates in long-term memory
- Problem
  - Multiple pattern, but 1 character

- Solutions
  - Normalization (rotation, size)
  - 1 pattern, several templates

Feature theory

- Pattern = set of features
- Feature detectors

- Example
  - Neisser (1964)
    - look for letter Z, which line



- IMVXEW
- WVMEIX
- VXWIEM
- MIEWVX
- WEIMXV
- IXEZVW

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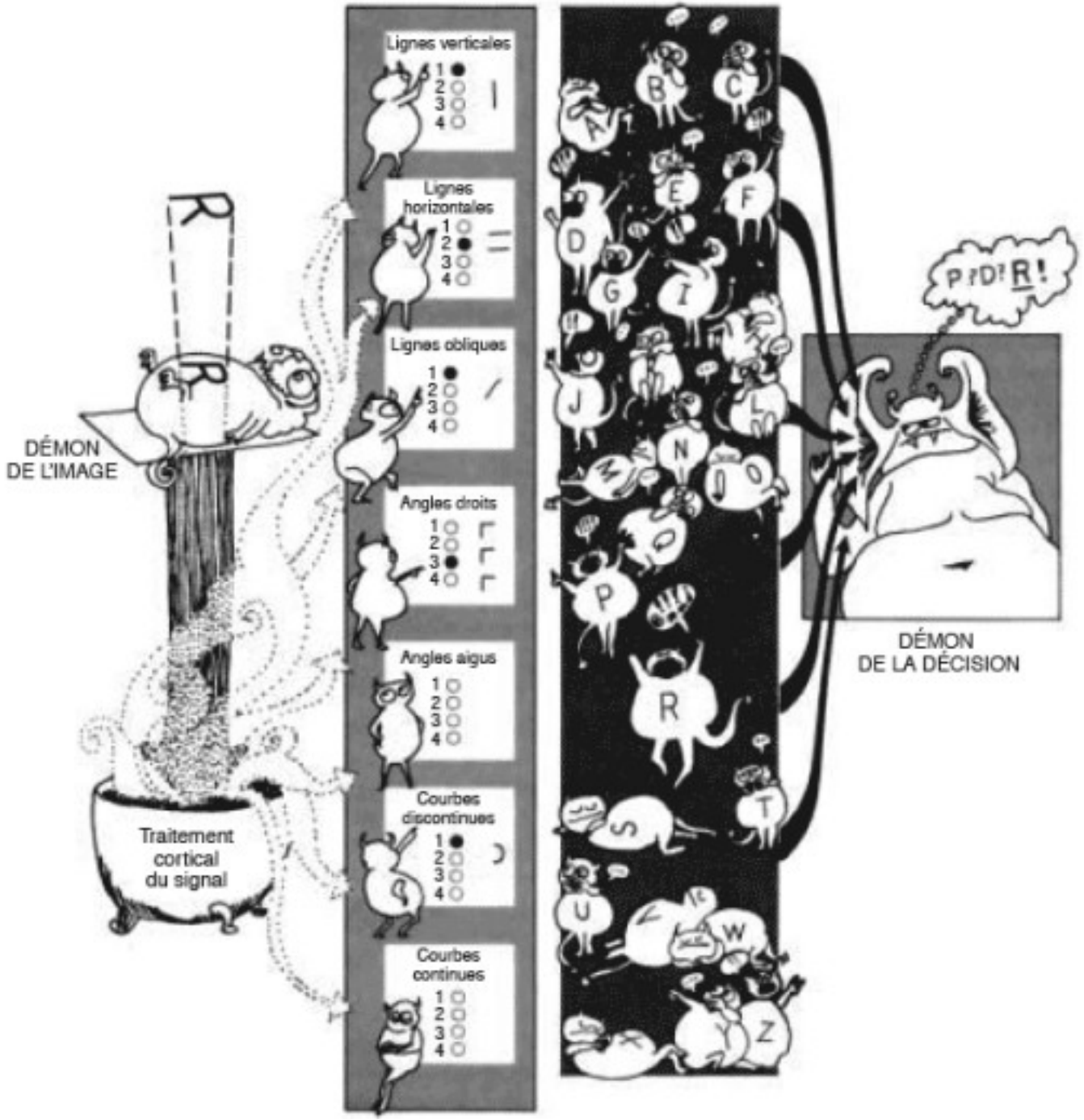
- IXEZVW

- ODUGQR
- GRODUQ
- DUROQG
- RGOUDQ
- GUQZOR
- DRUQGO

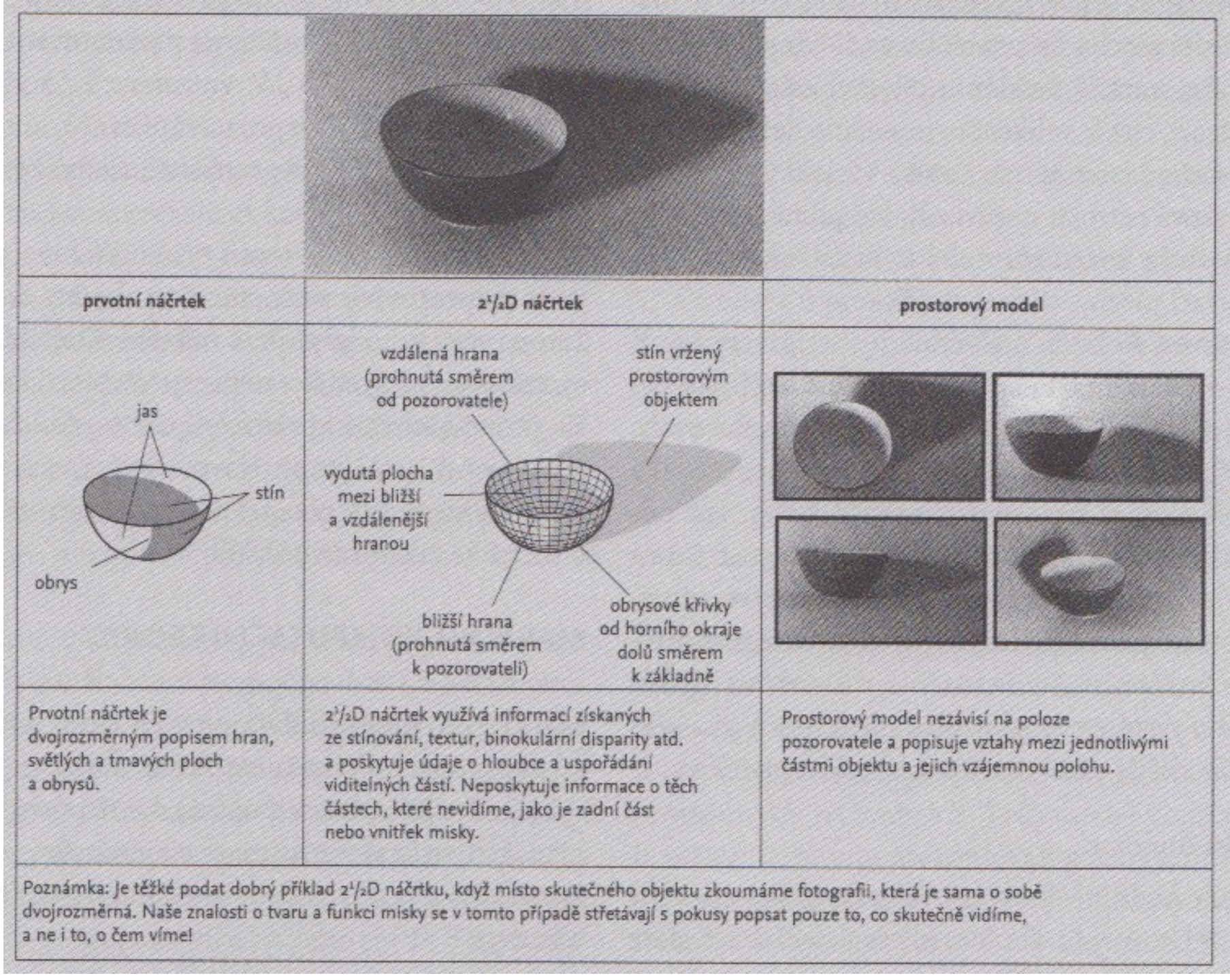
Pattern recogniti (example)

- Pandemonium
  - Oliver Selfridge



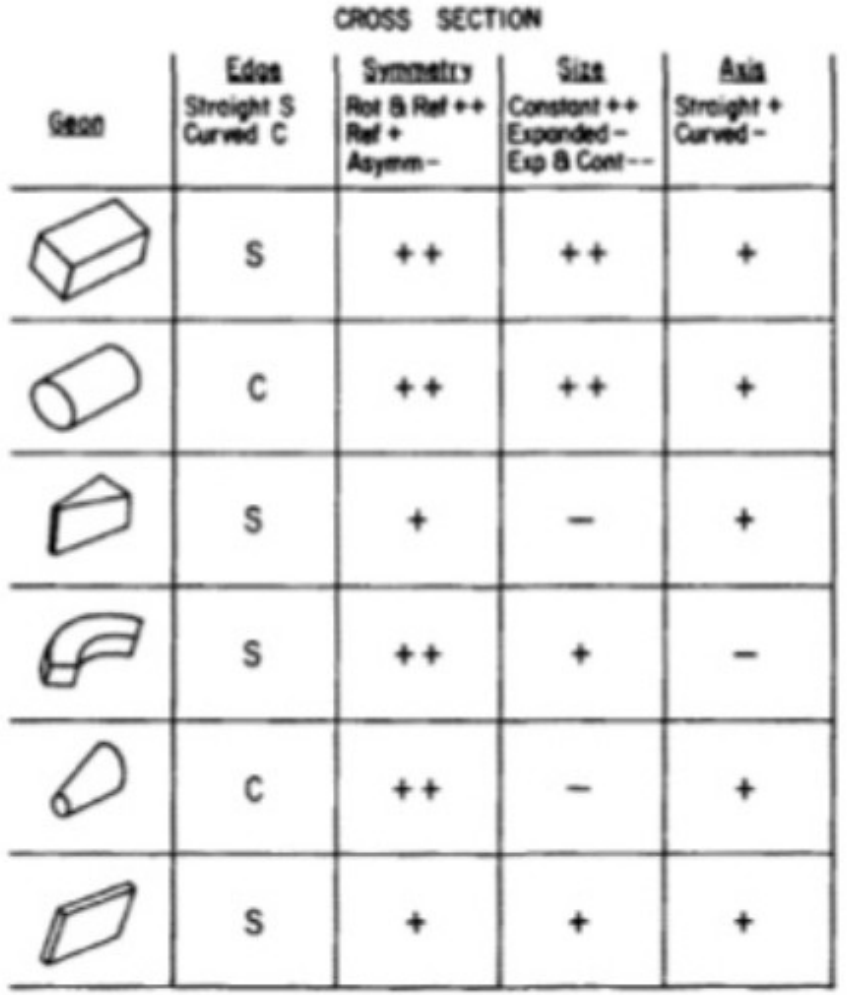
Marr’s model

- Primary sketch
- 2½D sketch
- 3D model



Recognition-by-component

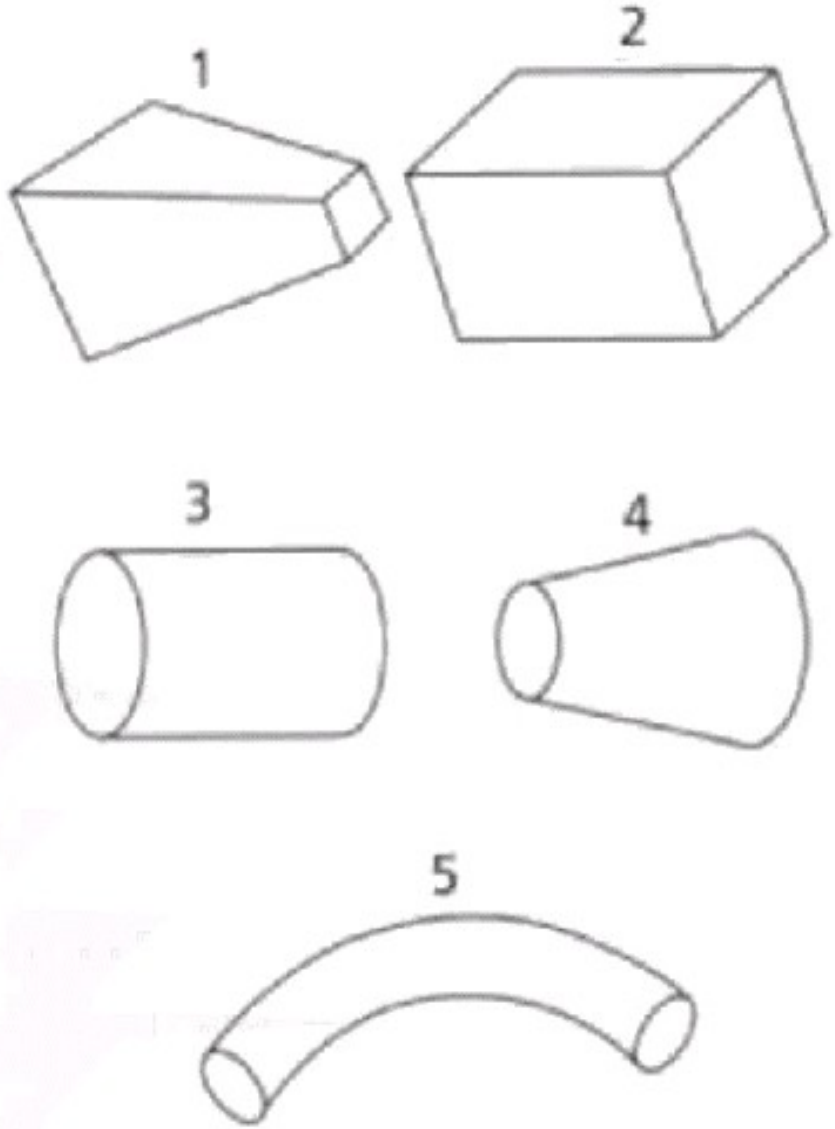
- Shape of cross section
  - round vs. straight
- Axis
  - straight vs. curved
- Size of cross-section along an axis:
  - constant
  - expanding (or contracting)
  - expanding then contracting
- Termination:
  - truncated vs. converging to a point vs. rounded



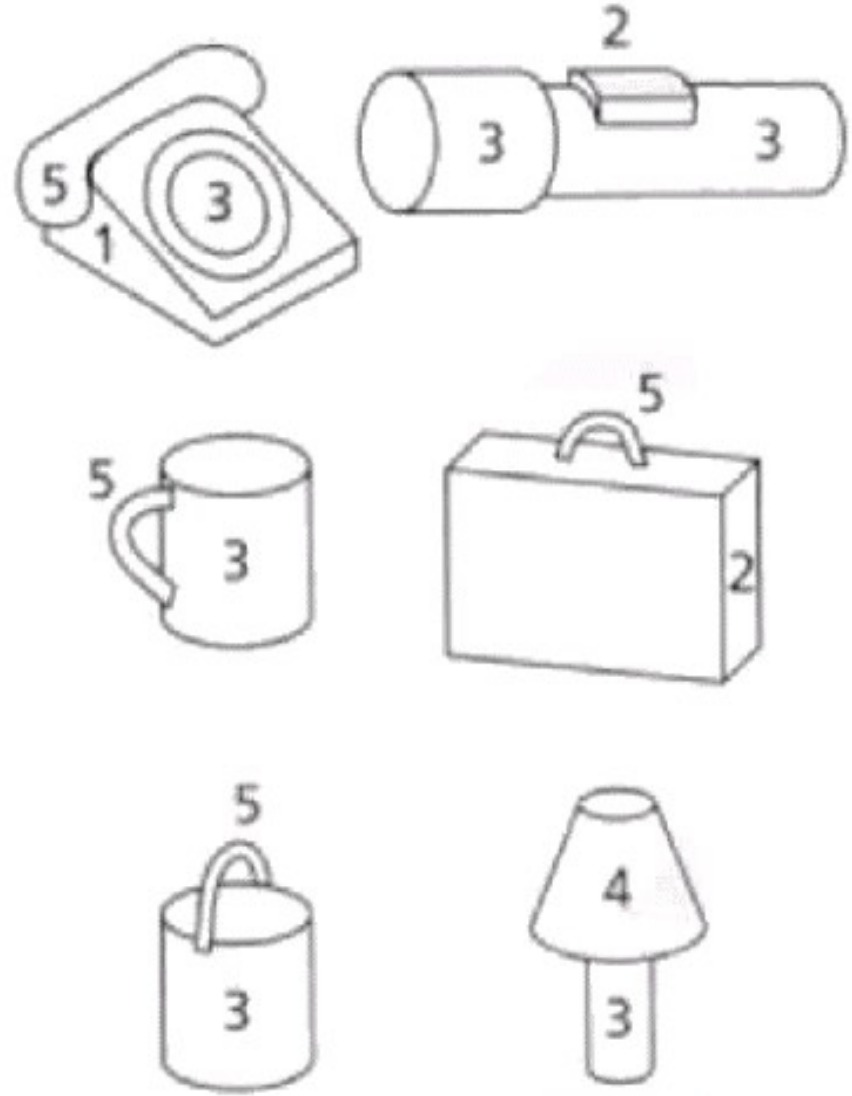
Geon	Edge: Straight S, Curved C	Symmetry: Rot & Ref ++, Ref +, Asymm –	Size: Constant ++, Expanded –, Exp & Cont – –	Axis: Straight +, Curved –
	S	++	++	+
	C	++	++	+
	S	+	–	+
	S	++	+	–
	C	++	–	+
	S	+	+	+

Generalized cones, **geons**

Geons

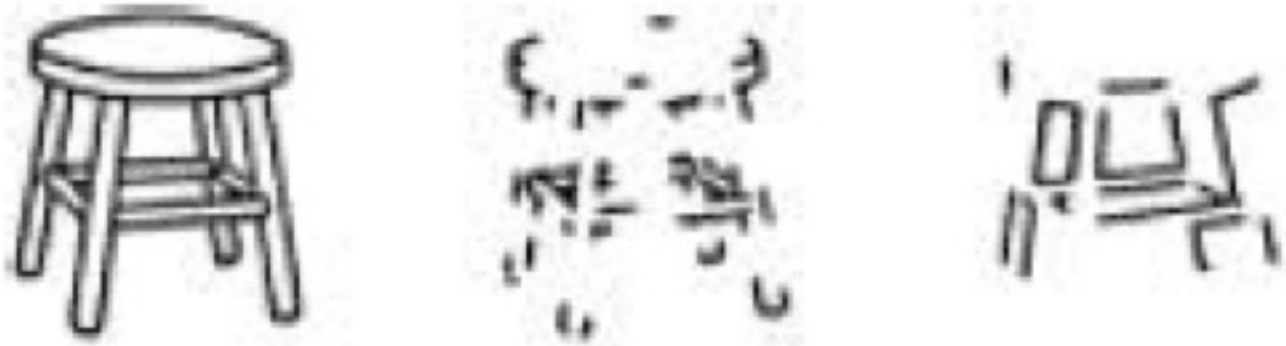


Objects



Biederman (1987)

- Importance of edges or vertices?



Theories of perception

- General principles
  - Top-down processes
  - Bottom-up processes
- Theories of perception
  - Marr’s model
  - Recognition-by-components
  - Gibson’s ecologic theory
  - Top-down approach

Processes

Bottom-up

- Starting with data, towards higher representations

Top-down

- Starting with higher representations, towards data

Gibson’s ecologic theory

- **Perceptual system**
  - active, more than receptors, hierarchical
    - eye (retina)
    - eye + oculomotor muscles
    - two eyes
    - moving head
    - head with moving body
  - Searching for stimuli, affordance spectra
- **Affordances**

Top-down theories: perception as constr

- Example - Ulric Neisser
  - Perception as cycle

- Other representatives
  - Herman von Helmholtz
  - Jerome Bruner
  - Richard Gregory
  - Irving Rock

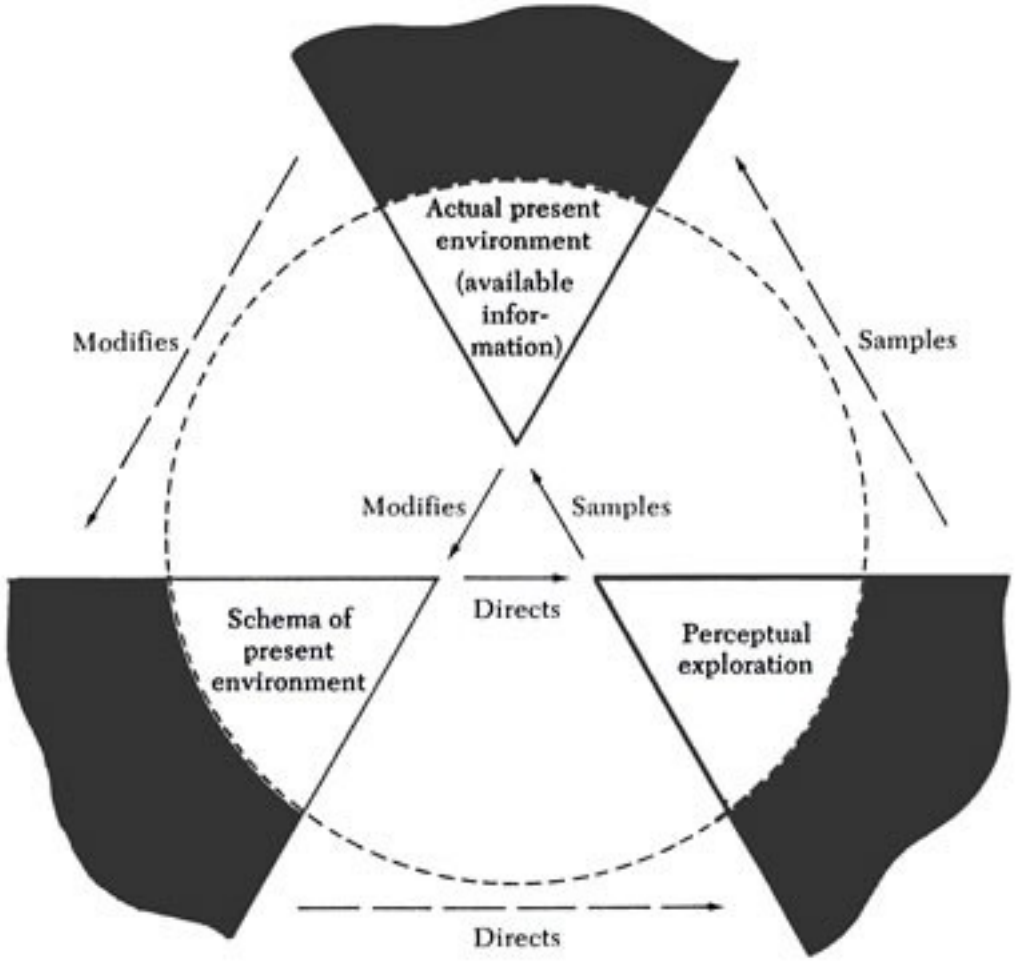


FIGURE 4. *Schemata as embedded in cognitive maps.*

Perception-action cycle (Neisser, 1976)

Top-down theories: perception as construction

- Contribution of higher processes
- Perception as unconscious judgment
- Influence of context
- Hypotheses testing

Abstraction

- World is full of details
  - Only some details important for our actions
- Effective coding
- Př. Carmichael, Hogan a Walter (1932)

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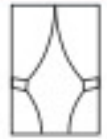
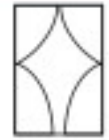
	záclony v okně		kosočtverec v obdélníku	
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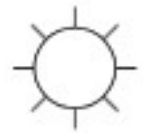
	kormidlo		slunce	
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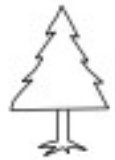	borovice		zahradnická lopatka	
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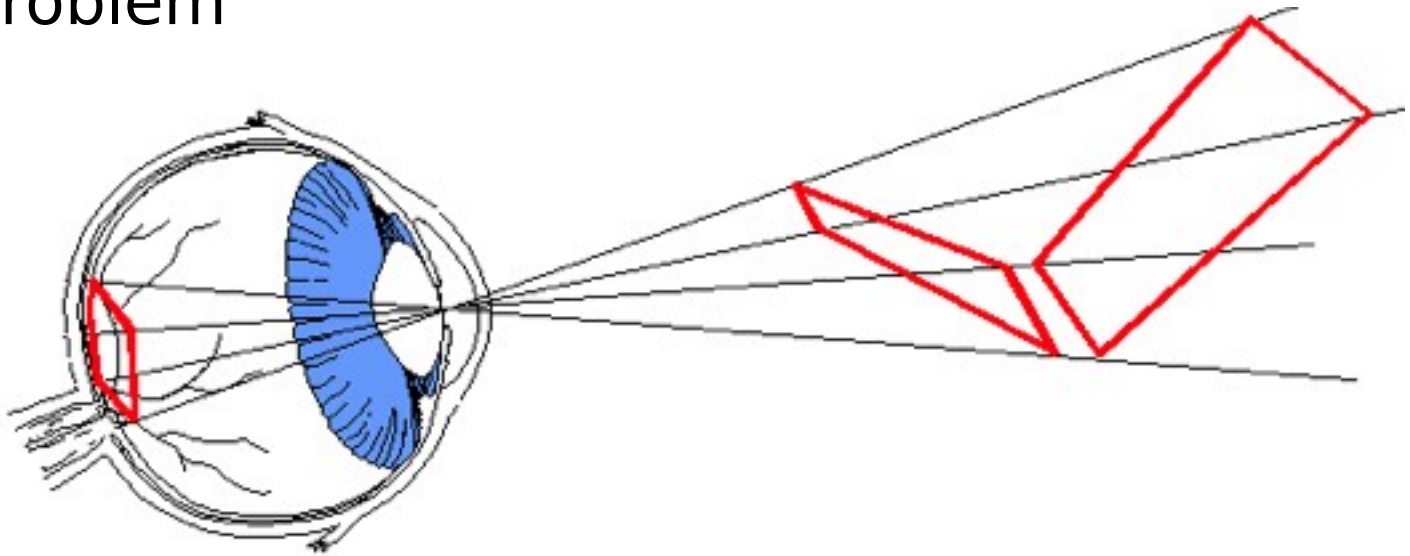
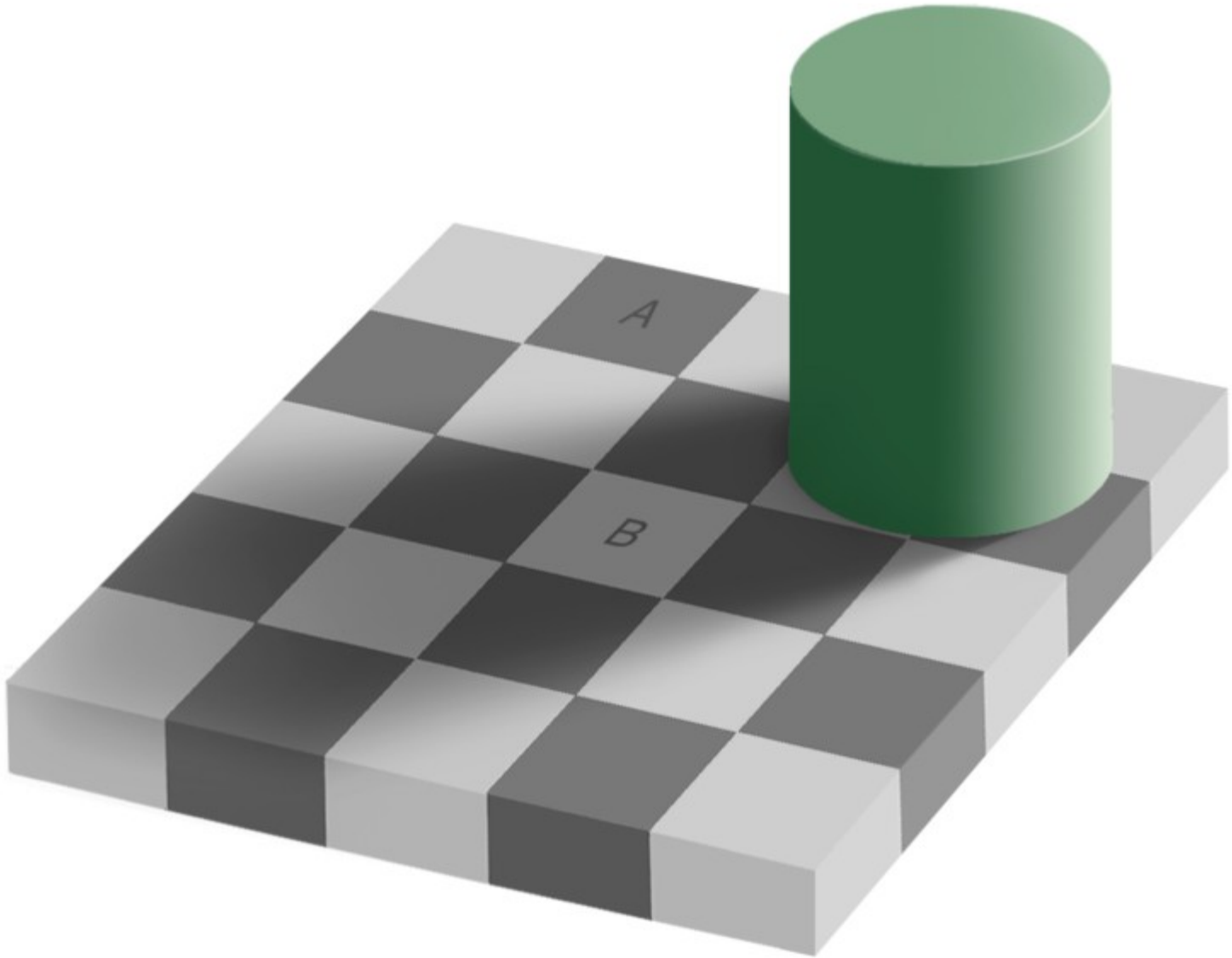
Perceptual stability

- Details, volatility
- Perception as unsolvable problem

- Constants
  - Luminance, Colour
  - Shape
  - Size



- Perceptual illusions
  - http://www.michaelbach.de/ot/
  - http://en.wikipedia.org/wiki/Optical_illusion



Adelsonova iluze

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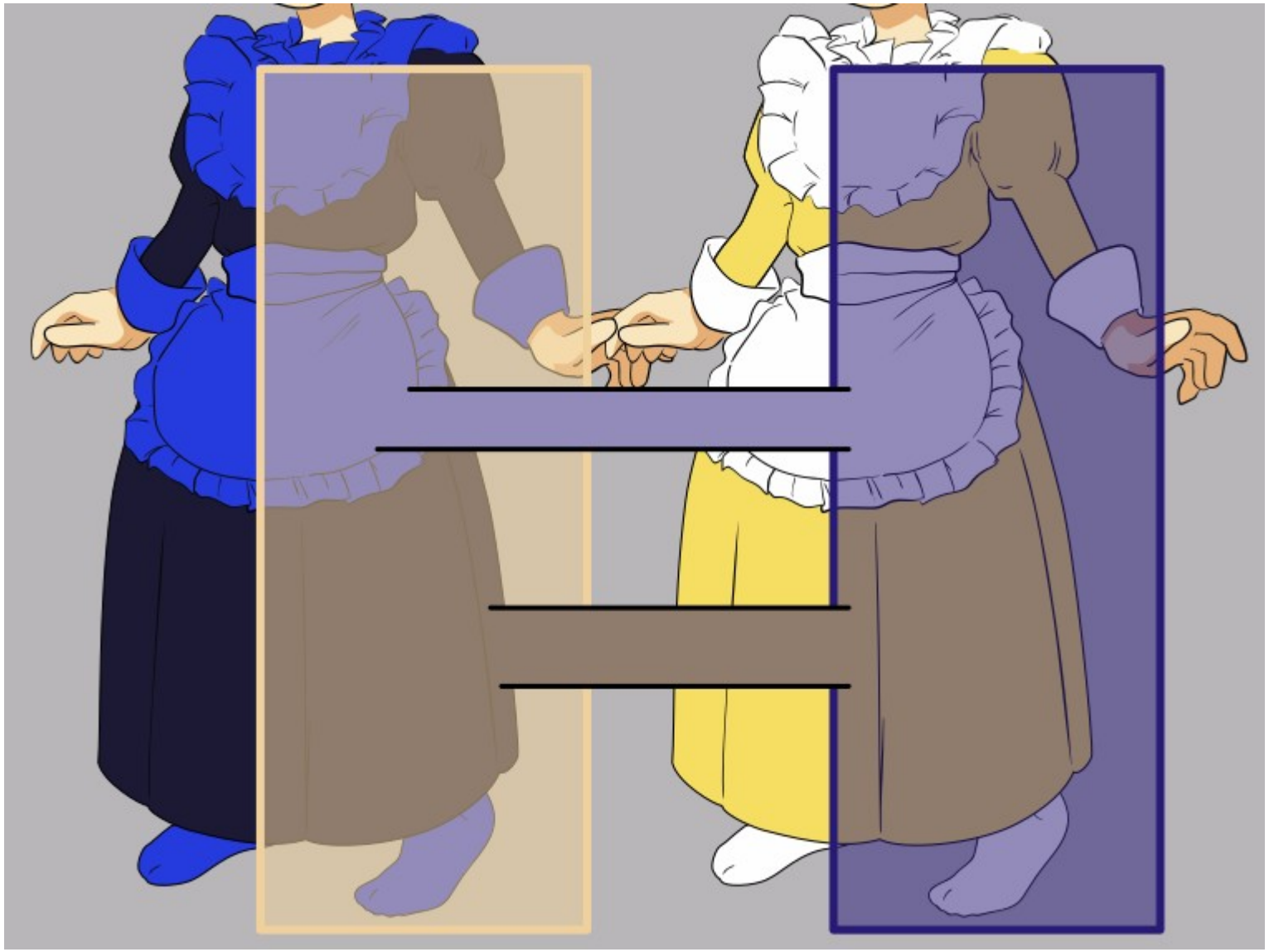
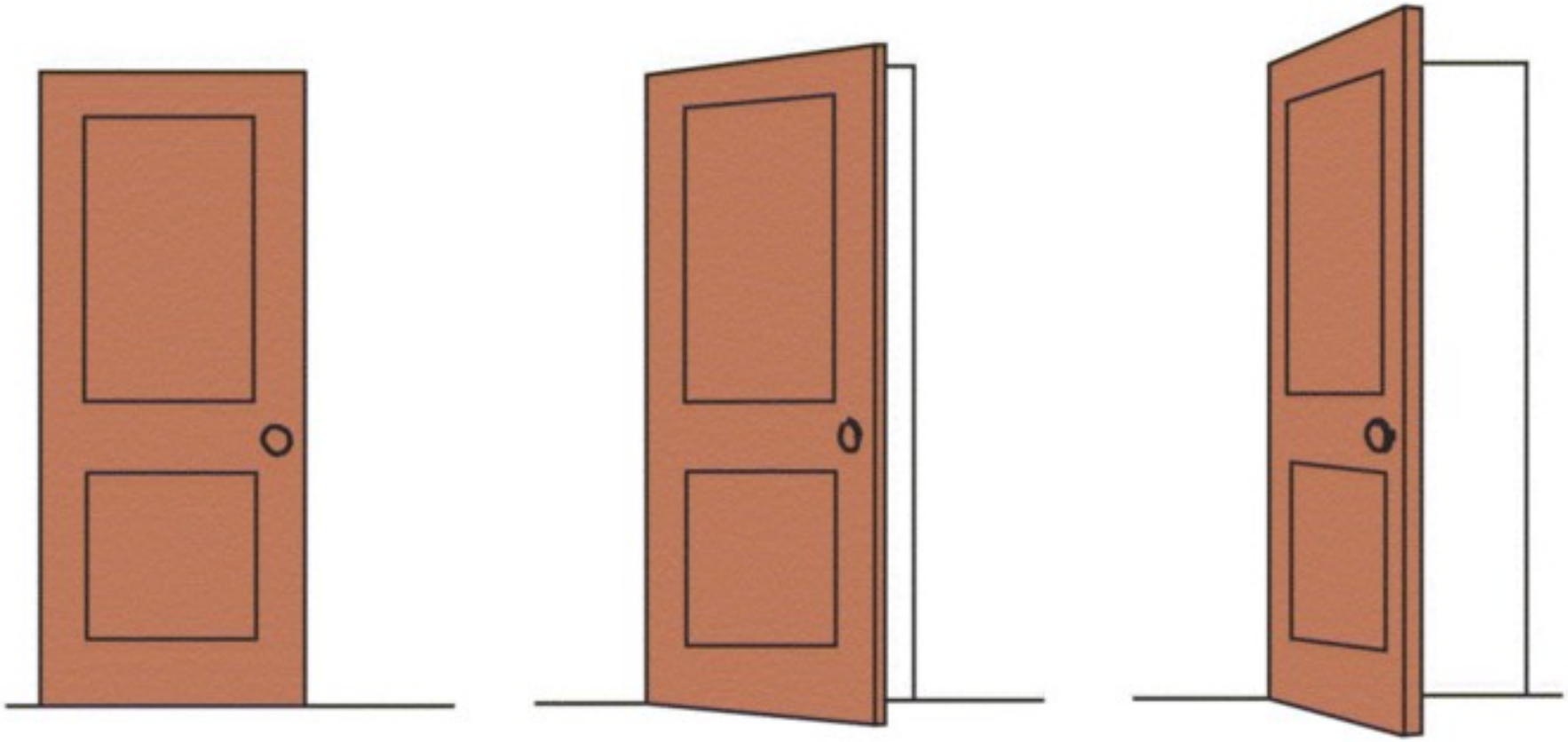
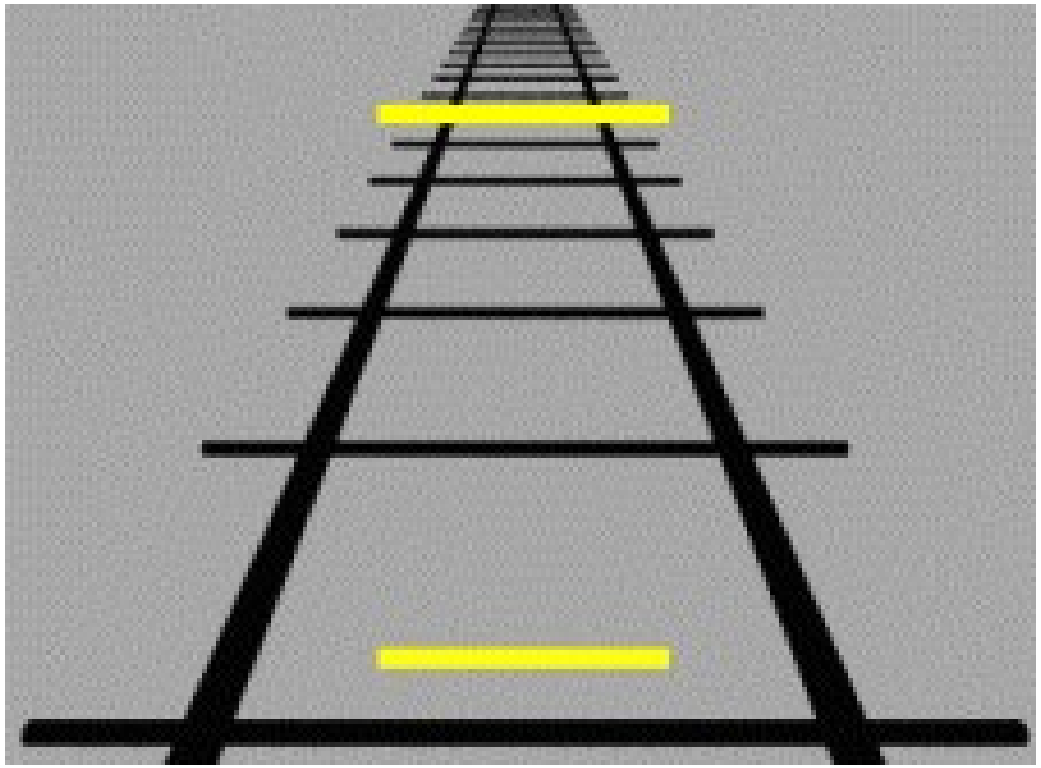


Shape constancy



Size constancy

Ponzo illusion



Czech textbooks

- Psychologie Atkinsonové a Hilgarda - 5. kapitola Vnímání
- Kognitivní psychologie (Eysenck) - 4. kapitola/Rozpoznávání objektů