



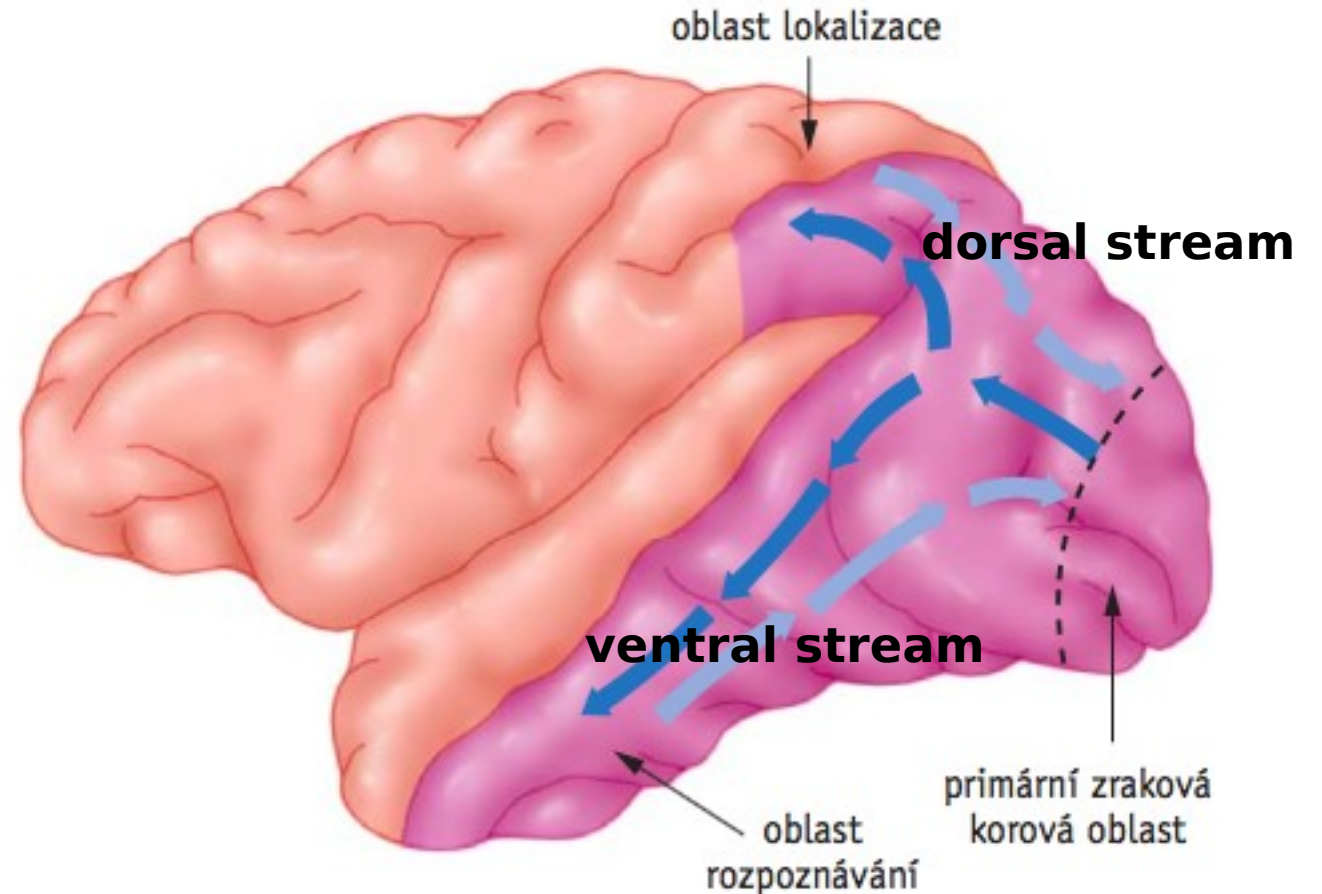
Katedra psychologie

PERCEPTION

Jiří Lukavský

Perception – information input

- Sensation
- Perception
 - Automatic processes
 - Localization
 - Recognition
- David Milner & Melvyn , Goodale (1992)
 - Two-streams hypothesis



Function of perception

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

(Atkinsonová)

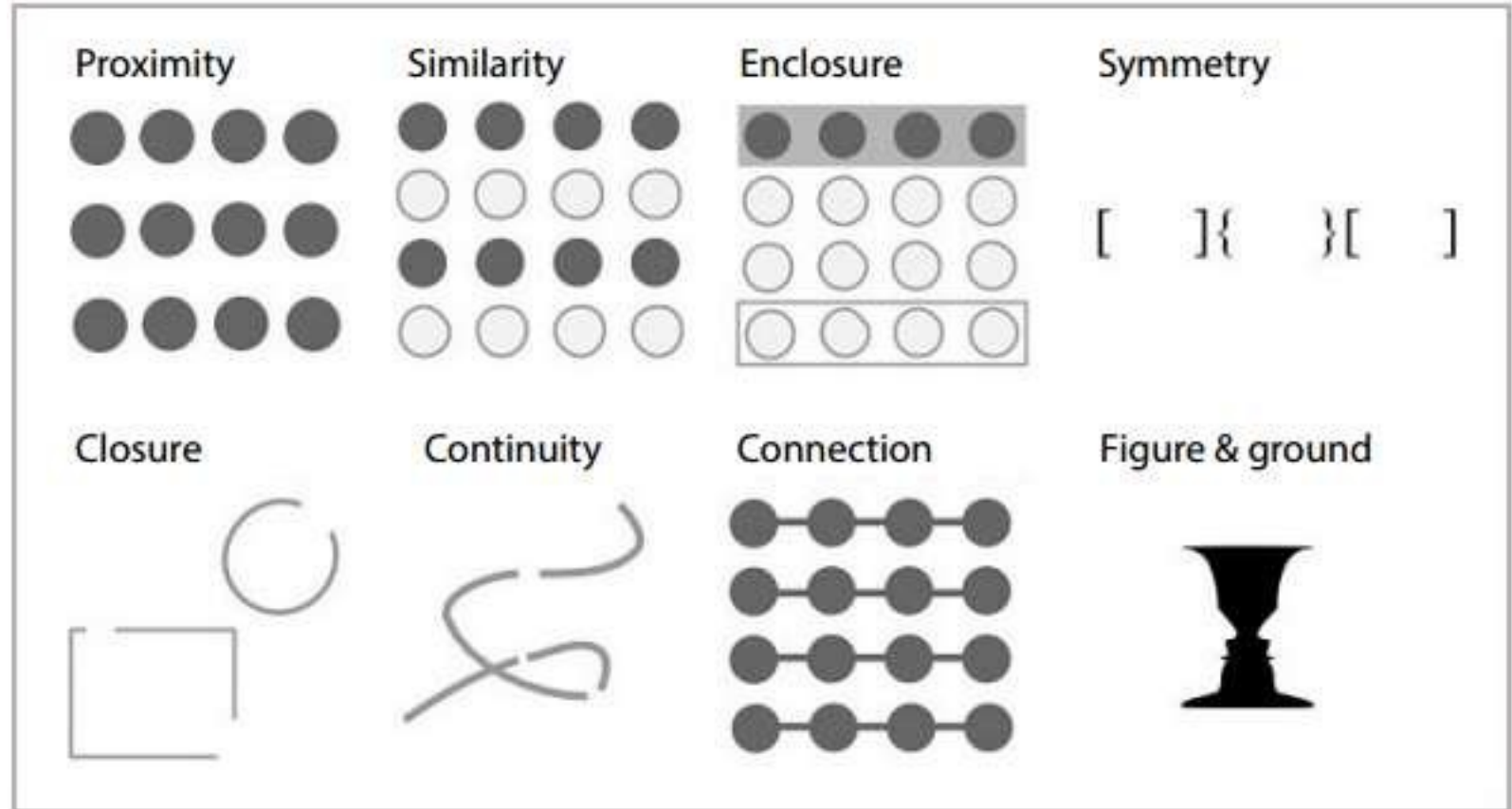
Lokalization

- Location in visual field/in 3D space
- Gestalt psychology
 - Figure vs background
 - Grouping objects
- Distance judgments

- Figure & background

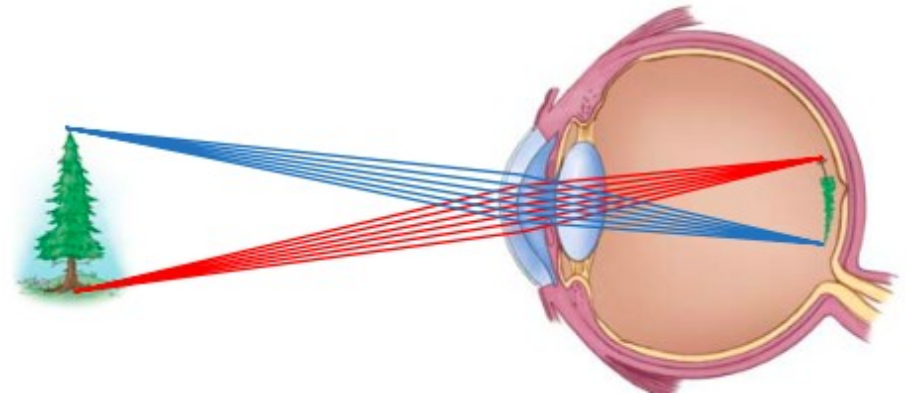


- Gestalt laws



Distance judgments

- Monocular cues
- Binocular cues



Monocular cues

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

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



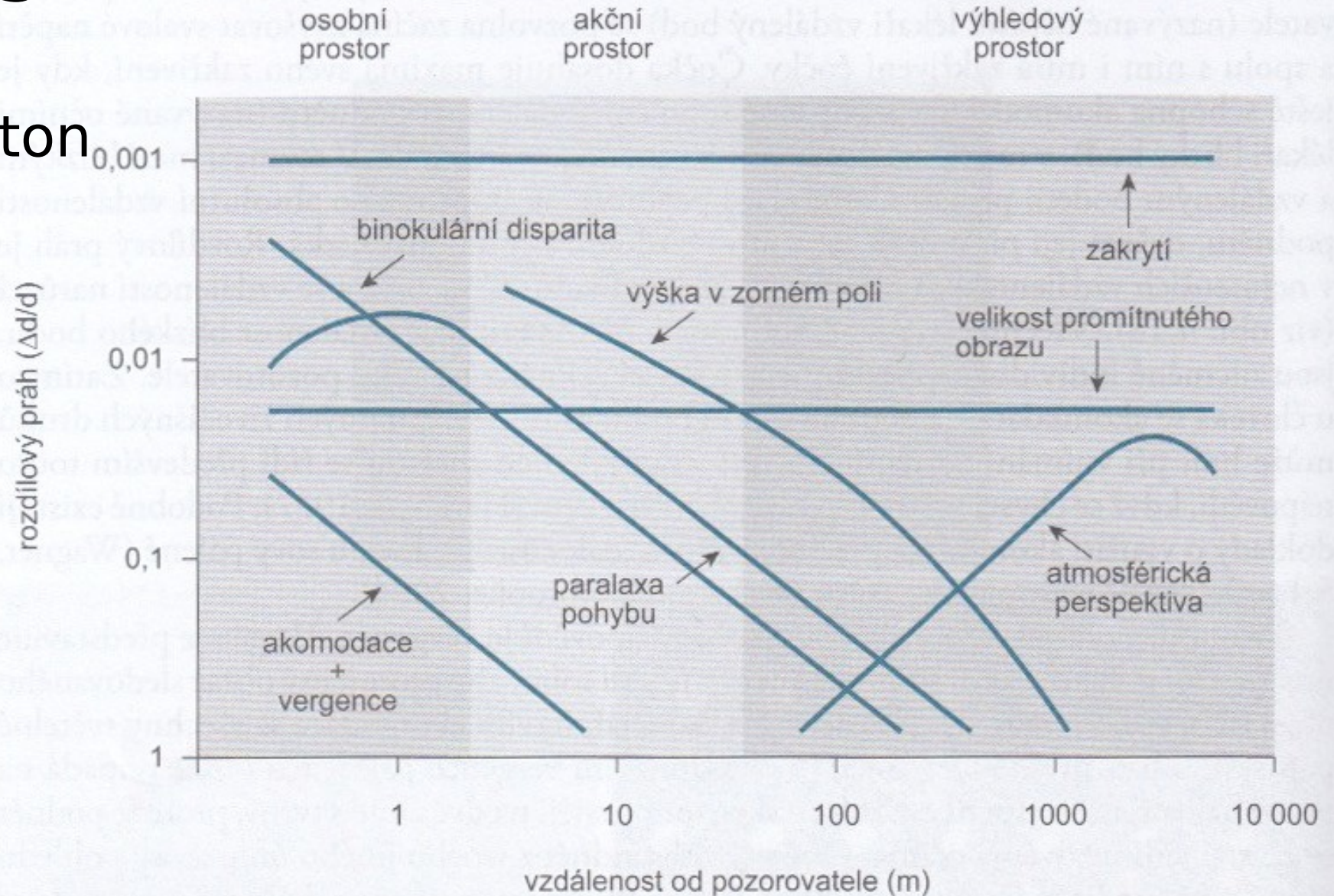
Binocular cues

- 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

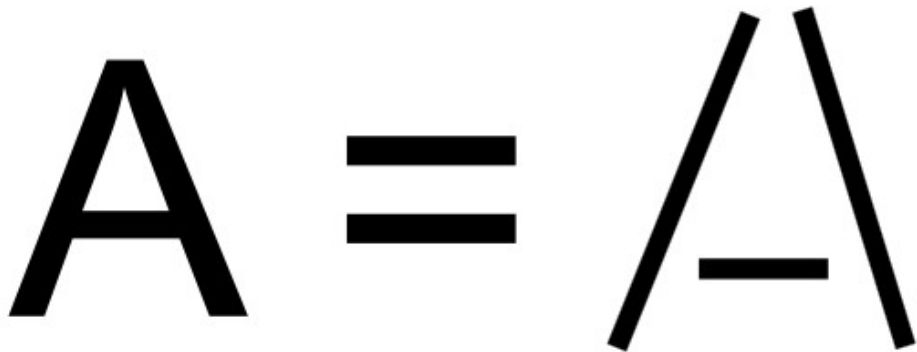
- Templates in long-term memory
- Problem
 - Multiple pattern, but 1 character

- 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



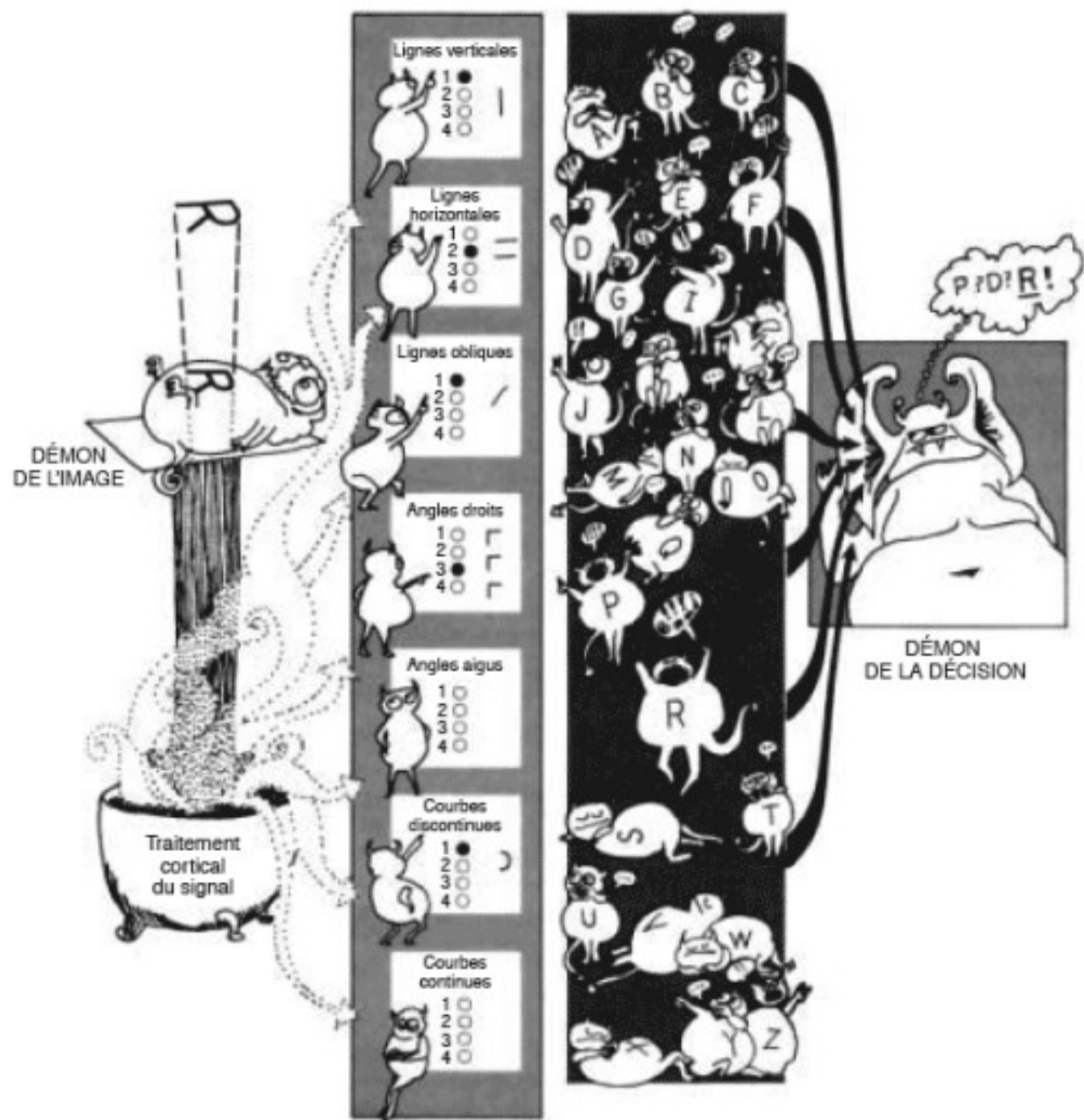
- IMVXEW
- WVMEIX
- VXWIEM
- MIEWVX
- WEIMXV
- IXEZVW

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

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

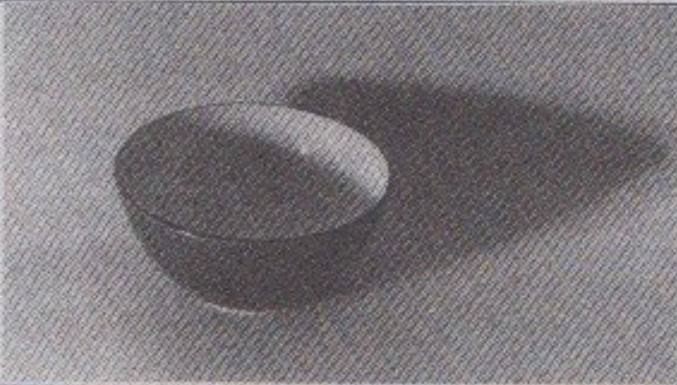
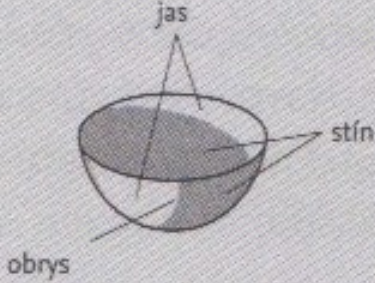

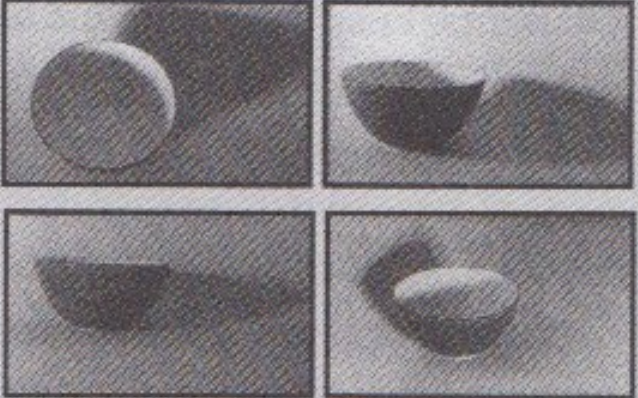
Pattern recognition (example)

- Pandemonium
 - Oliver Selfridge









Marr's model

- Primary sketch
- 2½D sketch
- 3D model

		
prvotní náčrtek	2½D náčrtek	prostorový model
		
<p>Prvotní náčrtek je dvojrozměrným popisem hran, světlých a tmavých ploch a obrysů.</p>	<p>2½D náčrtek využívá informací získaných ze stínování, textur, binokulární disparity atd. a poskytuje údaje o hloubce a uspořádání viditelných částí. Neposkytuje informace o těch částech, které nevidíme, jako je zadní část nebo vnitřek misky.</p>	<p>Prostorový model nezávisí na poloze pozorovatele a popisuje vztahy mezi jednotlivými částmi objektu a jejich vzájemnou polohu.</p>
<p>Poznámka: Je těžké podat dobrý příklad 2½D náčrtku, když místo skutečného objektu zkoumáme fotografii, která je sama o sobě dvojrozměrná. Naše znalosti o tvaru a funkci misky se v tomto případě střetávají s pokusy popsat pouze to, co skutečně vidíme, a ne i to, o čem víme!</p>		

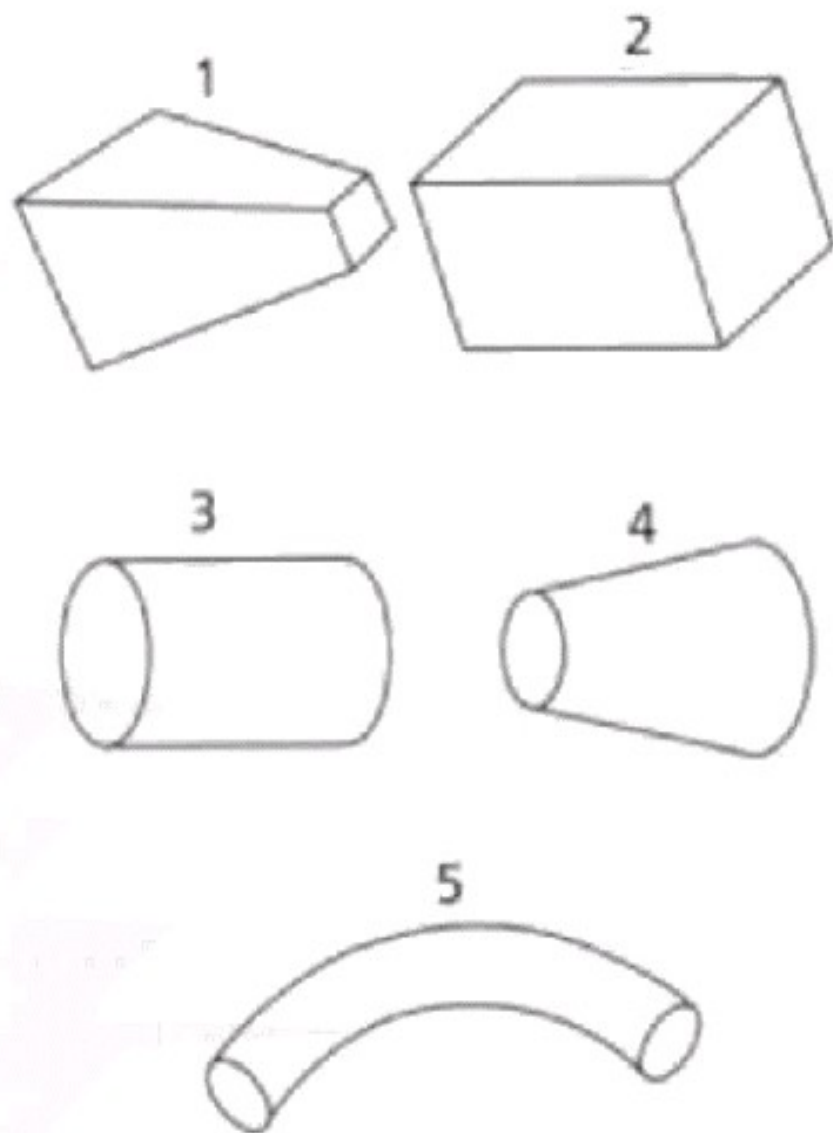
Recognition-by-component

- 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

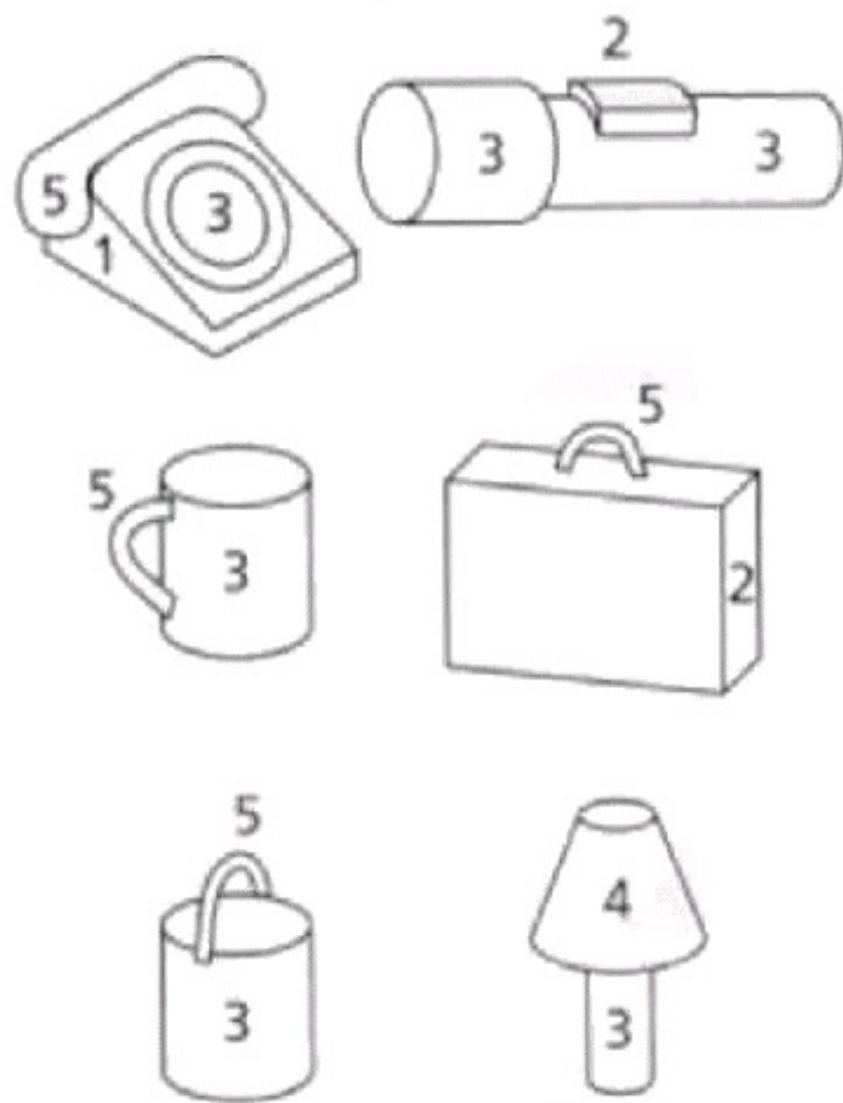
Geon	CROSS SECTION			
	Edge Straight S Curved C	Symmetry Rot & Ref ++ Ref + Asymm--	Size Constant ++ Expanded -- Exp & Cont--	Axis Straight + Curved -
	S	++	++	+
	C	++	++	+
	S	+	-	+
	S	++	+	-
	C	++	-	+
	S	+	+	+

Generalized cones, **geons**

Geons

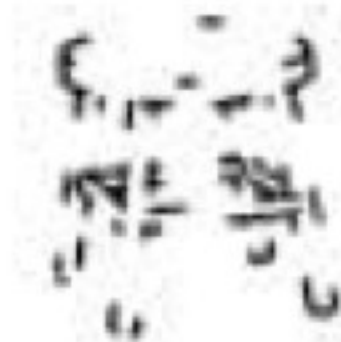


Objects



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

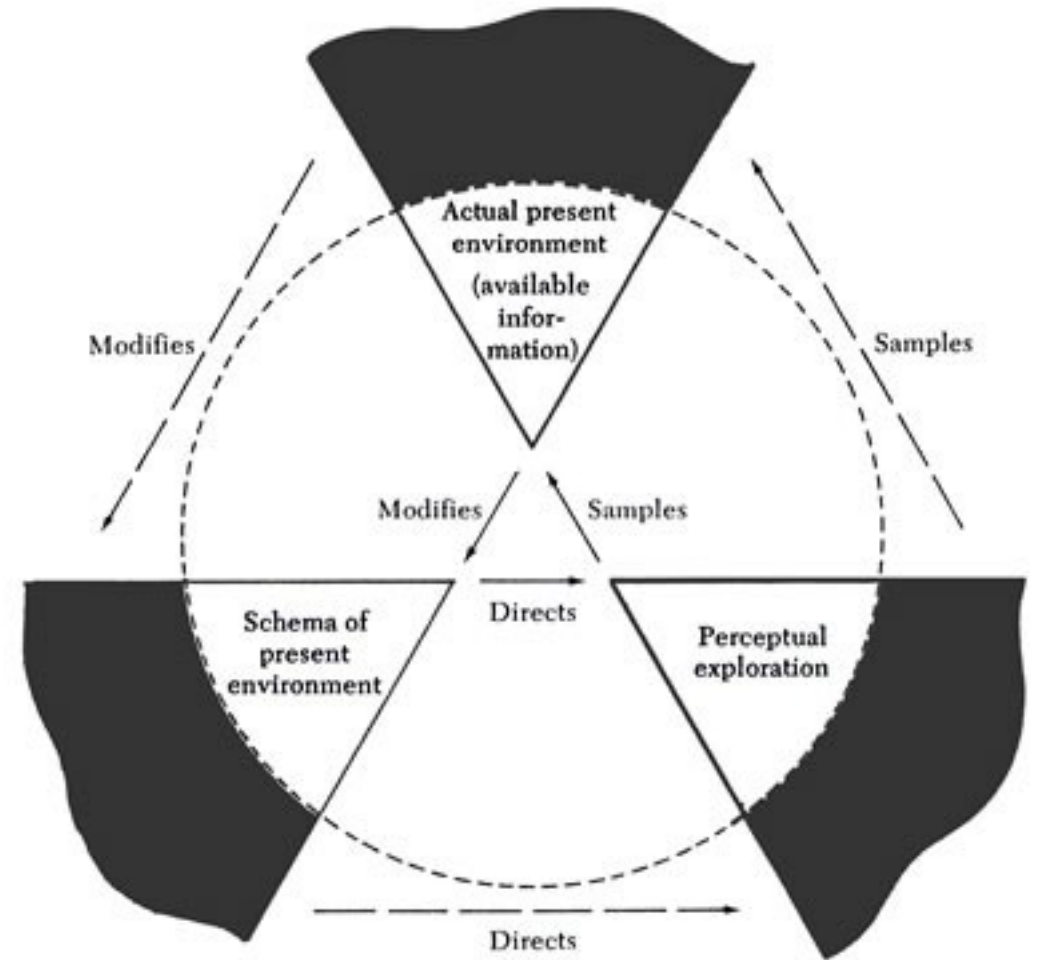


FIGURE 4. Schemata as embedded in cognitive maps.

Perception-action cycle (Neisser, 1976)

Top-down theories: perception as construction

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





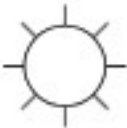


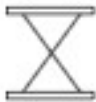




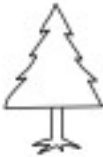
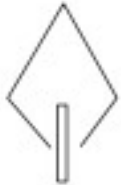




The image shows the text "THE CAT" in a stylized, hand-drawn font. The letters are black with a white outline, giving them a three-dimensional appearance. The background is a light gray with a fine, dotted texture. The text is centered horizontally and occupies the lower right portion of the slide.

THE CAT



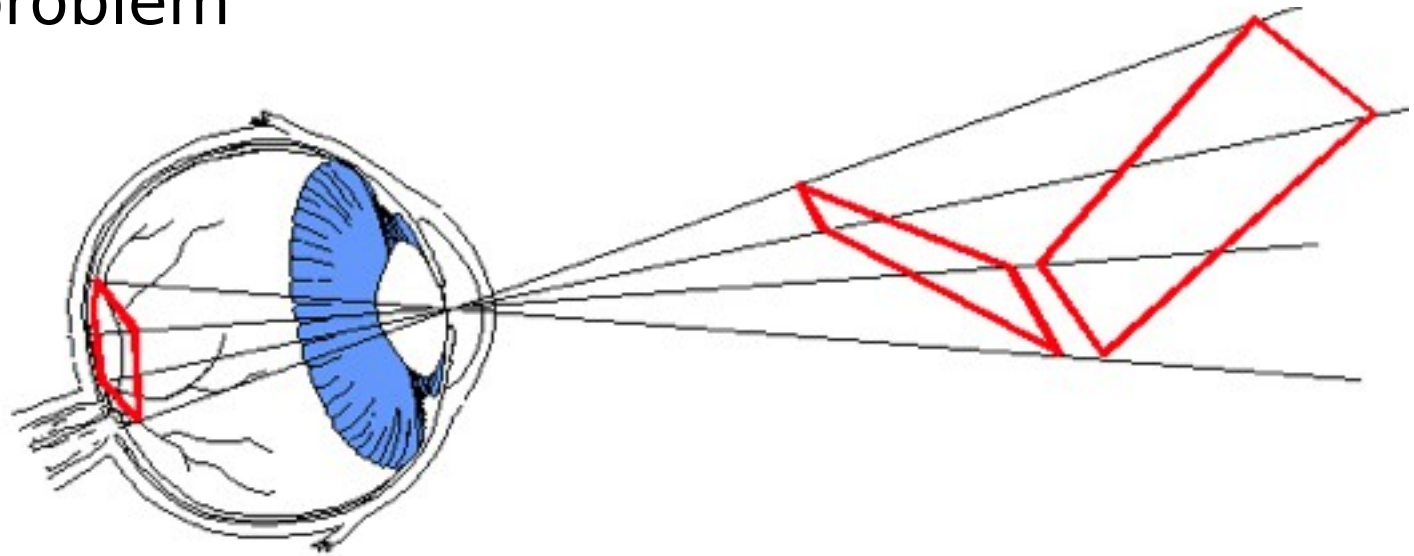
Abstraction

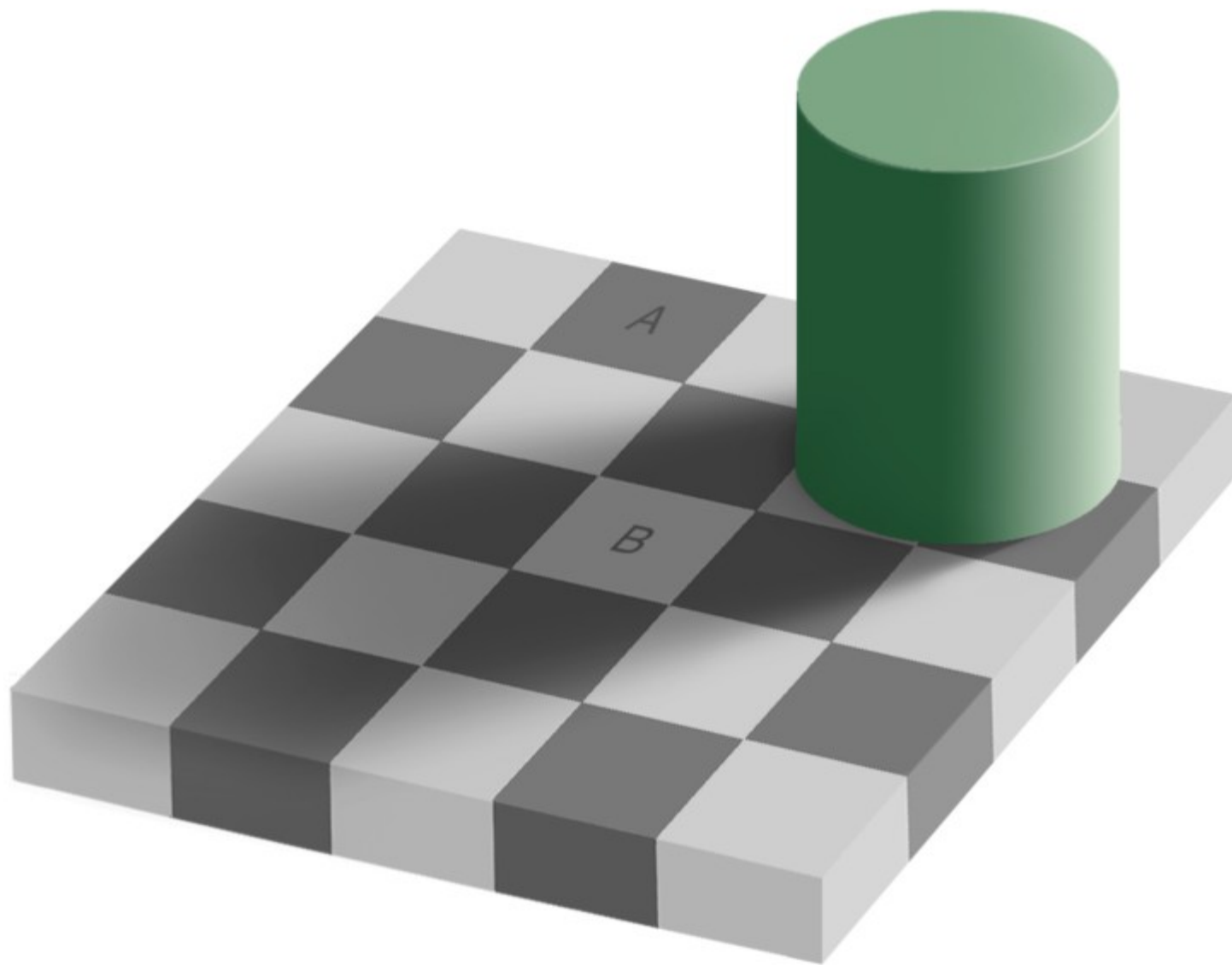
- World is full of details
 - Only some details important for our actions
- Effective coding
- Př. Carmichael, Hogan a Walter (1932)

reprodukováný obrazec		slovní označení	původní podnět	slovní označení		reprodukováný obrazec
	←	záclony v okně		kosočtverec v obdélníku	→	
7	←	sedm	7	čtyři	→	4
	←	kormidlo		slunce	→	
	←	přesýpací hodiny		stůl	→	
	←	fazole		kánoe	→	
	←	borovice		zahradnická lopatka	→	
	←	puška		koště	→	
2	←	dvě	2	osm	→	8

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

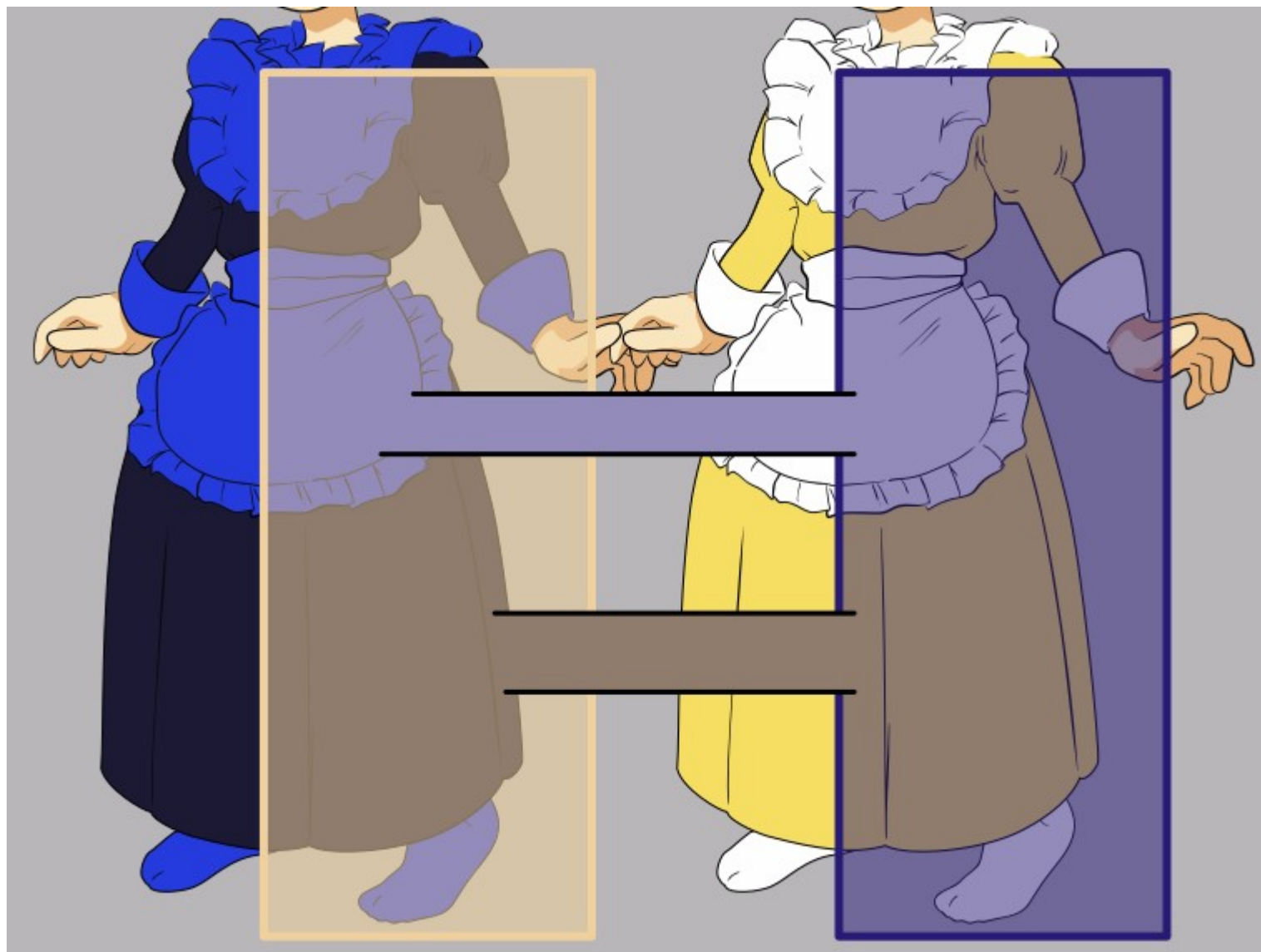




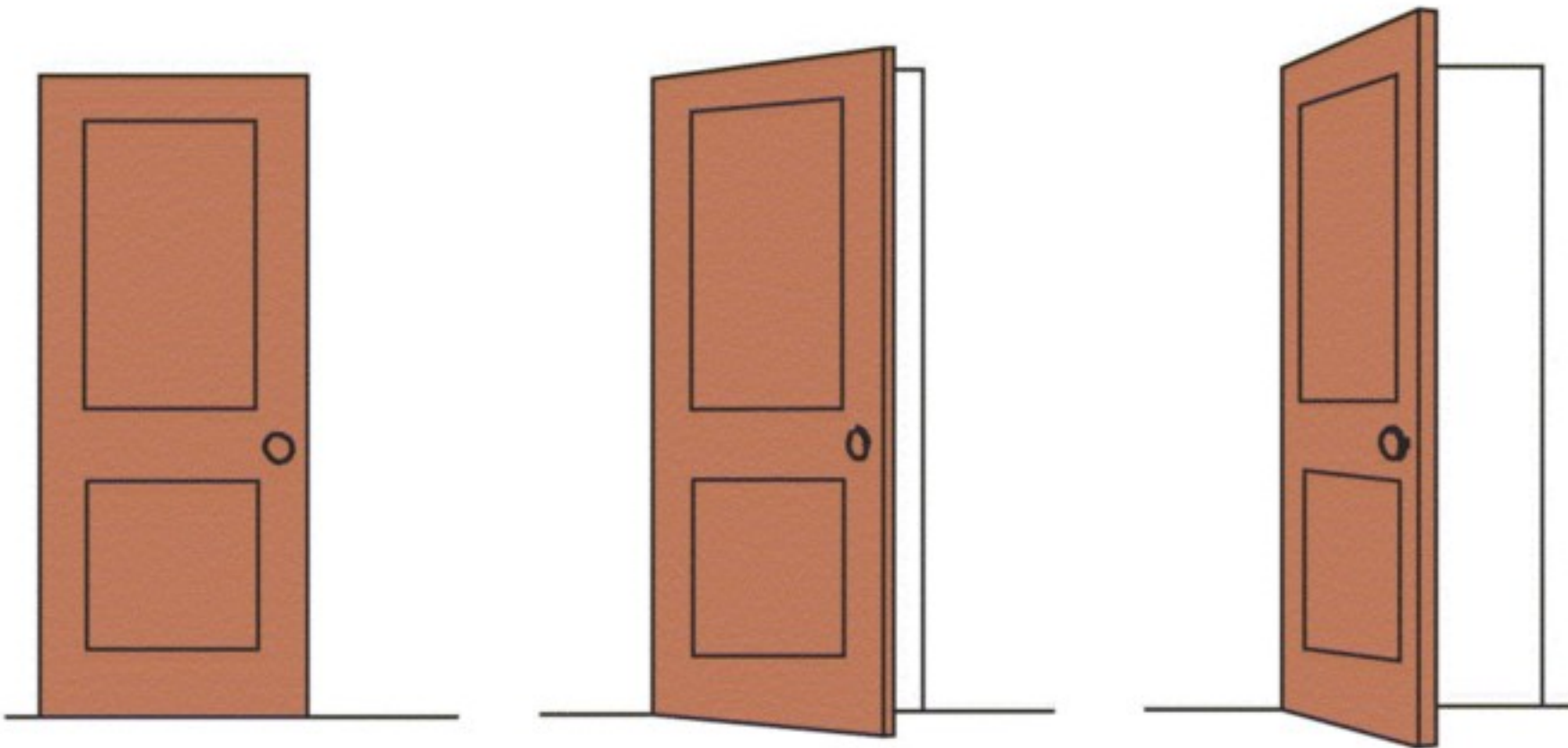
Adelsonova iluzija

#theDress



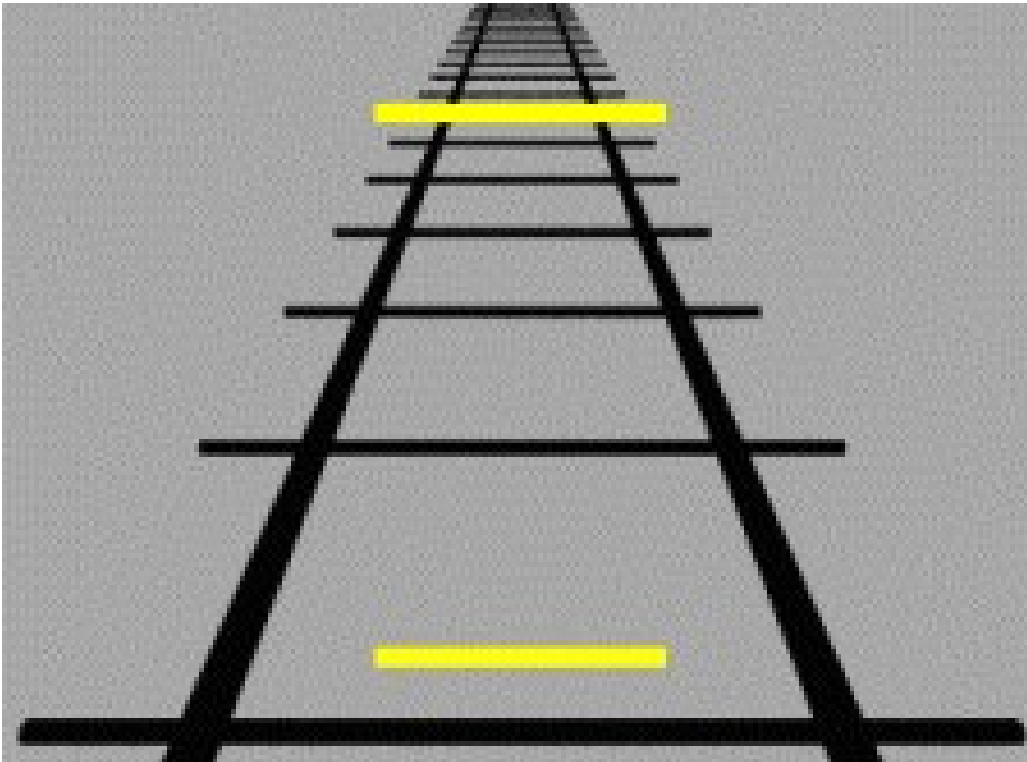


Shape constancy



Size constancy

Ponzo illusion



Czech textbooks

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