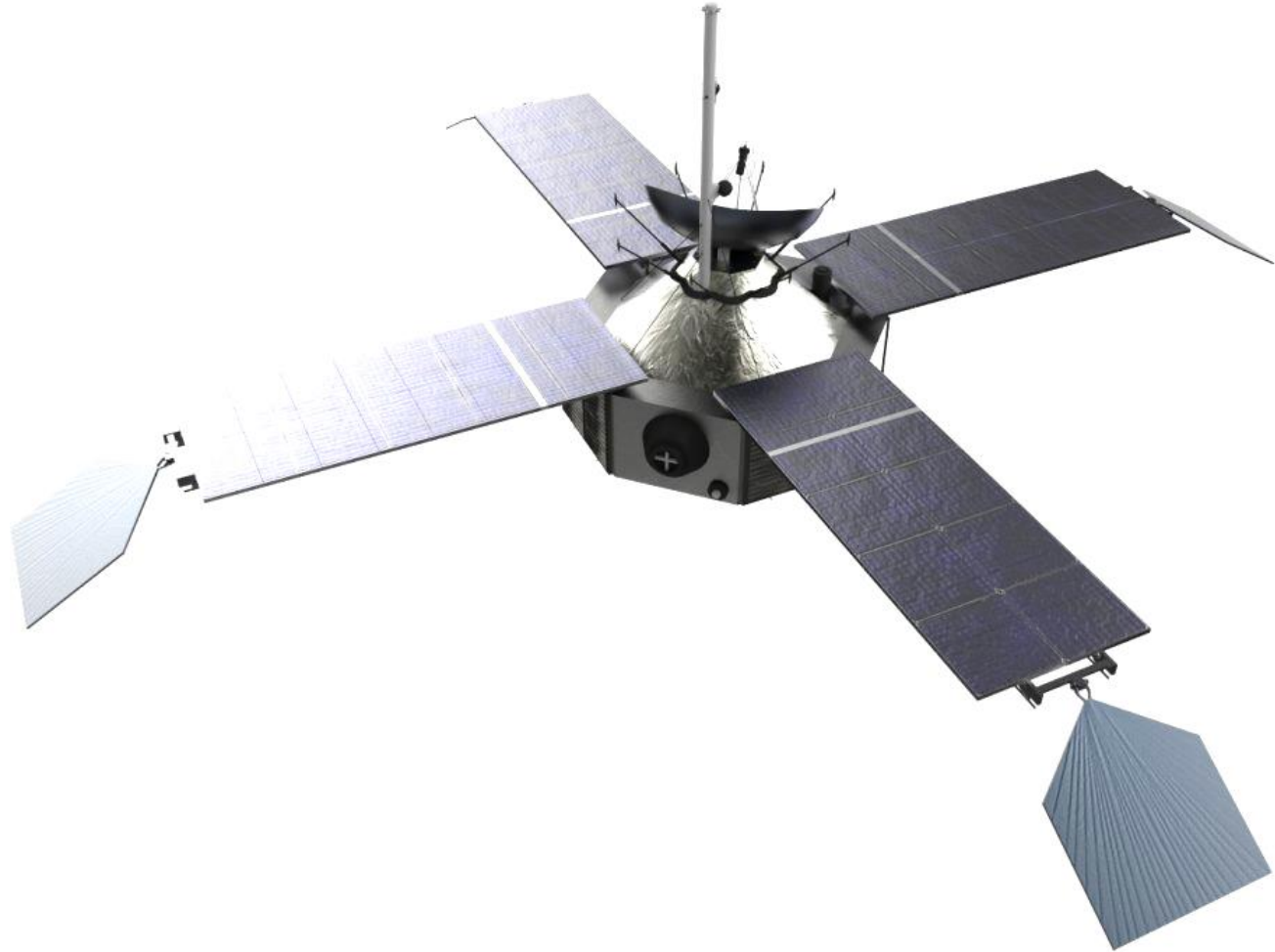


Vizualizace dat

Základy vizuálního vnímání

6. 10. 2022

Mariner 4
1965

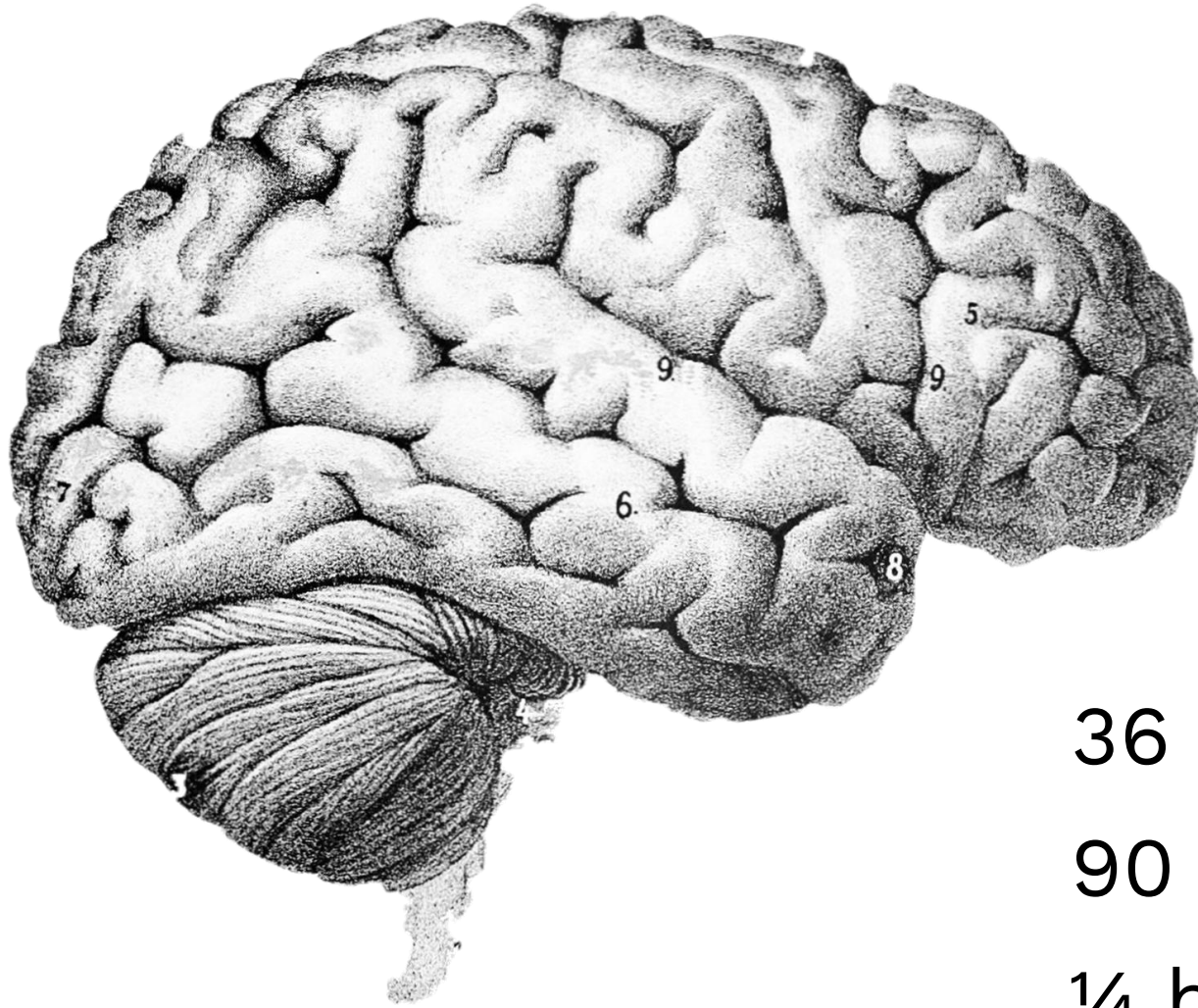


Mariner 4
1965





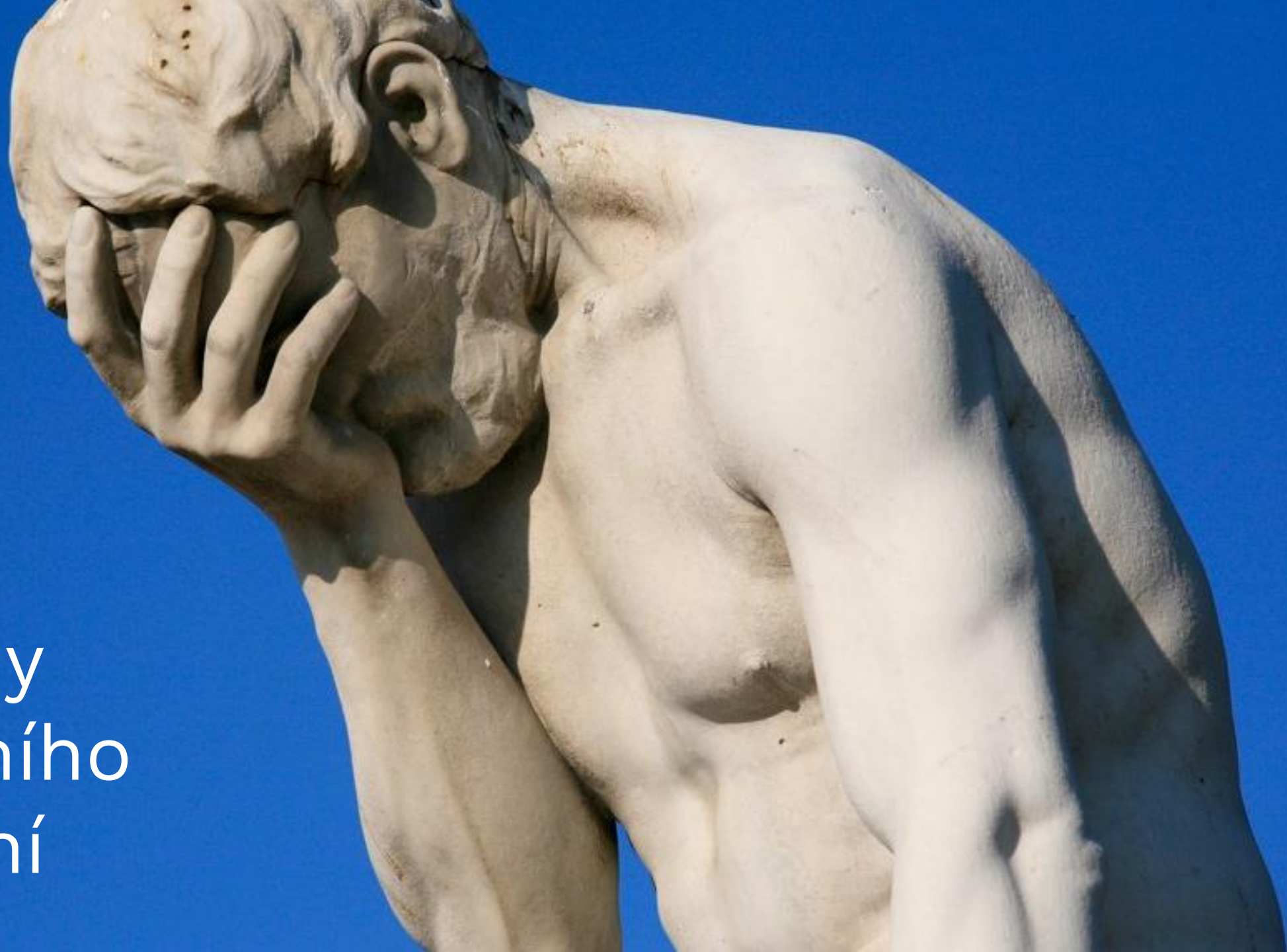


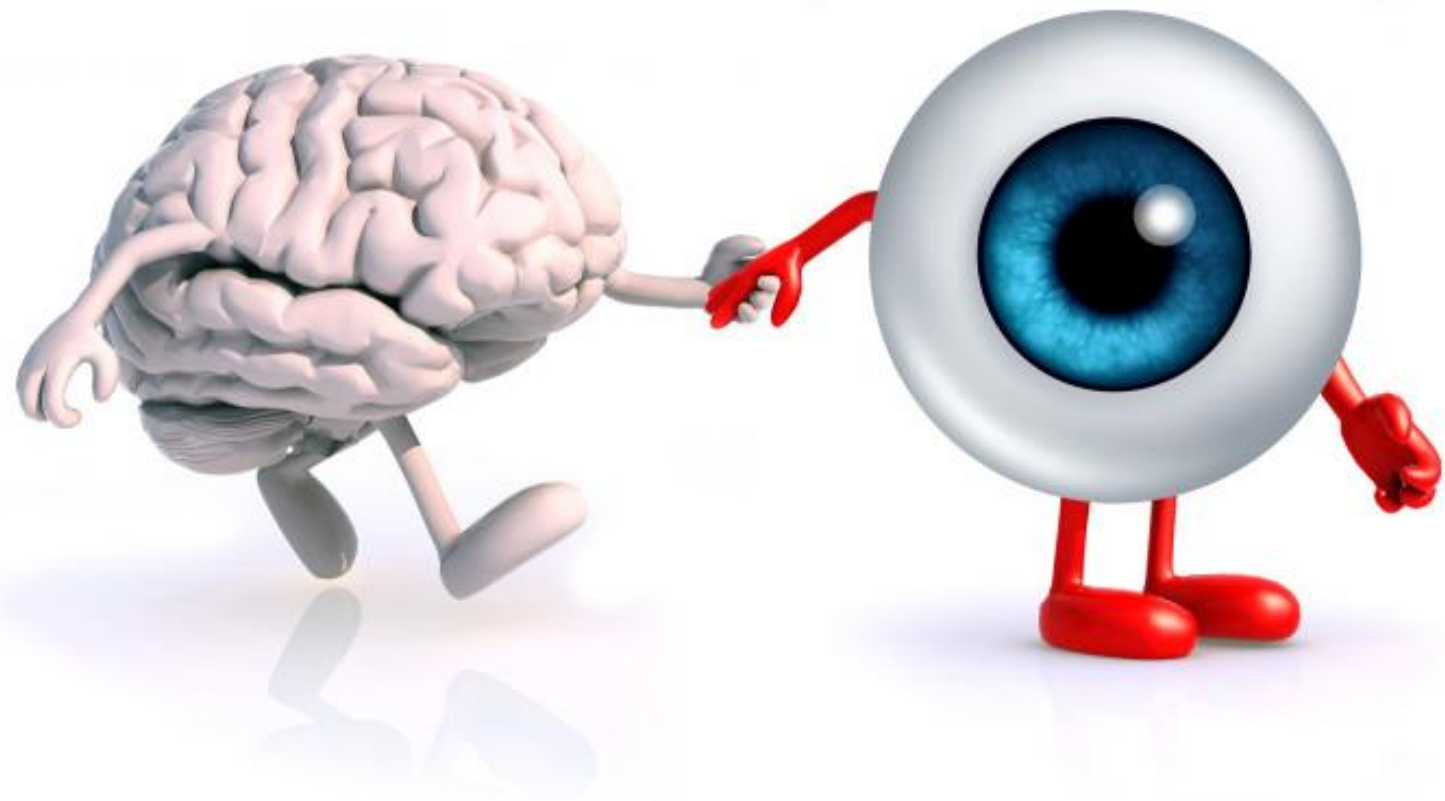


36 000 vizuálních podnětů
90 % celkových podnětů
 $\frac{1}{4}$ buněk v mozkové kůře
13 milisekund

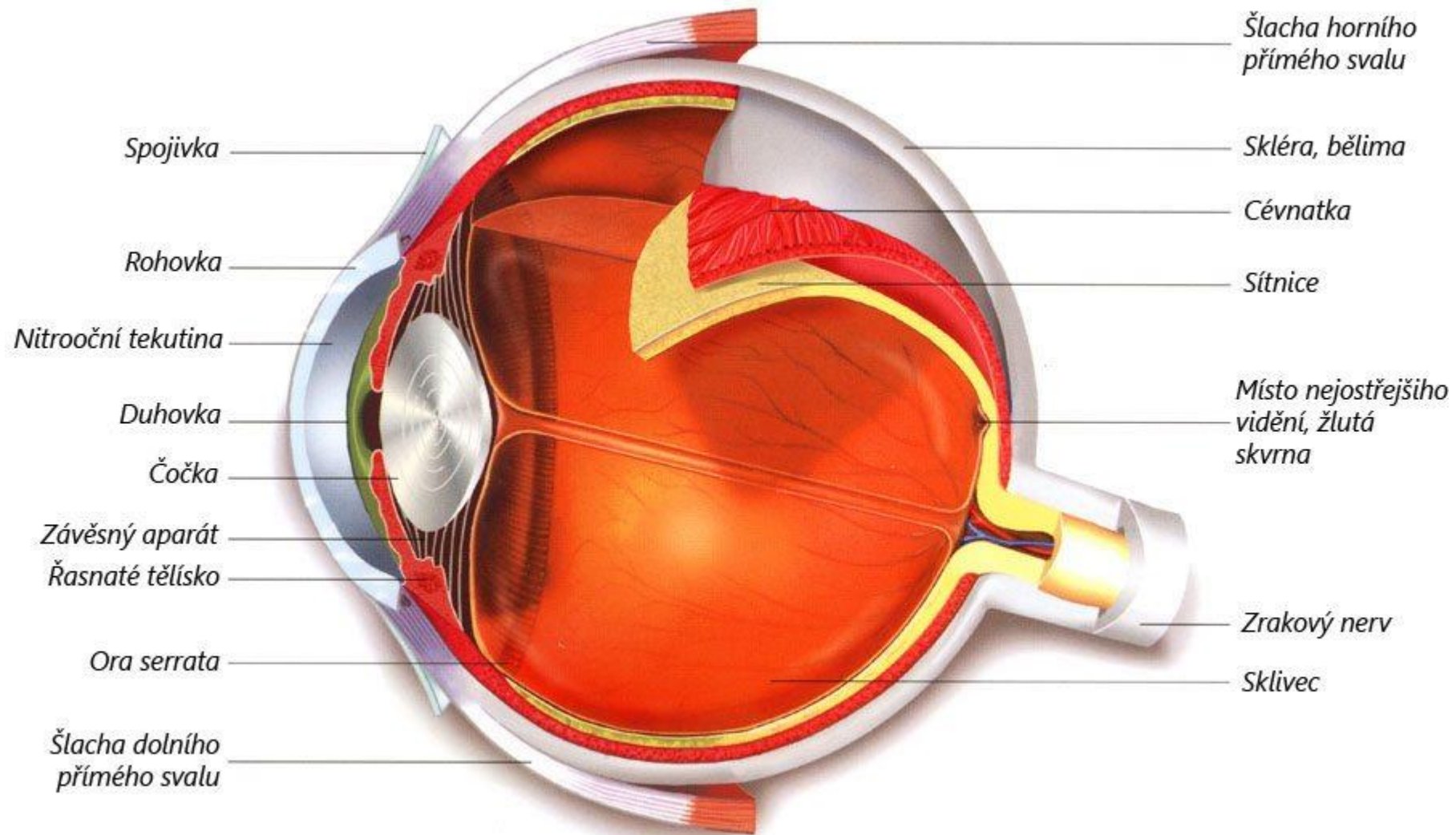
kognitivní přístup
k vizualizaci dat

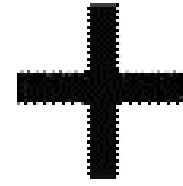
Základy
vizuálního
vnímání

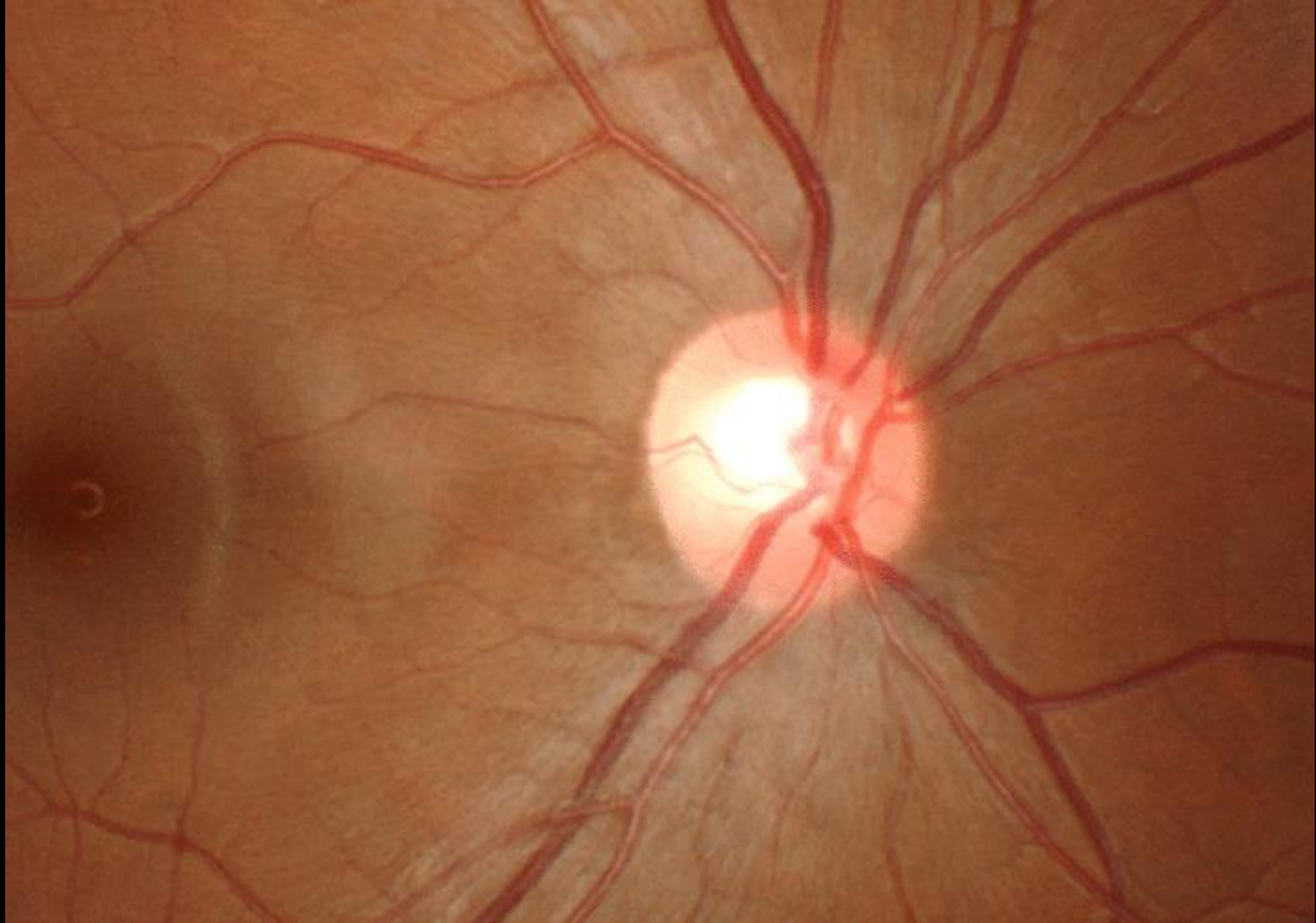


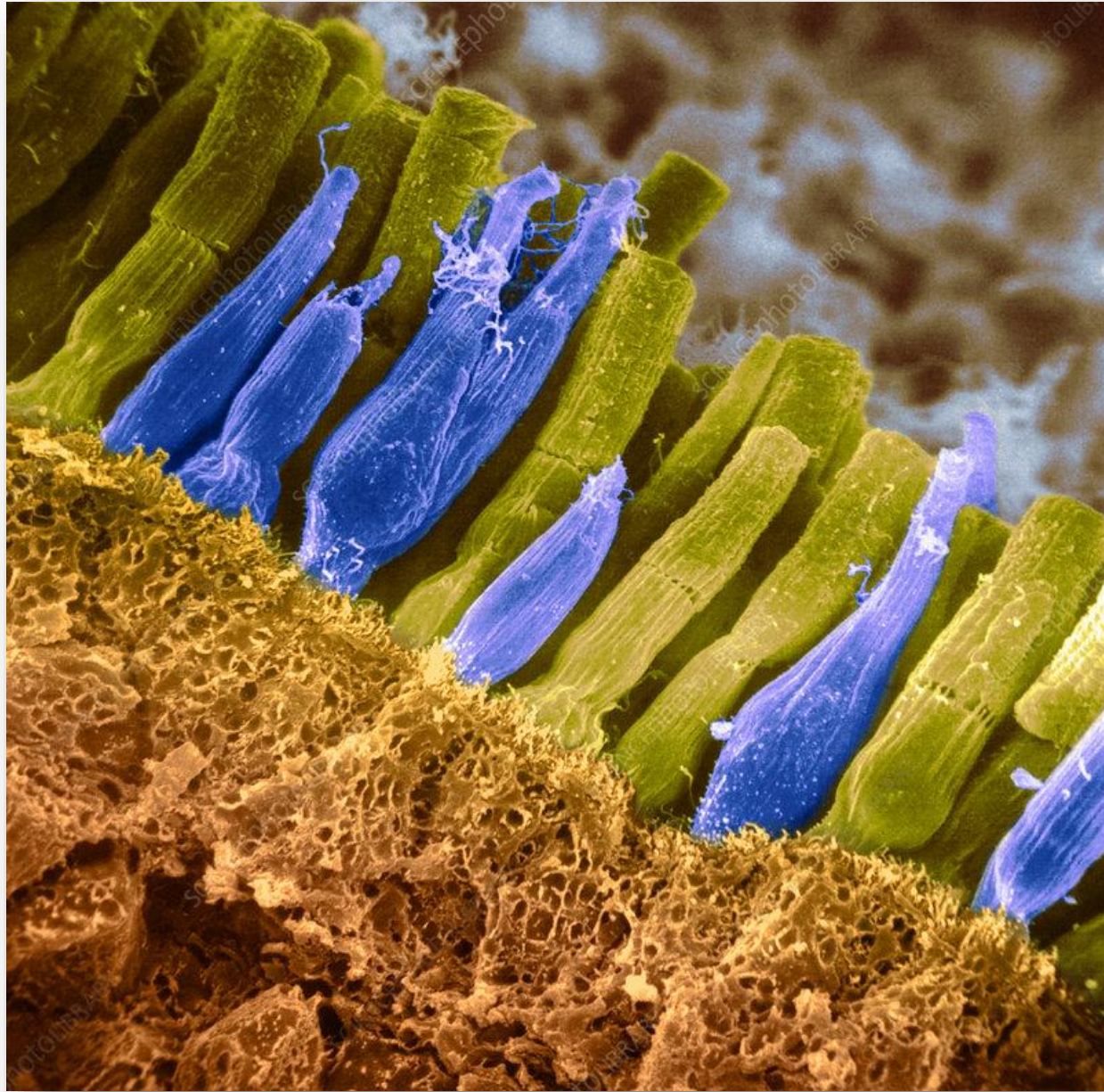


macula fovea

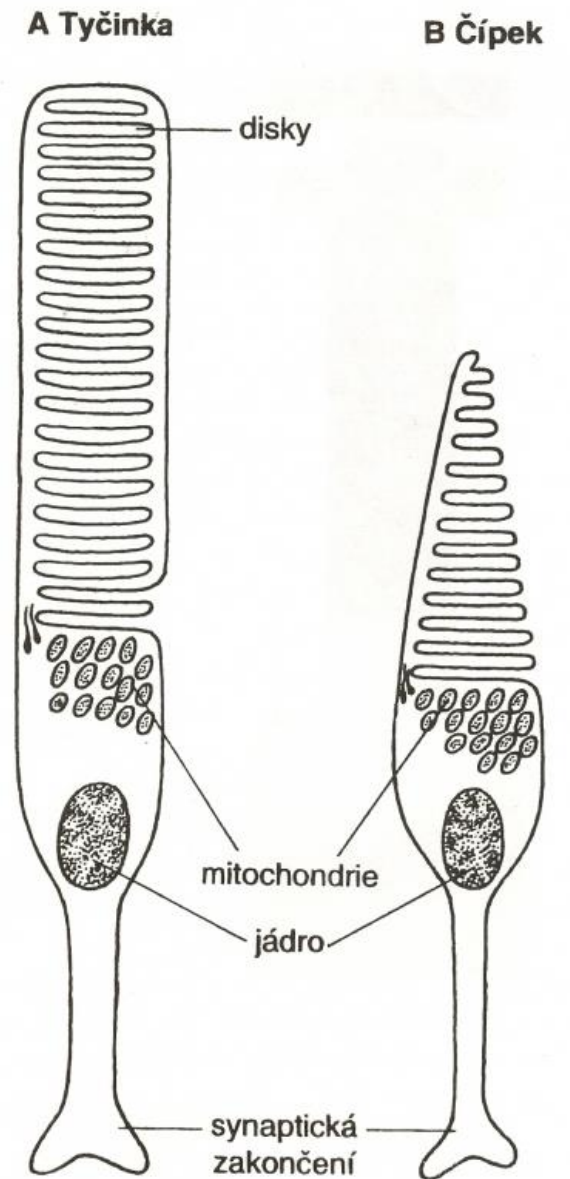
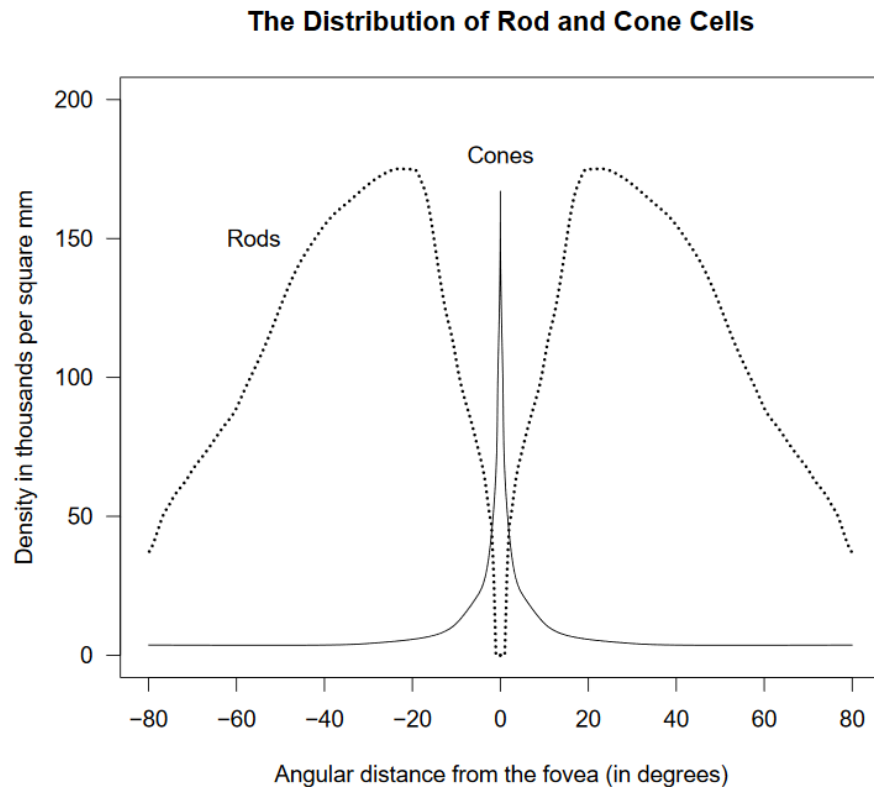




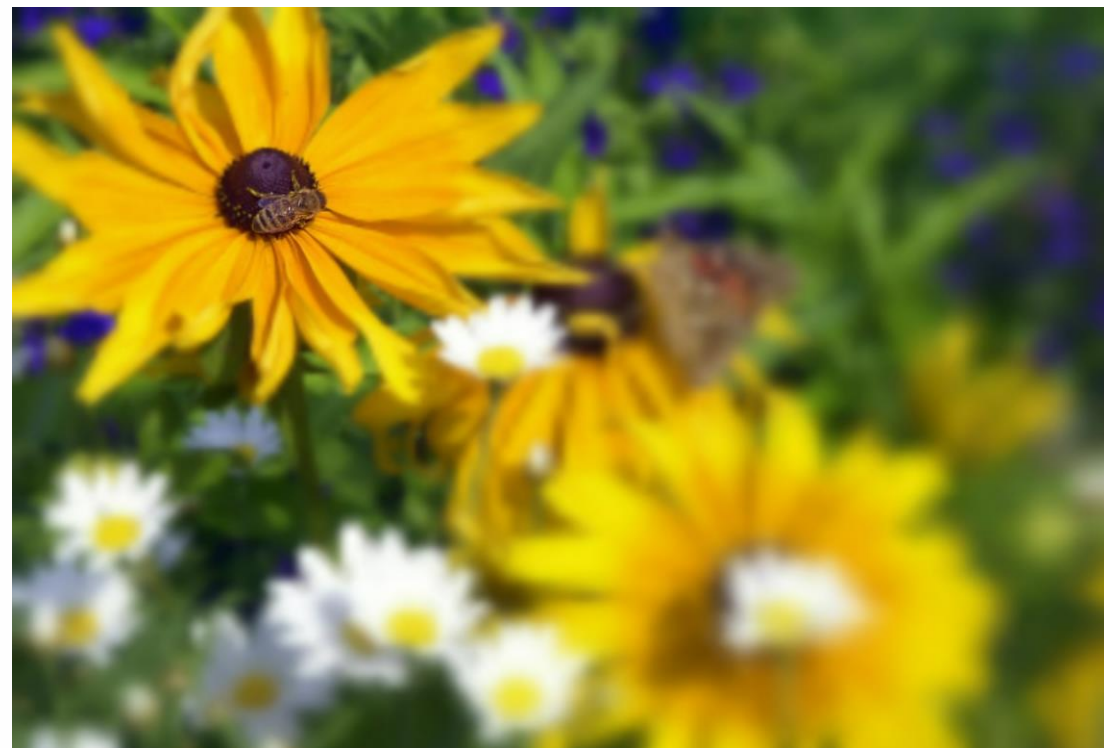
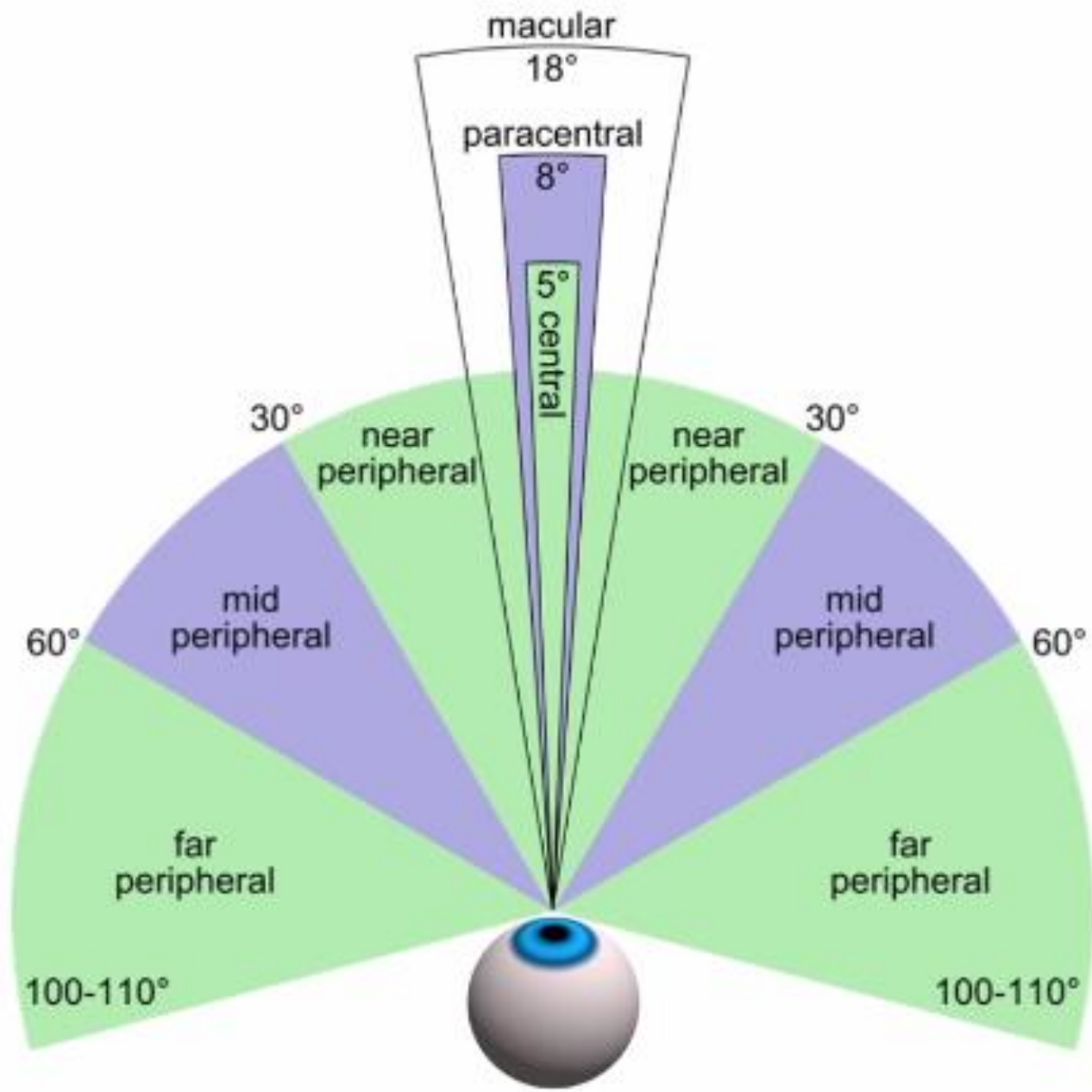




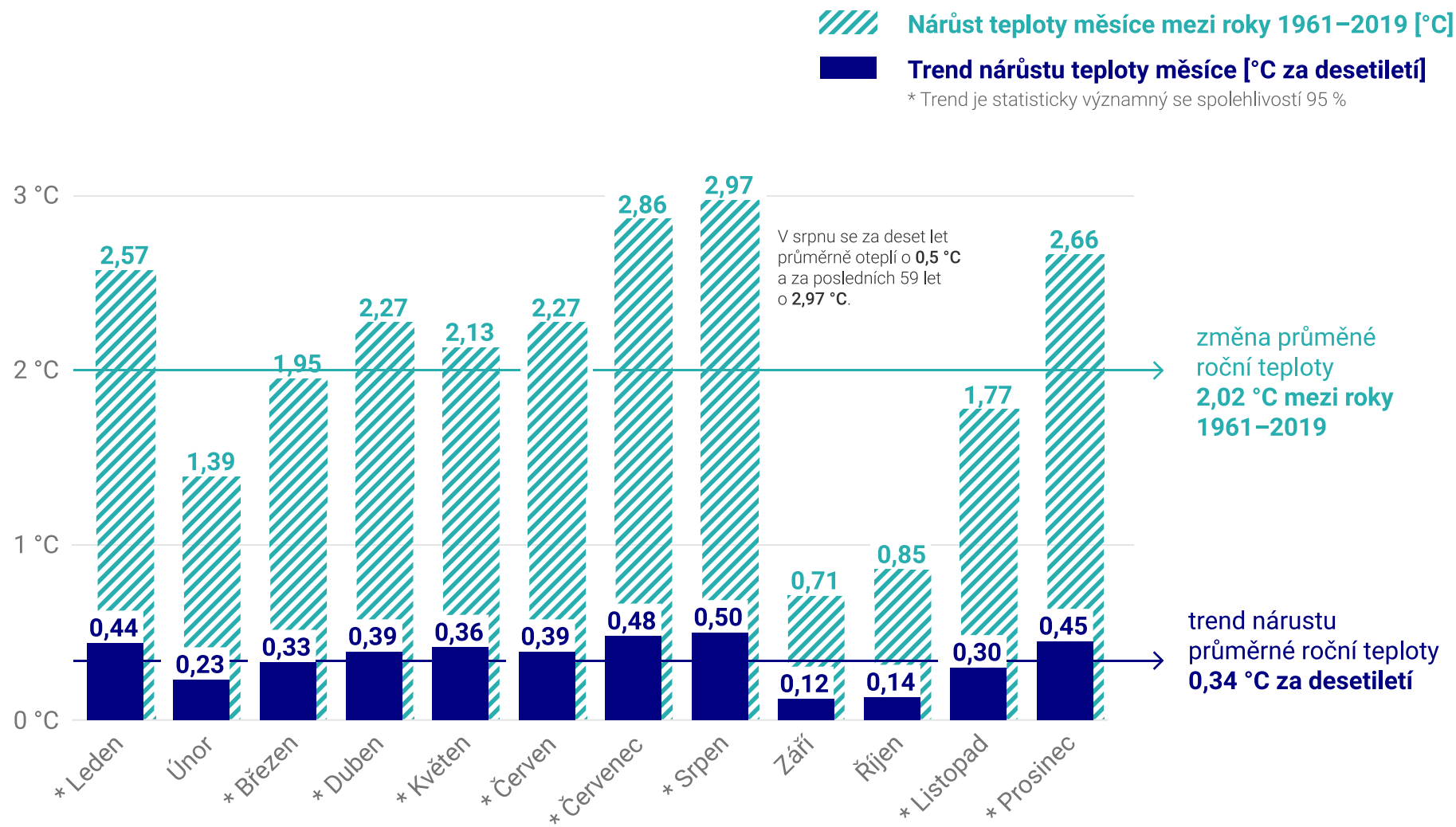
tyčinky (jeden typ) a čípky (vl. délka)
fotopické a skotopické vidění
jejich distribuce není stejnoměrná



subjektivita barevného vidění
achromatopsie



TREND NÁRŮSTU TEPLOT V ČR V JEDNOTLIVÝCH MĚSÍCÍCH



výzkumy eye-trackingem
posloupnost čtení

1870 | Louis Émile Javal – výzkumy čtení

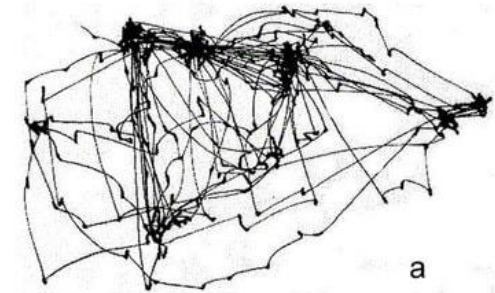
1908 | Edmund Huey

Počátky eye-trackingu...

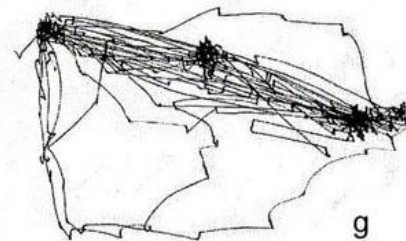
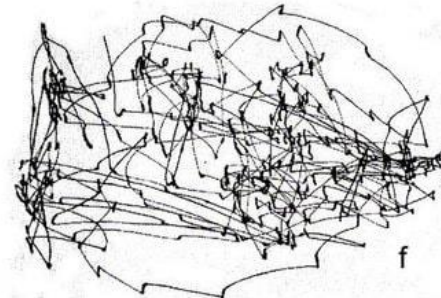
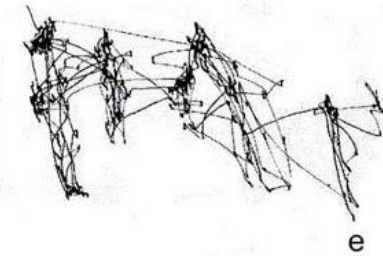
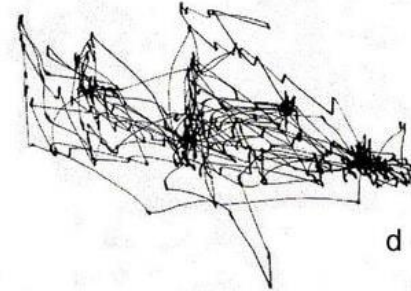
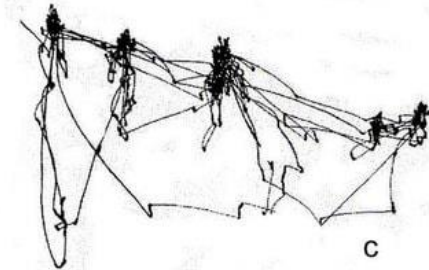
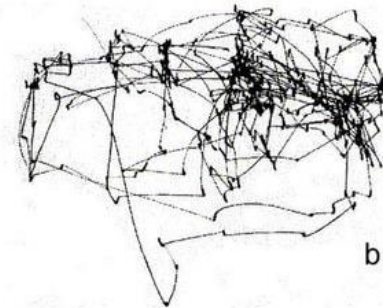
- fixace a sáky
- nestále a pořád, pod setinu sekundy

Alfred L. Yarbus





1. Odhadněte věk postav
2. Odhadněte, jak bohatá je tato rodina
3. Odhadněte, co rodina dělala než dorazil návštěvník
4. Zapamatujte si pozici lidí a objektů v místnosti



Anstis
chart



Zpracování v mozku

- vizuální vnímání se odehrává v mozku
- podněty se skrze optický nerv přenášejí do vizuálního kortexu
- část zpracování se odehrává už na sítnici
- komplexní proces, příliš toho o detailech vlastně nevíme
- mnoho z toho, co víme, víme díky iluzím
- *iluze* = mozek usuzuje nesprávně o tom, co vidí



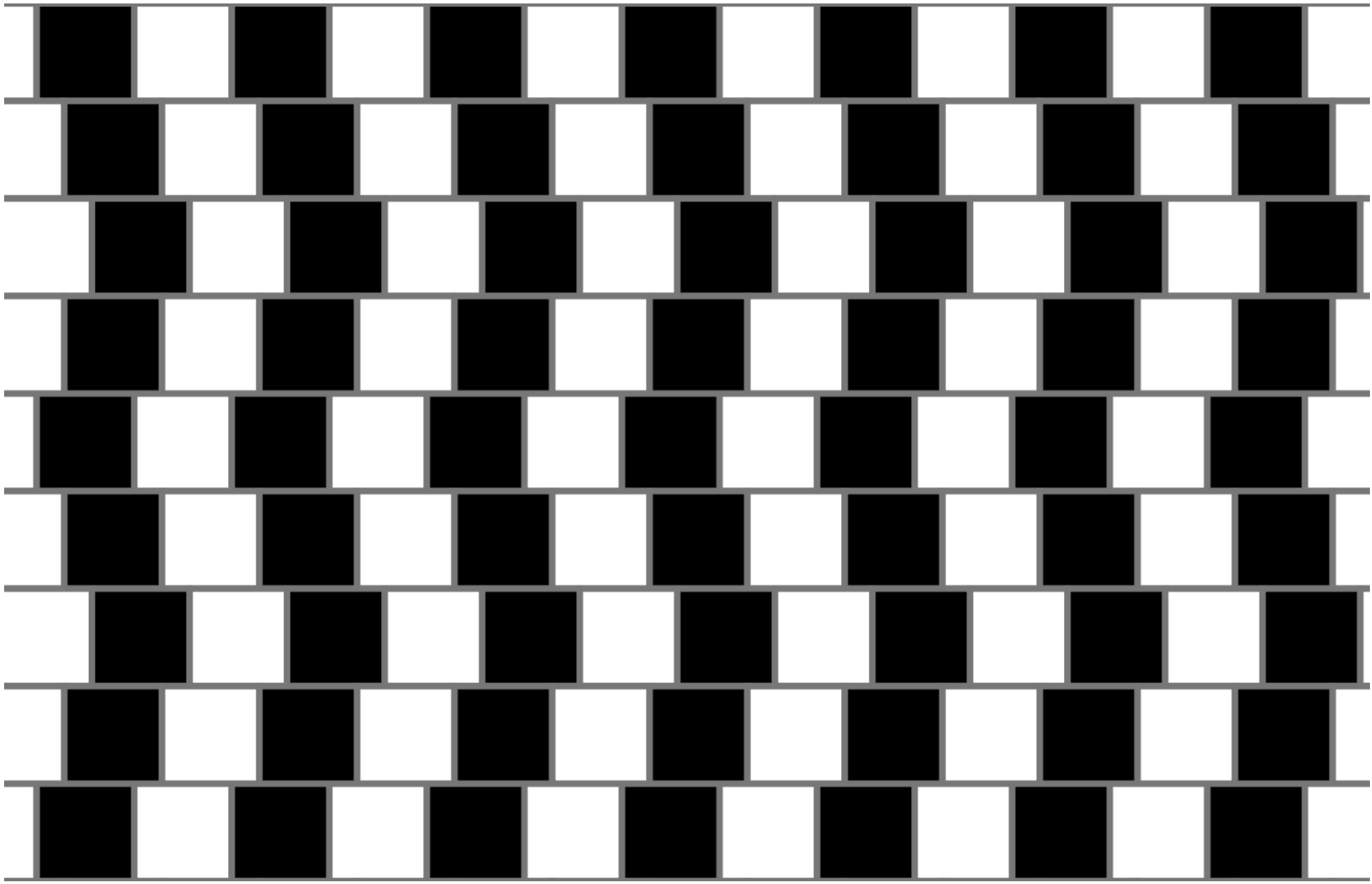
JUICES & SMOOTHIES

at Delight
NO PUREES, POWDERS or MILK
JUST FRUIT

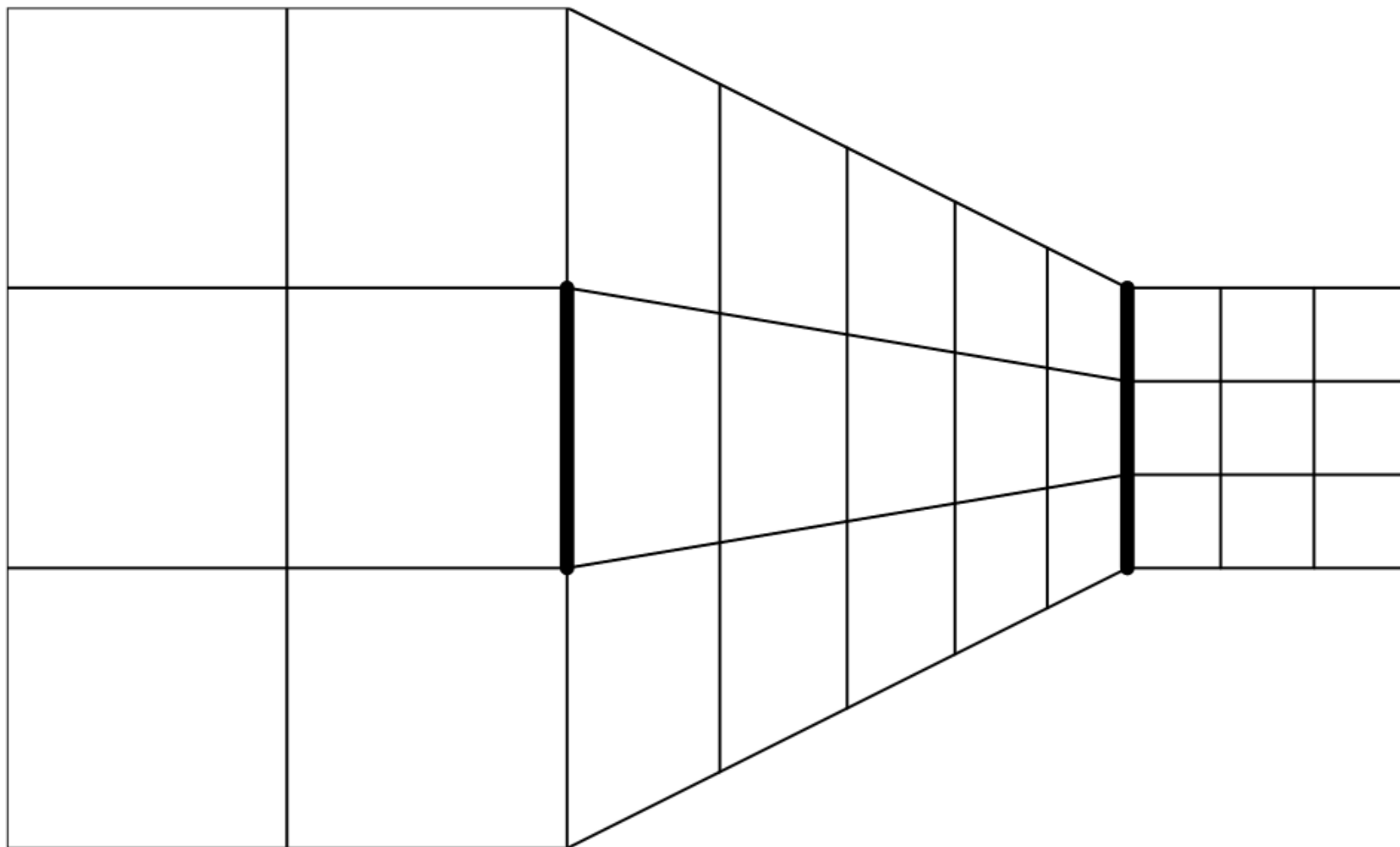
- Choose from:
- * ALL FRUIT SMOOTHIES
 - * MILK SMOOTHIES (or SOYA MILK)
 - * YOGURT SMOOTHIES
 - * ICE CREAM SHAKES

Also, large selection of freshly-squeezed juices from £2.10

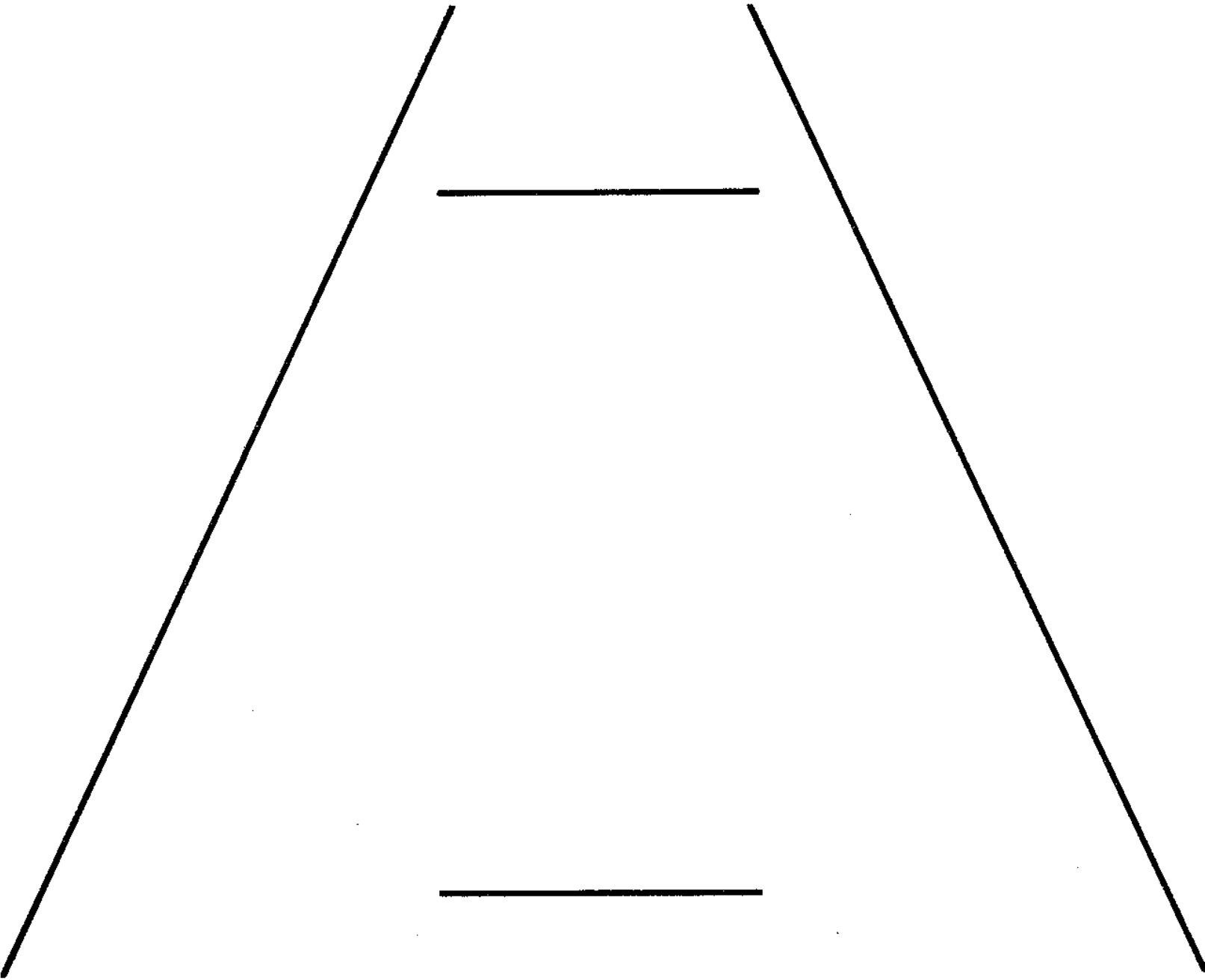
ENGLISH MEAT



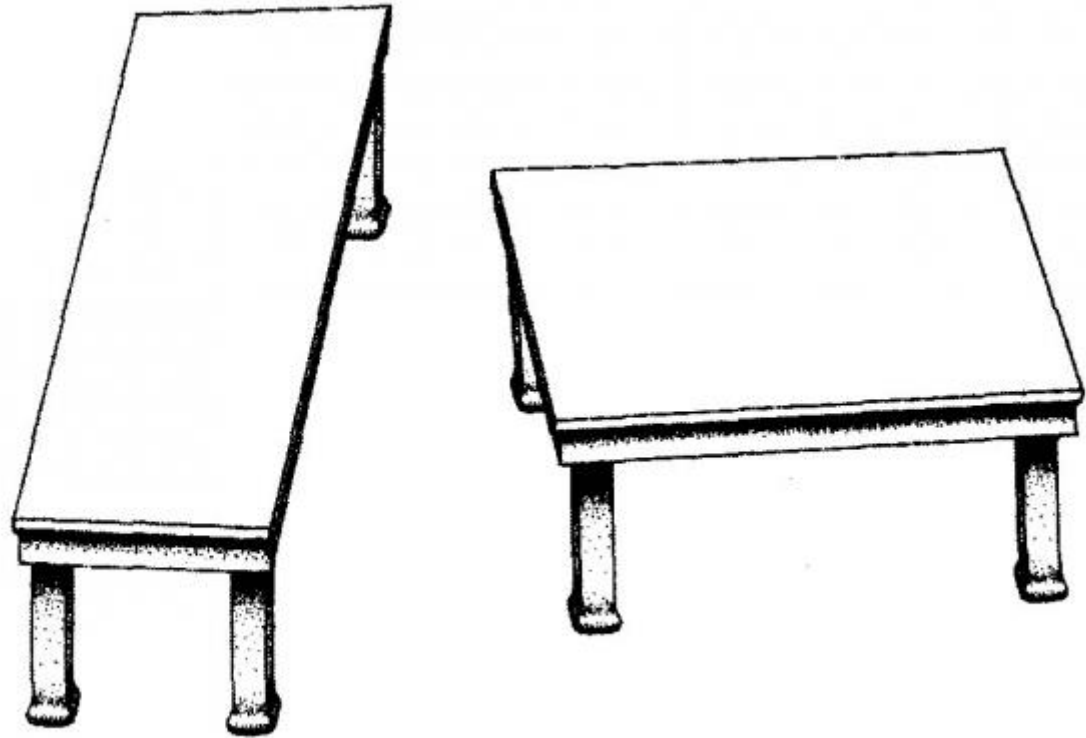
Iluze perspektivy



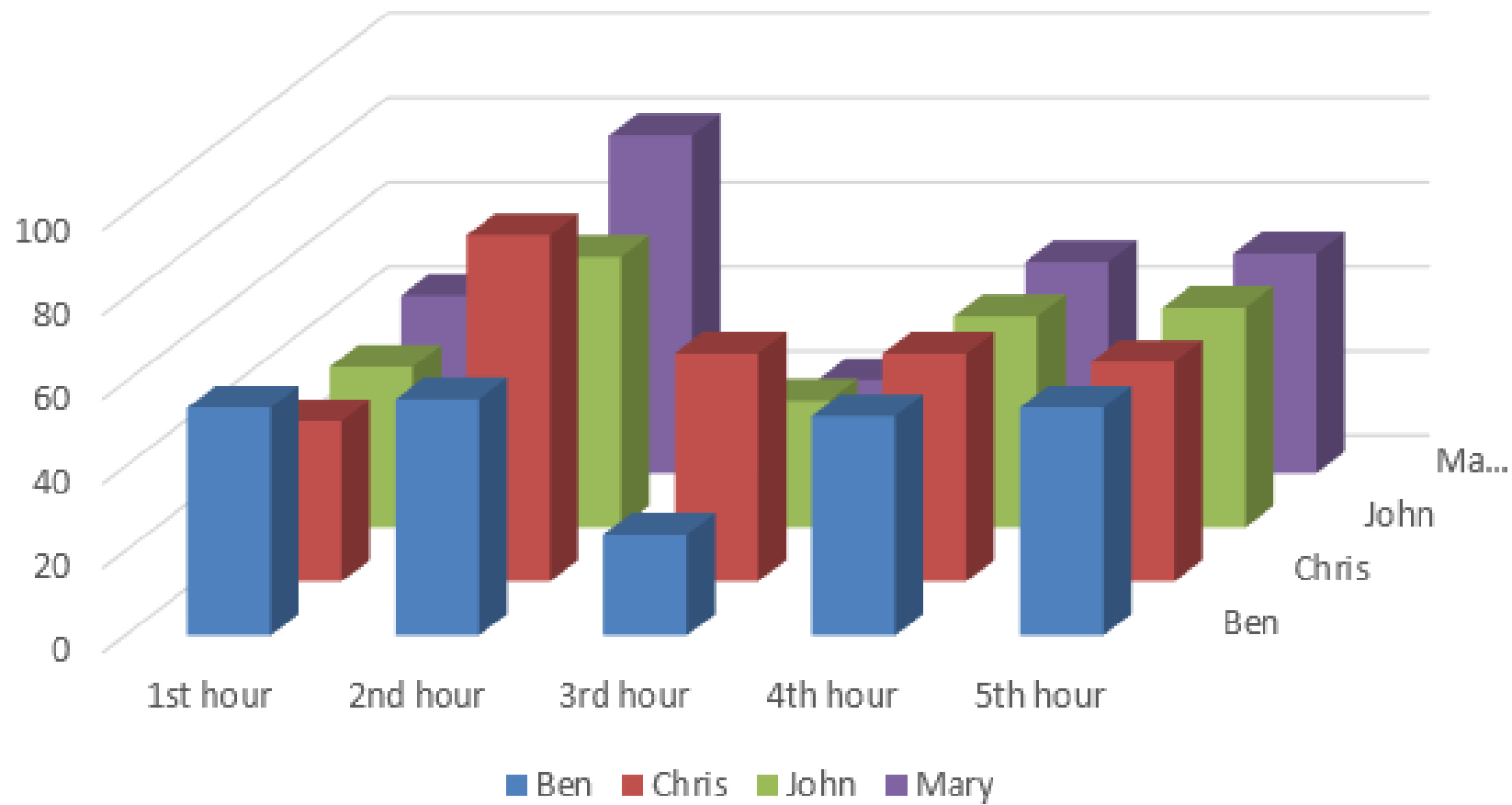
Ponzo



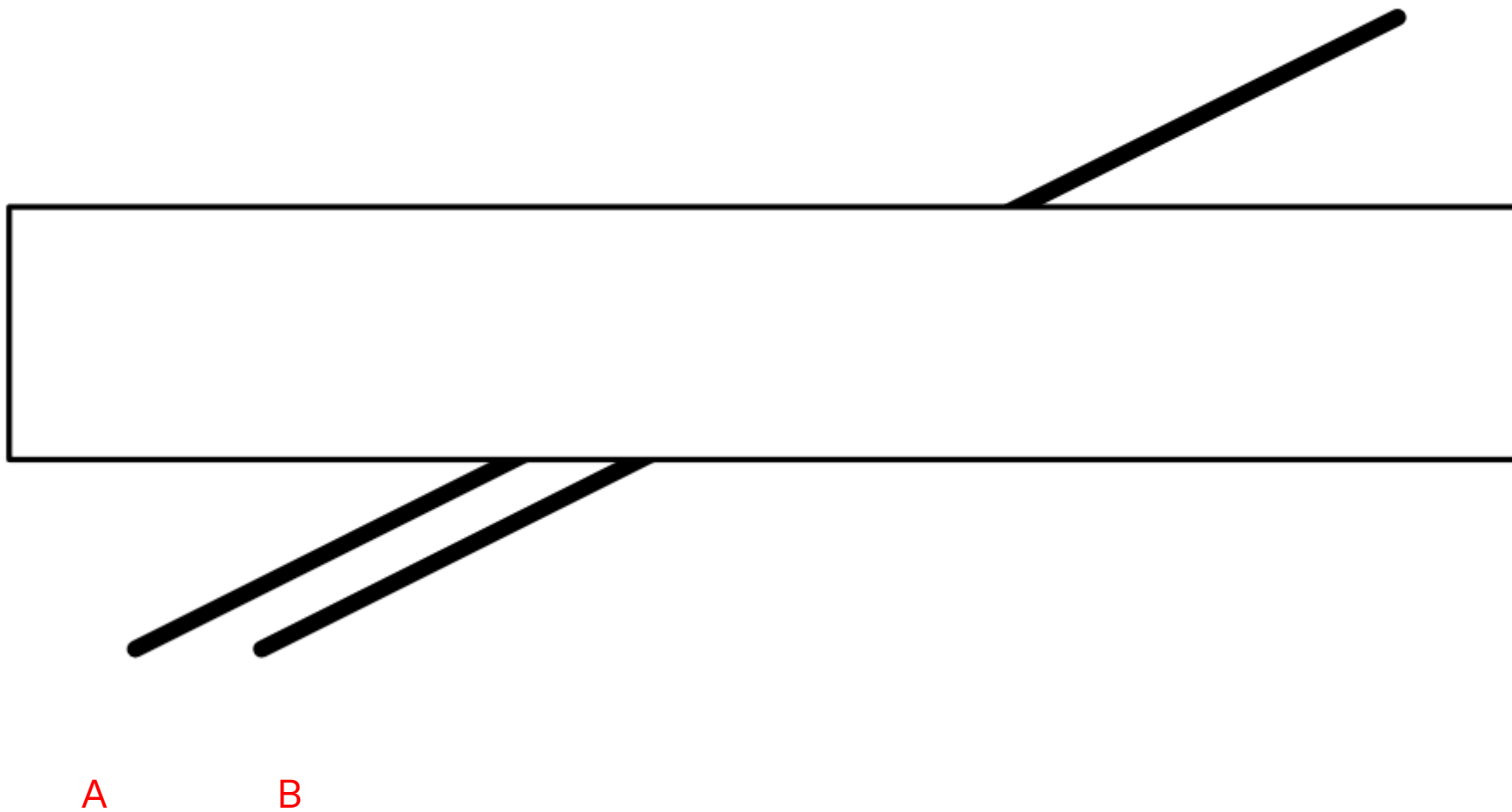
Shepard's table

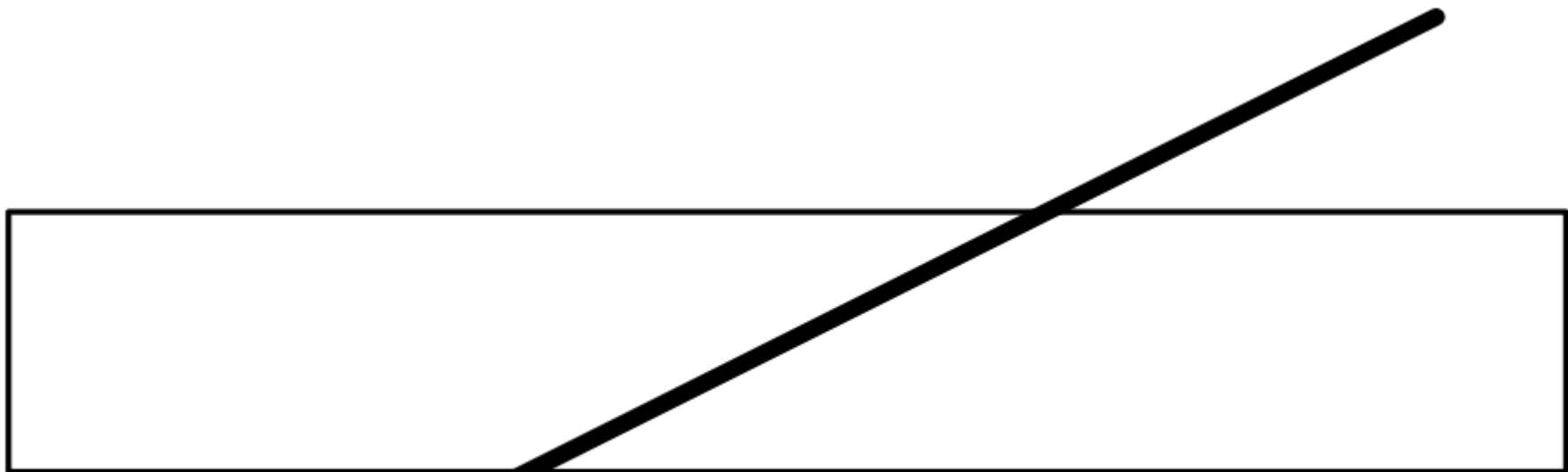


<https://michaelbach.de/ot/sze-ShepardTables/index.html>



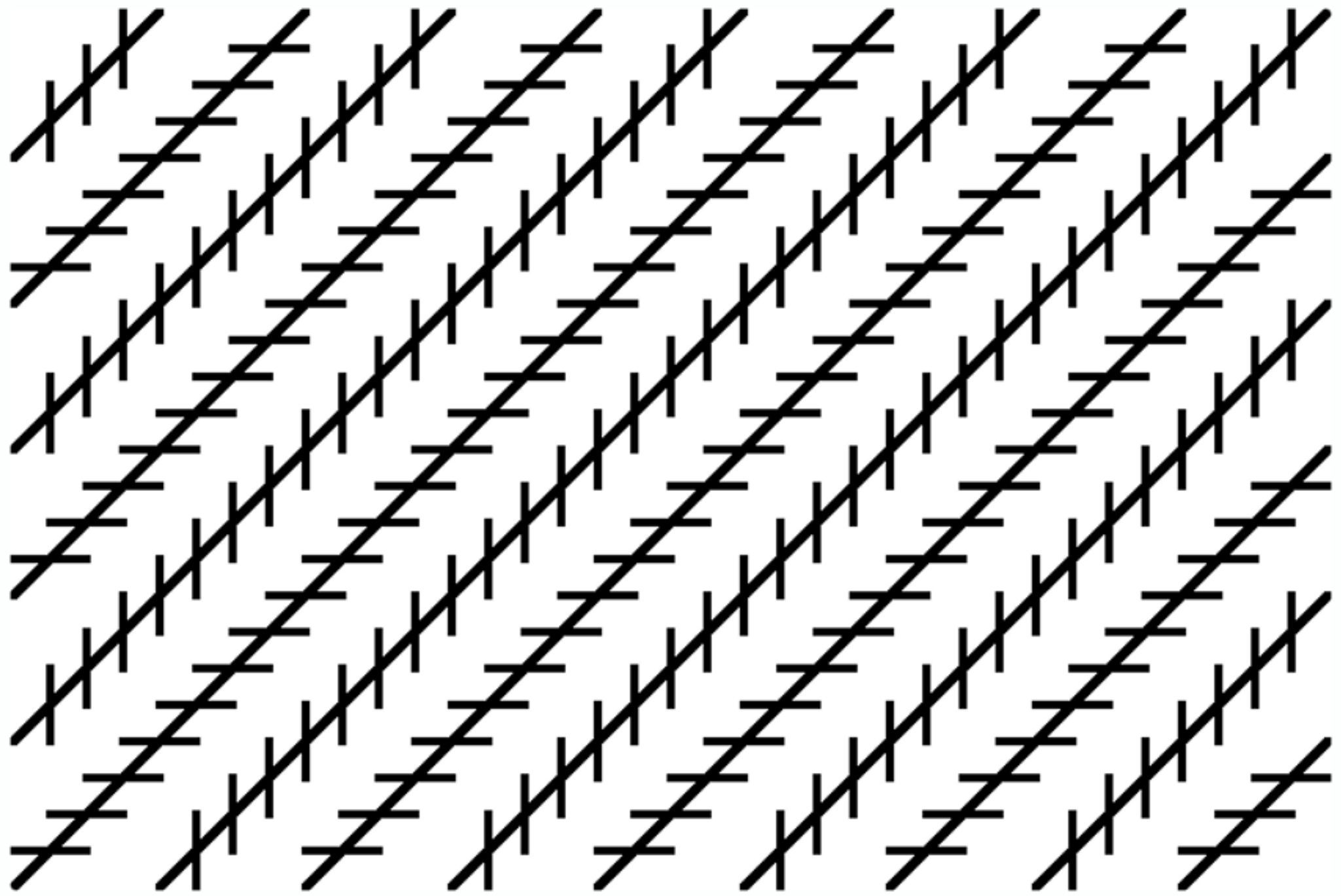
Iluze úhlu
Poggendrof





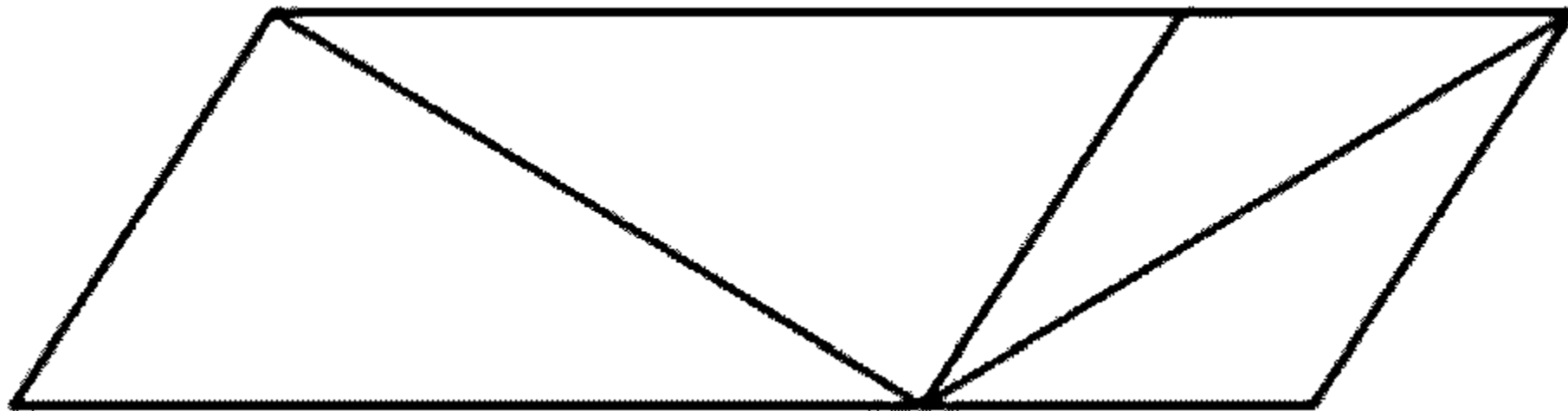
A

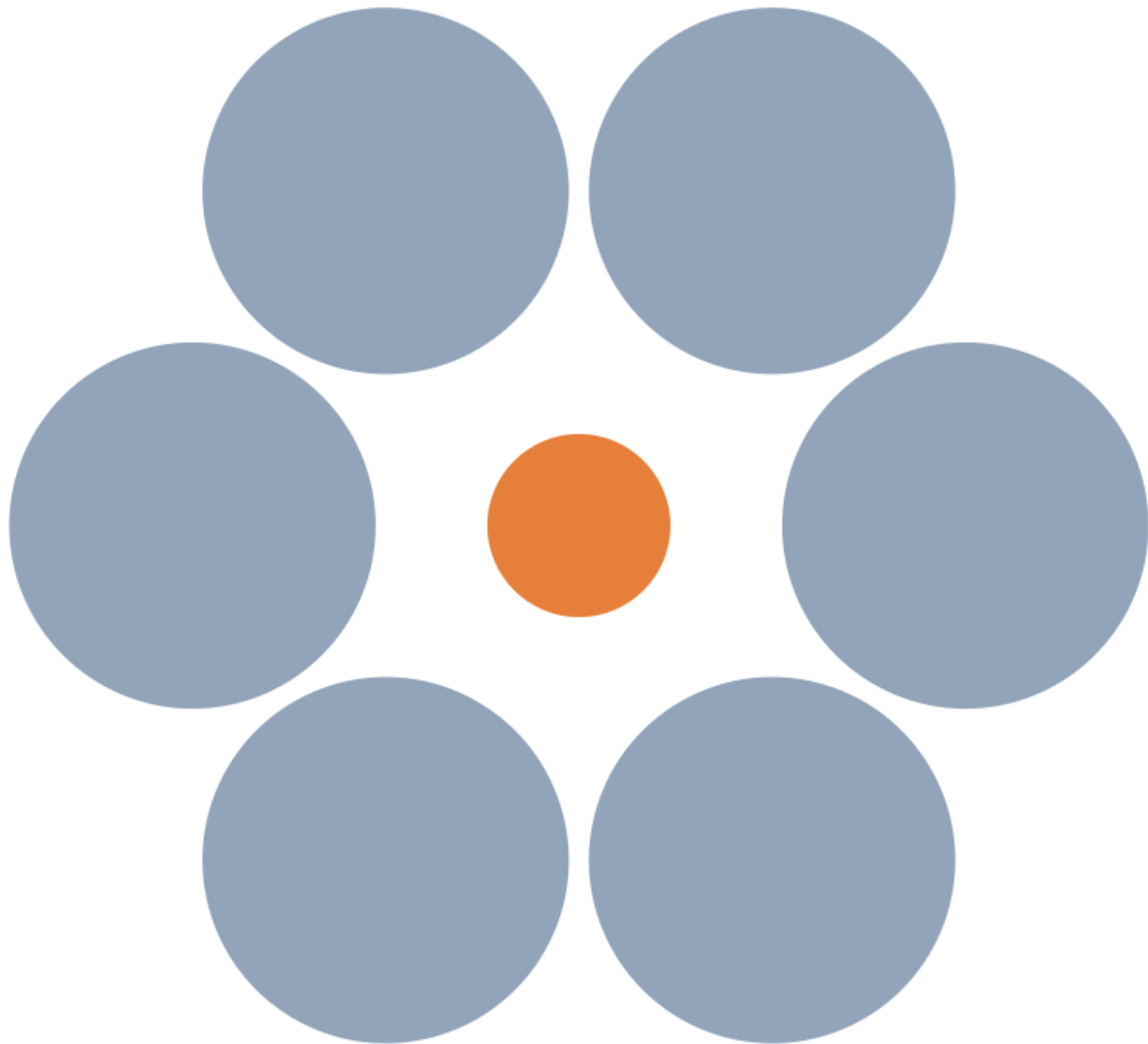
B



Iluze velikosti

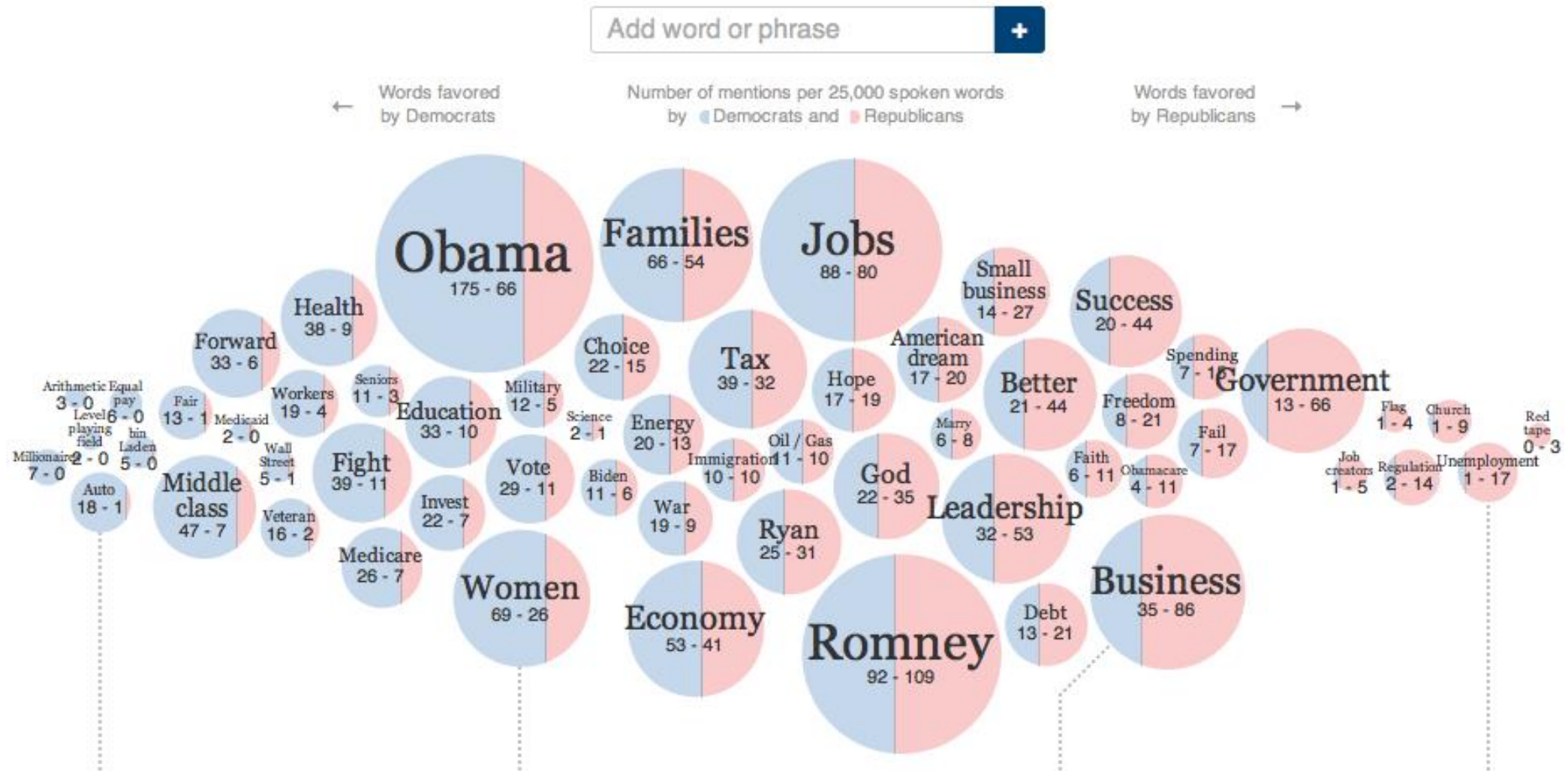
Sander





At the National Conventions, the Words They Used

A comparison of how often speakers at the two presidential nominating conventions used different words and phrases, based on an analysis of transcripts from the Federal News Service.



AUTO Democrats credited President Obama with the recovery of the auto industry after the 2009 bailout, while Republicans left the topic unmentioned.

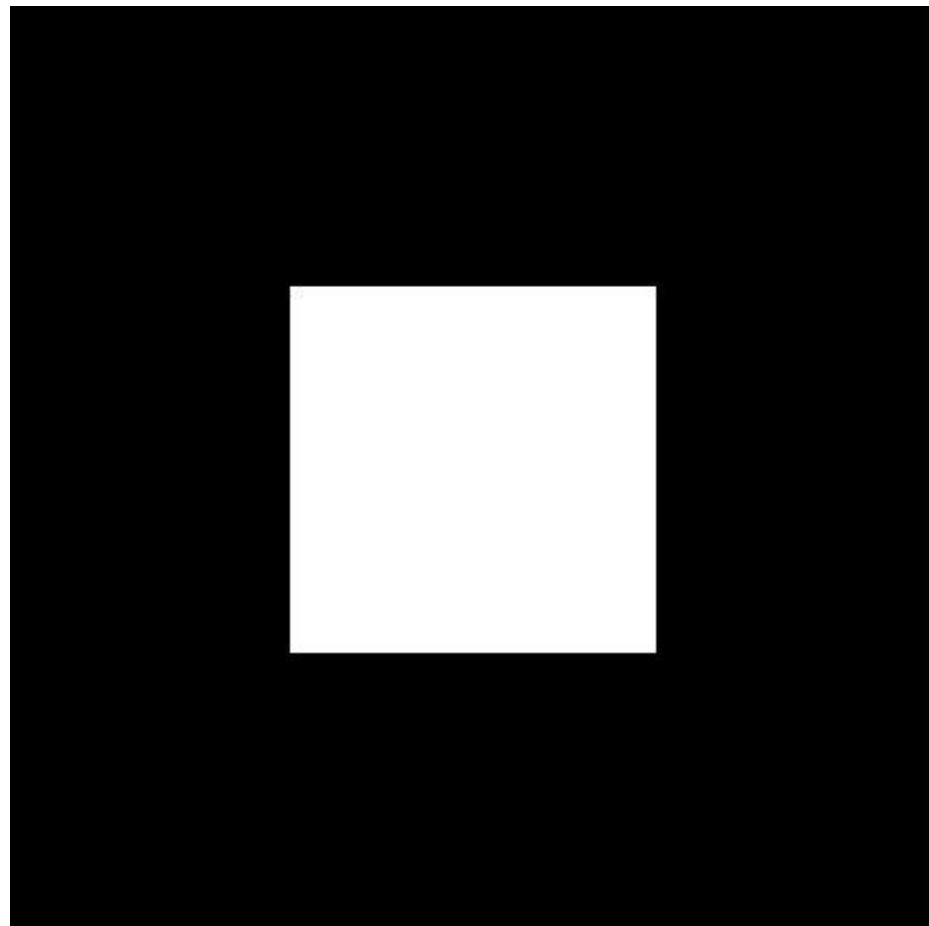
WOMEN Democrats used the word much more frequently, primarily in reference to women's health and equal pay.

BUSINESS Republicans were more likely to talk about businesses, emphasizing Mr. Romney's private-sector experience and plans to improve the economy.

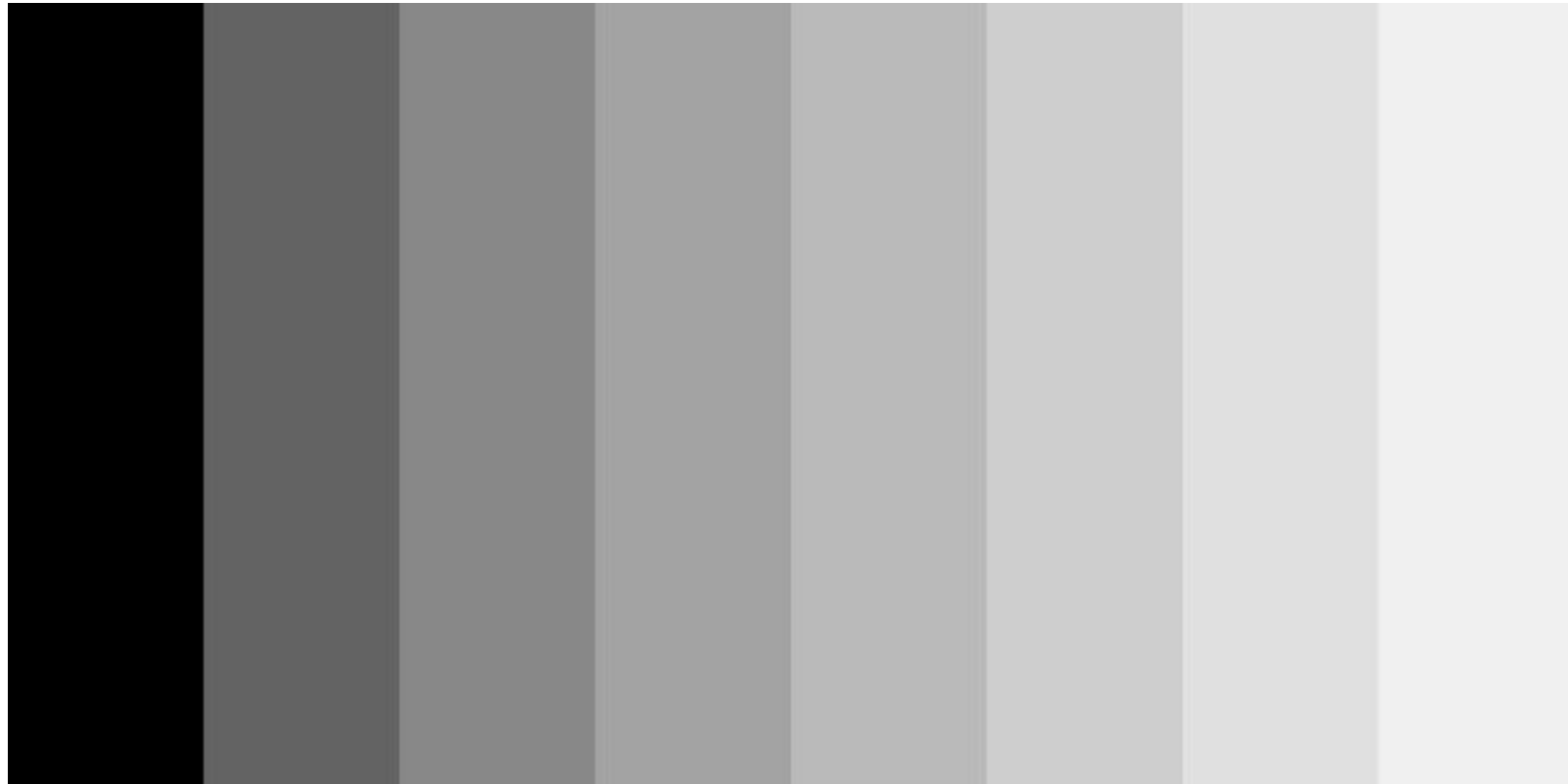
UNEMPLOYMENT Many Republican speakers brought up the still-high unemployment rate and the number of Americans who remain jobless, while Democrats largely avoided the topic.

Iluze barvy

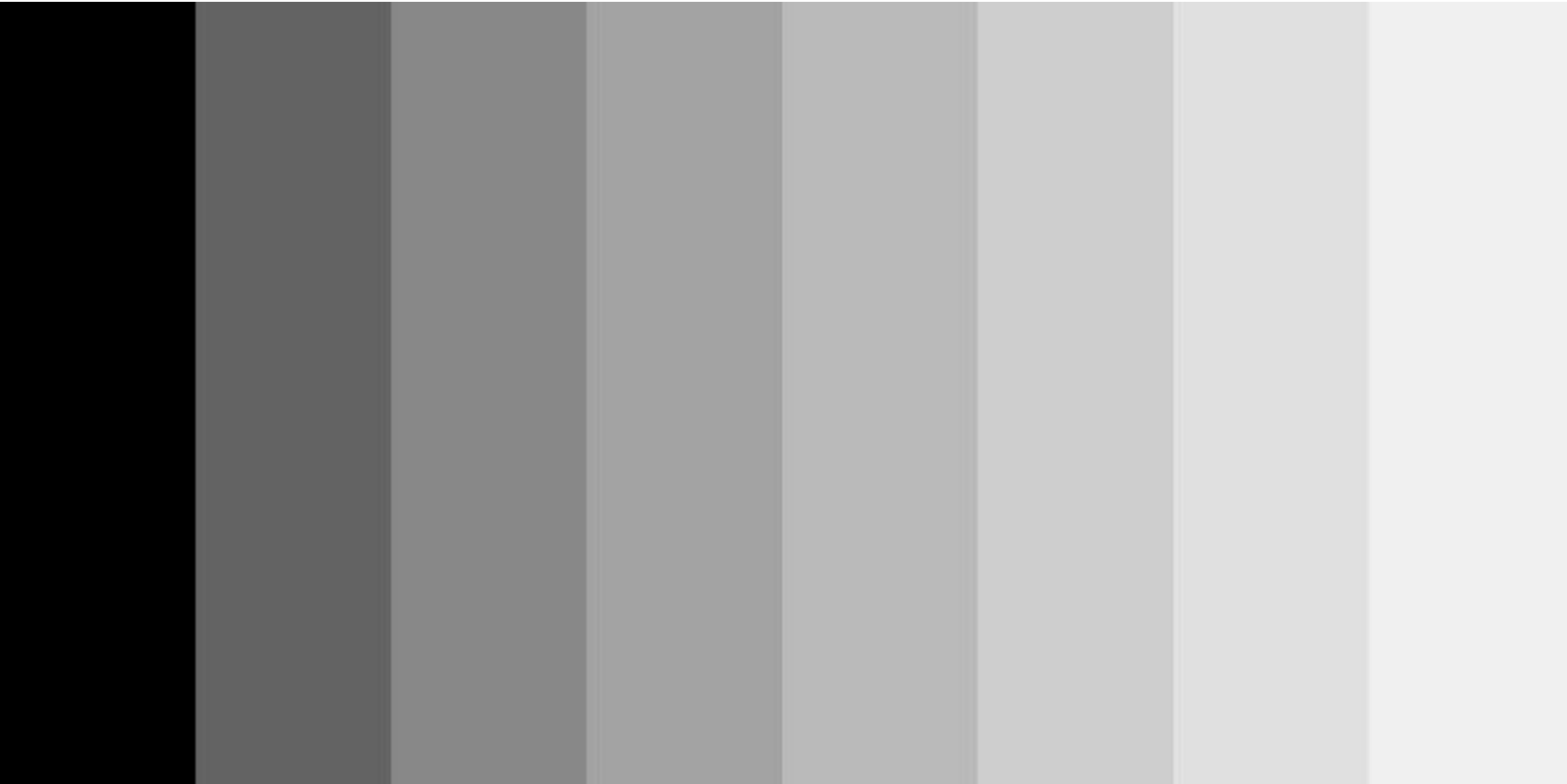
Iradiční



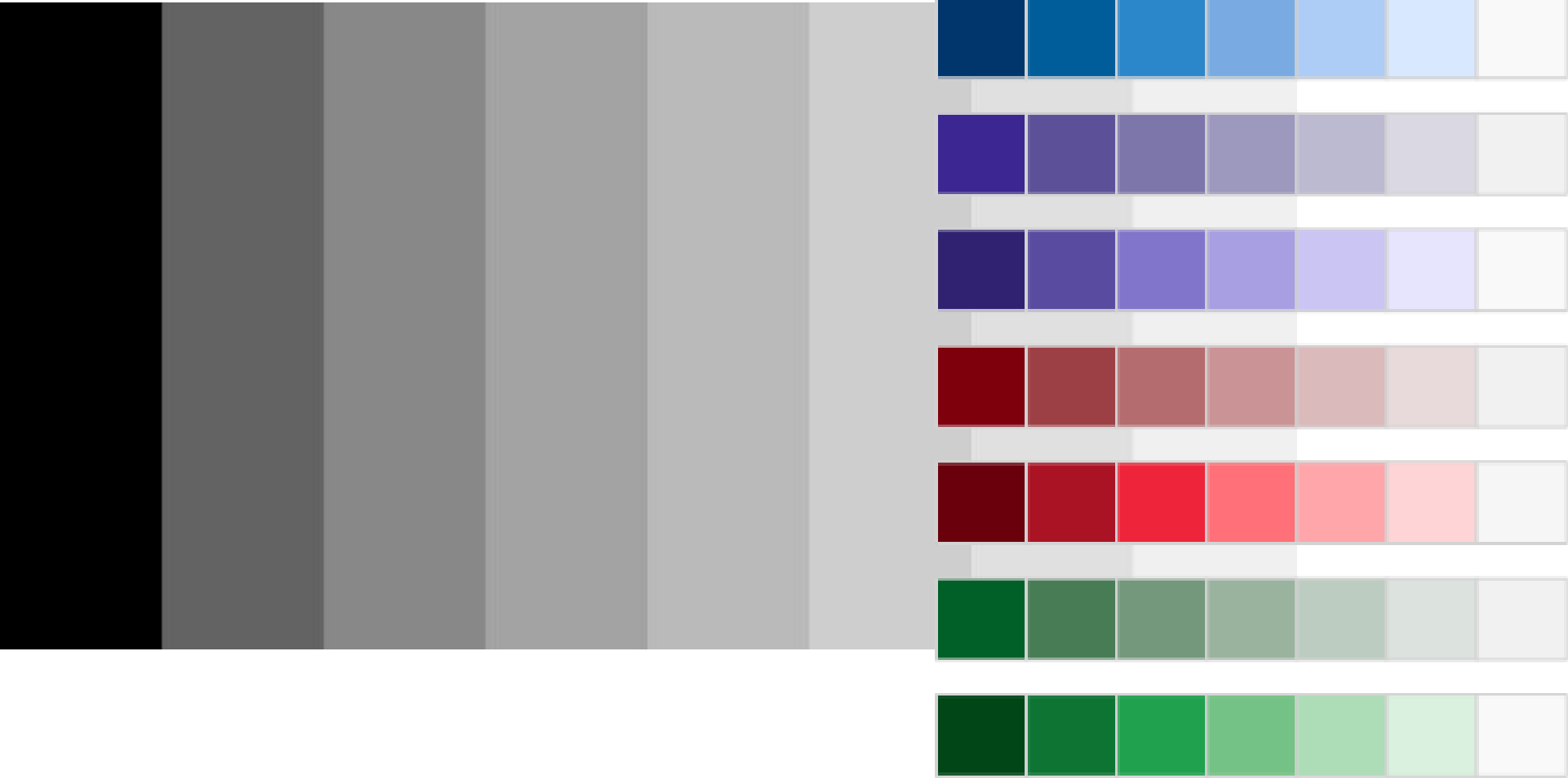
Machovy proužky



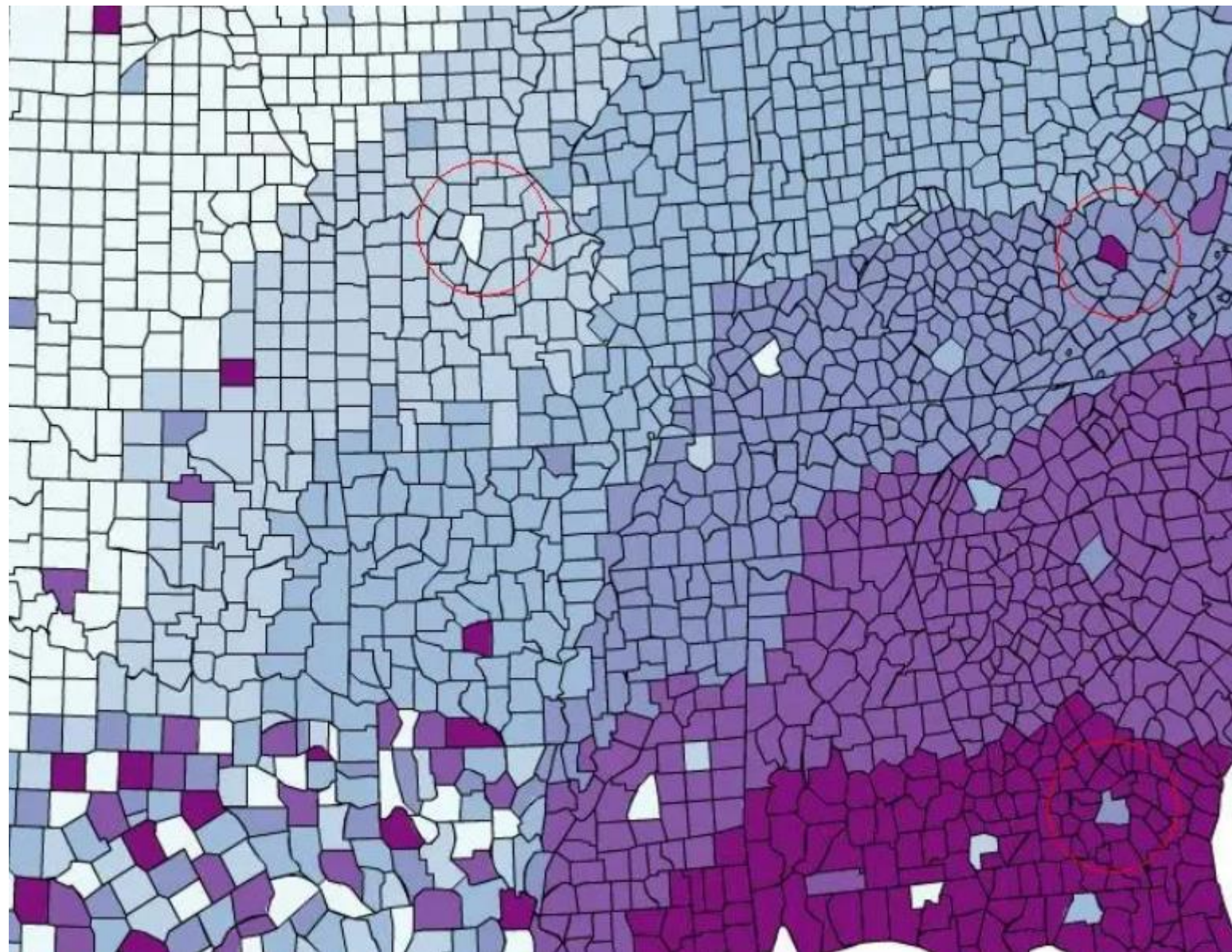
laterální inhibice



Machovy proužky (*chromatické?*)



Machovy proužky



Effect of Scenario and Experience on Interpretation of Mach Bands

Christen J. Nielsen DMD, MS 

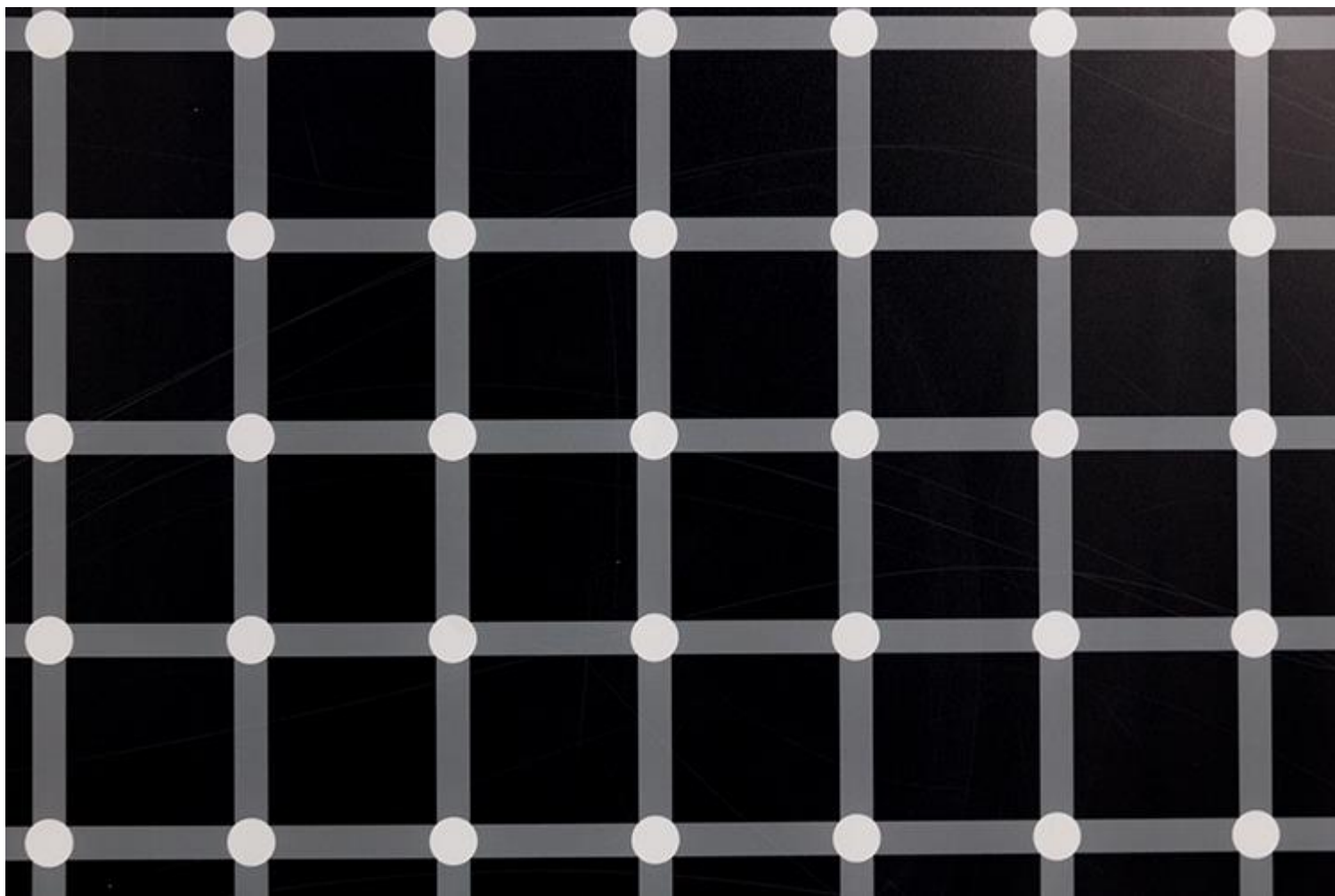
<https://doi.org/10.1097/00004770-200111000-00009>

[Get rights and content](#)

The creation of the radiographic illusion known as a mach band at the intersection of two images of differing radiopacities can be misinterpreted as pathosis in certain situations. After reviewing instances where misinterpretation may occur, this study asked 33 fourth-year dental students and 40 dentists to interpret the same radiograph involving a maxillary central incisor under two different hypothetical scenarios: first, in the case of a patient requesting vital bleaching, and second, where a patient has received recent trauma to the mouth. Results showed that dental students are more susceptible than dentists to misinterpreting as a horizontal root fracture (a mach band illusion) what is known to be the junction of alveolar crestal bone and root. Furthermore when presented with a scenario of trauma, both students and dentists are more likely to mistake what is being seen as being a fracture line.



Hermannova mřížka



<https://www.illusionsindex.org/i/hermann-grid>

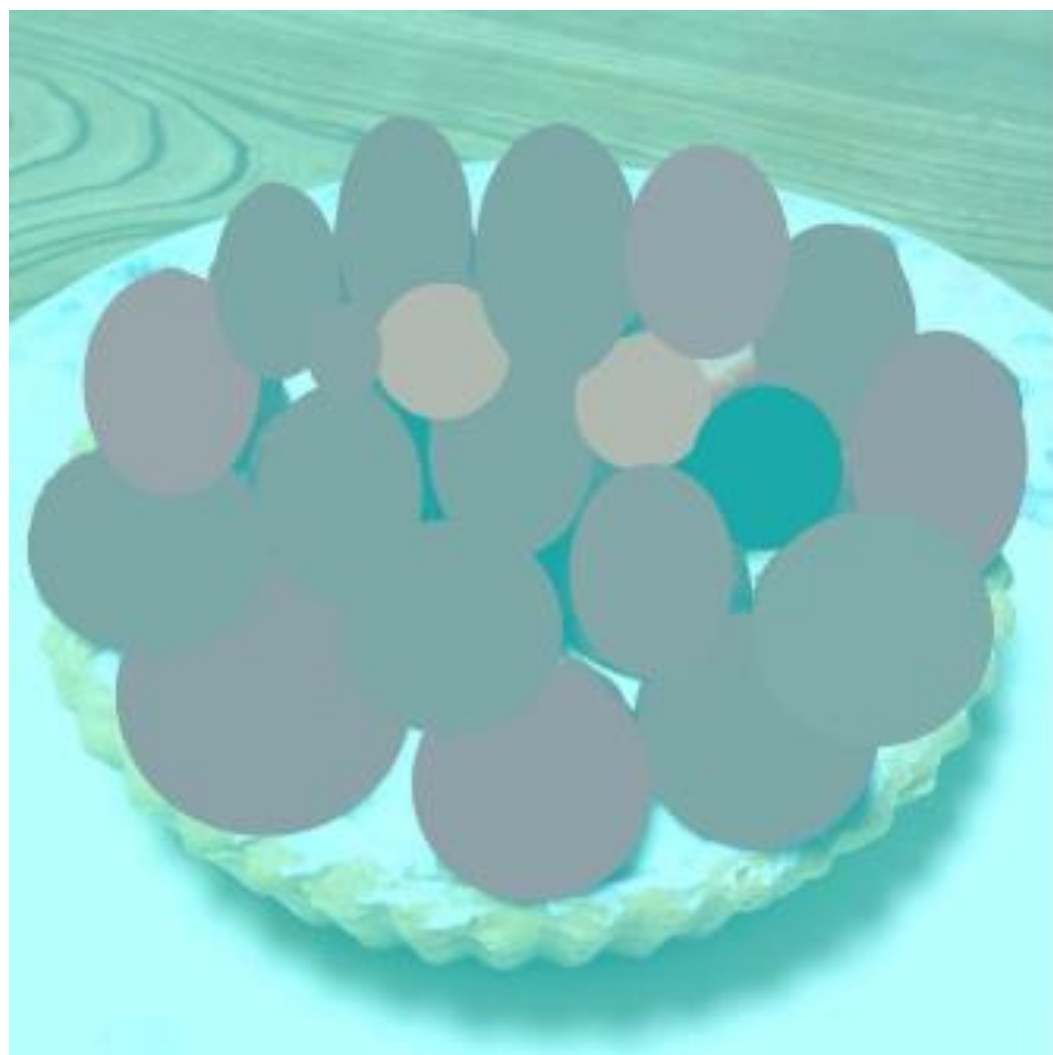
Akiyoshi
Kitaoka

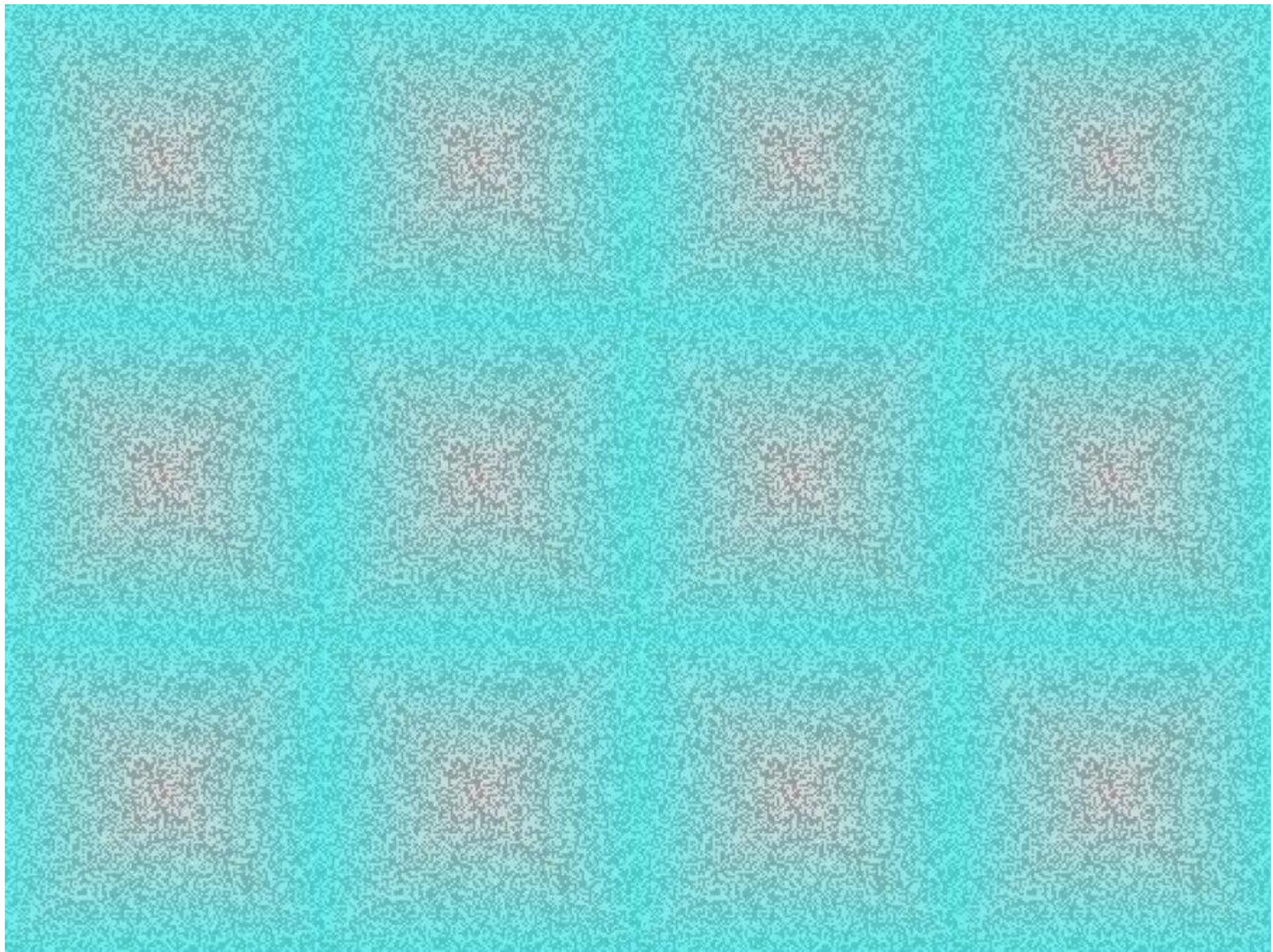












<https://www.illusionsindex.org>

Třístupňový model

Colin Ware

Fáze 1: neurony na sítnici a ve vizuálním kortexu hledají nejzákladnější objekty ve vizuálním poli (tunable/pop-out).

Fáze 2: mozek rozdělí vizuální pole na regiony a snaží se detekovat vzory (gestalt zákony).

Fáze 3: Základní rysy se kombinují do složitějších objektů, které se ukládají do operativní paměti a porovnávají se i s tím, co už známe (vizuální proměnné).

Typy procesů

Vizuální vnímání je ovlivněno dvěma typy procesů

- bottom-up procesy (kontrolka v autě)
- top-down procesy (hledání Walda)

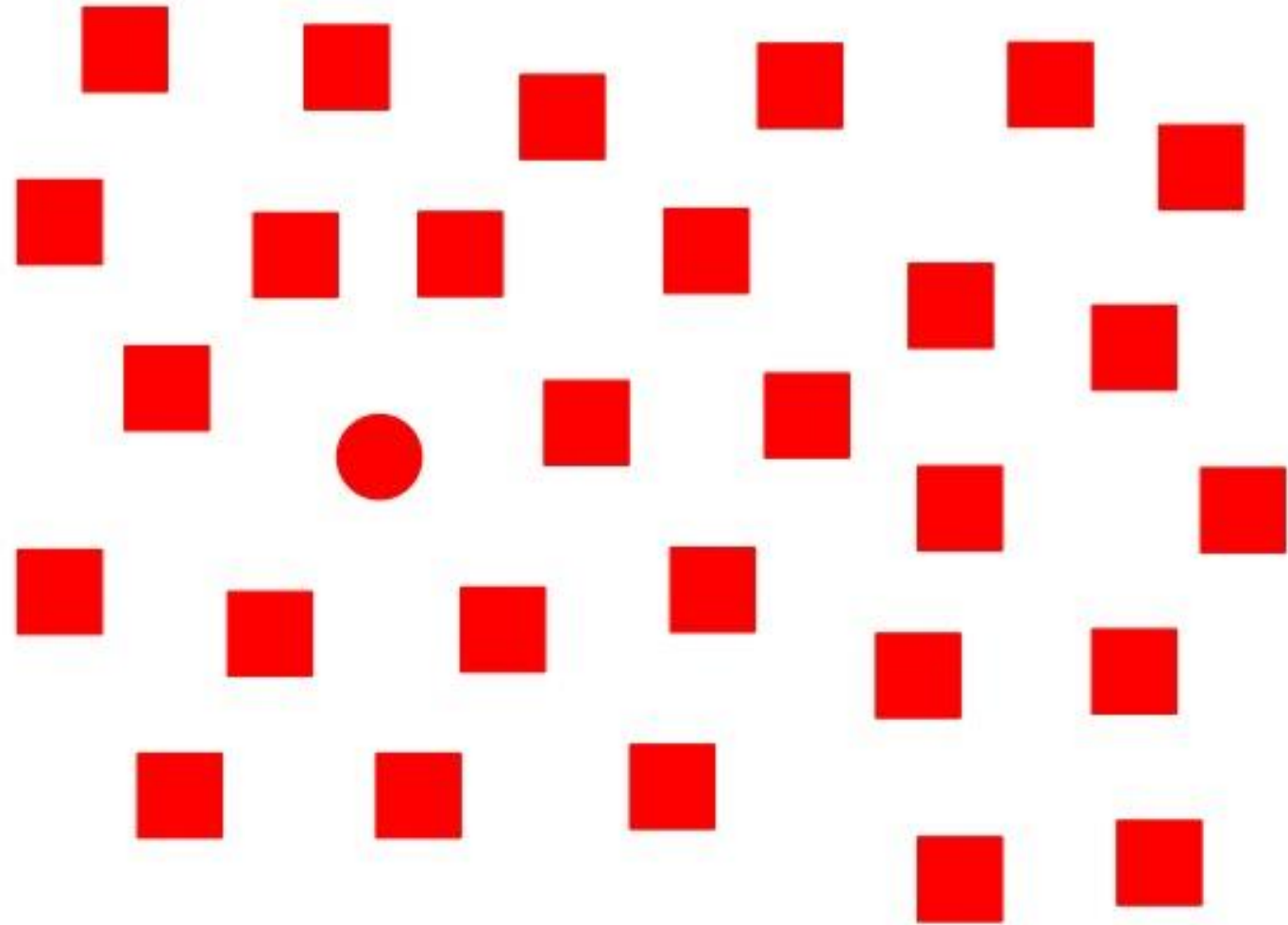
Třístupňový model

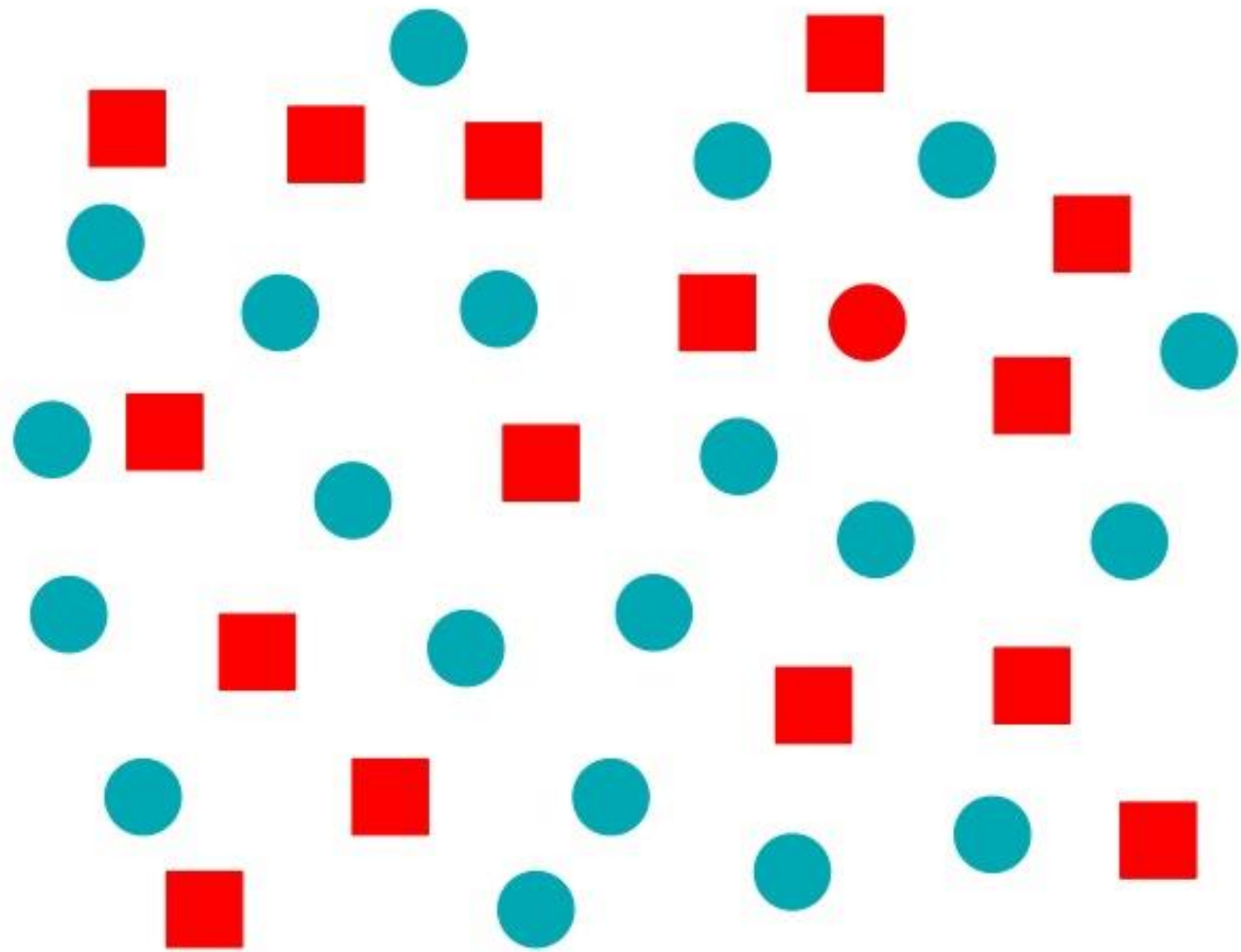
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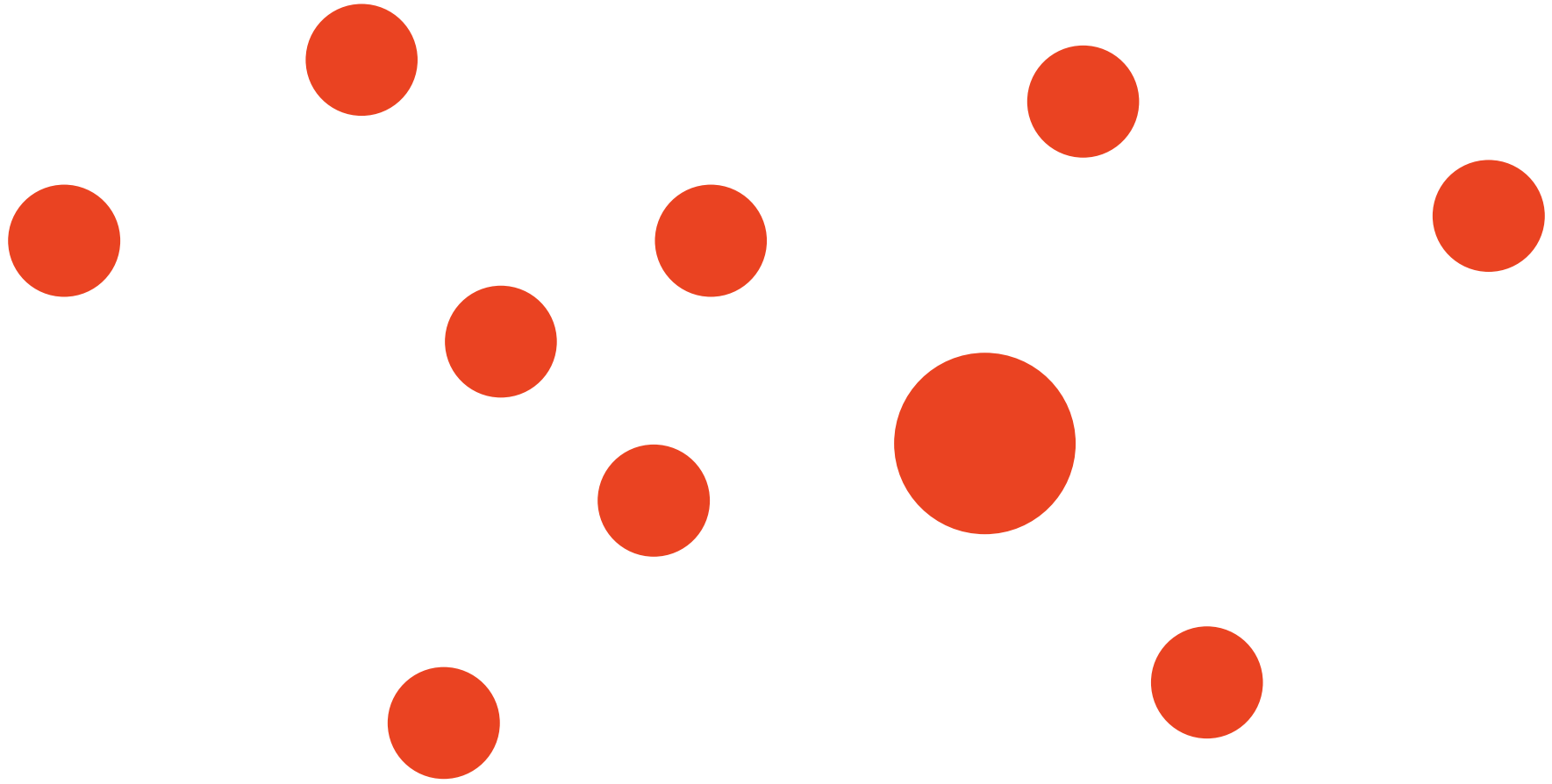
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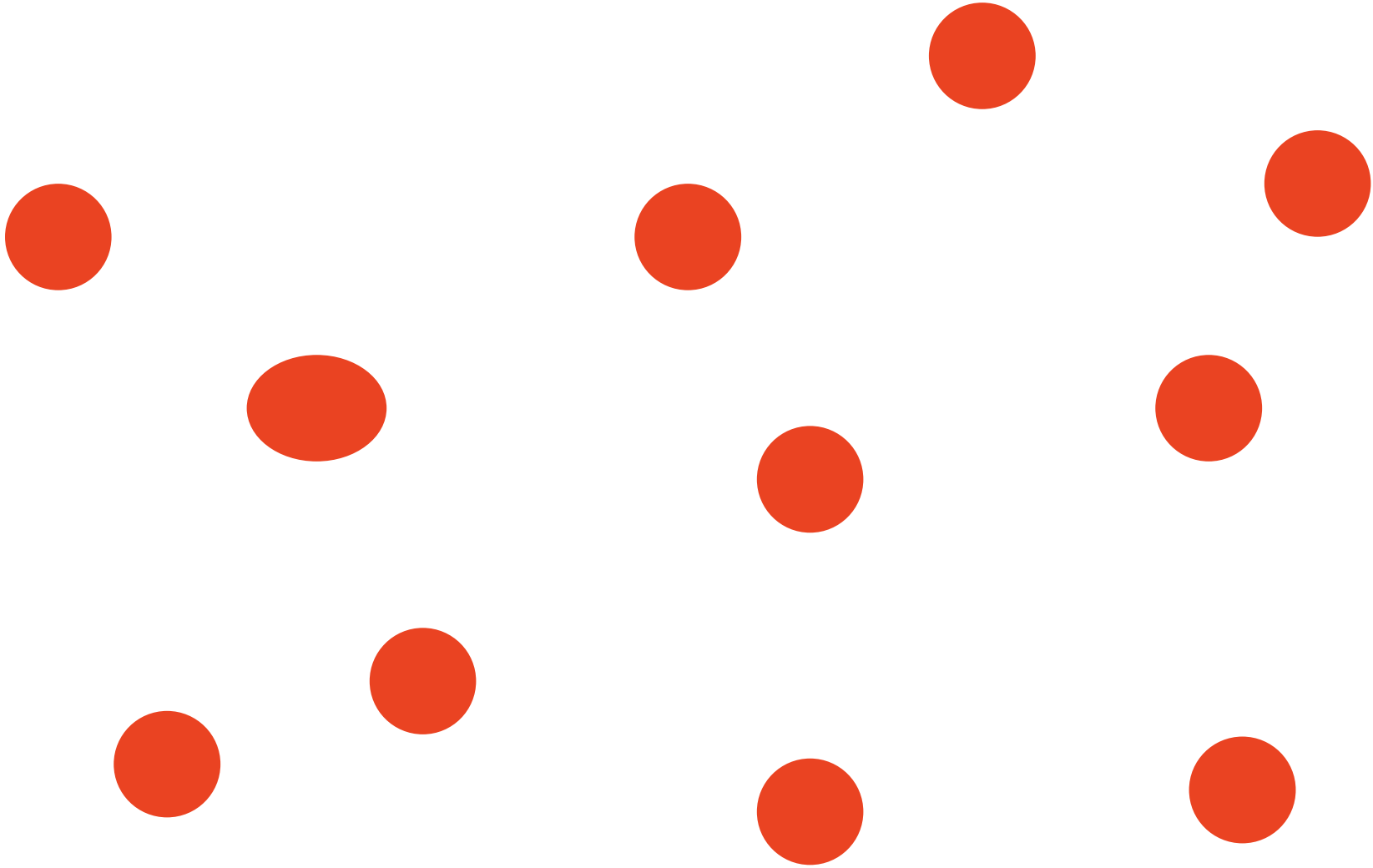


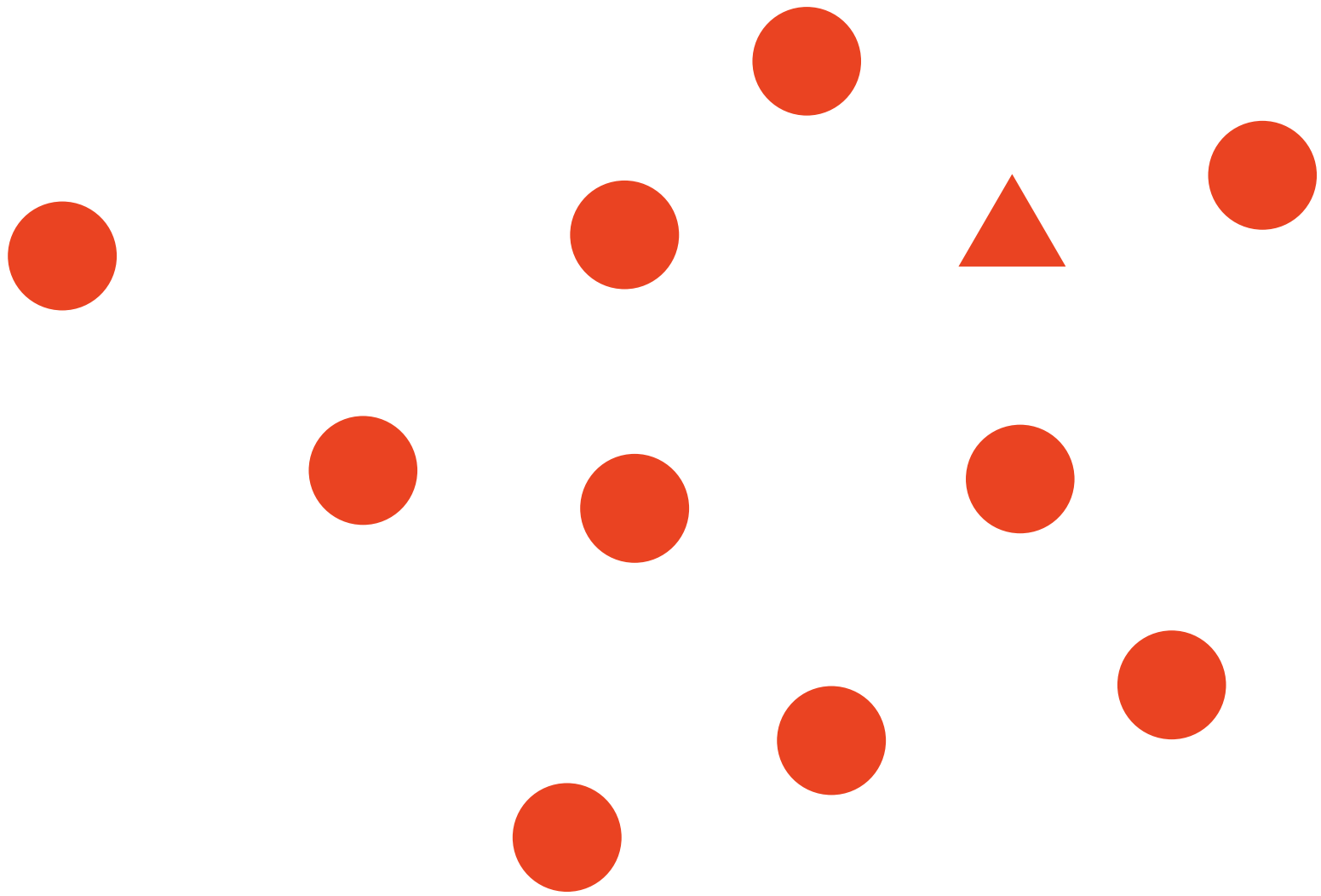


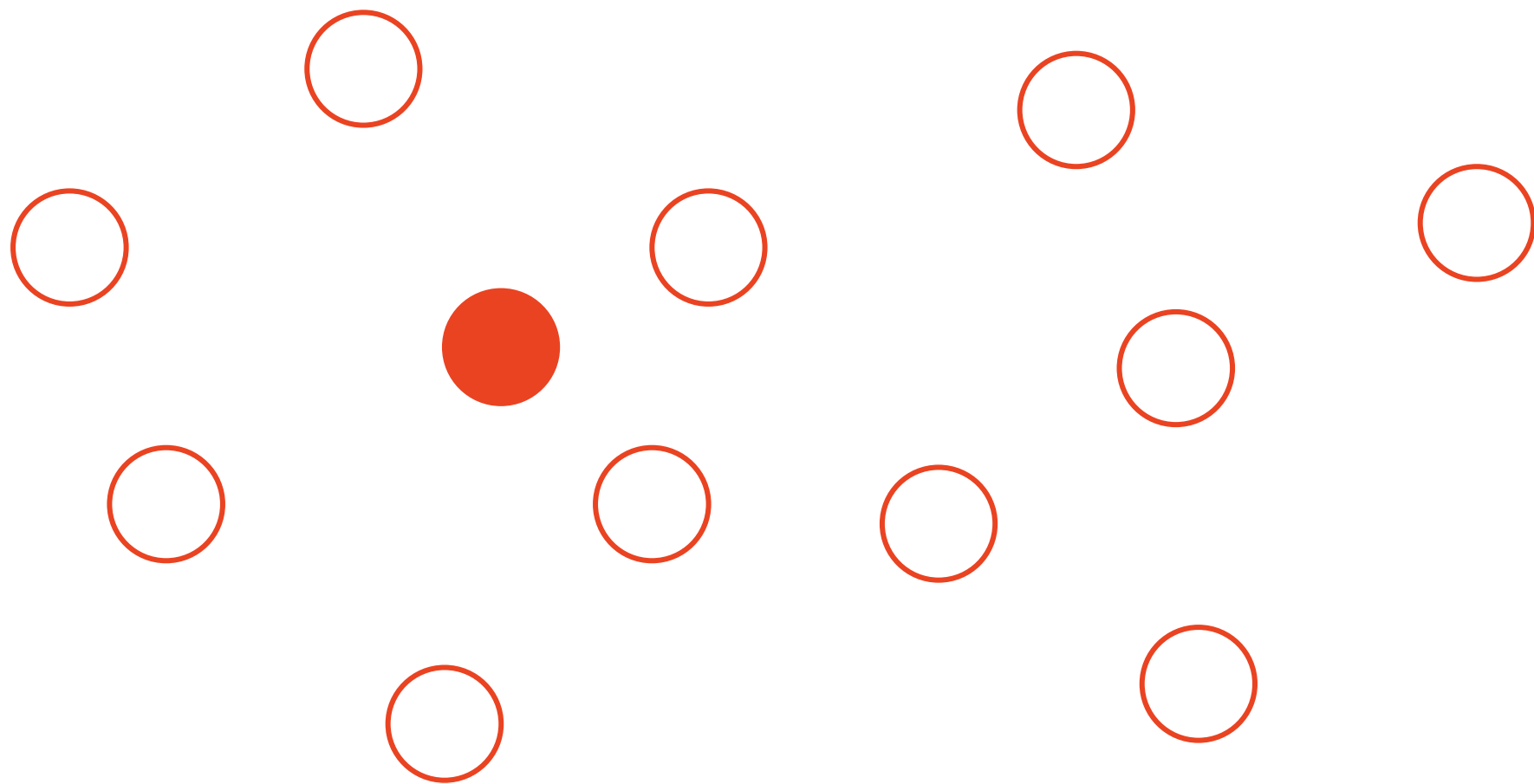
Guided Search

- *salientní hledání (bottom-up)*
- *orientačně-pátrací reflex*
- předpozornostní zpracování = 200 ms a méně
- *tunable* features | předpozornostní atributy
- míříme na vizuální zpracování na nejnižší úrovni
- tj. fáze 1 třístupňového modelu

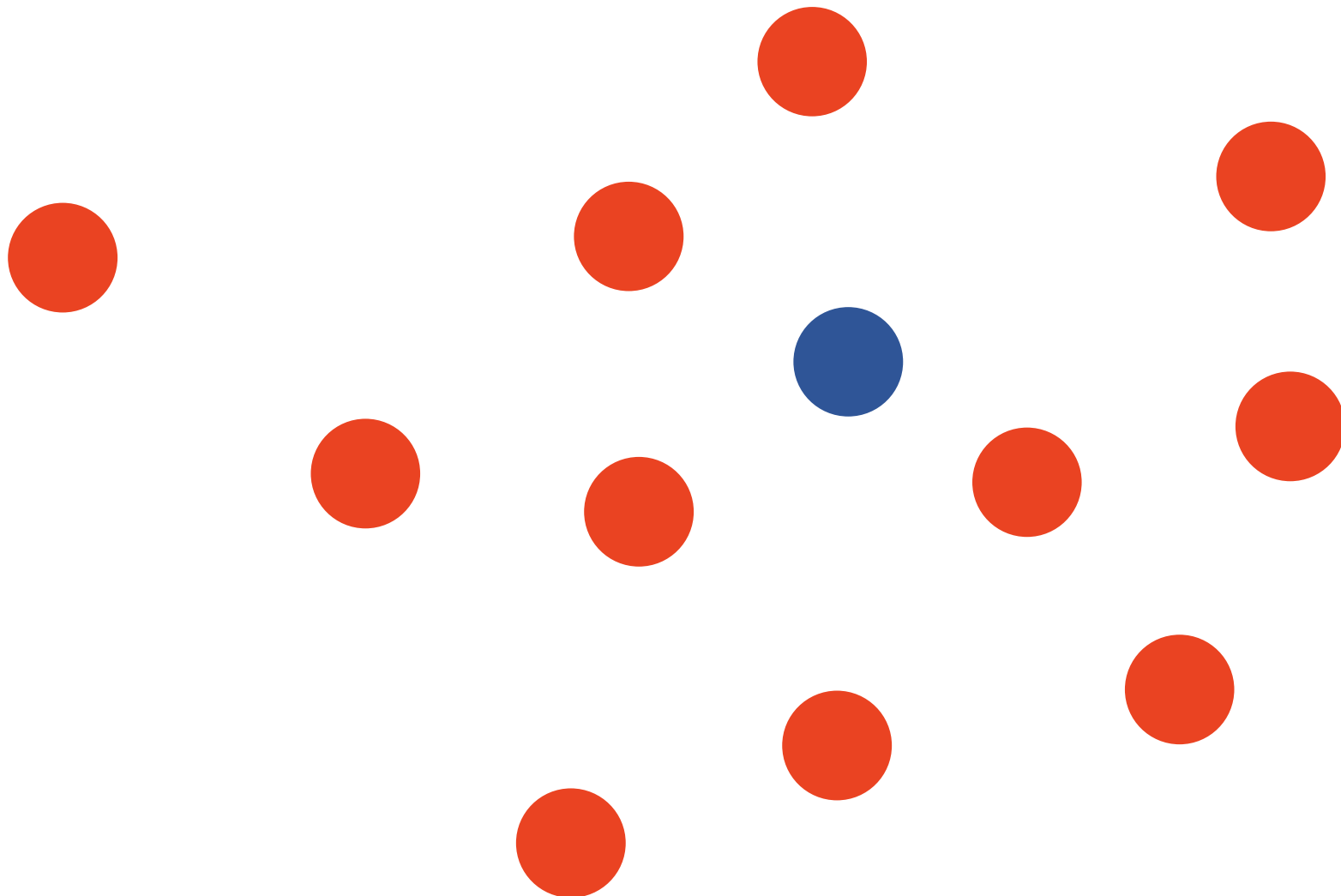












Horizontal blue bar

Horizontal blue bar

Horizontal blue bar

Horizontal blue bar

Horizontal blue bar

Horizontal blue bar

Horizontal blue bar

Horizontal blue bar

Diagonal blue bar

Horizontal blue bar

Horizontal blue bar

Horizontal blue bar

7 2 3 4 8 6 3 5 9 0 6 5 4 3 7 2 9 8 6 3 5 6 3
0 9 8 6 3 7 5 3 7 8 9 2 3 7 6 5 1 0 9 3 8 7 2
3 4 5 6 3 8 9 0 6 5 4 3 3 2 9 8 6 3 5 6 5 2 0
9 8 6 3 5 5 3 4 8 9 2 2 7 6 5 1 0 9 3 8 6 2 3
4 5 6 3 5 9 0 6 5 4 3 7 2 9 8 6 3 4 6 4 5 0 9
8 6 2 2 5 3 7 8 9 2 3 7 6 5 1 0 9 3 8 1 2 3 4
5 6 3 5 9 6 6 5 4 3 7 2 9 8 6 3 5 6 5 2 0 9 8
6 3 5 5 3 7 8 9 2 3 6 6 7 1 0 9 3 8 7 2 3 4 5
6 3 1 9 0 6 5 4 3 3 2 9 8 6 2 5 6 5 2 0 9 8 6

7 2 3 4 8 6 3 **5** 9 0 6 **5** 4 3 7 2 9 8 6 3 **5** 6 3
0 9 8 6 3 7 **5** 3 7 8 9 2 3 7 6 **5** 1 0 9 3 8 7 2
3 4 **5** 6 3 8 9 0 6 **5** 4 3 3 2 9 8 6 3 **5** 6 **5** 2 0
9 8 6 3 **5 5** 3 4 8 9 2 2 7 6 **5** 1 0 9 3 8 6 2 3
4 **5** 6 3 **5** 9 0 6 **5** 4 3 7 2 9 8 6 3 4 6 4 **5** 0 9
8 6 2 2 **5** 3 7 8 9 2 3 7 6 **5** 1 0 9 3 8 1 2 3 4
5 6 3 **5** 9 6 6 **5** 4 3 7 2 9 8 6 3 **5** 6 **5** 2 0 9 8
6 3 **5 5** 3 7 8 9 2 3 6 6 7 1 0 9 3 8 7 2 3 4 **5**
6 3 1 9 0 6 **5** 4 3 3 2 9 8 6 2 **5** 6 **5** 2 0 9 8 6

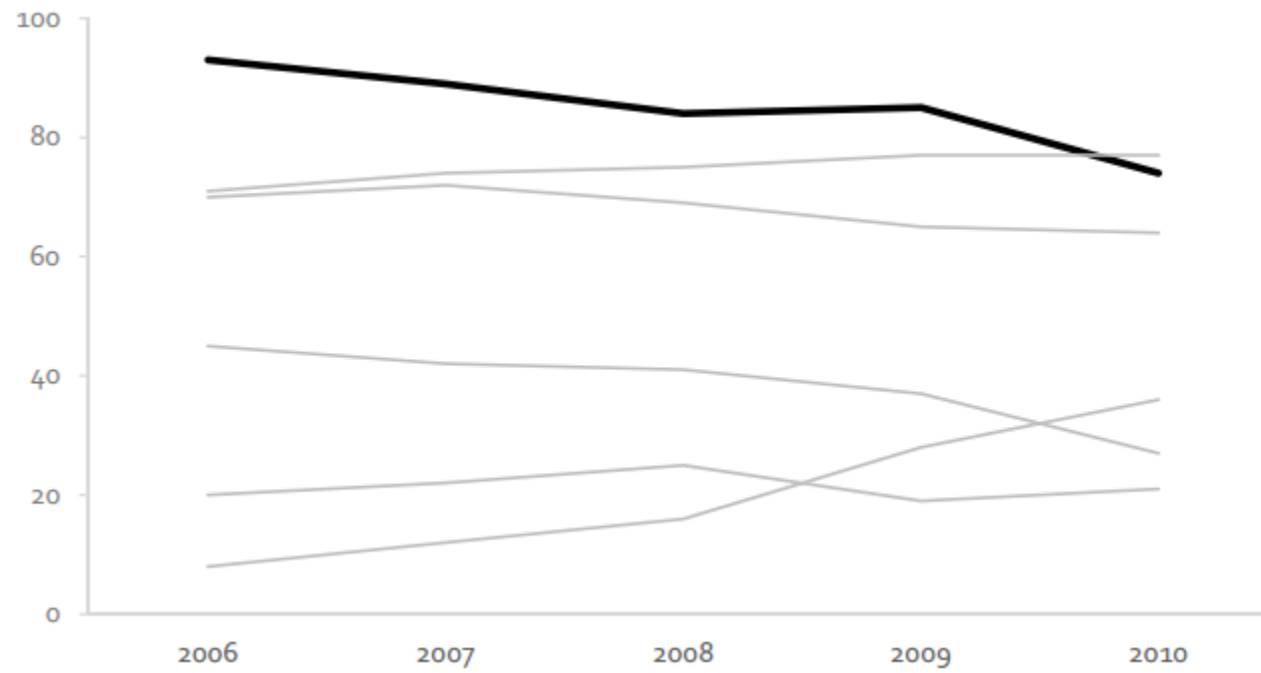
Předpozornostní atributy

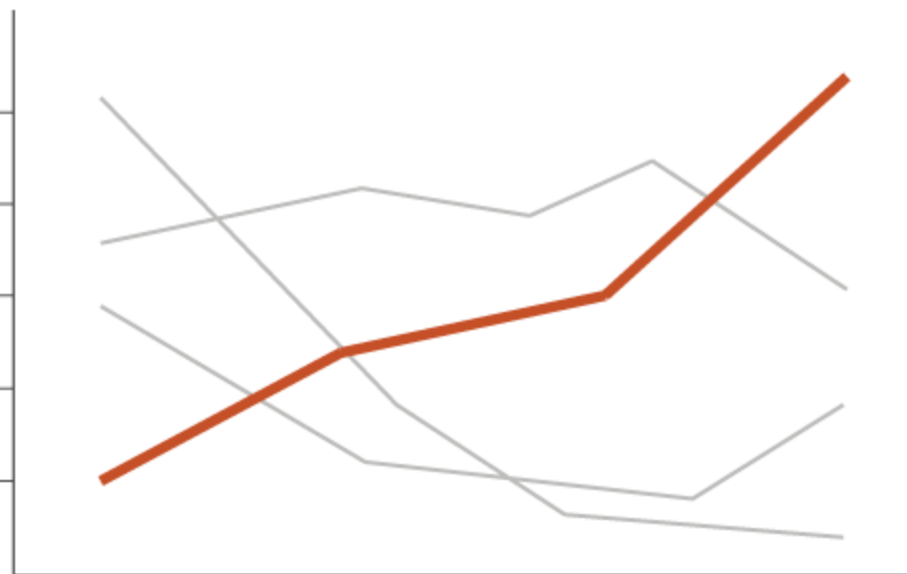
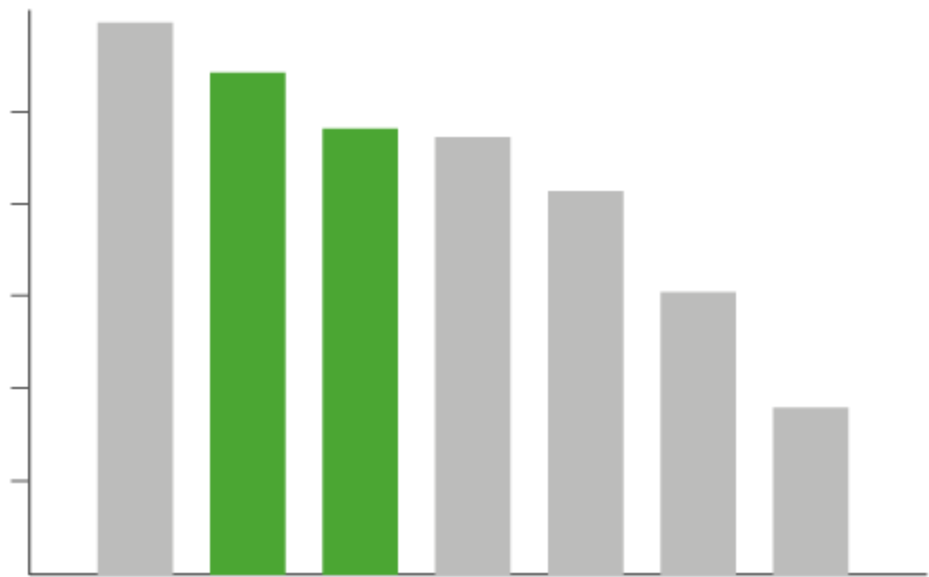
Orientace, tvar, délka čáry, šířka čáry,
velikost, pozice, odstín a sytost,
pohyb,...

Zjednodušeně všechno, co *narušuje vzory*,
co se vymyká okolí.



co s tím?

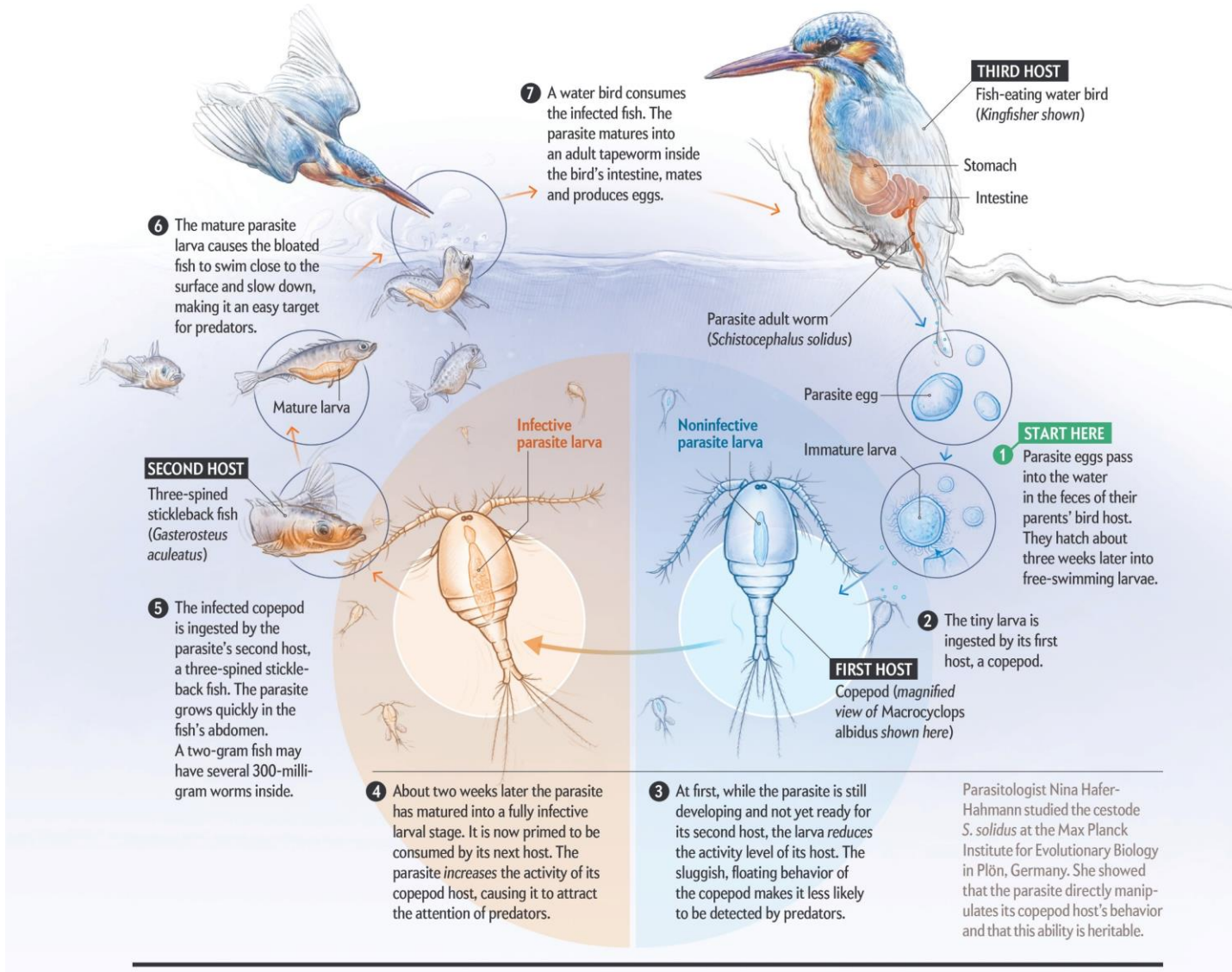






GRAPHIC SCIENCE

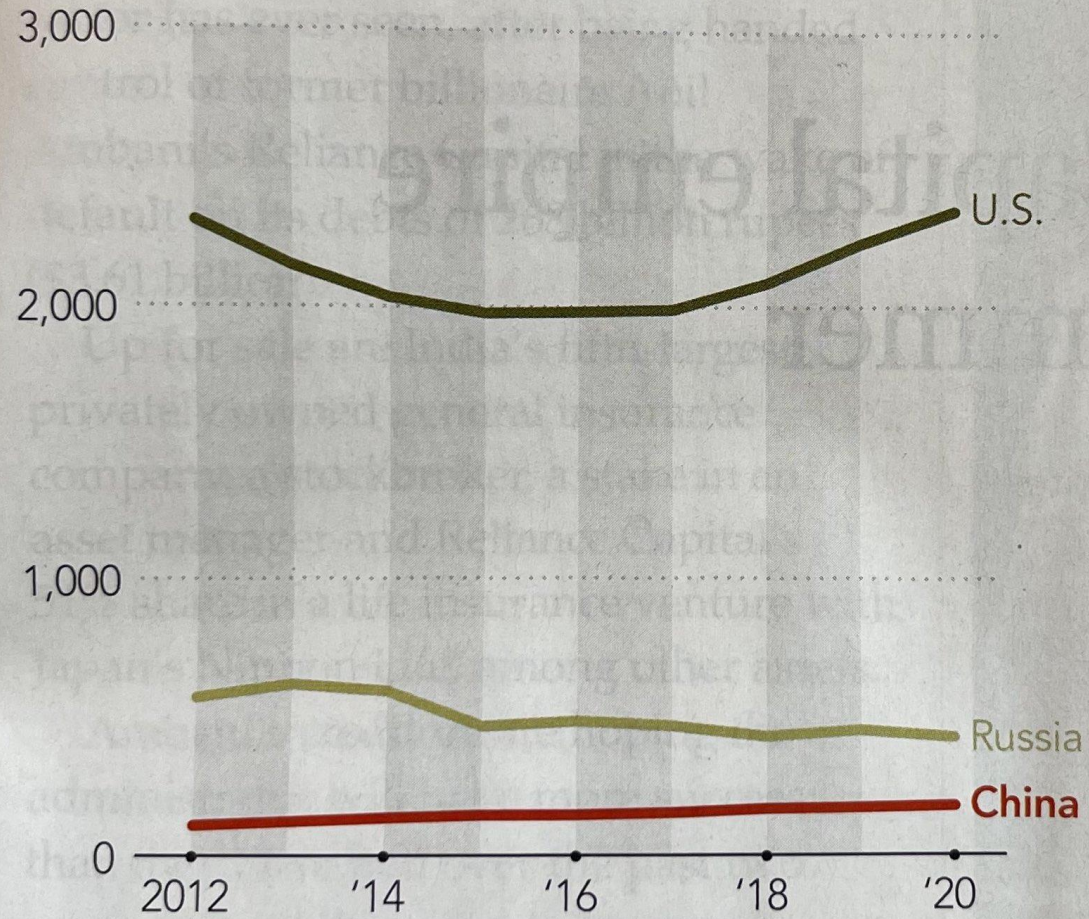
Text by Madhusree Mukerjee | Graphic by Daisy Chung



Parasitologist Nina Hafer-Hahmann studied the cestode *S. solidus* at the Max Planck Institute for Evolutionary Biology in Plön, Germany. She showed that the parasite directly manipulates its copepod host's behavior and that this ability is heritable.

China's military spending has risen steadily over the past decade

(Military expenditure per capita, in dollars)



Source: Stockholm International Peace Research Institute

vedení pozornosti *odbočka*

https://youtu.be/IGQmdoK_ZfY?t=5

<https://www.ncbi.nlm.nih.gov/pubmed/10694957>

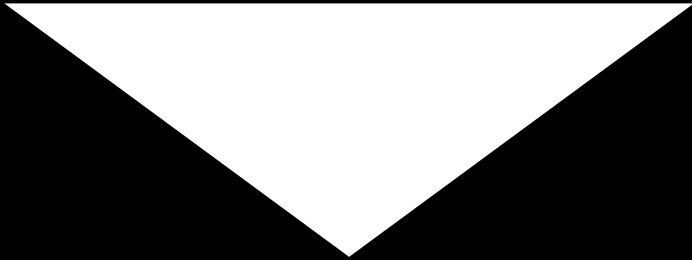
Třístupňový model

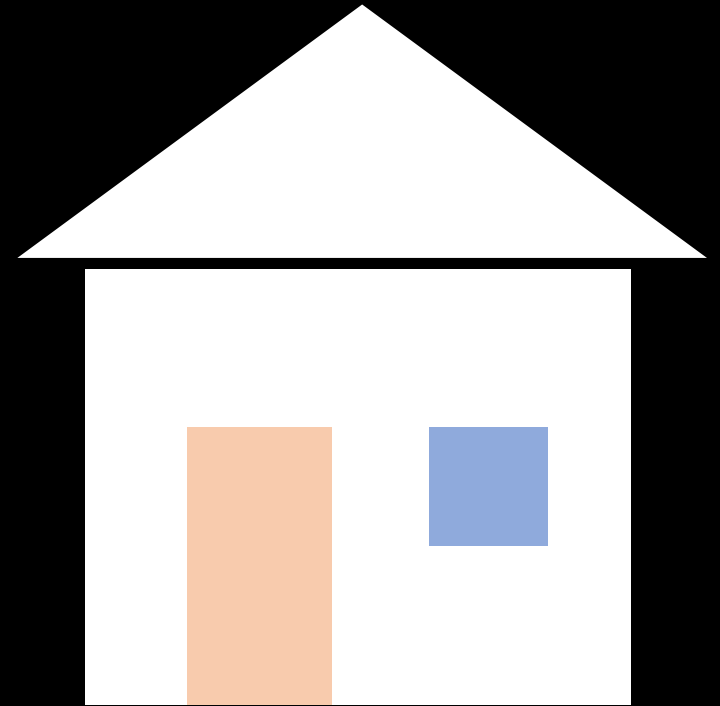
Colin Ware

Fáze 1: neurony na sítnici a ve vizuálním kortexu hledají nejzákladnější objekty ve vizuálním poli (tunable/pop-out).

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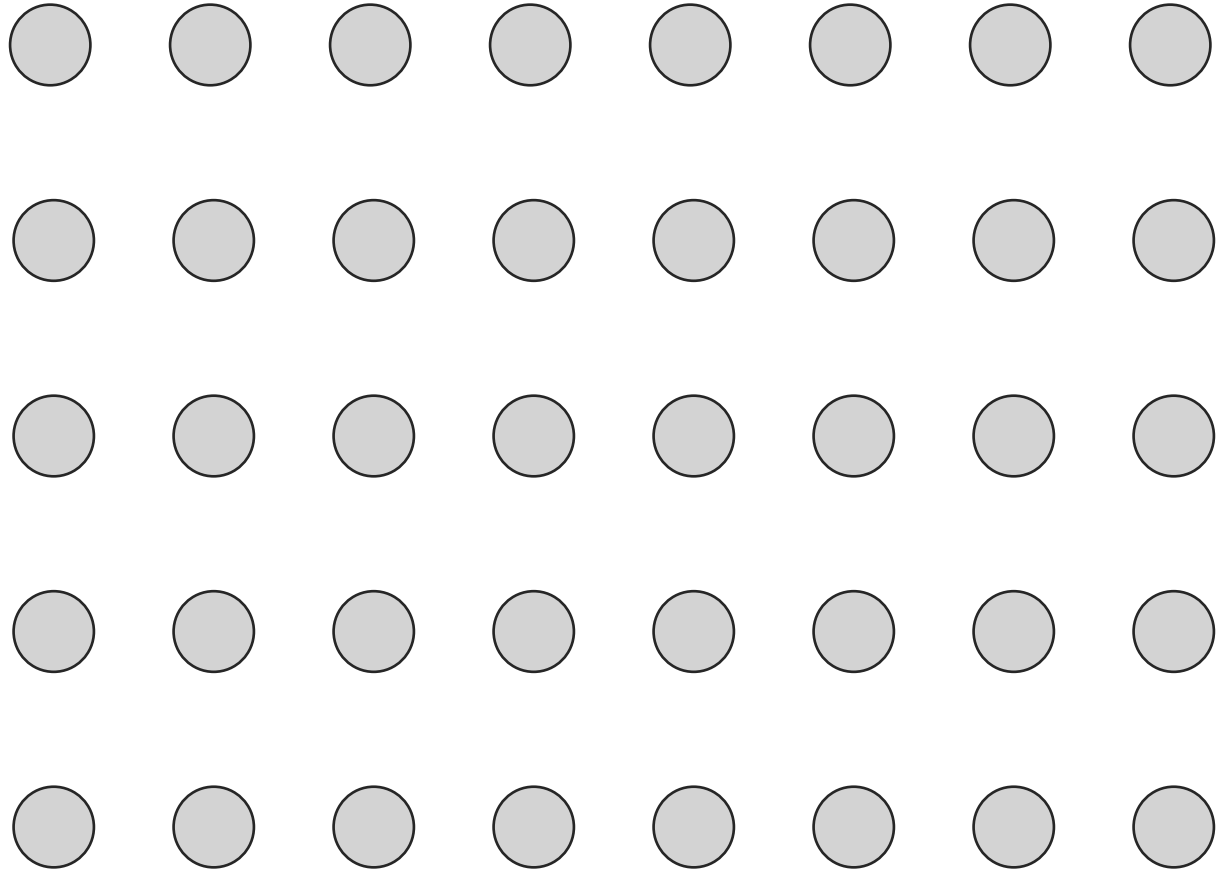


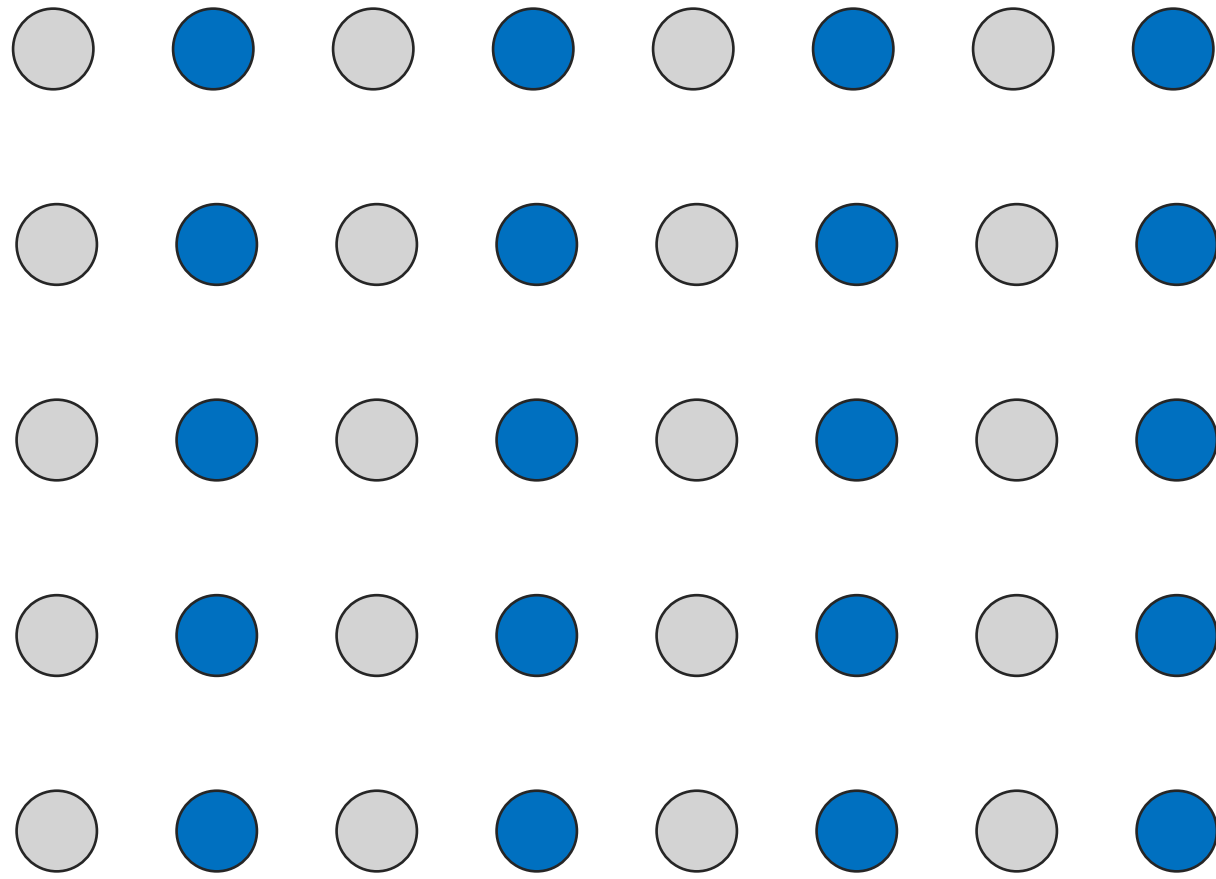


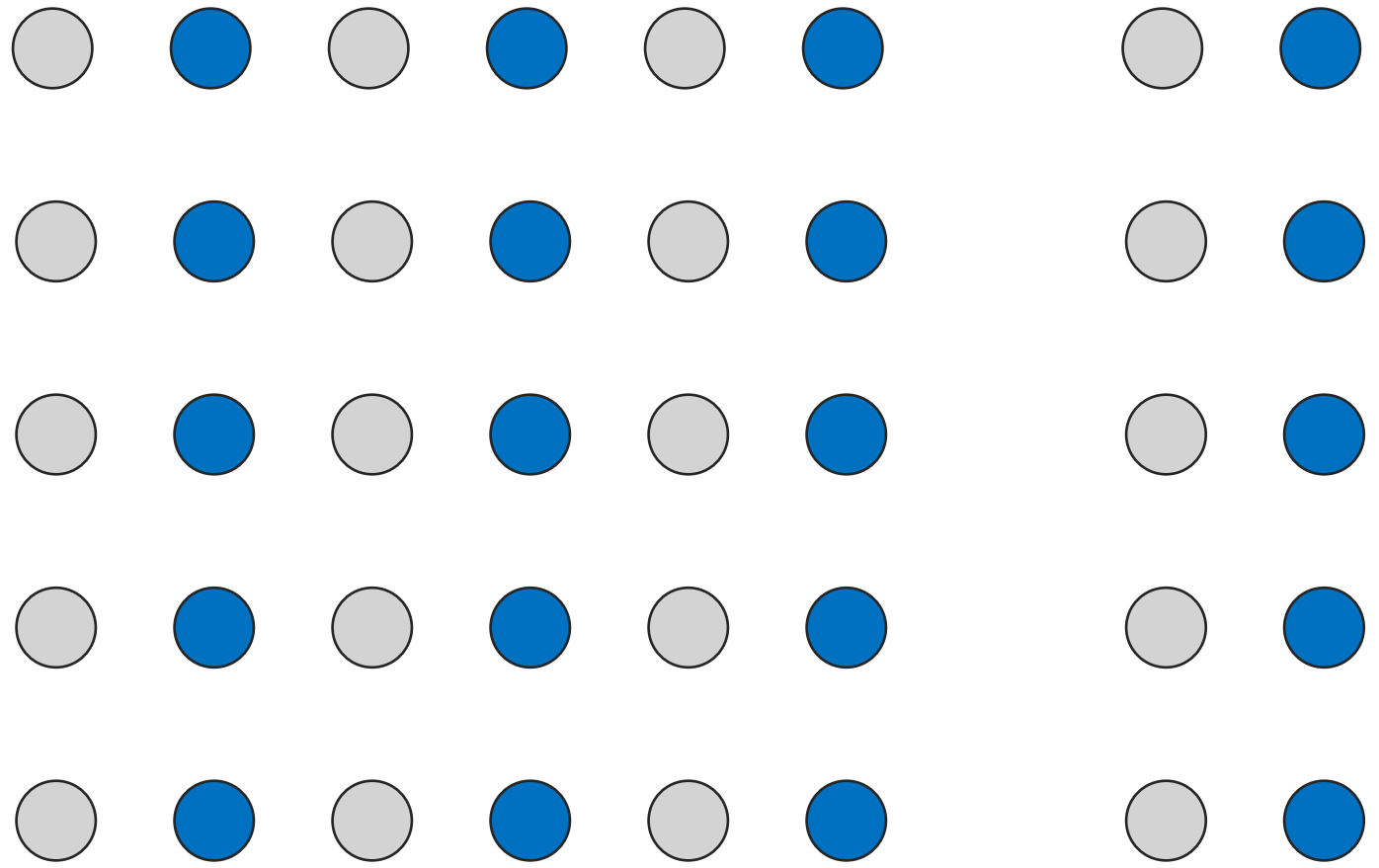


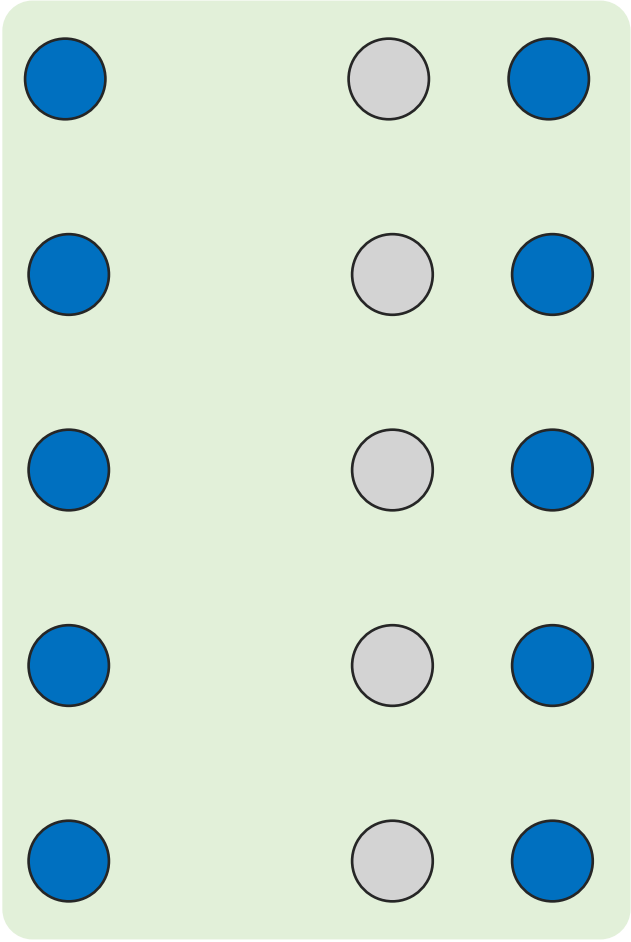
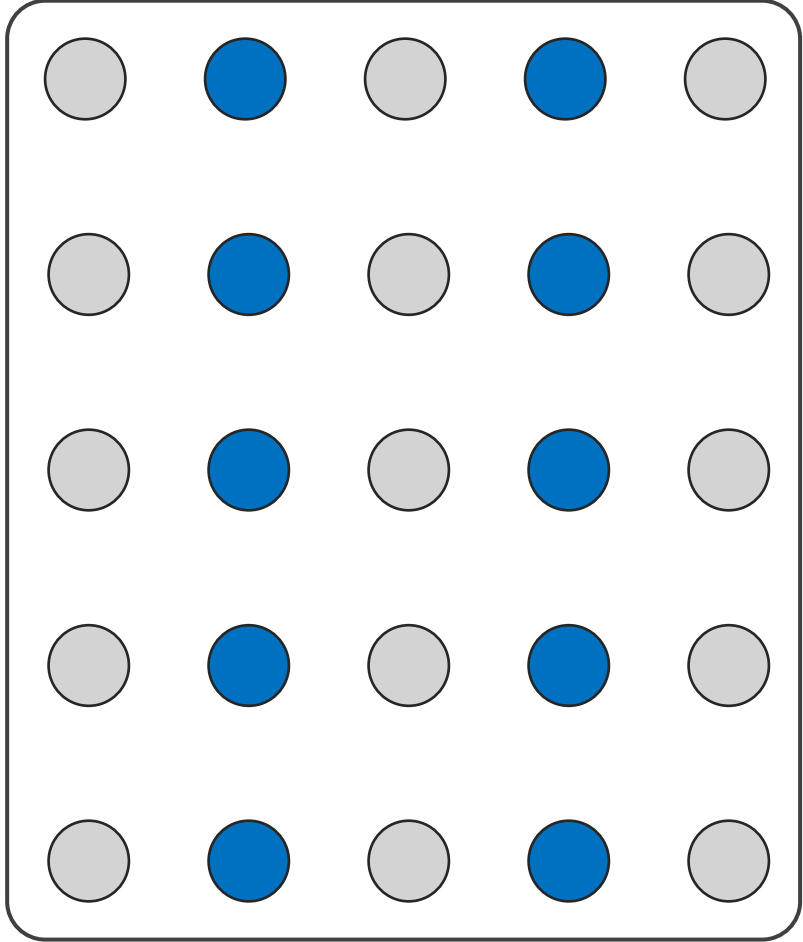
Zákony gestaltu

figura a pozadí





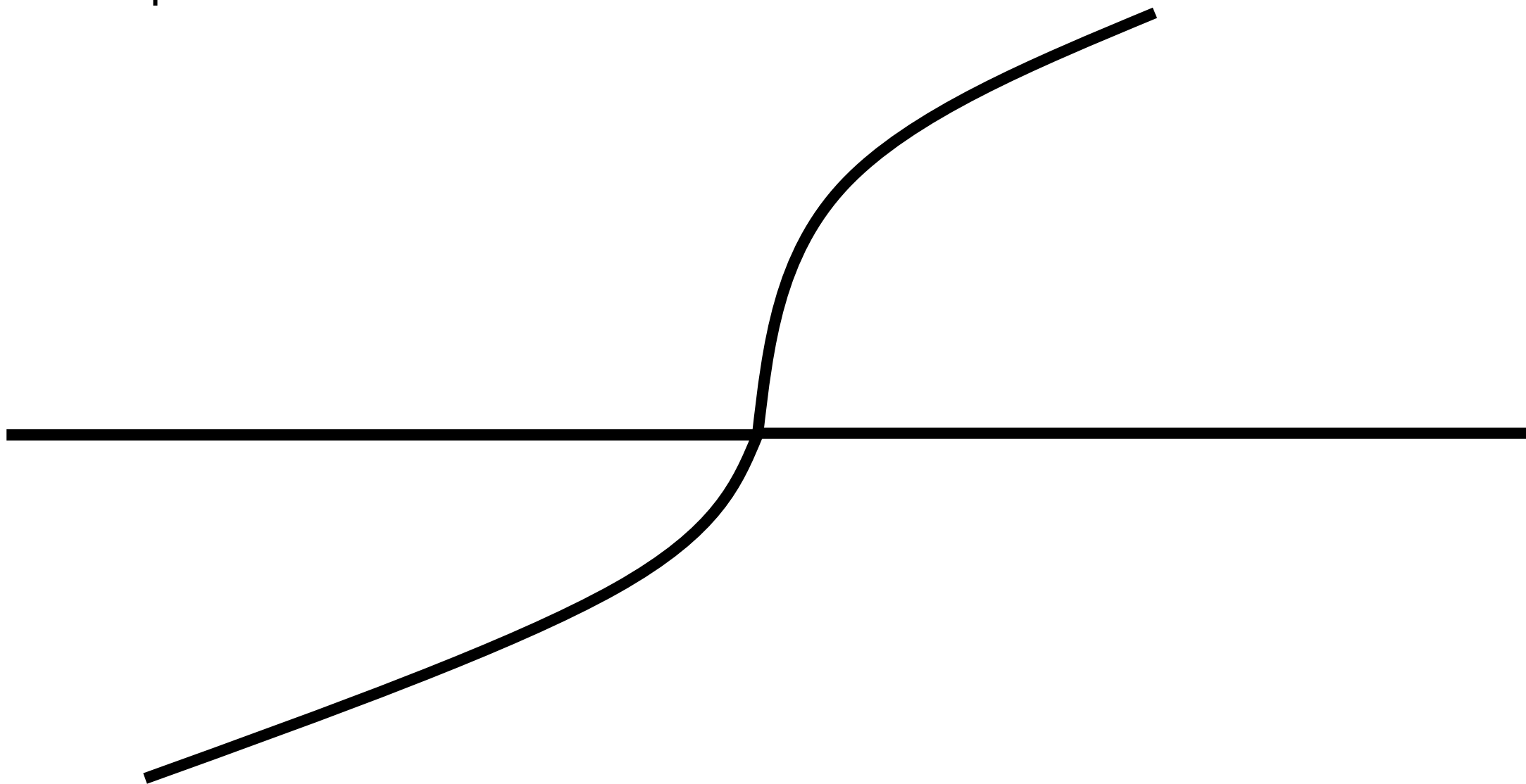




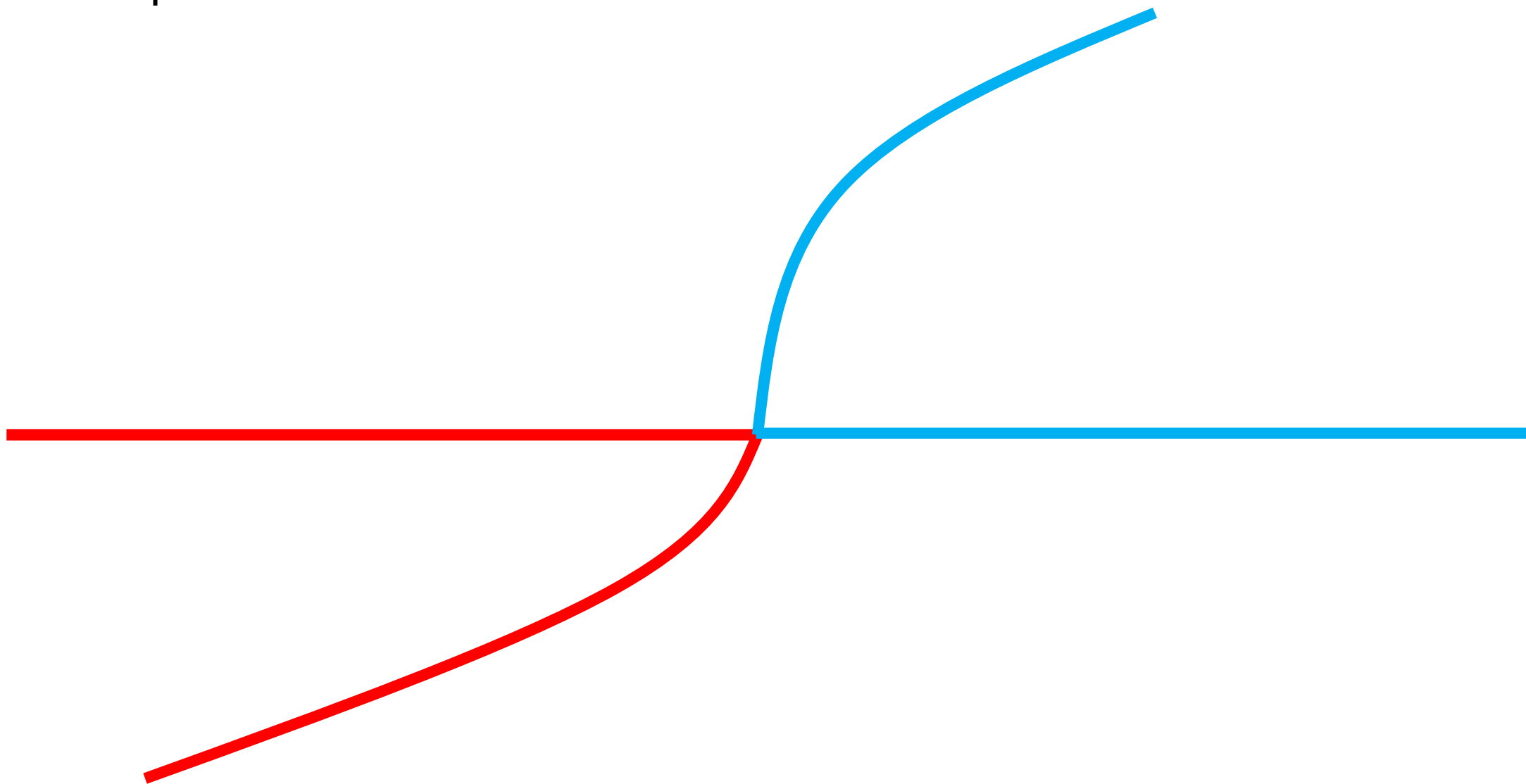
Zákon společného osudu



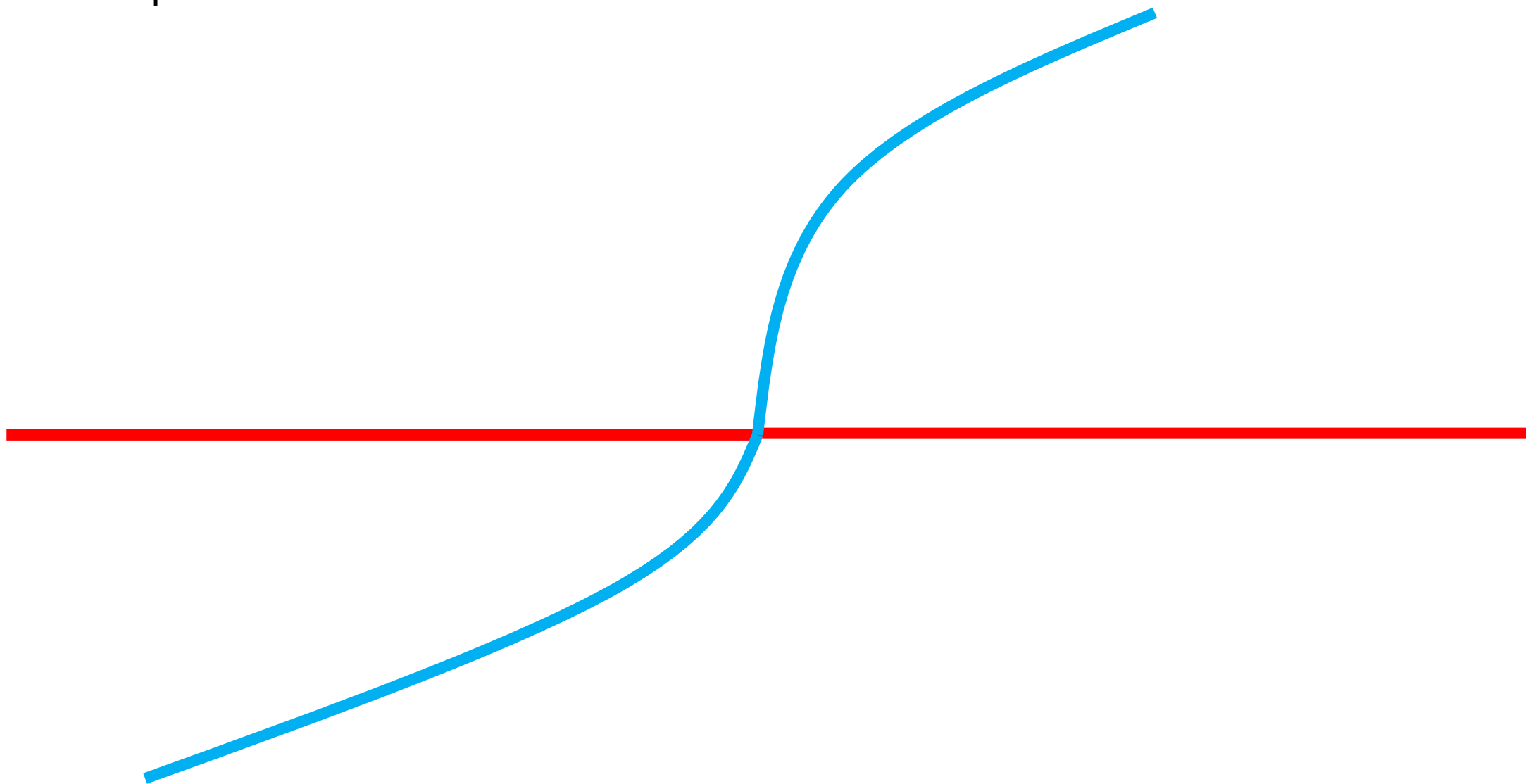
Zákon pokračování



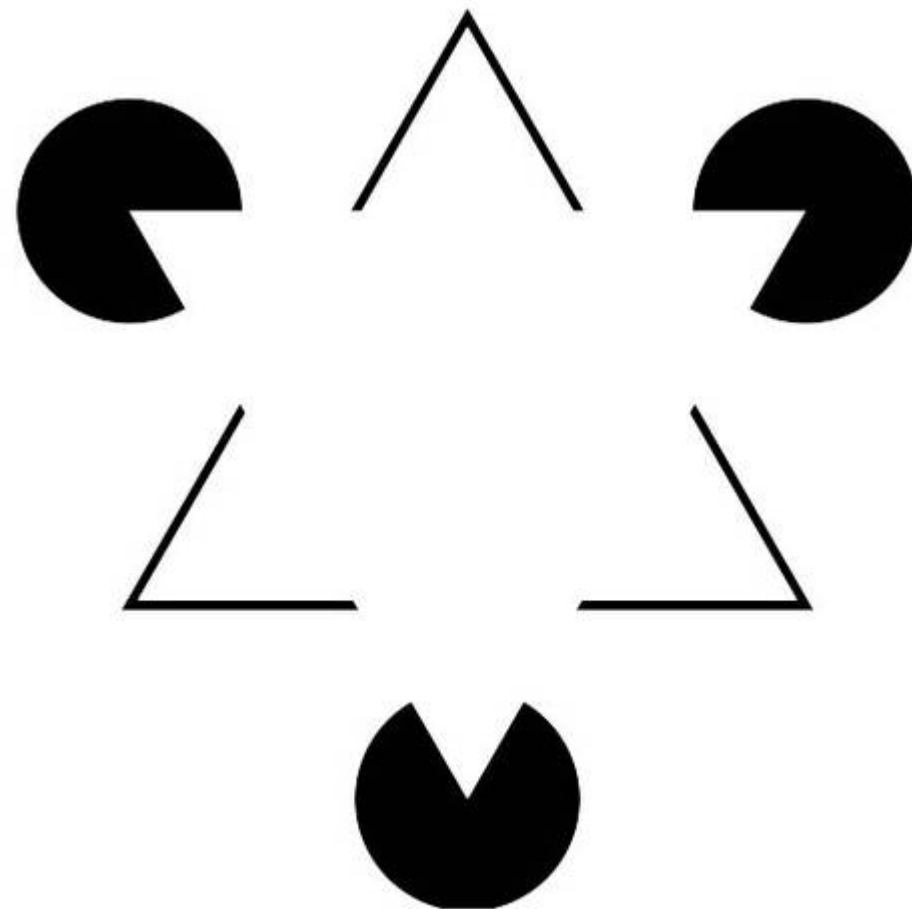
Zákon pokračování



Zákon pokračování

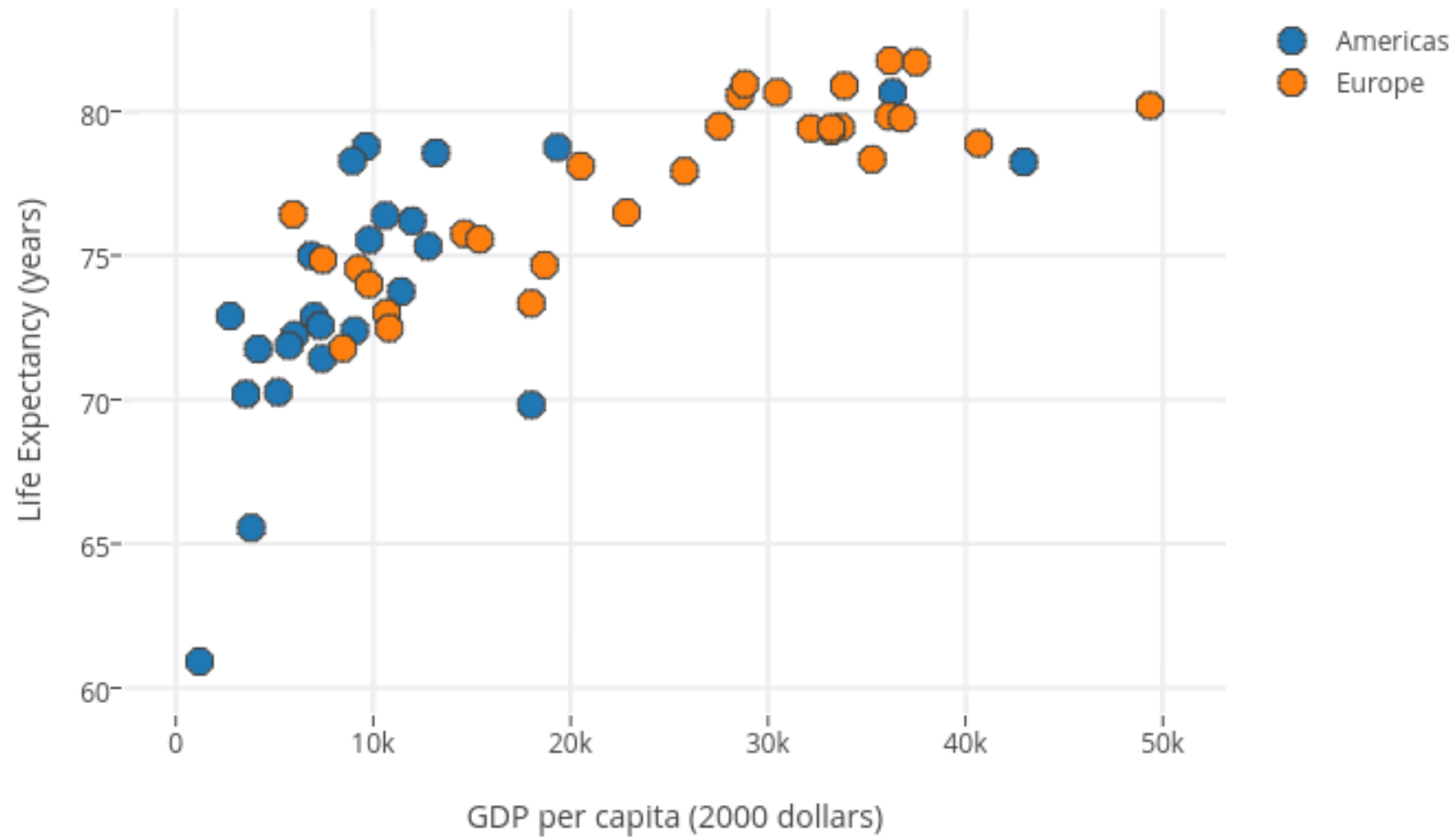


Zákon uzavření



co s tím?

Life Expectancy v. Per Capita GDP, 2007



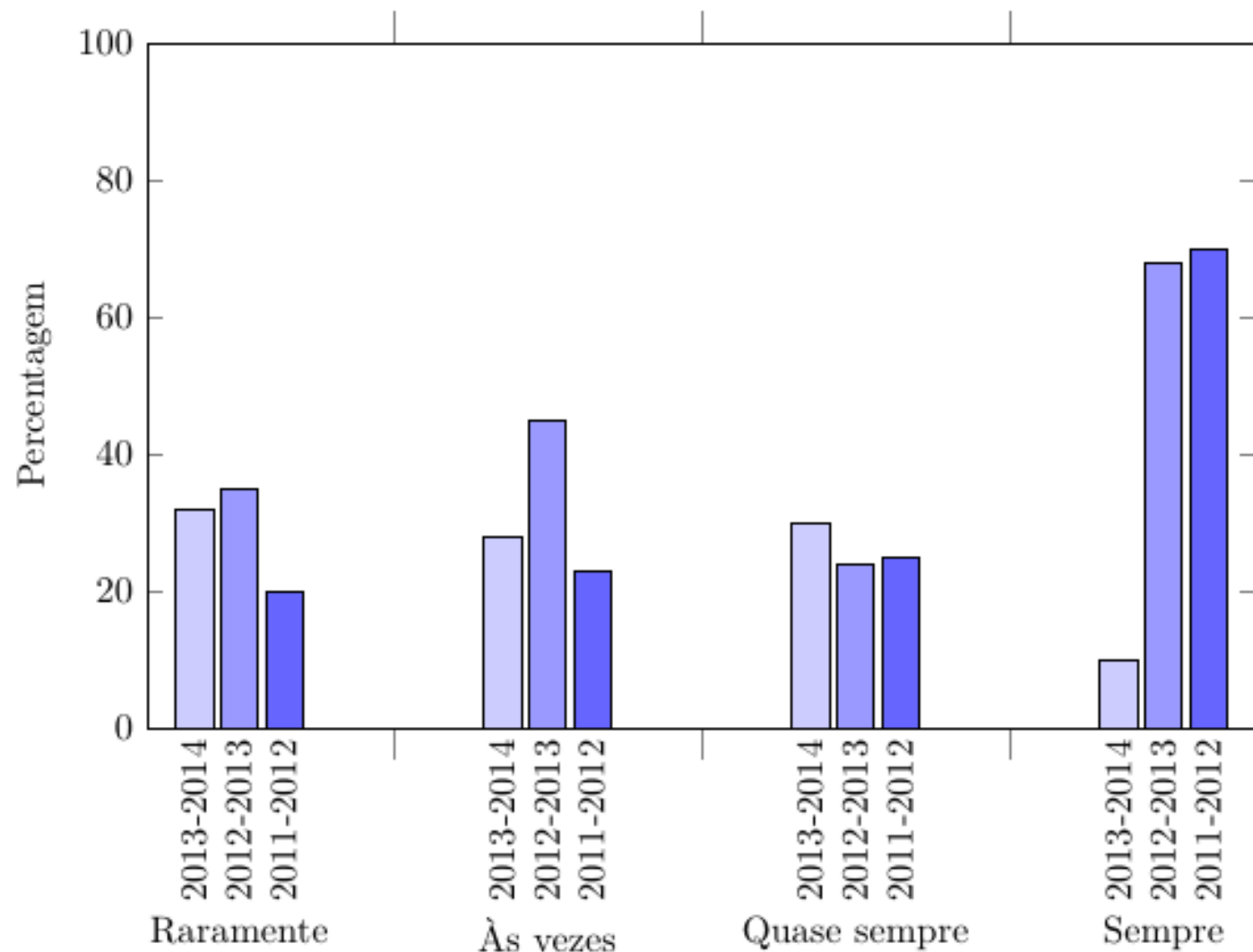
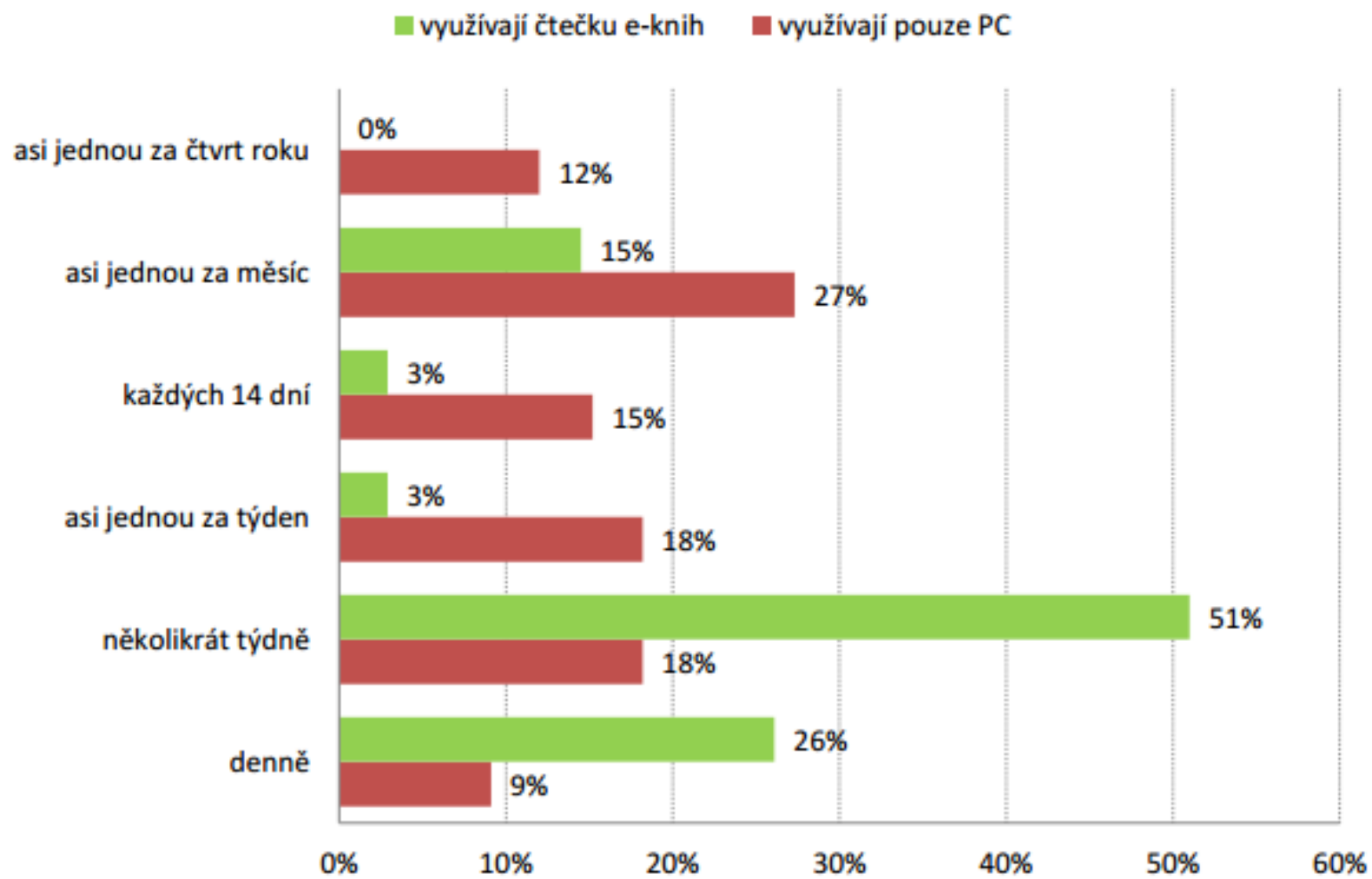
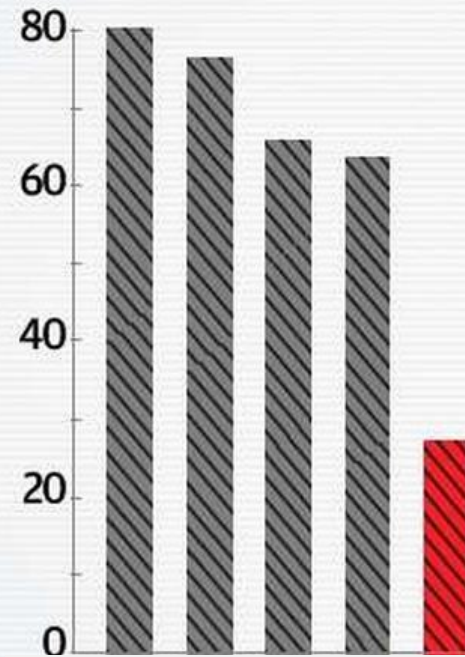


Gráfico 1 – *Em sua casa é costume desligar os equipamentos no controlo remoto, deixando-os em standby (modo de “espera”)?*

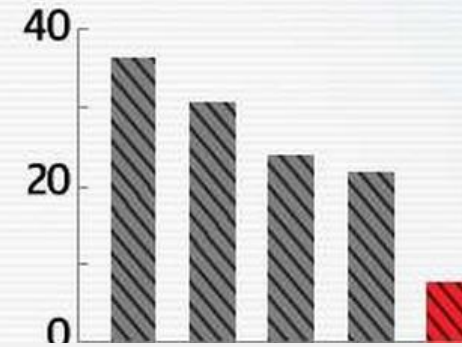
Graf 6: Frekvence čtení e-knih v závislosti na zařízení



Percentage of Americans that believe God exists



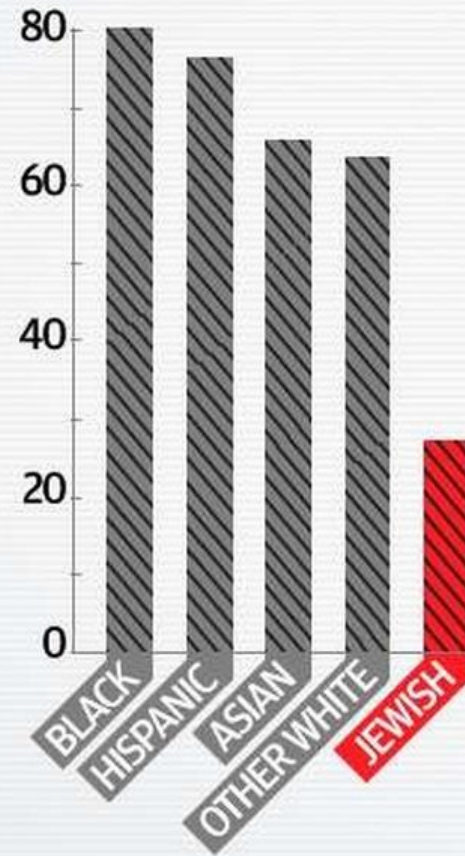
Percentage of Americans that attend religious services



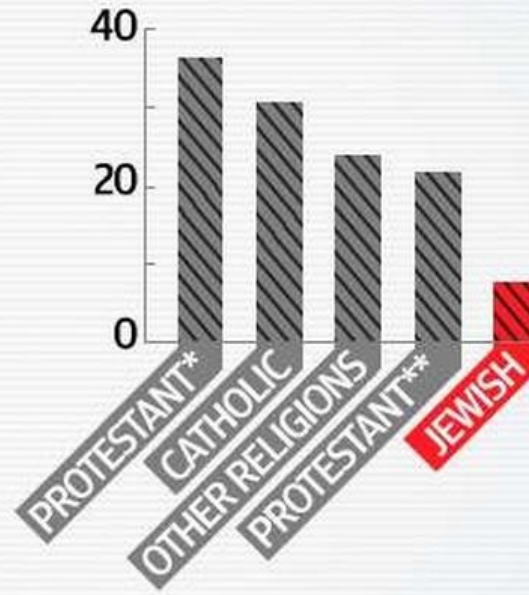
*FUNDAMENTALIST **LIBERAL

SOURCE: JEWISH DISTINCTIVENESS IN AMERICA BY DR. TOM SMITH. THE AMERICAN JEWISH COMMITTEE. APRIL 2005.

Percentage of Americans that believe God exists



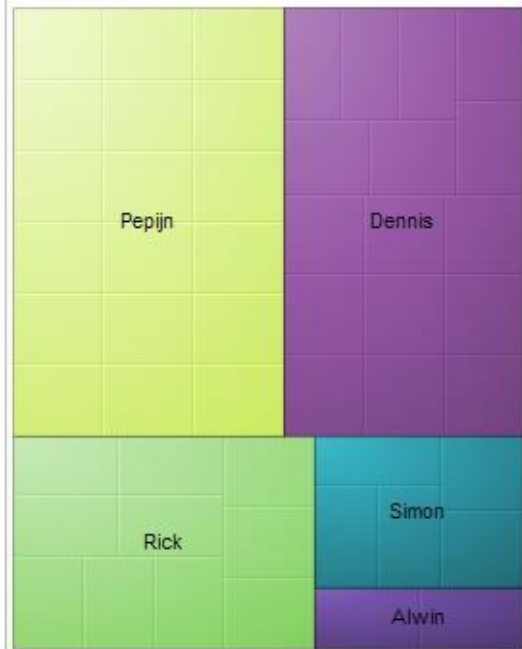
Percentage of Americans that attend religious services



*FUNDAMENTALIST **LIBERAL

SOURCE: JEWISH DISTINCTIVENESS IN AMERICA BY DR. TOM SMITH. THE AMERICAN JEWISH COMMITTEE. APRIL 2005.

Dr.Pepper 51



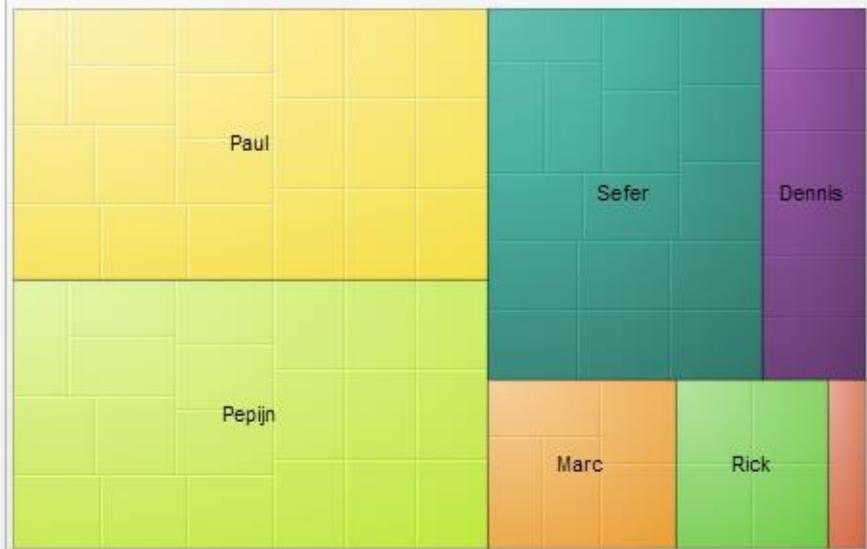
Fanta 33



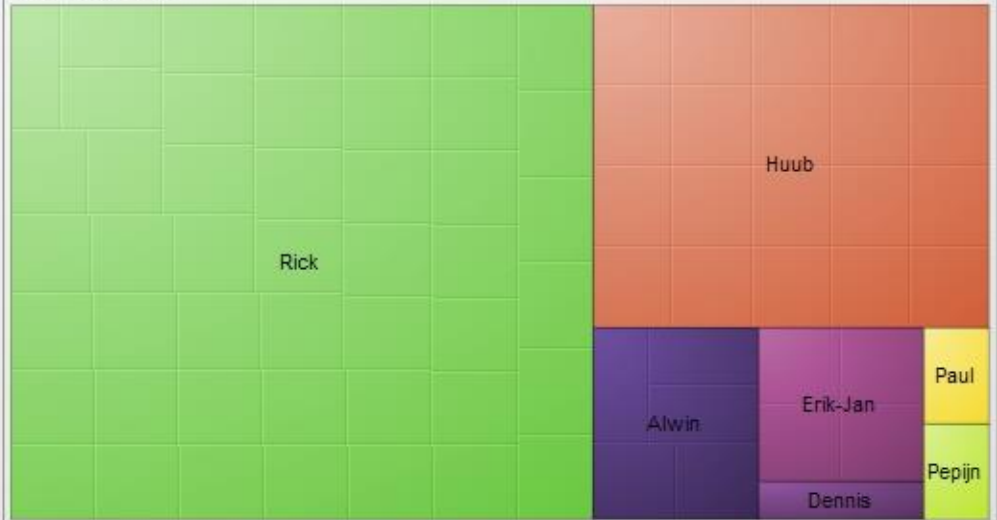
Coca Cola 100



Ice Tea 72



Coca Cola Light 79



● 1% Growth ● 2% Growth ● 3% Growth ● 20% Growth

Asia

Indonesia

Russia

Malaysia

North America

United States

Mexico

Canada

South America

Colombia

Brazil

Africa

Nigeria

Egypt

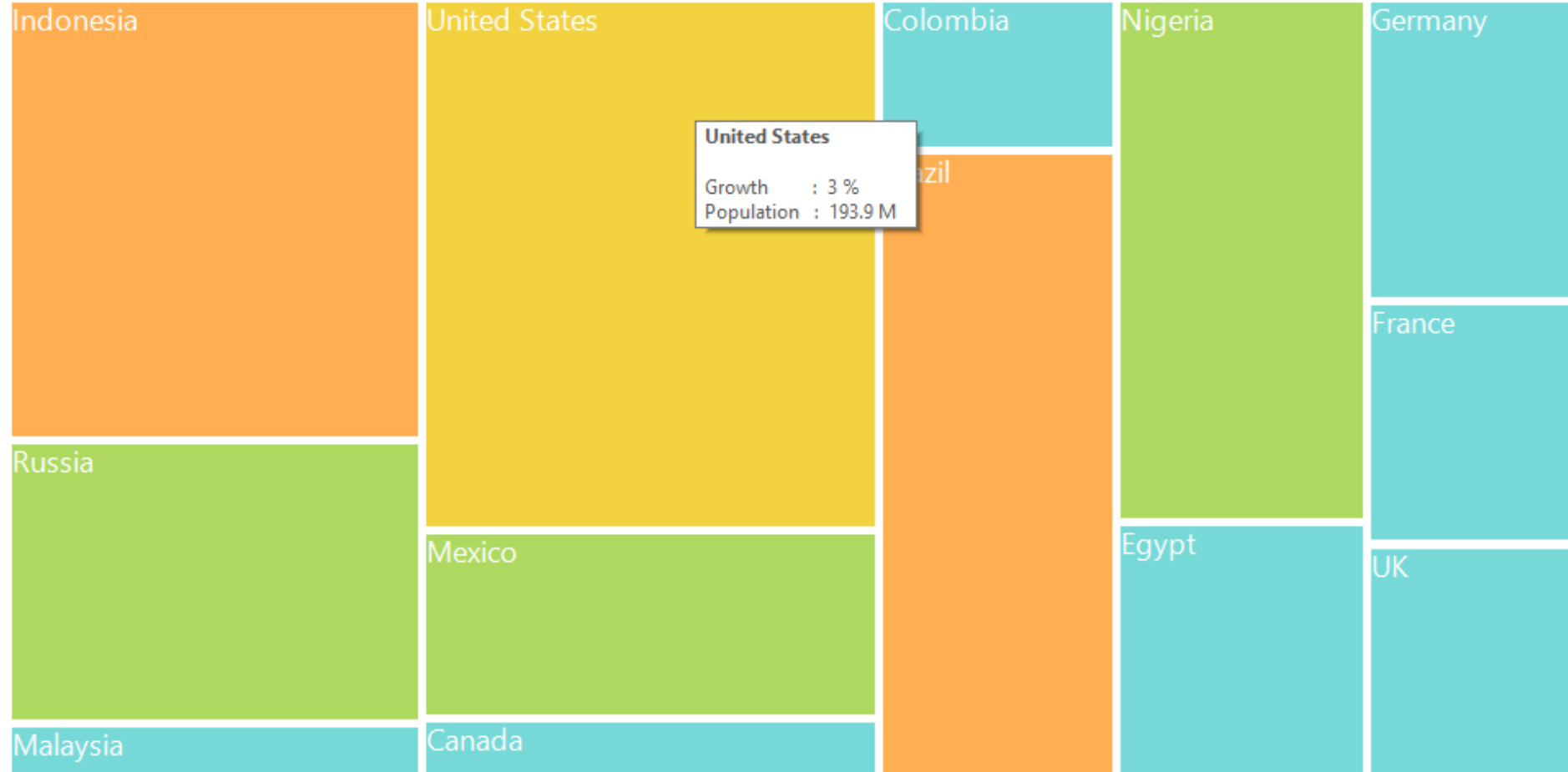
Europe

Germany

France

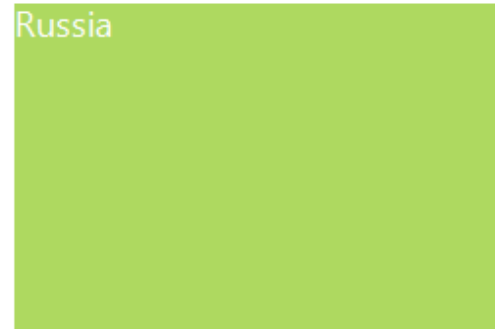
UK

United States
Growth : 3 %
Population : 193.9 M

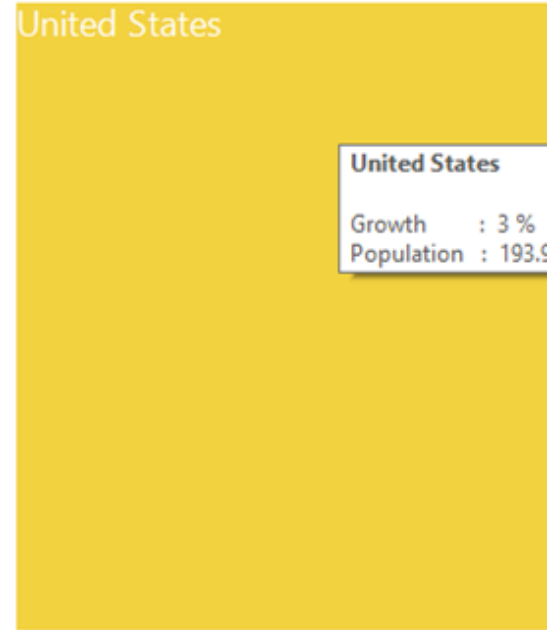


● 1% Growth ● 2% Growth ● 3% Growth ● 20% Growth

Asia



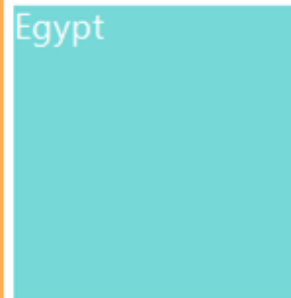
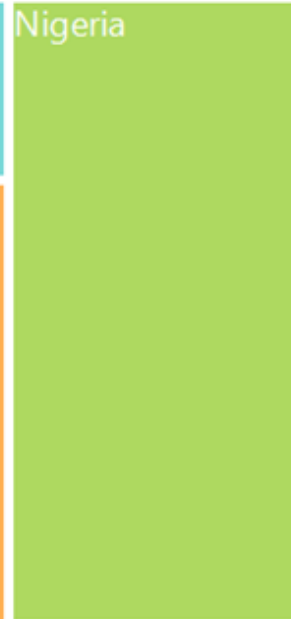
North America



South America



Africa



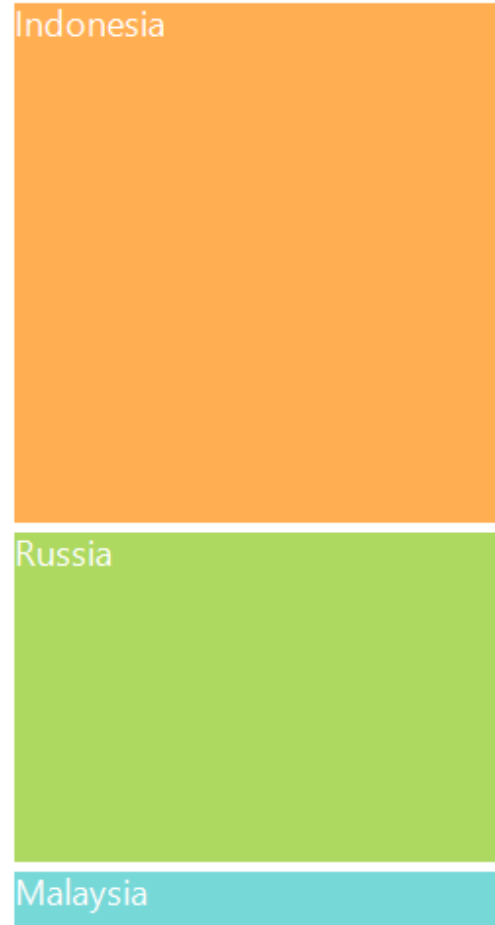
Europe



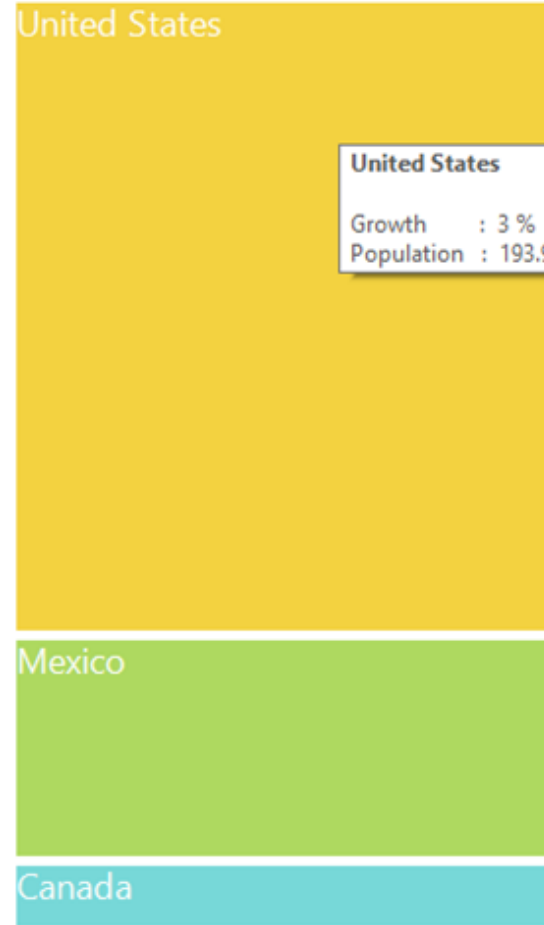
United States
Growth : 3 %
Population : 193.9 M

● 1% Growth ● 2% Growth ● 3% Growth ● 20% Growth

Asia



North America



United States
Growth : 3 %
Population : 193.9 M

South America



Africa



Europe



Koronavirus v Česku

9
mrtvých

26 698
testovaných

1925
nakažených

10
vyléčených



* Data z krajů jsou podle údajů KHS. Od celkových čísel se mohou lišit.

28.1. 30.1. 1.2. 3.2. 5.2. 7.2. 9.2. 11.2. 13.2. 15.2. 17.2. 19.2. 21.2. 23.2. 25.2. 27.2. 29.2. 1.3. 3.3. 5.3. 7.3. 9.3. 11.3. 13.3. 15.3. 17.3. 19.3. 21.3. 23.3. 25.3. 27.3.

● testovaných celkem ● testovaných denně ● nakažených ● vyléčených



Burza cenných papírů Praha

@prazskaburza



Co kdybyste na začátku roku investovali 10 000 Kč? Porovnali jsme YTD výkonnost několika populárních světových titulů se zástupci #BCPP a kdo má tituly z pražské burzy ve svém portfoliu, určitě nelituje

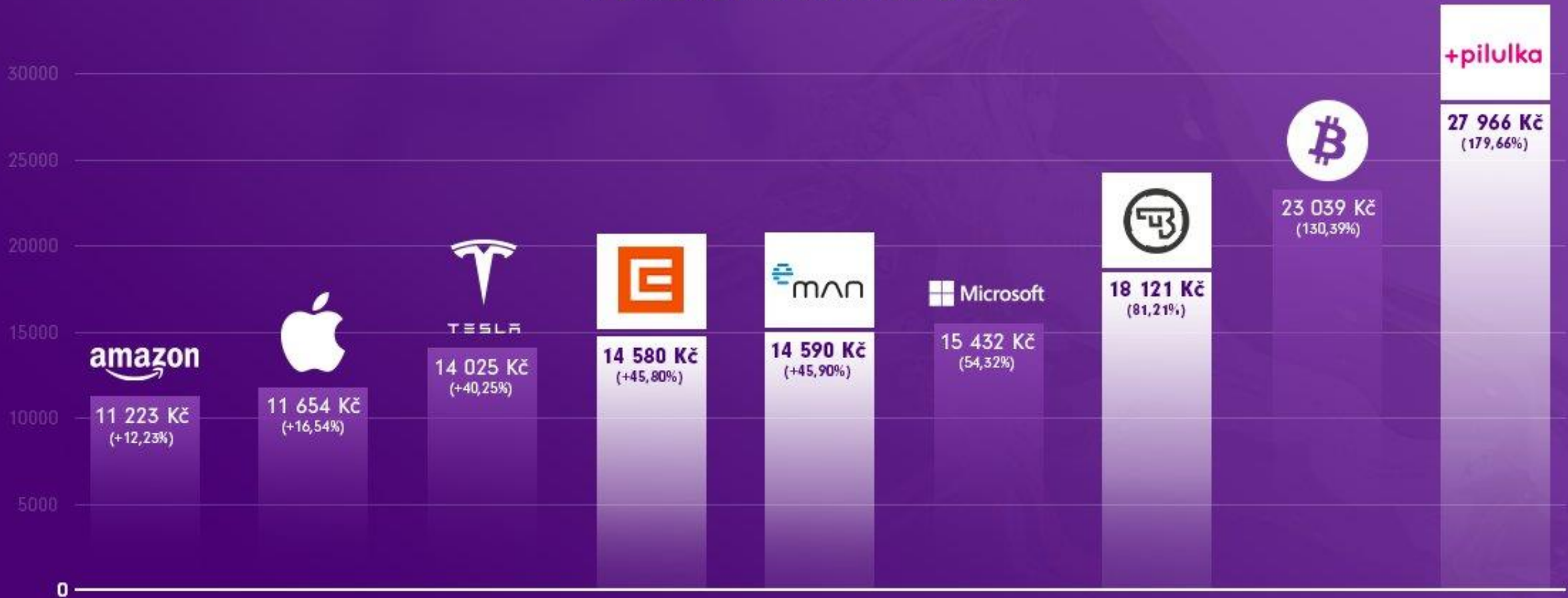


Pilulka.cz a Skupina ČEZ

11:45 dop. · 11. 11. 2021 · Twitter Web App

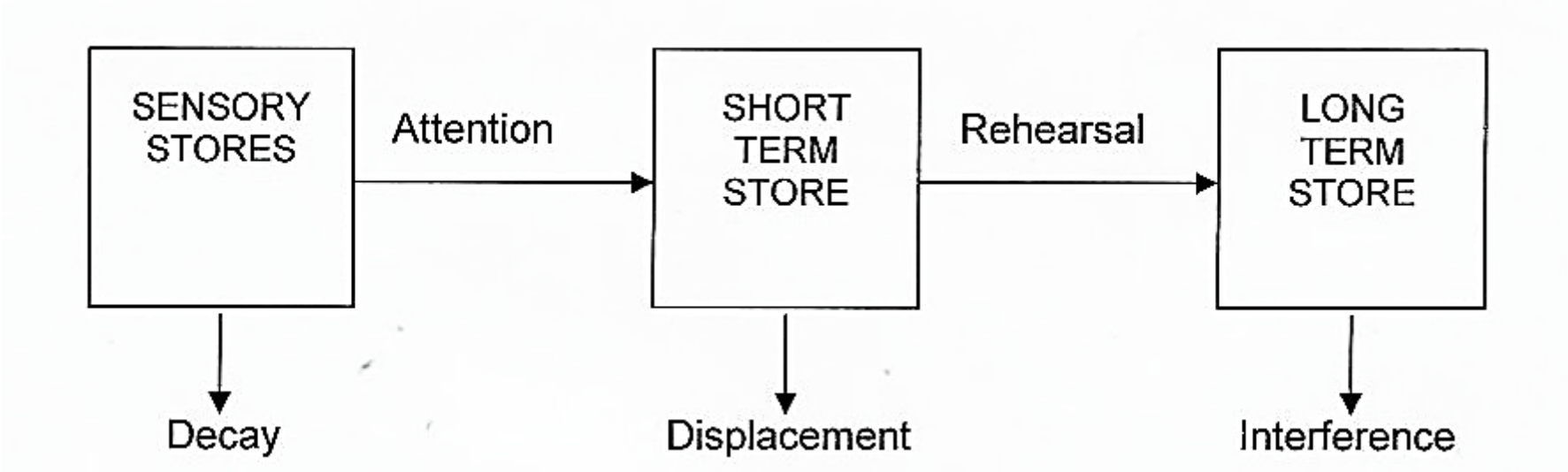
10 000 Kč

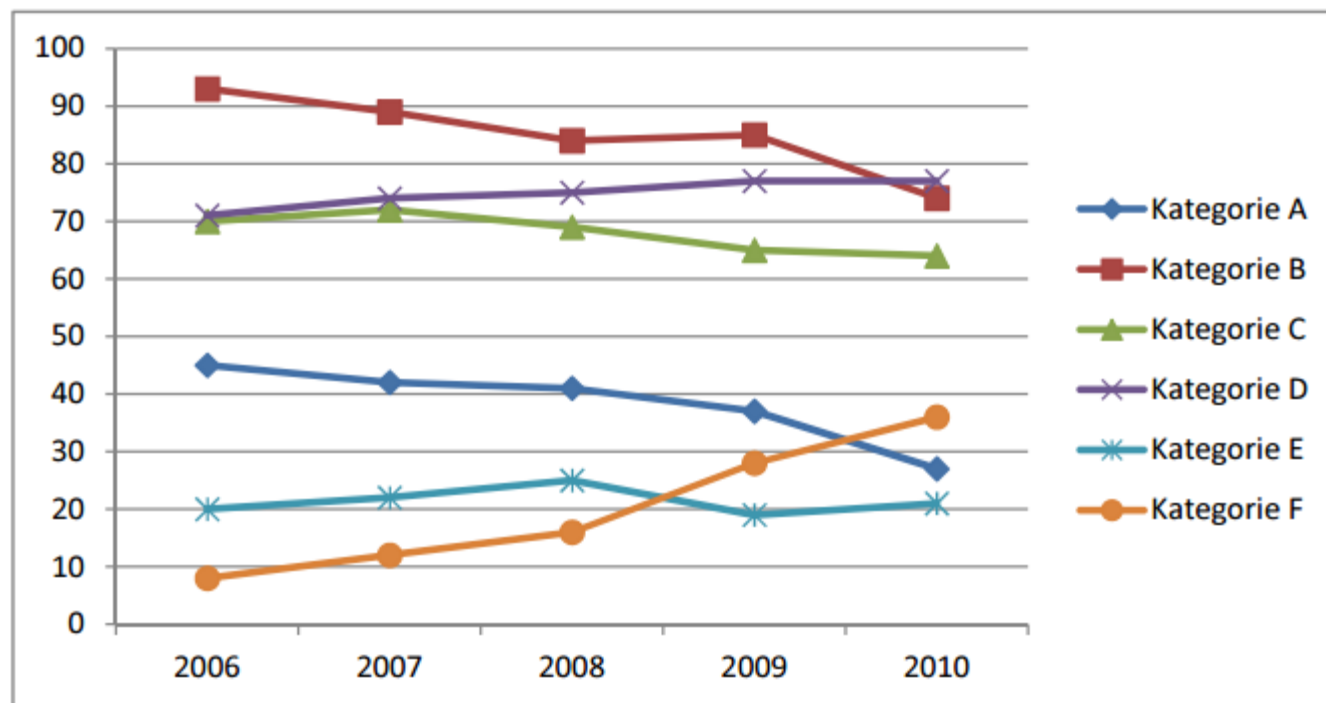
na začátku roku vs dnes



*Data se vztahují k průběhu dne 10. 11. 2021

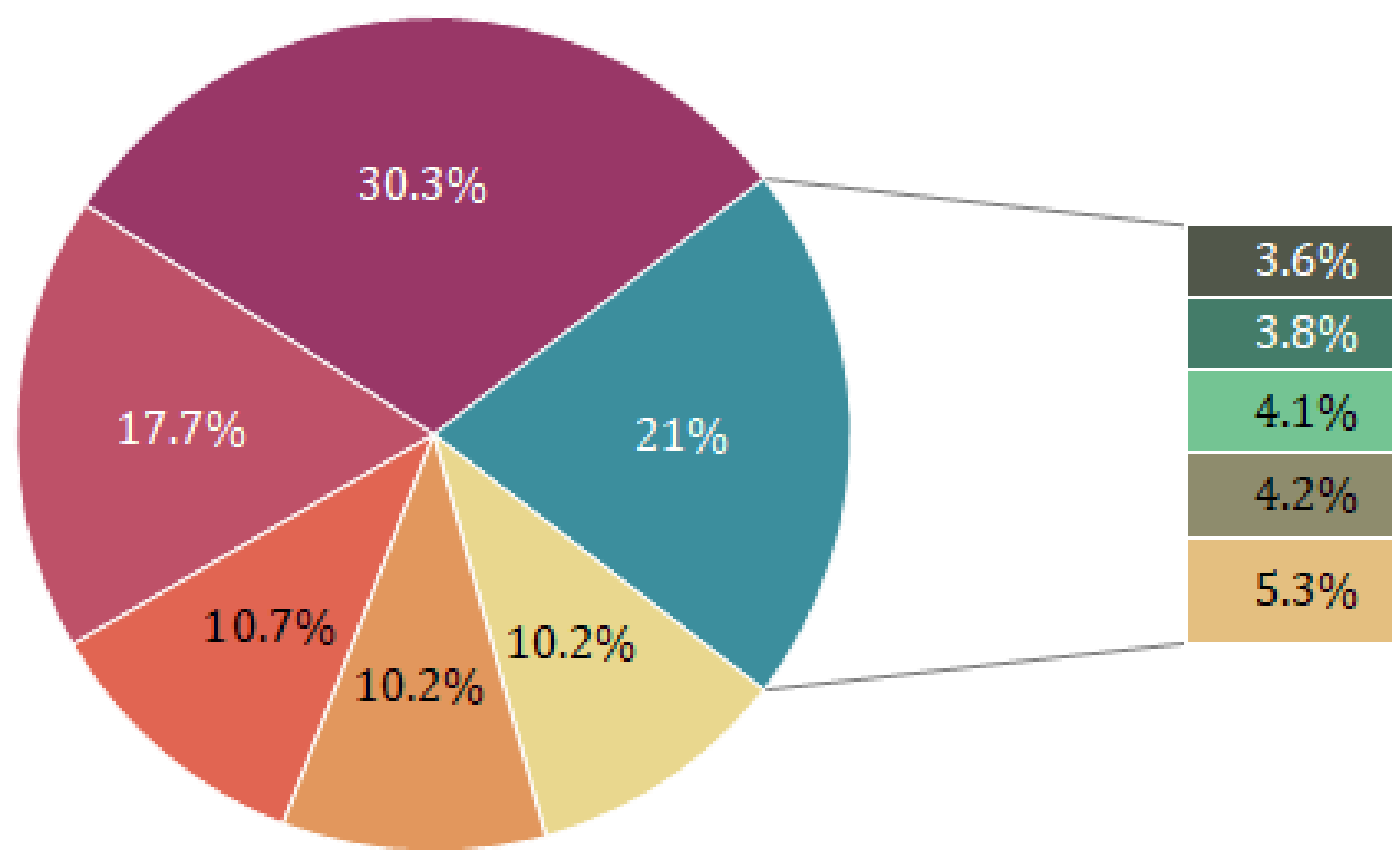
Limity paměti





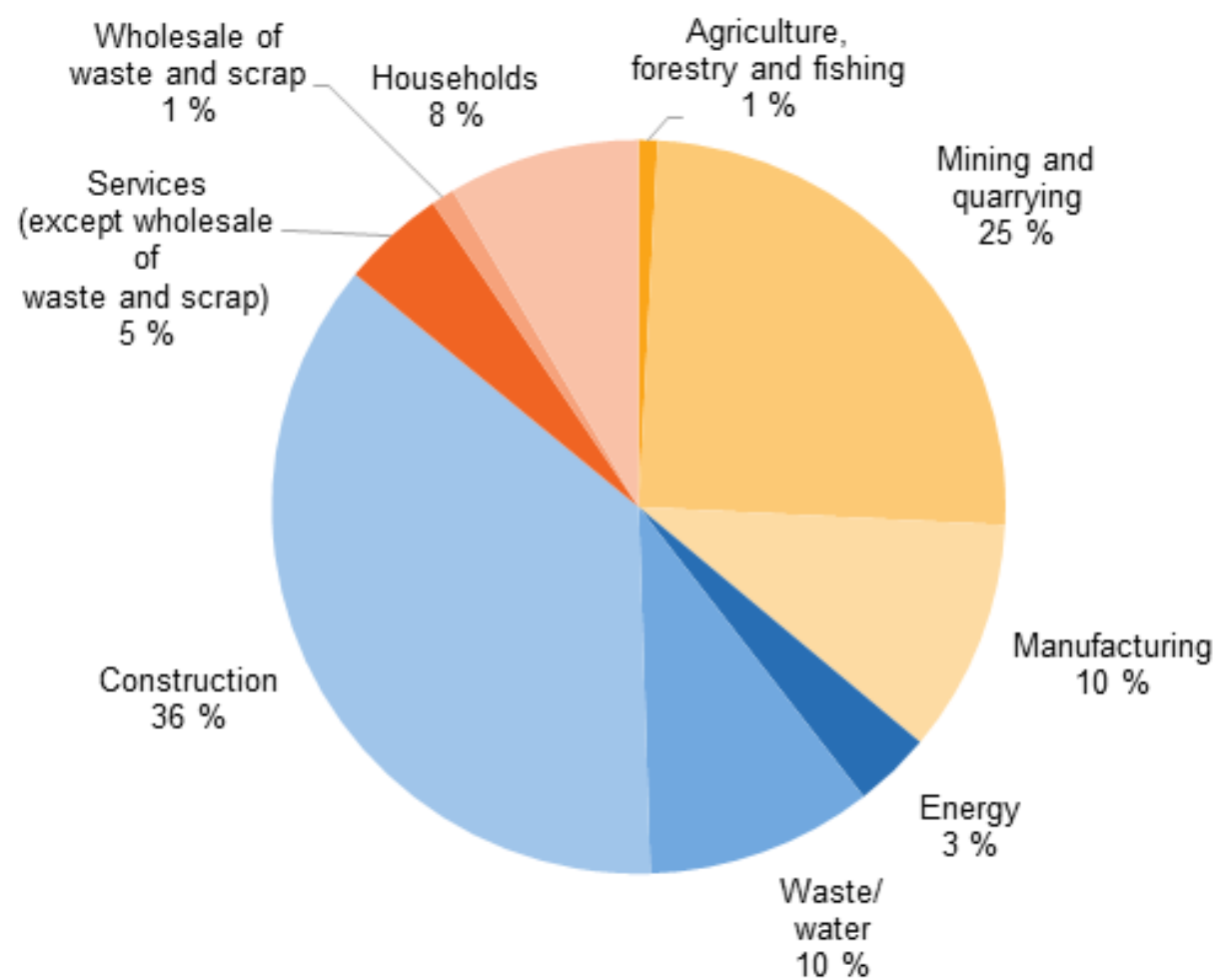
krátkodobá paměť

co s tím?



- Germany
- Greece
- Iceland
- Ireland
- Italy
- Austria
- Belgium
- Denmark
- Finland
- France

**Waste generation by economic activities and households,
EU-28, 2016**
(%)



Vizualizace, kterou můžeme z hlediska vizuálního vnímání považovat za *efektivní*, především pracuje s předpozorností, je si vědoma limitů krátkodobé paměti, respektuje základní zákony gestaltu a vybírá správně vizuální proměnné.

Vnímání prostoru

- Persepektiva
- Stereoskopické vidění
- *Co se stane, když přijdete o jedno oko?*

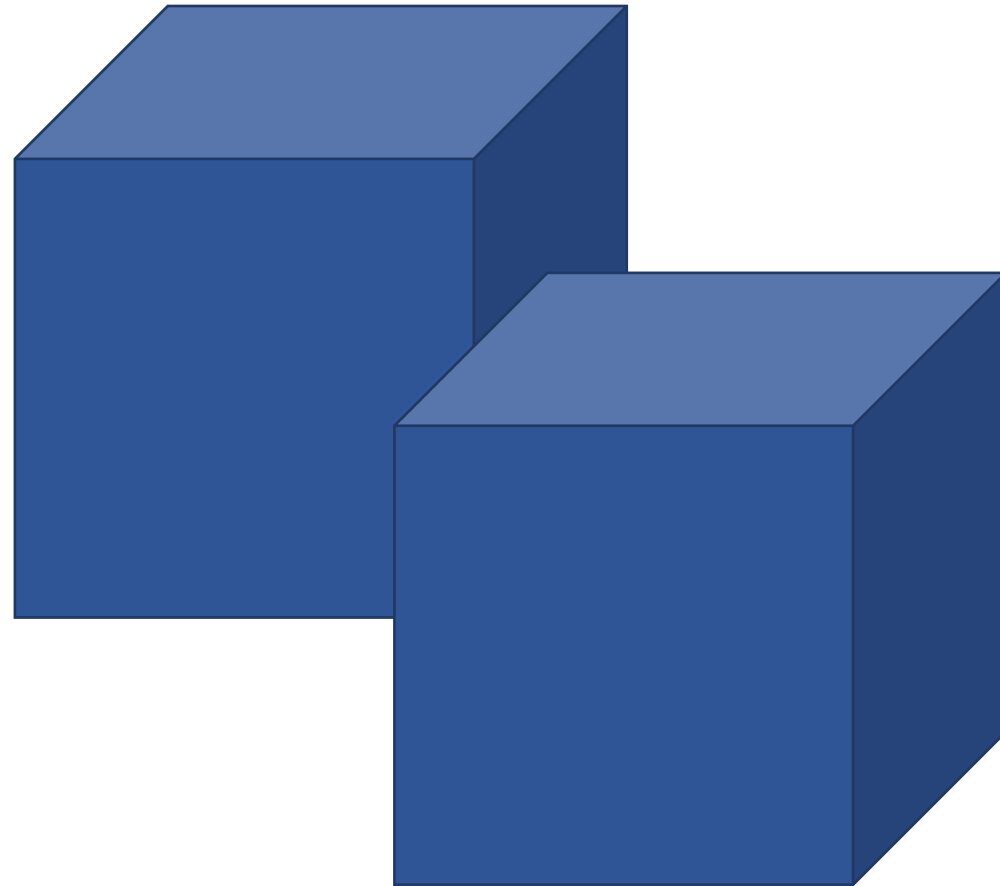
Vnímání prostoru

- Persepektiva
- Stereoskopické vidění
- Co se stane, když přijdete o jedno oko?

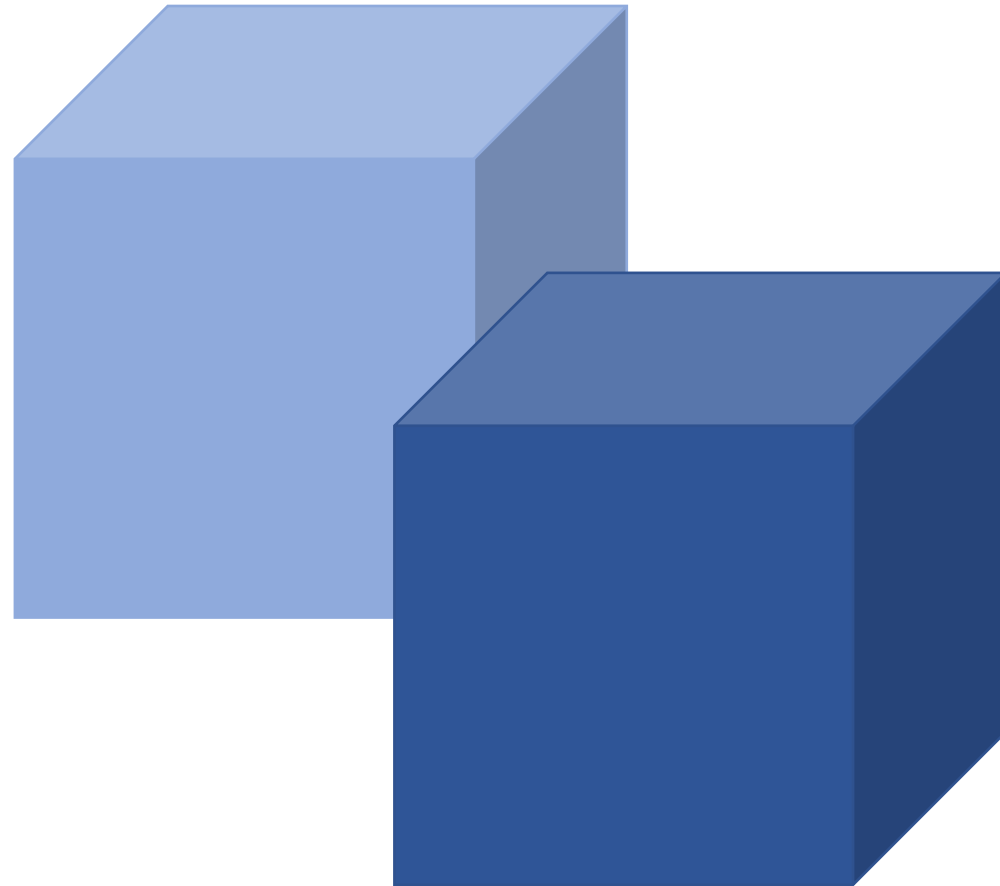
+ vodítka pro vnímání hloubky

Colin Ware: 11 „hloubkových“ vodítek

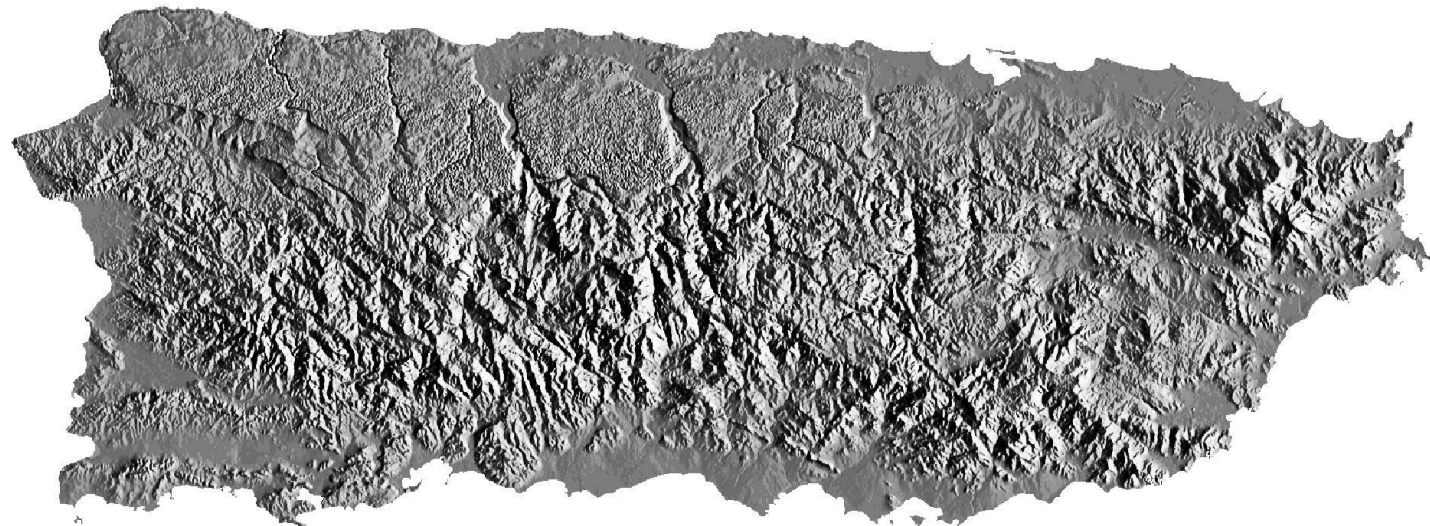
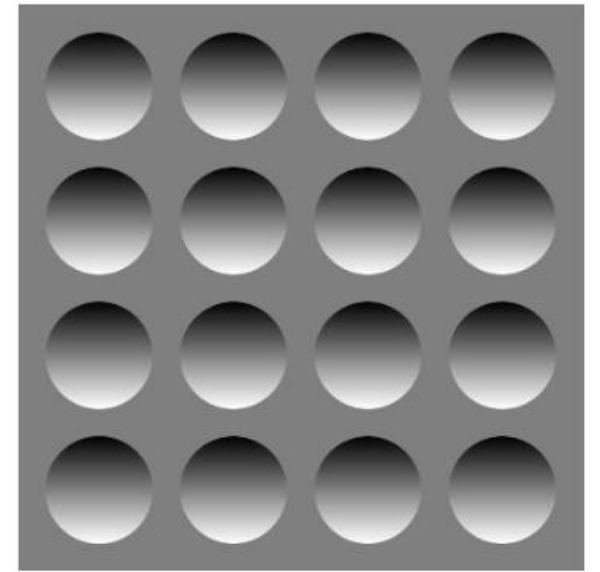
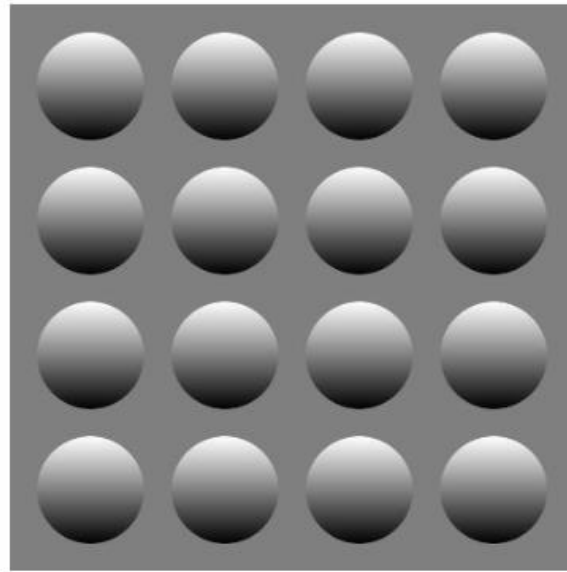
Překrytí



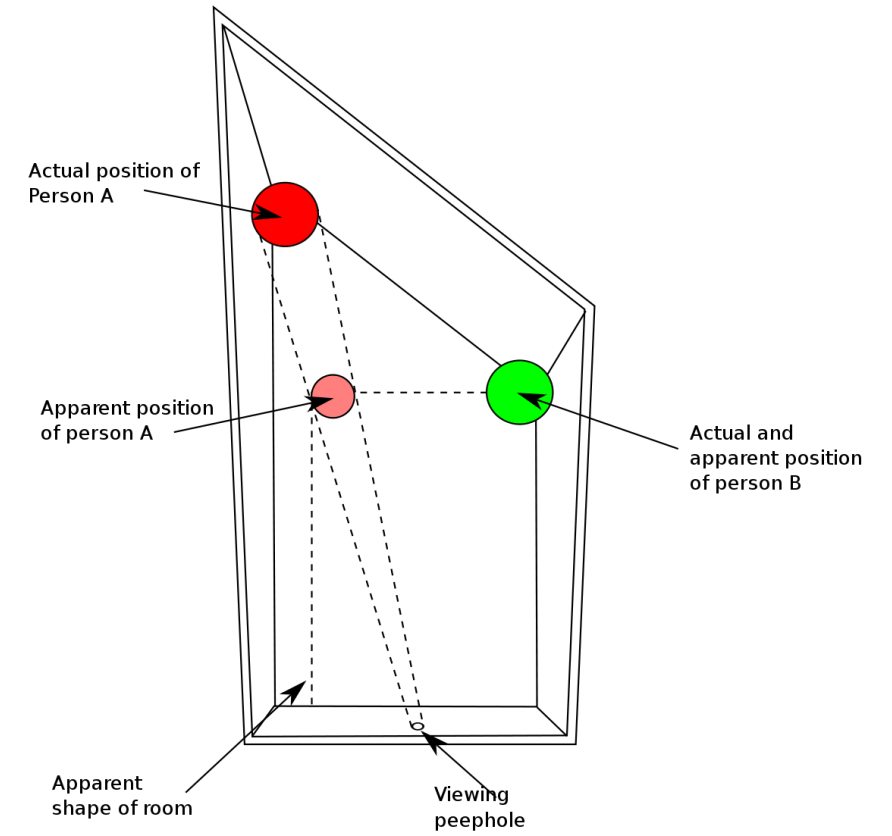
Překrytí s mlhou



Světlo a stín

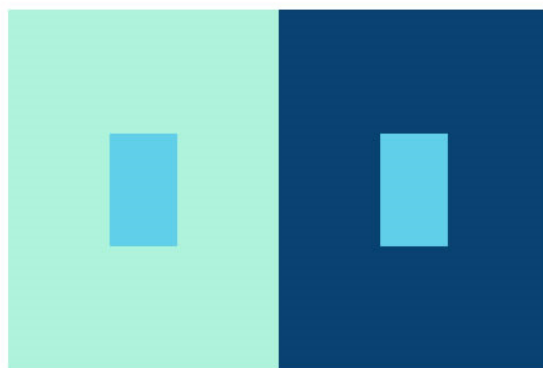
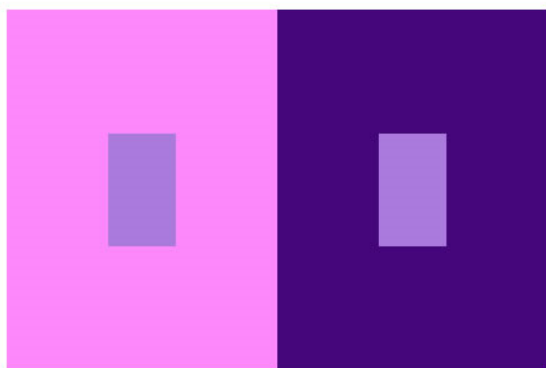
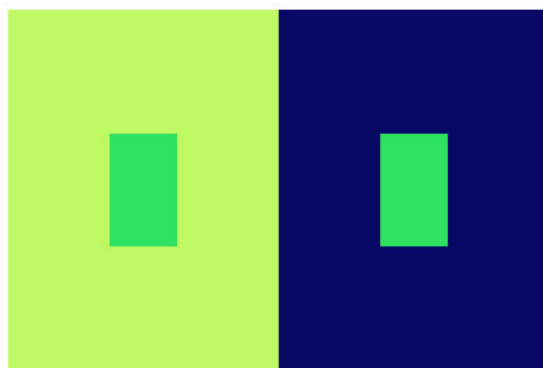
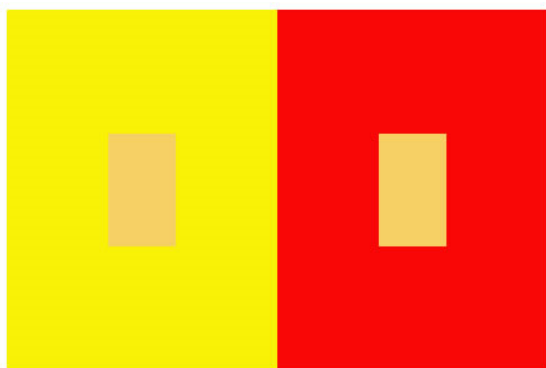


Amesův pokoj



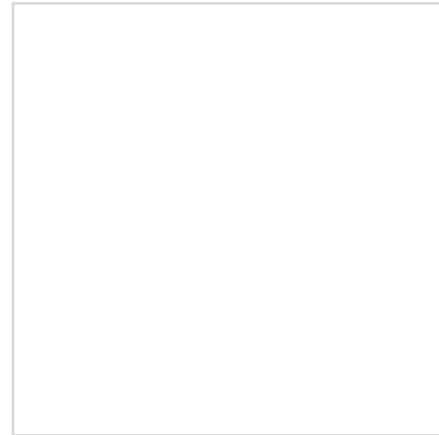
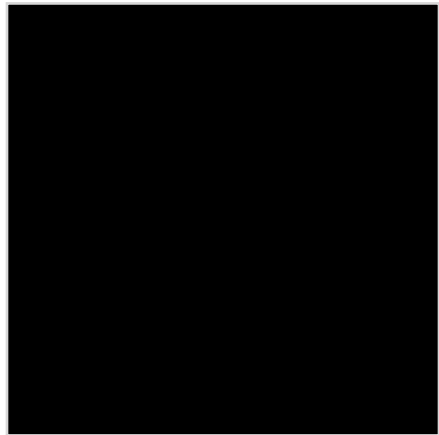


vnímání barev



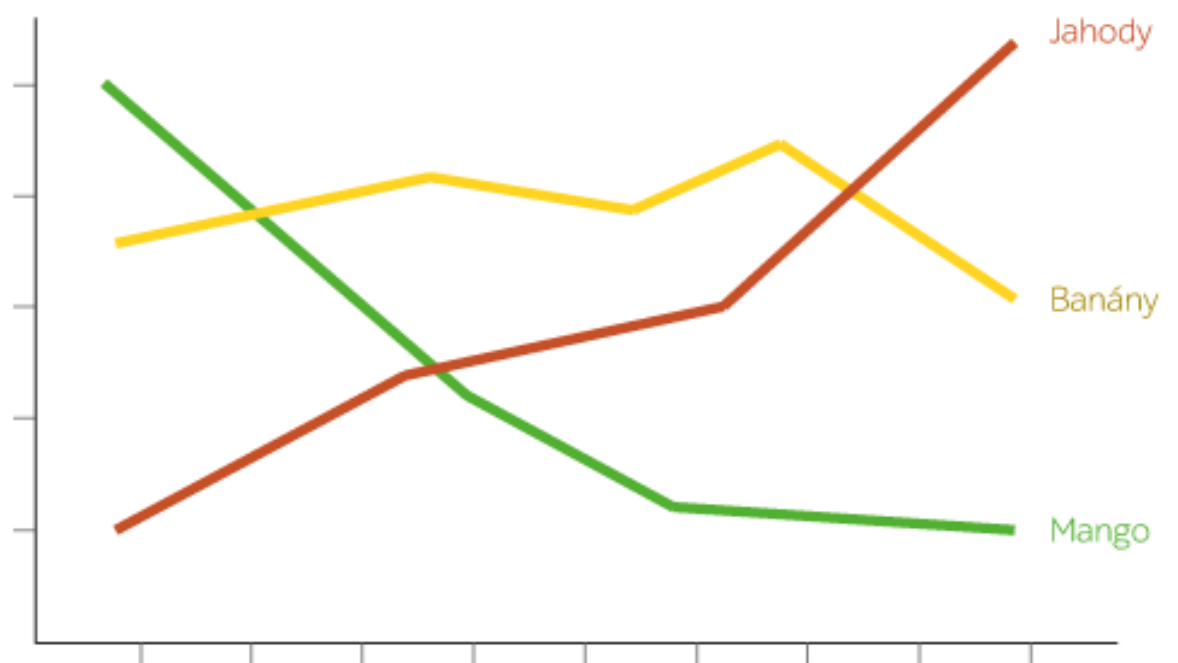


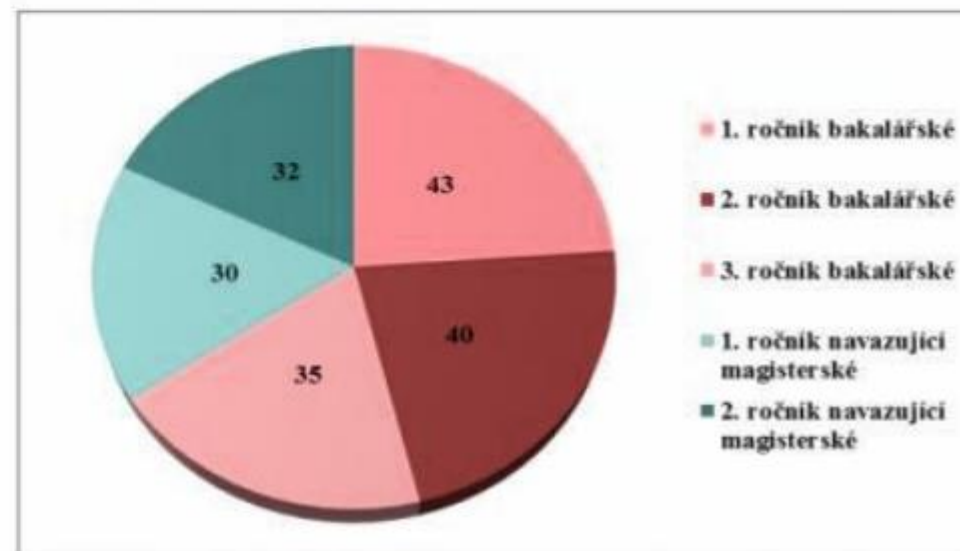
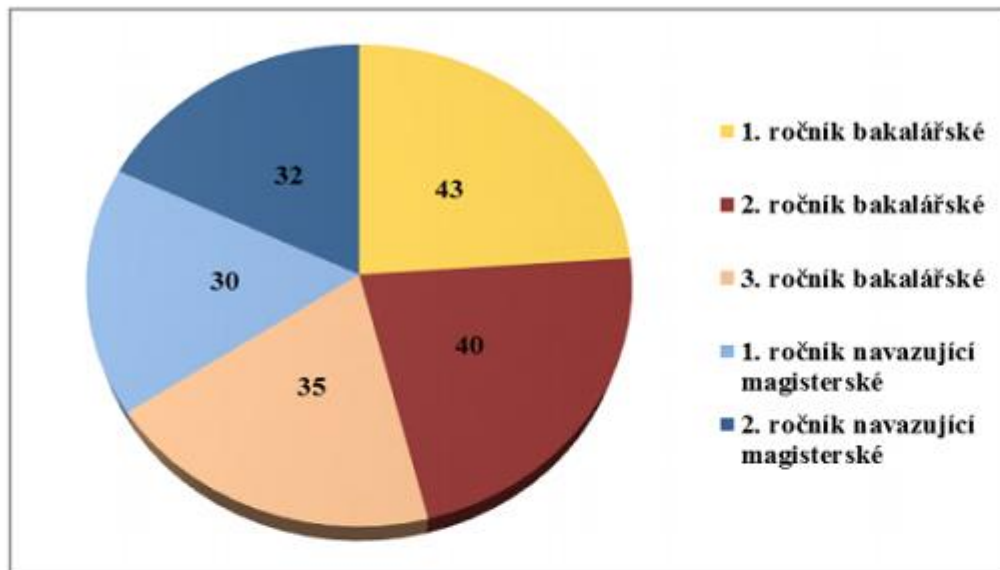
Smutek a smrt











Příště...

- Barvy
- Barvy
- Barvy
- Barvy
- Barevné škály
- Hodně barevné to bude...

Mgr. Tomáš Marek
marek@kisk.cz