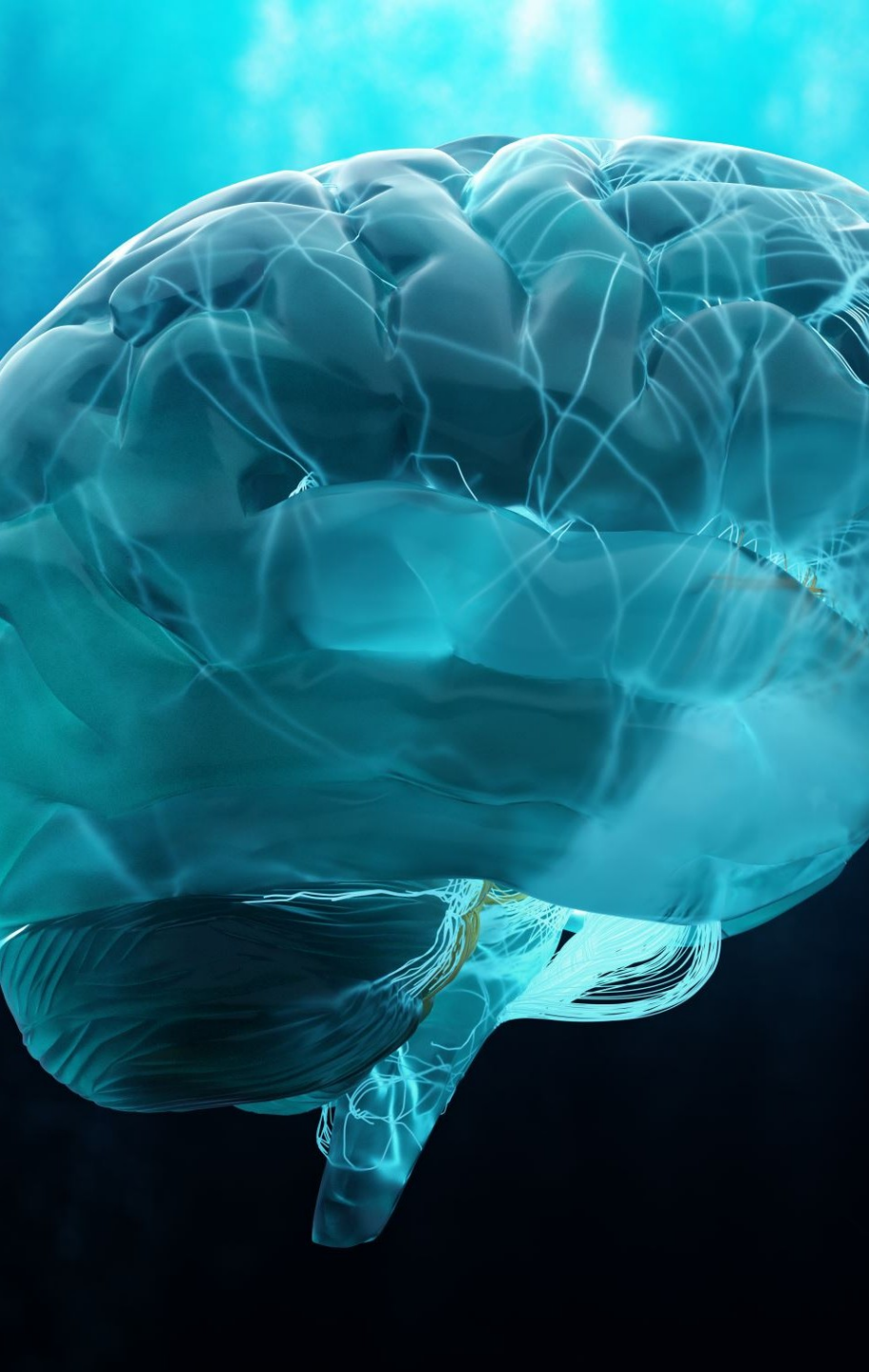


# Neurosciences in Economics and Management

Ing. Bc. Jiří Rotschedl, Ph.D.

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"The basic function of the brain is to convert sensory input into **appropriate behaviour**".

**Human behaviour** at the CNS level is dependent on complex interactions between individual neurotransmitters and neurohormones.

**The social environment** greatly influences these brain substances and their interplay.

(Hess, Sliva, 2021)

# Introduction to the human brain - development

- What has influenced the development of the human brain:
  - 7 million years ago: bipedalism
    - Narrowing of the birth canal
    - Increasing demands on the growth of the human brain
  - 4 million years ago: the growth of the human brain began
    - The beginning of the dilation of the birth canal
  - the dilemma of childbirth:
    - the female pelvis is a compromise between bipedalism and brain size at birth
    - the expansion of the pelvis was slower than the need for a large human brain
    - result: human offspring are born about 1 year earlier than other mammals (the size of the adult brain corresponds to a gestation period of at least 2 years in nature, but the child is born after 9 months)

# The brain of the child

- The brain of a newborn is neurologically immature
- The baby's skull is soft to:
  - enable brain growth in the first 3 years of life
  - to pass through the birth canals, which are very tight in humans
- A child:
  - needs intensive parental care for the first 2 years
  - (mammals are more independent soon after birth, humans are not)
  - The brain is born with all the basic neurons not connected by synapses
  - by the age of 2, the same number of synapses are formed as in an adult
  - doubles by the age of 3 years, maintains until the child is 10 years old and then gradually decreases

# Key components of the brain

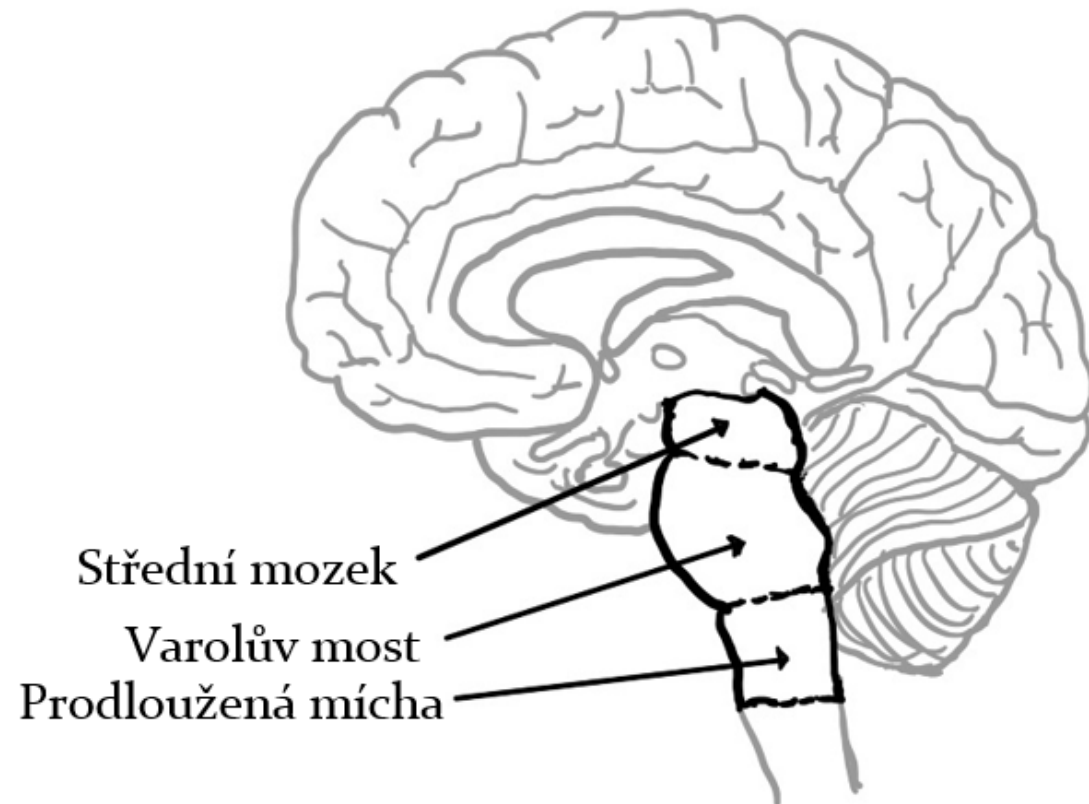
- Brain stem
- Brainiac
- The Intermediate Brain
- The end brain

# Key areas of the brain - Brain stem

## Involved in:

- Balances
- Mimics
- Speeches
- Sucking, swallowing, chewing

**Locus Coeruleus** = produces noradrenaline and plays an important role in stress.



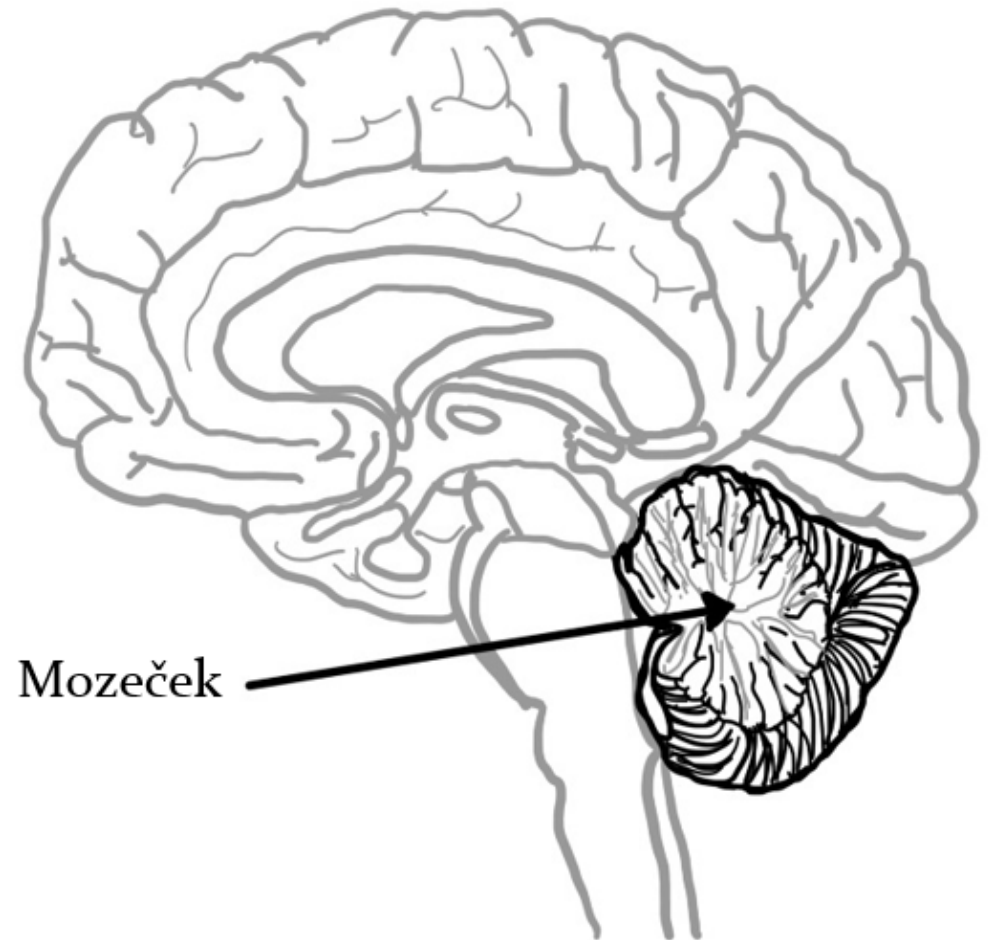
# Brainiac

## Responsible for:

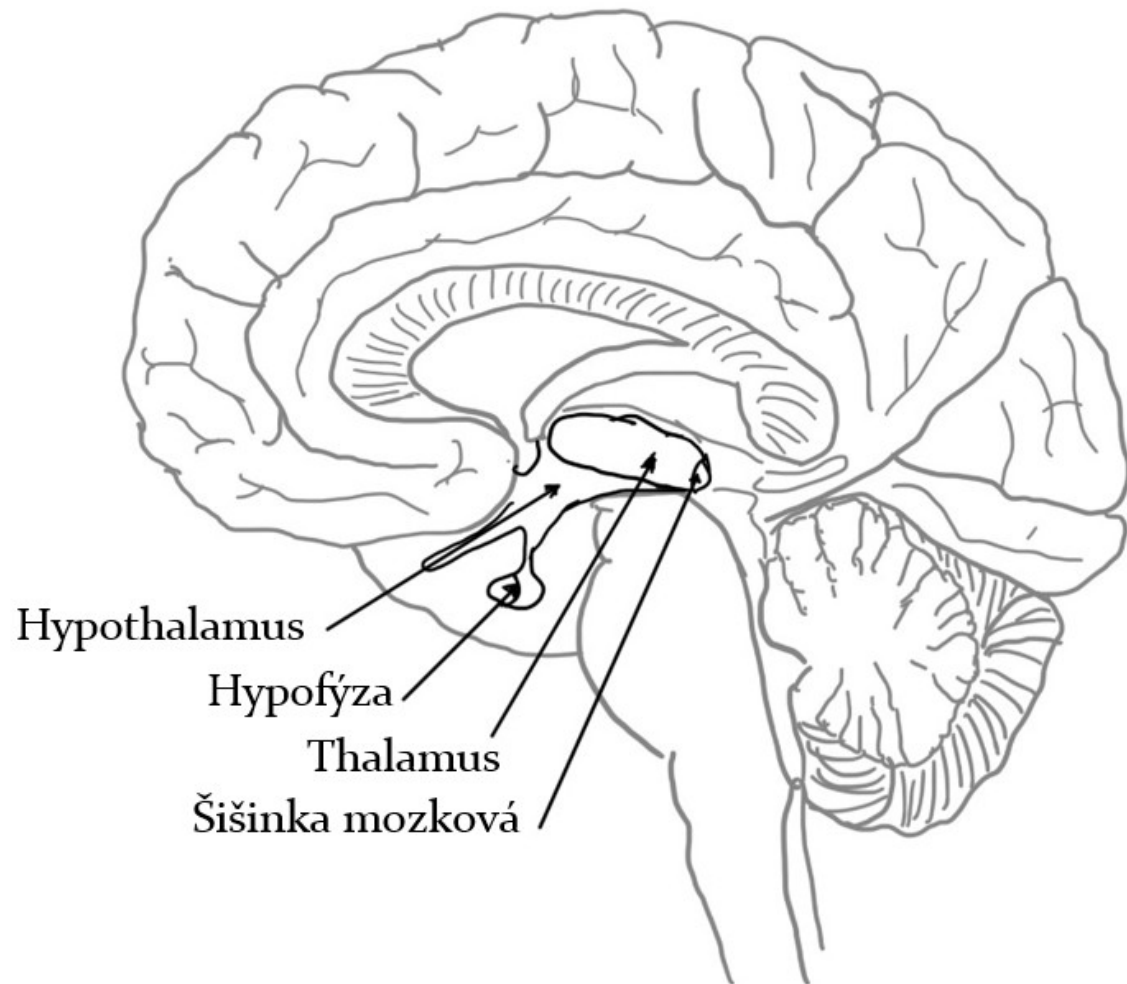
- attitude
- muscle tone
- coordination of movements (movement experience and skills)
- unconscious learning and procedural memory - automated movements (when speaking, playing a musical instrument or other activities requiring dexterity)

**Contains 4 times more neurons than the neocortex**

It also appears to be involved in **higher cognitive functions**



# The Intermediate Brain



- It is located in the middle of our brain between the hemispheres of the hindbrain
- It consists mainly of two key parts: the **Thalamus** and the **Hypothalamus**
- A very small component is also the **pineal gland**, which is an unpaired small neuroendocrine gland in the mesenchymal



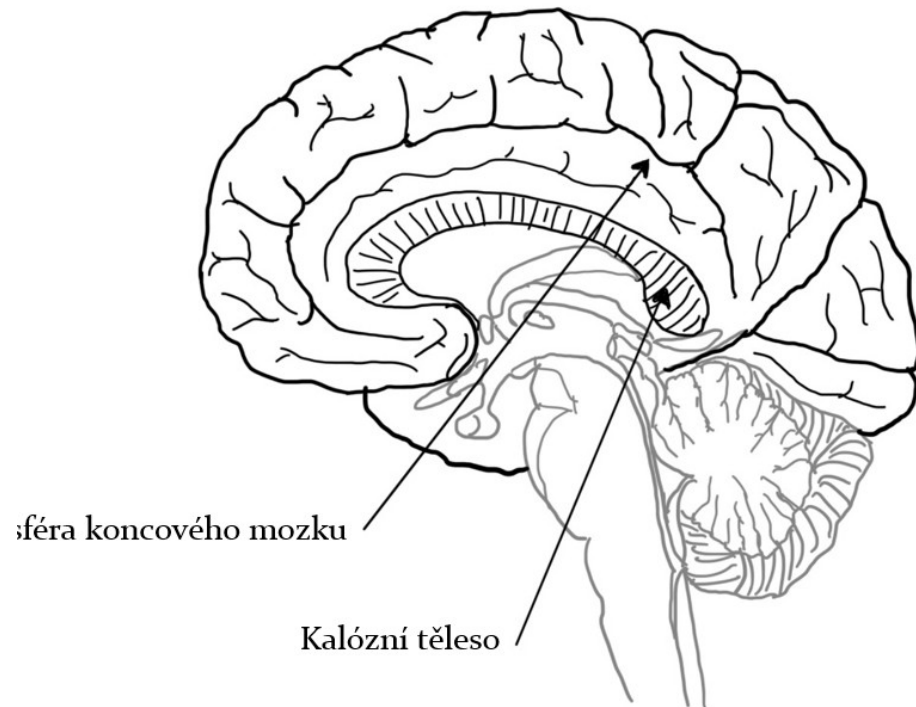
# Pineal gland

- Endocrine gland
- Plays an important role in setting biorhythms, especially **circadian** (daily cycle) and **circadian** (annual cycle)
- It contains a lot of **norepinephrine** and **serotonin** and from these neurotransmitters it produces **melatonin**
- In terms of biological evolution, the pineal gland evolved **from the third inner eye in reptiles** - it has elements from the retina and remnants of the lens we have in our eye.
- **Melatonin** is a regulator of **hair** and **eye** pigmentation via **melanin**

# Hypothalamus

- Involved in the control of **homeostasis** - a stable internal environment
- It is part of the **Sympathetic** and **Parasympathetic** nervous systems
- The hypothalamus mediates the physical accompaniment of **emotions** and modulates the **experience of emotions**, especially feelings of **likes** and **dislikes**...
- Affects:
  - **CRH** (corticotropin-releasing hormone) - involved in the stress response
  - **Oxytocin**
  - **Dopamine**
  - **SRH** (somatotropin-releasing hormone)
- The outer hypothalamic region contains centres that influence attention and arousal

# The end brain



It consists of two hemispheres connected by a callose body. The cortex of the terminal cerebrum consists of grey matter 2-5 mm thick.

Connecting the hemispheres through the corpus callosum, does not affect intelligence

**The left hemisphere** controls the movement of **the right part of the body**, and the **right hemisphere controls** the movement of **the left part of the body**.

# The role of the hemispheres

- **The left part** controls the **ability to write** and **express oneself in language**, as well as **comprehension of text** and the **spoken word**.
- **The right** end brain processes **visual** and **emotional stimuli** and is responsible for **spatial imagination**, **geometry** and **perspective**.

# The amygdala and motivation

- However, a study (Courtin et al., 2022) reveals new insights into the function of the amygdala in relation to the expectation of reward after performing an action without a signal. The mouse learns to perform the action first and receives a reward as a result of performing the action.
- The amygdala is responsible for controlling **voluntary goal-directed behavior**
- It is involved in determining the **probability of receiving a reward as well as its value**. The amygdala sends this information to subregions of **the striatum** that are known to control **goal-directed behavior**

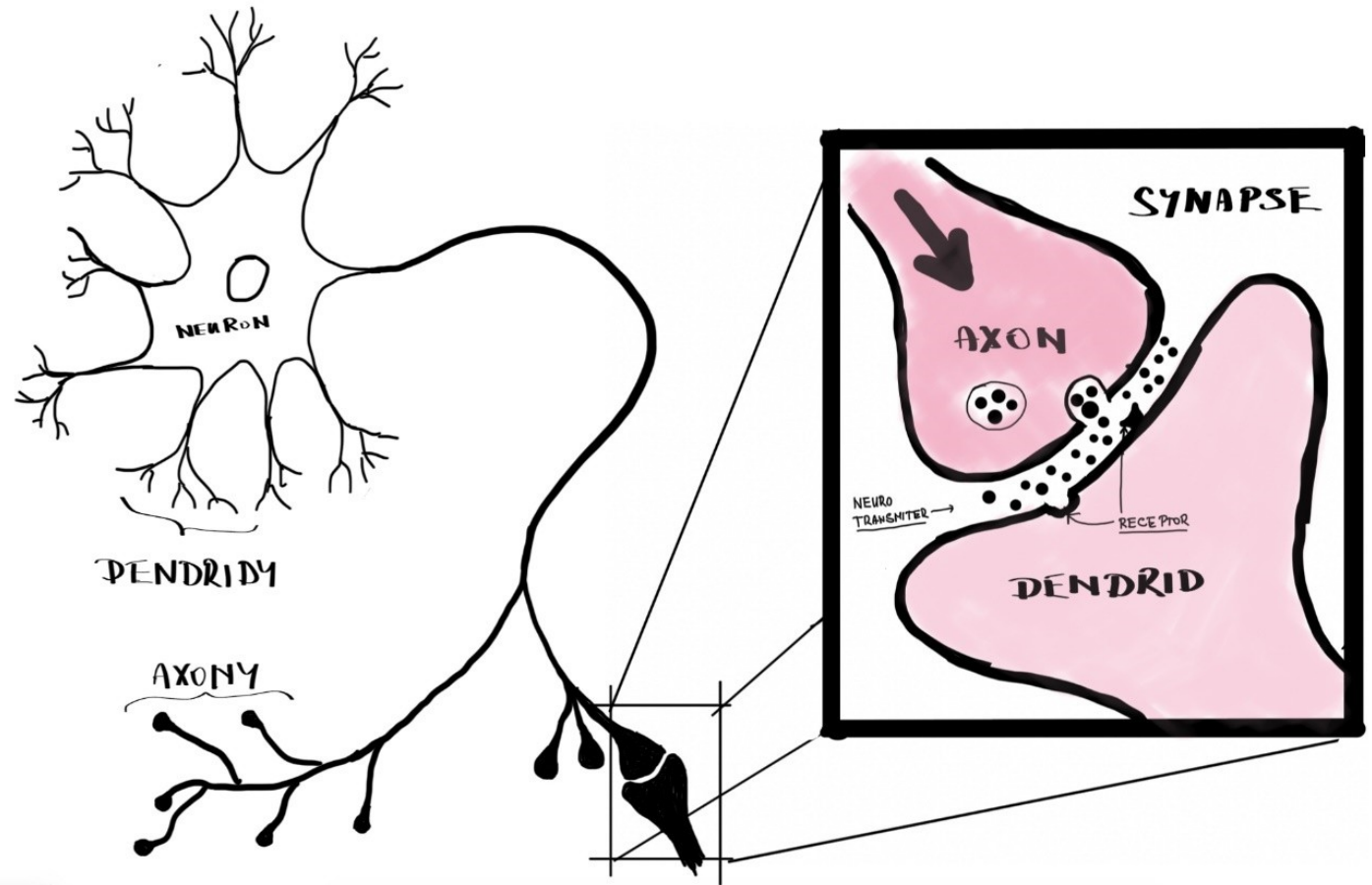
# Neurons and synapses

# What is a neuron and a synapse

The cornerstone of the nervous system are neurons and their connections - i.e. synapses

**Dendrites** are projections from the body of the neuron that carry the signal to the center of the neuron

**Axon** (neurite) is longer and transmits the signal from the neuron to the outside



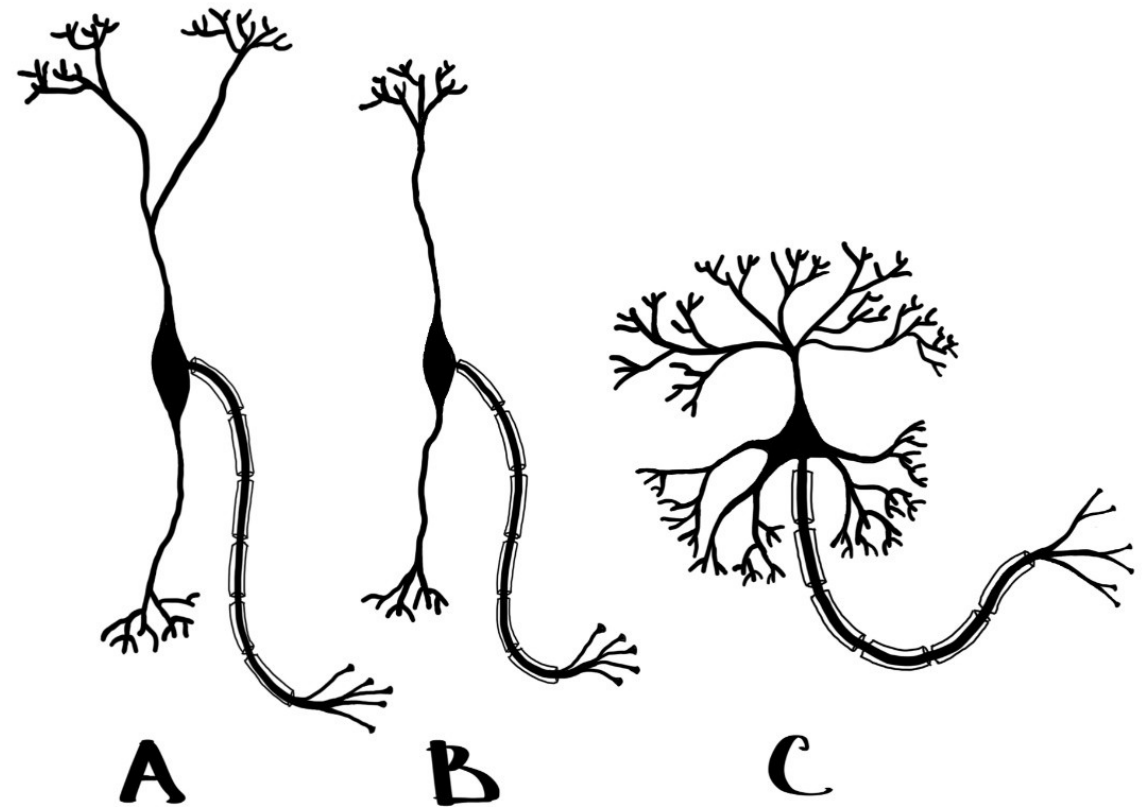
# Neurons and synapses

- Dendrites have so-called **dendritic spines** and signals are transmitted between them and **axons** via **neurotransmitters**.
- The most famous neurotransmitters:
  - dopamine,
  - serotonin,
  - noradrenaline,
  - acetylcholine,
  - GABA,
  - Adenosine.
- For the proper functioning of transmissions between axon and dendrite, receptors through which the signals pass are also necessary.



# Specific neurons - VEN

- In 1925, **Constantin von Economo** (Economo, 1926) first described a long, thin neuron about 4 times larger than the previously known pyramidal neurons.
- Unlike **pyramidal neurons**, **VEN** has only **one dendrite** in the upper (apical) and one **in the lower** (basal) part of the spindle-shaped cell body - so it has **bipolar dendrites** with minimal branching. The axon emanating from the side of the VEN cell body is very long.



# VEN neurons

- These neurons have only been described in:
  - **humans**, see e.g. (Allman et al., 2011)
  - **great apes**, see (Allman et al., 2010) or (Stimpson et al., 2011),
  - **elephants** (Hakeem et al., 2009)
  - **dolphins** and **cetaceans**, see (Raghanti et al., 2019) or (Butti et al., 2009)

**Man** is the **only one** of the above creatures with a large brain that has the **most of** these **neurons** in both absolute and relative terms.

Neuroscientists believe that **VEN** is **involved in rapid and intuitive action** on **social issues** (Gazzaniga, 2013)

# Forked neurons

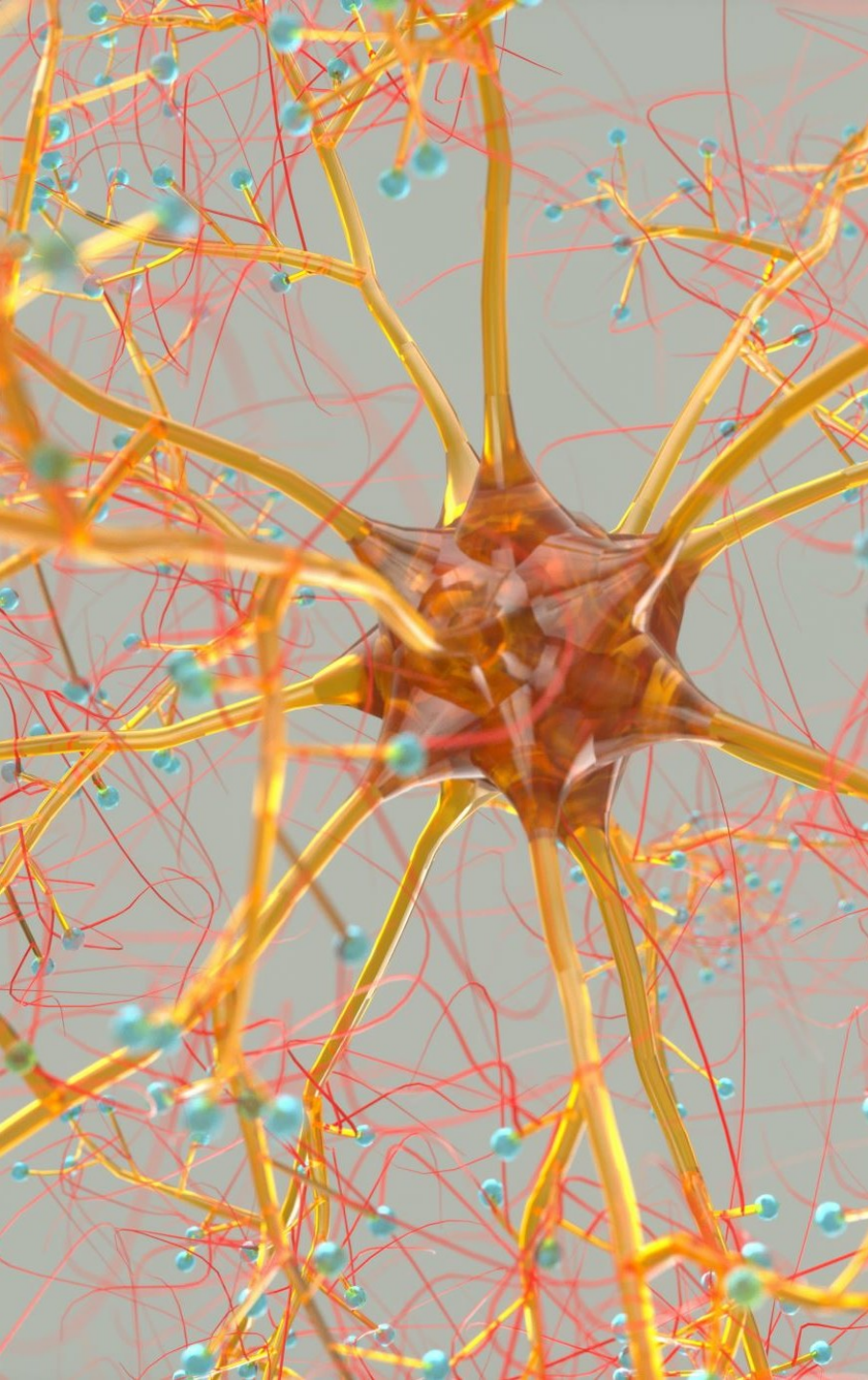
- Very similar are the so-called **fork neurons**, which differ from VEN only in that the **apical dendrite** (coming from the upper part of the neuron) branches **into a fork shape**.
- **VEN** functions together with **fork neurons** play an important role in human behaviour and action. It is responsible for:
  - social-emotional function,
  - empathy,
  - intuition.
- Example: in **frontotemporal dementia**, the loss of these neurons causes social changes in the behaviour of the affected person: socially inappropriate behaviour, **loss of social tact, impulsivity, reckless or careless behaviour**. It also includes **apathy, listlessness, indifference** to other people's needs, **decreased social interest, relationship impairment or loss of warmth** (Rusina et al., 2021)

# VEN + forked neurons & behaviour

- VEN and fork genes play a **neurobiological basis in human economic behavior**.
- People with lower levels of these neurons may exhibit impulsive behaviour - **unthinking buying behaviour**.
- The lack of these neurons will also play a role in the **reckless, almost selfish behaviour** that forms the basis of **the economic principle of maximising utility or profit**

# Experiment





# Mirror neurons

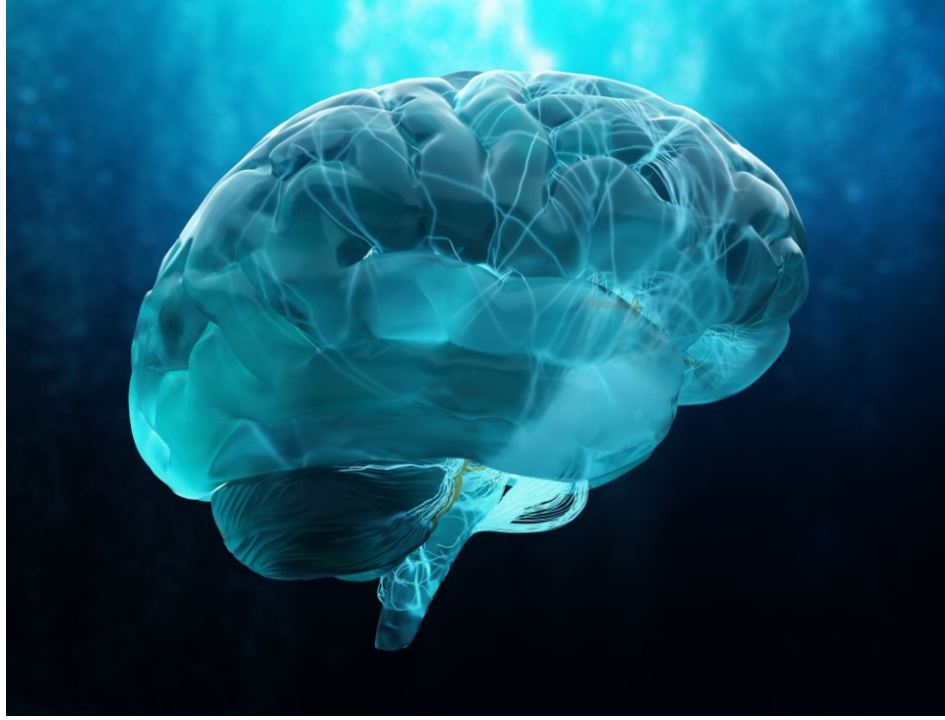
- **What is it?** Neurons that are activated in two situations:
  - I'm doing an activity
  - I see someone doing some activity
  - I imagine I'm doing a certain activity
- **WHEN** were they discovered?
  - In monkeys, early 1990s
  - For people in the second half of the 1990s

Neuroscience shows that mirror neurons influence our ability to **learn new skills**, **acquire knowledge**, and **form deep emotional connections** with those around us, and even help us **understand why people do what they do** (Cook et al., 2014)

# What activities are mirror neurons involved in?

- **Initiation, planning and coordination of movements** and storage of motor programs for learned activities.
- **Processing sensory information** related to touch, pressure and proprioception (perception of body position) from different parts of the body.
- **Sensorimotor integration, spatial awareness and perception of objects in relation to oneself.**
- **Emotion processing and regulation of emotional reactions**

**(Penagos-Corzo et al., 2022; Eysenck & Keane, 2015)**



**In addition to the brain  
What contributes to our behaviour?**



# Microbiome = colonies of microorganisms

We also have microbiomes in our mouths, on our skin and in/on other parts of body.

The largest colonies of microorganisms are found in the gut = **gut microbiome**.

It is involved in the **expression of our emotions** and **communicates with our** brain through the **vagus nerve** (Forsythe, Bienenstock and Kunze, 2014).

# The importance of the microbiome in general

- The quality of the microbiome is very important
- It can have a direct effect on the formation of:
  - depression,
  - anxiety,
  - autism,
  - Parkinson's disease and other diseases

(Quigley, 2017), (Cenit, Sanz and Codoñer-Franch, 2017)

# How does our microbiome communicate with the brain?

So the microbiome communicates with our brain through the **vagus nerve**, and

- from the brain to the organs 20% of fibres
- 80% of the fibres run from the organs to the brain



(Bonaz, Bazin and Pellissier, 2018)

**The microbiome therefore represents our second "brain" that influences our actions.**

# What is the *Nervus vagus* (vagus nerve)

- The vagus nerve is:
  - longest
  - the most complex of the so-called cranial nerves
  - 10<sup>th</sup> cranial nerves.
- It runs through:
  - Face,
  - chest, including the heart,
  - in the abdomen.
- It connects the larynx, pharynx, vocal cords, heart, lungs and most of the digestive tract to the brain.

# What do we have *Nervus vagus* for?

- It distinguishes between pathogenic and non-pathogenic bacteria and **stimulates the brain to an anti-inflammatory response.**
- It can **produce anxiety or anti-anxiety effects.**
- It can be **activated through nutritional stimuli**

# Sympathetic and parasympathetic

# Sympathetic and parasympathetic nervous system

- It belongs to the "autonomic" nervous system - it is activated autonomously
- Peripheral system acting against itself
  - Sympathetic - **activating**, works by wiring:
    - Dopamine
    - Adrenaline
    - Noradrenaline
    - Glucocorticoids etc.
  - Parasympathetic - **dampening**, works by wiring e.g.
    - Oxytocin etc.

# Sympathetic - why do we have it?

- It activates our organism at a time when:
  - we are at risk
    - **escape** x **fight** x **retreat**
  - when we want to hunt prey
  - we have sex
  - when we are stressed for reasons other than physical combat or physical exercise
- The present time is full of **Sympathetically dominant** (lots of tasks, lots of stressful situations on a psychological basis, everything is fast).



# Sympathetic - what is activated?

- The sympathetic is activated as a whole, so it manifests itself in all parts of the body at once:
  - increase in heart rate
  - increase in breath
  - deactivation of the immune system
  - upset the homeostasis of the body
  - blood clotting is increased
  - stress hormones are produced in the adrenal glands

# Sympatikus - Side Effects

- Managers and workers with long-activated sympathetic:
  - are more likely to be sick
  - eat more (manager = min. 1 kg extra weight per year)
- Food is primarily supposed to activate the parasympathetic, but if we are in sympathetic permanently/long term, it doesn't work
  - That's why we have to take our time to eat, not eat on the way - it doesn't work as a parasympathetic activator.

# Parasympathetic - when does it work?

- A system that calms the body and helps bring it into homeostasis
- **Parasympathetic** is active:
  - at the time of rest
  - in digestion, etc.
  - in a safe environment
- It helps to relax the brain and it starts to connect more - it gives **creativity** or **flow**.

# Parasympathetic - what is it good for?

- **Manager/Leader**
  - if he needs to think about strategy
  - if he needs to come up with new ideas (new products, etc.)
- **Creatives**
  - if they need to come up with an idea
- **Engineers**
  - if they need to find unique innovative designs

Must have **Sympathetic deactivated** and **Parasympathetic activated**

# How to activate parasympathetic?

- **Being in a safe environment** - being in the company of more people (listening)
- **Touching** (victims) = related to Oxytocin production
- **Meditation**
- **Singing and making deep vowel sounds** - oooh, ooooh

# Breath

- Activation by long exhalation with deep sound
  - there are different techniques - **breathing into a square**
  - short inhalations and **long exhalations**
- Improving cognitive function - **breathing in through the nose, into the abdomen**
  - Flushes out nitric oxide - improves blood flow, improves blood pressure, expands airways and improves oxygenation of the body and brain
  - breath is more effective
- Relax the shoulders (trapezius muscle) when exhaling
- Control mechanisms of breath:
  - **autonomic** (originating from the brain stem - **locus coreuleus**)
  - **conscious** (coming from the **motor centres of the brain**)

# Eye

- **Peripheral looking** = activates parasympathetic (calms the body)
  - sunrise and sunset
  - looking into the distance
  - looking sideways left-right (reduces amygdala activity)
- **The Eye Pupils:**
  - parasympathetic reaction: they contract
  - sympathetic reaction: they stretch

# Smile

- Smiling = leads to activation of the parasympathetic system
- The brain knows that smiling is associated with pleasure, in which certain parts of the brain and neuromuscular connections (e.g., facial muscles) are active. The brain associates smiling with a safe environment
- Artificially induced smile activates the same areas of the brain = it improves mood, increases the feeling of joy
- **An artificially induced smile** is ideal when **you can't fall asleep** - it activates the parasympathetic system and the body quickly settles down and falls asleep.



# Listening

## **The parasympathetic is activated by listening**

- listening to music
- podcasts etc.

## **Effective is:**

- Increase the tone of voice
- Slower talking

# Acetylcholine

One of the main mediators of Parasympathetic

## **Example:**

You have the task of leading a discussion, presenting a new product and you have to be alert - to be able to focus on the audience, be creative, have an active mind, you have to activate the Parasympatheticus (see previous slides) - e.g. **by supplementing with Acetylcholine** or another nootropic.



Biological clock

# Circadian rhythms of the body

# Inner clock (chronobiology)



**Ultradian** rhythms = 90  
min. cycles



**Circadian** rhythms =  
diurnal cycle



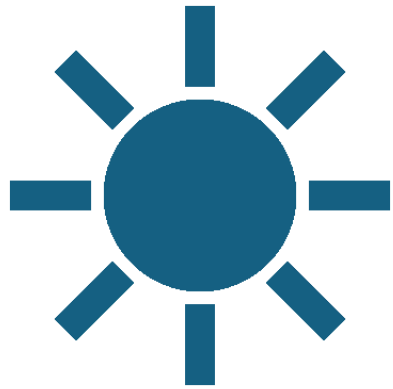
**Circalunar** rhythms =  
lunar cycle



**Circaannual** rhythms  
= annual cycle (dark  
hormone = melatonin)

# Main synchronization signals

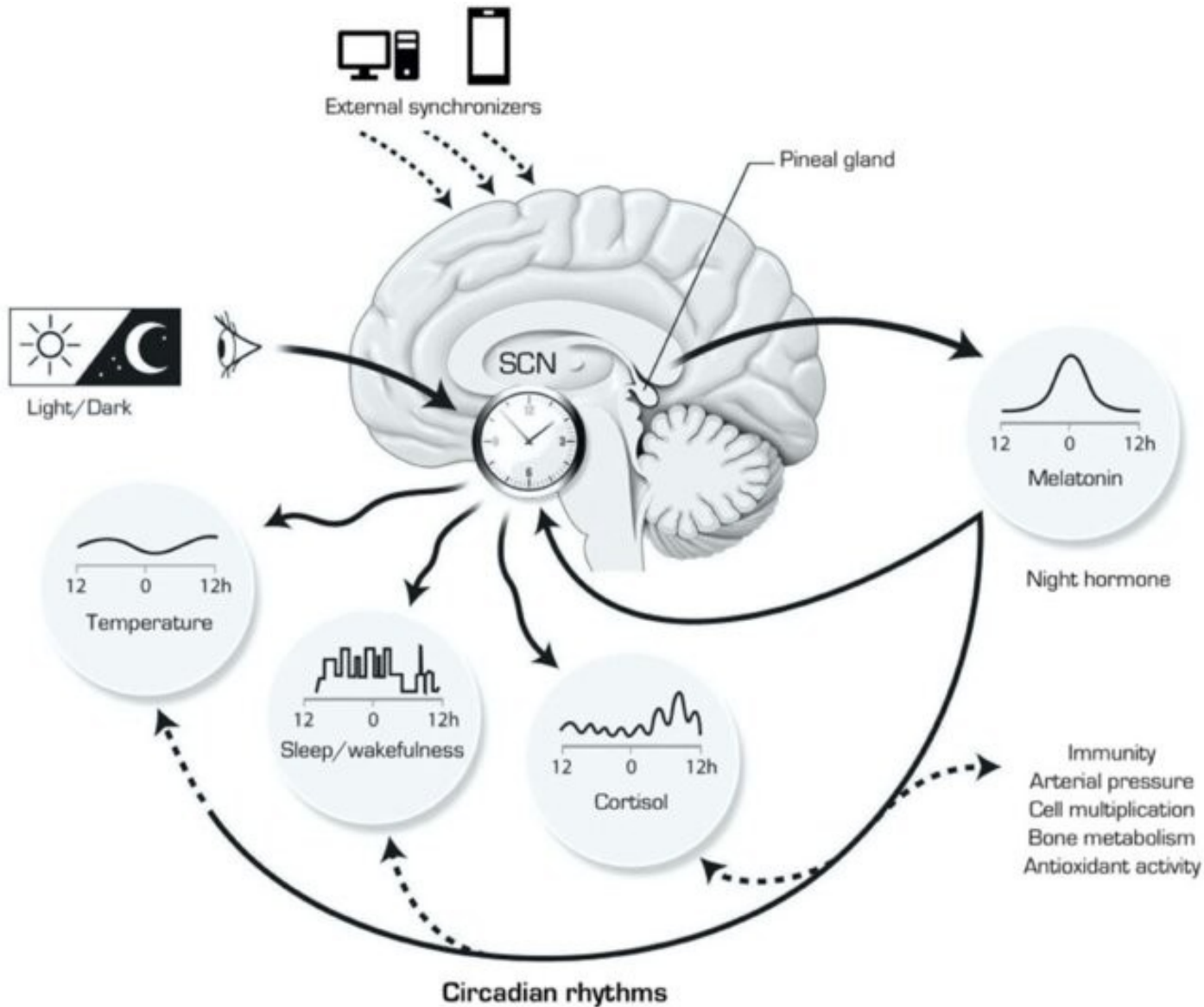
**Photoperiodic change in nature:**



**Sunrise**



**Sunset**



# Circadian clock system in the body

Regulating processes inside cells to make circadian rhythm work

The main synchronizer of the cells are the **suprachiasmatic nuclei of the Thalamus**

# Key organ - eyesight

- **Photoreceptors on the retina**
- Ganglion cells in the eye that signal what time of day it is
  - time signals (light, temperature, food)
- Cells in the eye distinguish the angle at which a light source strikes the retina
  - in the morning and during the day the source of the world from above = **daylight**
  - in the evening the light source is from below - sunset + fireplace = **red light**

# Suprachiasmatic nuclei

- They perceive light - they are connected to the retina of the eye
- They're constantly watching whether it's day or night

## Functions of suprachiasmatic nuclei:

- Synchronizes bio rhythms in cells according to light intensity
- Regulate feeding behaviour
- They regulate the metabolic organs
- Regulates body temperature - changes enzymes in the body
- It regulates hormones:
  - **Melatonin** - "the hands of our biological clock"
  - **Cortisol** - has a peak at the beginning of activity (informs the organs that it is daytime)



# Chronotypes

- **owls**, extreme owls
- Undefined
- **lark**, extreme lark

Causes of different chronotypes:

- **Gene mutation** (owls have a slower clock, larks have a faster clock) Different gene mutations affect regulatory processes in the body

## Larks:

- They have a harder time tolerating eastbound flights (it goes against their clock)
- They have problems adapting
- The lark has **one peak of activity (in the morning until 15:00)** and then tapers off)

## Owls:

- More prone to chronic dysregulation
- Sleep deprivation results from a longer cycle than
- The owl has **two peaks of activity (10:00 - 14:00 and the other is 20:00 - 00:00)**

Differences  
between  
owls and  
larks



Does circadian nuclear transcription control the cell clock?

# Body temperature level - bio clock regulation

- The temperature has its minimum about 2 hours before we wake up. The maximum is 4-5 hours after the minimum and at this maximum one should be doing temperature raising activities (exercise, cold shower). then it starts to drop. The next maximum is at about 16:00 - 17:00 - when it is best to exercise, to burn fat. The subsequent decrease in temperature leads to preparing the body for sleep.
- **Shortening the day:**
  - Ice shower in the morning at a time when the temperature is rising, shifting the peak to earlier in the day
  - Sauna in the evening leads to the activation of cooling of the body and faster cooling and shortening of the day
- **Extending the day:**
  - ice shower, cold therapy in the evening
- When it's hot, don't take a hot shower; rather, a lukewarm shower is a good idea to help cool the body down.

# Cortisol level

- Increases naturally upon waking and peaks 1 hour after waking
- Peak cortisol levels are earlier than temperature, but there is a correlation between the two
- Cortisol then decreases from the morning peak and slightly increases or stagnates before the second temperature peak and then decreases again
- **Individuals with depression, mood disorders** - have a flatter trend in cortisol levels throughout the day

# Melatonin levels

- Melatonin is related to cortisol - negative correlation between them
- When cortisol levels are high, melatonin levels are low and vice versa
- Plays a key role in sleep (reducing inflammation, cleansing the body, regenerating tissues, remembering things we've learned)
- Ganglion cells are very sensitive in the evening - inhibits (suppresses) melatonin production

## What does that imply?

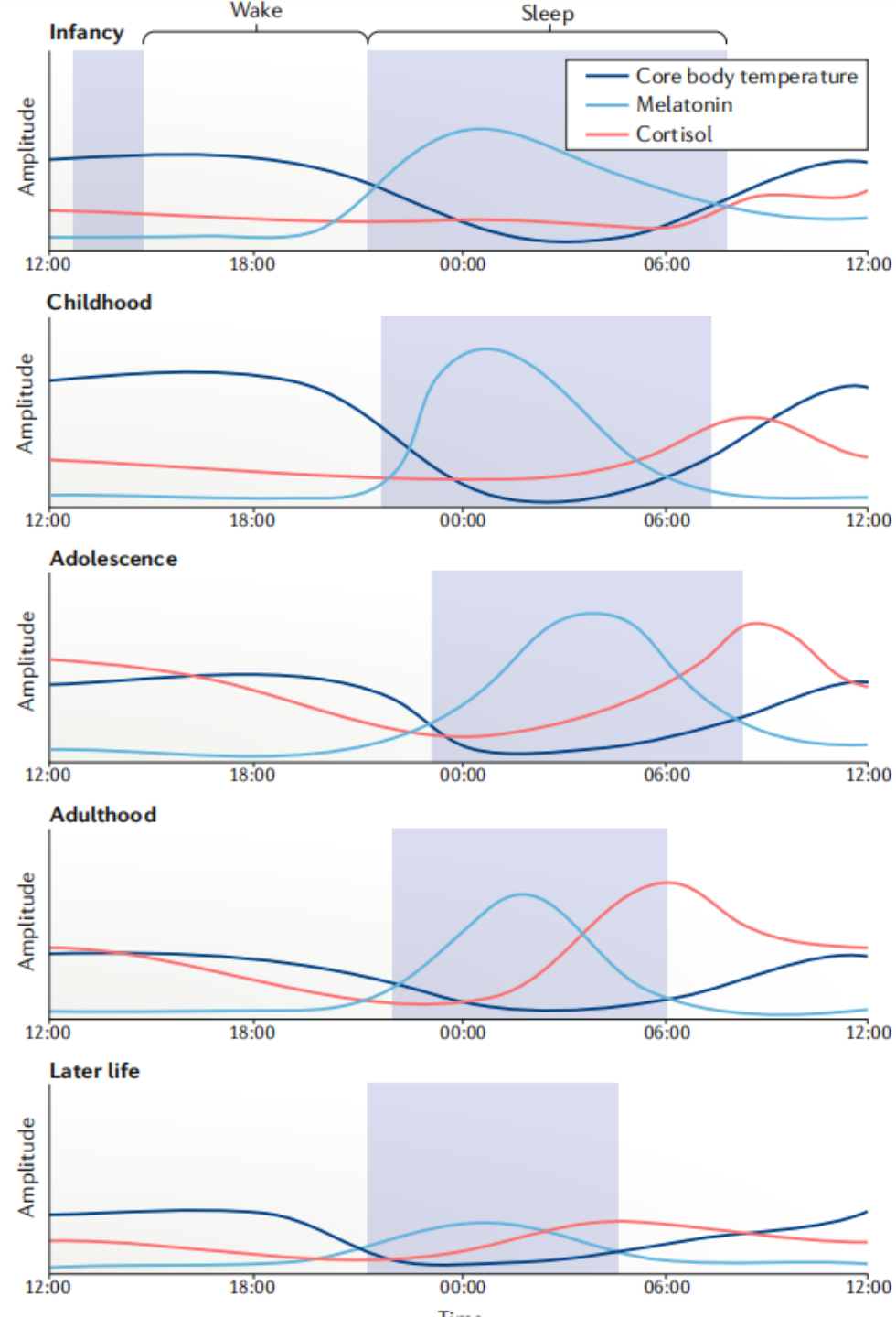
**If we are burdened with stress we fall asleep harder and have less quality sleep**

# Related substances with circadian rhythms

- **Vitamin D** - may suppress melatonin secretion
  - supplementation of vit. D in the morning improves sleep
  - supplementation of vit. D in the evening worsens sleep
- **Caffeine** - coffee drinking should be related to the circadian rhythm
  - Adenosines from ATP sit on receptors, thus signaling to the brain that the body is tired
  - Adenosines are free and wait for receptors to be released = then comes rapid fatigue
  - Not ideal for the first hour after waking up - coffee supplements cortisol and a decaffeinated start to the day is even worse
- **Protein:** are suitable in the morning
- **Carbohydrates:** in the evening they are associated with better quality sleep
- **Alcohol:** raises our temperature, impairs sleep quality

# Biological clock of the chronotype during life

- **Children** - mostly larks
- **Puberty** - mostly owls
- **Maturity** - different types - owls, barn owls, larks according to the Gaussian curve
- **Seniors** - mostly larks





# Circaannual rhythm - winter/summer

- With autumn, the production of melatonin, which affects the immune system, is prolonged
- Comply with the seasonal changes of lengthening and shortening the day has a health benefit
- in spring and summer we have more **cortisol, dopamine, testosterone, estrogen** = we have **more desire to have relationships**, have sex more often, we are more horny (animals mate more often with the arrival of spring as the day starts to lengthen)
- **The arrival of spring 03-04** is one of the two times of the year when most human relationships break down
- Daylight even in winter has a health benefit - at least 1 hour a day in daylight improves
- **Morning** - we need a lot of intense light
- **Evening** - **only yellow/red** light in winter

# Circadian rhythms and manager/economist

- **Increase the efficiency and performance of the work team:**
  - approach people individually according to their chronotype
  - avoid shift work that is irregular on a daily basis
  - Introduce afternoon rest breaks
- Proper setting of the team's biological clock:
  - reduction of team sickness
  - increase in human performance and use of all active phases (one phase in larks, both phases in owls)

# Shift work

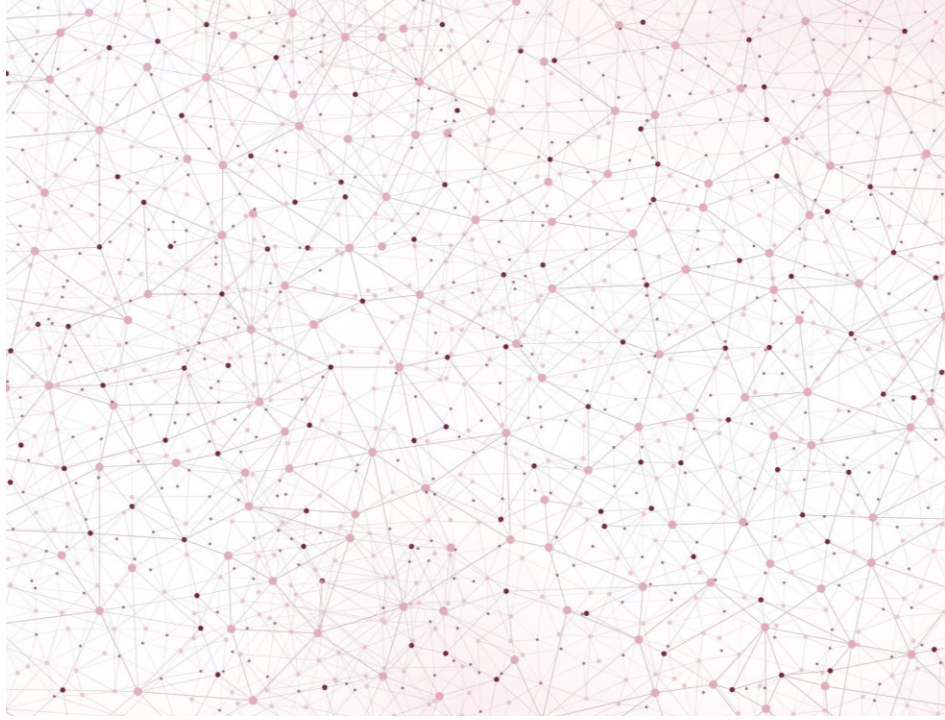
- Permanent changes in the working regime lead to dysregulation of circadian rhythms and cause:
  - **metabolic syndrome**
  - **depression**
  - **Hypertension**
  - **diabetes**
  - **various types of cancer** (breast cancer is associated with shift work, and cancers related to hormonal imbalances)



**Endorphins**

# Endorphin - Motivation for further performance

- **Feeling great after a hard day of hunting game was the main goal of going hunting the next day.**
- **Endorphins therefore encourage us to repeat the activity.** That is, to make us feel great again.



**Dopamine**

# Dopamine - disorders

- Genetic and epigenetic basis:
  - The D4DR gene, on chromosome 11, has a repetitive sequence in the middle
    - Repetition is 2 to 10 times
    - Higher repetition decreases dopamine receptor sensitivity
- People with a long gene (multiple repeats):
  - tend to engage in activities that produce large amounts of dopamine:
    - adrenaline sports
    - change sexual partners more often
    - seek sensation and new experiences
    - do not tolerate boredom
- People with a short gene (fewer repeats):
  - opposite

# Dopamine

## Neurologically and physiologically

- Its deficiency leads to **motor poverty**, reduced facial expressions, uncontrollable trembling at will and slow and monotonous speech.
  - Parkinson's disease
- It affects the production of **estrogen**:
  - in female athletes or ballerinas, it causes a drop in estrogen, which is associated with **cessation of menstruation**



# Dopamine

## Decision-making and economic behaviour

- Increased dopamine leads to **hyperactivity**, which alters buying behavior and leads to:
  - **impulse buying**
  - **the lack of forethought**, in particular with regard to **intermediate decisions**
- What our **subjective discount factor** is will be affected by the impaired reward dependence syndrome in particular.
- Hyperactive people are more likely to be **poor**, as well as more likely to go **into debt** or **save less**  
(Rotschedl, 2022)

# Dopamine

## Motivation and leadership

- More dopamine is released when we get an **unexpected reward** than when we **expect a reward** (Mirenowicz and Schultz, 1994)
- Dopamine also starts to form when you are done = it is advisable to write a TO DO sheet and check off the completed tasks
- The feeling of victory when winning, reaching the goal
  - Human is sight oriented = **seeing the target is essential**
  - Companies therefore set their **VISION** (from seeing) - this contributes to the creation of dopamine and motivation to go after the vision, to fulfill it.
- Therefore the VISION must be: **tangible**

# What's the problem with dopamine?

- The problem is not changing it, but increasing the "**base line**"
- A person addicted to dopamine has high levels of dopamine
- But the brain responds to "changes" in dopamine.
- For people with high "base line" dopamine it is difficult to induce a feeling of happiness, a feeling of reward from any activity - over time nothing motivates them to do anything - a classic manifestation of burnout: "they don't enjoy anything"

The problem is with people addicted to drugs - especially meth, cocaine. **Drugs change the physiology of the brain** (they lose dopaminergic receptors) and even if they go through the withdrawal phase, they are bored for the rest of their lives, **ordinary things don't make them happy.**



**Noradrenaline**

# Noradrenaline (norepinephrine)

## Chemistry of alertness

- WHY:
  - increases our **alertness**
  - plays an important role in the case of **unwitting attention**
  - Lower level: we feel **boredom**
  - Proper **dopamine** and **norepinephrine** levels = leads to **flow** (Rock, 2010)
  - **Higher levels** = in shy people, in people with fast metabolism (Hess and Sliva, 2021)
- WHERE:
  - It is produced in the **adrenal glands**
- HOW:
  - **Noradrenaline** is formed from **dopamine** by dopamine-beta-oxidase, and **adrenaline is then formed from noradrenaline**



**Serotonin**

# Serotonin

- A key hormone for **hierarchical division of society and status** (not only humans, but also animals)
  - Hierarchically, **elevated serotonin levels** have the highest **rank**
  - Hierarchically, those lower down the hierarchy have lower levels of serotonin, even though they were higher up before and were demoted
- When the leading "male" is removed, there is a decrease in the density of serotonergic receptors in the area of the brain involved in social behavior
- By supplying the precursor **Serotonin** = leads to **prosocial behaviour** and males treated in this way achieved higher status
- **It is the hormone responsible for a sense of pride and status**
- **gives a feeling of confidence**

# How to trick the status system?

- We live in a material society
- **Status** = expensive car, big house, designer clothes, logo on building or clothes

## What's missing?

- it is not the status due to a better relationship between the caregiver and the cared for
- **Despite the fact that we accumulate "status enhancing" things, we don't feel successful!**



# Serotonin

## How to influence serotonin levels?

- By increasing the intake of **Tryptophan** and at the same time less of other amino acids
- Increase **glucose** and subsequently insulin uptake = promotes amino acid delivery to muscles
  - Chocolate contains a lot of **tryptophan** = after consumption, plasma **serotonin** levels increase
  - Bananas contain large amounts of **serotonin**
  - After main meal chocolate dessert => tryptophan => serotonin
  - Milk and honey before bed => tryptophan => serotonin and melatonin
  - Sweets on the pillow at the hotel => for better sleep as a result of higher tryptophan absorption

**Note: Melatonin is also produced from tryptophan (produced in the pineal gland and retinal cells = regulates biorhythms).**

# Serotonin

## Management and leadership

- **As a leader: if you are not willing to give up benefits when needed, you should NEVER be promoted to the position you hold - You have the position, but you are not the leader!**
- If you promote to leader:
  - you have **MORE** work (not less)
  - **you are putting** other team members at risk
- It touches us deeply when people who are supposed to be leaders sacrifice their team for their own benefit when there is a problem.

# Serotonin

## Management and leadership

- **If we trust each other in the team, then:**
  - we will take **more risks**
  - we will **innovate**
  - we're going to **do great things**
- **If we don't trust each other in the team, we won't achieve these things**



Oxytocin

# Oxytocin

## Psychologically

- It is involved in the formation of emotional attachment:
  - of mother and child
  - between sexual partners during orgasm and fear
- Increases **trust and empathy** in the group
- Suppresses anxiety
- **Increases confidence and reduces fear**
- **Improves mood and reduces stress** response

# Oxytocin

## What increases it?

- Social contacts
- Cuddling, orgasm
- Doing **good deeds without reward.**

# Oxytocin

## Psychiatrically

- Oxytocin is used in addiction recovery because:
  - **reduces withdrawal symptoms**
  - **reduces drug addiction**

# Oxytocin

## Management and leadership

- **Social contact** - e.g. shaking hands of strangers is an important moment for joint negotiations and contracting
- Business and business relationships are often not rational, they are much more about a certain belonging, a sense of security.
- **Refusing to shake hands** will lead to
  - you'll be nervous or..,
  - you'll find the other side untrustworthy,
  - you don't have to sign the contract after all.
- **In management speak, giving your time and energy to someone else without getting anything in return = the basic activity of a Leader**



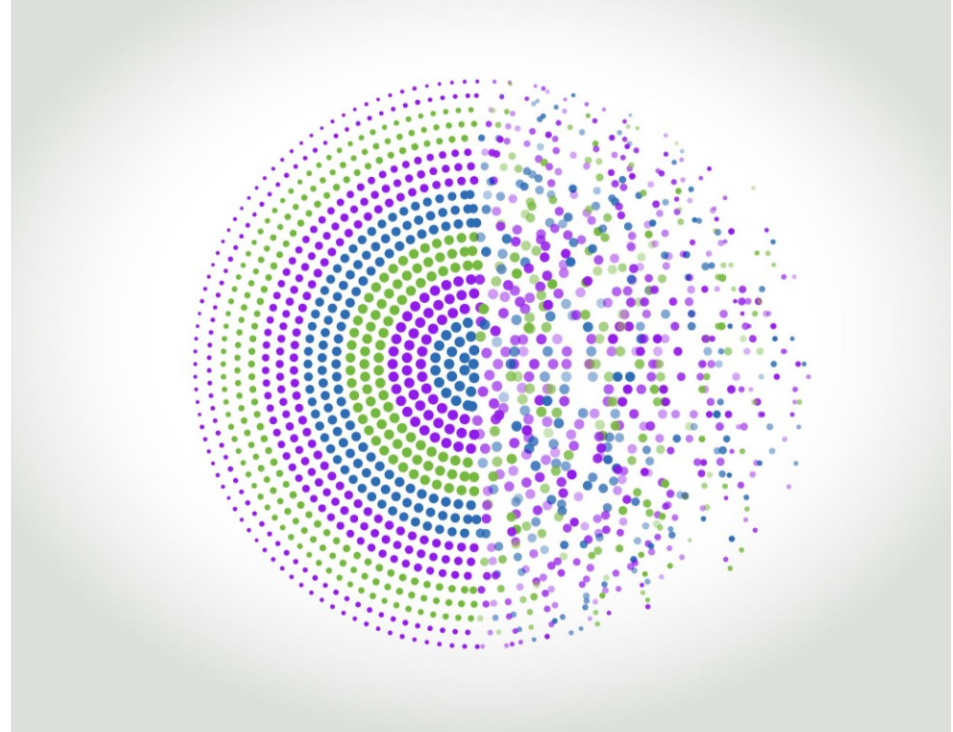
# Oxytocin

## Management and leadership

- Real leaders are those who give us their **time** and **energy**, not money - **money is not biologically effective**
- **Leader has limited time**
- **A leader's basic decision: who to give time+energy to and who not to**

**Leader realizes an important fact:**

- **Oxytocin also plays an important role in the overall health of the body and improving immunity** (happy people and people living in a relationship live longer - they are healthier)



**Cortisol**

# Cortisol

## chemistry of stress

- **WHY:**

- main role is the regulation of nutrient metabolism - carbohydrates, proteins and fats

- **HOW:**

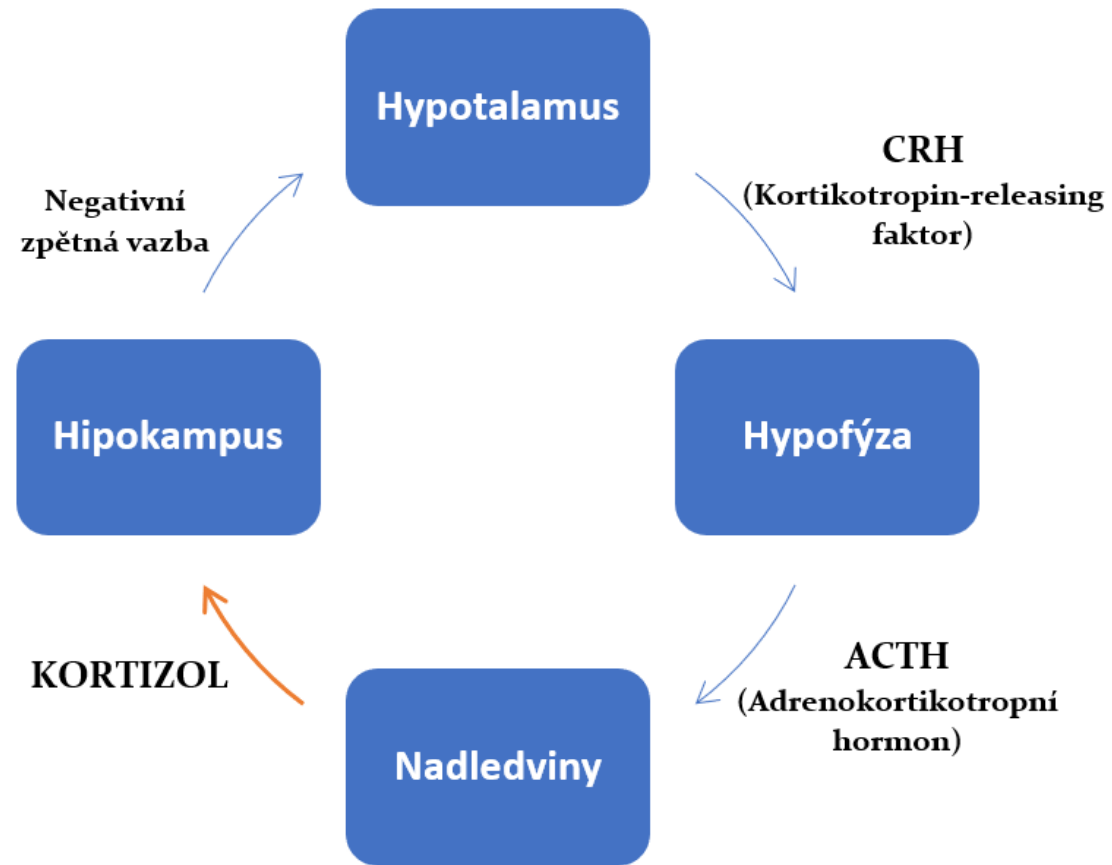
- Stress => signal to **Amygdala** => **Locus coeruleus** => activation of stress axis: **hypothalamus** => **pituitary** => **adrenal** => feedback via hippocampus to hypothalamus

- **WHERE:**

- produced by the adrenal cortex from
- the starting substance for the formation is cholesterol

- **CO:**

- Cortisol is one of the main steroid hormones
- It is a stress hormone



# Cortisol

## Physiologically and anthropologically

- Responsible for the initial reaction type: **running, attack, retreat**
- It prepares the body for this type of stress:
  - Induces a paranoid state: makes one nervous, makes others nervous
  - Sharpens our senses
  - Responsible for pumping glucose into the blood
  - Regulates blood clotting
  - Shuts down the immune system
  - Suppresses hair and nail growth
- Short term - OK, but long term it causes more frequent sickness,

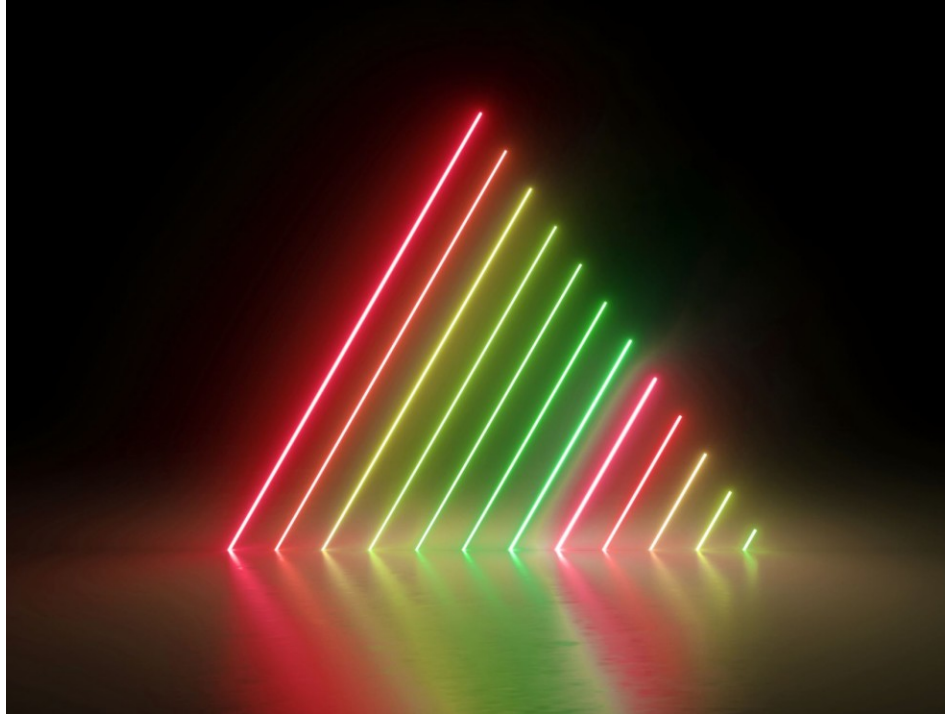
# Cortisol

## Psychologically

- Cortisol **increases selfishness** and suppresses oxytocin release
- biologically, our character is changed by long-term exposure to cortisol
  - less compassionate
  - less noble
  - we stop caring about others
  - we focus on protecting ourselves
- In the event of danger (an attack on a group of people), it is natural that a person will start to choose a side

# Cortisol Health

- Toxic environment, i.e. toxic company culture, enormous stress, etc. is killing us
  - This kind of work is killing us, and the people working in these companies should **leave as soon as possible because they are sacrificing the most valuable thing they have - their health**



Stress



# Stress

- In terms of risk, stress can be divided into two forms:
  - **A) EUSTRESS**
  - **B) DISTRESS**
- **Eustress** is a kind of stress that has a beneficial effect on our organism. This is, for example, sports. This type of stress is characterised by one basic characteristic: stress in which we have an influence on the events that cause it. In other words, we can stop this stress.
- **Distress** is one of the dangerous stresses that cause phenomena that we cannot control by our own actions. The worst situation is when our organism is exposed to such stress for a long time.

# Stressors

- repeated threat
- bossing and bossy behaviour, generally bullying
- frustration (e.g. due to extensive responsibility and low authority = I cannot influence the phenomena)
- conflicts and disputes

# The Yerkes-Dodson curve of human performance



# Burnout Syndrome

- H. Freudenberger 1975 - state of exhaustion, fatigue and permanent stress
- Stages:
  - **Zero:** High performance but insufficient reward
  - **First:** The feeling of not keeping up
  - **Second:** anxious chaotic and overworked
  - **Third:** loss of interest, irritability, disappointment, dullness



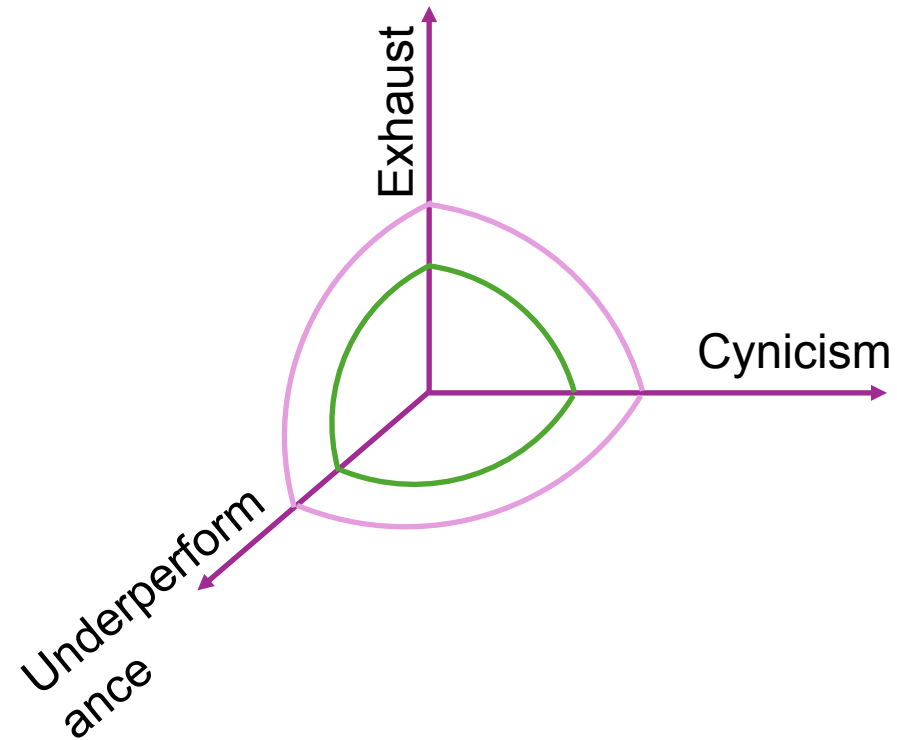
# Burnout syndrome - symptoms

- Fatigue
  - Depression and anxiety
  - Memory disorders
  - Attention deficit disorder
  - Sleep disorders
  - Somatic disorders
  - Crankiness, feeling of pressure
  - Alcohol, smoking
  - Disruption of interpersonal relations
- What it leads to:
    - decrease in enjoyment of work
    - decline in the capacity for empathy
  - It manifests itself further :
    - unwillingness to serve clients
    - cynicism
    - with impatience
    - irritability towards colleagues and clients
    - fantasies of testimony

# Measuring burnout syndrome

## Maslach Burnout Inventory (MBI)

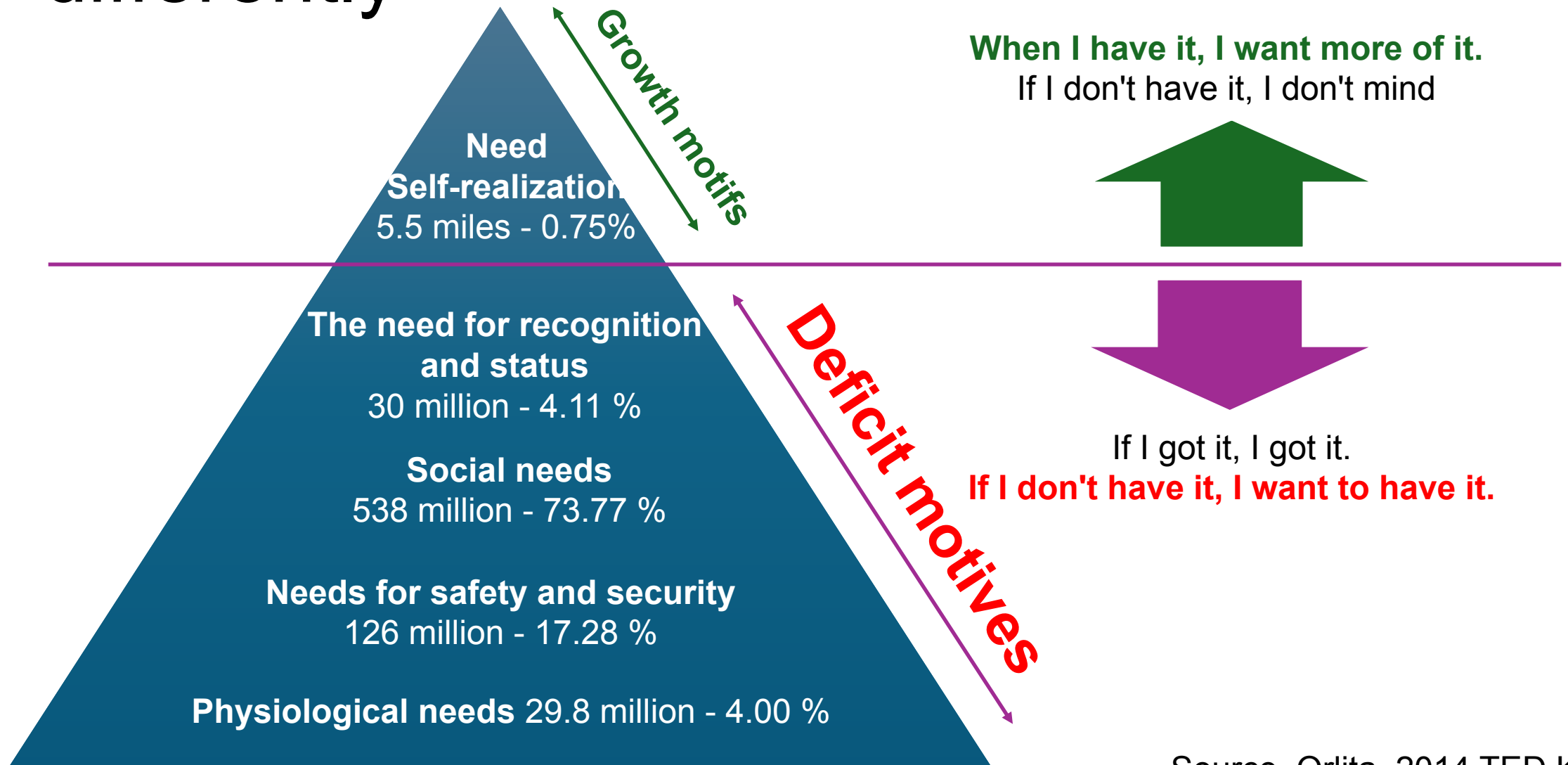
- 3 spatial model, evaluated from three perspectives:
  - Exhaust
  - Cynicism
  - Underperformance



# How to prevent burnout?

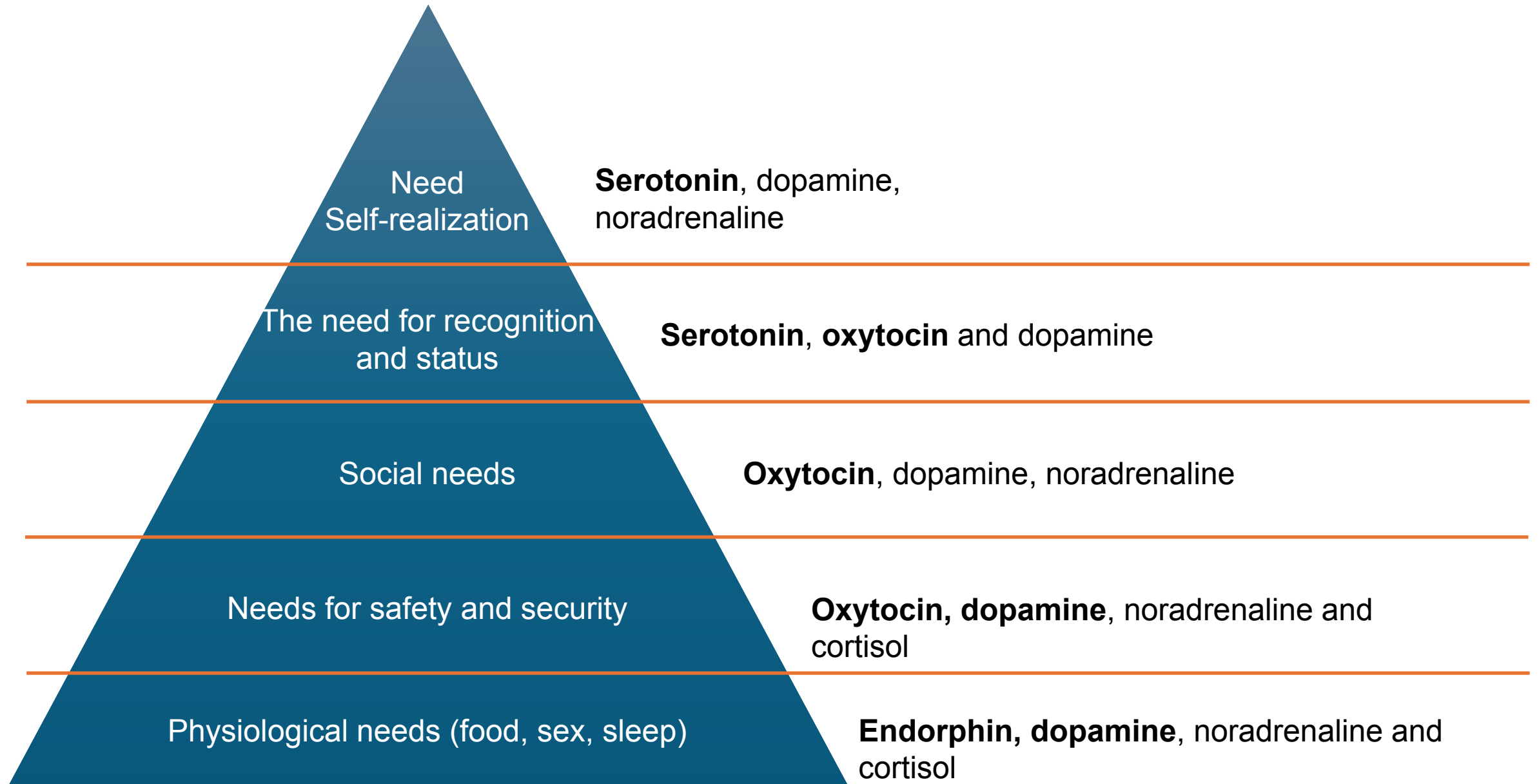
- **Time management** - setting priorities and urgency
- Functioning at least **two pillars of life** out of three:
  - Thesis
  - Relations
  - Hobbies
- Self-teaching and self-improvement
- Having an impact on events - supervising your own life
- To have my own sanctuary where I can be alone
- Know how to give but also receive praise
- We shouldn't aspire to do everything perfectly
- Doing things differently - prevention to stereotypes
- Create
- Don't always talk about work
- Plan - work and leisure,
- Know how to say yes and no - especially at work
- Humour (affects how we read the present)
- Sport

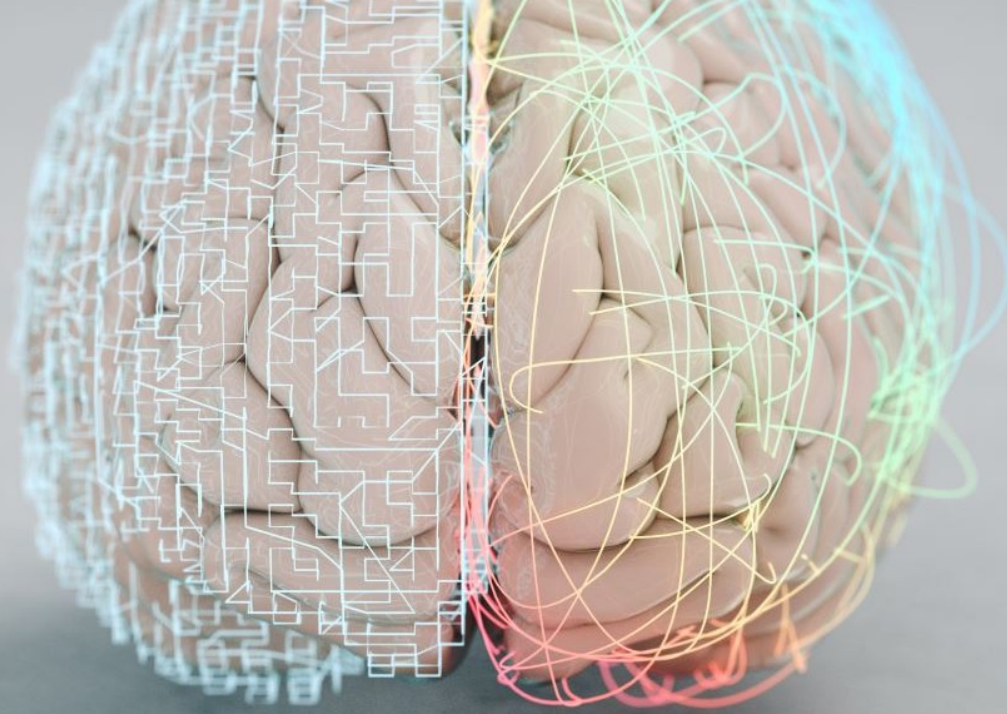
# Maslow's pyramid of needs a little differently



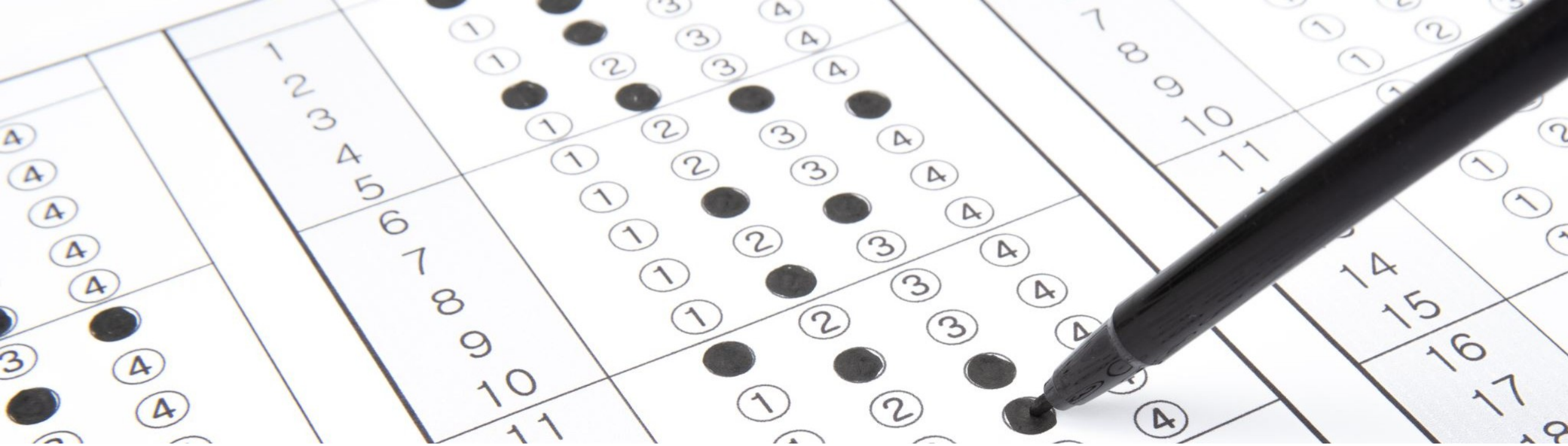
Source. Orlita, 2014 TED Kroměříž







# Intelligence and rationality



**TEST**

# Test

1. The bat and ball cost a total of **\$1.10**. The bat costs **\$1.00** more than the ball. **How much is the ball? \_\_\_\_\_ cents,**
2. If it takes **5 machines 5 minutes** to make **5 products**, how long would it take **100 machines** to make **100 products? \_\_\_\_\_**
3. There is a cluster of water lilies in the lake. **Every day the clump doubles in size**. If it takes 48 days for a clump to cover the whole lake, how long would it take for **the clump to cover half the lake? \_\_\_\_\_ days.**

# This was the **Congitive Reflection Test**

- by **Shane Frederick** (2005)
- CRT was conducted on 3428 students from different universities.
  - **33% of those tested could not identify the correct answer to any of the questions.**
  - **Only 39% of students answered two or all three questions correctly.**
  - **61% percent of respondents in the CRT test succumbed to the System 1 result and did not engage the controls available in System 2 at all.**

## **How did we do?**

# Why?

- Keith Stanovich (Stanovich, 2010) concludes that **high intelligence does not make people immune to biases in judgment**
- **Intelligence is not the same as rationality.**
- Stanovich concludes that CRT test-type tasks are superior to traditional IQ tests.

# Why?

- Failure in cognitive tests is due to "**lack of motivation**" (one does not try hard enough to verify the correctness of the answer generated by System 1)
- Those who have avoided intellectual laziness are **more alert**, more **intellectually active**, **less willing to be satisfied with superficially** plausible answers, and more skeptical of their intuition - **what** might be called "**engaged**"
  - are **more "rational"** (Stanovich, 2010) and (Kahneman, 2012).