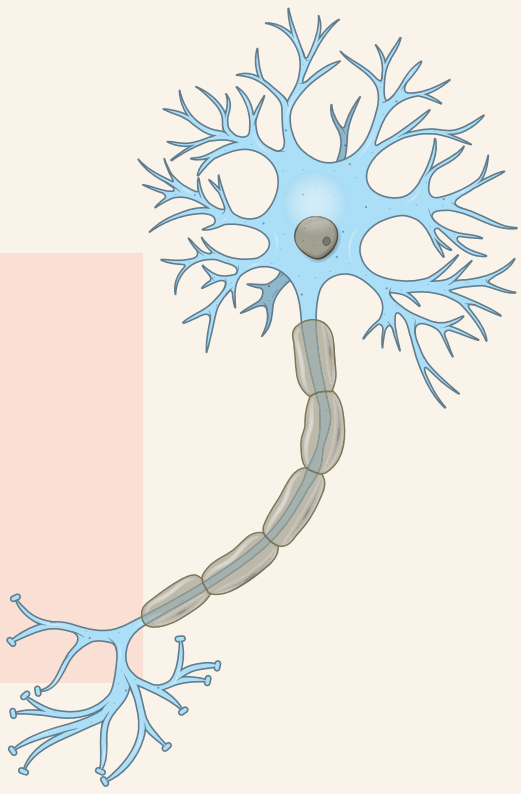
The brain complexity

*The **brain** is one of the most fascinating and complex organ of the human body, and is responsible of all our actions and thoughts. Neuroscience studies what it's like and how it works, to understand how to act in the case of pathologies that affect the central nervous system.*

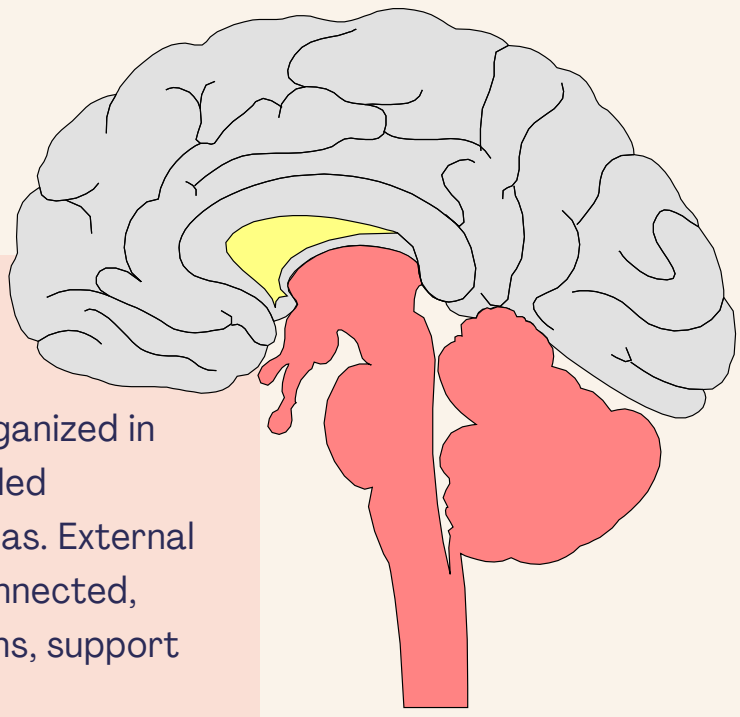


Neurons

In the brain there are many specialized cells, called **neurons**: it is estimated that an adult have more than **90 billions** of them!

Synapses

Each neuron can communicate with tens of thousands of other cells, through the so called **synapses**. It is this intricate network that allow us to perform a lot of actions, in each moment of our life.



The organization

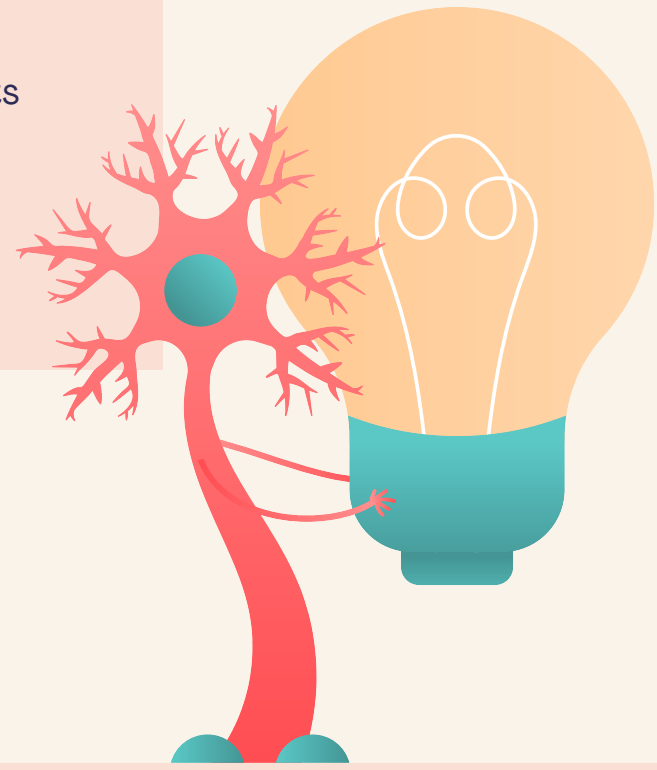
Within the brain, neurons are organized in more external areas - the so called **cerebral cortex** - and inner areas. External and internal layers are highly connected, and they contain, besides neurons, support cells (called **glial cells**).

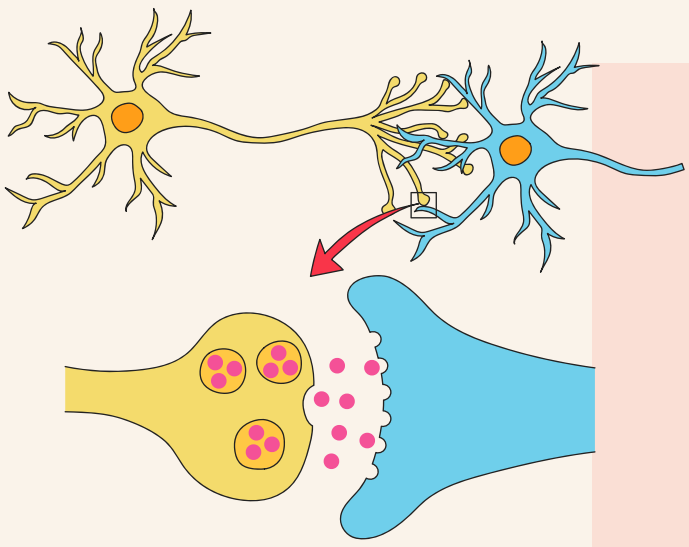
Neurons communication

***Neurons** are cells that, due to their shape and organization, are specialized to perform a specific task: **communicate** costantly, at a very high speed.*

The electrical signal

In neurons the communication starts thanks to an **electrical signal**, that travels extremely fast until it reaches a **synapse**.



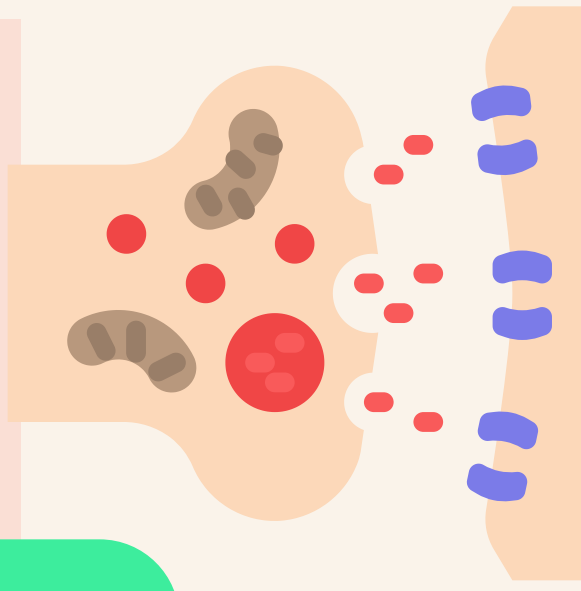


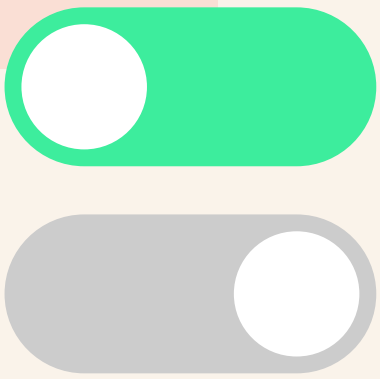
Neurotransmitters

There, following a series of reactions, there is the release of particular molecules, called **neurotransmitters**. Thus, from electrical the signal became a **chemical signal**.

Receptors

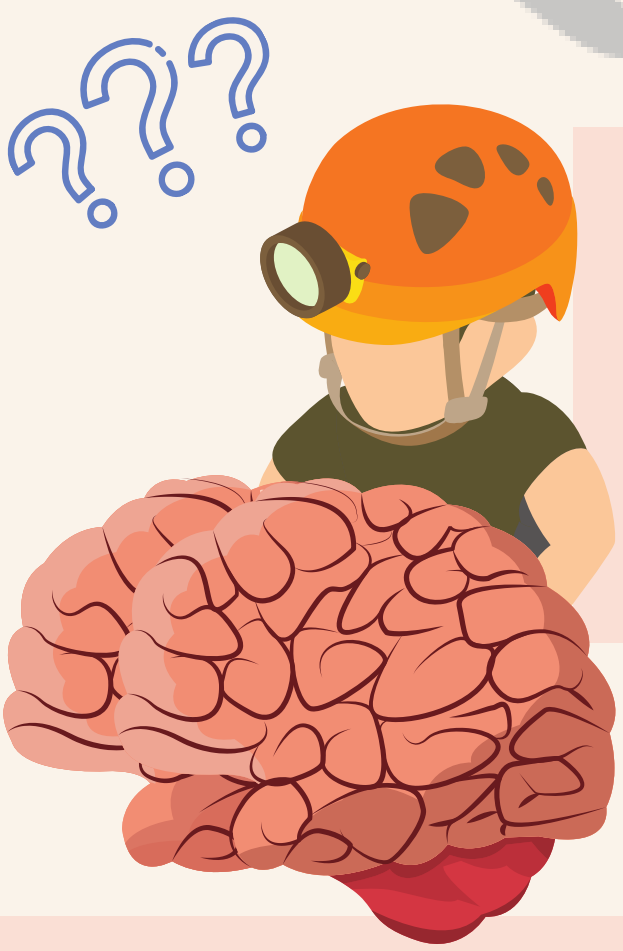
Neurotransmitters reach another neuron's membrane, and they bind with proteins called **receptors**. At this stage the neurotransmitter carries out its function: **excitatory** (the electrical signal re-start on the second neuron) or **inhibitory** (the second neuron "turns off").





In-depth study of the brain

*The **DEEPER** project aims to develop a new investigation methodology, based on certain properties of light, to study disorders involving the deeper layers of the brain.*

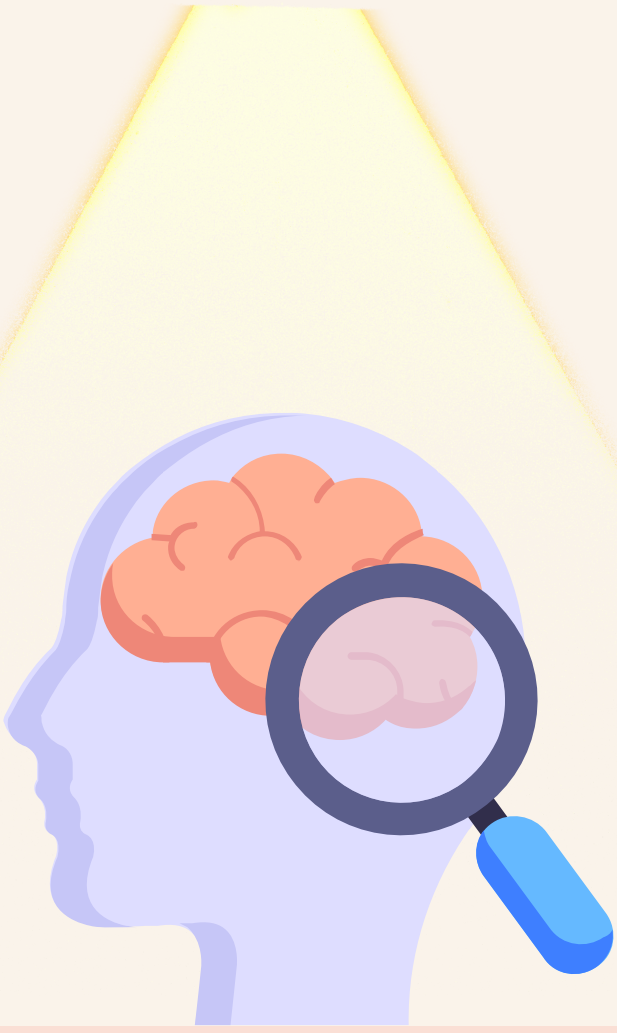


Deep disorders

Some brain disorders, such as **Alzheimer's disease**, chronic **pain**, **depression**, substance **addiction** and **schizophrenia**, arise from alterations occurring in deep regions of the brain that are difficult to reach with traditional analysis tools.

An help from light

Thanks to innovative technologies, a special external light source, such as an **optical probe**, can be used to non-invasively study what goes on in the deepest states of the brain.



The DEEPER project

Through the DEEPER project, Italian researchers will coordinate the **collaboration** between technologists, neuroscientists, clinical experts and hi-tech companies, with the common long-term goal of developing new optical methods of **studying** and **treating** neurological diseases.

Find out more on DEEPER, following its results and developments, on:

https://deeperproject.eu

@deeper_project

DEEPER is funded by European research and innovation programme Horizon 2020 (grant No 101016787).