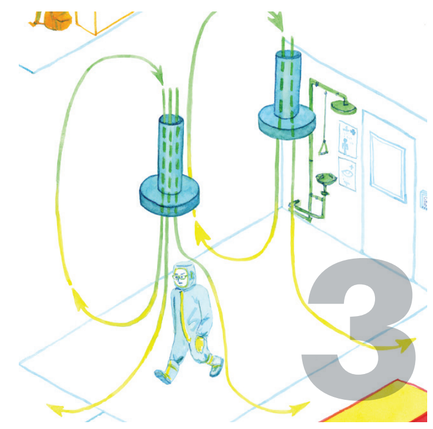
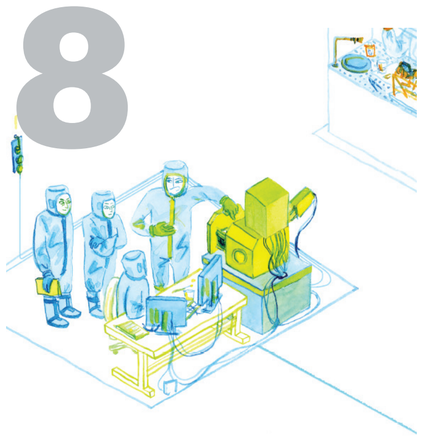
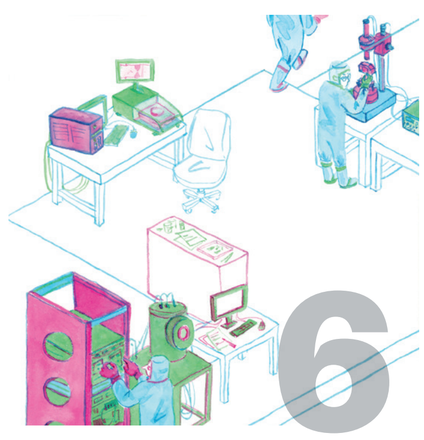
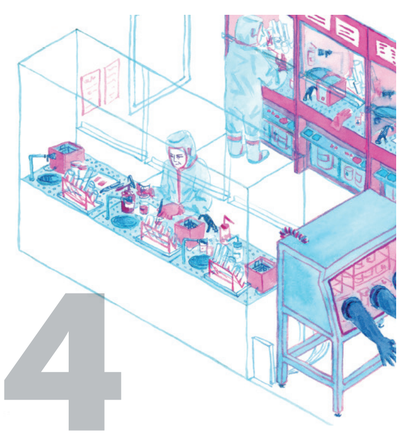
The clean room

The clean room is a space where the size and number of particles is controlled. It is then possible to fabricate structures smaller than these particles.









1 Cloakroom

2 Airlock: sticky carpet and a bench to separate the cleanroom from the outside.

3 Air is filtered and recycled. It is directed toward the floor and the outside so the particles cannot enter.

4 Humid zone: the fume cupboard allows to handle liquids. Each cupboard is dedicated to a type of liquid : acid, bas, solvent, etc.

5 Yellow zone: UV light is filtered which gives a yellow hue to the light. Photolithography is carried out in this room.

6 Grey room: this area is cleaner than the outside but less than the inside of the cleanroom.

7 Area where many instruments can be found for characterization or fabrication purposes (etching,evaporation...)

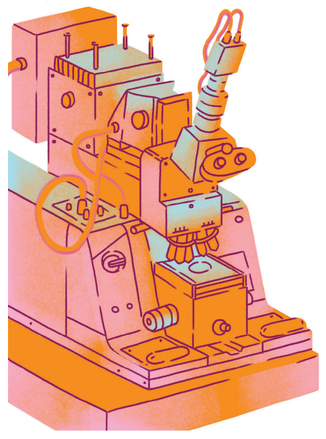
8 Inside the cleanroom, separate room may welcome specific set-up such as Scanning Electron Microscxope or Scanning Tunneling Microscope.

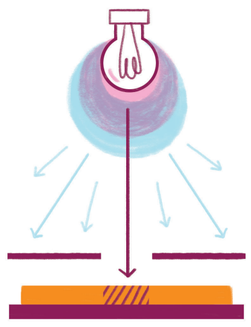
Graphic design : Clara Hinoveanu and Zoé Lemaire, Physics : Nathalie Lidgi-Guigui and Julien Bobroff. Discover all the posters at *www.vulgarisation.fr*

Fabrication

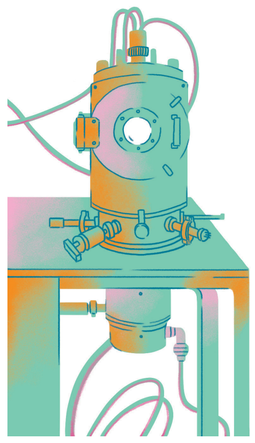
Lithography is a technique used to fabricate at the nano- or micrometer scale. Many variation of this techniques exist.

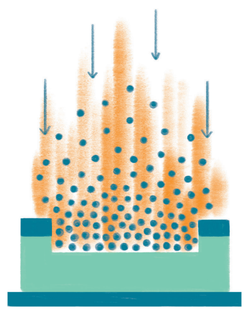
Mask aligner

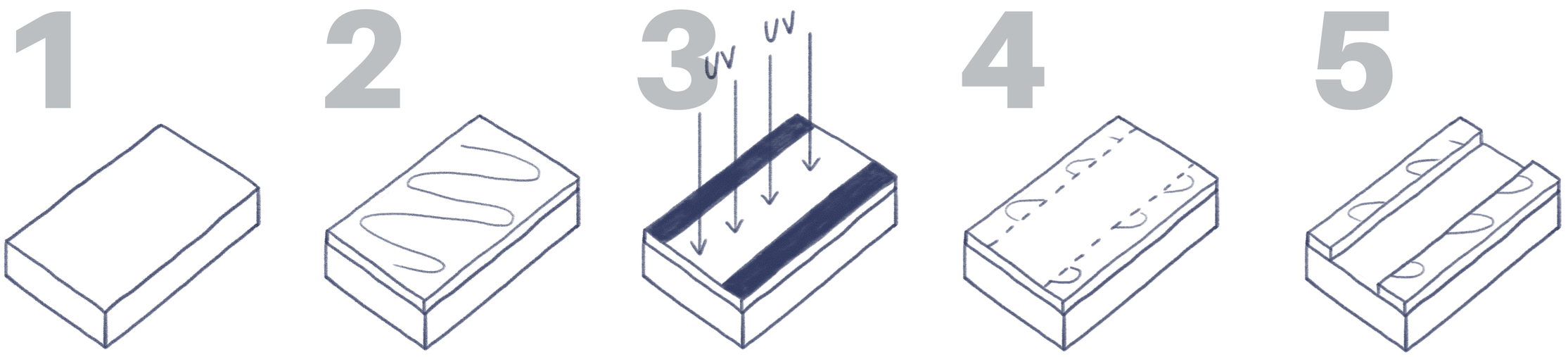


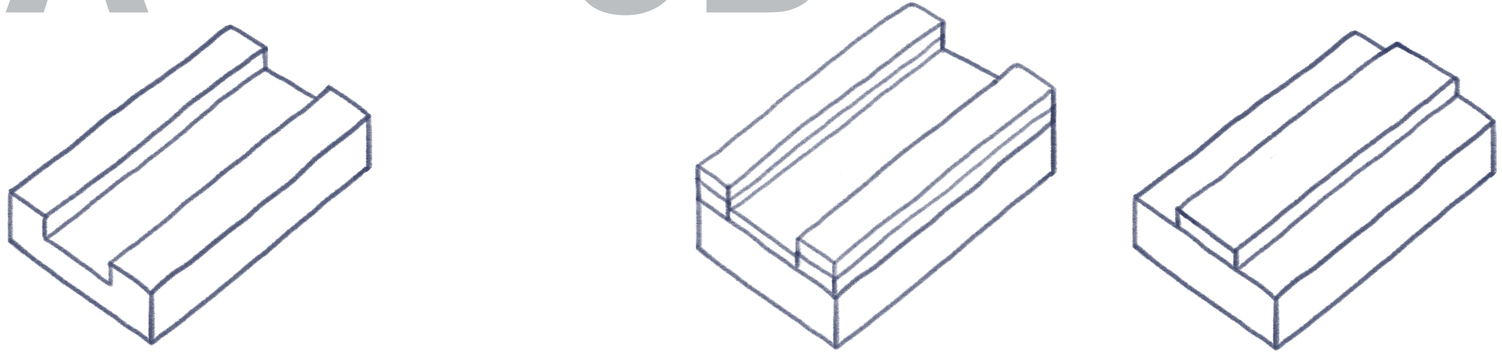


Etching system









1 Clean sample.

2 Resist deposited on the sample.

3 Exposing.

4 The resist is exposed only on the open part of the mask.

5 Development.

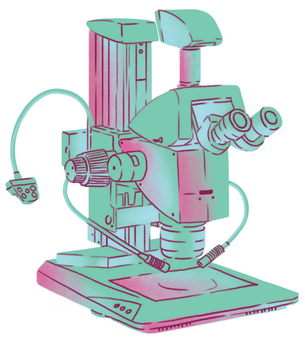
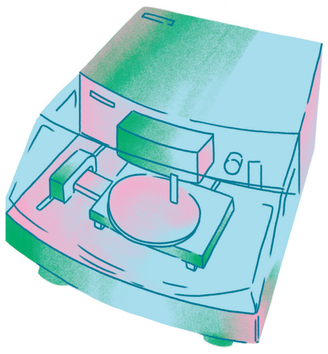
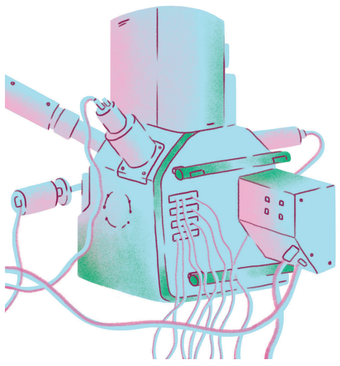
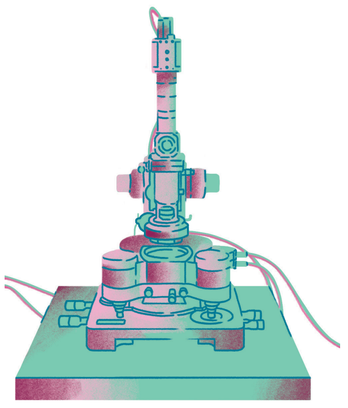
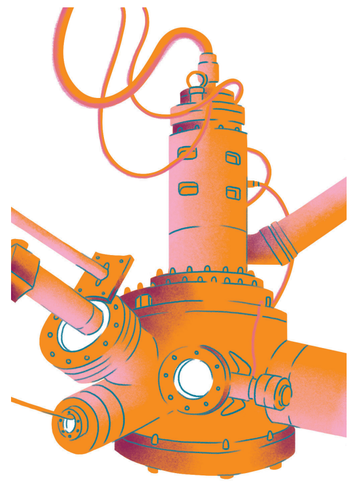
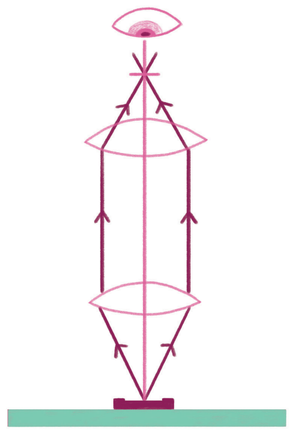
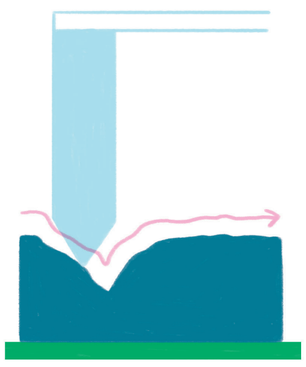
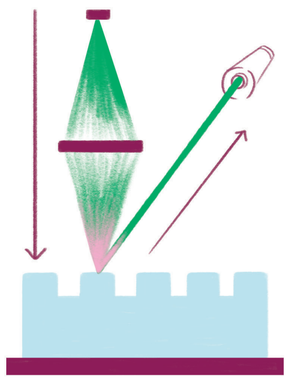
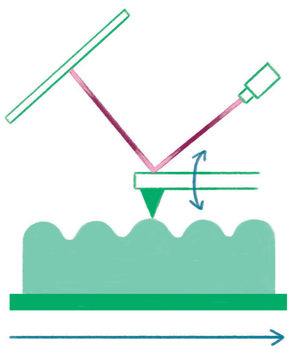
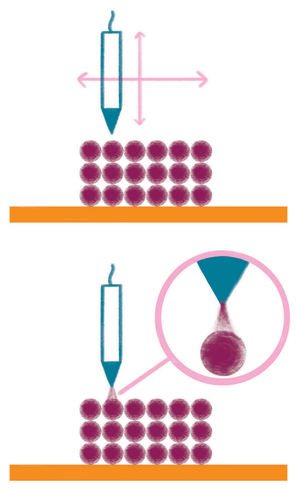
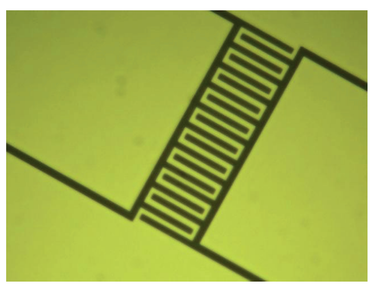
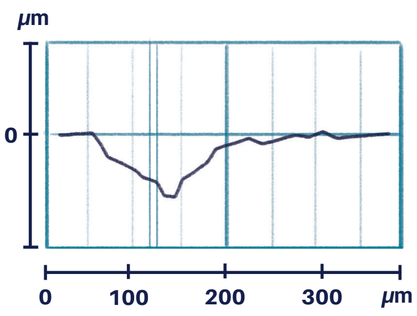
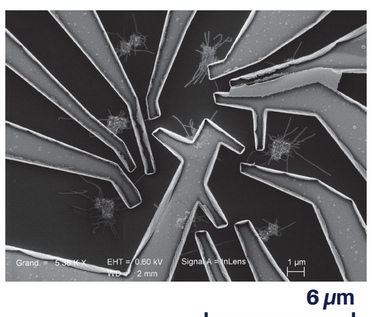
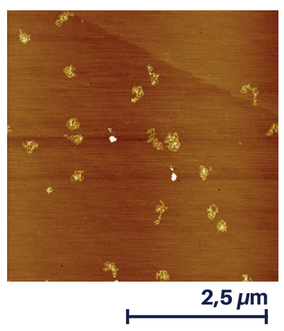
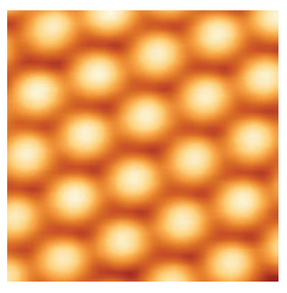
6A Etching.

6B Metal deposition and the lift-off: the resist is dissolved taking away part of the metal.

Graphic design : Clara Hinoveanu and Zoé Lemaire, Physics : Nathalie Lidgi-Guigui and Julien Bobroff. Discover all the posters at *www.vulgarisation.fr*

Characterization

Instrumentations which are used to control the fabrication.

	1 Optical microscope	2 Profilometer	3 SEM	4 AFM	5 STM
INSTRUMENT					
PRINCIPLE					
IMAGE					
	Interdigitals electrodes.	Profile for a surface.	Quantum dots based on carbon nanotubes.	DNA plasmids on mica.	Silicon atoms.

1 The optical microscope exploits the trajectory of light through lenses.

2 The profilometer is used to measure thickness and topography.

3 SEM: Scanning Electron Microscope. It is used to look at conductive sample up to a few tenth of nanometers.

4 AFM: Atomic Force Microscope. It is used, among others, to measure the roughness of a surface up to 0.1nm.

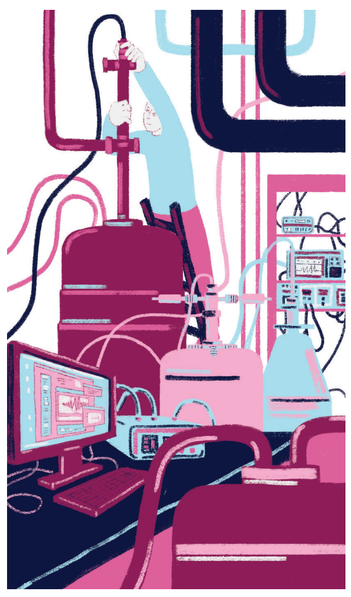
5 STM: Scanning Tunneling Microscope. Conductive surfaces can be observed with STM at the atomic scale

Graphic design : Clara Hinoveanu and Zoé Lemaire, Physics : Nathalie Lidgi-Guigui and Julien Bobroff. Discover all the posters at *www.vulgarisation.fr*

Researches & Applications

Objects designed in cleanroom are used both for fundamental researches at micro and nanometer scales and for industrial applications used in our every lives.

1



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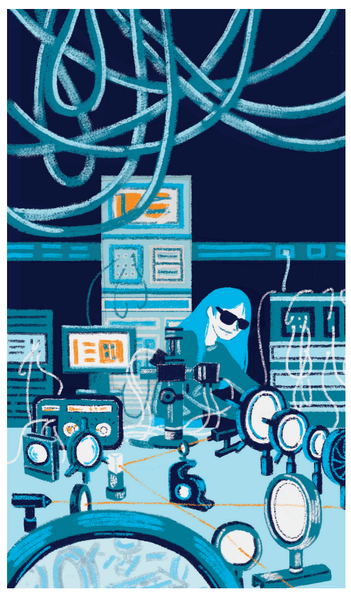

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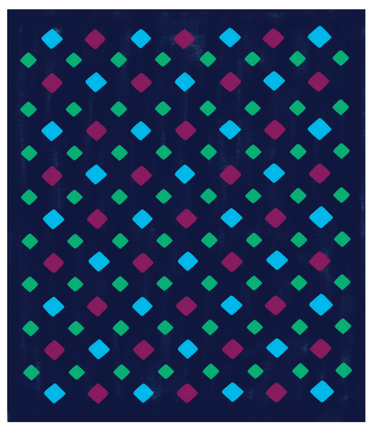

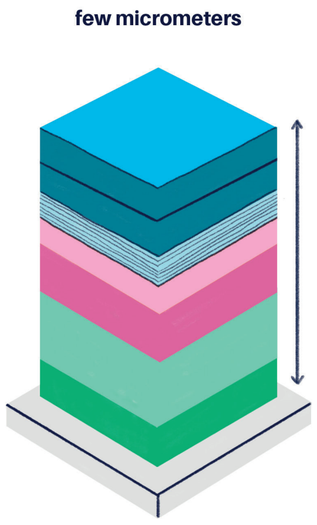

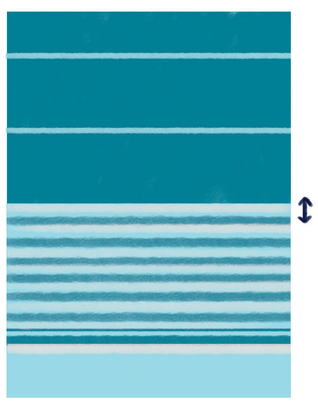

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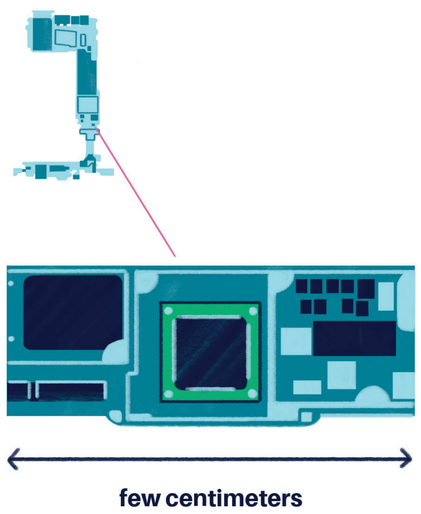

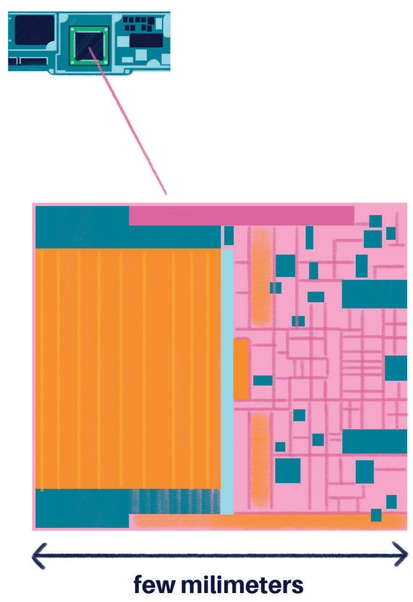

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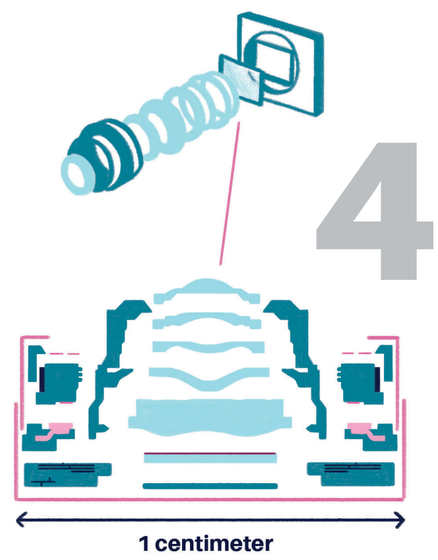

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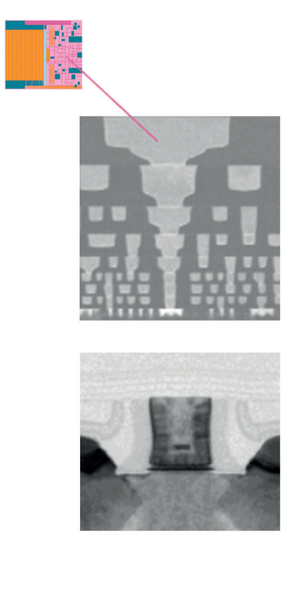

1 Solid state physics laboratory: researchers study quantum physics effects at the nanometer scale.

2 Photonic laboratory: researchers looks at the behavior of photons interacting with nanoobjects.

3 Soft Matter laboratory: researchers study the flow of fluids in micro- and nanometer scales canals.

4 The camera lense is composed of several lenses all made and assembled in clean room.

5 The screen is made of 3 colors pixels. Each of them is an electroluminescent diode often made of organic materials. These OLED are composed of stacking of micro and nanometers thick layers.

6 The processor is found among other component in the S.O.C. (System On Chip). Inside the processor, billions of transistors are found as small as a few tenth of nanometers.

Graphic design : Clara Hinoveanu and Zoé Lemaire, Physics : Nathalie Lidgi-Guigui and Julien Bobroff. Discover all the posters at *www.vulgarisation.fr*