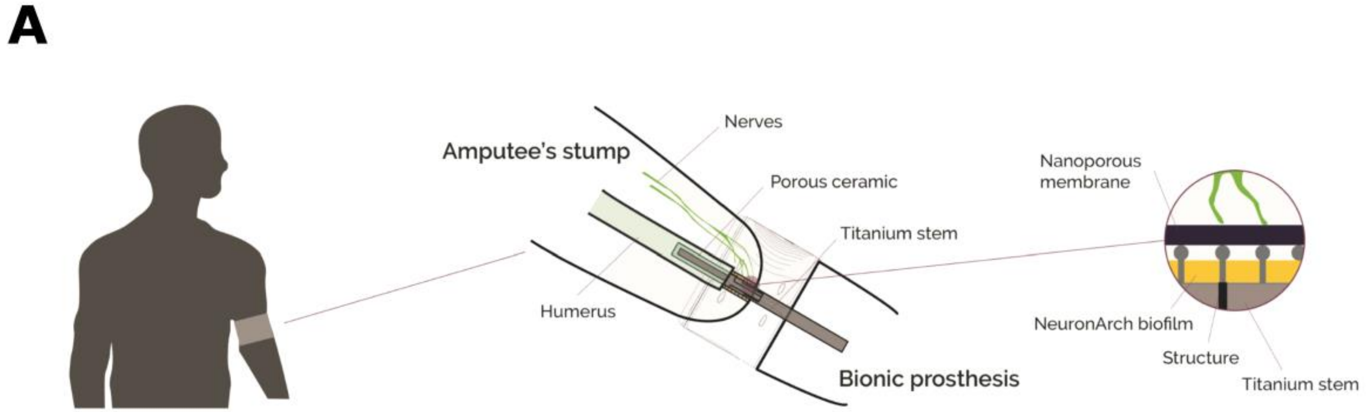
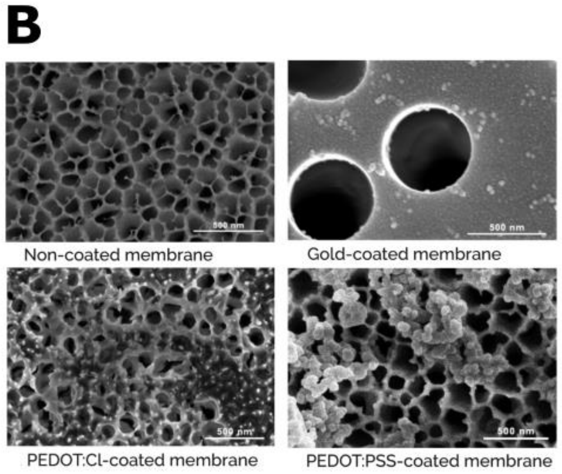




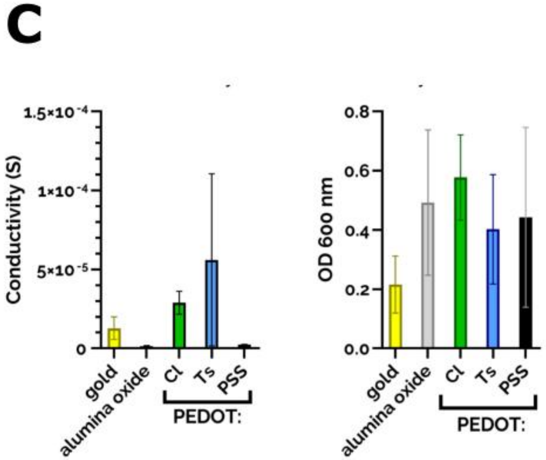
NeuronArch INTERFACE

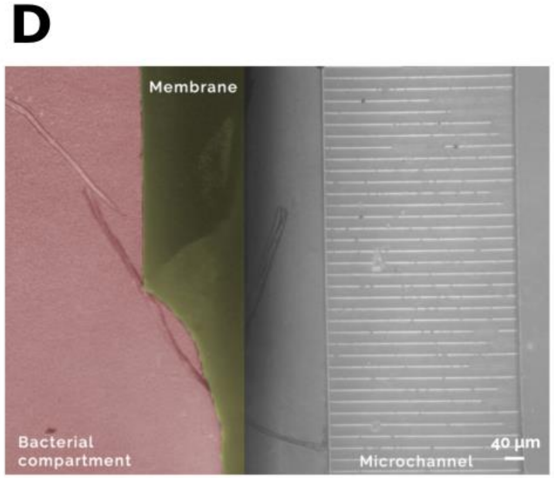
Overview and security measures

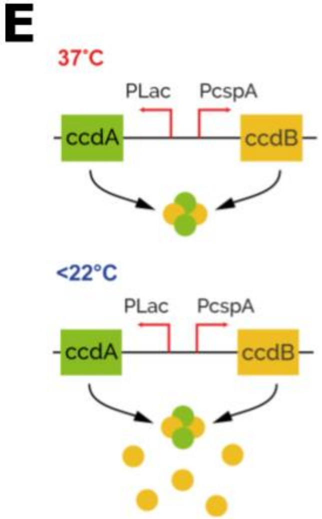
We decided to create a universal biological interface that would be able to connect the residual nerves from the amputees' limbs to the prostheses. We came up with the idea of coating the implants with a genetically engineered biofilm. Bacteria secreting neurotrophins from the interface will help the nerves grow back towards the prosthesis.

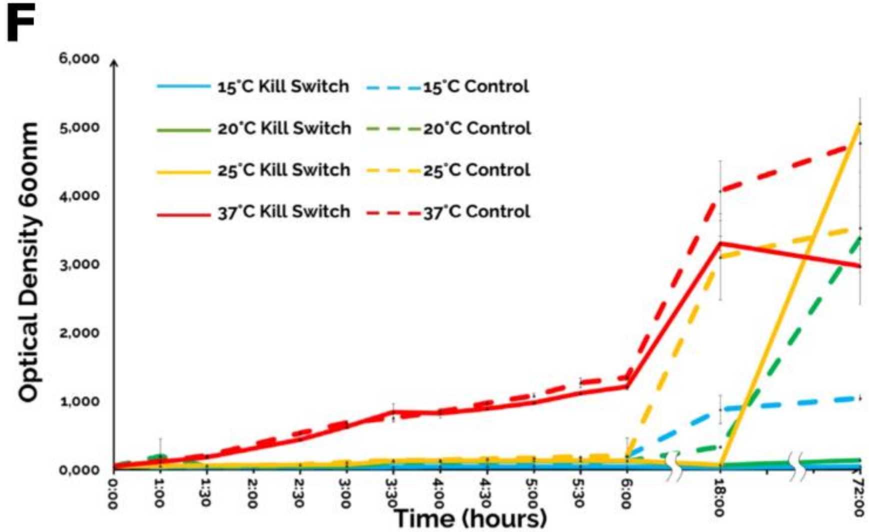
We want genetically modified bacteria to stay at the interface between the prosthesis and the external organic medium. At the same time, one of the main issues our project wants to tackle is the conduction of the neuron influx to the prosthesis. The answer to these questions came as a double solution: confinement of the bacteria by conductive nanoporous membranes.

An additional security measure was added as a kill-switch, designed by Finn Stirling, a Harvard graduate, to prevent the modified bacteria to develop outside in the environment.









A : Overview of the NeuronArch interface.
B : SEM images of different coated membranes tested
C : Conductivity and biocompatibility assays on different types of coated membranes.
D : Microfluidic chip with retaining membrane under microscope. *E.coli* is unable to pass through the membrane.
E : Schematic representation of the temperature-dependant Cryodeath kill-switch. At 37°C, the same amount of toxins ccdB and antitoxins ccdA is produced. Below 22°C, more toxins are produced and the bacteria's growth is inhibited.
F : Effect of different temperature on the growth of Cryodeath