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Center for Artificial Muscles inaugurated this morning in Neuchâtel

27 June 2018 – The Center for Artificial Muscles was inaugurated this morning at Microcity in the presence of Jean-Nathanaël Karakash, the Neuchâtel State Councilor for the Economy and Social Action, and Martin Vetterli, the President of EPFL. The Center will allow EPFL – working first with the Bern University Hospital (Inselspital) and then with the Zurich University Hospital – to develop a less invasive cardiac assistance system for treating heart failure.

The Center for Artificial Muscles was inaugurated this morning at Microcity in Neuchâtel following the announcement of a 12-million-franc donation by the Werner Siemens-Foundation a little over six months ago. The event was attended by Jean-Nathanaël Karakash, who is Neuchâtel’s State Councilor for the Economy and Social Action, EPFL President Martin Vetterli and representatives from the Werner Siemens-Foundation.

Under this ambitious initiative, EPFL is responsible for setting up the Center for Artificial Muscles, collaborating initially with the Bern University Hospital (Inselspital) and then with the Zurich University Hospital. The first project, slated to span the next four years, will focus on developing a less invasive cardiac assistance system for treating heart failure, which many forms of heart disease lead to. In such cases, patients can be saved only by a heart transplant or a complicated assistance system. The prosthetic device that EPFL will develop – in the form a ring around the aorta – will avoid the complications of hemorrhaging and thrombosis because it will not be in contact with blood. Two other projects will follow: a facial-reconstruction project aimed at restoring patients’ ability to make expressions and a project to develop an artificial sphincter using the cardiac assistance technology.

Real progress has been made since the plans to set up the Center were announced last December. EPFL’s Integrated Actuators Laboratory (LAI) in Neuchâtel now has a team of ten people working on the less invasive cardiac assistance system. The system they are developing will be composed of rings placed around the aorta and controlled by magnetic induction. “Our system will obviate the need to operate on the heart,” says Dr. Perriard, who runs the LAI. “The rings placed around the aorta will help the heart pump blood through magnetic induction. This method will therefore be less invasive than current cardiac assistance procedures.”

A less invasive technology

The device will consist of a series of rings made out of dielectric electroactive polymers (DEAPs). These polymers dilate when a current is applied and contract when the current is switched off. Because the reactions are immediate, the contraction-relaxation movement can be controlled in real time. The force required by this movement is achieved thanks to a
high-precision spring developed by H2i, located in Cortaillod, which has teamed up with LAI. “In December, we already knew that the dielectric electroactive polymers alone wouldn’t be enough,” says Yoan Civet, an LAI researcher. This led to the development and patenting of a high-performance titanium spring whose leaves measure only 0.1 mm.

The system comprising the spring and the polymer, when placed around the aorta, helps the heart pump blood.

**Teaming up with Inselspital and the University of Bern**

In order to develop this system, Dr. Perriard's lab is working closely with Thierry Carrel, a renowned cardiac surgeon and the chairman and head surgeon of the Department of Cardiovascular Surgery at Bern's Inselspital. “For patients, this technology would definitely be less invasive than current cardiac assistance systems because it does not interfere directly with the blood flow or blood cells. It may also turn out to be effective in treating patients earlier on to prevent terminal heart failure,” says Dr. Carrel.

In addition to the ten people developing this system, Dr. Carrel’s research group at the ARTORG Center for Biomedical Engineering Research and the experimental surgery section of the Department for BioMedical Research at the University of Bern will make a significant contribution to the project. Dr. Carrel will oversee the entire first phase, which will be spread out over four years. At the end of this phase, and after the technology has been thoroughly vetted in laboratory tests, the surgeon will implant the device on animals. It is only then that the researchers will know if the technology is viable.

**An initiative with real potential**

According to EPFL President Martin Vetterli, “This initiative, at the crossroads of engineering and medicine, offers real potential. I am especially pleased with the university collaborations it has led to, particularly the one with Inselspital.” The Center’s unique features appealed to the Werner Siemens-Foundation. “Through this donation, we really hope to help drive the study of muscle diseases through the advanced research to be carried out by the Center for Artificial Muscles. This revolutionary and forward-looking project aligns perfectly with the Foundation’s sponsorship criteria,” says Hubert Keiber, the Foundation’s chairman.

Jean-Nathanaël Karakash, the Neuchâtel State Councilor for the Economy and Social Action, is equally enthusiastic: “We are very proud that the manufacturing, research and technological capabilities of Neuchâtel's innovation ecosystem, embodied in the innovation cluster at Microcity, are being harnessed for this project. This is a worthy endeavor that will save lives.”

**First the heart, then facial expressions**

This initiative will not be limited to cardiac assistance. The Center will branch out into other fields in a subsequent phase, which will take place over ten years starting in 2022. One project will focus on the urinary sphincter, while another will delve into the reconstruction of facial muscles so that victims of serious burns and other accidents can regain control of their expressions. This latter project will involve Nicole Lindenblatt from the Clinic for Plastic and Reconstructive Surgery at the University Hospital of Zurich.
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Integrated Actuators Laboratory (LAI)
Department of Cardiovascular Surgery at Bern's Inselspital (German only)

Funding
Werner Siemens-Foundation: http://www.wernersiemens-stiftung.ch/en/home/

The Werner Siemens-Foundation supports innovative technological and scientific research projects in universities and institutes of higher education that meet the highest standards. It also supports select projects aimed at educating, training and promoting young researchers.

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Press kit
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