

A human being: a hydrogel system

People are cleverly-constructed hydrogel systems: the brain, muscles and tendons are soft materials that are connected to hard materials such as bones in such a way that they form a soft, intelligent system. These types of systems serve as models for Dr. Martin Kaltenbrunner and his team, as they seek to develop a new generation of soft, adaptable and intelligent systems.

“When we look at people we can see that both hard and soft materials are needed in a highly-functional system,” says Kaltenbrunner. “The question is how to bring them together in an intelligent way, so that together they form a soft, functional system.”

Hydrogels have the advantage that they allow fluids to be transported, and connecting hydrogels to electronics –bioelectronics - is a new field of scientific study. This field is very promising for biomedical applications. For example, it may allow new solutions to be found to transport medication, bringing local anesthetics to where they are needed in the body. Sweat on the skin can be analyzed to determine lactate and glucose levels. Additional possibilities include the integration of electronics into mobile health applications, e.g. the creation of a type of “smart” tattoo.

Currently, a number of large research groups are active in the bioelectronic field throughout the world, for example at MIT (USA), ETH Zurich (CH) and Cambridge (UK). “At our institute, we have often been the first to take initiative,” says Kaltenbrunner. “Our approach is then adopted and further developed by others.”

The first article based on the project’s research has already been published, in which the connection of hydrogels to other materials is examined.