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BIONIC HAND THAT SENSES TOUCH

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Many disabled people, having lost a limb, stop feeling touch or feel the temperature of an object, as the nerve channels are damaged. But to date, a bionic hand has been developed that can enable a disabled person to feel touch again.

In the design of such artificial limb «the sensor data is connected to sensitive nerve endings in the patient's forearm, creating its own interface between organic tissue and the artificial arm. An implantable electrode, known as a cuff microelectrode array, or, more simply, a cuff electrode, is the main component in a bionic arm. The development of such an electrode continued for many decades. The main function of the cuff electrode, which is a plate of flexible material with several electrodes on the surface, is aimed at electrical stimulation of muscles and receiving signals from nerve fibers. In this case, undesirable effects on the nerve endings of the ‘foreign’ device are minimized. New cuff electrodes can now interact with individual groups of axons (an integral part of the neuron), avoiding penetration into their protective sheaths» [1].

The process of adapting the electrodes was very complicated. However, the real problem was to maintain stimulation of different types of axons for a long time. The forearm has three types of nerve endings – medial, radial and ulnar, which connect motor sensory nerves to various bundles. Currently, scientists are using one end of one nerve, connecting this nerve with 20 sensory sensors. The use of several electrodes on one nerve allows you to create many

neural connections. The signals that the prosthesis transmits to the user's nerve endings are as close as possible to the tactile sensations of a real hand [2].

However, conventional prostheses can reproduce such smooth movements only in manual mode, i.e. when the disabled person accurately repeats each movement. In a study published in the journal Science Robotics [3], two volunteers were fitted with bionic arms and their movements were tested. Both volunteers performed basic daily tasks such as picking up and using cups, bottles, and ballpoint pens. One of them could even use a smartphone. According to the researchers, they performed these tasks as intuitively as they did before losing their limbs.

While the bionic prosthetic hand looks great, it does not yet have sensory functionality, such as being unable to convey the temperature or softness of the object it touches. However, this problem has already begun to be addressed. A team of South Korean scientists has created artificial leather gloves with built-in S-sensors (there are currently 400 of them) that can send signals to the brain [4].

The development of bionic prostheses will continue in future.

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