Multifunctional fibers to help repair nerve damage or deliver treatment for mental, neurological disorders

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Understanding and reverse-engineering the brain's powerful circuitry have tantalized researchers for decades. Today, new tools and techniques provide unprecedented access to the nervous system, increasing our understanding of the brain and creating exciting new opportunities. Engineers investigate how the brain calculates, learns and controls the body, and tap into the nervous system's capabilities to create intelligent systems and better assistive technologies. The researchers also study how these technologies affect our society. In the future, neurotechnologies will become a seamless part of life. Find out more in this Special Report. Credit: Nicolle R. Fuller, Sayo-Art LLC

Polina Anikeeva hopes to one day be able to regenerate the spinal cord to restore movement for paralyzed people or possibly bypass the spinal cord altogether with a device that mimics its function.

With support from the National Science Foundation (NSF), the materials scientist and her team at the Massachusetts Institute of Technology (MIT) are engineering a nerve repair "tool kit," with an eye toward repairing damaged nerves and even growing new ones.

They're designing multifunctional polymer strands—thinner than a human hair—that would be implanted right alongside damaged neurons. The strands can have hollow channels to deliver drugs, embedded electrodes to send electrical signals, or optical guides to transmit light for optogenetics, a method for switching nerve signals on and off.

The team is also designing fibers that can act as tiny scaffolds or 3-D structures, to support new nerve tissue as it grows or even accelerate the growth. The ultimate goal is to help doctors treat diseases such as Parkinson's, schizophrenia and depression, in addition to healing spinal injuries. Anikeeva's research helps advance NSF's efforts to enable scientific understanding of the full complexity of the brain, in action and in context.

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