NEUROSCIENCE

Robots could soon be probing your brain

BY SOPHIE BUSHWICK

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To figure out how your brain works, researchers need to be able to measure the electrical activity of neurons. But now, a new method allows robots to perform the task instead.

Your brain and nervous systems are made up of neurons, sending and receiving the electrical signals that let us breathe, move, think, remember, and generally function. So knowing how individual neurons work, their patterns of electrical activity, and which of their genes are activated at any given time also will also give us insight into how the brain functions as a whole.

But how exactly do you crack open a neuron to analyze its activity? The current method of

doing so is a highly specialized technique called whole-cell patch-clamp electrophysiology. In this method, you touch a micro-pipette to the cell membrane of an individual neuron, as in the illustration. Gently, suck a tiny section, or "patch," of membrane into the tip of the pipette without breaking the cell. Now, you can study the ion channels in that particular patch of membrane.

Even more ambitious. The next step is simply stronger suction, displacing your patch and leaving the pipette tip sealed to the outside of the cell. Through the open cell membrane, instruments can record the entire neuron's activity.

As you might imagine, patch-clamp is a fussy and difficult technique that requires months of training, limiting its practice to few laboratories. But what if you could automate the process? Instead of training humans to perform patch-clamp, labs could just order a robot programmed to do the job.

Researchers at MIT and the Georgia Institute of Technology have delegated whole-cell patch-clamp electrophysiology to a robot arm equipped with a cell-detection algorithm. The arm lowers the patch-clamp pipette into the brain of an unconscious

mouse while measuring how easy it is for electricity to move out of the pipette. With no

when the pipette runs up near a neuron, the flo
Under the guidance of an algorithm, the pipette
measuring the electrical impedance ten times e
impedance shoots up, indicating the presence o
perform the patch-clamp procedure on it.

So far, the automated robot arm is great at dete
time, but it's not as good at performing the patc
about 40 percent of the time. Still, considering
the robot arm is pretty good at this technique, a

Based on their results, the researchers suggest t
automated:

applications of robotics to the automation of in
vivo assays in bioengineering and medicine, wil
es, and to install them automatical
ing throughput prevention. The use of
monitoring could enable a single human operat
hroughput.

While having robots examine brains for us woul
possibly more precise than human operators, I
True, humans can make devastating
of our robot brethren cracking my h

Via Nature Methods

Contact Sophie Bushwick:

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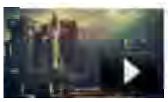

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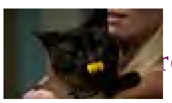

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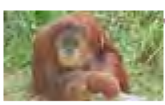

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