Research Highlights

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Subject Category: **Nanosensors and other devices**

Biotechnology: Axon, ax-off

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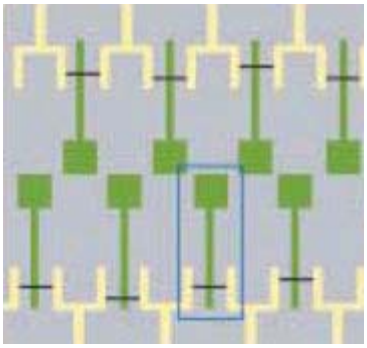
Neuronal electronic signal transfer is controlled and measured using silicon nanowire device arrays



Conventional techniques for detecting and controlling electronic signal transfer in a neuron use micropipettes. However, multiplexing this process is difficult. Now, Charles Lieber and colleagues[1] at Harvard University in the US have made integrated neuron–silicon nanowire transistor arrays to detect, stimulate and even halt neuronal signal transfer.

Numerous device architectures were studied, but the essential structure consists of the neuron body with its axon and dendrites stretched over an array of silicon nanowire transistors. A polylysine pattern directs the dendrite and axon growth along the nanowire array during cell growth and ensures successful neuron–nanowire electrical contact. Measurements are made by stimulating the neuronal action potential at the cell body with a microelectrode and detecting the signal at a given nanowire–neuron junction. Growing the axon or dendrite across a series of nanowires permits the measurement of both signal speed and distortion. Moreover, setting the voltage of one of the nanowires in the series above a certain threshold completely blocks signal propagation.

The importance of this work lies in its evident scalability. Successful growth and signal detection of a neuronal axon across 50 nanowire elements suggests the potential of these devices for designing real-time cellular arrays and for drug testing.

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Ancillary details

References

1. Patolsky, F. *et al. Science* (2006).
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