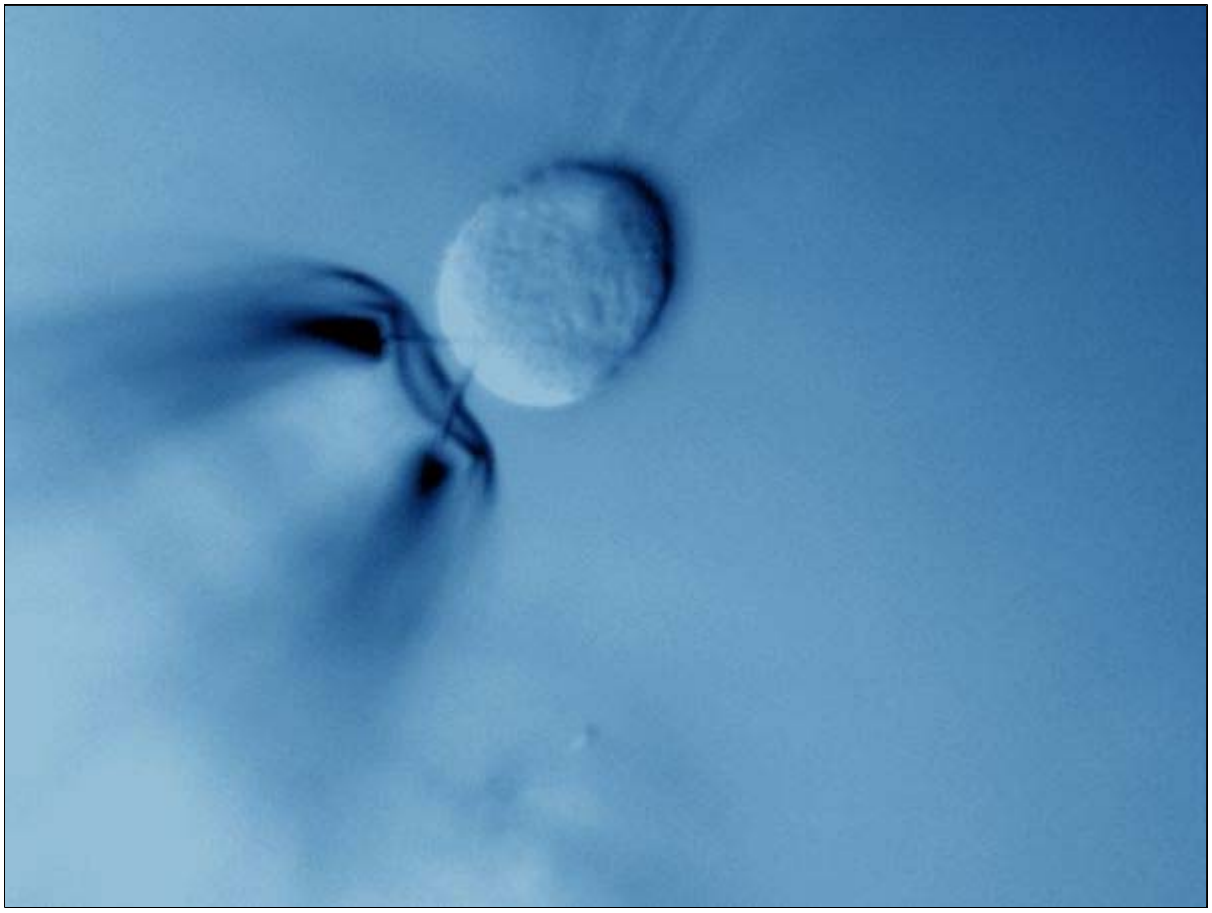
Nano "Wiretap" Spies on Cells

Tiny transistor "listens in" on crucial biological functions, study says.



A new nanowire transistor attached to a cell (pictured) may "wiretap" biological functions, scientists say.

Photograph courtesy Science/AAAS

Brian Handwerk
for National Geographic News

Published August 12, 2010

A new nanotech "wiretap" can enter living cells and monitor their activities in real time, scientists say.

Scientists used silicon nanowires to create hairpin-shaped conducting transistors that are smaller than a typical virus. The transistors are able to float freely inside the cells and "listen in" on crucial biological functions.

When put to the test inside cultured chicken heart cells, the transistors recorded changes in the cells' heartbeat-driving electrical output.

The new device is surprisingly noninvasive, said study leader Charles Lieber, a nanoscientist at Harvard University.

That's because the wires were coated with cell membrane, so that target cells were enticed to fuse the wires with their own membranes and "suck" the wires inside naturally, Lieber said.

(Related: "New Needle So Tiny It 'Injects' Meds Into Cell Organs.")

The nanowire method also eliminates the need for needle-like insertions, which can harm cells.

Nano "Wiretap" May Offer New Insights Into Body

If hooked up to an external computer, the tiny wires could potentially provide scientists with far more sophisticated analyses of human cells producing electrical impulses, such as beating heart cells or firing brain neurons (human-body interactive).

For instance, by adding protein receptors to the wires' ends, scientists could monitor real biological changes inside cells, such as the production of certain molecules.

The nanotechnology may also help nanoscientists better understand how cells interact with toxins or drugs, Lieber said.

"So this could be useful as a kind of tool for drug discovery or maybe just for understanding how neural circuits are working in a deeper manner than before."

(Read more about brain mysteries in *National Geographic* magazine.)

Nanotech Could Improve Medicine by "Light-Years"

Future developments of the nanowire could further blur the line between biology and technology, Lieber added.

Several transistors could be made into a "circuit" inside the cell, he suggested, and neural or heart tissue could be grown around the circuit to combine the biological functions of the cells with the power of the digital circuit.

"If you're thinking about neural implants, you might bridge hybrid tissue to this device and connect it to a prosthetic," he said. (See "Nanotech Clothing Produces Power From Motion.")

"You're going to be light-years beyond what's being done today."

Nanowire research published today in the journal Science.