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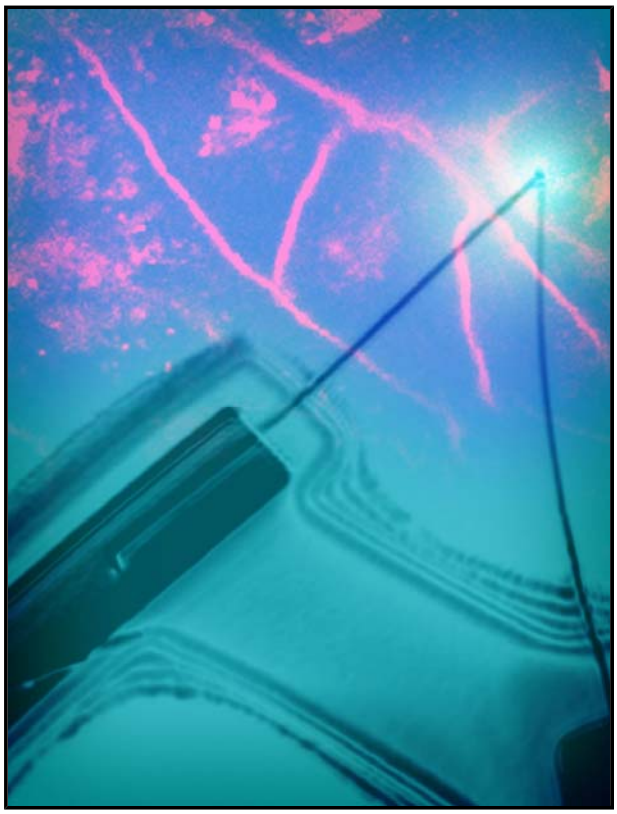
Nanoprobe can measure cell activity in real-time

By Boonsri Dickinson | Aug 17, 2010 | **0** Comments

Charles Lieber created a cyborg cell — it's something he has been dreaming about for a decade. The chemist at Harvard University drew doodles and the schematics of the nanoprobes in his 'idea notebook' for the last three years.



"What we have done for the first time is merge in a seamless manner the building block of the digital age — the transistor — with the building block of life — cells. Both the nonliving and living are process information and are integrated to make more complex things such as computers and living organisms," he says.

Harvard University scientists built a nanoprobe to sneak a peak at the inner workings of a cell — by using a lipid coated tip, the tiny device tricked the cell into accepting the foreign object and pulling it into the cell.

Normally, to measure the electrical activity in cells, scientists would use a micro-glass electrode. Ironically though, the clamp damages the very cell it is supposed to be observing.

"Once we made the scientific advance of understanding how to control 'synthesis' of

nanowires to introduce kinks, it was straightforward to make the hairpins. Indeed, it easy enough that a new student who just started work has done this himself," Lieber says.

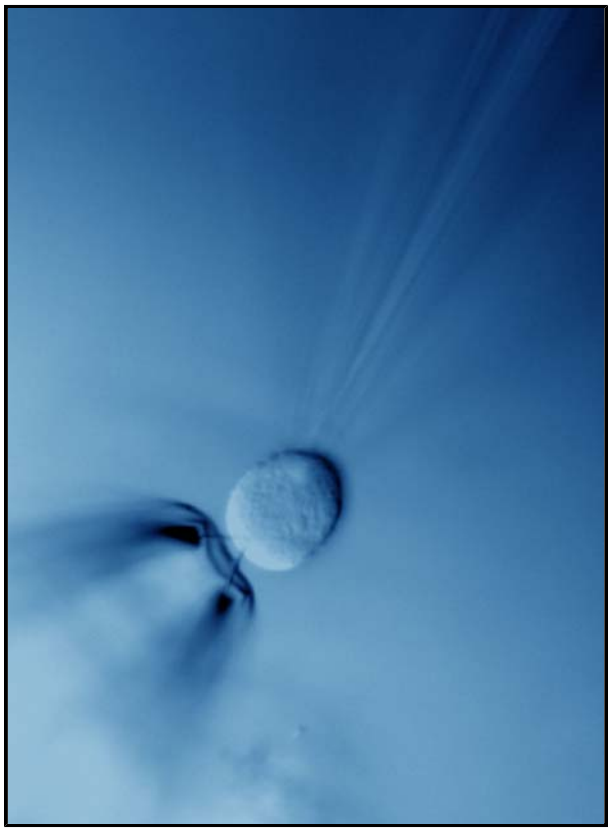
Lieber tells *Nature* that the current method is like using a metal detector — you get a sketchy and incomplete picture of what is happening underneath the ground.

The hairpin nanoprobe gives a rather up close view of what is occurring in the cells.

The scientists designed the device in the shape of a hairpin to make sure the transistor could act as electrical contacts. The smallest nanoprobe the

researchers made was smaller than most virus particles.

When the probe was tested out on an embryonic chicken heart cell, it measured the activity of the cell at 2.3 Hertz.



“Initially, one of the most straightforward ‘applications’ of the probes would be for cell screen chips, where one is interested in monitoring cultured cells or cells in tissue as a function of time and applied ’stresses’ such as toxins and drugs,” Lieber says.

The real test would to see if this could work on neurons. If the nanoprobe could be grown with artificial tissue, it could increase our ability to monitor the growth of the tissue inside the human body.

“We have blurred the distinction between these basic systems such that one can dream about power interfaces/communications between the two as well as totally new ‘hybrid’ tissue,” Lieber says.

If tissue can be embedded with power electronic devices — doctors can monitor the tissue using the nanotransistor devices to study the effects of different drugs on development and behavior of cells within tissue, he adds.

Lieber still holds onto his original doodles. “It is nice, but I like to ask myself, ’so what have you done today?’ The thing that is most exciting is opportunity for the future.”

Photo: B. Tian & C.M. Lieber, Harvard University

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Boonsri Dickinson is a science journalist, blogger, and producer based in New York City. She's a runner, explorer, and traveler.

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