Text transcript to video:

Wie wir mit Kreativität neue Methoden entwickeln (How we develop new methods with creativity)

Prof. Dr. Gary Lewin // MDC Berlin-Buch

Research: the sense of touch at the molecular level

If you want to discover something new, it's important to have the courage to come up with new ideas. And the creativity to develop new scientific methods.

My name is Gary Lewin, I'm originally from the 'Isle of Man' in the UK and am a neuroscientist or technically a neurophysiologist. I lead a research group at the Max Delbrück Center in Berlin-Buch and am also as a professor at the Charité. My research group studies the molecular mechanisms of the sense of touch.

When I came to Germany more than 30 years ago, neurobiological research focused on elucidating the molecular mechanisms of smell, sight, and taste.
Only a few researchers have asked themselves questions like:
How do touch receptors actually work?
How are mechanical stimuli converted into electrical signals?
And which molecules are important for this?

A common method for measuring the electrical activity of sensory neurons is the extracellular recording of axons using a metal wire. For this purpose, a piece of skin is prepared and then exposed to various stimuli, e.g. touch or heat. There are different sensory cells for different stimuli. The strength of a stimulus is encoded by the frequency of the action potentials triggered.

However, we wanted to go one step further and asked ourselves how a mechanical stimulus is translated into an electrical signal on a molecular level. For this research question we need to be able to stimulate very small areas of the cell surface with well-defined mechanical stimuli. The previous methods were too imprecise for this, so we had to develop a new method.

In our method we built a kind of flexible plastic brush. Their bristles, the so-called "pillars", are tiny. They have a diameter of 2 microns and stand only 2-4 microns apart. We then place individual neurons, which we previously placed in a cell culture, on these pillars. These cells then start to form neurites that grow over the individual bristles of our "brush".

With a high-precision 3D manipulator, we can poke individual pillars and thus mechanically stimulate small areas of the cell. This movement is transmitted to the neuron lying on it.
We use a glass mikroelectrode to measure the movement-triggered electrical signal from the sensory cell, and interestingly enough, a movement of 10-20 nanometers is enough.

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Since this signal can be measured after just a few microseconds, i.e. millionths of a second, we know that the ion channels in the cell membrane of the neuron are opened directly.
There simply wouldn't be time for a signal chain in between.
By specifically suppressing the production of certain proteins in the cell, we can find out which proteins are involved in opening the ion channels of the sensory endings.

The development of our "pillar method" shows how important creative ideas are for us researchers. Often the mere knowledge of neurobiological relationships is not enough and requires a high degree of interdisciplinarity. In this case, we combined the know-how of a physicist and myself as a neurophysiologist to develop this method.

Creativity is essential not only in the development of methods. It can also be found in the formulation of research questions and in the interpretation of data, actually everywhere. Even when we communicate our results.

But it also takes courage to face the research community with creative, perhaps unusual ideas. To have them recognized and accepted, you may have to assert yourself against prevailing opinions. And that can sometimes take a while. Not everyone can immediately understand new perspectives.

So, we always have to be open to new things and develop a spirit of discovery. Without creativity, science quickly stagnates and ceases to flourish.

Project website: **bcp.fu-berlin.de/nos**