Text transcript to video:

Seeing is Believing

Dr. Michael Ebner // FMP Berlin Buch

Research: Cell organelles under the electron microscope

In cell biology, our initial intuition is often wrong. This is because the processes in the cell work very differently than processes that correspond to our everyday perception.

My name is Michael Ebner, I am a cell biologist and work as a postdoc in the research group of Prof. Volker Haucke at the Leibniz Institute of Molecular Pharmacology in Berlin-Buch (abbreviated FMP).

I am fascinated by the inner architecture of cells. Various biomolecules cluster together in them to form superstructures and thus control important life processes. I am currently working on a very special superstructure, the so-called lysosomes.
Lysosomes are organelles, something like the organs of a cell. In Greek,
"lysis" means "dissolution" and "soma" means "body".
Lysosomes are called this because they split large molecules, so-called macromolecules, into their individual building blocks - and thus dissolve them.
After their discovery in the 1950s, lysosomes were thought to be a kind of "garbage can".
But today we know: Lysosomes make the generated cleavage products available to the cell in a targeted manner. Lysosomes are therefore not so much a garbage can as a recycling plant.

Although we already know a lot about how lysosomes work, there are still many more unanswered questions
Especially for visually thinking people - like me - microscopy is extremely important when approaching such questions. What I can see with my own eyes (albeit with the aid of all sorts of lenses and technical tricks), I believe most readily.
"Seeing is believing."
With ongoing technical innovations and the constant improvements in imaging techniques, we can see things and processes that I often would not even suspect could exist.

Questions arise that I was previously unable to ask, let alone answer.
Fortunately, we are very well equipped here at the FMP. Our latest acquisition is an electron microscope. With it, we can image the inner workings of whole cells at nanometer resolution, which is one millionth of a millimeter.

And we can do even more:
With a few tricks, we manage to overlay these electron micrographs with light micrographs of the same cell in its living state.

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We can therefore observe processes under the light microscope and then use the incredible resolution of the electron microscope to look at what is happening at the nanometer level.
On the computer, we can take a tour of the cell. You can zoom in on details without losing sight of the big picture.

Using this technique, we have discovered that there are different types of lysosomes that can transform into each other - as needed - and thus balance cell growth and the degradation of macromolecules.

For me, science is a process that brings human cognition closer to objective reality.
The visual perception of humans is limited to a very narrow scale range, from a little less than a millimeter to several kilometers. And intuitively we believe, the way things behave in this range, they will also behave this way in the whole universe. But this is not the case at all!
In the orders of magnitude in which the processes of cell and molecular biology take place, (i.e. in the nanometer to micrometer range) things behave completely differently in some cases:
Gravity, for example, plays no role at all here.
On the other hand, electrostatic interactions, (i.e. attractive and repulsive forces between molecules) are far more important in the cell than we are used to in our daily experience.
The visualization of these processes by microscopy helps us decisively to understand these strange worlds.
In addition, it is a well-known fact that we humans are not particularly objective.

All our decisions, judgments, our entire perception, everything is overlaid by our individual desires, preconceived opinions, like feelings such as pride, but also by career plans, and so on.
End
From this point of view, it is quite astonishing that humans could create a "scientific system" to outsmart their own subjectivity and create a constant approximation to an objective reality in spite of everything.

And we can look forward to what insights into this strange reality the microscopes of the future will give us.

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