Meritxell Huch has led her own scientific department at the Max Planck Society since last year, making her one of the youngest directors in the organization's history. However, the scientist was not born into her career.

TEXT: NORA LESSING

Meritxell Huch is from Barcelona. "My parents did not go to high school or even study at all," Huch recalls. On the contrary, they struggled for economic survival under Franco's dictatorship. "They were very fortunate to be able to work at all – they did not have any opportunities beyond that." Their daughter had to learn early on that she would have to work hard for everything in life.

As a child, she excelled in school, and it quickly became clear that she would be the first in her family who would be able to attend university. But her parents could not afford the tuition fees. Thanks to her outstanding grades, however, the young Spaniard was able to secure a state scholarship. To be able to afford books and clothes, she worked as a tutor alongside her studies, and then later as a pharmacist.

Why did she choose pharmacy as her discipline? "I remember learning about plant photosynthesis and other cellular processes in school and wondering: DNA, RNA – just how does it all work?" This period was also one of personal suffering: "As a teenager, I often had severe headaches and took aspirin. Each time I did so, I was fascinated: I swallow this tablet, and suddenly the pain is gone. How can this be?"

Meritxell Huch was able to persevere through her hardship-filled years of education thanks to her curiosity and diligence, and the support of her parents. She studied tirelessly, completing voluntary internships in addition to her studies and work. She was never overcome by the doubts she had about her chosen path. "In my fifth year, I was at the university from eight to midday, undertaking a lab internship from one to four in the afternoon, and working as a pharmacist from five to ten in the evening." She studied for exams on the subway – the university was on the other side of town from her parents' house. "You cannot cover a longer distance in Barcelona with the subway. I rode it every day." She suffered from long workdays, but more than that, she suffered from being unable to provide much financial support to her family, because she did not want to be a burden on her parents.

She could easily have become a pharmacist. "Working in the pharmacy was great. People tell you about their problems, you listen, you advise them. That creates a genuine sense of connection." But the desire to learn more was stronger. "Being in the lab, interacting with postdocs and older students – it gave me tremendous pleasure. I knew working in a pharmacy could not to give me that." One of her professors eventually became aware of her significant achievements and encouraged her to apply for a doctoral scholarship.

In her doctoral thesis, which she began in 2003, Huch worked with tumor cells from mice. She developed a novel method for treating pancreatic cancer and discovered that the cancer cells in the mice differed greatly from those in humans. Therefore, it was difficult to apply findings on this type of cancer from mice to people. "I thought a lot about this

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VISIT TO

MERITXELL HUCH

PHOTO: SVEN DÖRING FOR MPG

Stem cells are the passion of Meritxell Huch's career. She has skipped her lunch break on many occasions for these cellular jack-of-all-trades.

“For a long time, I put a lot of pressure on myself because I thought I was not good enough.”

problem, because rodents were a popular model organism for pancreatic cancer research at the time.”

At a conference, she finally experienced an encounter that would change her scientific career. The Dutch molecular biologist Hans Clevers offered her a job in his laboratory. Clevers is an expert on stem cells and, at that time, had just discovered stem cells in the intestine. Just as Huch arrived in Utrecht, Clevers and his postdoc Toshiro Sato had achieved their goal of growing natural intestine tissue in a Petri dish. The researchers had mimicked in the Petri dish the conditions that also prevail in a living organism. In such an environment, the cells “remember” their original function, proliferate, and form a structure in the Petri dish that is comparable to naturally formed tissue. This results in the formation of cell aggregates that can reach a few millimeters in size, contain every type of cell in the original tissue, grow independently, do not genetically alter, and still function as intended.

Before Clevers succeeded in growing intestinal organoids, researchers could only keep human intestinal cells alive in a Petri dish for a few days. Over this period, they lost their form and function, and eventually died, if not mutated. Hence, they could not be used for therapy. With the new technology, however, it appeared possible to grow bodily tissue in the lab and then transfer it to patients. Organoids were therefore much more than simply a multicellular structure – they marked the breakthrough into the cell therapy of the future.

In Clevers’ lab, Huch originally wanted to find out whether stem cells are also found in intestinal tumors. The experience she had gained in her doctoral thesis with the use of viruses to alter the genetic makeup of cells came in handy here. But now there was another burning question: because they contain proliferative stem cells, can organoids be grown exclusively with intestinal tissue? Or does this work with other tissue types as well?

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PHOTOS: SVEN DÖRING FOR MPG

Meritxell Huch is originally from Barcelona. After research stays in the Netherlands and the UK, she came to Dresden in 2020. Here, she heads a department at the Max Planck Institute of Molecular Cell Biology and Genetics.

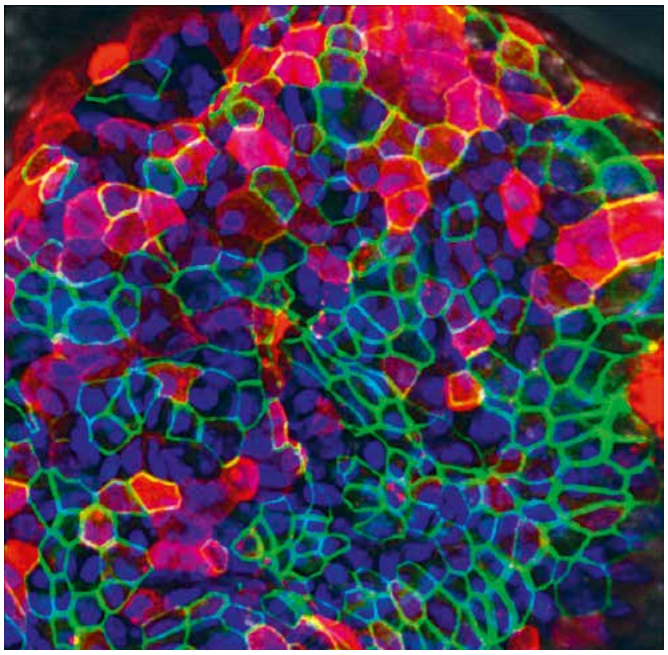

IMAGE: MERITXELL HUCH/MPI OF MOLECULAR CELL BIOLOGY AND GENETICS (MPI-CBG)

Microscope image of an organoid from human liver cells. Many processes occur in the pinhead-sized cell cluster, exactly as they would in a real liver. It can therefore be utilized to research how the natural organ works.

PHOTO: SVEN DÖRING FOR MPG

Meritxell Huch focuses on tissue regeneration in her research. She and her team have discovered, for example, that direct interactions between a previously overlooked type of liver cell and the surrounding epithelium regulate the liver's capacity to regenerate.

It seemed particularly promising to her to try growing organoids from stomach tissue, because this is very similar to the tissue of the intestine. But she had to wait a long time for success. "In the end, I set myself a deadline: if I did not manage to grow the stomach cells in the Petri dish by then, I would abandon the project. And, lo and behold, the first stomach organoid saw the light of day two weeks before the deadline," reports Huch. Next came organoids from hepatic and later also pancreatic tissue.

In 2014, Huch moved from Utrecht to Cambridge, where she set up her own research group. Her team was also successful in growing organoids from human tissue. The researchers used this technique to cultivate liver cancer cells as well as cells from people with hereditary liver diseases. "This is where the huge potential of organoids becomes apparent, because they can be used to test the effect of drugs on human tissue. This eliminates the need for the many animal experiments that would otherwise have to be carried out to develop new drugs," explains the scientist. Furthermore, organoids are reliable study objects because their cells do not mutate. Consequently, the risk of tumors developing from them is low. The technology now requires further development for use in medicine. There is still a long way to go before patients will benefit from it. In the world of basic research, however, organoids are already providing fascinating insights into the engine room of life.

Four years ago, Meritxell Huch received the first Lise Meitner Excellence Program Award from the Max Planck Society and moved her lab to the Max Planck Institute of Molecular Cell Biology and Genetics in Dresden. To begin with, she commuted between her family in Cambridge and her new job in Germany. Now all the relocations are complete and the new laboratory facilities have been put into operation. She has been a Director and thus a scientific member of the Max Planck Society for a year now.

From penniless pharmacy student to top scientist – a success story without a doubt. Nevertheless, her path was not entirely unplagued by self-doubt. "For a long time, I put a lot of pressure on myself because I thought I was not good enough." She responded with relentless diligence and battled through it. For years, she skipped lunch breaks and spent nights and weekends in the lab. Her life partner took care of the two children they had together and had her back. "The pressure is not lessening, it is shifting: first it was the worry of not being good enough, then the fear that my experiments might fail. Today, it is managing my team or balancing my personal life with my job. I never minded hard work – maybe because that is how I learned it at home. But balancing family and the lab is something I need to learn how to do better."

"I am very grateful for my life – I could not ask for more."

A day with 28 hours would probably help a lot. "Then maybe I could find some time for myself, listen to classical music, see plays, and read 19th century English classics." The way things look at the moment, these activities will have to wait for now. Nevertheless, she is at peace with herself: "No one in my family ever dreamt that I would get a college degree." Today, everyone is very proud of me, and my mother collects every photo of me being presented with an award and every article I have submitted. I am very grateful for my life – I could not ask for more."