Two materials scientists are up for the challenge



“A materials science startup has it both harder and easier than, say, a mechanical engineering startup”, says former Excellence Scholar Nicole Kleger.
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The idea for their startup had long been on their minds. With donor funding to back the project, Nicole Kleger and Simona Fehlmann are evolving from researchers into young entrepreneurs – and facing an explosive learning curve in the process.

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Exciting news from sallea: the start-up is using its technology to create edible structures for the foodtech industry. Its customers are companies producing lab-grown meat and fish, who are currently operating with limited scope and are only able to cultivate products such as minced meat or fish balls. Thanks to sallea’s support structures, steaks and fish fillets could soon be on the menu. We talked to co-founder Simona Fehlmann about this progression.

Last year, you had your eye on various markets – why have you now opted for this particular one?

We believe that working in this area lets us quickly exert a major impact on society and on the market. Climate change and food security are huge issues, and the field of cellular agriculture, which includes cultivated meat, is

moving at incredible speed: we urgently need eco-friendlier alternatives to conventional animal protein. Plus, the regulatory hurdles are comparatively low.

What are the latest developments in this market?

Migros and Coop have invested in companies in Israel and Europe. Alongside this, Migros has collaborated with Bühler and Givaudan to set up "The Cultured Hub", an initiative intended to accelerate cellular agriculture. Around three weeks ago, a manufacturer of cultivated meat was the first in Switzerland, and by extension, in Europe, to submit its documents for a permit. And while we're on the topic, the first two companies to do so in the US received their authorisations to sell cultivated meat back in June.

What is the soonest point at which, somewhere in the world, we might be able to eat meat or fish cultivated with your involvement?

In around three years, at the earliest, whether in the US or Switzerland. Given the developments of the past few months, it's very possible that Switzerland could pave the way in this field – and it goes without saying that this would be really exciting for us.

Long-standing donors may recognise her name: Nicole Kleger completed her Master's degree as an ETH Excellence Scholar. In a portrait in ETH Foundation's Uplift magazine, she hinted in 2020 that she could imagine founding a startup after completing her doctoral degree. The young woman is well on course: at the beginning of 2022, ETH Zurich reported that Nicole Kleger and her colleague Simona Fehlmann were two of seven newly funded young entrepreneurs. A jury of experts had awarded them a Pioneer Fellowship, providing them with seed capital and mentoring to pave the way to a market-ready product. Time for a reunion.

We meet the two materials scientists on the Hönggerberg campus, which is also where their paths first crossed: Nicole Kleger was supervising Simona Fehlmann's Master's thesis. As Pioneer Fellows they are still allowed to use ETH infrastructure, in their case that of Professor André Studart's Complex Materials group. With their system named 'sallea', the two work dedicatedly each day to drive their entrepreneurial project forward. The idea: to decouple the 3D printing process from the material by means of templates made of 3D-printed salt, which serve as an intermediate step. The idea has practical relevance because many materials cannot be 3D-printed directly. However, being able to produce small, complex structures from these materials – which 3D printing enables, in contrast to traditional manufacturing processes – would be extremely useful for numerous applications. A concrete example? Bone augmentation in the jaw area: before a dental implant can be inserted, it is often necessary to build up the bone. Sallea's process makes it possible to produce magnesium with structured porosity, thereby rendering magnesium implants conceivable for bone reconstruction: magnesium promotes bone growth and the body can break down the magnesium and absorb it as a mineral, eliminating the need to remove the implants by surgery.

Smart start

However, launching new products in the strictly regulated medical market is highly demanding. Nicole Kleger and Simona Fehlmann estimate that this could take up to ten years for their implants. In order not to fail at the first hurdle of this Herculean task, the two women will start with a simpler entry-level product: three-dimensional cell cultures. In such cultures, cells can grow in all three dimensions and interact with their environment. Pharmaceutical research is one area in which these products are applied. Transferability to organisms or tissue is higher with 3D models than with 2D models, which is why the former have been booming for several years: "The market for 3D cell cultures is growing by 30 per cent every year," says Simona Fehlmann. Scaffolds are often used for their cultivation. "In the next few months, our main task will be to find industrial partners who will work with us to further develop the materials and geometries of these scaffolds in detail, allowing the cell cultures to grow better than with conventional scaffolds," Simona Fehlmann continues. The two materials scientists are convinced that their method offers great opportunities in this field. And, according to Nicole Kleger: "The better 3D cell cultures become, the fewer animal experiments and clinical studies with humans will be necessary."

"A materials science startup has it both harder and easier at the same time than, say, a mechanical engineering startup," explains Nicole Kleger. "In mechanical engineering, the concrete application in question is often already part of the idea. We, by contrast, have to ask ourselves where we can use our material to solve the greatest problem." On the other hand, it's not so dramatic for us when a door closes because there are plenty of other doors potentially worth knocking on. "We have a clear focus, but also a plan B, C and D." The range of sectors they

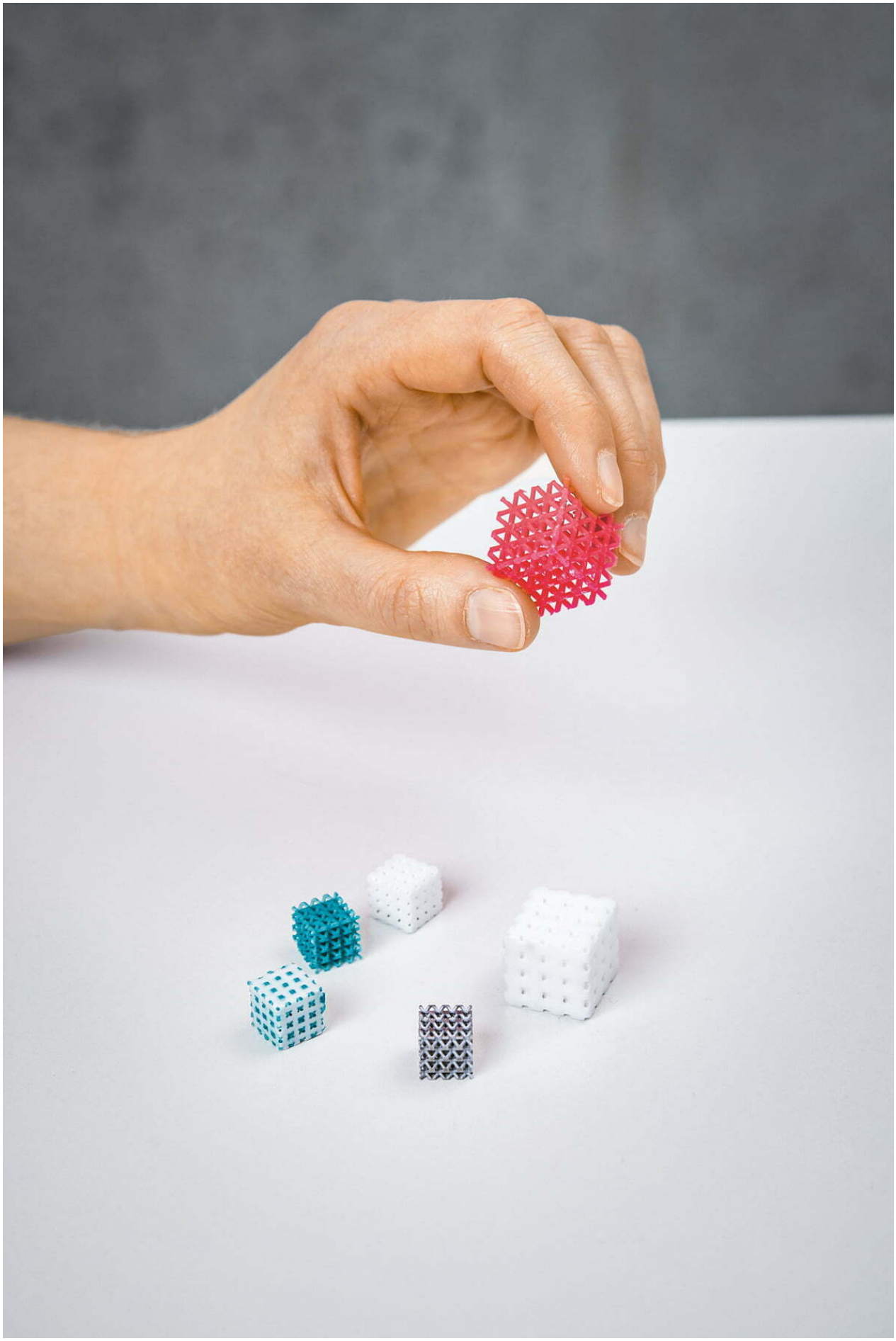
foresee even includes aerospace. Simona Fehlmann, who has already done two practicals at Beyond Gravity (formerly RUAG Space), sees potential here for customarily strong but lighter components.

Grateful to role models

In the past few months, the two women behind sallea have been hurled out of their comfort zone. In conducting market analyses, creating business plans and seeking funding, they have both faced a steep learning curve, Simona Fehlmann says. One key advantage is the fact that the Complex Materials group boasts a far above-average number of spin-offs: Spectroplast, FenX, Microcaps and NematX are all successful examples. “We‘ve spent hours with Manuel Schaffner from Spectroplast discussing the dos and don‘ts around applying for funding, specific questions we had on patent applications, how to find investors, and so on,” says Nicole Kleger. She continues: “It‘s really nice to experience how much support you get in the startup ecosystem, how much time all these busy people take, even when you can‘t pay a consulting fee.” At this point, Nicole Kleger refers to the upcoming Centre for Students and Entrepreneurs, destined to be a new hotspot for innovation on the ETH Hönggerberg campus: “Not all ETH graduates with entrepreneurial ambitions have this proximity to other startups like we do, and from which we draw such benefit. For this reason, I see the Centre as a project of enormous value for driving entrepreneurship at ETH.” However, as females, the entrepreneurs cannot count on benefitting from role models everywhere. Nicole Kleger hopes that the current buzz around female founders will make a difference: “It’s good to see that there are an increasing number of advisory services for female founders. Unfortunately, however, investors are still more reluctant to act, even though startups founded by women are proven to report higher revenue figures.” The mother of two also points out a blind spot in the system: “If there are to be more female founders with families, funding programmes must also address the topic of childcare support.”

Emboldened by donors

The two greatly appreciate the support sallea receives from all those who fund the Pioneer Fellowship programme through the ETH Foundation. Nicole Kleger points out: “What we’re doing needs a lot of grit and stamina. Without people who believe in us, it wouldn‘t work. Talks like the ones I have with people at ETH Foundation events such as Meet the Talent embolden me and give me strength for whatever is to come.”



Many high-performance materials are not directly 3D printable. Sallea‘s workaround enables complex lattice structures to be made from these materials too.

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https://ethz-foundation.ch/en/spotlight/talents-2022-two-materials-scientists-are-up-for-the-challenge/

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