

GLOBE



Algae and insects
on the menu
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Designer bacteria
fight it out
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Alexander Jäger: alumnus
with a political streak
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ENGINE OF INNOVATION

Start-up incubators here, competitions for young entrepreneurs there – Switzerland is an exciting landscape for fledgling companies. Right in the thick of it is ETH Zurich, which makes a major contribution to this entrepreneurial dynamism. It's no coincidence: in the mid-1990s, ETH Zurich expanded its knowledge and technology transfer, and offered new courses such as: “Striking out on Your Own” (“Lust auf die eigene Firma”) to familiarise students with the entrepreneurial mindset. Other decisive steps were also taken in those pioneering days, such as the foundation of Technopark Zurich and the launch of the “venture” business plan competition.

The seeds that were sown 20 years ago have now sprouted. At present, 20 to 25 spin-off companies are founded each year at ETH Zurich. They create highly skilled jobs and enrich the commercial soil in which innovation can grow. Young companies also play an important role in the competition between metropolitan regions as they vie to attract business. However, today's start-ups tend to be mobile. Will they base themselves in Berlin, London, or Tel Aviv? Or in Zurich after all? We would be well advised to create the right business environment for young companies and give them good reasons to put down roots and develop in Switzerland.

Backed by a network of partners from industry, science and the public sector, ETH Zurich possesses a **wide range** of tools for promoting spin-offs. Many of the approximately 350 spin-offs founded since 1996 have successfully established themselves in the market. Some, of course, failed – but what all entrepreneurs have in common is that they had the courage to strike out on their own and were willing to take risks. *Globe* presents some of these bold pioneers.

I hope you enjoy reading about them!

Lino Guzzella, President of ETH Zurich



Lino Guzzella,
President of ETH Zurich

A look inside the
world of spin-off support:
Page 20

Globe, the magazine for ETH Zurich and ETH Alumni.

ETH zürich

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A PHILANTHROPIC INITIATIVE OF A PRIVATE CONSORTIUM

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NO. 4/2016

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NEW AND NOTED



Antarctic sea ice covers an area the size of North America.

Global warming

SEA ICE FRESHENS ANTARCTIC OCEAN

Over the past few decades, the salinity of the Antarctic Ocean has fallen significantly; more so than in any other ocean. ETH researchers and their colleagues in Germany have shown for the first time that this change is due to the expansion of the sea ice along the Antarctic coast.

While the sea ice in the Arctic is rapidly shrinking, the maximum ice cover in the Antarctic Ocean now extends further north than it did 30 years ago. This expansion is mainly down to the stronger northward drift of the sea ice. It is a process that has some consequences for the ocean's salinity: when the ice at the northernmost edge of the sea ice melts, the fresh water is released into the ocean, thus lowering the salinity. The freshened, cold water then

sinks below the warmer surface waters to form what is known as the Antarctic Intermediate Water. At depths of about 600 to 1,500 metres, this water spreads out like a tongue to the north. The flux of freshwater into the Antarctic Intermediate Water has increased markedly over the past few decades, and the researchers have for the first time reconstructed the complicated process that causes it.

The freshening of the Antarctic Intermediate Water may have some far-reaching effects, for it intensifies the stratification of the ocean. As the Antarctic Ocean has so far acted as a climate regulator and carbon sink, this could in turn have an impact on the global climate and the carbon dioxide level.

Biomedicine

CELLULAR TEST OF STRENGTH

Biological cells can expand, contract and interact with neighbouring cells. ETH researchers have now developed a microscopy technique that determines, more directly and more accurately than previous methods, which forces are at work during these cell movements. The new technique can be used for studying the movements of cells or the interaction between cells and implants; it can also be applied in cancer research.



Primal life

PROTEIN-LIKE STRUCTURES

Experiments performed by ETH scientists have shown that it is remarkably easy for protein-like, two-dimensional structures – amyloids – to form spontaneously from basic building blocks. The scientists used four simple amino acids that existed on the prebiotic Earth over four billion years ago, under reaction conditions that also seem plausible in the primeval era. The discovery supports the researchers' hypothesis that primal life could have evolved from amyloids such as these.

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Research Photo Competition 2016

WIRELESS SYSTEMS FOR THE FUTURE

Smartphones and tablet computers are expected to receive growing volumes of data at ever higher speeds – and the growing demand for ultra-fast data transmission for mobile devices requires radically new approaches. Researchers at the Institute of Electromagnetic Fields (IEF) are working on new radio techniques based on optical technologies. Because optical switches are much faster than the conventional electrical switches, they can hugely increase the performance of antennas and wireless systems.

Maurizio Burla is a Group Leader at IEF. His picture won the 2016 Research Photo Competition run by ETH Zurich's Department of Information Technology and Electrical Engineering. The photo shows members of his research group testing an ultra-broadband antenna array in an anechoic chamber. The antennas in the foreground are designed not only to have an extremely large bandwidth, but also for ultra-fast changes of direction.

Insects and algae in place of beef and chicken

Conventional livestock farming alone cannot meet the world population's growing demand for protein. Alexander Mathys is seeking out the most sustainable alternatives.



Insects are sold as a delicacy at street markets in Thailand.

Alexander Mathys seems to be a much sought-after man: in his first few months as Professor of Sustainable Food Processing at ETH Zurich he has already made several appearances in the Swiss media. And Schweizer Radio has just asked him for an interview. His popularity is due not only to his eloquence and enthusiasm for the subject, but because his specialist area is currently a hot topic in the media: insects as a food item. This is more than just the latest food trend. Insects are a food source with the potential to meet the protein needs of a growing global population in a sustainable way. Compared

to raising traditional livestock, farming insects supplies more protein for less space and fewer resources; some species have a protein content of up to 80 percent. But whereas insects are widely consumed throughout Asia and South America, the food industry in Switzerland is treading new ground: in this country, insects are a novel food and not yet approved for human consumption. But this may soon change, with Switzerland due to permit the consumption of certain insect species as early as next year. In Europe, too, insects could soon start appearing on more menus.

A closer look

"There's a great feeling of excitement," says Mathys. But he is not quite as euphoric as some advocates. True, insects have some significant advantages over pigs, chicken and particularly cows. But unreservedly promoting insects as the single most sustainable solution would be misleading, he thinks. How will these insects be fed? How will they be kept? How will they be processed after they have been reared? "There are many aspects we need to look into closely," says our researcher, "and we shouldn't forget algae and pulses, which could also go a long way to meeting the growing demand for protein. In terms of sustainability, these plant sources are often better than insects."

Mathys backs up his argument by reference to a recently published article he has written with colleagues – an analysis comparing the life cycles of various protein sources. "This study gives a good overview of the most important factors," he explains, "and it's an ideal starting point, as we now know which processes we need to improve first." Over the next few years, the researcher wants to work with Bühler – the company providing start-up financing for his chair, together with the Migros Group's M-Industry companies – and other partners to optimise insect processing. "Bühler has considerable expertise and experience in the food technology field," says Mathys. "Our aim now is to optimise the exist-

ing processes so that we can filter off and conserve the valuable content of the insects as carefully as possible."

As much biomass as possible

Mathys considers algae just as important as insects: "I see a lot of potential here," he says with conviction. "First, certain algae have a very high protein content. Second, as the cultivation method is currently at a low technical level, there is plenty of scope for us to optimise it." The main task is to cultivate as much biomass as possible in a given quantity of water. How can we set up the cultivation plant so that the algae can absorb maximum light and CO₂? And how can we then draw off the algae as efficiently and carefully as possible in order to process their valuable protein content?

"Another reason algae and insects are attractive alternatives is that they can be cultivated on unproductive terrain – meaning even wasteland can be used to produce food," explains Mathys. This would marry well with the "urban farming" concept of producing food in cities themselves. "The number of people living in megacities is growing all the time; providing them with good-quality food is a major challenge," says Mathys, defining the problem. But urban farming alone cannot solve this: "We can't eat raw produce alone; it needs to be processed into safe, non-perishable foodstuffs. That's why we have to talk about urban food processing, too, and how we can process food in small on-site systems."

Plenty of new ideas

One interesting approach here is micro-processing technology, which allows for a continuous production process even with small quantities of raw materials. Already in use for producing high-grade chemicals in small-scale plants, this method could per-



Alexander Mathys visiting IGV's new algae cultivation plant at the last German Federal Round Table Meeting for Algae, held by the Forschungszentrum Jülich research centre.

haps be applied in food processing, too. "Many good ideas fall by the wayside because approaches that work very well with laboratory-scale batches don't produce the desired results in continuous industrial operation," explains Mathys. "With micro-processing technology, we can identify possible problems at the lab stage and optimise the process accordingly." Nestlé has now offered him suitable research equipment for testing his new ideas for preserving and processing sensitive, high value-added ingredients.

But Mathys has plans that go even beyond that: "There is great potential to use insects not only for food but also as animal feed," he claims. "We're looking to breed larvae on faecal waste in non-central locations, and use them to feed livestock." This would be an attractive option for developing countries, where farmers generally have no access to protein-rich feed for their animals.

Mathys has already gotten his first taste of success: he's just received project financing from the Sawiris Foundation, as part of the Engineering for Development (E4D) scholarship pro-

gramme. This funding will allow him to continue developing the application in collaboration with Stellenbosch University in South Africa, the Chinese Huazhong Agricultural University, and EAWAG in Dübendorf. But there are still many issues to be clarified, not least that of food and feed safety. — Felix Würsten

Chair for Sustainable Food Processing:
→ www.sfp.ethz.ch



When a mother gives her child an extra push, this sets up a complex swinging movement.

Metrology

MEASURING FORCES WITH OSCILLATIONS

Physicists at ETH Zurich have succeeded in calculating a particular form of swinging motion that occurs, for example, when a mother gives her child an extra push on the swing. Their discovery is particularly significant for metrology, as many sensors are already based on oscillations. Using the principle, intricate oscillations can now be used for measurements. This is good news for small sensors, as the measuring signal then stands out better against background noise.

Medical ethics

A LITMUS TEST OF FAIRNESS

Ethics experts have put forward various criteria as a kind of moral compass to ensure that scarce medical resources are fairly distributed. ETH researchers and their colleagues in the UK have now performed a “reality check” on these fairness criteria. In a questionnaire presenting nine criteria for the fair allocation of scarce medical resources, lay people, medical practitioners and ethics experts were asked to apply these criteria to three hypothetical situations: an organ transplant, the allocation of hospital beds during a pandemic, and a hip replacement.

In all three situations, the lay respondents rated “sickest first” as the fairest priority. Second priority was

“first come, first served” – position on the waiting list, and in third place, allocation according to the patient’s medical prognosis. Medical practitioners, however, were rather more discriminating. For example, in the case of organ transplants, they considered medical prognosis the fairest criterion. Unlike lay people, the medics also think the patient’s age is more important than their position on the waiting list.

The ratings awarded by the ethics experts to the various criteria were different again; there is a particularly big divide when it comes to the two criteria “sickest first” and waiting-list position. Certain ethicists believe the lottery principle to be fair, while medics and lay people consider this unfair.

The aim of the study was to trigger a discussion about to what extent these differences should be taken into account in future.

Lymphoedema

FOCUS ON INFLAMMATION

When fluid in the arms and legs no longer drains properly, people can develop lymphoedema. This often occurs following surgery for breast cancer involving the removal of lymph nodes. So far it has not been possible to cure this condition, only to alleviate it. Why some patients develop lymphoedema and others do not is not clear. A research team including ETH scientists has discovered that a particular type of immune cell – the regulatory T cells – can suppress lymphoedema. There are indications that while surgery plays a certain role in the onset of lymphoedema, inflammatory processes are also involved.

Systems biology

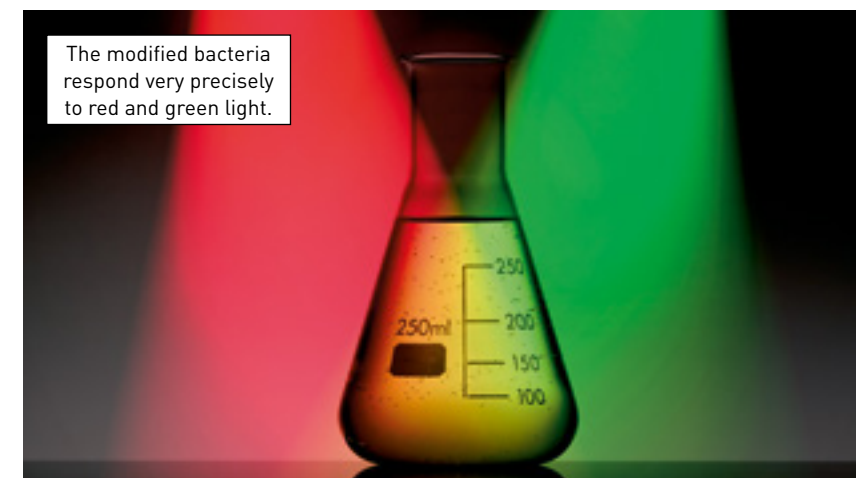
CYBORG BACTERIA DEVELOPED

Researchers at ETH Zurich’s Department of Biosystems Science and Engineering in Basel have created a cyborg – a hybrid that is part machine and part living organism. The organism in question is the *E. coli* bacterium, which is used frequently in biological research; the machine is a computer fitted out with the latest control technology that regulates the growth of the bacteria. Machine and organism are linked via two interfaces: the computer communicates with red and green light that the bacteria can perceive. In the opposite direction, communication functions via an optical measurement of the growth rate of the bacterial culture; the results are fed into the computer in real time.

The researchers had to carry out biotechnological modifications in order that the *E. coli* bacteria could be controlled by light. First they took a

strain whose blueprint contains genes from cyanobacteria, which are able to regulate their metabolism in response to light. Then the bioengineers modified these *E. coli* bacteria. To do this they coupled the cyanobacteria’s genetic light-sensing systems with the cellular regulation of an enzyme that produces methionine, an amino acid essential for bacterial growth. When the computer illuminates the *E. coli* culture with a red light, the bacteria stop producing methionine and grow more slowly as a result. Green light, on the other hand, stimulates methionine production and the bacteria grow more rapidly.

Five years ago, the researchers presented a basic proof of concept for a light-based interface between a computer and a yeast cell. Today they are able to control the growth of the microorganisms fully automatically – and in a very tuneable and precise way. For the regulation process, they use advanced feedback-based control algorithms just like those deployed in passenger aircraft to maintain a steady flight altitude.



Parabolic flight

RESEARCHING IN ZERO GRAVITY

Swiss researchers have used a special flight to investigate the effects of weightlessness on biological and physical processes. An Airbus aircraft performed a series of parabolic manoeuvres that created 22 seconds of weightlessness between each ascent and descent. On board was an ETH Zurich team with an experimental apparatus to test the influence of gravity on phytoplankton.

Nutrition

IRON TO FIGHT LEAD

Lead is a toxic heavy metal that can cause irreversible brain damage, particularly in children and teenagers. Targeted iron supplements in biscuits can significantly reduce the concentration of lead in the blood of children exposed to high levels of the metal. This has been demonstrated for the first time by an ETH-led research group in a study of schoolchildren living in Morocco.

Filtering the best ideas:
How innovative research
concepts are channelled
swiftly into practice
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Bright lights in
start-up support:
A guide to the world of
funding initiatives
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Each year, a diverse range of ETH Zurich
spin-offs bring ETH technologies to the
market. Their chances of success are excellent,
thanks in no small part to targeted support.

ILLUSTRATIONS Stephan Walter

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hard work: The spin-off
that became part of
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“Filtering the best ideas”

How much support do spin-offs need? And what are the best ways to provide it? Detlef Günther, ETH Vice President for Research and Corporate Relations, and Michael Stucky, spin-off founder and Head of Business Development at Wyss Zurich, discuss the issues involved.

INTERVIEW Roland Baumann and Martina Märki

Is there enough entrepreneurship at ETH Zurich?

Detlef Günther – That’s a question I would prefer to tackle in a broader context. In my view, one of ETH’s primary tasks is basic research – the ongoing pursuit of new scientific knowledge for its own sake. Spin-off activities essentially revolve around the commercial exploitation of ideas, financial interests and job creation. If we focus too single-mindedly on fostering entrepreneurship at our University, will we still have enough talented people who are keen to enter the open expanses of basic research – where you are not working towards a concrete application, prototype or similar fixed goal? What we need is the right balance. At the moment we provide targeted support for entrepreneurship where it seems to make the most sense. Over the past 10 years ETH has produced more than 20 spin-offs a year, averaging between 150 and 200 invention disclosures. That’s a great balance in my opinion.

Do you share that view, Mr Stucky?

Michael Stucky – Absolutely. When you look at how prudently the sup-

port and funding has been allocated, those figures are pretty impressive. But based on the outstanding research work happening at ETH and the great people we have here, I think that we could be producing at least twice that many spin-offs in five years’ time. Obviously that won’t happen on its own; we need to promote entrepreneurship even more vigorously. ETH has already taken some interesting new steps in that direction in recent years, and I think we will see those taking effect.

“I think that we could be producing at least twice as many spin-offs in five years’ time.”

MICHAEL STUCKY

Can you give us some specific examples?

Stucky – ETH initially took a very cautious approach to building up its support for spin-offs. I’m thinking specifically of the technology transfer office,

ETH transfer, which has been doing a great job for a number of years. Technopark Zurich has also been up and running for over 20 years. But recently we’ve seen some other initiatives emerging, such as the ieLab and the Pioneer Fellowships. That makes things feel very different now compared to 12 years ago when we founded our spin-off.

Professor Günther, are you concerned that too much support for spin-offs could rob academic research of good people?

Günther – No, that’s not the issue here. Last year some 2,500 ETH students completed their Master’s or doctoral degrees. Based on their individual interests, they will decide whether to pursue academic careers, channel their knowledge into industry as highly qualified employees, or set up their own companies – to name just a few of the options. Whatever choices they make, society benefits from the knowledge they acquired at ETH. It’s not really a question of whether we establish 25 spin-offs at ETH or 50; in my view, what matters is that we maintain our ability to filter the best ideas. Quality is more important than quantity.

It’s quite a contrast to the American risk culture, which generates far more spin-offs, but where more companies go bust.

Günther – Well, in principle everyone here also has the opportunity to try things out and even to fail, because the broad ecosystem of Swiss funding incentives is open to everyone. But our task at ETH is to use our own funding instruments and the corresponding selection processes to ensure that the very best of the novel technologies emerging from ETH are put to good use, and that we empower our young people to market their innovative ideas. There’s a reason why the ETH label is regarded as a hallmark of quality, and it is reflected in the particularly high survival rate of ETH spin-offs. But we also treat people very fairly if their idea fails.

What are the best criteria for selecting ideas that could potentially lead to successful spin-offs?

Günther – In my experience it’s not just about how good the idea is – the person behind the idea is an equally important factor. If I see that a person and their idea are a great match, then I know it’ll be a success.

How do you approach this issue at Wyss Zurich, Mr Stucky?

Stucky – We only founded our centre just over a year ago, and the way we started out was somewhat unusual. In our initial projects we essentially had to build up teams around each specific idea. One lesson we learned relatively quickly is that entrepreneurial activity doesn’t come from the professors who put forth a topic, but rather from the young people who really make an idea their own. Though of course professors do play a key role as active and engaged mentors.

Günther – The role of professors is often overrated in this context. The real

commitment comes solely from the person who wants to put their idea into practice. I don’t think I’ve ever seen a case where the professor has actually shielded someone from the risk and pressure they face as they go down that entrepreneurial path. And of course that’s not the professor’s job: their task is to ensure their team keeps coming up with new ideas and to pave the way for other talented people who want to make a go of things.

What are the best ways to help someone channel their idea into a spin-off?

Günther – Since the 1990s, ETH transfer has been helping young ETH members to establish their own companies. The services it offers range from evaluating the business case and choosing the best type of company to providing key legal and financial expertise. We also provide spin-offs with office and lab space at preferential rates. As a result of all this, ETH spin-offs enjoy an outstanding reputation – which is ultimately the most valuable kind of commercial support you can get! A lot of venture capitalists on both a national and international level are now familiar with ieLab, where our Pioneer Fellows implement their ideas. It’s become an established brand.

In addition to internal ETH support, there are now numerous other funding bodies and competitions. Is that a good thing?

Stucky – When Michael Wacker, Urs Tuor and I founded the spin-off GlycoVaxyn over 10 years ago, I think we came across only three or four funding initiatives. Now there are probably five times as many. There has been an extraordinary proliferation in these kinds of instrument since the year 2000, and that’s good, because people weren’t doing enough for spin-offs at the beginning. But now I would agree >

DETLEF GÜNTHER

Detlef Günther is Professor for Trace Element and Micro Analysis at the Laboratory of Inorganic Chemistry. He has been Vice President for Research and Corporate Relations at ETH Zurich since January 2015 and is also responsible for strategic research supervision, putting research results into practice (technology transfer), and fostering collaboration with industry.



MICHAEL STUCKY

Michael Stucky is Head of Business Development at the Wyss Translational Center Zurich, a joint research and development centre of the University of Zurich and ETH Zurich that aims to accelerate the transition of research findings into commercial applications. He studied at the University of Zurich and Stanford University before building a career in the finance industry, and founded the biotech start-up GlycoVaxyn 12 years ago with Michael Wacker and Urs Tuor, two ETH graduates.



there is a danger of too much fragmentation in the funding sector. When I coach spin-offs, I generally recommend participating in no more than two of the three or four most prestigious funding competitions. That means competitions like “venture”, which require the kind of work you would have to do anyway to set up your own business. Participating in those kinds of competition also helps you build up a good network and gives you a label.

Günther – In the current ecosystem of spin-off funding I think there’s a danger that a young entrepreneur could successfully hop from one competition to the next. That can be a pretty good life for a while, but then they discover they haven’t made any progress whatsoever on putting their idea into practice. The best thing would be to somehow pool and combine these competitions and small-scale funding initiatives.

That brings us to the topic of seed funding. How can Wyss Zurich help in this context?

Stucky – The fact is, the standard prizes of between 50,000 and 150,000 Swiss francs won’t actually get you very far, especially in the fields that ETH and the University of Zurich specialise in. People very quickly find that they need venture capital of 2 million francs or even more. Unfortunately, the situation in Switzerland is such that even venture capitalists are increasingly looking to invest their money in the later stages of a company’s development. In medicine, for example, they typically wait until after the expensive clinical trials are over. That creates the notorious “valley of death” where so many spin-off ideas fail. At Wyss Zurich, we’re trying to change this situation – at least in the fields of robotics and regenerative medicine.

What concrete support does Wyss Zurich offer?

Stucky – Money is certainly an important aspect, but we also collaborate with ETH and the University of Zurich to offer people the technology platforms and infrastructure they need, as well as access to the experts who run these platforms – and that’s very important, too. We also help young people with a research background to get in touch with people who have industry experience and who know what prospective customers need.

“We don’t just need outstanding CEOs – we also need good, successful teams.”

DETLEF GÜNTHER

What more needs to be done in the future?

Günther – I think we should be making even more of an effort to harness the University’s potential for creating teams and recruiting talented people for spin-off companies. We don’t just need outstanding CEOs – we also need good, successful teams.

Stucky – I agree with that completely. Getting people together to share their experiences is absolutely crucial. We need to support that more. Obviously geographical proximity is an issue here. We need spaces where people can come together to exchange ideas.

Are you thinking of an innovation park like the one in Dübendorf?

Stucky – Yes. But you can’t just set yourself up there and hope something

happens.

Why not?

Stucky – Company founders already have various choices of where to set up a business in Zurich; for example, the Impact Hub. But an ETH spin-off based on complex technologies is very different from an initiative driven by an 18-year-old who wants to implement an idea in new media. Those two things need very different resources. I think the best chance of success lies in building on the foundations that already exist at ETH and the University of Zurich.

So you think that ETH and the University of Zurich should shift some of their activities to the innovation park?

Günther – Let me outline a scenario to illustrate what I mean. Imagine that ETH had a hall in Dübendorf where it could set up a couple of modular containers. I would immediately send a couple of research groups and spin-offs to work there, perhaps in the fields of mobility and robotics. They could try out drones on the airfield there and experiment with new kinds of mobility. That would be the nucleus around which you could build an ecosystem. Things could really take off – and not just in the literal sense!

What would you say to young people who want to make the leap into the world of spin-offs?

Stucky – I should start by saying that personally, I’m not someone who has the entrepreneurial zeal that enables them to pursue their ideas even in the face of major resistance. People who have that capacity will found their company whatever the circumstances. The problem is that people at ETH are incredibly well educated, so they sometimes overthink things. That’s why I always say that if you want to do something, then just do it. You can go over

Facts and figures

350

new companies have been founded at ETH Zurich since 1996.

20

For the last decade, spin-offs have been founded at a consistently high rate of 20 or more a year.

92%

of ETH spin-offs are still going strong after five years. That survival rate is 40 percent higher than other Swiss start-ups.

2,500

To date, ETH spin-offs have created at least 2,500 jobs.

your idea 15 times in your head, and there’s always a reason to hold back. But I say go ahead and do it!

Günther – I think Michael has touched upon something very important there. Founding a company isn’t for everyone. Some people who study here want to do basic research at a university; others want to focus on research work in industry. Then you have the entrepreneurs who want to set up their own companies based on their own ideas. Finally, you have people who might not want to found their own companies, but would love to help out as a team member in a spin-off. We should be nurturing this entire ecosystem. Plus, we should not forget that our main task is to give the most talented people a solid education and show them all the opportunities that are out there. ○

Find out more about spin-off support at ETH Zurich:
→ www.spinoff.ethz.ch



Strong networks benefit veterans and newcomers alike: Vice President Detlef Günther welcomes company founders to the 2016 ETH Spin-off Dinner.

Bright lights in start-up support

Nowadays there is an array of organisations offering advice and funding for young entrepreneurs. But it is not always easy to get an overview of this rapidly expanding scene. *Globe* presents a selection of the support schemes that ETH and other organisations provide that are of particular interest to young ETH entrepreneurs.

COMPILED BY Martina Märki

VENTURE KICK

→ www.venturekick.ch

In a three-stage competition, aspiring entrepreneurs can win up to 130,000 Swiss francs of pre-seed capital, combined with coaching and network access. The initiative is financed by private foundations, companies and individuals; its goal is to fund early-stage business ideas from Swiss universities.

TECHNOPARK ZÜRICH

→ www.technopark.ch/en

KICKSTART ACCELERATOR

→ www.kickstart-accelerator.com

Kickstart – the Swiss Accelerator attracts the best early-stage start-ups from all over the world to Zurich. Its 11-week programme provides entrepreneurs with mentoring, office space, access to industry partners, and up to 25,000 Swiss francs in prize money. The programme is an initiative of digital-switzerland, operated by Impact Hub Zurich.

MASSCHALLENGE

→ www.masschallenge.org

Originating in Boston and active all over the world, this sponsor offers young start-up founders a four-month programme in the US, Israel, the United Kingdom, Mexico and recent joiner Switzerland. Applicants have the chance of winning seed capital in a multi-stage accelerator programme.

VENTURE

→ www.venture.ch

As the leading Swiss competition for start-ups, "venture" offers coaching and contact with over 100 top-ranking experts and jury members. At its annual awards, prize money is given for the best business ideas and business plans. ETH Zurich has organised this competition since 1996 with McKinsey & Company, Knecht Holding, the Commission for Technology and Innovation (CTI), and EPFL (since 2016).

IELAB

→ www.ethz.ch/ielab-en

The Innovation and Entrepreneurship Lab (ieLab) supports talented young entrepreneurs from ETH and offers Pioneer Fellows and spin-offs advice, training and infrastructure. The young entrepreneurs can learn from one another in the open-plan offices while benefiting from the support offered by experienced mentors and successful company founders.

ESA BIC SWITZERLAND

→ www.esabic.ch

ETH Zurich has just recently been awarded the contract for the ESA (European Space Agency) Business Incubation Centre Switzerland. The centre supports Swiss start-ups aiming to apply innovative space technology to non-space fields. Offering up to 500,000 euros per start-up in addition to technological and commercial assistance, it is one of the most attractive programmes in Switzerland.

ETH and partners

SPIN-OFF SUPPORT

→ www.spinoff.ethz.ch

Spin-off Support at ETH transfer advises ETH members on the first steps in founding a spin-off company, discusses and evaluates their business ideas, advises and arranges licences, and sets up contacts.

ETH TRANSFER

→ www.transfer.ethz.ch

The ETH Zurich technology transfer office assists ETH members with any questions relating to inventions, cooperating with industry, applying for patent applications and licensing, and setting up an ETH spin-off company.

ETH

CHAIR OF ENTREPRENEURSHIP

→ www.ethz.ch/entrepreneurship

BUSINESS TOOLS

→ www.btools.ch

PIONEER FELLOWSHIPS

→ www.pioneerfellowships.ethz.ch

The Pioneer Fellowship programme supports young ETH researchers intending to commercially exploit a service or product developed in the course of their Master's or doctoral degrees. Fellows are awarded 150,000 Swiss francs for a period of 18 months to support them in founding a company. More than half of the fellowships are financed from donations to the ETH Zurich Foundation.

GEBERT RÜF FOUNDATION

→ www.grstiftung.ch

CTI ENTREPRENEURSHIP

→ www.cti-entrepreneurship.ch

→ www.ctistartup.ch

The Swiss federal training programme for start-up founders at the Commission for Technology and Innovation (CTI) supports the next generation of scientists and entrepreneurs in developing their business ideas, setting up their companies and implementing growth strategies. As well as four training modules all run and led by experienced entrepreneurs, there is also a coaching programme on offer: CTI start-up.

WYSS ZÜRICH

→ www.wysszurich.uzh.ch

This University of Zurich-ETH Zurich joint research and development centre was made possible by a donation from the businessman Hansjörg Wyss. Its mission is to drive the translation of innovative ideas from research in medicine and robotics into practice. It offers financial assistance for projects, access to technology platforms and expert advice on business strategy.

SWISSNEX

→ www.swissnex.org

VENTURELAB

→ www.venturelab.ch

venturelab offers Swiss start-ups that show international potential an extensive network of business persons and investors. The most promising young entrepreneurs present themselves once a year as Venture Leaders in Boston, New York or China. This private initiative belongs to the Institut für Jungunternehmen (IFJ) and is supported by companies and universities.

ETH ENTREPRENEUR CLUB

→ www.entrepreneur-club.org

WA DE VIGIER FOUNDATION

→ www.devigier.ch

More about the entrepreneur scene in Switzerland:
→ www.gruenden.ch
→ www.swiss-startup-guide.ch



Off to a good start with drones and tracers

How do ETH spin-offs manage the leap from academic research to industry? The stories of the beginnings of Haelixa and Wingtra show how fledgling companies at ETH can benefit from the University's unique start-up and development conditions.

TEXT Michael Keller

That accursed first year: when young researchers found a company, it's just them and their idea. No time, no money, no experience – and good advice is expensive. At any rate, that's the cliché. Michela Puddu and Basil Weibel, two ETH graduates and young entrepreneurs, freely admit that the initial phase is a real challenge. Yet they don't feel like they've been left to go it alone. Quite the opposite: both value the broad range of support measures that allow their companies to take their first steps in a safe space. Weibel and his team at Wingtra build an aerial robot that takes off and lands vertically like a helicopter, but flies forward as efficiently

as an aeroplane. At the newly spun-off Haelixa, Puddu is hard at work bringing a new generation of marking substances to the oil and geothermal markets.

DNA markers for the oil industry

Puddu laid the foundation for the high-tech spin-off while writing her doctoral dissertation at the ETH Functional Materials Laboratory under Professor Wendelin Stark. Together with Gedinmas Mikutis, who would later co-found the company, she developed a new type of marker based on DNA. This marker makes it possible to provide any liquid with a unique fingerprint. Such tracers can be employed in, say, the oil industry or geothermal drilling as a way of gaining information about subterranean flows of oil or of water.

In contrast to conventional tracers, Haelixa markers are ecologically sound, easy to detect and can be used in extremely small quantities. While finishing her doctorate in summer 2015, Puddu was already starting to analyse the market potential and draft a business plan. She successfully competed in the Venture Kick spin-off competition and received a Pioneer Fellowship from ETH Zurich. Haelixa has been registered as a GmbH (limited liability company) since May 2016.

From incubator to industry

With the Pioneer Fellowship, Puddu receives start-up support to the tune of 150,000 Swiss francs as well as access to the offices and laboratory facilities in ETH Zurich's Innovation and Entrepreneurship Lab (ieLab). The lab provides coaches and serves as a kind of incubator for embryonic companies as they test the feasibility and potential markets for their business ideas. At the same time, the founders also benefit from the network created by the bud-



The aerial robot could be used in agriculture to monitor fields.

ding start-up ecosystem at ETH. "We learn a lot from each other here, which makes the transition from research to industry smoother," says Puddu. She is using this opportunity to find potential corporate customers. The fact that Haelixa is an official spin-off of ETH Zurich is also a help.

The market for oilfield tracers is worth some 350 million dollars annually – but the oil industry is a conservative one. To have a chance, Haelixa needs influential partners. In her search for such partners, Puddu is supported by Professor Stark, her doctoral advisor Robert Grass, and the ETH Industry Relations team, which opens doors and provides valuable contacts.

Making a prototype into a product

At present, Haelixa has no finished product to market. However, the spin-off is already collaborating with partners in underground exploration, who are interested in the tracer technology and are prepared to finance joint development projects. This helps Puddu to better understand her customers and to reduce the technology risk, which

will be an advantage in future financing rounds. "And we were able to use early revenues to hire a third team member," she says happily.

Puddu plans to convert the company into a public limited company at the end of 2016. There are two patents held by ETH to which Haelixa holds exclusive licensing rights. How much these cost is still the subject of negotiation. Haelixa is currently financing itself with funds from the Pioneer Fellowship and from start-up competitions as well as its first earnings. Thus far, the company has not required any seed financing from external investors. Puddu and Mikutis continue to work with partner companies to complete technology validation and convert the prototype into a marketable product. They plan a seed round for next summer.

A focus project takes off

Wingtra, by contrast, has already completed its initial rounds of financing. The ETH spin-off from the Autonomous Systems Lab (ASL) has so far raised a total of 3.1 million dollars in

seed capital to let its autonomous aerial robots take flight. "I'm certain we're already heading up out of the valley," says company founder Basil Weibel. But one thing at a time.

The idea for the aerial robots came about in 2013 as part of a focus project at the Department of Mechanical and Process Engineering – a teaching format in which Bachelor's students apply their knowledge in practice. In that project, Weibel and his small team developed the predecessor of the agile and efficient Wingtra drone. The result impressed Roland Siegwart, Professor for Autonomous Systems at the ASL. Weibel smiles as he recalls what happened next: "Siegwart was so convinced of its potential that, in autumn 2014, he gave us the opportunity to continue our research project at the ASL."

After that, things progressed quickly. Weibel and the other three co-founders worked day and night, and in the first year they invested over 120,000 Swiss francs out of their own pockets. In 2015, the project received 300,000 francs from the Gebert

IN FLIGHT

Wingtra produces a drone that flies as flexibly as a quadcopter and as efficiently as an aeroplane. Equipped with cameras, the intelligent aerial robot can generate field maps or monitor large areas of land. It is suited for applications that require long flight distances but offer little space for take-off and landing. Wingtra is always looking for programmers and investors.

→ www.wingtra.com



Operations at the Grimsel Test Site

Rüf Stiftung, which in this early phase led to a decisive surge in growth. In February 2016, the Wyss Translational Center Zurich began funding the young company, and private investors started investing in Wingtra this past summer.

Financing powers market readiness

Weibel sees the financing mix – the founders' private funds, financial support from ETH, and external venture capital – as one of the reasons for their success. "Every stake brings with it valuable relationships, contacts, and expertise," he notes. Yet more than any of these, it is the commitment from Wyss Zurich that is giving Wingtra the development boost it needs. Ten of the 24 "Wingtranautes" currently employed are financed directly by the Wyss Center. The young company, which so far is not generating any sales, can use office space and infrastructure and receives access to networks and experienced advisors. All this imbues the spin-off with the power to make its drones ready for the market in a short space of time.

But Weibel points out that it is precisely this final step of producing a marketable product that is frequently underestimated. It often happens that new inventions work well in the lab, but not in real conditions. Thanks to Wyss Zurich, today Wingtra has a functional prototype; with the current production setup it could manufacture some thousand units per year. "At the moment we're still honing the robustness of the control software, but product development will be finished by the end of 2016," Weibel is certain. Since this past summer, Wingtra has been working with selected companies that are testing the drones. Its first sales are set to be concluded in early 2017.

Wingtra has applied for a patent and has a technology-transfer agree-

ment with Wyss Zurich that will be settled in company stock. Weibel considers this an advantageous model, since investors are often sceptical about companies that do not own their intellectual property. And Wingtra plans to grow further, as size is a critical factor for them. "We are targeting a rapidly growing market in which we are facing much larger competitors," he says, "and that's why we have to take swift and decisive action."

Entrepreneurial luck on campus

As different as the stories of Wingtra and Haelixa are, their founders have one thing in common: ETH's unique start-up and development conditions. "Of course it's a challenge for us that

there are no oil wells in Switzerland, but to be at ETH in the initial phase is a huge advantage," states Puddu. And for Weibel, one thing is for sure: "ETH has given us major support multiple times. Without encouragement from Roland Siegwart, who believed in us right from the start, and without the support of the Gebert Rüf Stiftung and Wyss Zurich, Wingtra would be virtually unthinkable – so we are very grateful." ○

CLEVER MARKERS

Haelixa develops DNA-based markers (tracers) that can be used to mark and track any number of liquids or items. The environmentally friendly tracer technology is suitable for discovering oil fields, monitoring subterranean conditions, and authenticating and checking the quality of products.

→ www.haelixa.com

From start-up to global market leader

Sensirion and GetYourGuide: two ETH spin-offs in entirely different market sectors, but both highly successful. Their common denominators? Fruitful business ideas, entrepreneurs with the courage to venture into new territory – and the support of the right employees.

TEXT Roland Baumann

They call Rome the Eternal City – and it certainly feels like an eternity when you wait in line to visit historic sites like the Sistine Chapel. Unless you have the GetYourGuide app on your smartphone. Then you can book tickets in advance, get directions for how to get there, and visit the Vatican museums without standing in line.

An exclusive offer for travellers

"We are able to make this kind of exclusive offer because we have reached a volume that makes us an attractive partner for tour operators," explains Johannes Reck, the 31-year-old CEO of GetYourGuide. Since the ETH spin-off set up shop in Zurich's Technopark in 2010, it has evolved into the world's leading agency for excursions and local tourist activities, with more than 30,000 offers in 2,000 different cities and employing 250 people at a dozen locations.

The story actually began two years earlier, with a business idea that has since been modified but is still reflected in the company's name. In 2008, six ETH students set up an internet platform offering the services of students as tour guides throughout the world. This initiative failed because they were unable to recruit enough students to work as tour guides. But the platform nonetheless attracted the attention of

tour operators who saw it as a useful advertising medium. This gave rise to the business idea for the second attempt, and the budding entrepreneurs – now a group of five – started out again.

In their efforts, the group could count on support from mentors. "The Swiss start-up culture is second to none in Europe, especially at ETH," enthuses Reck. He continues, "I had the opportunity to meet with German Chancellor Angela Merkel and suggested that German universities should set up technology transfer facilities like ETH transfer." It would improve the chances of young start-ups and give students the courage to try out their own ideas.

The creators of GetYourGuide certainly needed courage on more than one occasion. For instance, at one point they realised they wouldn't be able to employ more people in Zurich, because the internet culture hadn't yet caught on in Switzerland. They decided to set up a second office in Berlin. "In the beginning it was hard for us to manage the balancing act between the two locations," Reck recalls, "but the experience paid off in the long term and came in useful when we started to set up offices in other countries."

A series of new beginnings

Then came the mobile revolution that redefined the internet. Company website GetYourGuide.com was a typical desktop website that didn't adequately support smartphones or offer apps. Virtually overnight, its owners decided to reposition the product and redirect all their resources into developing a mobile version. But technology is one thing, content quite another. The tour operators were not in the habit of offering last-minute deals, but travellers wanted to be able to book services via smartphone once they were already at their destination. And so, one challenge led to another. >



TOURISM

Created in 2010 by Johannes Reck, Pascal Mathis, Tobias Rein, Martin Sieber and Tao Tao, GetYourGuide is a platform offering personalised services to tourists. Today the company employs around 250 people: 190 in Berlin, 10 in Zurich and 50 at other locations around the globe. Between 10 and 20 of these employees are ETH graduates.

→ www.getyourguide.com



Rome is just one of the 2,000 destinations where GetYourGuide provides exclusive visitor services for tourists.

It goes without saying that this all costs money – a lot of money. The company's earnings were far too meagre, but GetYourGuide rapidly found reputable investors. Over the years, it has raised almost 100 million dollars. GetYourGuide has never turned a profit (so far): like other internet companies, it's all about growth. If the company manages to win out over the global competition, the financial rewards will be considerable. But it wasn't money alone that was responsible for the start-up's success. It's also important to have the right investors. For GetYourGuide, they include Kees Koolen, wellknown as one of the co-founders of Booking.com. "He helped us to revise our corporate structures and define the company's strategic orientation," says Reck.

GetYourGuide is currently working day and night to evaluate the huge volume of existing booking data so as to be able to personalise the offers it suggests to its customers. "We are the

only platform with such a large inventory of data, and yet even after seven years we are effectively starting all over again," says Reck. Among other things, the company aims to grow further by expanding its workforce in Zurich, preferably by recruiting ETH graduates. Reck appreciates the fact that "ETH students are used to working under pressure, possess outstanding analytical skills, and have been educated to the highest standards."

This opinion is shared by Felix Mayer and Moritz Lechner, both of whom earned doctorates in physics from ETH. They founded what is probably the best-known ETH spin-off: Sensirion employs 600 people, a quarter of whom are ETH graduates. "ETH provides an excellent education for highly talented students, both on a national and international level," says Lechner. Mayer adds, "Obviously, we also recruit graduates from other universities, and more than half of our employees hold a university degree."

The dream of running their own business

It has taken nearly 20 years for the two entrepreneurs to build up the company that today is one of global leaders in the market for sensors and sensor solutions. "Even as students, we knew that we wanted to set up our own company, even if that was a pretty far-fetched idea at the time," remembers Mayer. ETH offered little in the way of support for such projects; one exception was a lecture by Branco Weiss on how to found and manage a company.

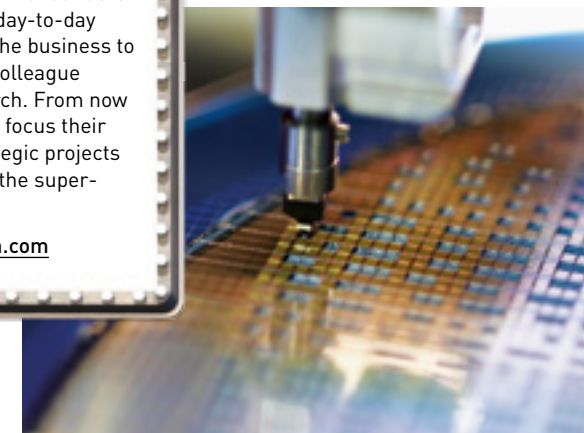
In 1998 Thomas Knecht, the managing director of McKinsey's Swiss office at the time, joined forces with ETH Zurich to establish the "venture" start-up contest. "We knew that this was our chance to realise our dream," says Lechner. He and Mayer won the first edition of the "venture" competition, but that's now ancient history.

Yet despite their determination to found their own company, it took them a long time to decide exactly what

SENSORS

Felix Mayer and Moritz Lechner founded Sensirion as an ETH spin-off in 1998, and jointly led the company to success. In 2015, the company generated sales of 117 million Swiss francs with 600 employees, including 550 based in Stäfa. In June 2016, the two founders handed over the day-to-day management of the business to their long-term colleague Marc von Waldkirch. From now on, they intend to focus their attention on strategic projects as joint chairs of the supervisory board.

→ www.sensirion.com



Made in Switzerland, used throughout the world: sensors from Stäfa

product they wanted to offer. In the end, they chose to develop and commercialise two novel sensors based on Mayer's doctoral thesis. It was a go-for-broke decision because, as Mayer explains: "ETH had made several previous attempts to transfer this sensor technology to industry. Knowing that all of them had failed definitely made us a little nervous."

Entrepreneurial risks

To add to the challenge, developing and producing this type of technology is expensive and time-consuming. The two partners couldn't simply set to work on their own and grow progressively from there. Right from the start, they needed an infrastructure and co-workers. They poured all the money they had into their business, even taking out loans. All this before they could start work and look for an investor – "not the usual Swiss way of doing things," comments Lechner with a wry smile. They went on to develop two types of sensor, one for measuring humidity and temperature and the other for measuring gas flow, in the hope that at least one of them would work.

As it turned out, both products worked. They found a few customers, then more and more. The company was on course to reach break-even point, allowing the two entrepreneurs to breathe a sigh of relief. But then

came 9/11, only three years after the company was founded and just as it was beginning to find its feet. In next to no time, its orders dropped by 75 percent. "It was a heavy blow that sent us back to square one," comments Lechner.

But the company quickly recovered, continued to improve its products, and ventured into one new market after another. The first was medical devices, followed by the automotive industry and consumer goods. In the era of the Internet of Things, in which all products are equipped with smart functions, sensors have become indispensable in almost every area of industry. Would it be fair to say that the two entrepreneurs anticipated this development? "Two or three years after we founded our company, we could see that computing power was becoming cheaper, and that this would lead to an increased demand for sensor technology," says Mayer. "We recognised this growing trend and wanted to be a part of it." Today, Sensirion is a major player in the field.

The company's growth has been driven by huge investment in research and development, corresponding to one fourth of its revenues, and by Sensirion's unique corporate culture, which enables it to find solutions in even the most difficult situations. This was the case when a new gas sensor failed field tests, despite the dedicated work of 100 or so development engineers. Initial improvements didn't solve the problem, and a comparison with rival products revealed that they, too, were unable to meet field testing requirements. "We interrogated everyone who works for the company to find out whether they saw a future for this product," reports Lechner. The consensus was to continue believing in the sensor. They tried out a whole panoply of ideas until finally finding the one that worked – on the last attempt. As Lechner says, "That's what innovation is all about: Stretching ourselves to the limit and leaving the safe and familiar behind. It doesn't always work, but then you simply have to stand up and try again." ○

Rewarded for all the hard work



Many spin-off founders dream of a big takeover deal. However, unique technology on its own is not enough to turn this dream into reality. The success story of GlycoVaxyn is a case in point.

TEXT Corinne Johannssen

It was surprising enough that the top management of the British pharmaceuticals company GlaxoSmithKline (GSK) visited the laboratory of the ETH spin-off in Schlieren. But when they placed a takeover bid on the table, it was more than anyone had dared to hope for. Michael Wacker, then CSO and co-founder of GlycoVaxyn, remembers the day back in December 2014 with satisfaction. “Of course, everyone secretly hopes for a takeover,” Wacker says. “But when the bid turns out to be competitive as well, it’s especially gratifying after all the hard work.” The young start-up company had already been collaborating with GSK for some years, and the pharmaceuticals company obviously liked what they saw: they offered 212 million dollars for the ETH spin-off.

What sets GlycoVaxyn apart from the crowd is a novel biotechnology method for the production of vaccines, which Wacker had developed while working on his doctorate at the laboratory of Markus Aebi, Professor at the ETH Zurich Institute of Microbiology (see box). However, although GSK dug deep into its pockets to acquire the

young ETH company, the latter has yet to produce a marketable vaccine. The most advanced vaccines target *E. coli* bacteria, which cause blood poisoning, and Shigella bacteria, which are responsible for severe diarrhoea among children in developing countries.

**“At the end of the day
it’s the team
that’s decisive, not
the technology.”**

MICHAEL WACKER

“The final hurdle is tough,” Wacker says. And so he has no choice but to wait for the vaccine that has the capacity to save lives. “This has always been what drives me on,” Wacker explains. Without this driving force, he may well have thrown in the towel. For as suc-

cessful as the takeover has ultimately proved to be, the road to success has not been easy.

Expensive development

During his time as a postdoc with Aebi, Wacker joined with two co-founders Michael Stucky and Urs Tuor to draw up a business plan – working nights and weekends. In 2004, the three young entrepreneurs established the ETH spin-off GlycoVaxyn and started to look for investors. The search proved quite difficult. “Vaccines aren’t very attractive financially,” Wacker says. “It’s far more lucrative to treat an infection than to prevent it.”

Ultimately, they succeeded in finding two investors willing to seed the company with an investment of over a million Swiss francs. This enabled them to hire their first paid employees and carry out animal testing to prove that their vaccines actually stimulate an immune response. Thanks to agreements on objectives reached with the same investors, they were able to keep going, this time with backing amounting to 12 million. The company continued to grow and set up shop in

former ETH laboratories in Schlieren. Two years later, another successful financing round brought a third investor on board with 25 million Swiss francs.

All this sounds like a lot of money and a smooth ride. But along the way bankruptcy threatened on more than one occasion, investors pulled out and the company produced research results that sometimes disappointed. One particular challenge when developing vaccines is the high costs, which do not necessarily lead directly to a marketable product. “We never stopped believing in ourselves; otherwise we wouldn’t have been able to invest so much blood, sweat and tears,” Wacker says. “And we certainly would never have succeeded in getting investors on board if we weren’t thoroughly convinced of the merit of our vision.”

Investment in bright minds

Ahead of the final financing round before the sale, they licensed a vaccine to Johnson & Johnson. Wacker is still pleased about that “first year in the black”. But the big turning point came in 2014. By then, the investors had already been on board for eight years. “To be able to borrow more money for development and offer the investors a chance to get their money back, we started to prepare for an IPO,” Wacker recalls. But before the step was completed, GSK was already knocking on the door.

As part of the takeover, GlycoVaxyn’s management created a new company, LimmaTech Biologics, which further develops the technology for GSK under a research agreement. “We are a kind of centre of excellence,” Wacker sums up. He is clearly pleased that all the approximately 60 staff were also taken over. “At the end of the day, it’s the team that’s decisive, not the technology,” Wacker says. But it’s not just bright minds that have helped ensure the fledgling company’s success. “Taking decisions has always been our strength. Looking back, some of them were wrong, but that’s still better than not taking any at all.”

The takeover also brought about major changes for Wacker: “For years, I worked day and night for the company,” he says. “It was time for a change, and it came just at the right moment.” Wacker has withdrawn from active management, but still serves on the LimmaTech Biologics board of directors. He has also set up a consulting company. Furthermore, on behalf of Switzerland’s Commission for Technology and Innovation, he coaches

young entrepreneurs who are in the same position today as he was over 10 years ago.

“I follow what’s happening in the start-up scene closely,” Wacker says. He notes that the challenges are still the same as they were then: to develop ideas, present a solid business plan, convince investors. But one thing has changed: there are more good examples – such as the success story of GlycoVaxyn. ○

QUICKER AND CHEAPER

Bacterial vaccines consist of sugar chains (polysaccharides) that are characteristic for the pathogen. To ensure that the vaccine has a long-term effect, the sugar is attached to a protein. This takes place in a chemical conjugation process. LimmaTech Biologics, a spin-off of GlycoVaxyn, develops vaccines that are conjugated in bacterial cells – a process that’s both quicker and cheaper.

→ www.lmtbio.com

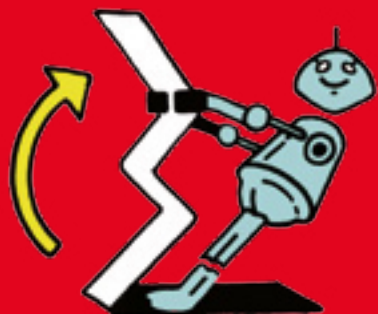


It’s a long way from lab to market.

An ETH spin-off for every eventuality

Globe looks at nine novel business ideas.

COMPILED BY Corinne Johannssen



For beautiful curves

AutoForm software solutions are so effective that almost all the major car manufacturers use them to simulate the shaping of sheet metal into car body parts. It's a particularly swift and cost-efficient way of designing new forms. And a joy for all car lovers.

→ www.autoform.com/en

For the helpless

New flats are in high demand, but are often snapped up before they're even completed – leaving many buyers and tenants standing helplessly in front of the building site with nothing more than a floor plan to go on. Using *Archilogic* software, sellers can now draw up their properties in 3D, so flat hunters can explore their future homes interactively. Anticipation becomes half the fun.

→ www.archilogic.com



For the neglected

Who wants to be left high and dry? Neglected plants can consider themselves lucky if kitted out by their owner with a sensor developed by *Koubachi* (now Husqvarna). This translates the plant's requirements into fun symbols on a mobile phone. Your plant need never go thirsty again.

→ www.koubachi.com

For the fashion-conscious

A few key measurements, a clever algorithm, and those made-to-measure jeans fit perfectly. The *RealLook* software conjures up a 3D model of the customer's legs as the pattern for each pair of jeans. But to keep that long-lasting perfect fit, the fashion-conscious must take care their template stays constant – despite any Christmas indulgence.

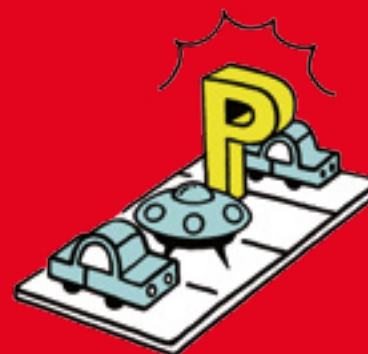
→ www.selfnation.com



For eager learners

Too bad for Pippi Longstocking that she never got the chance to use *Dybuster* to help tackle her difficulties with maths and reading! These interactive learning programs are a good way for children like Pippi to get to grips with these subjects while also having fun.

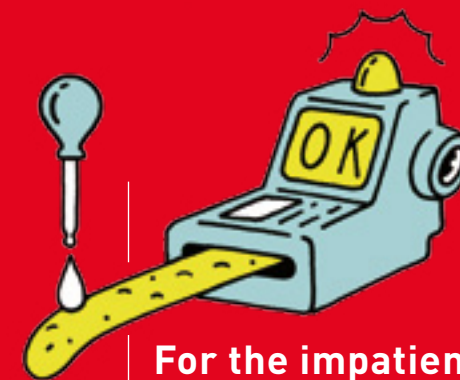
→ www.dybuster.com



For the desperate

Looking for a vacant parking spot can drive you to tears. The *Parquery* app makes it simple: it analyses camera images in real time and displays the available parking spaces on your smart phone.

→ www.parquery.com



For the impatient

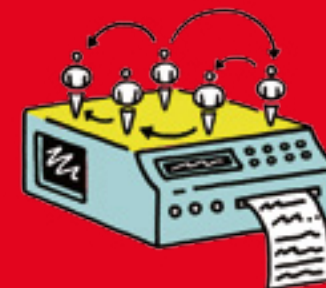
Bacteria can spread like wildfire and trigger epidemics, but detecting them in a lab culture may take days. *Rqmicro* determined to speed this up. Using a microfluidic chip, they can detect these agents of disease directly in the sample, rather than having to grow them in a Petri dish. Legionella and other bacteria will suffer for it.

→ www.rqmicro.ch

For fallen heroes

Some footballers do in fact have every reason to writhe in pain on the pitch. A torn cruciate ligament really hurts – as does removing the tissue necessary for treating it. How fortunate then that *ZuriMED Technologies* have developed a partially synthetic implant. No more need for that painful extraction.

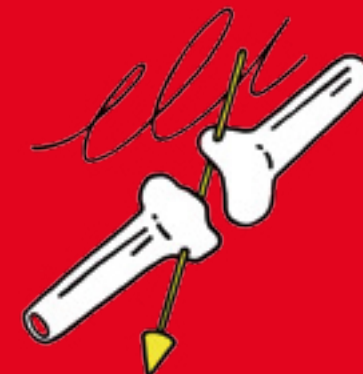
→ www.zurimed.com



For globetrotters

Capturing data from the mobile phone network to locate users sounds like spying and violations of data protection. Far from it: *Teralytics* is not interested in individuals, but in the movements of large segments of the population. This spin-off uses software that can, for example, analyse in real time the most popular means of transport between two cities.

→ www.teralytics.net



**Perfekt sitzende,
massgeschneiderte Hosen
schnell und bequem
online bestellen?**

Das geht.

Beim ETH Spin-Off SELFNATION gibst du deine Masse einfach online ein. Bevor du die Bestellung abschliesst, schaust du dir deine individuellen Jeans oder Chinos als 3D-Modell an.



**SELFNATION Hosen sind jetzt auch im ETH Store erhältlich.
Lass dich heute noch vor Ort vermessen.**

Exklusiv im ETH Store an der Sonneggstrasse 3, 8092 Zürich

COMMUNITY



The students learnt how to communicate their ideas effectively.

ETH Week

THE WATER CHALLENGE

ETH organised a second ETH Week at the beginning of September. This time the theme was water – a resource under mounting pressure. More than 180 students from 20 countries and all 16 departments sought sustainable solutions, with much of the focus on the learning process itself. Working in interdisciplinary groups, the participants learnt how to think across disciplines, define problems, and present complex issues attractively. ETH Week forms part of the ETH Zurich Critical Thinking Initiative.

ERC Starting Grants

SUCCESS IN EUROPE

This year, young ETH researchers shone on the European stage once again. Six scientists (two women and four men) from ETH Zurich were successful in the prestigious competition for the European Research Council (ERC) Starting Grants. These grants support young talent at the beginning of their academic careers. Each of the scientists will receive approximately 1.6 million Swiss francs in grant funds to drive their research projects forward – meaning a total of over 9.3 million Swiss francs is going to researchers who submitted their projects through ETH.

The six talented young researchers work in diverse fields, ranging from visual computing and health sciences to quantum optics, but com-

mon to all the projects is scientific excellence. Detlef Günther, Vice President for Research and Corporate Relations at ETH Zurich, is particularly happy about the range of outstanding projects: “Our talented researchers have competed side by side with the best Europe has to offer – and succeeded. They are all from different disciplines, which speaks for the quality of our young scientists, and also shows that ETH is following an extremely successful recruitment policy.”

A total of 29 ETH researchers applied for the coveted ERC Starting Grants. Of that group, 13 advanced to the second call for proposals, and 11 were assessed as “excellent”.

ZISC

NEW FOUNDING PARTNER

The Zurich Information Security and Privacy Center (ZISC) has gained another founding partner, the SIX Group. The service provider for the Swiss financial market infrastructure is making a donation specifically for setting up the ZISC Open Lab.

In the Open Lab, students, scientists and IT specialists from partners and companies involved in the ZISC can directly exchange ideas and information, and pursue common projects. Amongst other things, this will help to drive the transfer of research findings into everyday applications.

25 years of CSCS

Powering Swiss research

The Swiss National Supercomputing Centre (CSCS) has celebrated its 25th birthday. Now internationally renowned, the centre operates the latest supercomputers and supports users at the pinnacle of research.



From left: Jakob Nüesch, ETH President; Heinrich Ursprung, State Secretary for Science and Research; Giuseppe Buffi, Ticino Cantonal Councillor; Alfred Scheidegger, Director of CSCS

ETH Zurich Professor Eduard Stiefel pioneered the use and development of computers in Switzerland, bringing Konrad Zuse's Z4 – the world's first universal computer – to Zurich in 1950. While the Z4 can hardly be compared with today's electronic computers, it did help solve important technical problems in research – for instance the structural analysis of the Grande Dixence dam wall in Valais.

Thirty-five years later, the Swiss federal government decided to establish a national computing centre in

Switzerland and to procure a supercomputer that would be available to all universities. The project received 40 million Swiss francs of funding, and in 1987 the SWITCH foundation was established to connect the universities and also safeguard the exchange of data with the computing centre.

Performance of an iPad

Following six years of heated debate as to where the centre should be located, the Swiss National Supercomputing Centre (CSCS) was opened in Manno

in the canton of Ticino in 1991. ETH Zurich ran the centre from its inception, and CSCS's first supercomputer was an NEC SX-3 with two processors. With a computing power of 5.5 gigaflops, the machine was able to perform 5.5 billion calculations a second – about the same as an iPad today. The computer supported Swiss research primarily in the domains of climate, astronomy and engineering – for instance in the simulation of fluid dynamics processes.

Since supercomputers become outdated every three to four years, they have to be replaced or overhauled with new, more powerful technologies. This is what happened at CSCS in 2002, when then-director Michele Parrinello procured the centre its first massively parallel computer. The IBM SP4 had 256 processors and was capable of performing 1.3 trillion calculations a second. The supercomputer was almost ten times more powerful than its predecessor (NEC SX-5) and, moreover, was useful for solving problems in new application domains such as molecular dynamics. Application fields became even more diverse in 2005, when the IBM computer was replaced with a Cray XT3, which was even more general purpose. Today, high-performance computing (HPC) is a key technology that allows researchers to make new discoveries and come up with new solutions to highly complex issues in the fields of physics,

chemistry, environmental science, energy, health and economics.

Supercomputing strategy

In December 2009, the Swiss parliament approved a strategy for high-performance computing and networking (HPCN) drawn up by the ETH Board on behalf of the Swiss State Secretariat for Education, Research and Innovation (SERI). The Swiss federal government, ETH Domain and universities thereby laid the foundation for an internationally competitive Swiss supercomputing network. Three years later, CSCS moved into a state-of-the-art new building in Lugano and took receipt of "Piz Daint", a Cray XC30 supercomputer that was Switzerland's first petaflop machine and can perform millions of billions of calculations a second. One of the goals of the HPCN strategy was to support top-level research in Switzerland and thereby secure the country's competitiveness. In Piz Daint, Switzerland currently possesses Europe's most powerful supercomputer, used by some 600 researchers in Switzerland and abroad. The computer allows for an even more realistic and efficient simulation of highly complex problems. It can also structure and analyse large quantities of unstructured data, such as that produced by CERN's Large Hadron Collider (LHC).

The HPCN strategy has also yielded successful initiatives in which researchers have cooperated with hardware and software developers to allow for more efficient use of new and future supercomputer architectures. These initiatives led for instance to an optimised weather code and a new computer for MeteoSwiss. Since the summer of 2016, these solutions have made it possible to make weather forecasts in greater detail than ever before while still being energy efficient. Close ties



Today: «Piz Daint» is currently the most powerful supercomputer in Europe.

have also been established with USI Università della Svizzera italiana, particularly in data science.

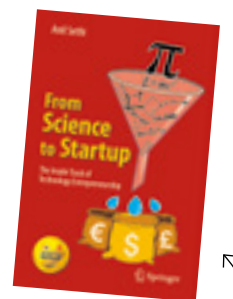
In the 25 years since it was established, CSCS has had a colourful history with nine directors. Thanks in no small part to the HPCN strategy, CSCS – led since 2008 by Director and ETH Professor Thomas Schulthess – is regarded as a scientific computing centre with an international reputation. It offers its users a comprehensive range of hardware and software services. As well as Piz Daint, CSCS also runs the abovementioned weather computer for MeteoSwiss, the computer cluster of the Swiss Institute of Particle Physics (CHIPP) and, since 2013, the supercomputer of the Blue Brain Project. — Simone Ulmer

The Swiss National Supercomputing Centre (CSCS):
→ www.cscs.ch

Spin-off

KNOW-HOW

Recognition for Anil Sethi, the Entrepreneur-in-Residence at ETH's Chair of Entrepreneurship: his book *From Science to Startup* was recently chosen by the Chartered Management Institute (CMI) and the British Library as one of the world's top five books on the subject of innovation and entrepreneurship. The book describes the experiences, stumbling blocks and insights that lie along the road from scientific idea to start-up company. In writing the book, Sethi drew on his own broad experience as a entrepreneur. He was co-founder of the ETH spin-off Flisom and also founded a company that guides technology start-ups along the path to a global market launch. At ETH Zurich, he provides support to Master's and doctoral students as they use their technologies to develop commercially viable ideas for business start-ups.



Anil Sethi: *From Science to Startup: The Inside Track of Technology Entrepreneurship*, Springer 2016



The Skintegrity project aims to develop skin replacements for burn victims and gain a better understanding of our largest organ.

Skintegrity

TOP-LEVEL RESEARCH INTO SKIN DISEASES

Scientists, engineers and physicians at ETH Zurich, the University of Zurich and a number of university clinics in Zurich will collaborate in future on developing new therapies and diagnostic procedures for skin diseases and tissue repair disorders, and to investigate the basic mechanisms underlying these conditions. Their large-scale “Skintegrity” project is to become University Medicine Zurich’s new flagship project. It is being supported with 1 million Swiss francs as start-up funding, with ETH and the University of Zurich each receiving half of this amount. Skintegrity was officially launched in October.

ETH Zurich and the local university institutions already boast a high

level of expertise in skin research, both in terms of basic research and clinical application. The Skintegrity project will allow Zurich to continue building on its interdisciplinary strengths as a centre for skin research. Not only will the project strongly promote research in Zurich, it will also give a crucial boost to the Swiss medical technology, biotechnology and pharmaceuticals industries.

The engineering sector, where ETH Zurich is especially strong, is closely involved in the collaboration. The University of Zurich contributes the medical expertise for translating the research into clinical applications, together with the University Hospital and the Children’s Hospital, where a number of solutions have already been clinically tested. Skintegrity should also have a positive effect on the training of medical doctors, basic researchers and engineers.

Student Project House

PILOT OPENED

The Student Project House is a creative environment and workshop where ETH students can pursue their own projects. The pilot station prototype was opened on the Hönggerberg campus in September. With the Baugarten Foundation, the Ernst Göhner Foundation and Plastic Omnium, ETH Zurich won strong founding partners whose donations to the ETH Zurich Foundation provide the funding for the Student Project House. The future centre will be located in ETH Zurich’s former district heating plant in Clausiusstrasse.

ETH Alumni

822 UNDER 40

At present, the ETH Zurich Foundation’s donor list includes 822 alumni under the age of 40. Now a new event series, “think talk tibits”, is encouraging dialogue amongst these young patrons of ETH Zurich. The events are held at the vegetarian restaurant tibits, where participants can mix and mingle with like-minded people and learn more about their fascinating life stories.

The plan is to hold think talk tibits twice a year in the future. Each event focuses on a young ETH alumna or alumnus and their biography. First speaker was ETH alumnus Reto Frei, co-founder of tibits restaurant. Initial networking events have already taken place in Zurich and London.



Column

President of the ETH Board: a dream job?

With things as they are at the moment, you might think there is no easier job than being president of the ETH Board and representing the ETH Domain in the wider world. Both ETH Zurich and EPFL are among the world’s best institutions of higher education. Internationally, they have never seen such high rankings, and more and more young people are being drawn to study here. Ten years ago, we had just under 20,000 students; today, we have 30,000. At the same time, the four research institutes of the ETH Domain – PSI, WSL, EMPA and EAWAG – are doing outstanding work in their respective fields, whether in the areas of energy, environment, materials and

waste water, or in collaboration with business and public authorities. Everything is fine and in great shape, you might say.

But it’s not quite that simple. If ETH Domain institutions are to continue delivering such top-quality results, three conditions must be met. First, adequate funding from the Swiss federal government, which has a constitutional obligation to engage in running the Federal Institutes of Technology. Second, autonomy. And third, an open and international environment in Switzerland. Currently, there is much debate about Switzerland’s openness. Let me say only this: in the ETH Domain, half of our employees and two thirds of our professors hold foreign passports. To remain at the forefront of research, I am convinced that we must continue to be able to recruit the best talent from Switzerland and abroad. For this reason, the ETH Board is active in politics and the public arena to ensure the ETH Domain exists in an environment that allows it to prosper and to advance Switzerland as a centre of knowledge and industry.

You, our readers, are ideally placed to support the Board in this mission. More than 50,000 people have a connection to ETH Zurich, whether as alumni, students or staff. Imagine if all of them were to take a more active role in politics and society, representing the viewpoint of their university as ambassadors of ETH Zurich and of Switzerland as a place of education and research. Imagine what you, the graduates of ETH Zurich, and you, decision-makers in politics, business and society, could achieve by getting involved. Support Switzerland as a place in which knowledge and industry prosper, support future generations of students and faculty, support closer collaboration between industry and the universities. I am convinced that together, we could move mountains.



Fritz Schiesser was a representative of the canton of Glarus to the Swiss Council of States from 1990 to 2007. Since 2008, he has been President of the ETH Board, the ETH Domain’s strategic management and supervisory body.

The long road to Boston

Armed with the idea of using designer bacteria to detect inflammatory bowel disease, this year's ETH team set out to convince the iGEM competition jury. This meant long hours in the lab and a lot of enthusiasm.

TEXT Felix Würsten IMAGE Daniel Winkler



The lab buzzes with industrious activity until just before departure for the US.

Lucas and Mattia are still not entirely satisfied. They've just given their trial presentation, and it's not quite as polished as it could be. "You're still using old slides," supervisor Janine points out. "You're going to have to go over it again." The team of students from ETH Zurich have just 24 hours before they are due to unveil their work at the Giant Jamboree of the iGEM Competition in Boston's Hynes Convention Center. Together with teammates Andreas, Asli, Lukas, Sophie and Tina and their four supervisors, Lucas and Mattia go about putting the finishing touches to their presentation. For they are not only hoping to win over tomorrow's audience; they also want to convince the exacting judges, who will decide whether the ETH team wins a prize on Monday.

Rapid development

The 7 students are the 11th ETH team to take part in the annual iGEM Competition. iGEM stands for "International Genetically Engineered Machine", and is all about applying the principles of engineering to biology. The basic idea is to use standard components – usually DNA sequences – to modify organisms so that they perform certain tasks. Akin to assembling electronic devices from transistors, resistors and capacitors, organisms can be engineered with DNA switches, sensors or memory elements that enable them to detect specific substances or produce new ones.

The iGEM participation figures reflect the swift pace at which the field of synthetic biology has advanced in recent years: when ETH took part for the first time back in 2005, there were only 13 university entrants, and 10 of those were from the US. This year, over 300 teams from around the world travelled to Boston hoping to win a prize at the Giant Jamboree. Arriving at the congress centre straight from the airport on Thursday, just a few hours before their trial presentation, the students soon get a taste of how tough the competition is. The two exhibition halls where the teams are hanging up a



Were the predictions correct? The modellers wait impatiently for the latest data from the lab experiments.

colourful array of posters are already bustling with activity. Although the venue has about as much charm as a factory floor, the atmosphere is buzzing. Laughter fills the air – and that is very much in line with what the organisers intend. After all, entering the iGEM competition may mean having to work hard over the summer, but ultimately it should be fun, too.

There's very little sign of that at the Department of Biosystems in Basel at the end of June, however. Coming from such diverse fields as biochemistry, biotechnology, electrical engineering and computer science, the seven students first have to find their feet as a team. Above all, however, their task over the coming weeks is to come up with their own project idea and translate it into practice. "They have no idea how many obstacles they're going to have to overcome," Professor Sven Panke, one of three mentors along >



Countless attempts are needed until the bacteria function as planned.

with his colleagues Jörg Stelling and Kobi Benenson, says with a smile. Of course, Panke could point the students in the right direction by drawing their attention to potential pitfalls and critical points. But that is precisely what he doesn't do: "We want to empower the students to work independently. We professors only intervene if the project starts to go off track."

A clear plan

For the students, it is indeed quite a challenge to find an assignment that is both demanding and produces results in the short period of time available. But for now they are all still fairly relaxed. At least they already have a clear plan: "We want to genetically engineer *E. coli* bacteria that have the potential to act as a diagnostic tool for chronic inflammatory bowel disease," Lucas explains. Sophie adds: "The current methods for diagnosing IBD mainly rely on endoscopies or on analysing patients' faeces. Both diagnostic methods are flawed. The new, non-invasive method we want to develop could potentially help millions of people in Europe alone."

The project, known as "Pavlov's coli", has been designed to allow the genetically engineered bacteria to register when two characteristic molecules for the disease are present in the gut and memorise this information. When the bacteria in the faecal samples are subsequently examined in the laboratory, they indicate whether the patient is suffering from a chronic inflammation. Mattia and Sophie used a numerical model they developed themselves to calculate precisely how the bacteria have to be modified in order to gather this information. The task for Asli, Tina, Lukas, Andreas and Lucas is to verify the calculations in laboratory tests and at the same time deliver the output data for the model.

The plan makes sense. However, implementing it is fraught with unforeseen complications. Despite the fact that four doctoral students are on hand to offer advice and the students can consult with other researchers, in Oc-



A whole new experience: the team complete a project on their own.

tober Sven Panke's prediction comes true: two weeks before the Giant Jamboree, the laboratory is buzzing with industrious activity. The seven valiant students are frantically trying to iron out the final weaknesses in their system. To have any chance of reaching the final, they also have to complete additional project-related tasks. For example, in addition to his work on the project, Lukas has to characterise a number of existing parts. The iGEM organisers attach importance to being able to reproduce the results; this is the only way to establish a base of clearly specified parts that do precisely what they are supposed to do.

Above all, however, the teams are required to document their project in detail in a wiki. Precisely seven days remain until the "wiki freeze". After this magic moment, the students are

not allowed to make any more changes ahead of the Giant Jamboree in Boston. Given how many tasks they need to complete at the same time, it is no surprise that the team in Basel have to put in a few night shifts. The uncontested record holder is Andreas, who in the last week spent 60 hours non-stop in the laboratory.

No show elements

Here in Boston, all this blood, sweat and tears is history. Now it's time to present the results and establish new contacts to the other teams. The variety of ideas showcased in the poster session and the creativity with which some teams have completed their assignment – gaining attention with original posters and costumes – is impressive.

Sophie, Asli and Lukas are also doing everything they can to attract a large audience for their presentation – for example by handing out chocolates that they individually wrapped the night before their flight. The presentations are as different and varied as the posters in the hall: some of the teams have perfected choreographies to music, devised futuristic plans for solving major social challenges, or developed

apparently sophisticated gadgets in only a few months that can be interconnected using an iPhone app.

The ETH team manage without such show elements. Nevertheless, Lucas and Mattia pull off a lively performance, which makes it clear even to the non-experts in the audience just how much painstaking work has gone into the preparation in Basel. The careful revision of the slides on the final night has obviously paid off and is rewarded by the audience with enthusiastic applause. Stelling is also pleased with what the students have accomplished: "They have presented results and openly discussed what works and what does not." Now it's up to the judges to evaluate their work. As well as considering the originality and innovativeness of the "Pavlov's coli" project, they will also look at how the idea has been implemented and what concrete

results the ETH team have produced. Last but not least, the judges will take into account whether the students have considered the project's social and ethical implications and sufficiently addressed the issue of biosafety.

For the time being, however, the students can take a deep breath: having successfully presented their work, they have cleared the most important hurdle. Now they can relax and enjoy the remaining two days of the conference. "For me it's been a great experience," Andreas says. And Tina adds: "The cooperation within the team was super. It's definitely been worth all the effort." The excitement mounts again at the awards ceremony on Monday morning: the ETH team are nominated twice for a prize – but both times another team pips them to the post. They accept the verdict sportingly, but understandably are a little disappointed.

"It's such a pity they didn't get a prize because they all did a truly excellent job," Panke says, praising their achievements. "But experiences like this are also part and parcel of the competition." ○

Information about the project:

→ 2016.igem.org/Team:ETH_Zurich

Information about iGEM at ETH:

→ www.bsse.ethz.ch/bpl/education/igem



Intense days in Boston – from the opening until the final photo with all teams.



Relief after a successful presentation: the ETH team are proud of their work – and rightfully so.



CONNECTED

1 *ETH Alumni Ball*

HAVING A BALL OF A TIME

The traditional ETH Alumni Ball rolled around again this autumn. Almost 250 alumni and guests streamed into The Dolder Grand for their ball evening. Entirely befitting this year's motto, "Swing with me, sway with me," the musician [Marc Sway](#) mingled with the guests. And the band This Masquerade also got the guests out on the dance floor. Roulette and blackjack tables set up in the hotel lobby set hearts racing.

2 *Industry Day*

BUSINESS MEETS SCIENCE

At the fourth ever Industry Day, representatives from business and industry once again met up with researchers at ETH Zurich. Food and nutrition was one of the main topics at the event. Other presentations gave visitors insights into the research being conducted in the fields of data science, energy and raw materials, entrepreneurship, and material sciences. With a [record number](#) of some 550 participants this time round, the event is attracting more and more people each year who want to discuss current research projects with the scientists.

1 *ETH Alumni Ball*



2 *Industry Day*



3 *ETH Day*



4 *Long Night of the Careers*



5 *Official visit*



ETH President Lino Guzzella (right) in conversation with Slovakian President Andrej Kiska.

3 *ETH Day*

HONOURING EXCELLENCE

At this year's ETH Day, Rector Sarah Springman (right) and ETH President Lino Guzzella (left) presented two outstanding personalities with [honorary doctorates](#): Max Ernst Meyer (second from right), Technical Director of VSL International Ltd, for his drive and inventiveness as an engineer in the field of pre-stressing technology; and climate scientist Thomas Stocker (third from right) from the University of Bern for his outstanding services to science and society. In addition, ETH Zurich appointed Thomas Knecht (second from left), owner and president of the supervisory board of Knecht Holding, as an [honorary councillor](#).

4 *Long Night of the Careers*

THE OTHER JOBS FAIR

Once again this year, the ETH Career Center hosted the Long Night of the Careers in the main building. In a relaxed atmosphere, students, doctoral candidates and alumni chatted with potential employers and made important contacts.

5 *Official visit*

DISTINGUISHED VISITORS TO ARCH_TEC_LAB

[Slovakian President Andrej Kiska](#) (foreground, left) visited the Hönggerberg campus together with his host, [Swiss President Johann Schneider-Ammann](#) (right). In the robotics hall of the newly opened Arch_Tec_Lab, President Kiska was given a powerful overview of the innovative research being carried out at ETH.

Agenda

EVENTS

2 March 2017 / 8.30 a.m. – 5 p.m.

Resolving conflicts

At the ETH Alumni Association's Career Seminar, participants learn how to confidently and effectively handle conflicts with managers, employees and customers. Expert Thomas Nast analyses the nature of conflicts and shows how the right communication and the classification of conflicts help people to find an appropriate response. Event takes place in German.

📍 ETH Zurich

→ www.alumni.ethz.ch/events



22 Jan. 2017 / 2 – 4.30 p.m.

Fairy tales in ice and snow

In conjunction with the Swiss Fairy Tale Society, focusTerra invites you to an exciting and surprising search for ice-worlds in fairy tales. Matthias Möhr accompanies the fascinating tales of storyteller Erika Schönauer with enchanting glockenspiel music. Afterwards, there are various children's activities based around the phenomena of snow and ice. ETH Zentrum, NO building. Event takes place in Swiss German.

📍 ETH Zurich, NO building,

Sonneggstrasse 5

→ www.focusterra.ethz.ch/en



Plate 20 from *La Tauromaquia*, 1816, etching and aquatint

*Collection of Prints and Drawings***A BANKER'S TRUE GOLD**

Until 5 Feb. 2017 By the time he died, the banker Heinrich Schulthess-von Meiss (1813-1898) had managed to accumulate a collection that covers the history of graphic printing from 1450 to 1800 almost without gaps. His energy and passion for collecting have given ETH Zurich's Collection of Print and Drawings its most precious holdings and its reputation as one of the most impor-

tant graphic print collections in the world. In 1894, he gifted some 12,000 copper engravings, etchings and woodcuts to the University.

The first exhibition celebrating the Collection of Prints and Drawings' 150th year remembers this endowment: 80 precious graphic prints – including works by Albrecht Dürer, Rembrandt van Rijn and Francisco de Goya – are being taken out of storage and displayed to the public.

📍 ETH Main Building

→ www.qs.ethz.ch/english.html

*Cuisine***ETH RESTAURANT FOR EXTERNAL GUESTS**

Bellavista, the new restaurant on the Hönggerberg campus, offers beautiful views and haute cuisine. At midday, it serves various three-course menus along with other options. In addition to the classic dining area, there is also an

area with high bar tables and a lounge with sofas and lower tables. Bellavista is the first restaurant at ETH Zurich that is explicitly designed also for external guests. It is set to become a popular meeting point for ETH members and their guests.

📍 ETH Zurich, Hönggerberg Campus, Hönggerberggring 47

→ www.ethz.ch/bellavista

EXHIBITIONS

9 Dec. – 11 Jan. 2017

Master's projects in the spotlight

Fruits of their labour: Master's students from the Department of Architecture present their final projects to the public.

📍 ETH Main Building

→ www.arch.ethz.ch/en

Until 31 March 2017

Exhibition extended

The Max Frisch Archive is extending its current exhibition, *No literature discussed here*, which focuses on Max Frisch's activity as a practical architect, town planning theorist and surveyor. The famous writer studied architecture at ETH Zurich and then worked in the profession for 14 years.

📍 ETH Main Building

→ www.mfa.ethz.ch/en



CONCERTS

15/19 Dec. 2016 / 7.30 p.m.

Akademisches Orchester Zürich

Pyotr Ilyich Tchaikovsky (1840–1893):

Violin Concerto in D major, op.35

Dmitri Shostakovich (1906–1975):

Symphony No. 10

Conducted by Martin Lukas Meister

📍 Stadthaus Winterthur (15 Dec.)

Volkshaus Zürich (19 Dec.)

→ www.aoz.ethz.ch

17 Jan. 2017 / 7.30 p.m.

Concert during January lull

The "Harpsichord and Quill" concert evening features elegant harpsichord music, court dances and female epistolary correspondence in Versailles.

Harpsichord: Urte Lucht

Recitation and dancing: Stephan Mester

📍 ETH Main Building, Semper Aula

→ www.musicaldiscovery.ch



GUIDED TOURS

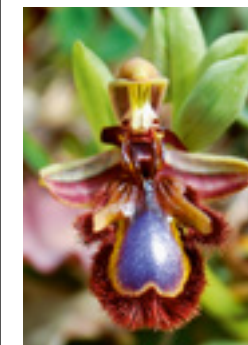
13 Dec. 2016 / 6.15 – 7.15 p.m.

Botanical treasures and their secrets

The evening walk gives plant lovers fascinating insights into the herbariums belonging to the university and ETH Zurich. Garden staff reveal the secrets of their botanical treasures. Event takes place in German.

📍 Botanical Gardens at the University of Zurich, meet in front of cafeteria Zollikerstrasse 107, 8008 Zurich

→ www.ethz.ch/eveningtours

*Book tip***MARCEL GROSSMANN: FOR THE LOVE OF MATHEMATICS**

"Grossmann, you must help me, or else I'll go crazy!" With these words, Albert Einstein solicited the help of his friend Marcel Grossmann. Without Grossmann's mathematical skill, Einstein would not have been able to prove and publish his draft of a theory of general relativity and of gravitation.

In her book, Claudia E. Graf-Grossmann, granddaughter of the ETH professor, paints a picture of Grossmann as a fiery, multi-talented scientist and patriot. She sets out to trace a family of entrepreneurs at a period of breakneck industrial expansion. Following the family's ups and downs, the reader is taken through the vibrant streets of Budapest and experiences the pioneering atmosphere at the young Zurich Polytechnic – and also the fraught decades of the Great War and the interwar years.

Römerhof Verlag

ISBN 978-3-905894-32-5

328 pages, CHF 38.00

available in German only

“We need more ETH people in politics”

Despite not ending up in research, ETH alumnus Alexander Jäger maintains close ties with ETH Zurich to this day, in his roles as politician, industry representative and neighbourhood association president.

TEXT Felix Würsten IMAGE Victoria Loesch & Christian Gerber

Alexander Jäger is one of those politicians whose political beliefs shine through in their personal life. He deliberately never learnt to drive, hasn’t flown in over 25 years and collects his compostable waste religiously. Even just a brief glance at his website leaves no doubt that the environment is an issue about which he is truly passionate. However, despite his tireless work in encouraging more sustainable use of resources and his conviction that our current lifestyle cannot be sustained long term, he is far from evangelical in his ideology. “It is my personal belief that our jet-setting ways aren’t a good idea,” he says. “But who knows, maybe I’m wrong. I certainly don’t think I hold a monopoly on the truth.”

Jäger has been interested in environmental issues since his youth. “I knew from a relatively early age that I wanted to study something in this area,” he recalls. His views were shaped by his secondary school chemistry teacher, who made him aware of some of the issues. At ETH Zurich, he chose environmental microbiology as his area of specialisation. “I wrote my diploma thesis at EAWAG in Dübendorf, looking at sugar breakdown by *E.coli*,” he remembers with a smile. He would have happily continued as a researcher, but unfortunately it didn’t work out. “Now I’m an advocate for environmental topics in the political arena.”

Student activist

Jäger got involved with politics as a student, when he became a member of the Young Liberals of Switzerland. “I wanted to do something for the environment and was convinced that this was possible within the liberal party,” he says in explaining his choice. His first big action came ahead of the Swiss federal vote in September 2000. At the time, the Young Liberals were – in contrast to their parent party – campaigning for the introduction of an energy tax. Jäger headed up the campaign in the canton of Zurich together with the other youth parties. “We even had the youth branch of the Swiss People’s Party (SVP) on board,” he recalls.

Although the measure didn’t pass, for Jäger it would act as a springboard for his political ambitions, and in 2002 he became a councillor for the city of Zurich. Just a few months into his new role, he launched an initiative that would finally be realised many years later. Jäger’s idea was for Zurich to collect compost separately so that it could be used to power a biogas facility. It would be eleven years before the initiative was finally implemented. It was a tough fight, as Jäger admits: “There aren’t many councillors who are successful in implementing this sort of initiative against the will of the rest of the council.”

“It is impressive what ETH has done on the Hönggerberg campus.”



ABOUT
Alexander Jäger

Jäger studied environmental sciences at ETH Zurich and undertook teacher training in chemistry. From 2002 to 2015, he was a Zurich city councillor for the Free Democratic Party (FDP), and joined the cantonal assembly in 2015. He is a passionate cyclist and sports fan, and two years ago he founded the fan club for the Voléro Zurich volleyball club. He is also interested in industry culture, German history and chess.

“If everyone sticks stubbornly to their position, we won’t make progress.”

Sometimes politics calls for a great deal of patience, a fact that Jäger takes in his stride. “You have to remember your role,” he says succinctly. As a parliamentarian – especially when you are in the minority – there is a limit to what you can achieve; as Jäger points out: “The easiest thing is still to block something.” Nevertheless, he is still angry when he recalls how the authorities back then attempted to block the biogas plant with an external assessment. “The parameters of the assessment were deliberately chosen to obtain a negative result,” he explains. “At moments like these, if you as a member of parliament wish to hold your ground, you need to have a firm grasp of the issue. Fortunately I did, thanks to my background in the natural sciences.” It is an experience that has strengthened Jäger’s conviction that politics needs more natural scientists and engineers and the expertise that they possess.

A benefit to the neighbourhood

Jäger, who is also a board member of Pro Velo Zürich and treasurer of the renewable energy association ZÜRICH ERNEUERBAR, represents views that are not necessary shared by all of his party colleagues. It is not something that bothers him overly much. For one thing, his party isn’t against environmental concerns per se, he notes. He also points out that many of the concerns that were bitterly debated in the 1990s are widely accepted today. “Some ideas just need a bit of time to take hold.” It is clear to him that there is still a need for the Swiss value of compromise. “The way we debate transport issues in the city of Zurich is simply unsustainable. If everyone sticks stubbornly to their position, we won’t make any progress.”

In 2015, Jäger left municipal politics for the cantonal assembly, with a very strong middle-class flavour. “When you are in the majority, you have to be all the more careful how you formulate your proposals. After all, they might be implemented in precisely that way,” he says with a grin. What he misses in his new role is that he now has less contact with local people. Nevertheless, as association president for Zurich’s Höngg neighbourhood, he is still able to meet directly with his constituents, which he values greatly. “It’s a fulfilling role, since we offer the people in the neighbourhood a great deal,” he says. In this capacity, he is of course following the devel-

opment of ETH on the Hönggerberg campus with great interest. “I find it impressive how ETH has established such a vibrant campus. It’s a real boost for our neighbourhood.”

An underappreciated profession

There is still one more level on which Jäger maintains close contact with ETH, and that is in his main occupation as deputy director of Swiss Engineering, a professional association that represents engineers and their concerns in the wider world. Jäger believes that engineers are generally underappreciated. “But in fact they are hugely important for the country, since ultimately it is the engineers who develop the ideas and products that keep our economy competitive.” As a representative for the industry, Jäger campaigns for an increased emphasis on science and technical subjects in schools. He is also a proponent of fair compensation for engineers and more attention on the political level. “Half of engineers earn less than 117,000 Swiss francs a year. A doctor or lawyer would never accept that sort of salary,” he says.

At the same time, it is also important to him that he does not lose touch with the hard reality of work in his life as an academic and politician. That is why he retains the part-time job that supported him in his studies. To this day, on a Sunday morning he can regularly be seen in Höngg delivering newspapers – by bike of course, as he takes care to emphasise. In this job, he has experienced for himself the sort of challenging circumstances that can come about in this line of work. After the postal service took over newspaper distribution from the big publishing houses, it decided, for cost reasons, to cut the salaries of delivery workers by some 20 percent at a single stroke. “There are people who earn their living with this work. For them, it was a devastating cut,” says Jäger. “As a cantonal representative, you don’t usually know what such a measure means in concrete terms.” ○

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5 QUESTIONS

Werner Wegscheider treasures academic freedom and feels that the current proliferation of publications is a good thing: *“Electronic publications make our work more efficient.”*



1 Who have been your most influential teachers?

I was lucky to receive an excellent scientific education in school, particularly from my physics and mathematics teachers. Later in the transition to university, what inspired me most was the great freedom and flexibility in the study programme at the time.

2 Why is internationality important for a university?

At good universities, teaching and research thrive on cross-pollination of ideas from people with different cultural and educational backgrounds. This is what drives a university's continuous development. Cutting off the international aspect would severely limit further development. It's also worth noting that excellence in research is the result of international competition. This spirit of competition must be present at all levels – from applying for research grants and recruiting doctoral students, postdocs, senior scientists and professors to publishing results at conferences and in international journals.

3 What's the best way of helping talented people to flourish?

Talented scientists can grow and develop particularly well if they are given academic freedom with sufficient funding, no set goals, and minimal bureaucracy.

4 Does the current system of publishing harm academic research?

In my opinion, the recent proliferation of publications in a variety of different media is actually extremely positive. All the various search options,

and the excellent electronic access that ETH Zurich researchers enjoy, have made laborious document requests from libraries a thing of the past. This makes scientific work more efficient. I also don't believe it leads to increased pressure on young scientists to publish as much as possible. It has now become standard practice for grant applications, evaluation boards and appointment committees to submit only a certain number of the best publications, or to consider the prestige of the journal.

5 Are there any areas in which your work hasn't been a success?

I'm an experimenter at heart, and I like nothing better than working in the lab. In my former role as a university professor in Germany, the size of my working group and the related administrative burden meant I almost completely lost contact with the lab environment. I hope that won't happen again, despite my various and interesting role as University Assembly President at ETH Zurich. — Recorded by Martina Märki

Werner Wegscheider, Professor of Solid State Physics, has also served as the University Assembly President at ETH Zurich since June 2016. The University Assembly is composed of the university members' elected representatives.
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