

GLOBE

TALENT? TALENT!

How ETH is
cultivating gifted minds

PAGE 14

Fat cells:
Size matters
PAGE 10

Tamed floods:
New laboratory
PAGE 38

Actelion: “Everything could
have gone horribly wrong”
PAGE 46

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CULTIVATING THE RIGHT TALENT

Switzerland's education system is a true "talent factory" that receives worldwide attention. Its dual-track nature allows most young people to explore their potential and accomplish great things in their area of expertise.

Swiss high schools produce well-educated and highly motivated students whom we welcome to ETH. We also attract highly talented master's students, doctoral candidates, postdocs and lecturers from all over the world. Regardless of where the talent comes from, our main job is to foster and nurture it. For a few years now, we have been working closely with our stakeholders to probe how we can do this even better. One of our findings is that we should be urging our students to look beyond the borders of their chosen discipline, form their own opinions and state these with confidence. This is in line with our general understanding of talent, and we are continuously developing new "Critical and Creative Thinking" offers to help students hone these skills.

In addition to these efforts, we offer a whole range of instruments to target and cultivate ETH talent – from undergraduate students to faculty members. We present these instruments in our special focus section starting on [page 14](#). There you can also read what outstanding individuals, both inside and outside ETH, have to say about talent cultivation.

Lino Guzzella
President of ETH Zurich



Lino Guzzella,
President of ETH Zurich

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NEW AND NOTED

7 News from ETH Zurich

8 Innovative giant

10 Fat isn't necessarily fat

FOCUS: TALENT

16 What is talent?

Ten perspectives on the talents we need, and the best ways to cultivate them.

21 Talent promotion

Globe takes a look at some of the top support schemes.

22 A rocket boost for students

How ETH supports its best master's students.

25 "Conceive it, see it through, send the bill"

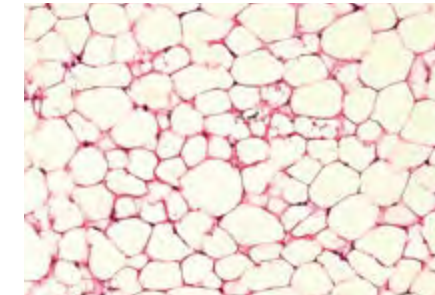
ETH juniors sees itself as a school for entrepreneurs and a talent factory.

26 "You have to be fired up"

Intelligence researcher Elsbeth Stern talks about the relationship between talent, intelligence and industriousness.

28 First steps to becoming an entrepreneur

As a Pioneer Fellow, Mattias Ivarsson is taking his first steps towards making his research vision a reality.



Large fat cells are unhealthier than small ones. – page 10



How can you protect a village from floods? – page 38



COMMUNITY

31 Connected to ETH Zurich

32 How private patrons support ETH

35 New routes to success

37 Column

REPORT

38 Taming the floods
ETH's hydraulics engineers are working with realistic models in a new laboratory.

CONNECTED

42 Encounters at ETH Zurich

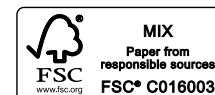
44 Agenda

PROFILE

46 "Everything could have gone horribly wrong"
Walter Fischli is a cofounder of Actelion. His motivation was not commercial success.

5 QUESTIONS

50 Ralph Spolenak
"My students help me develop my professional skills."



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NEW AND NOTED



The invasive plant most frequently for sale is passionfruit, or *Passiflora edulis*.

Invasive plants

ONLINE SALES ARE BLOOMING

To get an estimate of how much of the global trade in invasive plants is done online, ETH researchers used their own software to track over a period of 50 days which plant species were offered for sale – and how often. The scientists conclude that invasive species are very easily available, at the click of a mouse. The study also reveals that continuous monitoring of trading platforms makes it possible to detect species that are new to the market.

Health research

FIGHTING SENILITY WITH MIND AND BODY

In promoting mental health, combined mental and physical training is more effective than physical training alone, as ETH human movement scientists have shown. To conduct their study, the researchers recruited 89 healthy seniors of both sexes, aged between 70 and 94. The participants were divided into three groups. One group went through a video training programme to learn a dance with a particular series of steps. A second group was given exercises on a treadmill and memory training at the same time. The third group just did straightforward treadmill exercises. All three groups also received training to improve their balance and strength. The participants in the study were tested for cognitive abilities at the start of the training

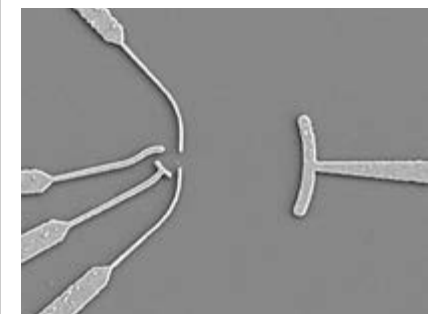
period, three months in, and at the end of the period.

These tests now show that combined training is particularly effective for what are known as executive functions. This term refers to those mental abilities that control thought and behaviour – and help us to cope successfully with everyday life. Executive functions are located in the front of the brain. As this is the region that shrinks most quickly with age it's very important to exercise it. What particularly surprised the researchers was the fact that participants' cognitive performance remained almost as strong even a year after the programme had ended. The researchers see potential to use this kind of combined training programme with people who already suffer from mild cognitive impairment or are showing early signs of dementia.

Quantum science

A RESONATOR FOR ELECTRONS

Physicists at ETH Zurich have managed to build a resonator that focuses electrons rather than light waves. Such resonators could be used to build quantum computers and to investigate many-body effects in solids.



*Digital fabrication***INNOVATIVE GIANT**

Inspired by the idea of 3D printing technology, researchers from the Gramazio Kohler Research group at ETH Zurich and the Self-Assembly Lab at MIT worked together to develop “Rock Print”, a full-scale architectural installation currently on show at North America’s first architecture biennial at the Chicago Cultural Center. The installation takes 3D printing and applies it on an architectural scale. It is made from just two materials – rocks and string – and was assembled using robotic fabrication technology. The researchers developed a special algorithm to guide the robotic arm through the process of laying down over nine kilometres of string in a complex pattern. The robot alternated the string with layers of a loose granular material to create a stable construction.



Rock Print is four metres tall and fully reversible.

Fat isn't necessarily fat

ETH professor Christian Wolfrum is seeking out new substances with which to combat diabetes. One particular bile acid already looks promising – but he isn't satisfied, so the search goes on.

“We're looking for ways to encourage fat cells to form,” says Christian Wolfrum, ETH professor of translational nutrition biology, “because that's good for your health.” The idea that additional fat cells could improve your health might seem counterintuitive, but it's been known for over 100 years that having more fat cells doesn't automatically mean you weigh more. “The more fat cells we have, the smaller each cell is, since the fat present in our bodies is spread across many cells,” Wolfrum explains. And that's healthier than having fewer, bigger cells (see infographic). “It's an aspect

that's always underestimated,” he adds, “since in fact it's cell size that plays the biggest role in the development of diabetes.”

Once fat cells expand beyond a certain volume, they are no longer able to absorb fatty acids, but instead release them into the bloodstream. If the level of fatty acids in the blood is permanently high, fat is deposited in the liver and muscles. Worse, insulin – whose job it is to regulate the release of fatty acids into the blood – becomes ineffective. The result is insulin resistance and, ultimately, the metabolic disease known as type 2 diabetes.

However, in slim people – but also in overweight people with small fat cells – the risk of type 2 diabetes is low. This could be the case because these people's fat cells are able to store the fatty acids, releasing them in a controlled way and only when necessary. During fasting, for instance, fatty acids are released, which are absorbed by the liver and then converted into energy. That's why certain diabetes medications are designed to regulate the formation of new fat cells. This leaves patients no less overweight than they already were, but healthier. However, these medications can have major

long-term side effects, which is why scientists around the world are looking for new substances for type 2 diabetes treatment.

New factors identified

Wolfrum and his team are looking for factors that stimulate the formation of fat cells. Until now it was always assumed that fat cells secrete substances that prevent precursor cells from turning into fat cells. “It makes physiological sense: if you already have lots of fat, you don't want even more,” Wolfrum explains. But it's actually more complicated than that, as a new study by his team demonstrates. A detailed analysis has shown that such suppressive secretions do exist, and that their effect dominates overall. But the ETH researchers also found substances that stimulate the formation of new fat cells – which is precisely what Wolfrum is looking for.

“We still have no idea what effect these factors have on metabolism, because many of them are completely unknown,” Wolfrum says. However, some of the data in human fat cells show a clear correlation with insulin sensitivity. “We now need to follow that up and work out these factors' physiological role,” he adds. In the process, he always bears his main question in mind: Which factors control the formation of new fat cells, and how can it be modulated in the fight against diabetes?

One such modulator is the bile acid THBA. Its lock-and-key bond with the ROR receptor serves to inhibit the

receptor's activity, which promotes the formation of new fat cells. This mechanism has been understood for some time; what Wolfrum and his team have succeeded in doing is to identify the bile acid THBA as a modulator. “There was a bit of luck involved, too,” Wolfrum admits. He goes on: “We were coming from fundamental research, but it was definitely worthwhile researching further.” There's no doubt about that: the discovery that the bile acid THBA can modulate fat cell formation is what led to the formation of the spin-off Glycemicon – which after just three years managed to take ninth place in Switzerland's TOP 100 Startup Awards 2015. With the first set of preclinical tests now concluded, clinical trials are set to go ahead next year.

Every improvement is worth it

This kind of success is something to be celebrated, but Wolfrum takes a more sober line: “Diabetes can't be cured, but perhaps we can use the bile acid THBA to delay the progress of the disease.” If it means patients can wait ten years before moving on to stronger medication with more side effects, then that's already a major benefit. “With diabetes, every improvement is fantastic,” Wolfrum stresses. When it comes to this metabolic disease, it's worth thinking for the long term.

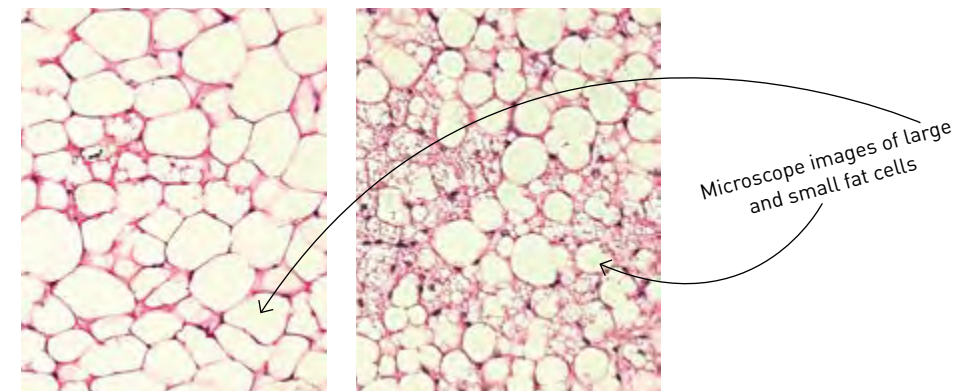
Currently the spin-off is also analysing which foods naturally contain the bile acid. Initial results suggest that it is most prevalent in meat products such as liver or kidney. But Wolfrum is

unwilling to give advice on what people should eat. “You basically can't go wrong if you eat a wide variety of foods,” he says, “not least because of the millions of substances in food that have yet to be identified but are surely important.” Wolfrum does have a clear idea of the best way to combat diabetes, however, and there are scientific studies to back him up: weight loss is much more effective than any medication. “Move more and eat less – it's the first rule of thermodynamics,” is Wolfrum's succinct take on the theory. If only it were that easy in practice.

– Corinne Johannssen-Hodel

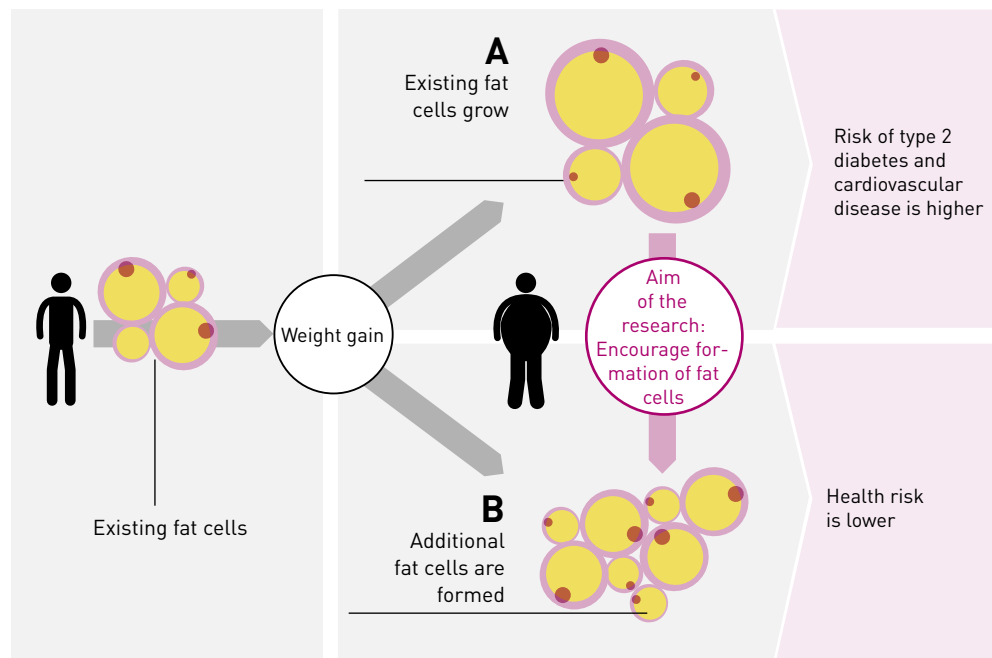
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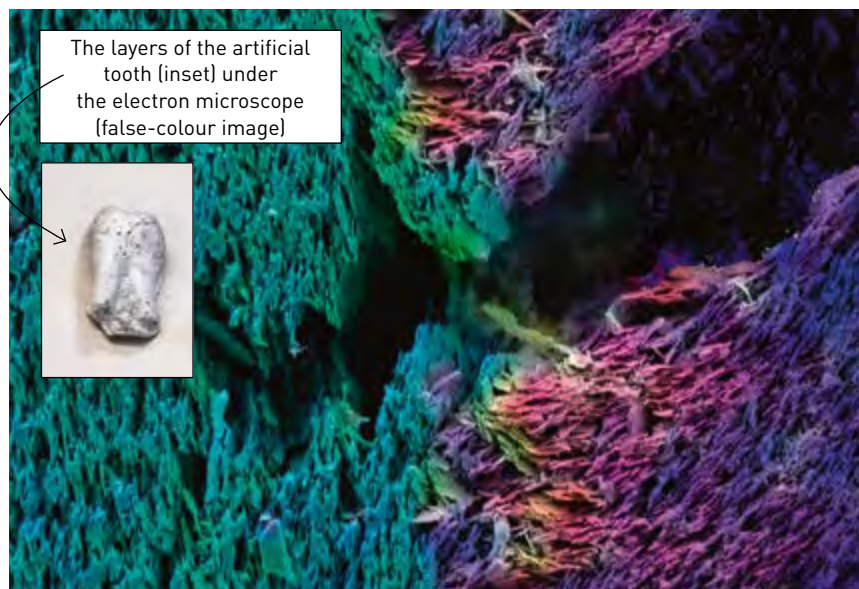
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WEIGHT GAIN

There are two scenarios for weight gain: either the additional fat is absorbed by existing fat cells, which causes them to grow in size (A), or it is distributed among newly formed fat cells (B). Some 20 percent of overweight people are healthy and have smaller fat cells. Their risk of developing diabetes or cardiovascular disease is very low compared to most overweight people, who have enlarged fat cells. That's why ETH professor Christian Wolfrum and his team are looking for ways to encourage the formation of fat cells.





Complex materials

NATURAL MODEL FOR DENTAL PROSTHESES

Materials researchers at ETH Zurich have developed a procedure that allows them to mimic the complex structure of biological composite materials such as teeth. The secret of these materials lies in their special fine structure: they are composed of different layers within each of which countless micro-platelets are joined together in identical orientation. The ETH scientists have now succeeded, for the first time, in preserving multiple layers of micro-platelets with differing orientation in one piece.

First, the scientists made a plaster cast of a wisdom tooth. They filled this mould with a suspension containing aluminium oxide platelets as well as glass nanoparticles as mortar. Using a magnet, they aligned the platelets perpendicular to the surface of their

object. Once the first layer was dry, the scientists poured a second suspension into the same mould. This suspension, however, did not contain any glass particles. The aluminium oxide platelets in the second layer were aligned horizontally to the surface of the tooth using the magnet. This double-layered structure was then fired at 1,600 degrees to compress and harden the material. Finally, the researchers filled the pores with a plastic monomer used in dentistry, which subsequently polymerised.

The ETH researchers are very happy with the result. The surface of the artificial tooth is as hard and structurally complex as a real tooth, while the layer beneath is softer – just like the dentine of the natural model.

Metabolites

EFFICIENT ANALYSIS IN REAL TIME

Biologists at ETH Zurich have developed a method that allows them for the first time to measure changes in the concentration of several hundred metabolites, simultaneously and in near real-time. To do this, they took cells from two species of bacteria, one species of yeast, and mice – and grew these in a culture medium right next to the measuring equipment. A pump system removed a sample for analysis every ten seconds. As well as proving the principle that it is possible to make such online measurements, the scientists were also able to use their technique to demonstrate how *E. coli* bacteria behaved when their culture medium was deprived of sugar for two hours: the bacteria stopped producing most metabolites and broke down those already present to obtain energy from them. When sugar was added, the cells began producing metabolites again within a minute so as to grow and divide.

Out of almost 300 metabolites examined, however, the concentration of ten of them rose during the starvation phase – and fell again in the optimum feeding phase. The researchers assume these are key metabolites that control the way the whole metabolism switches rapidly between the two phases.

Synthetic biology

DETECTING CANCER WITH BACTERIA

Students at ETH Zurich took home several prizes from the iGEM Competition in Boston, an event for young scientists organised by the International Genetically Engineered Machine Foundation. The students' project aimed to improve cancer diagnosis by using genetically modified bacteria to detect cancer cells circulating in blood samples.



The successful ETH team

Future Cities Laboratory

LESS ENERGY, MORE SPACE

Due to Singapore's tropical climate, buildings constructed there using conventional methods devote up to 70 percent of their energy to air conditioning. Now, researchers at ETH Zurich's Future Cities Laboratory in Singapore have built a prototype for an energy-efficient office building. Thanks to a cunning bit of technology that also saves space, the researchers were able to fit three storeys into a building that previously would have housed just two. The 3-for-2 office building will open in December.

Gene transfer

GREATER AMOUNTS OF VITAMIN B6

In many tropical countries, especially those in sub-Saharan Africa, cassava is one of the most important staple foods. This tuberous root has one disadvantage however: its high starch content fills bellies but is poor in vitamins. Vitamin B6 in particular is present in only small quantities. For this reason, people living in regions where cassava comprises a main part of their diet frequently suffer from a vitamin B6 deficiency, which can lead to cardiovascular disease, diabetes or neurological disease.

Plant scientists at ETH Zurich and the University of Geneva have looked for a way to prevent this deficiency by boosting production of vitamin B6 in the roots and leaves of the cassava plant. And they have succeeded; devel-

oping a new, genetically modified type of cassava that contains many times more the amount of this key vitamin. What's more, further experiments have shown that the increased production of vitamin B6 remains stable even in subsequent generations created by vegetative reproduction.

The researchers have not patented their new methods, believing that the gene construct and the technology should be readily available to all interested parties free of charge. At any rate, many countries have no laws regulating the cultivation of genetically modified cassava and other crops.



The 3-for-2 building in Singapore: office space and test lab in one

TALENT? TALENT!

ETH attracts talent from around the world, students and researchers alike. And when talent flourishes here, Switzerland stands to gain as well. But what talents are the best fit for ETH? And what is the best way to cultivate them so that they benefit Switzerland and the world?
A look at the breeding ground for talent.

**WE SHOULD LET
TALENTED
PEOPLE GET ON
AND NOT TEST
THEM ALL THE
TIME.**

MICHAEL HAMPE
→ P. 16

**GOOD MARKS ALONE ARE
NOT ENOUGH.
STUDENTS SHOULD ALSO
BE CREATIVE
AND LEAP AT THE CHANCE
TO TAKE RISKS.**

JOACHIM BUHMANN
→ P. 22

**IT'S JUST LIKE
HIGH-LEVEL SPORT,
ONLY YOU COMPETE
WITH YOUR MIND.**

LUCAS MOSER
→ P. 25

**TALENT NEEDS
INTELLECTUAL
CHALLENGES, WHICH
A GOOD SCHOOL IS ABLE
TO PROVIDE.**

ELSBETH STERN
→ P. 26

**IT'S INSPIRING TO SEE PEOPLE
FROM COMPLETELY DIFFERENT FIELDS
COME TOGETHER.**

MATTIAS IVARSSON
→ P. 28

WHAT IS TALENT?

What talents do we need and what's the best way to cultivate them? *Globe* asked individuals both inside and outside ETH to share their thoughts on the matter.

EDITOR: Martina Märki ILLUSTRATIONS: Pascal Staub



GETTING INVOLVED IN A PROFESSIONAL, STUDENT OR TEACHING ASSOCIATION ALONGSIDE STUDYING HELPS FOSTER DIFFERENT TALENTS.

CHRISTIAN VAHLENSIECK

Student and head of communication for the Association of Students at ETH (VSETH)

Specialist skills are the only ones that count – that's what you'll often hear from ETH students. And it's true: those are the skills you need at university, and up to now it's been mostly this academic talent that has been nurtured. But in the real world, you need skills beyond your specialty. When working on a doctorate, in industry or in the financial world, success often comes down to how you get your message across, challenge critical facts and develop new ideas. I'm very happy to report that ETH has recognised this discrepancy and is trying to cultivate these extra talents and skills as part of its Critical Thinking Initiative. This is an important step towards getting students to think for themselves. But we students can also take action, for example by getting involved in a study association, student or teaching association alongside our studies. This can be another key to gathering a wide range of skills and experience that will help us in our careers after university.

FRANZ EBERLE

Professor of secondary education at the University of Zurich, director of teacher training for grammar schools

Passing a Swiss university entrance exam requires achieving passing grades in a minimum of 13 subjects – more than almost anywhere else. Does it make sense to insist that those who excel in one particular area also take many other subjects as well? Absolutely. Even scientific geniuses and tomorrow's cutting-edge researchers have to be articulate. They should be able to deal with aspects of life beyond their chosen milieu – normative/evaluative questions that affect society, politics and the economy, as well as fundamental existential questions. They

BROAD-BASED EDUCATION AT SWISS SECONDARY SCHOOLS, WITH MANY COMPULSORY SUBJECTS, IS HELPING TO DEVELOP LASTING TALENT.



have to learn to use their talents responsibly and with foresight. Taking a wide variety of subjects also helps keep university entrance largely free of extra exams and limits on enrolment. We already have the tools to develop specialised talent, such as primary and secondary subjects plus matriculation projects. Many secondary schools are making exemplary use of this room to manoeuvre.



FROM A BUSINESS PERSPECTIVE, THE VALUE OF ANY TECHNICAL INNOVATION CORRESPONDS TO HOW WELL A TEAM CAN REALIZE IT AND BRING IT TO MARKET.

JODOK REINHARDT

Environmental sciences graduate (ETH) and CEO of Metrohm

Fortunately, people have all kinds of talents – from singing, painting, dancing, listening, moderating, organising and juggling, to solving equations, doing experiments, finding rational solutions and mastering manual, technical, creative or knowledge-based tasks. And that's just the tip of the iceberg! As a manager, I focus on another aspect of talent: how can we work together to achieve goals that one person alone could not? Anyone who can answer that question knows how to create jobs and is invaluable to their company and to society. In this respect, someone with talent is someone who understands how groups of people work and can have a positive effect on them. That person would most likely have the essential character traits of self-esteem, a willingness to reflect, a sense of personal responsibility, empathy, motivation, initiative, integrity and the capacity to change. We can call these traits "talents" as well. So what do we have to do in order to nurture them? It's probably difficult to develop them fully once we are grown up. So we need the courage – and when it comes to education, the opportunity – to listen to our subconscious, to accept help and to keep learning about ourselves.

RENATE SCHUBERT

Professor for Economics and Delegate for Equal Opportunities at ETH Zurich

If you mention university talent, many people immediately think of geniuses: people of outstanding (mental) ability whose immense intelligence is accompanied by an appealing mix of creativity, imagination and intuition. However, geniuses are not exactly renowned for their ability to work as part of a team. The belief persists that to succeed in the areas of physics or mathematics, or even architecture or philosophy, you have to be a genius. This cult of genius, and the stereotypes that perpetuate it, are what is keeping some talented people, women in particular, away from ETH. But it's certainly not the case that all researchers and students at ETH Zurich have to, or should be geniuses. Of course they have to have talent, and ETH must create the right conditions for people to systematically and appropriately develop their talents. ETH and society at large both benefit most when many diverse talents come together and help each other to achieve their full potential. It's time to get serious about cultivating talent, promoting talent diversity and taking great care when dealing with (gender-specific) stereotypes!

WE DON'T NEED JUST GENIUSES. WE NEED PEOPLE WITH A WIDE RANGE OF TALENTS. PROMOTING DIVERSITY IN THIS RESPECT IS ESSENTIAL.





TALENTED PEOPLE NEED TO BE AROUND OTHER TALENTED PEOPLE. OUR JOB IS TO LET THEM GET ON AND NOT TEST THEM ALL THE TIME.

MICHAEL HAMPE

Professor of philosophy, head of the Department of Humanities, Social and Political Sciences at ETH Zurich

What talents are ETH and society at large looking for? In my opinion, there's a simple answer – many different ones. Architects need to be artistic and imaginative, mathematicians and theoretical physicists need to have an aptitude for logic and numbers, scientists need to be creative experimenters, and engineers need to be innovative problem solvers. This is why those in charge of ETH admissions should be aware of the diversity of talents and make every effort to appreciate the skills required in disciplines other than their own.

I assume that anyone who teaches in one of ETH's core areas can look at, say, plans for a new building, an attempt to prove a theorem, or a technical idea, and recognise if someone has talent in their particular field – just as I can tell from reading one essay on knowledge or happiness if the author has the potential to become a talented philosopher. This has precious little to do with testing, which is why our job is to let them get on and not test them all the time. Talented people need to be around other talented people who understand what they're about and have similar interests. They naturally seek out like-minded individuals.

MARKUS SPÄTH-WALTER

Head of HSGYM, Member of Cantonal Council

Anyone who holds a Maturität – a leaving certificate from a Swiss high school – has been through a highly selective education. And all these talented people have a right to expect a place at a university; after all, the certificate is documentary proof of their general aptitude for study. Whether these people have the particular gift they need to make a success of studying physics, say, or sinology, or mathematics, is another question entirely. It's a decision that the Swiss education system leaves to universities. Just as high schools have the right to select which pupils will take the path to a Maturität, so universities can decide during the first few semesters whether their freshers have what it takes. This presents both high schools and universities with a momentous challenge. They must conduct their selection process with a due sense of responsibility, taking care to consider not just the candidates' prior education but also what can fairly be expected given current education policy and social climate. Selection must be fair and transparent: candidates may be judged only on what they were taught. And we have a duty to promote talent. It's essential to make sure that talented young people aren't demotivated or put off by content that has been selected primarily on the basis of whether it is suitable for examinations. This is an area in which both high schools and universities have yet to find an optimum solution.

BY INSISTING ON TOO NARROW A SET OF SELECTION CRITERIA, WE ARE LETTING TALENTED PEOPLE SLIP THROUGH OUR FINGERS. THIS IS SOMETHING WE CANNOT AFFORD TO DO LONG-TERM.



MY ERC GRANT DOESN'T HELP JUST ME; IT MEANS I CAN EMPLOY AND FOSTER OTHER YOUNG TALENT.

TANJA STADLER

Assistant professor in the Department of Biosystems and Engineering and recipient of an ERC Starting Grant

In 2013 I was awarded an ERC Starting Grant. These grants are awarded by the European Research Council (ERC) to 5-year research projects being run by promising scientific talent. My grant allows me to pursue my research goals in epidemiology on a larger scale over several years. I'm certain that receiving this prestigious honour helped me to get a tenure-track position as assistant professor. Today I run a group of ten people in the Department of Biosystems and Engineering at ETH in Basel. We are funded by the ERC grant, ETH, ETH postdoc fellowships and a SystemsX grant. So the ERC grant doesn't help just me; it means I can employ and foster other young talent.

The funding mix I mentioned helps to recruit excellent postdocs. Thanks to the funding I receive from ETH, I can guarantee positions for some superb postdocs, which also gives them some security in planning for their near future. These highly talented individuals tend to soon finance themselves with fellowships, allowing me to consider yet another application from an excellent postdoc. When selecting doctoral students I benefit from the excellent Master programmes at ETH.

MARTIN VETTERLI

President of the National Research Council of the Swiss National Science Foundation

In the ancient world, "talent" referred to a unit of currency. We've since moved on from quantities to qualities, using talent to describe human ability. However, a quantitative definition and yardstick is impossible, and even a qualitative assessment of intelligence, creativity or dexterity tells only half the story of what talent is. For me, the Australian mathematician Terry Tao is a current and unique example of a talented scientist in that sense. Applying original approaches and a healthy dose of creativity, Tao is the author

FROM EINSTEIN TO FEYNMAN, GROTHENDIECK TO TAO, THE GREATEST RESEARCHERS OF OUR TIME HAVE ALL BEEN MAVERICKS.



of countless mathematical solutions and proofs. For example, in 2006, aged just 31, he was awarded the Fields Medal, which is known as the Nobel Prize for mathematics and is given only every four years. But Tao is more than a "mere" child prodigy – he's also an excellent team player who often solves problems by using unconventional and unexpected approaches such as online collaboration. So when allocating research funding, as we do at the Swiss National Science Foundation, it's important not to create a template or model that talented people have to fit themselves into. The first duty of education and research funding is to create the freedom that raw talent needs to grow and flourish. We may not be able to measure or control talent, but we can nurture it. Most importantly, we know it when we see it – and not before.

TALENT PROMOTION MACHINE

ETH Zurich recognises and nurtures talented people: from students to professors, from basic researchers to founders of spin-offs.



BRANCO WEISS FELLOWS ARE JUST ONE WAY ETH CAN EXPLORE NEW TOPICS AND ATTRACT INTERESTING AND TALENTED RESEARCHERS.

HEIDI WUNDERLI-ALLENSPACH

Former rector of ETH Zurich, co-director of “Society in Science: The Branco Weiss Fellowship”

Even defining the term “talent” is hard enough. There are a great many synonyms and qualities that can be used to express the various facets of what the word talent might mean – ability, aptitude, calling, gift, intelligence, potential, to name but a few. So how does one go about trying to find something that is so loosely defined? No matter how you define it, it’s the conditions we create to develop talent that count, and that means providing support and funding.

The entrepreneur and patron Branco Weiss devoted much of his life to the questions of how best to nurture talent and help find talented scientists. These endeavours led to his generous endowment in 2010 to ETH for the Branco Weiss Fellowships that support young postdoc researchers around the world, allowing them to independently pursue a unique project at the institution of their choice for a period of five years. The idea is for fellows to break free of the constraints of their own discipline and enter a dialogue that draws on social, cultural, political and economic ideas. The success of fellows to date shows that this kind of support is a means of tapping real potential.

GERD FOLKERS

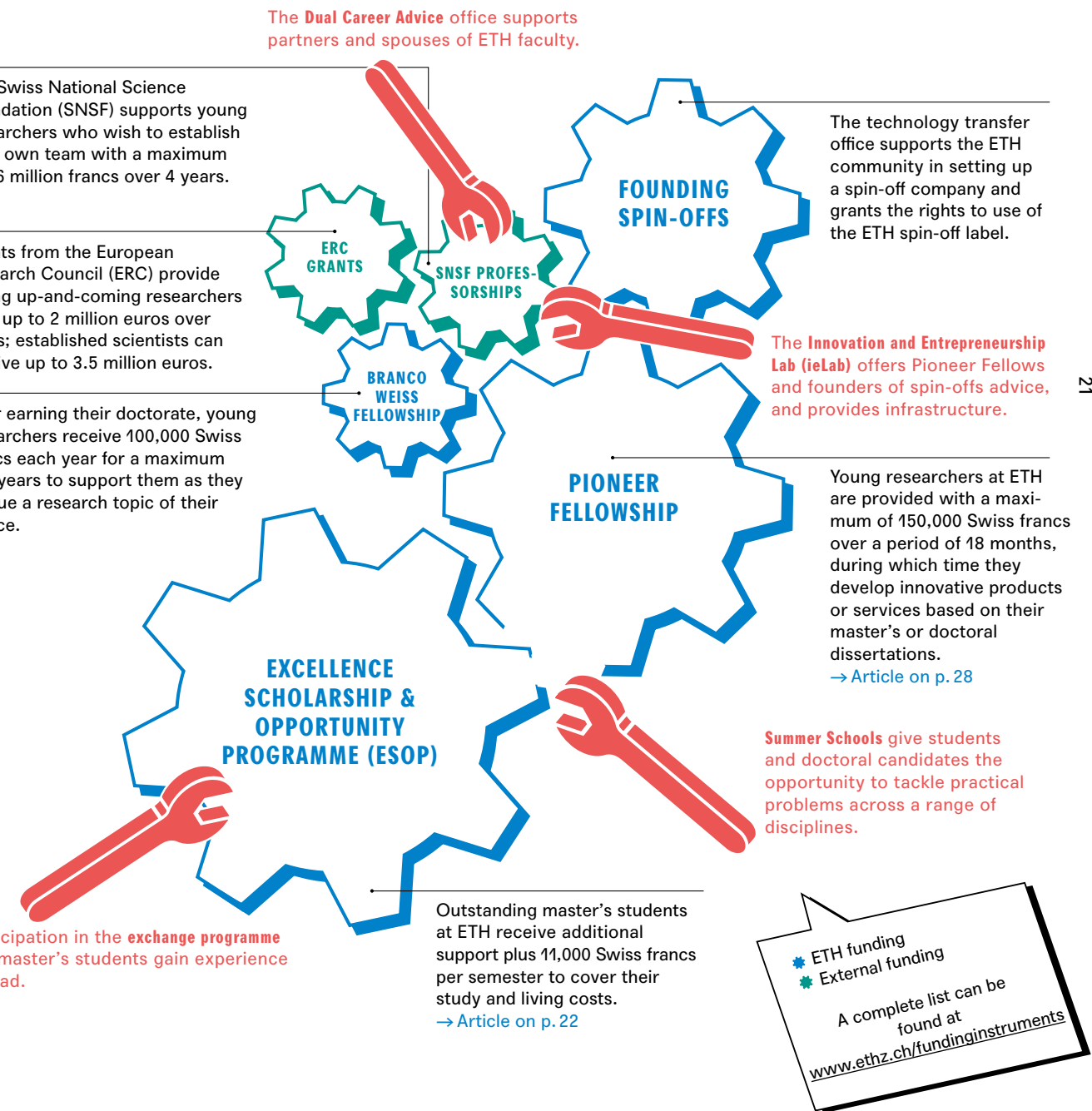
Professor of Pharmaceutical Chemistry at ETH Zurich and Chair of Collegium Helveticum

ETH has an ideal: to offer young people a creative environment in which they can develop the scientific persona that makes the most of their talents. It’s getting harder and harder to achieve this ideal, since scientists are compelled to produce results fast, but with less money available. This in turn exacerbates the problem of selecting who gets to study, and in our attempts to solve it we cling to parameterised methods of assessment – ratings and rankings, number of papers – anything tangible that we can measure. This is

IN MY OPINION, THE ESSENCE OF A TRULY GREAT UNIVERSITY IS THAT IT DOES NOT COMPROMISE TO FIT IN WITH THE MAINSTREAM.



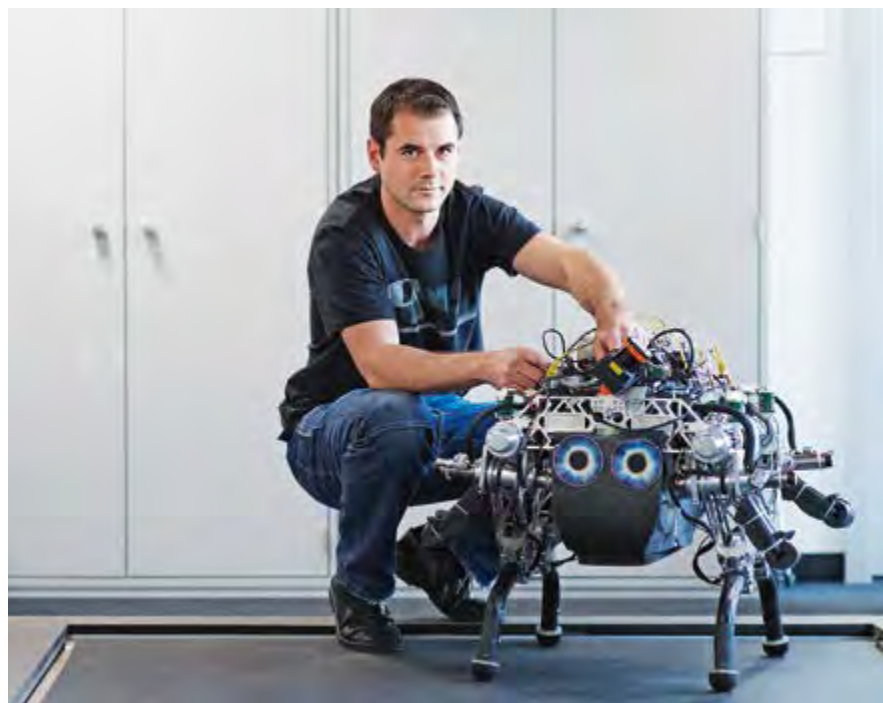
not the best way to nurture talent. Talented scientists must be allowed to spend four years working without having to publish, so that they can push past the low-hanging fruit and get to the top of the tree – even if it means falling off the ladder. Admittedly, it’s not easy to create the right conditions to help talented individuals in this balancing act. But “publish or perish” definitely strikes me as the wrong model. The essence of a truly great university is that it does not compromise to fit in with the mainstream, but rather strives to set new benchmarks. However, it will take more than a solo effort to achieve this paradigm shift. We have the power and the wits we need to talk to other universities about alternative models, for instance one that would put the emphasis on collaboration instead of competition. There are many encouraging examples to be found in the likes of summer schools or ETH’s Critical Thinking Initiative. ○



A ROCKET BOOST FOR MASTER'S DEGREE STUDENTS

The Excellence Scholarship and Opportunity Programme offers support to the best incoming master's degree students. *Globe* meets three talented individuals at various stages of their journeys and gives an insight into what the programme means for them.

TEXT Martina Märki



En route to success: Marco Hutter and walking robot Star1ETH

The aim of the Excellence Scholarship and Opportunity Programme (ESOP) is to attract the finest master's degree students from both within Switzerland and abroad. "ESOP recognises academic excellence and aims either to attract new students to ETH or to encourage existing ones to stay on for their master's degree," explains Joachim

Buhmann, vice-rector for study programmes and professor of computer science at ETH Zurich. Recipients of the scholarship are expected to have excelled in their bachelor's degree; and, more than that, they need to submit an exciting research proposal. As Buhmann explains: "Good grades on their own aren't enough. Students

need to be bold and creative in choosing the topic for their master's degree." That's the combination you need if you want to go on to achieve true academic excellence, says the vice-rector.

The scholarship enables talented individuals with clear potential to complete their master's degree free of significant financial stress, and covers

study and living costs for the duration of the master's programme. ETH also exempts scholarship holders from paying tuition fees. Last but not least, award holders benefit from a special support structure, thanks in large part to the ETH Zurich Foundation, which made it possible to offer such an extensive scholarship scheme in the first place. The scholarships are financed almost entirely from donations to the ETH Zurich Foundation. On top of

tacts, important people and potential research sponsors I was able to meet through the ETH Zurich Foundation," says Hutter. His research group can only benefit from the contacts. The former ESOP scholarship holder has recently been made assistant professor at ETH Zurich's Institute of Robotics and Intelligent Systems and heads up a research group of 12 people. The group develops autonomous mobile robots designed to autonomously navigate difficult terrain, for instance in search and rescue



Marco Hutter, ESOP scholarship holder in 2007, studied mechanical engineering at ETH Zurich. He is now assistant professor at the Institute of Robotics and Intelligent Systems and takes an interest in challenging research on topics of practical relevance. He says: "The ESOP scholarship brought me some important contacts."

this area of research. Without a good team and good teamwork it just doesn't work."

Fieldwork in Ecuador

Gabriela Ponce's research is about to begin. She's packed her cases and is all set to spend the coming weeks in Ecuador collecting water and sediment samples for her master's thesis. The ESOP scholarship holder was born and grew up in Ecuador. After leaving school, she first headed to Hamburg for an exchange year. Even at school, Gabriela had taken a keen interest in environmental policy and social

Gabriela Ponce, born and raised in Ecuador, won her ESOP scholarship in 2014. She is now in the middle of her master's thesis looking at the environmental impact of mining in Ecuador. She says: "I can use my work at this great university to do something worthwhile for my home country."



operations or for the inspection of industrial facilities. It is important to Hutter that his research has an application-oriented

aspect. His dream is that soon mobile robots will be used in various different areas. He has worked unstintingly towards this goal: "During my master's programme, I developed a single leg, while my aim for my doctorate was to build an autonomous four-legged robot. Now we're working on the third generation of these robotic dogs," says Hutter as he describes his journey. It's a succinct appraisal, but shouldn't conceal the sophistication of the extremely varied technologies Hutter and his research colleagues have developed in the process, which are also used in various related fields.



Samuel Nobs is a doctoral student in immunology and has a passion for basic research. A native of Switzerland, Nobs spent part of his youth in New Zealand and returned to Switzerland in 2010 to take up an ESOP scholarship. "ESOP has strengthened my resolve to pursue an academic career," says Nobs.

this, the ETH Zurich Foundation regularly organises company visits for scholarship holders and invites them to events where they can meet sponsors and other scholarship holders.

From scholarship holder to professor

Marco Hutter was one of the very first students to receive an ESOP scholarship. "When I applied for the ESOP scholarship in 2007, I viewed it first and foremost as some extra financing to get me through my master's course," he says. Prior to that, the ETH mechanical engineering student from St Gallen's Rhine Valley had financed his studies with jobs on the side. "Now, looking back, I value the company con-

Hutter also modestly omits to mention that after his doctorate he was awarded a Branco Weiss Fellowship grant for postdoc research of particular relevance to society. Modesty is clearly something he believes in, and he swears by teamwork: "You can't go it alone in

issues, and so her next step was to enrol at Jacobs University in Bremen for an undergraduate degree in environmental science and geochemistry. After that, she moved to ETH Zurich to pursue her master's degree. She applied for an ESOP scholarship and was able to begin her master's programme in environmental science in the autumn of 2014. "I owe it to the scholarship that I'm able to attend this great university," Ponce says. Her master's thesis looks at the environmental issues surrounding mining in Ecuador. "Mining is a hot topic in Latin America," she explains. In the area she will be visiting for her fieldwork, there used to be medium-sized gold and silver mines. The remnants are now mined by small groups using large amounts of mercury, which is damaging to the environ-

ESOP WANTS TO ATTRACT THE BEST STUDENTS TO ETH ZURICH.

ment. And there are new plans for copper mining on a grand scale. "I want to demonstrate the environmental impact of these mining activities and examine whether environmental guidelines are being properly applied and implemented in the new mining projects," Ponce explains. The young researcher hopes she will be able to use her knowledge to protect the environment in her country. She also believes in getting involved outside of her studies, and is currently taking part in an initiative that promotes education for children around the world.

In love with the lab

When Samuel Nobs arrived at ETH Zurich in 2010 to take up his ESOP scholarship and embark on his mas-

ter's degree, it was a long-anticipated return to his native Switzerland. The young Swiss completed part of his secondary education as well as his bachelor's degree in New Zealand, where his family lived for a while on account of his father's work. "It was a great opportunity to get an education in an English-speaking country," Nobs says, "but I always knew that I would return to Switzerland at some point to continue my studies at the best possible university." Accordingly, he coordinated his studies in New Zealand with ETH to ensure that they came as close as possible to the ETH bachelor's programme. "That made applying for the ESOP scholarship a whole lot easier, especially when coupled with the early research experience I gained in New Zealand through work placements in laboratories," he says.

For his master's degree at ETH, Nobs was able to join Manfred Kopf and his research group at the Institute of Molecular Health Sciences. This is a perfect match for Nobs, as it allows him to focus exclusively on investigating the immune system – something that has always fascinated him, with its constant battle between the body's defence forces and the threat of pathogens such as viruses and bacteria. In fact, he was still at school when he decided this is what he wanted to do. At the time, a school experiment gave him the opportunity to spend a few days in a laboratory at the University of Bern. "I remember feeling that this is what I wanted to do one day."

Fast forward to today, and Nobs is working on his doctoral thesis. His research focuses on understanding the immune system of the lungs, in particular on elucidating factors governing the development and function of dendritic cells, which are specialized sentinel cells responsible for the activation of the adaptive immune system.

Recently he and co-workers identified a gene that regulates the development of these cells specifically in the lung. "It's basic research, of course, but one day it might allow us to support the immune system in a more targeted way than is possible with current medicines," says the young researcher. He is clear about his future path: more basic research and a career in academia. Certainly, he says, the ESOP scholarship was an early encouragement on that path. ○

Information on ESOP:

→ www.ethz.ch/esop_en

ESOP in numbers

The scholarship was founded in 2007 with 12 scholarship holders, and in 2015 50 master's degree students received a scholarship. Of the 283 ESOP scholarship holders to date from 42 different countries, 86 have been from Switzerland. Around 42 percent of ESOP students are women. A good half of ESOP scholarship holders go on to complete their doctorate at ETH Zurich. Since 2012, new scholarships have been funded exclusively through donations to the ETH Zurich Foundation, with approximately 2,000 alumni making a contribution:

→ www.ethz-foundation.ch

"CONCEIVE IT, SEE IT THROUGH, SEND THE BILL"

ETH juniors sees itself as a school for entrepreneurs and a talent factory. But how do ETH students learn the skills for managing a business?

TEXT Florian Meyer

Talent is a promise that can be fulfilled. Few people know this as well as entrepreneurs who open a business with no guarantee that they will succeed. Only through practice and customer contact can one really learn this craft. That's what Matthias Strodtkötter, president of ETH juniors, and Lucas Moser, head of customer contact for ETH juniors, say. The group was founded by students at ETH Zurich in 1997. "Only once you've thought through a project with a customer, carried it out, presented the bill and received payment can you really understand what it means to be an entrepreneur," says Moser, a civil engineering student. "Every junior is also an ETH student and we run the group professionally, in the same way we would run a company," says Strodtkötter, who is studying physics. These days, the juniors are well networked within ETH Zurich and with businesses, landing some 60 new project orders from industry each year. They help place ETH students in more than 100 jobs per year – which translates to around 12,000 working hours.

The hierarchy is flat – everyone in the group is equal, although the presidency carries the ultimate responsibility. Strodtkötter brings California, the founder Mecca, into the game: "In Silicon Valley, start-ups don't adhere to standard processes, they don't have fully equipped offices, and there are no



ETH junior Matthias Strodtkötter is ready to hit the ground running.

firm hierarchies – they're all about highly motivated people who want to launch a crazy idea." That's Strodtkötter's dream as well, and anyone visiting the ETH juniors headquarters will be slightly reminded of that garage in which, according to legend, a very famous American company founder started his career. Indeed, among the two women and nine men, it's a hive of activity. "What makes ETH juniors a talent factory is that everyone here is highly motivated and that everyone brings their own ideas," says Moser. For him, ETH juniors is a place to learn discipline and self-management.

"It's like a competitive sport, but it takes place in your head."

To play a part in ETH juniors, students have to dedicate at least 15 hours a week. As a rule of thumb, they stay for around one and a half years and then move on. Strodtkötter and Moser have similar plans: in spring, both plan to go abroad. Strodtkötter will go to Tokyo to write his doctoral thesis in the field of quantum information theory. Moser would like to write his master's thesis in the real estate sector at Massachusetts Institute of Technology (MIT). Both anticipate starting their own business some day.

Along the way, they know they can always fall back on a strong network of some 150 former juniors: the ETH seniors. In addition, in the earliest phase of their start-up, before they have found any interested investors, they can also access the new ETH juniors jFund – which they themselves have been adding to with the operating income from their time at ETH juniors. This fund helps budding company founders make ends meet, and contributes to the transfer of knowledge. In this way, the juniors can give something back to ETH. ○

ETH juniors:

→ www.ethjuniors.ch/en/



Elsbeth Stern

Elsbeth Stern has been Full Professor for Research on Learning and Instruction at the Department of Humanities, Social and Political Sciences, ETH Zurich, since 2006. She is a cognitive psychologist who has been investigating the acquisition and use of knowledge for over 20 years.

“YOU HAVE TO BE FIRED UP WITH ENTHUSIASM”

Intelligence researcher Elsbeth Stern talks about the relationship between talent, intelligence and industriousness and how our society can better tap their potential.

INTERVIEW Roland Baumann

Professor Stern, would you describe yourself as talented?

You can define “talent” as “realised potential”. Since I’ve had some success as a scientist, I would say “talented” applies to me by definition (laughs).

What is your talent?

I can get to grips with complex subjects and draw conclusions based on what I find.

When did you discover your talent?

From a young age, I’ve delighted in getting to the bottom of things. Even in primary school, I realised that I was good at maths and especially good at understanding what I read.

What first piqued your interest in talent as a subject for study?

I became interested in psychology very early on. At school, my teachers gave me the impression that the natural sciences could explain anything and

everything. But I also knew that we didn’t understand human beings very well. That’s why, against the advice of my teachers, I decided to study psychology. And it’s a subject that continues to fascinate me to this day.

What exactly does “talent” mean?

Talent gets fairly rudimentary treatment in psychology. If it’s studied at all, then it’s as a special ability in a particular area, such as music or sport. When psychologists consider intellectual achievements in, say, mathematics, then they focus on intelligence, meaning the general ability to think and learn. Intelligence tests consist of verbal, numerical and visual-spatial tasks. But performing well on numerical tests is still no guarantee of a career as a mathematician. To truly excel in this area, you of course have to be highly intelligent, but you also need a specific interest in the subject.

You mentioned interest. Does this imply industriousness?

Absolutely. That is a definite requirement for high performance. You have to be fired up with enthusiasm for

something. No-one can excel in an area without devoting a great deal of time to it. That’s why we prefer to talk about expertise rather than talent.

Some children are described as “highly gifted”. What does that mean?

“Highly gifted” is a term applied to the two percent of people who are the most intelligent, meaning those with an IQ over 130. This is a convention based on intelligence research. There are a few ways to recognise intellectual giftedness; for example, highly gifted children learn very easily. They learn the alphabet more or less on their own and read for fun; they can already do maths that they aren’t learning in school yet. I should note that for the purposes of intelligence research, you can’t reliably diagnose this level of ability until the child is about ten years old. Some children have an IQ of 130 when they’re eight and then two years later it’s down to 125. It also has to be said that a child with an IQ of 125 can develop this gift only if he or she is given proper intellectual stimulation.

What do you mean by that?

These children need intellectual challenges, which a good school is able to provide. Good schooling can also compensate for deficits in the child’s home life. Our society has some children who are genetically predisposed to be highly intelligent, but are unable to develop this natural ability or translate it into good marks in school. It’s a major problem. I’m trying to help the situation, and educators also have to get involved.

Could you name an example?

Take a child who is much better in maths than they are in speaking or

writing. This can be an indicator that they possess more intelligence than is finding expression.

What is the best way to nurture and encourage a child like that?

The child needs to work on their weak areas. The teacher should speak with the parents and tell them that their child is doing well, but needs some extra help with language skills. A psychological assessment can reveal if the child performs well on a non-verbal intelligence test. The government also has a certain obligation here.

Why is that?

For the individual, it’s not necessarily a bad thing if they’re not working to their full intellectual potential. It

“NO-ONE CAN EXCEL IN AN AREA WITHOUT DEVOTING A GREAT DEAL OF TIME TO IT.”

might even afford them a greater degree of latitude and allow them to work more independently. But it means these intelligent people are absent from other areas. Society as a whole suffers when there are fewer intelligent people in high positions.

Are there certain groups that need special support?

It’s often children with an immigrant background who do just fine in life, but could actually achieve even more. People say, the child made it through secondary school, our job is done. But we should be helping them get to a Gymnasium that will prepare them for university. There’s potential there.

Are there gender-specific differences regarding intelligence?

Generally speaking, women have better language abilities and men are better at visual-spatial tasks. To what extent that’s nature or nurture is hard to say. However, men are more likely to have an intelligence profile in which their spatial and numerical abilities far outshine their linguistic abilities.

Is that why ETH has more male students?

That profile could certainly fit the typical engineer. Women who have strong mathematical and visual-spatial abilities also usually have excellent verbal abilities. You might say that in contrast to men, women have a choice. Perhaps they feel they have less support when they go into mathematical areas. There is certainly strong potential here, both for ETH and ultimately for society. ○



Mattias Ivarsson with the model of the molecule that he developed

FIRST STEPS TO BECOMING AN ENTREPRENEUR

Mattias Ivarsson has a vision: he wants to keep a dangerous pathogen in check using an innovative approach. As a Pioneer Fellow, he is now taking his first steps on the path to making that vision a reality.

TEXT Felix Würsten

ETH'S IELAB OFFERS ME AN IDEAL ENVIRONMENT IN WHICH TO DEVELOP AND EXPAND ON MY BUSINESS IDEA AND PREPARE TO FOUND A COMPANY.

It's a tricky situation: treating hospital patients with antibiotics has the adverse side effect of also disrupting their intestinal flora. This happens because the medication wipes out not only the pathogens that caused the disease but also the many bacteria that provide for a healthy intestinal tract. More and more frequently, the *Clostridium difficile* bacterium is proving itself to be a sly operator by taking advantage of this situation: with the other bacteria gone, this normally benign bacterium can spread unchecked throughout the intestine. In the process, it releases a toxic substance that in certain circumstances can cause life-threatening diarrhoea. When this situation arises, patients are

generally given more antibiotics to fight back against *Clostridium difficile*. But this is increasingly proving to be a blind alley. Administering more antibiotics weakens the intestinal flora even further; at the same time, *Clostridium difficile* is becoming ever more resistant, so the additional treatment proves ineffective.

No resistance

Mattias Ivarsson has discovered a possible way out of this impasse. As a doctoral student under Jean-Christophe Leroux at the Institute of Pharmaceutical Sciences, he developed a molecule that opens the door for a completely new kind of treatment. Rather than attacking *Clostridium difficile* directly, his innovative substance binds and inhibits solely the toxins. By preventing the onset of diarrhoea, this gives the intestinal flora a chance to regenerate, which enables them to get the nuisance bacteria back under control. The major advantage of this approach is that *Clostridium difficile* will not develop a resistance to this new substance.

The tests that Ivarsson has conducted in the laboratory so far have been promising, and the concept itself is a convincing one. However, a medicine is still a long way off. Ivarsson reckons that it will take at least another five years just to get to the point where he can test the substance in phase 3 clinical trials. In this situation, finding financiers who are willing to back his proposition is no easy task. But by this stage the academic route is also no longer appealing: it's now a question not of fundamental research but of applied testing – which doesn't promise any academic glory.

Inspiring environment

In his current predicament, Ivarsson is a perfect fit for the Pioneer Fellowship programme. This is aimed at young researchers who want to translate the results of their research work into a marketable product. Pioneer Fellows

OUR APPROACH SEEMS VERY PROMISING, BUT THERE'S STILL A LONG WAY TO GO BEFORE WE HAVE A MARKETABLE PRODUCT.

receive financial start-up support from ETH for a limited period, during which they can also use ETH facilities to continue their work.

Ivarsson has now decamped to the ETH Innovation and Entrepreneurship Lab (ieLab) on the Hönggerberg campus, where other budding young entrepreneurs have also set up shop. "It's an inspiring environment to be in," Ivarsson says. He likes the fact that the ieLab brings together people from completely different fields: "It's great to talk with someone who is developing an app, say, because in this phase we're both grappling with the same questions." He is also happy that the ieLab enables him to maintain close contact with his doctoral supervisor, although the physical separation makes it clear that he is no longer a member of the research group.

If he wanted to, Ivarsson could use the ieLab's laboratory infrastructure for experiments, too – but in his case this isn't necessary, as he is working with other laboratories that are conducting experiments for him. Which is why he is all the more enthusiastic about something else: as a Pioneer Fellow he gets external coaching from Marc Gitzinger, who as CEO of ETH spin-off Bioversys can fully appreciate Ivarsson's situation.

If the current round of tests are successful, the next step for Ivarsson is to found his own company. Then it will be time for further experiments that will show whether the substance is safe enough for use as a drug. Only at that point will it be possible to conduct tests on humans. Ivarsson is well aware that

"there are many hurdles yet to overcome." And yet he has reason to be confident: given that his patent covers not just a single molecule but a whole class of compounds, perhaps another one of those will prove to be effective even if the first attempt fails. ○

Pioneer Fellowship

Research is always leading to promising technologies and ideas, but in many cases it takes a long time to turn them into a marketable product. It is precisely at this early point in the process that implementation is faced with major uncertainties. In an attempt to prevent such ideas from simply fading away, ETH Zurich launched the Pioneer Fellowship – a programme that aims to pave the way for top researchers to bring their inventions to market.

Pioneer Fellows receive a maximum of 150,000 Swiss francs in financing from the university over a period of 18 months. This enables the budding young entrepreneurs to develop and expand on the results of their research and to develop a solid business plan. The goal is to develop highly innovative products or services that are of benefit to society. Applicants compete for Pioneer Fellowships. Twice a year a jury of ETH Zurich professors, selected business representatives and ETH transfer technology managers comes together to pick the best ideas. A total of 52 Pioneer Fellowships have been awarded to date. In 22 cases these have led to the founding of an ETH spin-off.

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"More than ever, the Swiss economy depends on first-class universities in our country. The more challenging the economic framework, the more important it is to get highly qualified people in the global competition for talent. ETH Zurich's achievements in this context are truly impressive."

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COMMUNITY



Creative through discussion: Students during ETH Week 2015

ETH Week

TACKLING REAL PROBLEMS

Experiencing theory and practice in a whole new way: Some 130 students from 15 departments spent a week developing suggestions for a sustainable nutrition system. The aim was to identify creative solutions relating to a range of topics including sustainable production, food waste and loss, healthy diet for humans and the environment, or animal feed and food imports in Switzerland. ETH Week is part of the Critical Thinking initiative, a programme ETH Zurich has launched to encourage creative and interdisciplinary thinking.

Coming soon to ETH Zurich

DEGREE IN MEDICINE

The University of Basel, USI Università della Svizzera italiana, the University of Zurich, and ETH Zurich are coming together to launch a new kind of degree programme in medicine. The four partners aim to promote the training of more doctors and simultaneously react to rapid developments in the medical field. Just as new therapies and products are gaining in importance worldwide, so too are new technologies that have the potential to revolutionise diagnosis, prognosis and therapy. The partner universities want to develop a seminal degree programme in medicine, with ETH Zurich contributing its scientific and technical know-how and the Faculties of Medicine their clinical expertise.

Specifically, starting in autumn 2017 ETH Zurich plans to offer a bachelor's degree in medicine for 100 students – in close cooperation with the partner universities, which will then take responsibility for the master's programmes. Successful completion of this bachelor's programme qualifies the student for acceptance into the master's programme in medicine at one of the partner universities. The bachelor's degree at ETH Zurich is set to run in a pilot phase for six years in accordance with the cantonal and federal guidelines for medical training. At the same time, it will maintain the research-oriented education standard of ETH Zurich.



Ranking

WORLD-CLASS ETH

ETH Zurich has been ranked among the top ten universities worldwide in two significant rankings for the first time this autumn. The university was awarded ninth place this year in both the QS Ranking and the Times Higher Education World University Rankings.

Bonds with ETH

Many former ETH students arrive at a point in their lives when they decide to give something back to the university. Although this comes in many forms, the common thread is the bond that alumni have with ETH Zurich.

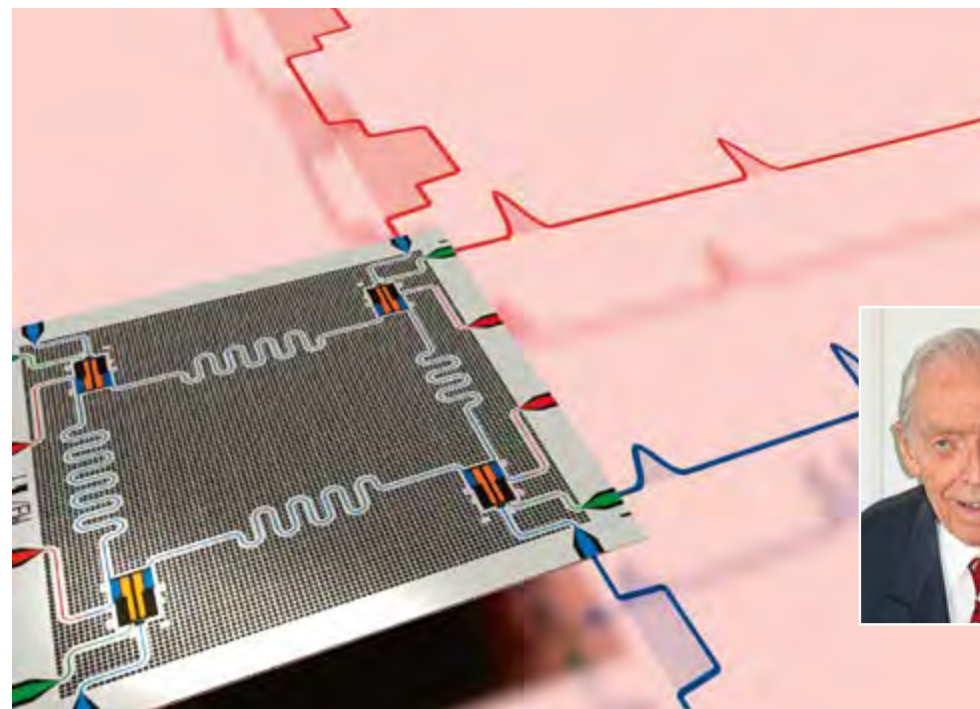
ETH alumnus Michael Kohn keenly recounts how even in retirement it's never too late to engage in something new – in his case quantum engineering. Not too long ago, former ETH President Ralph Eichler told him about a new ETH initiative aimed at translating the findings of quantum science into technical applications. As an energy specialist and impassioned engineer, Kohn was immediately keen: "I was excited by the idea of getting to grips with something new again, and I could see the importance of shaping how we process informa-

tion in the future." This was why Kohn directed his Foundation to make a substantial contribution in support of ETH Zurich's Quantum Engineering Initiative.

Building on ETH knowledge

Kohn can look back at a long and varied career. It's now over 60 years since he studied civil engineering at ETH Zurich and completed his subsequent thesis on dam construction. In 1953, he took up his first post at Motor-Columbus AG / Aare Tessin AG, where he spent over 20 years in senior engi-

neering positions and as a member of the supervisory board. Towards the end of the 1950s Kohn began a six-year stay in Israel, where he helped plan systems that would divert water from the Sea of Galilee in the north of the then new state to the arid regions in the south. "I was also able to channel much of what I learned at ETH Zurich into the project," says Kohn. He would later make a name for himself as Switzerland's "energy pope" – a title conferred largely due to his work as chair of the Swiss Federal Commission on Energy Policy (GEK), which was



Michael Kohn is fascinated by quantum research and supports the Quantum Engineering Initiative.



CHIEF OPERATING OFFICER

With effect from 1 November, **Lukas Burkhardt** (36) has been named the new Chief Operating Officer at Franke Group and so now sits on the management board. Burkhardt holds a PhD in mechanical engineering from ETH Zurich and has worked in various management positions around the world, especially in Asia.



ENERGY

In August 2015, **Michael Paulus** (43) was made the new head of technology and career training at the Verband Schweizerischer Elektrizitätsunternehmen (VSE, association of Swiss electrical companies) and member of the management board. Most recently he worked as a business development manager at Swissgrid AG, and prior to that had been at BKW Energie AG for nearly eleven years. Paulus wrote his dissertation while studying for his physics degree at ETH Zurich.

SBB INFRASTRUCTURE

Michel Kunz (56) will assume management of the Installations and Technology business unit at SBB Infrastructure in early 2016. Previously, Kunz served as CEO of the Swiss Post and of Orell Füssli Holding. He studied electrical engineering at ETH Zurich from 1980 to 1984.

founded in 1974 in response to the prevailing oil crisis. This role gave him a major hand in shaping Swiss energy policy. Although his support for building new nuclear power stations means Kohn has been under constant fire from environmentalists and the left ever since, he never shied away from dialogue with his political opponents. Indeed, his debate with Ursula Koch of Switzerland's Social Democratic Party, which was held at ETH Zurich, was the basis for the book "Titanic oder Arche Noah. Gespräche zu Energie, Technik und Gesellschaft" (Titanic or Noah's Ark. Discussions on Energy, Technology and Society). Kohn is still active as an energy consultant and his clients include the Swiss government. Asked about his hopes for ETH in the future, he said: "The focus should be on quality rather than quantity."

Thanks for a great experience

Kohn is by no means alone in his commitment to his alma mater. Chemist Dorothée Wegmann, who passed away in January, studied and wrote her thesis at ETH in the 1950s and maintained a lifelong connection with the university. After several years at the Universidad de La Laguna in Tenerife, she returned to ETH and worked for many years in the Department of Chemistry and Applied Biosciences. Until very late in life, she corrected and edited theses and scientific papers written by younger colleagues and was always keen to help doctoral students in any way she could. In her lifetime, Wegmann supported the Excellence Scholarship and Opportunity Programme. She died in January this year at the age of 80, and her will named the ETH Zurich Foundation as her sole beneficiary.

Xiaojing Zhang also has a strong bond with ETH, albeit one with a much shorter history. Zhang is currently

working on his doctoral thesis at the Automatic Control Laboratory, but back when he was studying for his master's degree, he benefited from the Excellence Scholarship and Opportunity Programme. "The programme made it possible for me to focus entirely on my studies and to expand my network," Zhang says. He also knows that it was another valuable feather in his cap when he was applying for a doctoral position. Today he is an ETH alumnus and patron of the programme. "It was the quality of the programme that won me over. More than anything, my sponsorship is an expression of my gratitude and the bond I feel with ETH. The kind of support I received is not something that can be taken for granted," he says. — Samuel Schlaefli

PERSONAL COMMITMENT

Private patrons can help achieve great things. Thanks to their commitment, for instance, the Excellence Scholarship and Opportunity Programme is effectively 100 percent privately funded. The ETH Zurich Foundation's donor list includes some 2,000 private patrons, over 90 percent of whom are ETH alumni. Most private patrons give smaller – but very much appreciated – donations of between 50 and 500 Swiss francs on a regular basis, but some alumni support ETH's development with contributions that stretch into millions.

ETH Zurich Foundation:
→ www.ethz-foundation.ch

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Retirement of Roman Boutellier

New routes to success

As vice-president of human resources and infrastructure, Roman Boutellier has played a defining role in ETH Zurich's robust development. Now he is ready to retire, and ETH professor Ulrich Weidmann has been tapped to follow in his footsteps.



Roman Boutellier with plans for the Innovation Park in Dübendorf

ing mathematics at ETH Zurich, he went on to be appointed to the management of Leica Heerbrugg, the chair of innovation and logistics at the University of St. Gallen and, later, the role of CEO at SIG Holding in Neuhausen.

Building for the future

Boutellier became a professor for technology and innovation management at ETH in 2004, and in October 2008 he was named to the university's Executive Board. The breadth of his expertise enabled him to quickly turn theory into practice: "As a professor, I supervised many doctoral theses on topics concerning organisation at ETH. That's how some of our risk management approach or the concept for ETH technology platforms came about, to name some examples."

ETH President Lino Guzzella is impressed by Boutellier's achievements as vice-president: "He carried out his responsibilities extremely effectively, and contributed significantly to ensuring ETH's future development. Roman Boutellier's wealth of experience and analytical skills were very important in forming opinions within the executive board. On behalf of ETH as a whole, I'd like to thank him for everything he's done."

The Hönggerberg site has seen extensive expansion, and current construction work is creating accommodation for some 1,000 students. Boutellier's tenure saw many other important building projects at ETH Zurich, including the new research and

teaching building on Leonhardstrasse, the construction and expansion of the Swiss National Supercomputing Centre in Tessin, the Agrovet-Strickhof agricultural research centre, plus the university's participation in the future Zurich Innovation Park in Dübendorf.

What will change as from 2016? "I'm looking forward to regaining control over my own diary," Boutellier says, "and I relish the prospect of spending more time with my family and my hobbies." But he's not about to start turning down chances to prove himself – including in the mountains. This year, the keen climber has already mastered a classic alpine challenge: the northeast wall of the Kingspitz in the Bernese Alps. – Norbert Staub

NEWS FROM THE ETH EXECUTIVE BOARD

At the request of ETH President Lino Guzzella, the ETH Board has nominated Ulrich Weidmann to take Roman Boutellier's place on the Executive Board from 1 January 2016. Weidmann, 52, has been a full professor for transport systems at ETH Zurich since 2004. Alongside his work as a professor, he has served as an expert advisor on a wide range of rail regulation and infrastructure development projects. Since 2013 Weidmann has been head of the Department of Civil, Environmental and Geomatic Engineering.

ETH Höggerberg

LIVING ON CAMPUS

Living space for students is scarce, so it's heartening to hear that progress is being made on the new accommodation. The HWO (pictured) and HWW buildings are going up on the south-west corner of the Höggerberg campus. Between them they will offer about 900 student rooms that should be ready by autumn 2016, alongside spaces for commercial use, study areas and a crèche. The construction projects are supported by Swiss Life AG and Luzerner Pensionskasse in a public-private partnership with ETH.



The HWO accommodation for students: building in progress

Alumni

EXPANDED NETWORK

ETH's alumni association has welcomed two **new groups** into its network: biotech and agri-food. Biotech alumni wish to strengthen the relationship between graduates and the Department of Biosystems Science and Engineering. The agri-food alumni are setting up a networking platform for graduates and current students of the Institutes of Agricultural Sciences and of Food, Nutrition, and Health, plus those of the World Food System Center.

In Boston, the **New England alumni chapter** celebrated its five-year anniversary. Rector Sarah Springman emphasised how important the international alumni chapters are for ETH Zurich.



IPCC

NEW MEMBER OF CLIMATE COUNCIL

ETH Professor emeritus Andreas Fischlin has been nominated to the Intergovernmental Panel on Climate Change (IPCC). He is now Vice-Chair of Working Group II, which is concerned with the consequences of climate change. Fischlin is a convening lead author for the IPCC and was part of the Swiss delegation to climate conferences.

ETH Zurich Foundation

CHANGES ON THE BOARD OF TRUSTEES

After seven years as president of the board of trustees for the ETH Zurich Foundation, Jürgen Dormann is passing the torch. From January 2016, the new president will be Pius Baschera, former ETH professor and chairman of the Hilti AG board of directors. He also sits on the board of directors for the Schindler Group and for Roche Holding Ltd. In addition, the foundation is welcoming new trustee, Beatrice Weder di Mauro. A professor of economics at Johannes Gutenberg University Mainz, she also serves on the board of directors at UBS Group AG and Roche and is a member of the government commission for the German Corporate Governance Code.



Column

A gift that gives back

It was almost like Christmas: at the end of October, students who had passed their first-year exams over the summer were given a hoodie. Some received theirs directly from the hands of the rector. And just like at Christmas, there were many joyous faces. Not so much because of what the hooded sweatshirt cost, but because of the gesture.

The price of one hoodie won't exactly break the bank, but the money still has to come from somewhere. This gift was made possible by a generous grant from a foundation.

As the head of finance at ETH Zurich, it was important to me to know that no tax money went toward purchasing the hoodies – particularly at a time like the present, with clouds gathering on the financial horizon. All the decision makers at ETH are aware that in the coming year we will put more

emphasis on querying the benefit of each item of expenditure and on distinguishing between what is necessary and what is merely nice to have.

So do we even need to give the students hoodies? After all, they were happy enough just with the letter from the rectorate informing them that they had passed their exams. But there was more to this gift. The hoodie expresses that we as a university are aware of how much we demand from our first-year students. It is a recognition of their achievements, and as such engenders a feeling of appreciation and enthusiasm for the university. I'm not saying this as the head of finance, but rather as a father whose daughter also successfully passed her first-year exams this year. When students wear this pullover, they aren't boasting that they have passed a difficult exam. Instead, they are proclaiming how proud they are to be part of ETH.

In light of the straitened situation of public budgets, we will be making further efforts to use our resources even more efficiently. For example, ETH Zurich has already been able to achieve considerable savings thanks to KoBe ETH+, a purchasing association for coordinating procurement with partners. External funding is also playing an ever greater role, namely donations from foundations and private individuals, which allow ETH more latitude in its decision making. These resources also support projects that have a high symbolic value and an indirect but positive effect on research and teaching at ETH. Projects like the hoodie gift, which is certainly not necessary for the university's immediate survival but will give its long-term prospects a boost.



Robert Perich has been in charge of finance at ETH Zurich since 2003, and was made Vice President Finance & Controlling in 2008.

Taming the floods

How do you optimise the operations of a new hydroelectric plant? And how can you protect a village from floods? These are the kinds of questions ETH's hydraulics engineers are investigating in a new laboratory with realistic models.

TEXT Felix Würsten PICTURES Simon Tanner



Claudia Beck leaps lightly to the other riverbank and hastens to help her colleague, who is standing up on the platform operating the heavy silo tank on a large crane hook. The flood has reached its zenith and Beck has to make sure she keeps track of what's going on. At their feet, the entire reservoir is filled with a brown soup. Further down, at the dam, foaming water churns through the open sluice gates. Beck climbs back down and takes a quick look at her computer. Everything is going according to plan. The flood she has to keep an eye on is not a dangerous natural phenomenon, but a controlled experiment she is running in the large hall at the Laboratory of Hydraulics, Hydrology and Glaciology (VAW).

Research fellow Beck is using a model measuring several metres long to examine flow behaviour in a reservoir that a Korean company plans to build in Pakistan. One of the things the company is hoping to learn from the ETH experts is how fast electricity generation can be brought back online after a flood. "In a flood, water flowing down from the mountains transports large amounts of fine sand into the res-

ervoir," explains Beck. "If you start up electricity generation too quickly afterward, the particles suspended in the water will soon wear down the turbines." Today's experiment should indicate where sediment will build up during a flood. In the real world, the flood in question would last three days; in the model it's just 11 hours.

When the floodwater is at its height, as it is now, it flows into the res-

ervoir in the model at a rate of 88 litres per second – a mere fraction of the 1,200 cubic metres per second that would occur in nature. Meanwhile, lab employee Raphael Heini pours 12 kilograms of finely ground walnut shells into the inflowing water per minute. To maintain the model's scale of 1:45, they ought to be adding fine clay particles to the water; however, their surface characteristics make them >



The VAW's new laboratory opened about two years ago and has room to run some dozen experiments.

behave differently to real-life sediment. In contrast, walnut particles' settling behaviour mimics that of fine sand in nature and therefore provides a better representation of processes in the reservoir.

A renaissance of physical models

Not so long ago, it seemed that the practice of experimenting on physical scale models had had its day. General opinion held that as computer power increased, it was just a matter of time before numerical simulations would replace physical models. Yet hydraulic testing has meanwhile seen a genuine renaissance, as explained by Robert Boes, professor of hydraulic structures and director of the VAW: "Mathematical models also have their limits and can be inadequate for mapping certain phenomena." The demand for physical models shows just how important they still are. "In terms of available space, we are almost at full capacity," says Boes with more than a hint of pride. Advances in instrumentation have also contributed to the renaissance of experimenting on physical models. Various high-tech devices are used in dam models, too, for instance to take measurements of water pressure at critical points in rapid succession.

Still, running this sort of model experiment is a time-consuming undertaking. Just building a model is a science unto itself. Testing normally lasts several months, but meticulous preparation is needed before that can even begin. All the important parts – such as the dams or the weir systems – are reproduced in VAW's own workshop with millimetre accuracy using plastic, Plexiglas, metal and mortar. Duplicating the topography similarly demands painstaking work by the in-house craftsmen. "We're fortunate to have an experienced workshop team," Boes says.

Strict control

Meanwhile, the next phase of experiment gets underway: while project leader Nicola Lutz turns on the tap behind the model, Beck is busy in front

on the dam's sluice gateways. She opens up the bypass tunnel envisaged in the operating company's design. Since the water level in the reservoir is supposed to be kept constant, Beck has to keep running back and forth to make the necessary adjustments.

Now comes the calmer part of the experiment. With less water flowing into the reservoir now, the amount of sediment being added can also be reduced. Slowly, the outflowing water clears. It is at this point that the operating company wants to restart electricity generation, and yet Beck is sceptical. She takes a sample from the discharge pipe that, in the model, represents the pressure tunnel to the turbine. "There's still quite a lot of material in the water," she says, looking at it critically.



Claudia Beck documents the water flowing out of the reservoir. At the flood's height, the reservoir discharges 88 litres of water per second.

Massive amounts of sediment

In the back of the hall, research fellow Benjamin Hohermuth is getting ready for the next flood. His model, built to a scale of 1:32, relates to flood control efforts in Alpnach, in canton Obwalden, Switzerland. The village was nearly flooded by the Kleine Schliere, a nearby mountain stream, in 2005. Now the VAW model is being used to demonstrate which construction measures

the town can take to prevent something similar happening in future. Testing conducted previously at the VAW on an initial concept proved it to be unworkable. At the time, even small changes in the discharge regime led to unexpected behaviour on the part of the river. "That's of course not what we're going for," says Hohermuth. "In flood control, you need robust solutions."

Every experiment requires a bit of heavy lifting.



In today's experiment, Hohermuth is simulating an event that statistically speaking can be expected once every 300 years on average. He is testing two measures. One is to ensure that the river deposits most of its sediment in an overflow basin located in the centre section of the model. The second is a bypass canal in the lower section,



The pumps in the cellar move the water from the backflow basin to tanks located in the building's attic.

which should keep the village from being flooded even if the water level is extremely high. Unlike Beck, who works with walnut shells, Hohermuth uses a specially prepared mix of regular sand and gravel. Each test involves a total of 1,200 kilogrammes of material – a huge amount that after each round has to be collected, dried, and remixed.

In the engine room, Hohermuth starts up the large pump that will bring the water from the backflow channel in the cellar to the storage tank in the attic, and opens the main gate valve. A small trickle starts flowing along the streambed. In just a few minutes, the water begins to swell and transports

more and more sand and gravel down below. When the flood reaches its highest point, Hohermuth removes the blue piece of polystyrene separating the stream from the bypass canal. The polystyrene represents what in real life would be a levee that breaks when the water gets too high. In cases of extreme flooding, the path to the bypass canal would quickly be cleared. "We can't realistically reproduce a levee like this in our model, so we do ourselves a favour and use a piece of plastic as a shortcut," explains Hohermuth.

once again slowed to a thin trickle. Hohermuth turns off all the equipment. Now for one final, crucial step: he carefully puts away the ultrasound probes, which measured the water level at various locations during the test, and heads to the upper storey of the building. Leaning out from a platform, he hangs a 3D laser on the crane. Over a quarter of an hour, the apparatus measures over six million different points. From this data, Hohermuth can later determine how much material was deposited, where it was deposited and what effect the flood had on the riverbed. About two thirds of the material stayed in the upper retention basin, with the remaining third being carried downstream. Hohermuth is satisfied: that's exactly how it should happen in an emergency. ○

Laboratory of Hydraulics, Hydrology and Glaciology:
→ www.vaw.ethz.ch/index_EN

In the tests, coloured sticks represent logs that have been swept along by the water.



Passing the acid test

This flood, too, demands plenty of concentration. Hohermuth has just noticed that a probe on the container for collecting flood debris isn't functioning properly. He quickly pulls on his Wellington boots and wades directly into the water. A couple of manual adjustments and the problem is solved. "Sometimes you just have to be pragmatic," he says with a laugh. The computer slowly reduces the water inflow. For Hohermuth, this is where things really start to get exciting: more and more material in the upper part of the river is being deposited in the upper retention basin, where it creates an island that gradually gets larger.

After precisely 4,000 seconds, the nightmare is over: the raging river has

CONNECTED

1 Scientifica

POPULAR SCIENCE

The fourth Scientifica was a roaring success: during the first weekend in September, some 25,000 visitors seized their chance to experience at first hand the research being carried out by ETH Zurich and the University of Zurich. With 60 exhibition stands and 40 brief lectures, the Zurich science days offered fascinating insights into the world of light. Once again, it was clear that Scientifica is an outstanding platform for presenting the diversity of current research to an interested public. The event offered visitors a broad spectrum of scientific topics – from light waves, X-rays and photolysis to motion analysis, dental diagnostics or even light and dark as philosophical concepts. Special events, such as the flying robots show and the laser experiments, proved particularly popular, as did the family programme.

1 Scientifica



2 Eni-Award



2 Eni-Award

LOOKING UNDER THE SEA WITH MORE PRECISION

In mid-September in Rome, Italy's President Sergio Mattarella presented ETH Professor Johan Robertsson with the Eni Award, the world's most prestigious prize in the energy sector, in the category "New Frontiers of Hydrocarbons". The professor of geophysics and his team have developed a piece of innovative technology that harnesses seismic methods to better model the underground structures beneath the ocean floor. This technology goes beyond the current limits for visualising and characterising subsurface structures.

3 Johann Schneider-Ammann



In discussion with ETH President Lino Guzzella (r.) the federal councillor was impressed by the work of ETH researchers.

4 First-year exams



5 ETH Day



3 Johann Schneider-Ammann

BRIEF STOP-OFF AT THE HÖNGGERBERG

Johann Schneider-Ammann, Federal Councillor and head of the Swiss Federal Department of Economic Affairs, Education and Research, visited ETH Zurich in mid-October. During his three-hour tour, he learned all about the opportunities and challenges of digitalisation.

4 First-year exams

RECOGNITION IN THE FORM OF A HOODIE

Bachelor's degree students received an unusual gift as a reward for passing their first-year exams. ETH Rector Sarah Springman (centre) presented them with a specially designed hoodie – both to congratulate them for passing their exams, and to strengthen ties between the students and the university. The idea proved very popular.

5 ETH Day

THREE HONORARY DOCTORATES

Three researchers received honorary ETH Zurich doctorates on this special day for their outstanding achievements: Mark Felton Randolph (next to ETH Rector Sarah Springman), Professor at the University of Western Australia, for his contribution to the field of offshore geotechnics, Frances Hamilton Arnold (left), Professor at the California Institute of Technology, for her research on the directed evolution of proteins, and Mildred Dresselhaus (second from left), Professor at the Massachusetts Institute of Technology, for her work on carbon structures.

Agenda

EVENTS

12 January 2016, 8–9.30 p.m.

A look into the brain

Public talk as part of the "Mensch nach Mass" series. With Beatrix Rubin, neurobiologist and philosopher of science at the Collegium Helveticum, and Markus Christen, neurobiologist and medical ethicist at the University of Zurich's Institute of Bioethics and History of Medicine.

📍 Sphères, Hardturmstr. 66, Zurich

→ www.menschnachmass.ch



25 February 2016, 5.30–7 p.m.

Genetic testing of children

Public talk as part of the "Mensch nach Mass" series. With Professor Andrea Büchler, legal expert at the University of Zurich, and Professor Peter Miny, medical geneticist at the university hospital in Basel.

📍 Cantonal hospital Olten, multi-purpose room, Baslerstrasse 150, Olten

→ www.menschnachmass.ch

15 January 2016

Engineered System Risk

4th ETH Risk Center Dialogue Event

📍 ETH main building

→ www.riskcenter.ethz.ch/events.html



The BodenSchätzeWerte exhibition provides a comprehensive picture of our use of natural resources.

focusTerra

BODEN SCHÄTZE WERTE

Until 28 February 2016 We rely on mineral resources every day. We take it for granted that they will be there, and global consumption is on the rise. But what are the long-term implications of our increasing use of these non-renewable resources? What challenges lie in store?

Visitors to the BodenSchätzeWerte (Earth's Treasures) exhibition can learn about the origins, extraction and use of mineral resources – and what happens when we no longer need a product. What can we do to obtain raw materials as economically and responsibly as possible? How do we ensure that we use them for as long as possible and recycle them as efficiently as possible?

📍 ETH NO building, Sonneggstrasse 5

→ www.focusterra.ethz.ch/en

Max Frisch Archive

THE MIRROR OF CARICATURE

Until 31 March 2016 Max Frisch enjoyed a high media profile both in Switzerland and abroad. This was reflected in numerous caricatures, in which he was portrayed not only as an architect and author, but also with subtle irony or a

bit of bite as a political intellectual. This special exhibition showcases a selection of the best drawings by Swiss cartoonists.

📍 ETH main building H26, ETH Bibliothek Reading Room Collections and Archives

→ <http://mfa.ethz.ch/en>

Photos: Stiftung Science et Cité, Collegium Helveticum, Paulus-Akademie Zurich; Jon Etter

Book tip

THINKING AHEAD

Increasingly, the digital revolution is changing the basis of our whole society. It now takes just one year for us to generate as much data as we have over the entire course of human history. But what exactly does this shift mean for society? Dirk Helbing, professor for computational social science at ETH Zurich, explores these questions in his new book, "Thinking Ahead – Essays on Big Data, Digital Revolution, and Participatory Market Society". The author illuminates the full breadth of this topic. He argues that we must set up new participatory systems that can not only make coordination easier within digital society but also help avoid conflicts arising from the way we reach political and commercial decisions today.



ISBN 978-3-319-15077-2

Springer Verlag

Price: CHF 27.00

EXHIBITIONS

Until 17 January 2016

Andy Warhol

ETH Zurich's Collection of Prints and Drawings has selected some 80 examples from a treasure trove of drawings that caused a sensation when they were discovered in Andy Warhol's archives in 2011. These works can now be seen in a special exhibition entitled "Andy Warhol – The LIFE Years 1949–1959".

📍 ETH Zurich's Collection of Prints and Drawings

→ www.gs.ethz.ch/english.html



Until 31 January 2016

The crocodile in the tree

The special exhibition entitled "The crocodile in the tree" presents evolutionary phenomena using the example of the crocodile and its ancestors. How and why did certain archosaurs die out more than 200 million years ago? How did other ancestors of the crocodile manage to adjust and survive? Researchers find answers to these and other questions in the fossil record.

📍 University of Zurich Zoological Museum

→ www.lifescience-zurichevents.ch

24 February–31 March 2016

Peter Märkli

The department of architecture is bidding Peter Märkli farewell with an exhibition and a publication. As professor of architecture and construction, he shared his ideas on construction with students. This selection of some 110 student projects,

along with documents from seminar trips and courses, provide a clear illustration of Märkli's approach and demonstrate how wide-ranging his teaching was.

📍 ETH Main Building, main hall

→ www.ethz.ch/gta_arch_exhibition

CONCERTS

14/19 December 2015, 7.30 p.m.

Akademisches Orchester Zürich

Franz Liszt (1811–1886): Danse Macabre

for piano and orchestra

Gustav Mahler (1860–1911):

Symphony No. 1

Conductor: Martin Lukas Meister

📍 Tonhalle St. Gallen (14 December)

📍 Tonhalle Zürich (19 December)

→ www.aoz.ethz.ch



19 January 2016, 7.30 p.m.

Quatuor Sine Nomine

Kammermusikabend

J. C. de Arriaga (1806–1826):

String quartet No. 1 in D minor

D. Shostakovich (1906–1975): String

quartet No. 7 in F sharp minor, Op. 108

A. Borodin (1833–1887):

String quartet No. 2 in D major

📍 ETH Main Building, Semper Aula

→ www.musicaldiscovery.ch

22 March 2016, 7.30 p.m.

Easter concert

Alessandro Marangoni, piano

M. Castelnuovo-Tedesco (1895–1968):

Evangélion, Op. 141

📍 ETH Main Building, Semper Aula

→ www.musicaldiscovery.ch



ABOUT

Walter Fischli

Walter Fischli began his studies in biochemistry at ETH Zurich. After obtaining his doctorate in peptide and biochemistry and a post-doc in endorphin research, he switched over to the Addiction Research Foundation at Stanford University. He then returned to Switzerland, where he worked for 15 years as a research scientist at Roche in Basel. Together with three colleagues, he founded Actelion in 1997. Since retiring in 2012, he has been aiding start-up companies by providing capital and sharing his knowledge through Altos Venture AG. In addition, the Walter Fischli Foundation is sponsoring young talents as well as research projects at the point where music and research intersect. Through the ETH Zurich Foundation, he also sponsors an oncology project led by Professor Wilhelm Krek.

“Everything could have gone horribly wrong”

Walter Fischli was a cofounder of the biopharmaceutical company Actelion, founded 18 years ago. His motivation was not commercial success, but rather the search for applications for very promising molecules.

TEXT Samuel Schlaefli PHOTO Daniel Winkler

We are meeting with ETH alumnus Walter Fischli at Actelion’s research building in Allschwil. He moves through the rooms with so much joy and verve, it’s as if Actelion had moved into the building just yesterday, rather than nine years ago. The first thing you notice about Fischli is that he speaks not just as a manager, but as a founder; every corner of the building tells a piece of Fischli’s story. He is particularly proud of the spacious lobby on the first floor. Concerts are held here regularly and sometimes he comes in on his own on Saturday afternoons to practice his violin – “this room has fabulous acoustics,” he says in a lovely Swiss Glarus dialect.

In the research building, you can’t help but notice the two huge murals stretching upwards across several floors and depicting a complex molecule: it is the chemical structure of bosentan, a drug to treat pulmonary arterial hypertension and the company’s centrepiece. “This drug has given independence back to people who were once too weak to leave their houses,” explains the now retired biochemist. “That’s exactly what we’d hoped for at the time. That was our drive in introducing bosentan to the market.”

A biochemist from a musical family

For a large part of his success as a biochemist and co-founder of Actelion, Fischli has his enthusiastic biology teacher at the Lucerne High School to thank. “He really got me excited about the sciences. Moreover, since then, I’ve known how important a positive stimulus is.” Prior to that, Fischli’s attention was focused on his music. He grew up in a

musical family in the canton of Glarus. Like his three siblings, he began playing music at a very young age and has always done so with passion. At 16, he played the violin in a chamber music ensemble and appeared on stage regularly. Today, he is convinced that music and science have much in common: “Albert Einstein, the biochemist Gottfried Schatz and many other excellent scientists and researchers were also outstanding musicians.” The intuition and creativity that flow when playing, the networked thinking among the ensemble members, all of that benefited him later on as a head of research.

Networking research and medicine

When Fischli began his studies at ETH Zurich in 1969, biochemistry was still in its infancy. It took time for spectroscopy, nuclear magnetic resonance and computer-aided methods to find their way into biological research. While working on his doctoral thesis, Fischli developed model systems for the first photo markings of proteins. That was fundamental research and very exciting, but nevertheless unsatisfactory for the young researcher. “I was never one to perform science in a vacuum,” he recalls. “How to apply it was what truly interested me.”

The move into medical application came about for him during post-doc work at the Addiction Research Foundation at Stanford University, a famous medical research centre in California. Fischli had recently done research at ETH on enkephalins, which are endogenous opioids. He found a job straight-away in the lab of Avram Goldstein, who >

“I was never one to perform science in a vacuum.”

“I simply wanted to do good research.”

had already achieved world fame in this research field. “Here, the networking of research and medicine was already far more advanced than at ETH,” remembers Fischli, adding: “At the same time, research was much more competitive. When colleagues were working on their papers, they covered their written work with their hands for fear that someone could steal their ideas.”

After three years, Fischli decided to return to Switzerland. He and his wife had had their first child and the second one was on the way. “It was important to us to be near family and in a familiar setting,” he explains. Whether this might have a negative impact on his career was secondary. Later, during his performance review meetings, he was always miffed about questions concerning his “career planning”: “I simply wanted to do good research.”

From trial and error to design

After his return to Switzerland in 1982, Fischli was offered a job by the pharmaceutical giant Roche in Basel. “That was a stroke of luck, because it was a time when many outstanding scientists began working in the pharmaceutical industry.” Simultaneously, it was the dawn of the age of rational drug design, driven by new technologies and new findings in medicine and biochemistry. Drug molecules were being very purposely “designed”, not only just selected from a huge pool of molecules based on trial and error as they had been in the past.

Fischli worked for 15 years on cardiovascular diseases in the research department, heading up a 10-person research group, among other responsibilities. It was there that he also met the three later co-founders of Actelion: cardiologist Jean-Paul Clozel, pharmacologist Martine Clozel and physician and computer scientist Thomas Widmann. Starting in 1986, Fischli’s and Clozel’s group were researching a new control mechanism, the endothelin system. They discovered bosentan, a receptor antagonist and very promising candidate to fight congestive heart failure. Yet in phase 3 of clinical development, there were signs of side effects. Roche dropped the project in favour of a different drug. But the idea of jumping ship had begun to take shape among the biochemist and his colleagues. “It wasn’t that we were frustrated,” emphasises Fischli, “but we were confi-

dent in our research and the potential of endothelin receptor antagonists.” To get these drugs out of the lab and into hospitals, they founded Actelion.

Pharmaceutical blockbuster

In December 1997, the four new entrepreneurs moved from the Roche headquarters in Basel into an empty building on the outskirts of town, furnished it with furniture from the Clozel family and drew up their first business plan. They were aware of the risk they were taking by leaving secure and well-paying jobs despite having children in school. The start-up capital came out of their own pockets, and there were no wages in the beginning. “Everything could have gone horribly wrong,” Fischli remembers, “but we simply had to give it a shot!” Five months after founding Actelion, the company received 18 million Swiss francs from a conglomerate made up of European investors. That was more than enough for them to build their own research lab, to license from Roche the drug that they themselves discovered, and to pay for initial clinical development. Two years later Actelion went public, raising 1.2 billion Swiss francs of capital.

Then came the shock: bosentan was useless in fighting congestive heart failure – even though, up until that point, all models and clinical results had pointed to the opposite conclusion. Luckily, it was extremely effective against pulmonary arterial hypertension, a rare disease with 80,000 patients worldwide that mainly affects young women and children. If left untreated, 50 percent of sufferers die within two to three years. In 2001, bosentan was approved for use in the United States, then came Europe, Japan and many other countries. The bosentan drug called Tracleer became a blockbuster and was soon earning revenues of over one billion Swiss francs annually.

“We were never a company that was founded with the sole purpose of earning a lot of money,” explains Fischli, “we were researchers who primarily wanted to cover a medical need.” Today, Fischli is convinced that the company’s financial success is a bit like his career: “You can only plan up to a certain point.” ○

ABOUT THE COMPANY

Actelion is a bio-pharmaceutical company that develops new drugs, tests them in clinical studies and introduces them to the market. Actelion markets and sells six products, of which Tracleer, the pulmonary arterial hypertension-fighting drug, is the most successful. Founded in 1997 in Allschwil, Switzerland, Actelion currently has 2,500 employees worldwide, with 1,000 in Allschwil. About 370 work specifically in fundamental research and drug development. The company operates 30 branch offices in the United States, Canada, Brazil, Australia, Japan and several European countries. In 2015, sales in the first three quarters have amounted to more than 1.5 billion Swiss francs.




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5 QUESTIONS

Ralph Spolenak applies the same critical thinking to his teaching as he does to his research.

“My students help me develop my professional skills.”



Ralph Spolenak is a Professor of Nanometallurgy.
→ www.met.mat.ethz.ch

1 *Which teacher most inspired you?*
The first person who really influenced my career was my doctoral advisor. He taught me to pinpoint the essence of a question and present it in a readily understandable way. He also set an example of what it means to be a good mentor, how asking the right questions can help people find their own path to a solution. Another person who inspired me was my supervisor, when I was doing a postdoc at Bell Labs. Despite his advanced age, he showed remarkable intellectual vitality. He taught me to question everything and never to regard a task as beneath me if it helped the group as a whole. And then there are my students, of course, who are always challenging me to become a better teacher and helping me develop my professional skills.

2 *How useful are large-scale international projects?*
The kind of international exchanges you get through attending conferences and taking extended research sabbaticals is enormously helpful for research. The only way to create something amazing is to build on other people's knowledge. And nowadays, if you have a solid relationship with your research partner, then distance is no longer a limiting factor in terms of what you can achieve together. But if

coordinating a group uses up too many resources, then projects start to lose their effectiveness, even if they still seem attractive politically.

3 *Is the current system of publishing bad for science and research?*
In today's publishing world the focus is more short-term, sensationalist and popular. Yet there are plenty of Nobel laureates whose citation frequency jumped only once they won the Nobel Prize. ETH Zurich is an institution that prioritises quality and scientific rigour over numerical rankings. I'm grateful to have the opportunity to carry out my research here. As long as there are enough places like this around the world, then I don't think science is in any danger!

4 *What does the term “critical thinking” mean to you? And how do you apply it on a daily basis?*
Critical thinking is the bread and butter of our day-to-day research work. It's all about objectively analysing and evaluating our own and other researchers' findings – that's the essence of scientific progress. And of course I apply it to my teaching, too, constantly asking myself whether I've chosen the right teaching methods for the particular group of students I'm working with. Lecturers and students also have to constantly strive to embed the actual course contents in a broader social context.

5 *How do you break out of the ivory tower syndrome?*
An ivory tower implies an academic pursuit that is disconnected from wider society. I'm fortunate enough to be working in the field of materials science, which inevitably deals with practical concerns of everyday life. Even though we're sometimes dealing with very fundamental topics, all our industry projects ultimately benefit from our knowledge.
— Interview by Corinne Johannssen-Hodel



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