

AI AGAINST DEFORESTATION

ETH for Development (ETH4D) develops innovative approaches to combating global poverty and trains future leaders who are committed to sustainable global development. As part of this ETH-wide initiative, the EcoVision Lab (left) and chocolate producer Barry Callebaut (right) are working together to use artificial intelligence and satellite images to halt deforestation in producing regions.

www.eth4d.ethz.ch



INDUSTRY AND SOCIETY



For ETH Zurich, an important part of social responsibility is maintaining an open dialogue, because complex issues require the sharing of information between science, industry and society. In this way, the university makes socially relevant research topics accessible to a broader public and the campus becomes a venue for public debate and information events. It specifically supports the transfer of scientific findings to industry and fosters scientific collaboration with national and international corporations and SMEs.



INNOVATING TOGETHER

ETH Zurich works closely with industry. There is increasing emphasis on collaborations with small and medium-sized enterprises.

By Martin Bornhauser

Grinding rail tracks as efficiently as possible or preventing bacteria in salmon farms from producing molecules that cause unpleasant odours – these were among the innovations that ETH Zurich researchers worked on with partners from industry during 2019.

They were supported by Innosuisse, the Swiss Innovation Agency. The successor to the Swiss Federal Commission for Technology and Innovation (CTI), Innosuisse finances science-based innovation projects carried out by research institutions and companies.

"Innosuisse is an important partner for ETH Zurich," says Silvio Bonaccio, Head of ETH transfer. In 2019, the Innovation Agency approved 25 applications from ETH, resulting in a success rate of around 61 percent. Applications are assessed by experts from Innosuisse.

If the assessment is positive and the Innovation Council approves the project, the agency pays half the project

◀ Environmental microbiologist Mark Lever and his doctoral student Pascal Wiesli (centre and left) share ideas with a partner from industry.

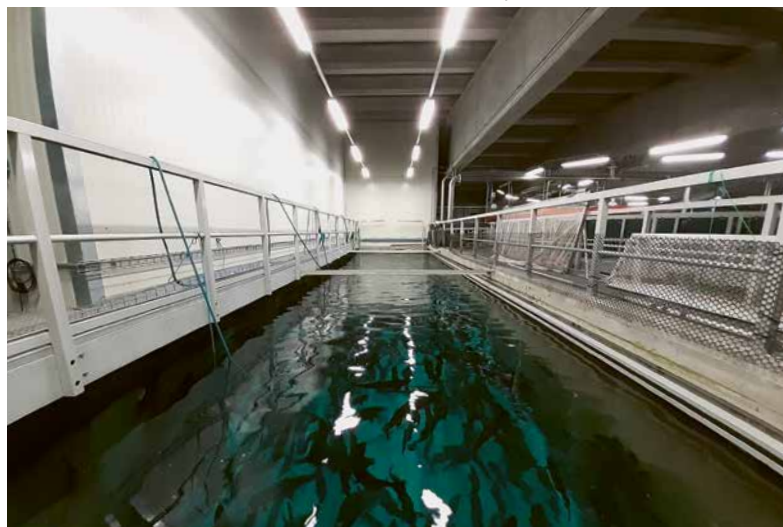
amount to the research partner, with the rest being paid by the participating company itself.

Industry Relations Manager Jan Zimmermann is also a fan of Innosuisse: "Our researchers are keen users of Innosuisse's services," he says. This is particularly true of established researchers who have a broad network of contacts with industry. Innosuisse is particularly involved in promoting innovation in SMEs, a goal that ETH Zurich is also pursuing. "Over 30 percent of ETH Zurich's projects with industry involve SMEs," says Zimmermann, emphasising the importance of research cooperation with small and medium-sized enterprises.

From rail transport to salmon farming

In the rail grinding project mentioned earlier, ETH Zurich's Institute of Machine Tools and Manufacturing works with Scheuchzer Ltd, which manufactures track-laying machines and "grinding trains". The background to the innovation project is that many lines of the Swiss rail network are exposed to heavy use, which means that the rails have to be ground regularly. The work has to be carried out as quickly and efficiently as possible so as not to impede railway operations. A grinding train currently has to make several passes over the rail when carrying out this re-profiling work. In future, grinding trains will only have to pass over the track once, thanks to the improved grinding process developed by ETH and Scheuchzer Ltd.

Researchers and industry are also working together on a project which aims to find out why bacteria in salmon farming produce molecules that cause odour emissions. Mark Lever, Assistant Professor in the Department of Environmental Systems Science at ETH Zurich, is taking part in the project, while Professor Lever's doctoral student Pascal Wiesli from the Zurich University of Applied Sciences (ZHAW) conducts experiments in Wädenswil.



▲ Sustainable salmon farming: Swiss Alpine Fish Ltd. in Lostalio feeds the fish without the use of chemicals or antibiotics.

The industrial partner is Swiss Alpine Fish Ltd. in Lostalio. While the fish are sustainably bred and fed without the use of chemicals or antibiotics, bacteria in biofilms in the water produce the alcoholic molecule geosmin.

"This molecule smells musty and its concentration in the water correlates with that in the salmon flesh," says Professor Lever. The unwanted odour reduces the price salmon fetch on the market.

"We are therefore looking to see which factors lead to bacterial production of geosmin." Tests have shown that

▼ To ensure that rail traffic is affected as little as possible when grinding rails, ETH researchers are working with a grinding train manufacturer to optimise the grinding process.



the choice of feed has an influence. "UVC radiation and the addition of ozone also change the geosmin concentration in the water," explains Lever.

Bridging the gap between research and application

The Bridge programme offered jointly by Innosuisse and the Swiss National Science Foundation builds a bridge from research to application. On the one hand, it supports junior researchers who want to test ideas to see whether they are feasible in reality. On the other hand, it can also benefit experienced researchers who want to put an innovation into practice.

In 2019, Volker Bartenbach was one of several members of ETH Zurich to benefit from Bridge. A Pioneer Fellow working in the Rehabilitation Engineering Laboratory, he launched a research project at ETH Zurich to develop exoskeletons for industrial applications. The wearable support systems are designed to protect the back during activities that put strain on the body, such as lifting and carrying heavy loads. With funds from Bridge, it is planned to spin off the research project from ETH Zurich.

ETH Zurich has a great deal else to offer companies and members of the university to promote cooperation between research and industry. The university's Industry Relations team provides special services for SMEs and supports companies and researchers submitting applications to Innosuisse. The Industry Relations offering includes a newsletter published every two months containing information about current ETH projects with industrial partners as well as events for industry. ETH transfer also helps researchers to draw up research contracts and patent their ideas.

ETH TRANSFER

TRANSFER OFFICE WINS AWARD

ETH transfer, the technology transfer office of ETH Zurich, won the award for Tech Transfer Unit of the Year from *Global University Venturing* magazine (GUV). This marked the first time the award was given to an institution outside the USA or UK, which indicates the highly successful and internationally competitive nature of technology transfer at ETH Zurich.

In particular, the efficient transfer of technology via ETH spin-offs gained recognition: with 30 new spin-offs in 2019, ETH Zurich was again able to increase the number of start-ups compared with the previous year. Detlef Günther, Vice President for Research and Corporate Relations, is delighted with the number of spin-off companies: "For ETH it is crucial that promising technologies and ideas arising from basic research are translated into businesses with high growth potential, thus creating new jobs."

ETH IN DAVOS

RETHINKING DESIGN

For the third time, ETH Zurich was present at the World Economic Forum (WEF) in Davos. Under the slogan Rethinking Design, the public science exhibition in the rooms of the Davos Hockey Club was dedicated to the question of how people should design their living space in the future and which materials could play a role in this.

The spectrum of exhibits ranged from game design, to a virtual reality tour of the Robotic Fabrication Lab, to new materials – for example, an "artificial tree" that converts CO₂ and light into solar fuel, lightweight fibres that can replace steel cables, or a new material that can be used to build computers in the future. The audience was as varied as the programme. School pupils met ETH alumni and local people met prominent figures from the worlds of politics, business and culture.

The star of the show was undoubtedly the four-legged, cat-sized, 3D-printed Skaterbot. It meandered slowly but not inelegantly across the ice in front of the pavilion, teaching itself to move on skates – thanks to artificial intelligence.

ETH organised numerous events for invited guests in its pavilion before, after and between the exhibition opening times. The first was a panel discussion entitled, "The Ethical Imperative". Chaired by Magdalena Skipper, editor-in-chief



of the journal *Nature*, Jean-Pierre Bourguignon from the European Research Council, Brian P. Schmidt, Nobel Prize winner and President of the Australian National University, and ETH Professor Gabriela Hug spoke about the necessity and feasibility of a code of ethics in science.

Other panels, organised with the support of companies such as Microsoft and Google, addressed the research area of artificial intelligence, which is central to the future of humanity.

▲ ETH alumni venture into a new reality at the exhibition.

▲ The Skaterbot takes to the ice – teaching itself to skate.

150 YEARS OF THE ALUMNI ASSOCIATION

CONNECT, ENGAGE, INSPIRE

The ETH Alumni Association celebrated its 150th anniversary in 2019. When it was founded in 1869, the then association of former students of the Swiss Federal Polytechnic School adopted statutes committing the association to work for the good of the school, cultivate relations among former students and support them in their professional interests. This still applies today. With its motto "Connecting – Engaging – Inspiring",

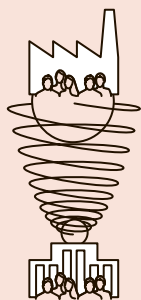
the association endeavours to maintain and expand the global network of ETH alumni. Today, the association has over 30,000 members who represent ETH Zurich as ambassadors all over the world.



▲ In May the alumni association celebrated its 150th anniversary.

IN DIALOGUE WITH INDUSTRY

At ETH Zurich's annual Industry Day, ETH researchers have the opportunity to present their work to businesses and people from industry and make useful contacts. In 2019, nearly 30 speakers and a record 80 exhibitors – including many new professors – took the opportunity to engage in dialogue with around 500 industry representatives.



OVERVIEW OF INDUSTRY AND SOCIETY

FROM SCIENCE TO INDUSTRY

Through knowledge and technology transfer, ETH Zurich makes a key contribution to Switzerland's development. Interaction with industry and business is firmly embedded in the university's strategy.

In addition to its core tasks of training specialists and conducting research, ETH Zurich makes a significant contribution to the innovation ecosystem of the greater Zurich area and to the economic success of Switzerland and society in general.

The university's primary aim is to **transfer knowledge and technologies to the marketplace** and convert them into new products, thereby creating new jobs in Switzerland.

To ensure the transfer of knowledge and technology, ETH has established various platforms and partnerships, which it is continuously developing. To help put research ideas into practice, it supports the spin-off of young companies, among other things through the **technology transfer office, ETH transfer**.

The number of **spin-offs** is rising steadily, and 30 new spin-offs were founded at ETH in 2019 (see page 34). Investor funds raised by ETH spin-offs also reached a new all-time high. The bulk of the venture capital totalling more than 640 million Swiss francs went to the company GetYourGuide. It is the university's first spin off to achieve a market valuation of over 1 billion US dollars, having raised almost 500 million dollars during a financing round in May (see page 10). The spin-off Dimpora, which is developing a biodegradable, mineral-based coating for outdoor clothing, also attracted international attention. In Stockholm, the company won second prize in the Global Change Award, worth 250,000 euros, for its "Sane Membrane".

To encourage creativity and inventiveness within the university, ETH also presents the annual **Spark Award** for scientific ideas.

In 2019, the prize for most promising invention went to Professor Raffaele Mezzenga's laboratory for developing a new type of filter that removes harmful fluoride from drinking water.

To mark Alfred Escher's 200th birthday in 2019, ETH Zurich inaugurated the **Alfred Escher Prize** for young innovators between the ages of 17 and 25.

ETH transfer achieved yet another success by winning the *Global University Venturing* (GUV) Award for Tech Transfer Unit of the Year.

In 2019 it became the first institution outside the USA or UK to receive this prize (see page 34). With its **Pioneer Fellowships**, ETH Zurich helps junior researchers to develop new products and services. The scholarships contribute significantly to the conversion of innovative research ideas into products or services. Since 2010, a total of 97 scholarships have been awarded, and 60 spin-offs have emerged from them to date. In the first half of 2019, ETH Zurich awarded four Pioneer Fellowships. Ten Pioneer Fellows are currently in the research programme. They benefit from the support of the **Innovation & Entrepreneurship Lab** (ieLab).

Platforms allowing regular interaction between science and industry are very important. **Industry Day** (see page 34), which has been a regular fixture since 2013, together with company visits and workshops, provide for such interaction. ETH is also active in various national innovation networks, including the **Swiss Technology Transfer Association (swiTT) and Innosuisse**.

In 2019, contacts between the university and industry resulted in projects like the Mixed Reality & Artificial Intelligence Laboratory, which was inaugurated by Microsoft in October and will work closely with ETH Zurich.

ETH Zurich's Mobility Initiative acquired another partner, namely Siemens Mobility Ltd. ETH Zurich also leads the ESA Business Incubation Centre Switzerland (ESA BIC CH), which supports high-tech start-ups related to space travel.

ESA BIC CH has already supported over 30 start-ups from all over Switzerland since it was founded in late 2016.

In the greater Zurich area, ETH is involved in the new **Switzerland Innovation Park Zurich**, which is being developed at Dübendorf Airfield. Here, multidisciplinary research teams will test new forms of cooperation with industry, with ETH contributing mainly in the areas of robotics and mobility. In Hangar 3, the Swissloop team that developed transport pods for the Hyperloop Pod Competition and various robotics research projects have already carried out tests. ETH plans to take over another hangar.