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science stories

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European Science Stories

Dear Reader

You may not yet be aware of how intensely the University of Zurich and ETH Zurich cooperate with the European Union and you may not yet know the manifold research possibilities presented by this cooperation. With this, our very first issue of Science Stories, we invite you to learn more about the fascinating world of science enabled by the financial means and within the networks of the EU. In this initial issue, Professor Adriano Aguzzi's portrait bears impressive witness to the importance of scientific cooperation within the European Framework Programmes for Research and illustrates vividly how these Programmes are at the same time fascinating, challenging, career enhancing, pioneering and innovative.

This journal introduces you to three scientists and their EU Research Projects. They talk about their experiences made during the proposal and implementation phases and consider the question of the scientific benefit generated by their research projects. You will see that the answer to this question differs for every project.

The young ETH Zurich Professor and EU Project newcomer Shana Sturla was awarded the prestigious ERC Starting Grant and thereby able to set up her first independent research group, achieving significant innovative findings within her area of research. The Science Story of her colleague, Professor Roland Siegwart, highlights the benefits of project coordination. He already has an excellent longstanding record of participating in EU Projects. The same is true for UZH Professor Adriano Aguzzi, who tells us how he managed to win an ERC Grant twice. He strongly recommends that young scientists participate in ERC Calls, thus confidently facing the European competition.

With these three initial success stories we would like to illustrate that research depends on international networking and open exchange – the EU Programmes are thereby a crucial instrument, also and particularly for Switzerland and its scientists. For more than 20 years, our scientists have participated effectively in EU Framework Programmes for Research and, within those, highly successfully so when it has come to ERC Grants. Already back in 1997, the two Zurich-based universities joined forces to support our researchers and established the joint EU GrantsAccess Office. The researchers portrayed in our three Science Stories were among the many who have been benefitting from the competent, individual counselling from EU GrantsAccess during every stage of an EU Project. However, because of the vote on the federal popular initiative against mass immigration, Switzerland lost its status of fully associated partner for Horizon 2020 and is currently merely partly associated in a provisional arrangement. Thus, a political solution must be found soon, so that Swiss universities as fully associated partners may continue to contribute our important share to a network of excellency within Europe.

We trust that the following pages will make interesting reading.

Detlef Günther
Vice President Research and Corporate Relations ETH Zurich

Christoph Hock
Vice President for Medicine and Science University of Zurich

Encounter with Shana

Predicting the risk of cancer

Chemicals in our diet can induce cancer. Shana Sturla is after the suspects. She is Professor for Food and Nutrition Toxicology at ETH Zurich and examines the complex molecular mechanisms that lead to the disease. Now she has found a new approach and is developing a tool to detect the damage at a very early stage. This might open the way for risk prediction and prevention. An encounter with the young scientist to talk about her research and her experience with ERC Grants.

She welcomes us with a cheerful smile when we enter her office in her lab at ETH Zurich. Shana Sturla already had a busy morning with a series of demanding meetings before we arrive. The paper for a science journal had to be re-edited with her senior scientist, the data of an experiment needed discussing with PhD students, the application for a new spectrometer had to be specified with her technician and speakers for an international conference had to be appointed by her and a professor colleague. To run a research lab of 26 staff members including 10 PhD students is quite demanding and requires a good deal of strategic planning and management as well as scientific creativity. The young American scientist Shana Sturla is obviously gifted in both of these fields. Six years ago, when she became Associate Professor of Food and Nutrition Toxicology at ETH Zurich, she started to build up her lab here. At the same time, she applied for an ERC Starting Grant and to her own surprise, she received it.

"The ERC Starting Grant really injected a big start into establishing the research program in our lab." Shana Sturla

Shana still remembers the moment that was so crucial for her career: "I got this ERC Grant as I came to Europe. I applied for it before I started my position at ETH and the Grant really injected a big start into establishing the research program. It allowed us to integrate several new team members, some who had come from the United States and some we newly added when I came to Europe. So the ERC Starting Grant offered me a great chance for a good start." She grabbed the opportunity and set out for an ambitious goal. Financed by the ERC Grant, she intended to develop a completely new strategy to explore the chemical damage in human DNA that can finally lead to cancer. The disease seems to be triggered by a minor change in the DNA of a person, which can be induced by smoking tobacco or by consuming foods

like cured meats. Some of their chemical substances react with the building blocks of a cell's DNA creating so-called DNA adducts. Up to now, it has been quite complicated and costly to detect them. But through their ERC project Shana and her team succeeded to find a new way to study DNA adducts. The project has just been completed when we meet Shana and she is more than happy with the outcome: "We made two important findings. In one way we created a new chemical approach to study the DNA damage. And using this approach we learned a lot of fundamental processes that control how an exposure to a chemical could then disrupt the biochemical machinery. And at the same time we realized that what we have on hand were new tools that could allow us to detect the chemical damage that is formed upon exposure to toxins." So her findings not only open a better scientific understanding of the processes which are at the very beginning of cancer but also are the key to new tools for further basic research as well as for future diagnostic strategies.

From basic research to a practical tool

Having realized this potential, in spring 2015 Shana Sturla applied for an ERC Proof of Concept Grant and she got it. She explains us what she would like to prove with this Grant: "Within the ERC Starting Grant project we had a result from which we developed a new probe that allowed us to detect damaged DNA bases within particular gene sequences. We could show this worked in experiments with model systems of synthetic samples. With the ERC Proof of Concept project, we will now work with real biological samples and see if our method works there as well." The target will be colorectal cancer and the biological samples will come from patients undergoing a routine check-up. Therefore, Shana and her team will collaborate with gastroenterologists. It is a small team of two scientists who will run this project within the next one and a half years and they have just started when we meet Shana. "Let's have a look into the lab", she suggests and leads us across the corridor. When we enter the lab, Céline Stäuble (photo on page 4), Shana's newly employed PhD student, is busy to prepare probes and calibrate the assay. Much preparation is needed before the team can begin to test if the probe also works with real biological samples.

> "At the same time we realized that what we have on hand were new tools that could allow to detect the chemical damage that is formed upon exposure to toxins." Shana Sturla on the result of her ERC Starting Grant project

Céline Stäuble will do these experiments, while Shana and Ioannis Trantakis (photo on page 4), the senior scientist who made the original discovery in the ERC project, will supervise the research and refine the commercialization plan. Shana intends to meet two goals by means of this project: First, to develop an assay that can be commercialized. For this purpose she collaborates with an ETH spin off company, which is producing the nanoparticles needed for the probe. And secondly, she would like to position the probe to be used on a large scale for prediction. "The medical community thinks a lot about

Shana Sturla

Shana Sturla has led the Laboratory of Food and Nutrition Toxicology at ETH Zurich since November 2009, and is a Tenured Associate Professor. She earned a degree in Chemistry from the University of California at Berkeley in 1996 and a PhD from the Massachusetts Institute of Technology in 2001. Following postdoctoral research at the University of Minnesota Cancer Center, she joined the faculty of the University of Minnesota, where she was an Assistant Professor from 2004 to 2009. She received a National Cancer Institute Career Development Award (2004) and the American Chemical Society Young Investigator in Toxicology Award (2014). The goal of her research is to understand how chemicals, such as diet-derived natural products or derivatives, impact disease incidence and treatment. Knowledge regarding molecular mechanisms of toxicity that will be gained from this research is expected to contribute to improved human health and disease prevention strategies.

European Research Council (ERC) Grants

Shana Sturla received an ERC Starting Grant in September 2010 of 1.5 million Euros for her project "DNA Adduct Molecular Probes: Elucidating the Diet-Cancer Connection at Chemical Resolution". The project ended in August 2015. In spring 2015, she was awarded an ERC Proof of Concept Grant of 150,000 Euros for the project "A Hot-Spot Bio-Barcode Strategy for Prognostic Biomarkers in Colorectal Cancer".

A new approach and a tool to detect DNA adducts

The onset of cancer is characterized by a minor change in a person's genetic material. A cell's DNA mutates in a particular area to the extent that the cell no longer divides in a orderly manner, but begins to grow uncontrollably. In many cases, this type of genetic mutation involves chemical changes to individual building blocks of DNA. These changes can be induced by smoking tobacco or consuming foods such as cured meats. This is because the contents of these materials can chemically react with and change building blocks of cellular DNA, thereby creating DNA adducts. Financed by the ERC Starting Grant, Shana Sturla and her team have succeeded for the first time in amplifying gene samples containing DNA adducts while retaining references to these adducts. This type of amplification is a prerequisite for the majority of technologies used by researchers to determine a gene's DNA sequence. In the future, it may therefore be possible to expand DNA sequencing from the four basic DNA building blocks to include adducts. The scientific community would have an important tool for providing a detailed analysis of the molecular mechanisms involved in the initiation of cancer and the corresponding risk factors.

The results which Shana Sturla and her team achieved are based on experiments with models for which the molecules were produced synthetically in the lab. The ERC Proof of Concept Award now opens the chance to test whether this probe developed on a model base also works with readily obtained biological samples. If the tests are successful, a tool would be developed which can be used for personalized exposure evaluation and risk prediction.

Source: ETH News January 15, 2015

https://www.ethz.ch/en/news-and-events/eth-news/news/2015/01/damaged-dna-amplified.html

early diagnosis, but at that stage the disease has already developed. What we would like to do is to take our knowledge of how the disease initiates and use it as a prognostic marker of an individual's possibility for developing the disease", Shana explains. And she has a very clear vision of the concrete result of her ERC Proof of Concept: "The result we hope for will be a product with which the damage can be detected in biological samples. This product will be very attractive for researchers in the field of epidemiology who do large scale investigations in people having particular diets or treated with particular drugs. Here, the product could help the scientists to detect damage in the DNA caused by food or drugs. And then, as a result of their data together with the availability of biomonitoring tools, we think we can shift the paradigm from early diagnosis to early risk prognosis." If Shana Sturla succeeds in reaching this goal, her ERC projects would turn out to be a keystone on the way to develop robust risk predictions of cancer and invest in prevention.

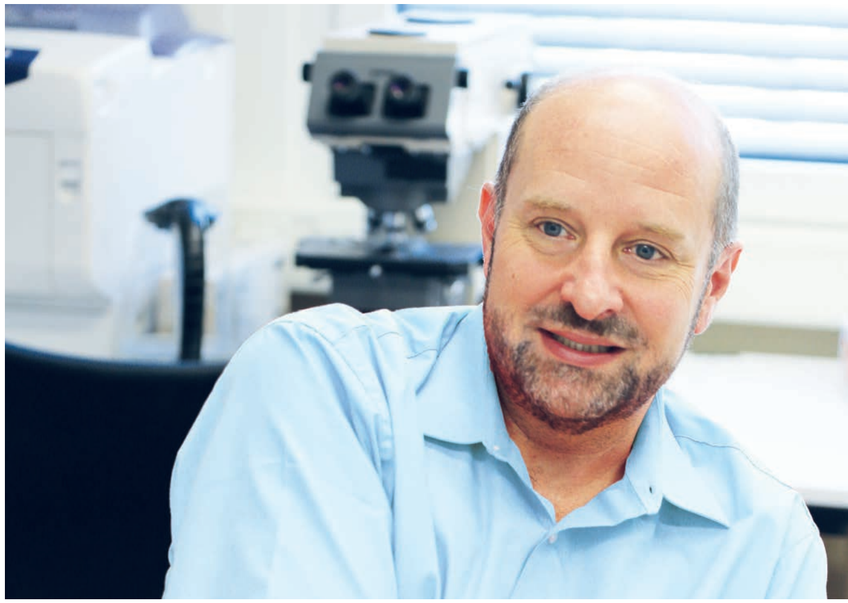
"What we would like to do is to take our knowledge of how the disease initiates and use it as a prognostic marker of an individual's possibility for developing the disease." Shana Sturla on her ERC Proof of Concept project

Back in her office, we ask Shana how she managed to apply for ERC Grants so successfully, even at the time when she was a newcomer. "I got support from the EU GrantsAccess Office of ETH and the University of Zurich, especially in the initiation phase but also during other steps", she answers.

"I would recommend that all new scientists who are at the stage I was when I joined ETH six years ago should apply for an ERC Grant." Shana Sturla.

"If I didn't have the EU GrantsAccess Office, I wouldn't know the next requirement to keep agreements on track and get the funding coming in." Before we say goodbye to Shana we want to know what she, based on her experience, would advise her younger colleagues regarding ERC funding. "I would recommend that all new scientists who are at the stage I was when I joined ETH six years ago should apply for an ERC Grant. They are at a stage of their career where they have a solid foundation of working independently and probably have a big idea for what to do next. An ERC Grant will help them to realize this idea", Shana says with a bright smile and rushes off to the next meeting.
● Rolf Probala

Interview clip: www.grantsaccess.ethz.ch



Science is exciting!

An interview with Adriano Aguzzi, Professor of Neuropathology at the University of Zurich.

Why Adriano Aguzzi loves team meetings, how he managed to acquire an ERC Advanced Grant for the second time, what he intends to do with the money, and why he thinks that Swiss science will decline if Switzerland and the EU do not find an agreement on the Free Movement of Persons.

You have just returned to your office after your weekly meeting with your team. What happens there?

For me, the weekly meeting is the highlight of the week. This is what I am looking forward to during the entire week, because this is when my lab members will explain what they have done, talk about the results, their interpretations, and what will be the next steps. So this is really what makes me tick as a scientist. I have a wonderful team of committed, clever, hard-working young scientists. It is always a pleasure to listen to them. Today was no exception.

It seems that this morning something excited you particularly?

Well, I am always like that (laughs). Science is exciting!

In 2010 you received your first ERC Advanced Grant (ERC AdG) within the EU 7th Framework Programme. It was completed in April 2015. What was the outcome?

We published around 35 papers, six of them in the top journals Science, Nature, and Cell. There have been almost 1000 citations of these papers until now and there will be more citations to come.

"Without my team, I would be nobody. This is the way science works today." Adriano Aguzzi

So I would say the scientific outcome of my first ERC AdG has been satisfactory. One might have different standards, but the outcome is reasonable. However, the most important impact is the recognition of scientific talent and the promotion of promising young scientists. This is even more important than our publications. I put a lot of effort into it.

In 2014, you successfully applied for another ERC AdG. What does it mean to you as a scientist to receive an ERC AdG twice?

Well, in essence it means that for the next five years I will not have to worry about how I am going to run my lab. There will be enough money to do that. It takes away all the preoccupation about paying salaries, buying equipment, etc. There is a truckload of money coming; the only thing we have to do is great science, which I think is an incredible privilege.

The focus of your grant is on prions

again. What is the scientific goal you wish to achieve?

I try to explain it in a very simple way: If you infect a cell with prions, this cell will replicate these prions very easily. It will amplify the infectious capability of a prion preparation ten thousand fold within a week. When you try to do the same in a cell-free environment, however, it works very poorly. We suggested that the cell contains a machinery that is capable of replicating prions very quickly. I have no idea what this machinery is, but the evidence that it does exist is compelling. So the primary goal of my second ERC AdG is to identify the physical components of this prion replication machinery. Once we have found it, it will satisfy my curiosity - of course. But it is likely that such a machine will also be a target for therapeutic intervention. Once you understand its physical nature, you can invent compounds that will block it and will prevent prion replication.

It does not occur very often that a scientist receives an ERC AdG twice. How did you manage to get it?

I was nervous about the second application, and I tried to maximize my chances. So, I ran a sort of internal competition within the lab. Every one of my co-workers postdocs, PhD students, even master students were invited to deliver a one page abstract, saying what they would like to do. Then we went through an iterative process, selecting the most promising ideas, developing them into full proposals and making a coherent story out of them. It was a true team effort. It is not that I sat in my little office and tried to invent something on my own. I really involved the entire team in this.

So the acquisition of the Grant was a team achievement?

Absolutely. Without my team, I would be nobody. This is the way science works today.

You are very experienced with both types of EU science funding, ERC Grants as well as collaborative projects. Where do you see the main differences in managing them?

They are completely different animals. The spirit is totally different. The 7th Framework Programme and Horizon 2020 collaborative projects typically address societal needs. So this is what happens: The EU sets up a questionnaire and asks a bunch of „stakeholders" about what they think are the important things that science should do in Europe. Stakeholders are often scientists, but of a sort that is politically more well-connected than me. They come up with some fields of activity, and then a call is issued by the European Union. The EU says, we have a problem, which could be pollution, or a disease, or whatever. It then continues to say: "Ok, you scientists make up a consortium with different capabilities." You apply by stating: "We are good at doing exactly this, and therefore we would like to be funded to solve this problem." It is similar to what we call „contract research"; there are deliverables, there are milestones - but the research is typically not curiosity-driven.

The ERC scheme is completely different. It is the scientist who says: "Look, I have a brilliant idea and I want to put it into practice." The ERC does not make any restrictions. You can have any kind of ideas. I do not put a value on these two models. They are both needed and important. But they couldn't be more different from each other.

Based on your experience, what would you recommend to a young scientist who wishes to apply for an EU Grant?

My recommendation is: By all means, apply for an ERC Grant! If successful, this will do wonders to your science and to your career. But the competition is brutal, so you better do the best job you can! I was a referee on the first round of ERC applications at the very beginning. We had 300 grants to award and there were 9'000 applicants; so the rejection rate was 97%, the success rate 3%. But if you don't compete, you can be sure that you will not get a grant. Therefore do compete! I am happy to advise any young scientist who considers applying for an ERC Grant. Call me up, send me an email; I am happy to meet and to tell you what I think is a good way of doing these things. Indeed, I have suggested to my friends Fritjof Helmchen and Roland Martin, who were also awarded an ERC AdG, that we should do a round table for scientists of the University of Zurich on „how to win an ERC". They were enthusiastic about this proposal!

Let us talk about Horizon 2020. Are you happy with the orientation and the design of Horizon 2020?

It's a compromise. To some extent, I worry that the European Union is putting too much emphasis on applied research. If you look at how big problems have been solved in the past, it has often happened by chance. For example, Howard Temin and David Baltimore were studying tumor viruses in mice that were not of any interest to anybody except a small number of scientists. Yet their research laid the foundation for understanding AIDS, for developing diagnostics tests, and now possibly vaccines. Hence, I think it is a fallacy to believe that all science can be undertaken through an engineering approach, where you say: "Ok, we are here at A. We have to go to B and these are the steps we need to undertake." Sometimes this approach works wonderfully. And sometimes it fails miserably. I say it again: we need a portfolio of different approaches, but I am a bit worried that the European Union is putting too much emphasis on research that will – allegedly resolve the problems of humankind.

Up to now Swiss scientists can participate as a partially associated country in Horizon 2020. But this could end by 2016 if Swiss politicians do not find an agreement with the EU on the disputed topic of Free Movement of Persons. What would it mean to Switzerland if there is no agreement?

This development is indeed fateful. Being able to recruit the best scientists from the entire world is always the winning propositi-

Adriano Aguzzi

Adriano Aguzzi is a Professor of Neuropathology and has been the Director of the Institute of Neuropathology at the University of Zurich since 1998. He is one of the most distinguished specialists on prion pathology in Europe. For more than 20 years, he has engaged in the research of prions and prion diseases like Mad Cow Disease (BSE) and Creutzfeldt-Jakob disease, as well as other neurodegenerative diseases like Alzheimer's and Parkinson's disease, where prion-like phenomena play a crucial role. Adriano Aguzzi studied medicine at the Albert-Ludwig-University of Freiburg (Germany), with stints at the University of Basel and at Columbia University (USA). He trained at the University Hospital Zurich and at the Institute of Molecular Pathology in Vienna. Adriano Aguzzi established the Swiss National Reference Centre for Prion Diseases in 1995. For his pioneering research on prions and prion pathogenesis he was awarded the EMBO Gold Medal (1998), the Robert Koch Prize (2003), the Antonio Feltrinelli Prize (2013), and together with Charles Weismann the Hartwig Piepenbrock - DZNE Prize (2013).

European Research Council (ERC) Grants

Adriano Aguzzi received several SNSF grants and participated in collaborative EU projects. Since his recruitment to the University of Zurich, he has acquired over 47 million CHF in competitive extramural funds. In May 2010, he was awarded an ERC Advanced Grant of 2.5 million Euros for his project "The prion protein in health and disease". In spring 2015, he received a second ERC Advanced Grant of 2.5 million Euros for the project "Function and malfunction of the prion protein."

A morning with Adriano Aguzzi's team

Thursday is a very special day in the life of Adriano Aguzzi. Every Thursday morning at nine o'clock sharp, he and his team meet for the weekly progress report. Attendance is compulsory for all members of the group. On this bright morning, 24 postdocs, PhD students and co-workers sit at the tables in the meeting room of the University Hospital Zurich with their cups of coffee when Adriano Aguzzi enters. He grabs a coffee as well, rushes to his chair and welcomes his team with a few cheerful remarks. Then the highlight of the day begins: The presentations of new results and insights by the team's scientists.

The highlights of the day

Today, it is Assunta Senatore's and Silvia Sorce's turn (photo on page 8). They both are postdocs and involved in prion research. Assunta starts by presenting the design and the latest results of her experiments to detect the expression of a mutated prion protein which is linked to genetic prion diseases. She is also trying to develop a new tool that would help to detect and measure this protein. Searching for tools is very typical for research on prions, because suitable methodologies and clever technologies are a prerequisite to reach an understanding of the prion pathogenesis and to ultimately develop a therapy. Assunta's results appear to be another promising step on the long journey to understanding prion pathology. Adriano Aguzzi reacts quite enthusiastically to her presentation, and a lively scientific discussion ensues among the team before Silvia Sorce begins the second presentation of this morning. She reports on the progress of her longitudinal study in which she is examining what happens in the brain of mice during the course of prion disease. "She has come up with a truly spectacular and unexpected finding", Adriano Aguzzi reveals to us later when we meet him for the interview. There is another round of intensive scientific debate after Silvia's presentation, until the meeting closes at eleven o'clock and everybody hurries back to the lab.

Working here opens doors

We take this opportunity to have a short talk with the two postdocs. Assunta Senatore is a biotechnologist, while Silvia Sorce holds a degree in Pharmaceutical Chemistry. They both originate from Italy, but had acquired their PhD in London and Geneva, respectively, before they applied for a postdoc position at Adriano Aguzzi's lab. Why did they want to come here? Assunta has a simple and clear answer: "This is one of the best labs in the world. Here you may profit from conditions and possibilities you hardly find anywhere else. Having been here opens doors for you." And Silvia adds: "The equipment and the technical support are excellent. There is a team of brilliant people on all levels. It is challenging to work here, but very inspiring." Indeed, Adriano Aguzzi has been very successful in attracting promising young scientists as well as in raising funds, which has allowed him to equip his lab with state-of-the-art technologies. He has just installed a brand new device which can do complex screenings of thousands of different samples in a very short time. In addition, he has hired a PhD student who will calibrate and adjust the processes of this new machine. The fact that Adriano Aguzzi has received another ERC Advanced Grant has further heightened the reputation of his lab within the international science community. Asking the two postdocs Assunta and Silvia about their dreams, they both reply that they would like to pursue an academic career. Being successful postdocs in Adriano Aguzzi's team ensures that they have a realistic perspective to make their dream come true

on, and Switzerland has understood this for many decades. A big part of our welfare and of our wealth depends on this. At the moment Switzerland is the number one worldwide in scientific productivity, for patent applications, etc. For most indicators we are at the top! Once we are no longer at the top, and this is likely to happen if we are kicked out of the ERC system, we run the risk of entering a spiral of decline which will be very difficult to revert. I have seen this happen in my home country, in Italy. The people are excellent, but no foreigner wants to go to Italy because the research environment is not so good. Therefore the research deteriorates. Consequently, even fewer good people come to Italy. Even Italians working abroad don't want to move back to Italy if offered a position! All this creates a vicious circle, from which it is almost impossible to escape.

But one can argue that Switzerland can afford to hire the best scientists from all over the world without participating in EU programmes like Horizon 2020.

(Shaking his head) I don't think this corresponds to reality. Even now it is difficult to hire scientists from outside Europe. Every time I have a brilliant applicant from India or China or even from the United States or Canada, it is incredibly cumbersome to get them a working permit. The Office for Economy and Labor, which is responsible for administering working permits, is unbelievably fiscal and narrow-minded. If these restrictions are also going to apply to European citizens, the attractiveness of Switzerland to scientists from abroad will definitely decline. I think we are shooting ourselves in the foot this way.

Imagine, Switzerland will not find an agreement with the EU. What would this mean to your lab?

I foresee a lot of trouble. I foresee an exodus of talented people, possibly a decline in the scientific output of my lab. I have very clear goals in my mind. I have another 11 years to go until my retirement and I want to reach these goals. In the end, if I cannot reach them in Switzerland because of these things, I also have to draw some conclusions. Switzerland has been great to me. Being an Italian immigrant, I have been living here for more than 20 years and this place has become my home. I am very grateful to the University of Zurich, the canton of Zurich, the University Hospital Zurich and the Swiss National Science Foundation for enabling me to put some of my scientific dreams into reality. I think, what I have been able to do here until now I would not have been able to do anywhere else in the world. But if these truly optimal conditions change, and I will no longer be able to do my work, then I will have to rethink my choices.

You said you still have 11 years to realize your scientific dreams. What would you like to achieve within this timeframe?

11 years are not an incredibly long time span! This means that I have to hurry up finding out exactly how prions propagate, how they replicate, how they damage the brain and what we can do against it. These are the goals for the final chapter of my tenure at the University of Zurich.

And you are confident you will reach these goals?

(Laughing) I think if I could get a third ERC AdG I might be able to reach them. And if I were to get a fourth one, maybe the University of Zurich might rethink its retirement ruling and grant me a few extra years!

● Rolf Probala

Interview clip: www.grantsaccess.ethz.ch

Prions

Prions are proteins in the bodies of humans and animals. The normal prion protein is important for the maintenance of peripheral nerves, through mechanisms that are still largely unknown. Normally, the prion protein is harmless, but it has a terrible characteristic: It can change its shape and become dangerous. Misfolded prions move from cell to cell and infect other healthy prions causing them to change their shape as well. Finally, a stream of misfolded prions reaches the brain, where they aggregate in neurons and gradually destroy the tissue. Human beings can be infected by pathogenetic prions that enter the body from outside. This happened in the 80's and 90's when people ate beef from cattle infected with BSE (Mad Cow Disease). However, prions can also misfold spontaneously. Even after more than 20 years of research, prions have not revealed all their secrets. We still do not know, for instance, which molecules are instrumental to change the shape of prions, and in which way the infected prions damage the brain.

A glimpse of the future

Driverless parking and charging for e-Mobility.

Imagine, you drive your e-car to go shopping. In front of the shopping mall you order your car to the parking area with a simple click on a button of your smartphone. Your car moves autonomously to the parking lot and drives into a vacant parking bay. If the car needs recharging the battery, it moves to a nearby recharging station first, before it parks itself. When you are done shopping, you just hit the button on your smartphone and your car arrives to pick you up at the entrance of the shopping mall.

It's on a sunny morning in July 2015, on a car park deck of the Amsterdam Schiphol Airport. A group of journalists from Ireland are watching a car moving slowly out of a parking lot, driving a round on the park floor, stopping to let a pedestrian cross and a car pass and finally parking itself over a mat, which inductively will charge its batteries. The Irish journalists are excited. There is no driver in the car! It is magically driving itself, led by a couple of on-board cameras and sensors as well as a 3D map of the building in its software system. "We just witnessed another important glimpse of motoring future", comments the astonished automotive expert Eddie Cunningham (photo on page 14) from the Irish Independent Newspaper to Roland Siegwart from ETH Zurich, standing just beside him.

The Irish journalists were flown in this morning by Volkswagen to join a promotion event for the new hybrid model Passat GTE. And they are not the only ones. The car manufacturer has rented a whole parking floor at the Amsterdam airport for ten days for its promotion campaign and flies in groups of journalists from all over Europe on a daily basis. But besides presenting the new hybrid model, VW also takes the opportunity to offer a glance into the future by presenting a self-parking and self-charging e-car. It is the result of "V-charge", the EU-financed project jointly run by four universities and two partners from industry: Volkswagen and Bosch. Roland Siegwart, Professor of Autonomous Systems at ETH Zurich, is one of the fathers of "V-Charge". Over coffee at the parking floor at Amsterdam Airport, he tells us how an idea turned into a successful project. In 2010, he met Jan Effertz from Volkswagen during a conference on autonomous cars. The two researchers quickly realized that they shared a common vision and common interests. Still at the conference, they sketched a draft for a joint EU project, set the goals and discussed suitable partners. A few months later, Roland Siegwart on behalf of Volkswagen, Bosch and four European universities submitted the project of a self-parking and charging car to the EU Commission.

EU GrantsAccess' Project Management Group attempts to assist researchers from the University of Zurich and ETH Zurich that are coordinating the so-called collaborative research projects within Horizon 2020. Such collaborative projects mostly require the coordination of a 3-4 year period including mostly between 8 to 15 partner institutions from all over Europe. Members of the Project Management Group are then full members of the UZH or ETH Zurich coordinator's consortium and take over the administrative parts of the project. Regina Notz, leader of the Project Management Group, was managing "V-Charge" over the last four years and is already teaming up again with Roland Siegwart for his new collaborative research project called "Flourish" as a coordinator.

Members of EU GrantsAccess' Project Management Group: Katharina Eggenberger, Regina Notz, Jonas Oehler, Luca Wacker

„Thanks to Regina Notz of EU GrantsAccess who took care of all administrative coordination matters I was able to fully concentrate on the scientific advances. She organized highly competent meetings, collected reportings from partners and negotiated possible ambiguities with the European Commission."
Roland Siegwart

The project was approved and "V-Charge" started in 2011 with Roland Siegwart taking the lead as coordinator. Now, as the project has come to its end, Roland Siegwart decided to fly to Amsterdam for a day to see how journalists react to the demonstration of "V-Charge". He is quite happy about the great interest and the positive reactions. But he is even happier about the scientific and technical results and the impact of the project on his team. "As a university we are educating young people. In this project they learnt how to manage complexity and to collaborate with others in very interdisciplinary teams with different partners in an international environment." As another great asset, Roland Siegwart mentions the collaboration with industry. "It is important to have partners like Volkswagen or Bosch, which set the specifications and goals on the part of the industry, so we are really challenged to move towards a useful technology. You can't do it in an office or lab at the university. You really need the interaction with people who know about the application and who later also evaluate the results of our research. Industry pushes you towards demonstrating what the true values of your results are."

Many good reasons to join EU collaborative projects

Roland Siegwart is a very experienced project coordinator. "V-charge" has been his fourth EU-funded project as a coordinator and there were four others he guided as co-coordinator. Many of his academic colleagues are reluctant when it comes to coordinating an EU project. They are afraid of the administration and EU bureaucracy. We ask Roland Siegwart why he likes to coordinate projects. He has a clear answer: "As a coordinator you are really at the forefront to define the vision. You can specify what the goal should be and you can also invite the partners. My experience is that in all projects with ETH coordination, we were very successful in having the projects approved." And regarding EU administration he adds: "Some people overestimate the bureaucracy with Brussels. It is not their goal to produce a lot of administration. Many of these projects are pretty lean." So what is the key to be successful in coordinating an EU-funded project? Roland Siegwart has a precise strategy: "Above all, you need competence, complementary and small teams. Then it is easy to run projects on this level. If you have large consortia it is more difficult. I think something between four and six partners is ideal." Based on his experience, Roland Siegwart strongly recommends scientists to apply for EU funds. "It is a really good funding source which allows to have a critical mass of people working together. It is not only one PhD student; ultimately, there are probably 20 PhD students, postdocs, scientists and technicians working together. The impact is much greater and together with the industry you also have to measure your results towards real application." For young scientists he has a special advice: "I would probably not recommend that very young scientists, e.g. assistant professors on tenure track, coordinate a project. But they should really join a consortium with good partners and then do great research. It also helps the PhD students which are involved in the project to exchange with other PhD students, with industry partners, which is a very strong added value for research and collabo-

Roland Siegwart

Roland Siegwart is founding Co-Director of "Wyss Zurich" and Professor for Autonomous Mobile Robots at ETH Zurich. He studied mechanical engineering at ETH, spent ten years as professor at EPFL (1996 to 2006), was Vice President of ETH Zurich (2010 to 2014) and held visiting positions at Stanford University and NASA's Ames Research Center. Roland Siegwart was the coordinator of multiple European projects and co-founder of half a dozen spin-off companies. He is recipient of the IEEE RAS Inaba Technical Award, IEEE Fellow and Officer of the International Federation of Robotics Research (IFRR). Furthermore, he is on the editorial board of multiple journals in robotics and acted as general chair at several conferences in robotics, including IROS 2002, AIM 2007, FSR 2007 and ISRR 2009. His interests are in the design and navigation of wheeled, walking and flying robots operating in complex and highly dynamical environments.

EU projects

Roland Siegwart has been participating in numerous EU collaborative projects as coordinator or partner. He also coordinated "V-Charge: Automated Valet Parking and Charging for e-Mobility", a collaborative research project between universities and industry (contract #269916). Project partners were ETH Zurich, the universities of Braunschweig, Oxford and Parma as well as the companies Bosch GmbH and Volkswagen AG. The project was supported with funding from EU's Seventh Framework Programme for Research and Innovation and had an overall budget of 5.63 million Euros. It started on June 1, 2011 and was completed on September 30, 2015.

ration." And what does he recommend young scientists consider when they wish to successfully propose their project to Brussels? "It's not enough to simply get five friends together and see what could be done together. It is really the best way to have a clear vision to begin with, originating from a small discussion group of two to three people and then go forward to inviting others. It is not about doing a project with friends. It is about defining a vision which is convincing and gathering the best partners."

Self-parking cars within 10 years

In the meantime, the Irish journalists have left the parking floor. Gradually, further groups of journalists form Scandinavia, the Baltic States and Belgium appear at the demonstration site on this July morning at Amsterdam airport. All of them are surprised when the "V-Charge" car turns up without driver and they are quite impressed by the "glimpse of motoring future" they are witnessing. Many of them want to know when self-parking and self-recharging cars will be part of our real life. Roland Siegwart and Wojciech Derendarz, who is responsible for the project at Volkswagen, admit that there are still a number of obstacles to be overcome. One of the problems is to equip all parking facilities with electronic maps that the car can download into its electronic system.

"Some people overestimate the bureaucracy with Brussels." Roland Siegwart.

Wojciech Derendarz assumes that the system could be ready for operation by the end of this decade on some single floors in some limited numbers of car parks. But he believes that it will take another decade until self-parking and self-charging cars will be part of the normal mixed traffic. However, the future is just around the corner. The results of the "V-Charge" project will pass now from the research to the development department of Volkswagen. And Roland Siegwart has agreed on a follow-up project with the car manufacturer. At the end of this day in Amsterdam, on the flight back to Zurich, he tells us about his new EU-funded project within the Horizon 2020 framework that he will coordinate. Its name is "Flourish" and it is all about robotics helping to improve farming. But this would be another story.
● Rolf Probala

Interview clip: www.grantsaccess.ethz.ch

V-CHARGE - Pragmatic innovation

A car, equipped with a smart system, can drive autonomously in a designated area (e.g. valet parking, park and ride, airport parking), stop at a recharge station in the parking lot, charge its battery and then move to a free parking space to wait there until it is called to drive back and pick up its owner.

This was the goal of the project "V-Charge". To reach the goal, the project team equipped a normal car with cameras and ultrasonic sensors arranging them for a 360 grade coverage of the surroundings. Connected to a remote parking slot server the vehicle receives a specially designed map for localisation and road-networking information for the parking lot. The localisation map stores visual information of all the places in the parking facility, enabling the car to determine its position with respect to the map by using its camera images. This technology does not rely on GPS sensors and allows the car to navigate also in indoors environments such as underground parking spaces where GPS is not available and was perfected to provide centimetre-level accuracy. Thanks to its smart system, the car can also recognize other moving vehicle and pedestrian in order to stop, when they cross. In the background, the parking lot server computes a time schedule for the car, based on the requested drop-off and pickup times, making the most efficient use of a potentially limited number of charging stations by prioritising imminent pickups. The owner of the car communicates with its vehicle by smartphone, simply pushing a bottom to send the car off and to call it back. The V-Charge team used contemporary cameras and close-to-market sensors, which are already installed in most of the up-to-date cars today. Work remains to be done to achieve higher levels of automation in the mapping processes and enable multiple automated vehicles to constantly contribute data to keep maps up to date. Allowing the system to learn behaviours of other road users and improve navigation over time will further promote smooth integration into everyday mixed-traffic operation.

Source: Press Release V-Charge, July 2015

EU GrantsAccess – An Office with a Long History

Ever since 2001, Sofia Karakostas and Agatha Keller are heading the joint counselling centre of the University of Zurich and ETH Zurich which, back then, was still very young and had just recently been joined together. Step by step, the two of them have adapted the services to both the scientists and the changing environments of the European research landscape and they have used the resulting opportunities for the benefit of Zurich. Based on its volume of currently supported EU Projects and its long-term permanence, EU GrantsAccess, member of the Swiss-wide information network Euresearch, is nowadays renowned to be one of the leading counselling centres in the area of European Research Programmes.

Agatha Keller and Sofia Karakostas can rely on many years of experience and therefore have a wide-ranging national and international network of useful contacts at their disposal. They are currently heading a team of 19 people with diverse backgrounds, constantly strengthening their expertise in the various fields that are necessary for a successful research proposal. Even though the main focus of EU GrantsAccess is the current European Framework Programme for Research and Innovation Horizon 2020 (2014-2020), there has been an increasing demand for advise on US grants over the last years, mainly NIH and NSF. The objective is to lift the sometimes immense administrative burden from the researchers' shoulders and thus support scientific excellency, academic freedom, creativity and innovation on a global level.

With the Science Stories, EU GrantsAccess aims to give researchers their personal medium to tell their story in their own words. The magazine at hand allows researchers to give advise and useful insight to their peers that allows them to navigate through the challenging world of writing international research proposals, shows them how to successfully manage large consortia as well as how to kick off a young research career. EU GrantsAccess is looking forward to learn about many more sensational stories from researchers in the greater Zurich area. Thus, do not hesitate to contact us for advise and counselling, but also approach us with your personal science story.

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