swiTTreport2019

SWISS TECHNOLOGY TRANSFER REPORT

swiTT
swiss technology transfer association

Share your BICAR

Zurich University of Applied Sciences zh aw School of Engineering

CO_2-FREE MOBILITY FOR A NEW URBAN LIFESTYLE

Problem – Challenge

Increasing traffic congestion and a new regulatory framework set by the EU in the field of environmental protection call for new strategies for more sustainable urban transportation systems. More than 60 cities in Europe will partially or completely ban the use of private fossil fuel-powered cars soon, meaning a huge opportunity for new individual mobility solutions. Current micro-mobility solutions (e-bikes and e-scooters) are only attractive to "the young and the fit", as they require confidence to drive a 2-wheel vehicle in city traffic. No weather protection is provided, and usage fluctuates heavily depending on season and weather.

Solution

In 2014, a research team led by Ing. Adrian Burri and Dr. Ing. Hans Jörg Dennig at the Zurich University of Applied Sciences (ZHAW) initiated work on a new vision for an innovative individual eco-friendly mobility solution. Two years of research and development activities led to the creation of a forward-looking product for urban mobility, the BICAR. After extensive positive feedback from mobility experts, visitors at fairs and end costumers, Ing. Burri and Dr. Dennig founded the ZHAW spin-off company "Share Your BICAR AG" (SYB) in 2016 with the goal of finalizing and commercializing the BICAR. The BICAR is designed for individual users to cover short and medium distances in urban areas. BICAR is the lightest (100 kg) and smallest (only 0.8 m wide and 1.55 m long) electrically powered three-wheel vehicle on the market (patent pending). It is radically sustainable and emission-free, will be Cradle to Cradle® certified and energy autonomous with integrated solar cells and a back-up Swap Battery System. According to very conservative calculations, one ton of CO_2 will be saved per BICAR per year. (https://www.bicar.ch)

Driving BICAR is not only fun. With BICAR, commuting, using Park&Ride, covering the first mile to the public transport connection becomes easier and more comfortable. BICAR can already be reserved in advance and will cost CHF 7000.

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SUMMARY

The annual survey "swiTTreport" is the most comprehensive analysis of the technology transfer activities of Swiss public research organisations (PRO). The report covers two main areas, a) research contracts of the participating institutions with private or public partners, and b) the activities for the economic exploitation of research results from these institutions. The Swiss PRO interact very actively with partners in the economy. These activities are collectively designated in the report as "technology transfer" (TT) activities.

Data on technology transfer activities from eight cantonal universities and the two Federal Institutes of Technology (collectively Universities), from six universities of applied sciences (UAS), and three research institutions of the ETH domain (RI) were available for this year's report.

Overall, the respondents reported the following indicators on technology transfer activities in 2018:

3895	New Research Contracts
662	Invention Disclosures
357	Priority Patent Applications
273	License & Option Agreements
89	Start-Ups founded

ZUSAMMENFASSUNG

Der jährlich publizierte "swiTTreport" ist die umfassendste Analyse der Technologietransferaktivitäten öffentlicher Forschungsinstitutionen (PRO) in der Schweiz. Dieser Bericht umfasst zwei Hauptbereiche: Forschungsverträge mit privaten und öffentlichen Institutionen und die wirtschaftliche Verwertung von Forschungsergebnissen. Diese Aktivitäten werden häufig auch unter dem Begriff „Technologietransfer" zusammengefasst. Der Bericht zeigt, dass die schweizerischen PRO sehr aktiv und erfolgreich mit der Wirtschaft interagieren.

Der Bericht umfasst die Aktivitäten von acht kantonalen Universitäten und der beiden ETHs (zusammengefasst unter Universitäten), von sechs Fachhochschulen (UAS) und von drei Forschungsinstitutionen des ETH-Bereichs (RI).

Insgesamt rapportierten die teilnehmenden Institutionen die folgenden Kennzahlen über ihre Technologietransferaktivitäten im Jahr 2018:

3895	Neue Forschungsverträge
662	Erfindungsmeldungen
357	Patentanmeldungen
273	Lizenz- & Optionsvereinbarungen
89	Start-Ups gegründet

RÉSUMÉ

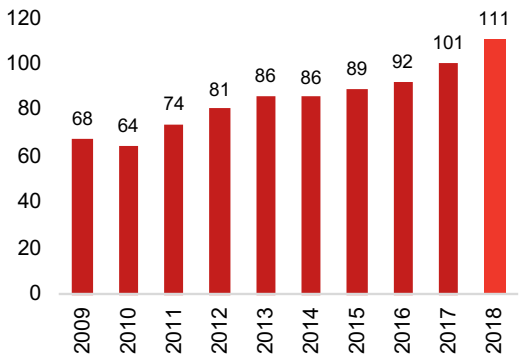
L'analyse présente est la plus exhaustive connue sur les activités de transfert de technologies réalisées par les institutions publiques de recherche suisses. Le rapport couvre deux aspects principaux: les contrats de recherche de ces institutions avec des partenaires privés ou publics et les activités liées à la valorisation des résultats de recherche obtenus par ces institutions. Ce rapport désigne collectivement ces collaborations et activités de valorisation sous les termes de transfert de technologies (TT).

Ces données proviennent de huit universités cantonales et deux Ecoles Polytechniques fédérales (Universités), de six universités de sciences appliquées (UAS) et de trois institutions de recherche dans le domaine des Ecoles Polytechniques Fédérales EPF (RI).

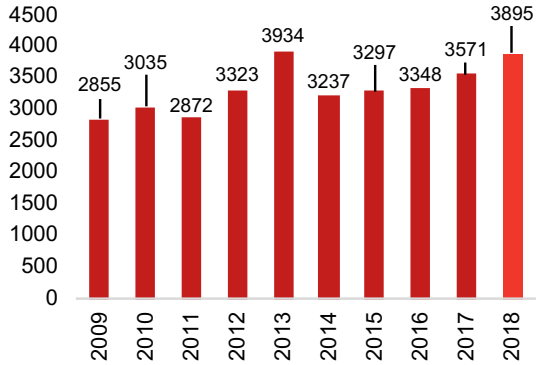
Dans l'ensemble, les personnes interrogées ont communiqué les chiffres clés suivants sur les activités de TT en 2018:

3895	Nouvelles contracts de recherche
662	Déclarations d'invention
357	Demandes de brevets
273	Contrats de licence et accords d'option
89	Créations de start-ups

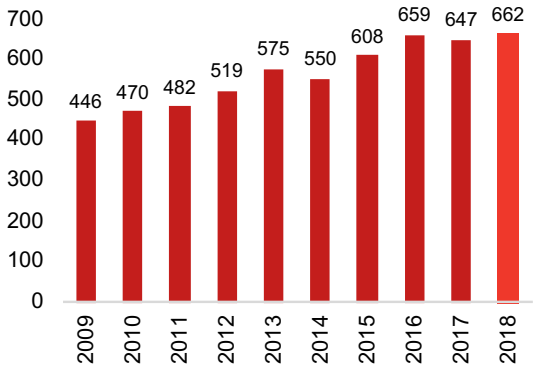
Full Time Equivalents (total)



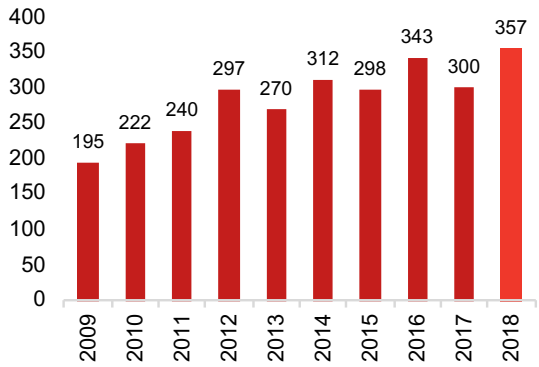
Research Contracts (total)



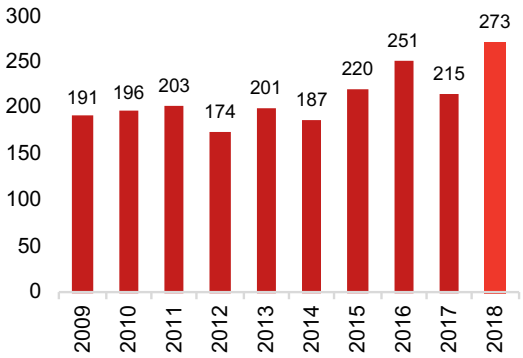
Invention Disclosures (total)



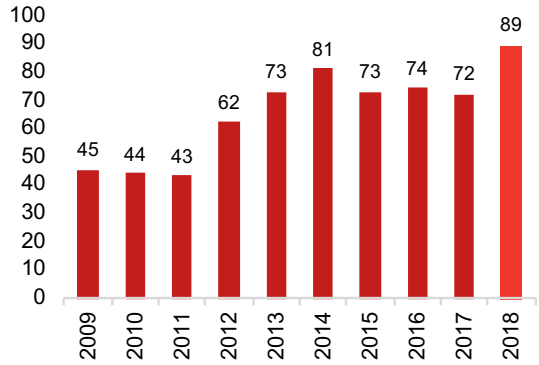
Patent Applications (total)



License Contracts (total)



Start-Ups (total)



Data of the last ten years showed a solid outcome of the TT activities in Switzerland.

CASE STUDY

ETH zürich SEERVISION

ROBOTIC CAMERA OPERATORS FOR PROFESSIONAL EVENT RECORDING

Problem – Challenge

Professional events are ideally recorded with a multi-camera system in order to offer the spectators the best overview on the live action and simultaneously a feeling of proximity. Very often, however, a production crew has to make do with fewer cameras, as the personnel cost for the camera operators is too high.

Solution

ETH researchers have developed an autonomous multi-camera system, which requires just one human camera operator, who commands all the cameras. The human operator is responsible of the creative tasks such as defining the field of view or which objects to track, while the autonomous camera system takes over the routine work like long-term tracking of people on stage, balls in a sports-field or cars in a race.

The challenges for implementing such a system are manifold. One aspect is choosing the right hardware for the robotic camera head, such as the motors and encoders, to mimic the smooth movements of a human camera operator. Another aspect is the actual tracking of an object. The researchers have built a custom-trained neural network, which analyzes frames from the live stream, computes the spatial position of the objects, and sends commands to the controller unit. Also important is a dedicated software, which predicts the real-time movement of the objects and plans camera and lens control according to cinematographic rules, that is, the optimal placement of an object within the frame.

The technology drew the attention of a Swiss production company. The inventors and the company joined forces and collaborated within the framework of an Innosuisse project. The project was very successful and laid the foundation of the ETH spin-off Seervision. The founding team are ETH inventors Nikolaos Kariotoglou and Reto Hofmann and their Innosuisse project partner Conrad von Grebel. Seervision's pilot product "The World's Most Advanced AI Cameraman" is market-ready.

1. PARTICIPATING INSTITUTIONS AND DATA COLLECTION

Two Swiss Federal Institutes of Technology (ETH) and eight cantonal universities (collectively "Universities"), seven universities of applied sciences (UAS), and three research institutes (RI) in the ETH domain were contacted in spring 2019 and asked to provide data on their technology transfer (TT) activities for the year 2018. The expression "technology transfer" used in this report covers the activities of these institutions with regard to research collaborations with partners from the economy and the commercialization of research results for the benefit of the economy and society overall.

The questionnaire was returned by all members of Universities and RI, as well as individual departments of six UAS. The data show that the handling of research collaborations with economic partners and other technology transfer activities varies substantially among different institutions. Of note: not all of them were able to provide a comprehensive overview and hence all aggregated data showed in this report represent the lower boundary of the actual situation. Appendix 1 shows the institutions that participated in the survey and comments on the comprehensiveness of the data provided.

The report mostly provides aggregate data for the three types of institutions covered in this survey. For those institutions that agreed to disclose individual data some key figures are listed in Appendix 3.

Comments on data received by the different types of institutions:

Universities
At several universities, only contracts for collaborative research projects with economic partners above a certain threshold need to be signed by university management. Therefore, not all collaborative projects can be reported by such institutions. Activities in research and technology transfer at university hospitals are usually closely linked to the respective university, hence the services of these TTOs are also available to researchers at the hospitals.

UAS
The management of technology transfer activities at the UAS varies widely among institutions and individual departments. Some departments or schools have professionals working in a centralized TTO and are able to provide comprehensive data. At other departments or schools, no centralized support functions exist and data are fragmentary or completely lacking.

RI
The research institutions that participated in the survey have centralized support functions providing technology transfer services for the researchers.

CASE STUDY

Bern University of Applied Sciences

SELECTIVE RETINA THERAPY WITH A NOVEL LASER

Problem – Challenge

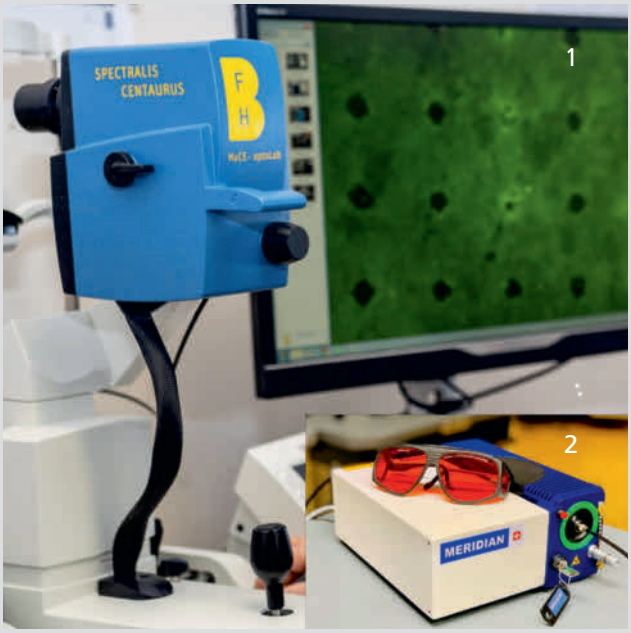
Laser photocoagulation of the retina has been performed for the treatment of diseased eyes for more than 40 years. The procedure enables coagulation and denaturation of retinal layers by the deposition of heat in the tissue. However, for treatment of retinal pigment epithelium (RPE) linked pathologies, e.g. diabetic retinopathy, the excessive adjacent tissue damage – and especially the denaturation of the photoreceptor layer – is considered to be disproportionate. An alternative treatment approach is selective retina therapy (SRT). SRT specifically targets RPE cells while sparing the surrounding tissue by using microsecond laser pulses, preventing unwanted side effects and scotoma. The selective treatment effects on the RPE are ophthalmoscopically invisible which makes the procedure difficult for the physician. In addition, lasers which optimally support SRT parameters are not readily available on the market. Therefore, a device for proper spatial spot application, documentation and laser dosing control is required, as well as a suitable laser.

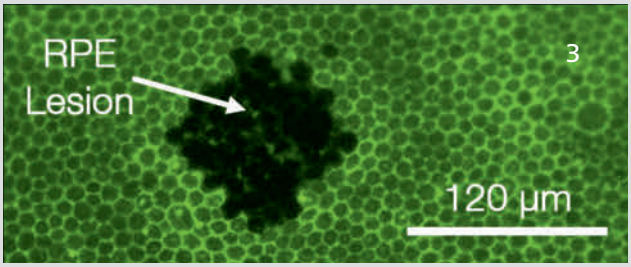
Solution

This was realized, by the Institute for Human Centered Engineering HuCE of the Bern University of Applied Sciences BFH, in a device called SPECTRALIS CENTAURUS which is a modified conventional optical coherence tomography (OCT) platform (Heidelberg Engineering, Heidelberg, DE). This system allows the treating physician to control SRT with OCT. Furthermore, a novel SRT laser has been realized together with the industrial partner Meridian AG (Thun, CH).

The SPECTRALIS CENTAURUS and the novel laser allow to perform fundamental and applied research. In experiments on ex-vivo pig eyes and RPE explants the OCT imaging function and the laser are used to investigate and improve SRT. Results show, that the combination of OCT and SRT in one system can be used for automated dose-control. Furthermore, the novel laser shows promising results by targeting the RPE with pulse durations from 2 µs to 20 µs. In general, results show that OCT as real-time dosimetry has the potential to establish SRT as standard therapy for retinal pathologies.

Currently available SRT lasers deliver pulses with a duration of 1.7 µs. The newly developed laser has adjustment options that make it possible to adapt the treatment to the highly individual retina absorption properties of patients. Thereby, the modified laser can still be used for its original purpose, which makes it suitable to treat the whole range from SRT up to laser photocoagulation. This opens market opportunities for Meridian because the laser is unique.





1
SPECTRALIS CENTAURUS
(upgraded Spectralis OCT platform,
Heidelberg Engineering, Heidelberg, DE)

2
Novel SRT laser from Meridian AG

3
Close-up view of a porcine RPE explant showing
a rectangular SRT lesion

2. INSTITUTIONAL RESOURCES FOR TECHNOLOGY TRANSFER

2.1 Services Provided

All University TTO are handling contracts for research collaborations. However, at several Institutions the finalization of research agreements with the support of a centralised administrative department (e.g. TTO) is not mandatory, or not all contracts are covered (e.g. contracts for EU project or contracts <50 kCHF not included). All University TTO deal with the handling and commercialization of intellectual property (IP), which includes the evaluation of the commercialization potential of products or services based on research results, the protection and management of IP, and the licensing or sale of IP to industrial partners. Seven of ten TTO at Universities also provided support for the coaching of start-up projects.

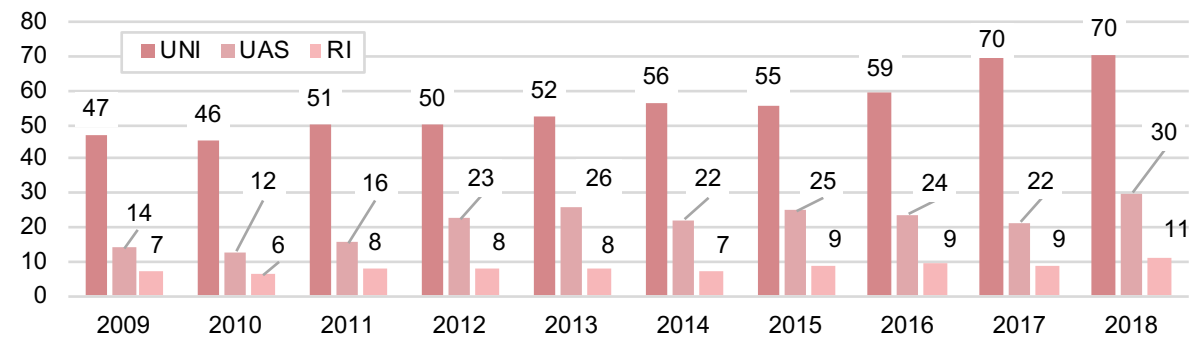
Five of six UAS TTO and all RI TTO offer support for research collaborations. Five out of six UAS TTO and all TTO of RI deal with the management of IP. The commercialization of IP is supported by all RI TTO and by five of six UAS TTO. Coaching of start-up projects is offered by four UAS TTO and one RI TTO.

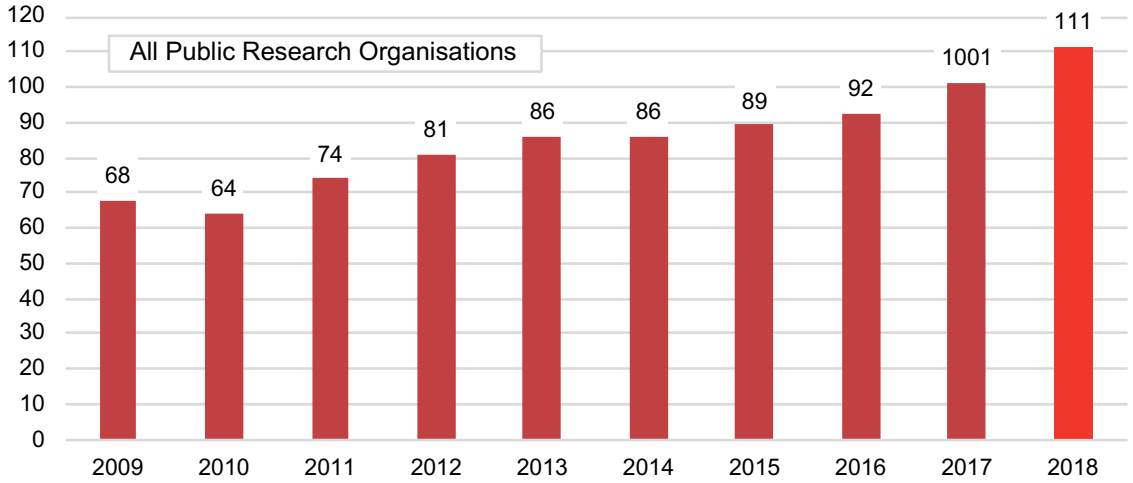
2.2 Staffing

Staffing refers to the number of full-time equivalents (FTE) employed for TT activities at an institution. These are professionals such as licensing, intellectual property, technology or research contract managers and administrational staff, whose main occupation is in the area of technology transfer. Their activities cover the drafting and negotiating of research and cooperation agreements, intellectual property management, patent portfolio management, patent, technology licensing and other technology transfer activities. Part of the staff may also be involved in the coaching of start-up projects.

TTO typically collaborate with external patent firms for the drafting, filing and prosecution of patent applications and may address specific legal issues to external attorneys. Several TTO also outsource legal issues to external attorneys. At some institutions, start-up projects are handled by dedicated organizations such as business incubators.

Fig.1: Development of staffing level / Full Time Equivalents FTE





3. RESEARCH CONTRACTS WITH PARTNERS

3.1 Research Contracts Handled by the TTO

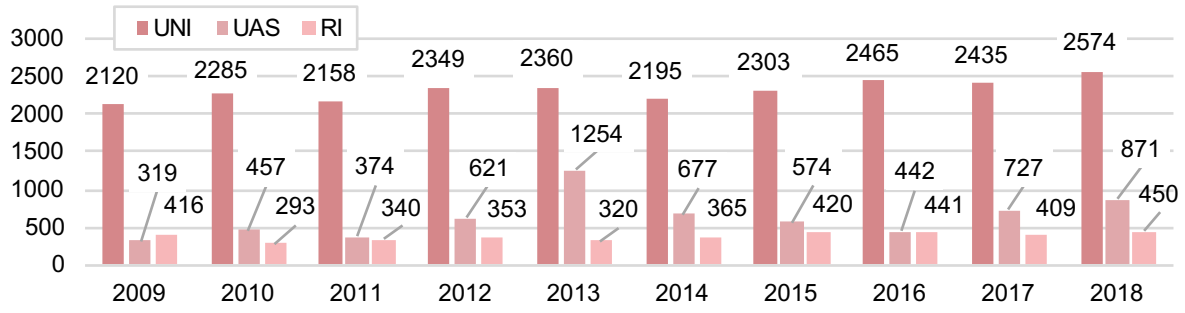
In 2018, the TTO handled a total of 3895 research contracts with economic and public partners, a plus of 9% over the previous year. This number includes collaboration agreements, clinical trial agreements, Innosuisse IPR and EU collaboration agreements. SNSF projects (with funding provisions) are only included in these numbers if they involve multiple partners and therefore require a collaboration agreement.

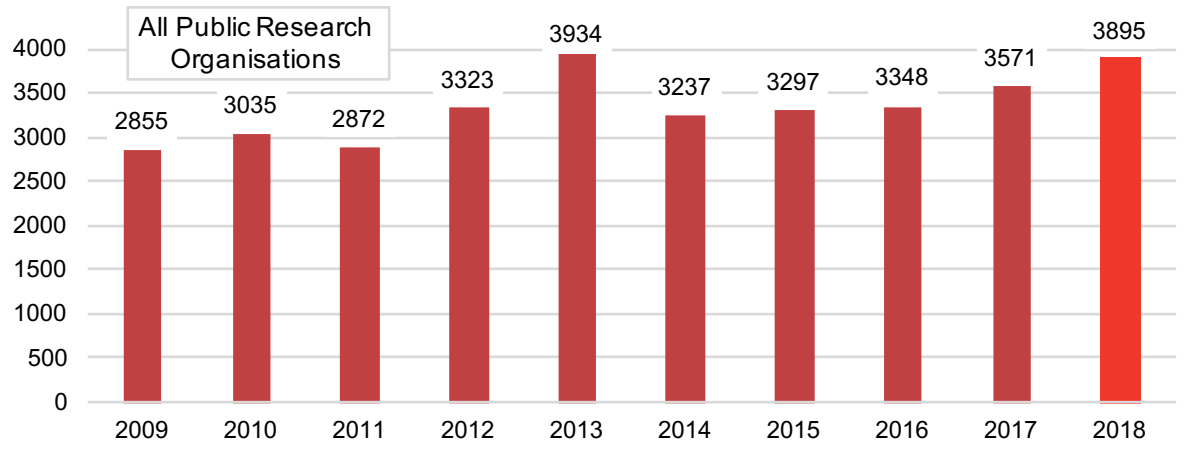
Research collaborations between academia and industry are a key aspect of TT, they do indeed represent various possible benefits to academia and the economy. They not only allow industry to access the know-how and infrastructure of academia, companies also gain access to academic talents through such collaborations.

Likewise, academic labs can also benefit from the know-how and infrastructure of the industrial partners. In addition, the funding of joint projects by partners from the economy may account for a significant contribution to the research budgets of certain PRO. Such collaborations are also a great opportunities to feed and enrich each other in cutting edge innovation areas. In this context, research collaborations are most important for TT.

In addition to research collaborations, TTO handle other types of agreements which foster the cooperation between academia and economic partners, such as consulting agreements, material transfer agreements (MTA), and non-disclosure agreements (NDA). In 2018, the institutions reported altogether 4308 (+40%) such other types of TT agreements.

Fig. 2: Number of Research Agreements and EU Contracts Handled by TTO





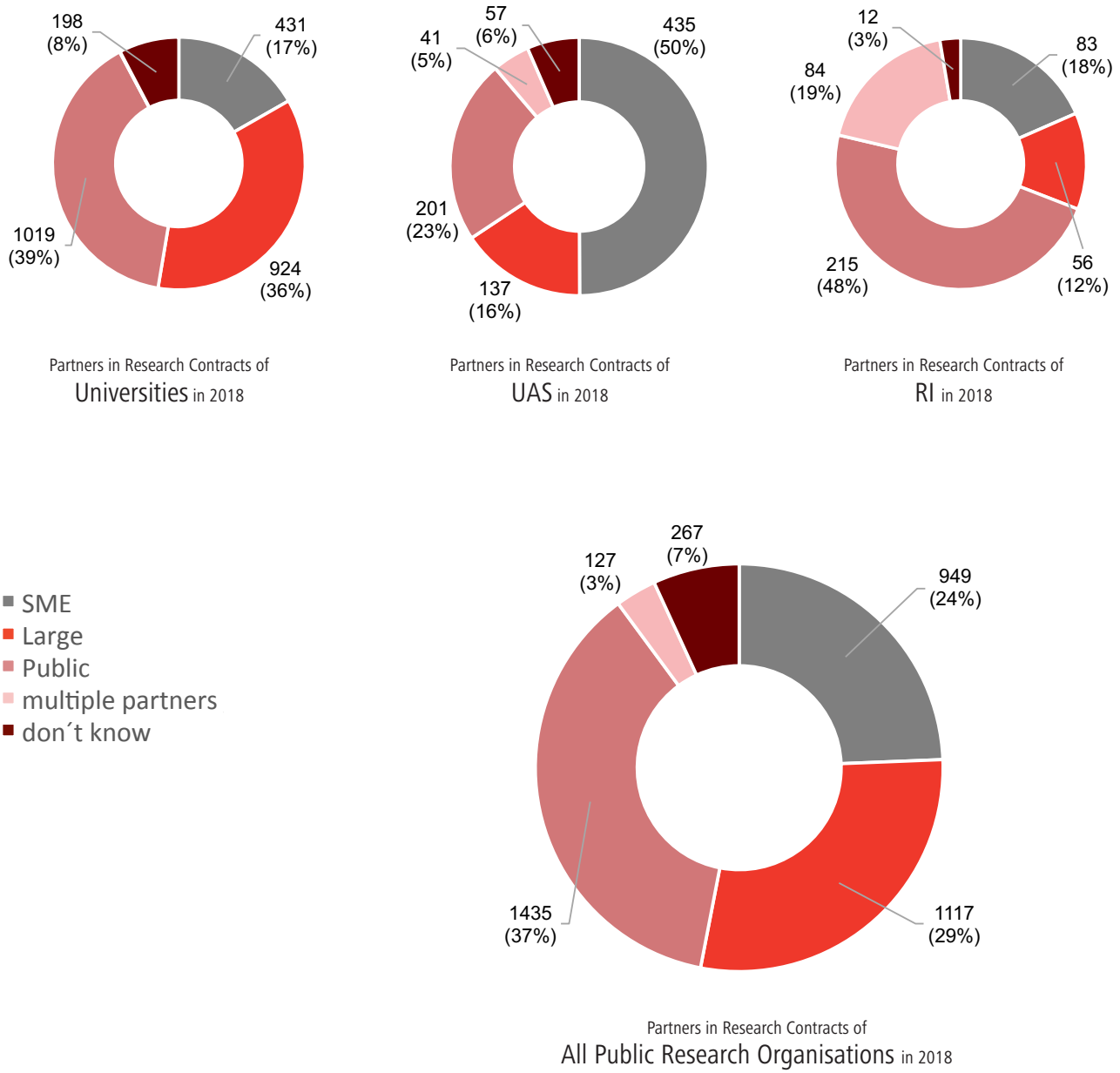
3.2 Type of Collaboration Partners

With regard to the type of collaboration partner, the small- and medium-sized enterprises (SME), i.e. companies with fewer than 250 employees, account for 24.4% of total research contracts reported for 2018, which is a significant increase compared to the 17.1% reported for 2017.

The shares for contracts with large companies and with multiple partners are almost on the same level as in the previous year, whereas the number of executed contracts with the public sector show a slight decrease (36.8% in 2018 compared to 42.5% in 2017).

If one considers only reported collaborative projects with the private sector (SME plus large Companies), SME account for 46 % (2017 38%) of all projects with commercial partners.

Fig.3: Partners in Research Contracts



CASE STUDY

FLAME RETARDANT TEXTILES

Problem – Challenge

Polyamide 6 (PA6) is one of the most used polyamides. Application areas are industrial textiles in automobiles, aviation, carpets or ropes, but also in sports or leisure textiles. One major drawback is its high flammability and the fact that large quantities of toxic gases are released when it burns. Halogen free flame retardant PA6 is commercially not available because of the lack of a flame retardant additive which is compatible with PA6 thermal processing and does not affect PA6 mechanical properties.

Solution

Empa's laboratory of advanced fibers has a long-standing experience in the chemistry of flame retardant additives, with several patent protected compound series which are developed in collaboration with industry.

After a successful preliminary project backed by Innosuisse, Empa researchers teamed up with the company Litrax to ready a new flame-retardant additive called L11 for the market. L11, for which a patent application was filed in 2018, is halogen-free, drip-free, can be processed into granules for fiber production via melt extrusion with PA6, and shows outstanding flame-retardant properties (LOI of 32) without compromising the good mechanical properties of the fibers.

The approval procedure is currently in progress under the EU chemicals regulation REACH and due for completion this or next year. Then nothing else stands in the way of marketing the flame-retardant polyamide fibers.

CASE STUDY

TRUVIS Imaging & Visualization

Universität Basel

DIGITAL RECREATION OF VISUAL IMPRESSIONS OF OBJECTS

Problem – Challenge

Photography was and still is an important tool for the documentation of objects of all kind. A digital image is a common way to disseminate the visual impression of surfaces, colors and the shape of an object. Illumination is thereby very important to point out attributes of the object. Unfortunately, photography is static. It represents an object as it looked like while it was captured. This makes it impossible to alter the scene the object was captures later on.

Solution

Truvis Authentica is a solution to capture the objects surface structure in a single process. The resulting surface model allows for later re-illumination and exploration of any detail in high resolution and with the full possibility to alter the scene.

Truvis Authentica allows to create high quality visual impression of e.g. candle light or various repro light settings. The resulting composition can be exported as image (JPEG, TIFF) or as web component, that can be integrated in any website to be visualized without plug-ins.

Typical application of Authentica are e.g. cultural heritage imaging, e-commerce, quality control or web-sites that allow exploration of artworks, collections or products. Authentica can be bought as integrated, full system, as software only and as Software as a Service (www.truvis.ch).

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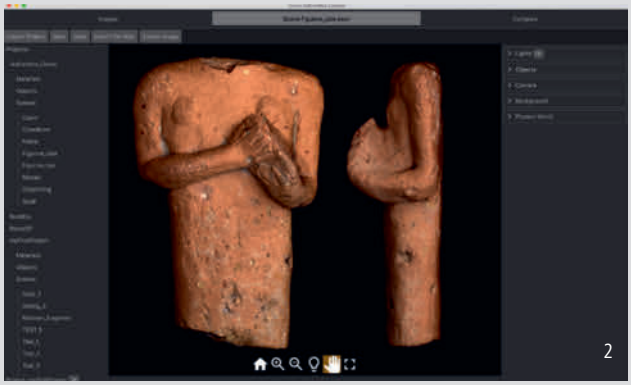

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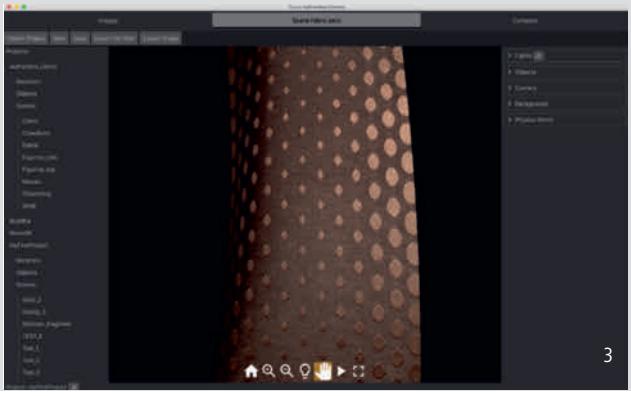


3

1
Light dome scope D50 for automated surface acquisition of objects or details

2
E-commerce application in the website of a made to measure suiting company

3
Authentica Creater software for scene composition and web-export

4. COMMERCIALIZATION ACTIVITIES

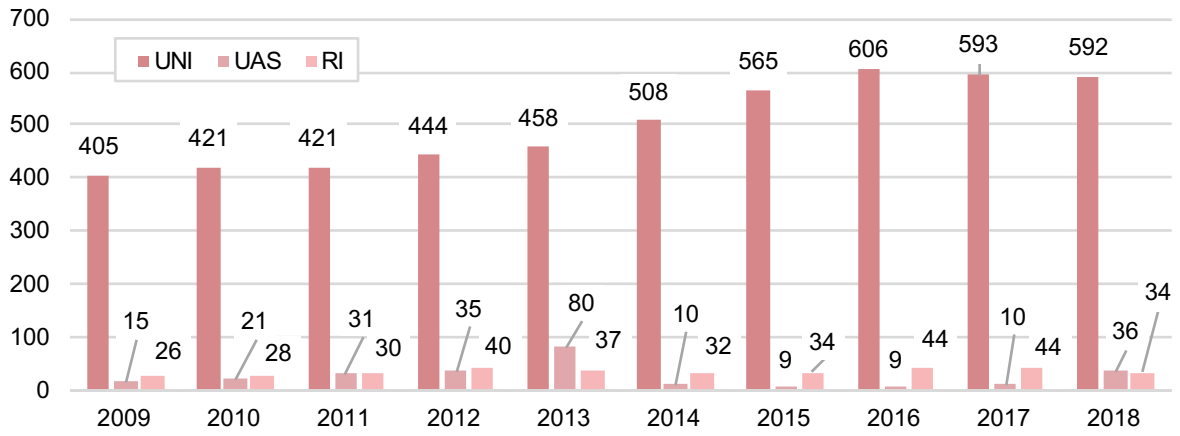
Research results of Universities, UAS and RI do have potential to form the basis for innovative products and services which are developed and later commercialized by companies. The public institutions strive to make research results with a potential for socio-economic impact available to the private sector. Usually this is done through licensing of technologies to companies. To raise the attractiveness of academic TT and licensing for industry, research results with socio-economic potential need to be screened and identified, and the corresponding intellectual property rights need to be secured. While software is usually protected by copyright, protection of most new technologies is sought in form of patent applications. Without an appropriate protection of the intellectual property, industrial or financial investors in many industry sectors will not consider investing for the research and development of products that are then free to be copied by competitors.

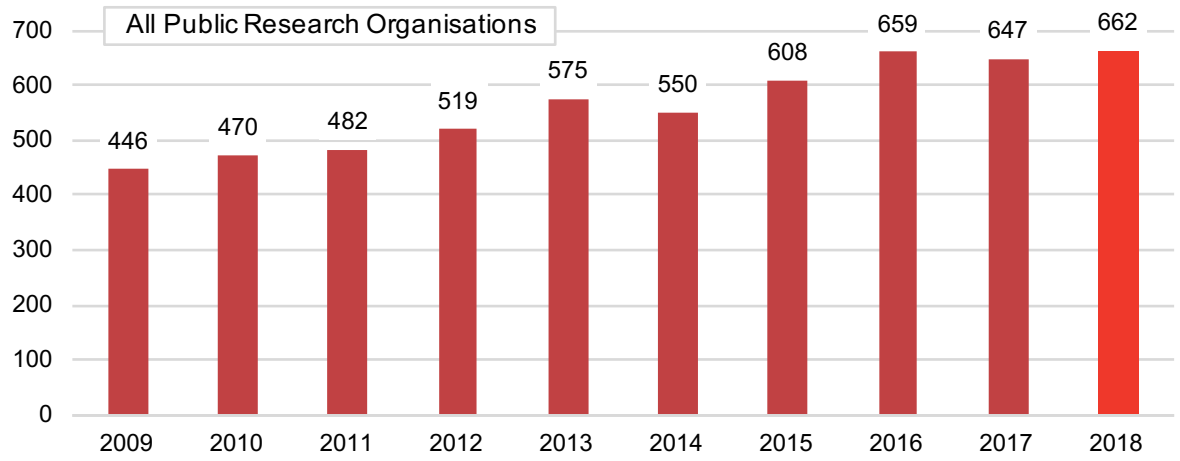
With regard to patentable inventions, this process involves the following main steps: identification and evaluation of research results through invention disclosures, filing of patent applications, identification of suitable licensing partners, negotiating and concluding license agreements with existing companies or newly created start-up companies. Within many institutions, the creation of such start-up companies is supported by various additional services. Sections 4.1 – 4.4. of this report describe the key TT indicators in relation to start-up activities from the participating institutions.

4.1 Invention Disclosures

A total number of 662 (+2%) invention disclosures were reported for 2018. The vast majority of invention disclosures were reported by Universities (89.5%). The three RI accounted for 5.1% of the invention disclosures, the UAS for 5.4%.

Fig.4: Number of Invention Disclosures





4.2 Patenting Activities

4.2.1 Priority Patent Applications

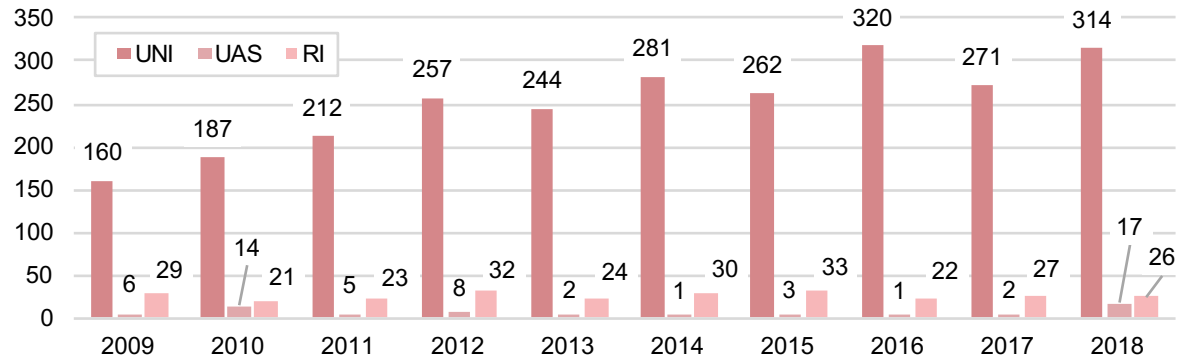
The protection of intellectual property in the form of patents is of great importance in many industry sectors. This is particularly true for industries with high product development costs and long product lifecycles, e.g. biotechnology and pharmaceuticals. The TTO at PRO must decide at an early stage about filing patent applications because patenting of an invention is no longer possible after the results have been rendered public in scientific journals or through other channels. Moreover, many companies will not consider evaluating a new technology if it is not protected by a patent. Thus, patenting activities of PRO can be a prerequisite for entering into a partnership with an industrial partner.

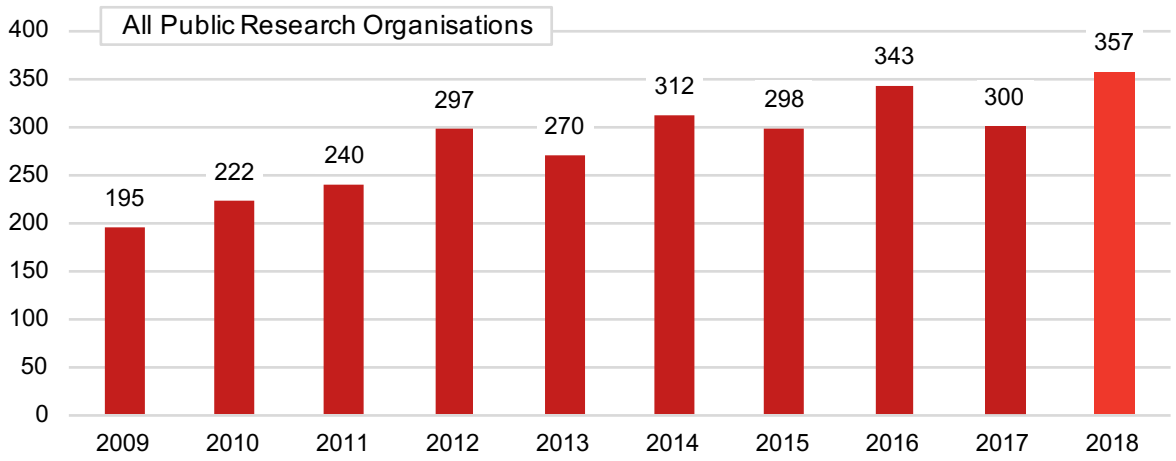
In total 88% of all patent applications were filed by Universities.

4.2.2 Patent Portfolio – Active Patent Cases End of 2018

At the end of 2018, the institutions participating in the survey reported 2611 (+3.7%) active patent cases which were either licensed to a company or for which they were searching for a licensee. Marketing of such technology opportunities is done by the PRO through various channels. Identifying the responsible person within the organization of a potential licensee is a challenge, and often existing contacts of researchers are used to approach companies. To support the research institutions in their technology marketing efforts, swiTT runs the searchable national technology portal swiTTlist (www.switt.ch/swittlist). swiTTlist provides industry with a quick and easy, up-to-date overview of current technology opportunities from Swiss PRO. TTO regularly upload new technologies on this searchable portal. With the help of an automatic alert system, company representatives are informed immediately each time a new technology is available in their field of interest.

Fig. 5: Number of Priority Patent Applications filed





CASE STUDY

ISO-CERTIFIED FISH CELL TOXICITY TEXT

Problem – Challenge

In 2017, more than 7,500 ecotoxicological tests were carried out on fish in Switzerland alone with the aim of protecting humans, animals and the environment. For many years, Eawag has been researching alternatives in order to reduce or even replace fish experiments. One of these alternatives involves experiments with a gill cell line of rainbow trout (RTgill W1 cell line), which can be used to reliably determine the acute toxicity of water samples and many chemicals to fish.

Solution

Eawag's Department of Environmental Toxicology has continuously refined the method over the last few years. In an international round-robin study, six laboratories from industry and academia took part and determined the robustness, transferability and comparability of the method with the RTgill-W1 cell line on the basis of six selected test chemicals. The results show that all laboratories were able to provide reproducibly comparable results using this procedure.

This methodology has recently also been extended to comply with ISO standards, which serve as standard references for researchers and manufacturers. The method is useful for e.g. effluent testing or in product development in order to decide in advance whether an animal experiment is worth carrying out or the product should further be pursued.

Yet, in order to replace fish tests for chemicals completely, regulators require an OECD norm first, thus an OECD submission is currently in preparation. Thanks to the ISO certification, the chances are good that the OECD fish cell test will soon be established. The Eawag spin-off aQuaTox-Solutions Ltd. offers animal-free alternative testing methods that are focusing on fish cells and fish embryos as test models. Of course they also have adopted the ISO certified-method as a service for industry and environmental authorities.

Images Empa

CASE STUDY

UNIVERSITÄT BERN

Optimeyes

FAST, PATIENT-SPECIFIC PLANNING OF CORNEAL SURGERY

Problem – Challenge

Every day, about 75'000 cataract operations take place worldwide; more than 90% of people over the age of 65, sooner or later, suffer from this condition. New technologies enable surgeons to go beyond simple visual rehabilitation by replacing the turbid lens: Refractive enhance-means in the course of surgery allow for correction of astigmatism, giving the patient a spectacle- free, clear vision.

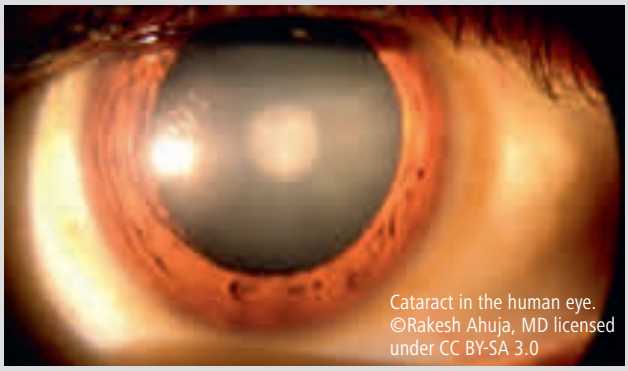
Correction of astigmatism depends on the accuracy of the surgery, considering the individual properties of the cornea. Unfortunately, currenly used planning methods of refractive cataract surgery are based on assuming a statistically averaged eye, which doesn't exist. Starting from a CTI funded project with the University of Bern, Optimo Medical AG decided to assume the challenge of personalized eye surgery planning.

Solution

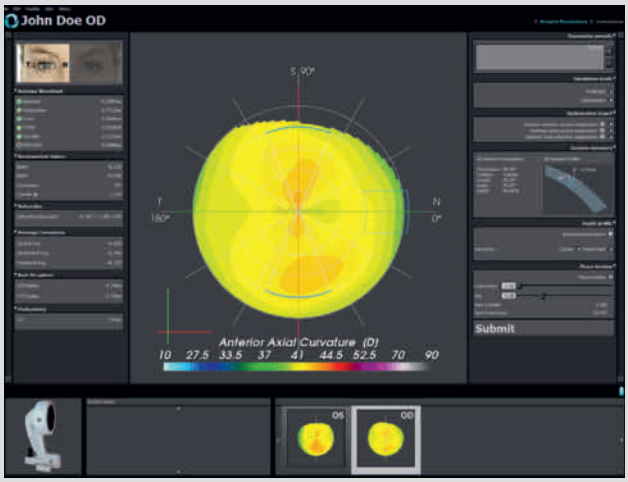
Optimeyes™ is a highly innovative planning software for cataract surgery based on state-of-the-art finite element modelling of the cornea. Based on uploaded patient derived CT-data, the software readily generates a "digital twin" of the patient's eye.

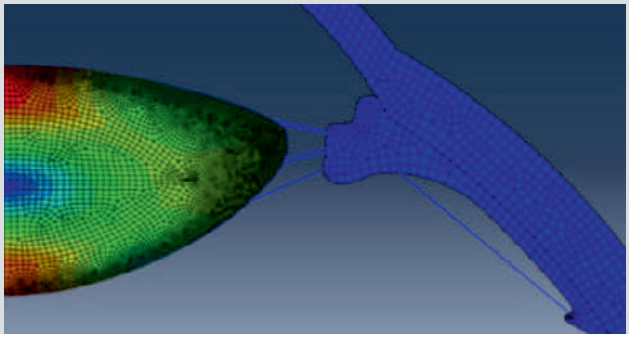
The surgeon then conducts a virtual surgery on the digital twin before the actual operation. This allows him/her to know the optimal surgery parameters for astigmatism management to give the best post-cataract surgery result and eliminate blurred or reduced vision. This method enables patients to regain clear vision by not only get rid of cataract but also the ability to see clear again to e.g. read TV subtitles or drive a car at night.

Optimeyes™ is based on years of research performed at the University of Bern. The software kernel and a patent application on efficient computing of eye models were licensed in from the University of Bern (http://www.optimo-medical.com).



Cataract in the human eye. ©Rakesh Ahuja, MD licensed under CC BY-SA 3.0





4.3 Licensing

4.3.1 Licenses and Sales of Intellectual Property (IP)

In 2018, overall 273 (+27%) new IP agreements, usually licenses, were reported, in a few cases the agreements involved a sale of the IP rather than a license. In total 83.5% of all agreements were handled by Universities.

4.3.2 Type of Licensing Partners

PRO regularly license technologies to their start-up companies, that are included in the SME share. Thus, start-up companies play an important role in developing university technologies. Depending on the industry segment and on the particular product these companies will either market the final products themselves or will sublicense the technologies to larger companies that have the necessary know-how and resources to bring the product successfully on to the market.

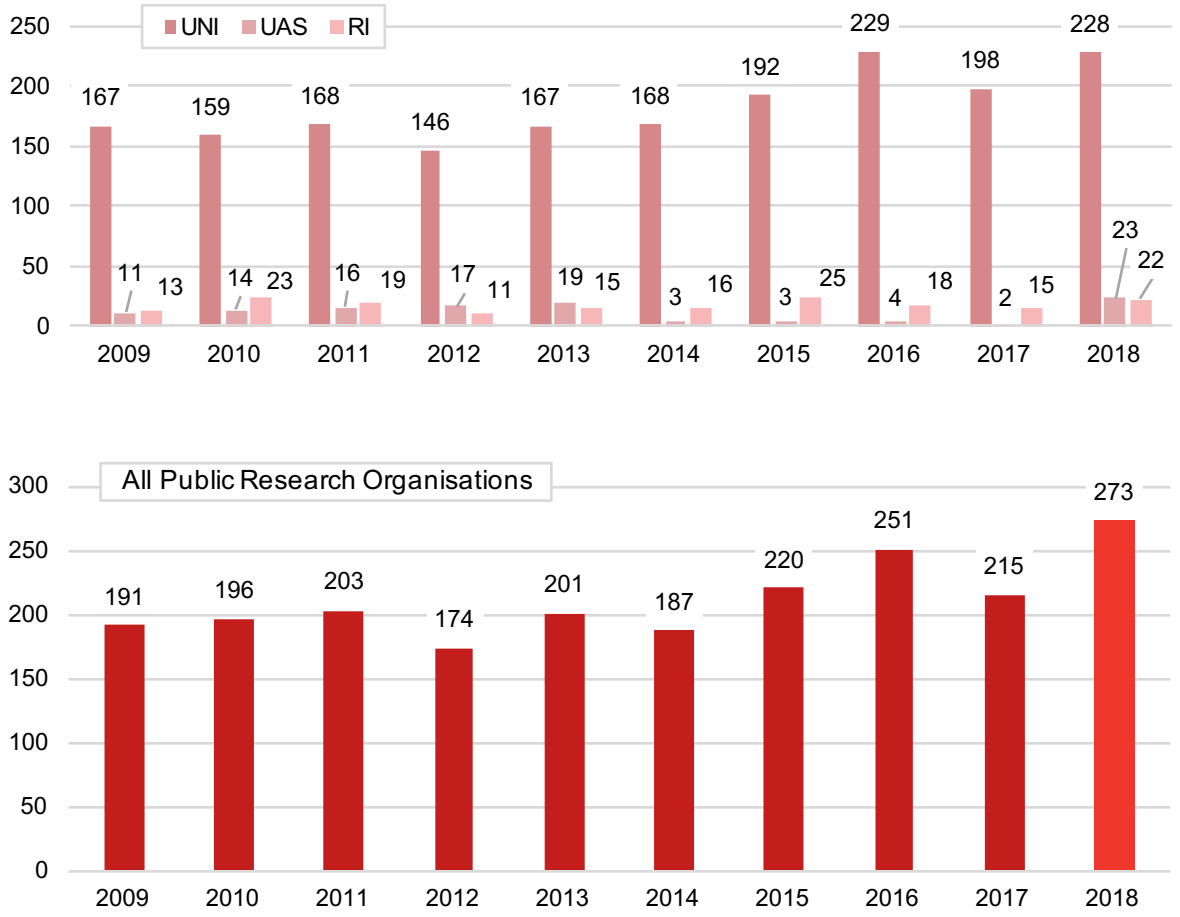
Frequently, projects or start-ups are acquired by larger companies once their products or services have reached sufficient maturity.

4.3.3 License Portfolio and License Income

The number of active licenses under management at the end of 2018 was reported as 1558 (+10%) cases. Thereof, 92.3% of active licenses were handled by the Universities, 6.6% by the RI and 1.1% by the UAS.

Of these active licenses 24.9%, namely 389 cases resulted in license income to the institutions and the researchers involved. In more than half of those cases (218) such license income came from royalties on product sales. This figure has increased continuously in the past years in line with the growing number of products sold on the market that are based on research results of PRO. In the other cases income resulted from other type of license fees, e.g. license issue fees or milestone payments for products still in the development process.

Fig. 6: Number of new License, Option or Sales Agreements for Intellectual Property Rights (IPR)



These figures reflect the typical situation of licenses granted to industry by PRO. Many of the licensed technologies are at an early stage and require extensive development by the licensee. It often takes several years until a product reaches the market. Moreover, the development risk is often high for these early stage technologies, and a significant number of projects are stopped before a marketable product is ready.

When licensing to start-up companies, some institutions may accept equity in such companies as a partial compensation for the licensing of technology. Such equity transactions usually replace down-payments or early milestone payments in order to avoid any cash drain from the start-up at the early stage of development. This results in a deferral of license revenues from such licenses until the shares in such start-up companies are sold by the institutions.

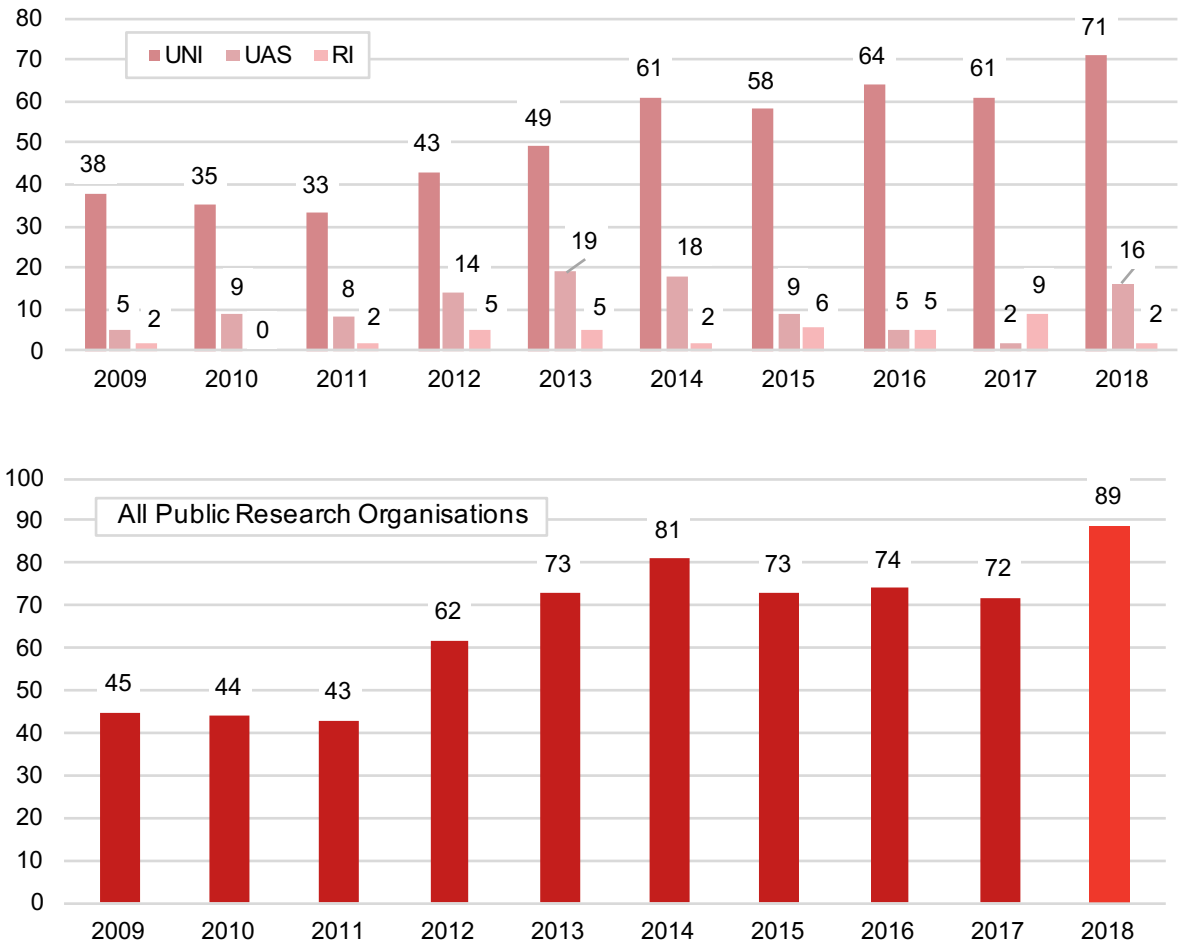
In the past years more institutions started to accept equity as part of their license deals, thus reducing the annual licensing income and adding the management of an equity portfolio to their services.

4.4 Start-up Companies

The number of newly created start-up companies from PRO show a slight increase after three previous years on an almost stable level.

In 2018 the institutions reported a total of 89 new start-up companies (+23.6%), whereby 44 of these companies (49.4%) relied on a license or a contractual transfer of intellectual property from a PRO. The remaining companies were created on the basis of know-how developed at the research institutions without a formal license.

Fig. 7: Number of Start-up Companies Founded



CASE STUDY

GTXmedical Motek EPFL

TARGETED EPIDURAL SPINAL STIMULATION

Problem – Challenge

Spinal cord injury (SCI) is a medically complex and life disrupting condition that each year affects 250 000 and 500 000 people worldwide. Most SCIs lead to chronic paralysis but the symptoms of spinal cord lesion will depend on the extent of the injury and the position of the damage along the spinal cord. The neurological damage caused by SCI essentially breaks down the communication between the brain and nervous system of the spinal cord that are responsible for driving essential neurological functions such as walking. Therapeutic approaches have been proposed to restore movement, typically by focusing on precisely reconstituting the circuit connectivity that was in place before the injury, but none have been found to be effective. The only interventions reported to promote recovery rely on activity-based rehabilitation therapies through training; a drawback being that patients who fail to produce active movements voluntarily, experience minimal benefits from these therapies.

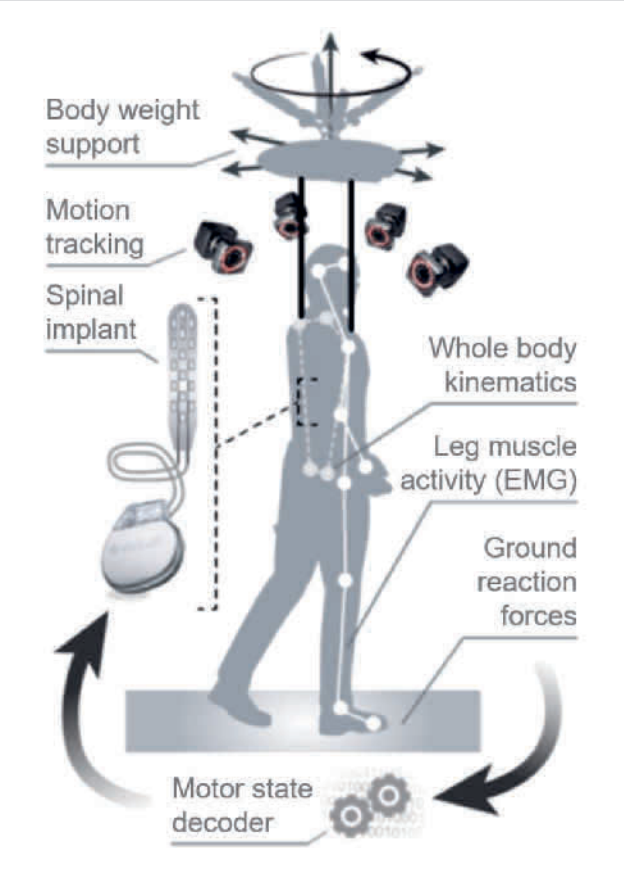
Solution

Based on the assumption that spared spinal cord circuits could be reactivated and reconnected with the brain by enabling an activity based rehabilitation, EPFL developed a multisystem technology to mimic in real time how the brain naturally activates the spinal cord. The core of the system relies on technologies that can electrically stimulate the spinal cord in very precise manner based on a deep understanding of the underlying biology.

Last year, an exciting milestone was reached following the outcome of a clinical study led by EPFL and the CHUV that demonstrated the efficacy of the technology in three human patients with chronic paraplegia. All three patients were reported to be able to walk "hands-free" over more than one kilometer with the help of targeted electrical stimulation in combination with a smart bodyweight-support system. Most importantly, the patients recovered the voluntary control of previously paralyzed leg muscles after only a few months of training.

A significant portfolio of patents has been licensed to the company GTX Medical, a spin-out of EPFL that is developing the technologies such as optimized paddle lead to stimulate targeted regions of the spinal cord and novel electronics to adjust the precise timing of the electrical pulses. The body-weight support robot developed by EPFL is being commercialized by the company Motek Medical.


@ Caillet Jamani



APPENDIX 1 – INSTITUTIONS WITH TECHNOLOGY TRANSFER ACTIVITIES CONTACTED FOR THE SURVEY AND COMMENTS ON THEIR DATA PROVIDED

Universities	TT-Office	Comments on data provided
Ecole Polytechnique Fédéral (EPF) Lausanne	TTO	Complete data, research contracts <50 kCHF only partly
Eidgenössische Technische Hochschule (ETH) Zürich	ETH transfer	Complete data, research contracts <50 kCHF only partly
Universität Basel / Universitätsspital Basel	Unitectra	Only aggregated data, data only for the Medical, Natural Sciences and Psychology Faculties, partial data for hospital
Universität Bern / Inselspital	Unitectra	Only aggregated data, data only for the Medical, Vetsuisse and Natural Science Faculties, no data for research agreements of other faculties
University of Fribourg, including Adolphe Merkle Institute	Tech Transfer Fribourg	Partial data, not all contracts pass through TTO, especially SNSF or EU-grants are treated separately
Université de Genève / Hôpitaux universitaires de Genève	Unitec	Complete data for commercialization activities, research contracts
Université de Lausanne / Centre Hospitalier Universitaire Vaudois Lausanne	PACTT	Complete data for commercialization activities, research contract
Université de Neuchâtel	TTO	Complete data
Università della Svizzera italiana (USI) / Institute for Research in Biomedicine (IRB) / Institute for Oncology Research (IOR)	SRIT	Complete data
Universität Zürich / Universitätsspital	Unitectra	Only aggregated data, data only for the Medical, Vetsuisse and Natural Science Faculties, no data for research agreements of other faculties

Universities of Applied Sciences	TT-Office	Comments on data provided
Berner Fachhochschule (BFH)	TTO	Partial data from several departments (AHB,TI,WGS,HKB,HAFL)
Fachhochschule Nordwestschweiz (FHNW)	TTO	Data available from School of Life Sciences (HLS)
Fachhochschule Ostschweiz (FH OST-NTB)	TTO	Data available from NTB Interstaatliche Hochschule für Technik Buchs
Zürcher Hochschule für Angewandte Wissenschaften (ZHAW)	Ressort F&E	Only data on TT services and FTE within ZHAW's rectorate
Lucerne University of Applied Sciences and Arts (HSLU)	Ressort F&E	No data
Haute Ecole Spécialisée de Suisse occidentale (HES-SO)	Tech Transfer Fribourg	Partial data from several departments
Scuola Universitaria Professonale della Svizzera Italiana (SUPSI)	Fond. AGIRE	Complete data

Research Institutes	TT-Office	Comments on data provided
Swiss Federal Institute for Materials Science and Technology (Empa)	Empa-Eawag TT-Office	Complete data
Swiss Federal Institute of Aquatic Science and Technology (Eawag)	Empa-Eawag TT-Office	Complete data
Paul Scherrer Institut (PSI)	PSI TT-Office	Complete data

Following universities with main scope in humanities were not contacted:
University of Lucerne, University of St. Gallen, FHS St. Gallen – University of Applied Sciences.

APPENDIX 2 – DETAILED DATA 2009 – 2018

Institution	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Full-time equivalents (FTE)	68	64	74	81	86	85.7	89.2	92.4	100.9	111.2
Research contracts (incl. EU contracts)	2855	3035	2872	2349	3924	3237	3297	3348	3571	3895
Invention disclosures	446	470	482	519	575	550	608	659	647	662
Priority patent applications	195	224	240	297	270	312	298	343	300	357
Active patent cases end of the year	1512	1573	1606	1818	1951	1969	2191	2429	2519	2611
License agreements	191	196	203	174	201	187	220	251	215	273
Active license agreements end of the year	1143	1237	1249	1307	1351	1437	1474	1591	1413	1558
License agreements with revenues in resp. year	289	288	299	308	386	376	406	463	451	389
New start-ups on basis of formal license	45	44	43	62(29)	73(45)	81(49)	73(47)	74(53)	72(52)	89(44)

Universities	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Full-time equivalents (FTE)	47	45	50.5	50	52.3	56.1	55.5	59.2	70.2	70.3
Research contracts (incl. EU contracts)	2120	2285	2158	2348	2360	2195	2303	2465	2435	2574
Invention disclosures	405	421	421	444	458	508	565	606	593	592
Priority patent applications	160	187	212	257	244	281	262	320	271	314
Active patent cases end of the year	1355	1358	1450	1664	1779	1839	2008	2202	2318	2376
License agreements	167	159	168	146	167	168	192	229	198	228
Active license agreements end of the year	1058	1135	1459	1167	1213	1320	1352	1487	1313	1438
License agreements with revenues in resp. year	268	258	257	270	337	339	203	410	429	357
New start-ups	38	34	33	43(23)	49(35)	61(38)	58(41)	64(44)	61(44)	71 (38)

UAS	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Full-time equivalents (FTE)	14	13	15.5	23	26.1	22.2	24.9	24	21.6	30.0
Research contracts (incl. EU contracts)	319	457	374	621	1254	677	574	442	727	871
Invention disclosures	15	21	31	35	80	10	9	9	10	36
Priority patent applications	6	16	5	8	2	1	3	1	2	17
Active patent cases end of the year	47	56	35	42	39	9	9	41	14	44
License agreements	11	14	16	17	19	3	3	4	2	23
Active license agreements end of the year	4	12	15	17	19	2	2	18	1	17
License agreements with revenues in resp. year	1	13	23	17	18	3	3	1	1	9
New start-ups	5	9	8	14(5)	19(8)	18(10)	9(6)	5(2)	2(1)	16(4)

RI	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Full-time equivalents (FTE)	7	6	8	8	7.7	7.4	8.8	9.2	9.1	10.9
Research contracts (incl. EU contracts)	416	293	340	353	320	365	420	441	409	450
Invention disclosures	26	28	30	40	37	32	34	44	44	34
Priority patent applications	29	21	23	32	24	30	33	22	27	26
Active patent cases end of the year	110	141	112	112	133	121	174	186	187	191
License agreements	13	23	19	11	15	16	25	18	15	22
Active license agreements end of the year	81	90	103	123	119	115	120	110	99	103
License agreements with revenues in respective	20	17	19	21	31	34	43	51	21	23
New start-ups	2	0	2	5(1)	5(2)	2(1)	6(0)	5(2)	9(7)	2(2)

Note (i): For new start-ups the numbers in parentheses refer to start-ups on basis of a formal license
Note (ii): The number of the institutions that participated in the survey varies between years

APPENDIX 3 – KEY PARAMETERS FOR INDIVIDUAL INSTITUTIONS FOR 2018

Institution	Name TTO	Start TTO	# of TTO FTE	Total # research contracts	# of invention disclosures	# of priority applications	# of IP agree-ments	# of startups
Universities								
Ecole Polytechnique Fédéral (EPF) Lausanne	EPFL-TTO	1993	13.2	244	132	90	32	25
Eidgenössische Technische Hochschule (ETH) Zürich	ETH transfer	1995	22.8	629	224	109	87	27
Université de Genève / Hôpitaux universitaires de Genève	Unitec	1998	9.2	116	52	20	18	2
Université de Lausanne / Centre Hospitalier Universitaire Vaudois Lausanne	PACTT	2000	8.5	266	24	12	6	3
Università della Svizzera italiana (USI) / Institute for Research in Biomedicine (IRB) / Institute for Oncology Research (IOR)	SRIT	2018	1.0	41	14	13	5	3
UAS								
Berner Fachhochschule (BFH)	TTO	1999	13.9	290	11	6	2	2
Fachhochschule Ostschweiz FH OST–NTB	TTO	2000	2.6	66	2	1	0	10
Haute Ecole Spécialisée de Suisse occidentale (HES-SO)	TT Fribourg	n.a.	9.7	426	14	5	9	3
Scuola Universitaria Professonale della Svizzera Italiana (SUPSI)	Fond. AGIRE	2008	0.8	33	5	5	5	1
RI								
Swiss Federal Institute for Materials Science and Technology (Empa)	Empa-Eawag TT-Office	2005	3.9	208	21	14	16	2
Swiss Federal Institute of Aquatic Science and Technology (Eawag)	Empa-Eawag TT-Office	2001	1.7	129	0	1	0	0
Paul Scherrer Institut (PSI)	PSI TT-Office	1999	5.3	113	13	11	6	0

Note: The table lists individual data only of those institutions that agreed to publish it.

GLOSSARY

EPF	Ecoles Polytechniques Fédérales
ETH	Swiss Federal Institutes of Technology
EU	European Union
FTE	Full Time Equivalent (for the number of employees)
IP	Intellectual Property
MTA	Material Transfer Agreement
NDA	Non-Disclosure Agreement
PRO	Public Research Organisation
RI	Swiss Federal Research Institutions in the ETH domain
SME	Small- and Medium-sized Enterprises (<250 employees)
SNSF	Swiss National Science Foundation
Start-up	Newly established company founded or co-founded by researchers from the respective institution and which either relies on a formal license of IP or on know-how developed at the institution
swiTT	Swiss Technology Transfer Association
TT	Technology Transfer
TTO	Technology Transfer Office(s)
UAS	Universities of Applied Sciences
Universities	Cantonal Universities and Swiss Federal Institutes of Technology

APPENDIX 4 – THE QUESTIONNAIRE

swiTT Technology Transfer Survey 2018 (online survey)

Preliminary Notes:

- All questions refer to the calendar year 2018. Please make your statements accordingly.
- If no answer is available for certain questions, please indicate with n.a. Questions for which your office or your institution does not collect data should be left open (n.a.) and should not be answered by giving an estimate.

1. Confidentiality			
Do you agree to the publication of the individual data collected in the questions marked *[pub] under your institution name? All other data will only be published in The aggregated format by type of institution? *All other data will only be published in the aggregated format by the type of institution*			☐ Yes ☐ No
2. Background Information			
2.1 Name of the academic institution/s			
2.2 Is your institution associated with a university hospital? *(If yes, please note that all figures given below should include the numbers of the hospital, too)*			☐ Yes ☐ No
2.3 Does your institution gave a dedicated office / responsible person for TT activities (TTO)?			
If yes which year did the TT program start)		*[pub]*	
2.4 Name of the responsible for survey program			
Name of responsible for survey data			
2.5 TTO address and contact information			
Office Name :		Telephone	
Office Name :		Telephone	
Street :		e-mail	
City :		Postal code	
3. Activities and FTEs			
3.1 What are the activities of your TTO?			
(A) Research contracts (drafting, negotiating, controlling)			☐ Yes ☐ No
(B) Evaluation, protection and management of IP			☐ Yes ☐ No
(C) Commercialisation of IP (licensing, marketing)			☐ Yes ☐ No
(D) Coaching of start-up projects			☐ Yes ☐ No
(F) Financial administration of research projects			☐ Yes ☐ No
3.2 How many full time equivalents FTE were employed in your TTO on Dec. 31st 2018 *(Do NOT include researches working as project managers in transfer project in this number)*		FTE *[pub]*	
3.3 Of these FTE, how many were employed to work on			
(A) Technology transfer activities *(Staff with main occupations (> 20%) in the area of technology transfer, such as 'Licensing Officers', 'Intellectual Property Managers', Technology Managers', or 'Research Contract Officers. Do NOT include project managers carrying out transfer projects)*		FTE	
(B) Administration and general management			
Comment 3.1 – 3.3 *(e.g. if additional people outside your TTO but inside your institution are also working in technology transfer activities according to 3.1, special organisation with specific faculties, centralized/decentralized organisations)*		FTE	
4. Research and Development			
4.1 Total number of new research contracts handled by your TTO (*Collaboration agreements, service agreements, clinical trial agreements, Innosuisse complementary and EU agreements, NO MTA, NO NDA, or other TT contracts (see 4.3) and NO SNSF contracts)*		[pub]	
Of these research contracts, how many were executed with small and medium enterprise (SME), how many with large companies and how many with public partners? *(Definition: SME are companies with 250 or less employees)*		(A) SME: (B) Large Company: (C) Public Institutions: (D) Multiple Partners (E) Don't know *(Sum shall equal 4.1!)*	
4.2 Amount of cash payments due to your institution from research contracts that were handled by your TTO according to 4.1 (*Please give the amount of cash due to your institution, NO material asset e.g. for machinery and NOT the total amount of Research Project, e.g. if an EU project adds up to 3 Mio. EUR but your institution gets only 200'000 thereof, the latter shall be given. Do not split the amount, if the contract is covering several years but report the fill amount in the year the contract is signed)*		CHF	
4.3 Number of other technology transfer contracts handled by your TTO *(Non-Disclosure Agreements (NDA), Material Transfer Agreements (MTA), consulting contracts, inter-institutional contracts, sponsoring, donations, but NO licenses, options, sales)*			
Comments to 4.1 – 4.3 *(E.g. restrictions/regulations of your institution. Knowledge of ALL contracts or only contracts above a certain amount)*			

5. Patent-Related Activity	
5.1 How many invention disclosures were received by your TTO?	[pub]
5.2 How many priority applications were filed by your TTO? *(Priority application being the very first application for a new technology in any patent office of the world)*	
(A) Of these, how many are based on research significantly funded by SNSF	
5.3 What was the overall number of active patent cases at the end of 2018 managed by your TTO? *(Active patents cases are pending or granted patents on a technically unique invention (patent family). Application in various countries on ONE technically unique invention count as ONE patent case)*	
6. Patenting Costs and Legal Fees	
6.1 Amounts spent by your TTO/institution on patenting costs and external legal fees? *(Including all external costs for patent filing, prosecution, maintenance, litigation, expenses or costs for drafting or support in negotiation of contracts)*	CHF
6.2 Amount of patenting costs and legal fees invoiced to commercialization partners? *(Does NOT include patenting costs or legal fees paid DIRECTLY to the patent attorney or other service providers by licensees or external partners)*	CHF
7. License, Option and Sales Agreements	
7.1 How many licenses/options/sales of protected or unprotected IP did your TTO execute? *(Count only the agreements for different technologies, i.e. 30 licenses for the same software library count as ONE. If a license agreement is combined with a research agreement (e.g. advanced sale of the results of a research project), this contract shall count only as research contract and NOT be included in this question unless the invention/software that is licensed/sold exists already at the execution date of the research contracts)*	[pub]
Of these licenses/options/sales, how many were licensed to SME, how many to large companies or public institutions? *(Definition: SME are companies with 250 or fewer employees)*	(A) SME: (B) Large Company: (C) Public Institutions: (D) Multiple Partners (E) Don't know *(Sum shall equal 7.1!)*
(D) Of these licenses/options/sales how many are based on research significantly Funded by SNSF?	
7.2 How many licenses/options/sales included equity? *(Equity meaning the ownership of interest in a company such as shares, options, warrants, etc. in consideration for granting a license or sale of IP)*	
7.3 How many licenses/options were active as of December 31, 2018	
Comments to 7.1 – 7.3 *(e.g. large variations to previous years, special situation, i.e. with free software licenses, openBSD, etc)*	
8. License Income	
8.1 What was the total number of licenses/options/sales revenue?	
8.2 How many licenses/options/sales yielded running royalties? *(Running royalties are based on product sales and are only due after launch of a product In the market)*	
8.3 What was the total amount of licenses/options/sales revenue received at your institution? *(WITHOUT patent costs and fees invoiced in 6.2)*	CHF
9. Start-up companies	
9.1 Total number of start-up companies formed at your institution	
(A) Of these start-up companies, how many are dependent on licensing transfer of your Institution technology?	
(B) Of these start-up companies, how many are dependent on unprotected know-how or technology of your institution (without license agreement)?	
(C) Of these start-up companies, how many are based on research significantly funded by SNSF?	
9.2 In how many of these new start-up companies does your institution hold equity?	
10. Post-Licensing Activities	
10.1 Did one or more of your institution's licensed technologies become available for consumer or commercial use in 2018?	☐ Yes ☐ No
If yes, how many?	
10.2 Information about the launched products *(please give a short title of each product success story and the e-mail of the contact person for additional information)*	[Title, Contact Person]
Comments	
(if you want to bring additional comments or suggestions to the attention of the team of the swiTTreport, please post them here)	

CASE STUDY

adolphe merkle institute
excellence in pure and applied nanoscience

NanoLockin
ADVANCED THERMAL IMAGING

NANOLOCKIN

Problem – Challenge

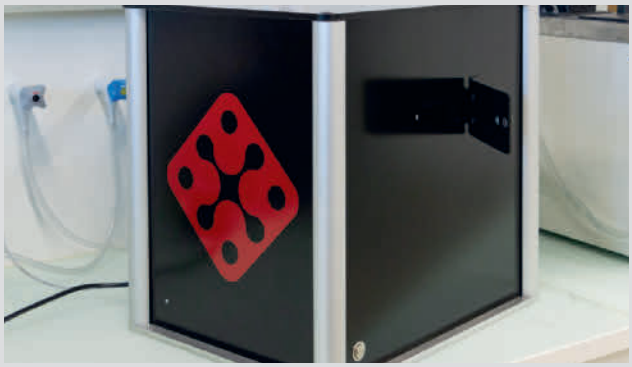
Smaller than living cells, nanoparticles are found in many products such as cosmetics, food, or clothing. An apparel company can for example integrate silver nanoparticles in sports clothing to ward off bacteria. This means though that issues such as nanoparticle concentration in fibers, and whether these particles can leach off fibers and affect the wearer's skin, need to be resolved before heading to market

Solution

NanoLockin's measurement system can respond to this type of query. The nanoparticles are stimulated to produce heat, allowing them to be detected, counted, and observed, by the system's built-in infrared camera. This technology has a number of advantages, including no damage to the sample, ease of use, and costing less than the market competition.

Located in Fribourg, the NanoLockin Application Lab allows interested customers to spend one or more days measuring samples and exploring the potential of the NanoLockin system. Possible uses include quality control for nanoparticles and products containing nanoparticles; localization of nanoparticles; risk assessment (nanoparticle detection in cells and tissues); heating properties of magnetic nanoparticles; and heating properties of gold nanoparticles.

NanoLockin is the first company launched at the Adolphe Merkle Institute, an interdisciplinary nanoscience research center at the University of Fribourg. The company was the winner of Fribourg's 2018 innovation prize in the startup category.



CASE STUDY

NOVEL MEDULLARY THYROID CANCER THERAPY

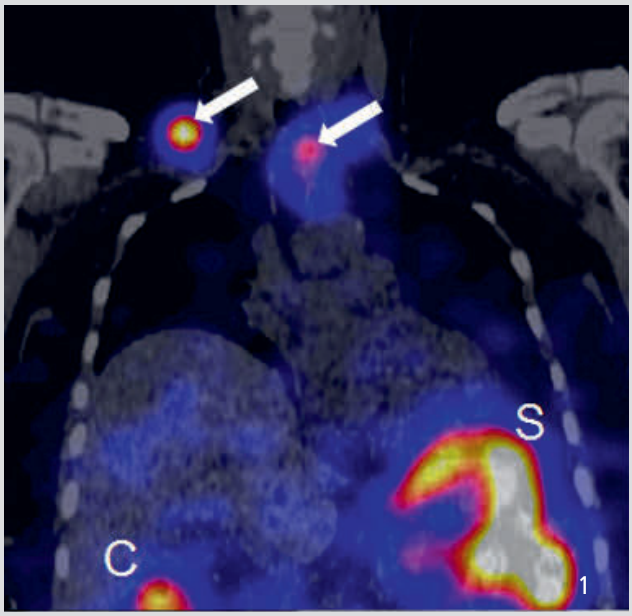
Problem – Challenge

Drug development is a highly expensive, lengthy and time-consuming process. Precisely targeting a specific dysfunctional receptor is arguably the most difficult aspect of modern drug design. Very often it requires decades from the initial idea to the finished product. Highly skilled specialists at the Centre for Radiopharmaceutical Sciences (CRS) from the Paul Scherrer Institute (PSI) have recently developed a targeted radio-pharmaceutical (an agent carrying a radioactive substance) to be directed against a rare type of tumor known as Medullary Thyroid Cancer (MTC), a disease which affects both children and young adults.

Solution

At the beginning of 2016 PSI had developed, and patented a short fragment (peptide) of a naturally occurring protein, known as minigastrin (MG). This peptide is able to bind to a specific type of cell receptor abundantly expressed on the surface of MTC cells. By labelling MG with a radionuclide, the peptide is then capable to directly deliver radioactive material to the targeted malignant cells which are then killed by radiation. The elegance of this approach is that the radiopharmaceutical can reach the MTC cells, even when they spread to distant tissues in the body. At the University Hospital Basel, doctors have used this new active agent for the first time, in patients with MTC.

Shortly after the publication of the preliminary results in patients, the discussions between PSI and Debiopharm, a Swiss-based biopharmaceutical company, reached full maturity. The company obtained an exclusive license for the use of PSI's proprietary MG in the field of oncology in December 2017. Aiming to develop innovative therapies that target high unmet medical needs, Debiopharm is committed to bringing the drug towards market authorization for MTC patients, as well as identifying additional tumor types that may benefit from this targeted approach.



1
Patient with metastasis of MTC:
White arrows: tumor metastasis
S: stomach with specific uptake
C: Kidney (clearance via kidneys)
Courtesy by Prof. D. Wild and Dr. C. Rottenburger, Nuclear Medicine University Hospital Basel

2
Working with open radionuclides requires specific protection

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swiss technology transfer association

swiTT, the Swiss Technology Transfer Association, is the association of the professionals in Switzerland dealing with the interaction between public research and industry. swiTT currently has more than 100 members from all parts of Switzerland. Most of them work in technology transfer at public esearch institutions, others are employed in the private sector. For further information about swiTT, please refer to **www.swiTT.ch.**

Among other services, swiTT operates swiTTlist, a unique portal with current technology opportunities from Swiss public research institutions available for licensing and development by industry. To search this opportunity database please visit **www.swiTTlist.ch.**

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IMPRESSUM

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Printed by
Druckerei Lutz AG, 9042 Speicher, Switzerland