KU LEUVEN RESEARCH & DEVELOPMENT
A LONG TRADITION OF
FOSTERING INNOVATION AND
HIGH-TECH ENTREPRENEURSHIP
Research, education, and service to the society are core missions of our university. Ever since the creation of our technology transfer office in 1972, we have aimed to increase innovation through a wide variety of interactions and mechanisms: facilitating collaborative and contract research, creating start-ups, managing intellectual property, developing science parks & incubators, and fostering regional development.

Our ambition is to operate at the frontier of the Triple Helix, where knowledge centres, industry and government mutually reinforce each other with regards to innovation and entrepreneurship. Day after day, this ambition inspires us to creatively design and develop highly novel, dedicated knowledge transfer platforms that foster and leverage collaborative research. The persistent pursuit of excellence in knowledge transfer combined with a drive for continuous innovation in transfer mechanisms, is at the heart of our mission. We aim to create a fair return on the generous investments society is making in education, science and innovation.

Technology transfer does not just happen. It requires a coordinated interplay between our researchers, the experts at our tech transfer office, and our partners. The efforts at KU Leuven have produced results. In 2016 alone, more than 2,800 new agreements were managed by LRD, and over the last twelve years, our spin-off companies have raised €875 million of capital, which has resulted in a stronger regional high-tech economy. We are proud to see so many innovative products and services in the market originating from research at KU Leuven. As an acknowledgment of our continuous efforts, Thomson Reuters ranked KU Leuven as Europe's most innovative university in 2016 and 2017.

KU Leuven has clearly demonstrated that scientific excellence can go hand in hand with positive results for society. Striving to combine scientific excellence and societal benefit in such a way that they reinforce each other has been our mission ever since we started in 1972, and we are looking forward to seeing further successes in the years to come.

Paul Van Dun
General Manager LRD

Koenraad Debackere
Managing Director LRD
KU Leuven Research & Development (LRD) was established in 1972 as one of the first technology transfer offices in Europe. Ever since, LRD has been building bridges between science and industry. By transferring knowledge and technologies to society and the marketplace, LRD advances the impact of research results on people’s lives around the globe. LRD has developed a solid tradition of collaborating with industry, securing and licensing intellectual property rights, and creating spin-off companies.

LRD consists of a multidisciplinary team of over 90 experts who guide researchers in their interactions with industry and society, and help them to best leverage the societal and economic potential of their research. LRD integrates four main technology transfer activities. First, LRD manages all research collaboration agreements between the university and the university colleges, which together make up the KU Leuven Association, and industry, varying from small consulting assignments commissioned by a company to long term research projects. LRD’s second activity is the commercialisation of the intellectual property of the KU Leuven Association. This requires adequate protection and an appropriate transfer strategy to ensure that innovation from research at KU Leuven finds its way into society.

Thirdly, LRD stimulates the creation of new spin-off companies by giving entrepreneurs the appropriate guidance and access to the KU Leuven Gemma Frisius Seed Capital Fund. 116 high-tech companies have been created thus far, directly employing more than 5,000 people. Finally, LRD plays an important role in the knowledge-driven regional economic development and the construction of science parks and incubators.

Within the university structure, a unique decision and incentive mechanism has been implemented. Researchers can form LRD research divisions, through which they can manage their technology transfer activities in an autonomous but supported way, and foster innovation and entrepreneurship in combination with high-level research and education. These LRD research divisions stimulate interdisciplinary collaborations by allowing researchers to cooperate across the boundaries of departments and faculties.

Researchers come to LRD for support in all technology and knowledge transfer related matters. From their first steps in the discovery process to the eve of presenting new results, researchers can contact LRD to discuss the options that will best leverage the commercial potential of their research.
How to make technology transfer successful?

- Conduct high quality research.
- Have a multidisciplinary team with experts in several research domains.
- Look at technology transfer with an integrated approach that takes into account intellectual property, research collaboration and spin-off creation.
- Offer clear incentives to encourage researchers and research groups.
- Cultivate a favourable entrepreneurial climate within the university.
- Be able to rely on networks that further professionalise the technology transfer support.
- Have available incubation instruments.
PROFESSOR FRANK LUYTEN
SKELETAL BIOLOGY AND ENGINEERING, KU LEUVEN
Due to my long experience with biotechnology in the United States, I developed an entrepreneurial spirit, which I further fostered upon my return to Belgium. As a clinician by training, I try to move developments from bench to bedside. Because of my U.S. experience, it has always felt natural for me to explore the transition of scientific progress and insights into biotech and pharma. Most importantly, I wanted to get things moving forward and get them done. In view of this, it was only a small step to get in contact with LRD.

LRD supports researchers in several ways. LRD offers structural support for all sorts of collaborations with organisations and companies. Over the last decade the operations of LRD have professionalised dramatically, making LRD a solid partner, known for its credibility and quality. Since 1998, LRD has so to speak evolved from a one man show to a large team of experts, with members focusing on specific domains. By creating a framework for the formation of LRD Divisions, LRD facilitates interactions between research groups and stimulates the creation of structural multi- and transdisciplinary platforms, such as Prometheus, which focuses on skeletal tissue engineering. LRD is a key partner in tech transfer and patent filing.

LRD really offers the services that researchers need. It’s important that researchers are aware of these services. Awareness creation and communication play a key role in making tech transfer successful.
LRD helps researchers to protect their intellectual property and devise appropriate strategies for transferring the intellectual property from the university to industry. LRD’s IP officers guide researchers throughout the entire technology transfer process. After an invention is disclosed, IP officers assist researchers in assessing the patentability and market potential of the invention, applying for a patent, finding companies that have the resources to bring the technology to market, and licensing the patented technology.

When setting up research collaboration agreements and creating spin-off companies, intellectual property is an essential part of the process. Transferring knowledge and technology from the university to industry calls for an integrated approach in which IP officers, legal counsellors, and business development managers closely collaborate.

How to make protection of intellectual property worthwhile?

- Conduct good innovative research.
- Contact LRD as early as possible in the discovery process to discuss the idea before disclosure to the public.
- Identify the technology landscape, the commercially interesting application(s) and the market segment in which the invention will and could be applied.
- Aim to protect the research in a broad way in order to enable publications and to minimise workaround solutions.
- Be actively involved in the patenting and licencing process.
- Promote and communicate the invention after protection has been secured to find industrial partners.
LayerWise is a spin-off from the KU Leuven Department of Mechanical Engineering that focuses on Additive Manufacturing for metal components. We both did our Ph.D. thesis research on selective laser melting, a technology that allows to make solid metal objects from metal powder. While doing this research, we became aware of the industrial applications of this technology. We decided to start preparations for the creation of a spin-off company, partly because we were regularly consulted by companies to manufacture metal prototypes of their components, and also because we wanted to stay active in the domain of Additive Manufacturing after finishing our Ph.D. studies. At the time, there were no other companies on the Benelux market that focused on metal Additive Manufacturing.

Market analysis showed us that there was interest in this technology in Belgium and the Netherlands. It wasn’t exactly clear where or in which industrial sectors the technology would prove successful. We already knew of possibilities in the dental field, and in the longer term the technology could offer significant advantages in the market of medical implants. In the beginning, a lot of people advised...

“In the end, as an entrepreneur, you have to do it yourself, but it’s good to know you can always fall back on people that have more experience in starting up a business.”

PETER MERCELIS & JONAS VAN VAERENBERGH
FOUNDERS OF LAYERWISE
us to focus on one market segment. We completely ignored this advice, since we didn’t yet know where our technology would prove to have the most added value. It’s very difficult to make such a decision before you’re actually operational and before you have any feedback about your products from the market. If you focus on one particular market and make the wrong choice, it’s over. We decided to spread the risk. We started our company in March 2008, at the time the economic crisis hit for the first time. If we would have targeted only the automotive industry, LayerWise probably wouldn’t exist anymore.

We have always had an entrepreneurial mindset, even when we were still researchers. To a large extent, this has been triggered by the freedom our promoter, Professor Jean-Pierre Kruth, has given us to follow our own path and to choose and monitor our research topics ourselves. He also has a very good feeling for the exploitation potential of fundamental research.

LRD has supported us in developing a business plan and a financial plan, and also managed our intellectual property. LRD has been a good partner in our search for investors. Besides the founders of the company, the KU Leuven Gemma Frisius Fund provided seed capital for our start-up, and together with LRD, we were also able to attract investments from Vinnof-PMV. In the end, as an entrepreneur, you have to do it yourself, but it’s good to know you can always fall back on people that have more experience in starting up a business.

A factor that has been crucial in the growth of our company is technological progress. We always had a lead over other market players. Up until today we have been able to hold and extend that lead because we have invested a lot of human resources and other means into R&D. You have to keep reserving time and resources to be able to develop and innovate. For starting companies it’s difficult to find the right balance between managing your daily business and keeping that technological head start. As a researcher, you might be happy you’re doing business, but if your technology remains at the same level, in time, your business will decrease. Because we’re now on a technologically more advanced level, surgeons for example have a lot more confidence in using titanium implants that were produced with Additive Manufacturing technology then five years ago.

An advantage of our technology is that it operates completely digitally. Working for a customer in the United States for example is as easy as working for a customer in the Benelux, because of this digital workflow. The disadvantage is of course that your existing customers might just as well send their files to Japan instead of Belgium. So it’s important for a company to be at the top. We’ve been competing with the major players worldwide from the first day we started.

To stay ahead at the technological level, we spend a lot of time and money on our internal R&D programmes. In addition, our collaborations with the KU Leuven Department of Metallurgy and Materials Engineering and the Department of Mechanical Engineering create a synergy for both parties which further pushes the boundaries of the technology.

At KU Leuven, researchers are further developing Additive Manufacturing, and we benefit from these developments. During the first years, we chose to locate LayerWise at the KU Leuven Innovation & Incubation Centre because of the support KU Leuven provides. The proximity to KU Leuven made it easy to drop by for a discussion with one of the technology or materials specialists at the university and has also been beneficial for applications of our technologies. The links to the Department of Oral Health Sciences and the Department of Development and Regeneration have resulted in the development of new products.

In 2014, LayerWise was acquired by the American company 3D Systems, allowing us to further grow our company in Leuven. We relocated to a larger office at the Haasrode science park and hired more people. We now have over 110 employees. Besides manufacturing metal prototypes and implants, we also started developing and selling Additive Manufacturing machines in-house.
COLLABORATING WITH INDUSTRY

Companies, both small and medium enterprises (SMEs) and multinationals, often turn to the university to answer part of their R&D needs, instead of performing the whole process themselves. When researchers collaborate with industry, LRD sets up well-balanced collaboration agreements which take into account the interests of all parties involved. In addition to carrying out services or research contracts commissioned by companies or other clients, researchers can also set up cooperative research projects together with companies or other organisations. LRD’s legal service supports researchers in drafting, negotiating and monitoring this broad range of agreements.

Specifically for European consortium projects, LRD’s EU advisors guide researchers in administrative, financial and legal matters during the entire project life cycle (from proposal to final reporting). LRD’s EU advisors assist researchers in managing EU Framework Programme projects, along with other European funded projects, such as EU-tenders and EFRO/Interreg projects.

How to make a research collaboration successful?

• Agree on well-defined research goals.
• Have a close follow-up of the research.
• Pursue a match between academic research and company needs.
• Maintain good relations with the industrial partner beyond project lines.
• Plan meetings and project reports on a regular basis.
• Get more out of the collaboration than just the fee.
• Gain new scientific insights thanks to the collaboration.
• Set up a fair agreement on key elements such as intellectual property rights.
“LRD has always been able to find the right attitude and looked upon the exploitation of research as an opportunity rather than an imperative.”

PROFESSOR JOHAN MARTENS
CENTRE FOR SURFACE CHEMISTRY AND CATALYSIS, KU LEUVEN
I have been conducting research at KU Leuven for more than 30 years and I have been working together with LRD since the beginning of my career. As a young researcher under the wings of colleague Professor Pierre Jacobs, I worked together with chemical and petrochemical companies in Europe, the United States and Japan. Back then, LRD entered into bilateral contracts with these multinationals, under which the intellectual property was usually transferred to the company, with a guarantee that the inventors would be mentioned on the patents, and with a financial compensation for the university if the patents were licensed. These agreements were very solid. The professionalism of LRD was universally praised by our industrial partners and was fairly unique in the academic world. As a researcher you were completely covered, which sometimes came across a bit strangely in the wording of the contract when you only signed ‘for information’.

Over the years, the LRD exploitation model was tweaked to incorporate stronger guarantees for the financial compensation, although always with the necessary sense of reality. Gradually, LRD encouraged KU Leuven researchers to patent inventions made outside the cooperation agreements with companies. The idea of screening all publications for intellectual property before publication once surfaced, but was abandoned. However, this is characteristic of the strong motivation of the LRD team.

The experience of LRD is an enormous benefit when defining an invention, working out the strategy for patent applications, and exhausting all possibilities. LRD sees opportunities and puts colleagues in contact with each other. It was LRD, for example, that put me into contact with colleagues at the Faculty of Pharmaceutical Sciences and pointed out opportunities for cooperation. Not every colleague has the same feeling for research exploitation and not every field of research immediately lends itself to it, but neither of these things is actually necessary. LRD has always been able to find the right attitude and looked upon the exploitation of research as an opportunity rather than an imperative.

The aspect of research exploitation offers an immense professional enrichment, above all for those who feel themselves drawn equally to the academic and the industrial world. For me, exploiting my research is a drive, one without which I cannot now imagine living. Over the past 15 years, I, together with LRD, have put together and submitted numerous patent applications, and several patent families have been granted. This patent portfolio is managed by LRD and has led to the creation of several spin-off companies (Ziscoat in 2004, Magnets for Emulsions in 2004, Formac Pharmaceuticals in 2007 and Aqua4C in 2014). It was LRD that provided guidance and support in setting up these spin-off companies, from working out the business model to signing the deed of establishment before the notary.

Without LRD, KU Leuven would not be what it is today. I would like to thank the LRD team for the wonderful years we have spent together and I hope to contribute many great projects in the future.
Instead of licensing-out an invention to an existing company, the intellectual property can also be the basis for setting up a new start-up business. LRD actively supports researchers who want to create a spin-off company. Spin-off companies are new business ventures that exploit research results, know-how and intellectual property developed within the university. LRD assists researchers during the start-up phase and guides them through the process of translating a business idea into a real company. Working closely together with LRD, researchers evaluate various markets for their potential and identify external business experts to support the team when management expertise is needed. LRD’s extensive network of local and international investors and business angels can also help researchers to raise sufficient funding. The first years after foundation, LRD typically maintains close ties with the spin-off company to support growth.

Over the past four decades, LRD has supported the creation of 116 spin-off companies, directly employing more than 5,000 people. The university invested €10 million in its spin-off companies in the period from 2005 to 2016, and €875 million of external capital was raised.

How to make spinning-off successful?

- Put together a highly motivated and complementary team that has both research expertise and management skills.
- Start from a sound and sufficiently validated scientific and technological basis.
- Determine an appropriate intellectual property strategy and evaluate freedom-to-operate.
- Build on a product or service that addresses a clear and validated market need.
- Elaborate a sound and convincing value proposition and business plan.
- Secure a significantly strong consortium of investors.
- Maintain good relationships with the research groups from which the spin-off company originates.
Researchers often use animal models when searching for human medication. The discovery of Tenofovir, which currently is the world’s most commonly used anti-HIV agent, is a case in point, since aids in cats (caused by feline immunodeficiency virus or FIV) was used as a model. Although 1 out of 15 cats in our area is infected with the virus, the FIV-data were shelved when the product entered the next stages of development. Professor Johan Neyts of the KU Leuven Rega Institute and Dr. Stefaan Wera, who was CEO of reMYND at the time, saw a huge potential for this kind of ‘recycled’ medication and wondered whether this could be the basis for a startup company. At that moment, LRD contacted me to look at the possibilities and help develop a business plan, since I had been closely involved in several startups before. Market research, writing and fine-tuning the business plan and building a shortlist of investors took us most of 2007.

Back in 2007, there were no veterinary biotech companies so there was no benchmark for us nor for our investors. Animal Health companies generated little innovation and hardly shared any information. Our interactions with the investors and their consultants forced us to generate several annexes to our business plan with details on veterinary blockbusters, regulatory aspects, the M&A scene, etc. Add the financial crisis of 2008 to that and it explains why it took nearly two years from the initial idea up to the capital increase. We eventually closed our 8.5 million euro financing round on October 17, 2008.

We truly took off in January 2009 and used lab space at the KU Leuven Rega Institute. We started growing very quickly and in November 2009 already we had to move to a larger office on the Haasrode Industry Park. As our research and development activities accelerated and the team grew to more than 10 researchers, we started strengthening our pipeline including the decision to replace one of our core products by a product which we thought was lower risk to develop and commercialize. And indeed, it proved to be the right decision. Novartis Animal Health showed interest in that particular product a few years later and made a deal with us in August 2013 to jointly develop and commercialize what should become the first antiviral drug registered for animals in the world.

“We have built our company on the topnotch research done at KU Leuven.”

ERWIN BLOMSMA
FOUNDER OF OKAPI SCIENCES AND VIROVET
In 2013 a lot of things changed for us in the animal health sector. Zoetis, Pfizer’s Animal Health division, went to the stock market. It was the first major IPO in the industry and provided analysts and investors with a first detailed look into the animal health arena. A few months later, Aratana Therapeutics followed Zoetis to the stock exchange and several other animal health companies started preparing their IPO’s. Shortly after their IPO I had lunch with Aratana’s CEO in Paris to learn more about Aratana and their experiences but also to assess if there was a basis for collaboration on one of our projects. Since we were preparing a second investment round at Okapi Sciences, we arranged for them to get access to our dataroom. As the discussions continued later that year the idea grew that an acquisition by Aratana could be an attractive alternative to our financing round. In December 2013, just before the holidays, we canceled the second investment round and decided to put all our efforts into closing a deal with Aratana, and so it happened on January 6th, 2014. We immediately saw the advantages of the collaboration, as did Aratana. Okapi Sciences’ acquisition resulted in a nice return for our investors and shareholders (including KU Leuven and Gemma Frisius Fund) and on top of that the research activities of the company could stay in Leuven.

Because Aratana focuses on pet animal diseases, we started thinking of continuing our livestock research, in which we had already invested millions. After several discussions late 2014 and early 2015, with the approval and support of the board of directors of Aratana, we created a new company ViroVet. ViroVet raised 5 million euro and is now an independent pioneering company dedicated to the development of disruptive and innovative technologies for the control of viral diseases in livestock. Our strategy is to develop and commercialize antiviral drugs and next generation vaccines to provide the livestock industry as well as national governments and international organizations with powerful solutions against outbreaks of viral diseases.

With the increasing concentration of livestock industry, the intensifying global trade and climate changes, there is an ever increased risk for the global spread of viral diseases, severely damaging the livestock industry. So, we need to be able to intervene very quickly when something goes wrong. And that’s where ViroVet comes in. We feel that ViroVet’s products have the potential to reduce the use of antibiotics and revolutionize the livestock industry worldwide.

ViroVet is headquartered in Leuven and we have continued and even strengthened our close collaboration with KU Leuven and the Rega Institute. During the creation of Okapi Sciences, LRD helped us to arrange all the necessary veterinary back licenses (as some of the products were licensed out already) and to set up the associated license agreements with Okapi Sciences. For ViroVet, we have gone through the same exercise again with LRD as several additional assets were identified together with and at the Rega institute that are important for our future growth. The topnotch research of the world renowned Rega Institute had originally not been intended for animals, but has been of vital importance for us. Thanks to the them, we got a piggyback ride to a successful veterinary story that still continues today with ViroVet.
In close collaboration with the city of Leuven, the province of Vlaams-Brabant, and the Flemish and European authorities, LRD actively supports the development of a favourable climate for knowledge-driven entrepreneurship and innovation. In particular, LRD is an active partner in setting up networking initiatives and technology clusters such as DSP Valley and LSEC, which focus on digital signal processing and IT security respectively. LRD is also a pioneering partner of Leuven MindGate. Leuven MindGate brands the Leuven region internationally as a premier destination for R&D, high-tech business development and innovation. Together with Leuven MindGate, LRD organises specialised practice-based training sessions and creates awareness regarding innovation management and entrepreneurship.

LRD is involved in planning, setting up and managing incubators, science parks and business centres, which provide state-of-the-art lab and office space for innovative spin-off companies as well as international research-intensive companies. Together, the three Leuven science parks constitute a technology belt around the city.

LRD is one of the key players in ELAt, the Eindhoven (The Netherlands) - Leuven (Belgium) - Aachen (Germany) triangle. ELAt aims to foster the knowledge economy in Europe through cross-border and interregional cooperation. In addition, together with the biomedical clusters of Cambridge (UK) and Heidelberg (Germany), Leuven has formed the Health Axis Europe alliance to foster health innovation across Europe.
“Anyone who has worked with LRD for any length of time will realise that in fact there are no professors who do not benefit in some way from the services offered by LRD.”

PROFESSOR PIET DESMET
FACULTY OF ARTS, KU LEUVEN & KULAK
From the very beginning, I have found LRD to be a service of support in every sense of the word. A service that provides you with very effective help and which solves problems even before you really know that they are there.

To this day, I have always been able to count on the competent support of LRD in a wide variety of dossiers. I am referring to a wide range of project applications, not just with Europe but also with Flanders Innovation & Entrepreneurship and iMinds/imec. I am also referring to government assignments and contract research with industry. The support that LRD offers in these cases is essentially of an administrative, legal and financial nature. It is of crucial importance that questions are answered in a quick and efficient manner, and that the advice is reliable and sound. For many such project applications, the procedure is so complex that an individual professor, no matter how competent he or she is, will find it extremely difficult to find his or her way through. But with the help of LRD, we manage to find our way through. The research output of KU Leuven in terms of projects would undoubtedly look very different without LRD.

In addition to relying on LRD for project applications, I have also been able to make use of the services of LRD twice for the creation of a spin-off company. Even for the Faculty of Arts this has turned out to be a very achievable goal. Drawing up a business plan, searching for investors and managing intellectual property are skills that do not form part of the primary competencies of a professor.

And yet they are of critical importance if spin-off activities are to be created in a professional manner. In this regard, LRD offers full support. The fact that KU Leuven has built up such an impressive spin-off portfolio is indisputably due to LRD.

The continued growth of LRD can only benefit KU Leuven as a whole. LRD is a crucial part of the backbone of our university and a key factor in attracting sufficient resources for conducting research. Also, LRD significantly facilitates the interaction with industrial and social players.

Without a doubt, in its further expansion LRD will be better able to anticipate the specific characteristics of each of our Faculties, so that the exploitation potential of all the scientific disciplines that KU Leuven features can be tapped even more effectively. Anyone who has worked with LRD for any length of time will realise that in fact there are no professors who do not benefit in some way from the services offered by LRD. In short, LRD is a driving force for our university.
Without financing, numerous promising R&D projects would not have the chance to realise an industrial proof-of-concept or produce a convincing prototype for the market. The KU Leuven Industrial Research Fund, financed by the Flemish Government, supports innovative research & development projects with clear industrial or societal applications. In addition, LRD has created several specialised incubation instruments in order to meet the need for financing projects at an early stage of development.

- **Researcher-controlled finances.** The unique mechanism behind the LRD research divisions allows researchers to manage their technology transfer activities autonomously. Each research division can use the resources it has acquired from research exploitation to finance early stage development and validation projects.

- **KU Leuven Patent Fund.** When researchers do not have the financial means to apply for a patent, they can turn to the KU Leuven Patent Fund for financial support. Each time a patent is licensed, a contribution is made to the Fund to make it self-sustaining.

- **Technology transfer platforms.** The Centre for Drug Design and Discovery (CD3) brings expert drug discovery capabilities and financial means to academic research groups and small companies in order to translate innovative research into promising drug discovery programs that are well qualified for further development by pharma or biotech companies. Supported by LRD and the European Investment Fund, CD3 launched a € 60 million fund in 2016. Another KU Leuven platform, PharmAbs, is dedicated to generating custom monoclonal antibodies.

- **Gemma Frisius Fund (GFF).** GFF is a seed capital fund that was established by KU Leuven, BNP Paribas Fortis Private Equity and KBC Bank in 1997 to stimulate the creation and growth of KU Leuven spin-off companies. Over the years, the GFF has invested € 30 million in KU Leuven spin-off companies.
“LRD drives and facilitates the interaction between academic research & development and solutions for real-life challenges.”

Founded in 2002, reMYND’s expertise was based on the complementary technologies of the Experimental Genetics Group (LEGTEGG) and Functional Biology labs. Broadly speaking, KU Leuven has transferred two main technologies to reMYND: a transgenic mouse model for in vivo testing of new candidate treatments for Alzheimer’s Disease (AD) and the use of modified yeast for in vitro screening of novel compounds directed against AD. The AD mouse model has long been in great demand by pharma companies that are developing new Alzheimer treatments. We realised that this demand could be best managed through a spin-off, which could further complement its service by offering the in vitro screen.

The AD mouse model predated reMYND, and LRD was already working on academia-business collaborations involving these transgenic mice. Using this knowledge, LRD played a key role in developing a business plan for reMYND. They also provided a professional approach to managing a biotech company and helped raise the seed-money to start the company.

LRD remains a pivotal player in the development of reMYND. Working with LRD ensures that reMYND is always aligned with KU Leuven. KU Leuven, together with the Gemma Frisius Fund, holds the majority of reMYND’s shares. Paul Van Dun from LRD serves as chairman of the Board of reMYND. It is also clear that LRD has ample experience growing a fledgling start-up into a full-blown company and LRD guides reMYND through the different stages, each having its own challenges.

LRD’s reach extends beyond Leuven, as LRD drives and facilitates the interaction between academic research & development and solutions for real-life challenges.

Many things have been instrumental to bring reMYND where it is now. For instance, our company values have been key: openness to continuously understand the scientific developments outside reMYND and the needs of patients and clients; humbleness to realise that there is much more that we do not know than what we do know; collaborative as we work together with more than 15 academic groups worldwide. These values allow us to be resilient, and such resilience is key to rapidly react to changes in our environment.
In 1988, I returned from the United States where I had been a post-doctoral researcher at Kansas State University. Back in Leuven, I set up a research group with a focus on cereal science and technology. Because we hardly had access to means from other channels to conduct research, I contacted a number of companies. Important fund providers from day one were the wheat processing company Amylum (now Syral), and Puratos, a Belgian multinational with focus on bread quality improvement systems. With the help of LRD, I managed to set up agreements for research projects with both companies, allowing me to gather sufficient critical mass to give a boost to

“If it wouldn’t have been for LRD, I probably would not have stayed at KU Leuven.”

PROFESSOR JAN DELCOUR
CENTRE FOR FOOD AND MICROBIAL TECHNOLOGY, KU LEUVEN
the research group. LRD thus played a crucial role in getting our research group on the rails. Learning how to collaborate with industry has also had a beneficial side effect. When choosing our basic research projects, we have come to a model in which we take into account whether, in a longer time frame (a decade or so), there could be applications of our research and benefits for society.

Over the years, our team has developed an understanding of what LRD can do for researchers and vice versa. LRD manages our research contracts and guides us in the process of setting up agreements with industry which respect the rights of all parties involved. Over the years, we have been able to witness how LRD has really professionalised the whole process of setting up and administering research collaboration agreements. This has allowed LRD to also focus on patenting, licensing and creating spin-off companies. Indeed, LRD has also assisted us and continues to assist us in applying for patents, in the negotiation process when licensing a patent to a company, and in the creation of a spin-off.

More recently, KU Leuven has become increasingly involved in European consortium projects and in Knowledge and Innovation Communities (KICs) of the European Institute of Innovation & Technology, such as EIT InnoEnergy, EIT Health, EIT Raw Materials and EIT Food. The complexity of setting up such communities is such that the competence that LRD has acquired over the years will be extremely helpful in guiding us in this process. LRD puts different people within the university in contact with each other, which is very important. I would not underestimate the role LRD plays as navigator within the university.

I also appreciate that LRD looks to its own professional community of Technology Transfer Offices (TTOs) worldwide and not only assures that it does not get isolated, but also that it is ranked among the top TTOs. I have for instance been able to witness that LRD is very involved in tech transfer associations such as ASTP. This will allow LRD to keep track of the latest evolutions in tech transfer, show the way to other TTO’s and remain in pole position.

LRD’s economic and societal impact stretches far beyond the Leuven region. The closer to Leuven, the stronger the impact of course. However, the realisations of professor Collen with regards to tPA and ThromboGenics, and the renowned AIDS cocktail based on tenofovir disoproxil fumarate prove that the exploitation of KU Leuven research has influenced the lives of people worldwide. We definitely should not be ashamed of what we have achieved. When thinking about it, to make tech transfer a success, research groups should clearly define their research mission, stick to it and only adjust it when deemed useful. I can only but observe that most tech transfer successes come from research groups that know what they want to achieve and are selective in what they do.

Finally, if it wouldn’t have been for LRD and its spirit, I probably would not have stayed at KU Leuven. I feel comfortable in an environment where patenting and licensing, collaborating with industry, and setting up spin-offs is well respected.
The world’s leading anti-HIV drug

Leuven has a long tradition of developing innovative and effective medications. One such medication is the antiviral agent tenofovir disoproxil fumarate, discovered in 1993 by Professor Erik De Clercq and Professor Jan Balzarini of the KU Leuven Rega Institute for Medical Research, in collaboration with Professor Antonin Holý of the IOCB in Prague and Dr. John Martin of Gilead Sciences. Tenofovir was licensed to the American biopharmaceutical company Gilead Sciences, which further developed it and now produces and distributes the drug under the trade name Viread® in exchange for royalty payments to KU Leuven. Tenofovir is also an essential component of the combination drugs Truvada®, Atripla®, Complera® and Stribild®, and has become the most commonly used anti-HIV drug in the world. In 2016, sales of Truvada® and Atripla® totaled over $4.5 billion and $3 billion respectively, while sales of Viread® reached over $1 billion. Drugs containing tenofovir are effective at reducing the HIV-titre in the blood, so that HIV-infected patients treated with these medications can manage the disease for many years. The discovery of the phosphonates, the class of compounds to which tenofovir belongs, has also contributed to the creation of the KU Leuven spin-off company Okapi Sciences, which specialises in the development of drugs for the treatment or prevention of viral infections in animals, such as swine fever and foot-and-mouth disease. In 2014, Okapi Sciences was acquired by Aratana Therapeutics.

Lighter, stronger suitcases

Samsonite, a leading luggage manufacturer, wanted to develop a lightweight, strong suitcase using a synthetic composite material called Curv®. Professor Ignaas Verpoest of the KU Leuven Department of Metallurgy and Materials Engineering (MTM) teamed up with Samsonite in the early 00’s to adapt the material for the production of suitcases. The team developed a layered design in which a top layer of material provides protection against scratches, while additional middle layers enhance the impact resistance. This new design requires a specific method of manufacturing, because the Curv® panels have to be stamped in the shape of a suitcase. The first prototypes of the suitcases were made in Leuven in collaboration with Professor Vandepitte of the Department of Mechanical Engineering. In 2009, Samsonite launched the Cosmolite® line of suitcases based on the KU Leuven technology. Cosmolite® is Samsonite’s best-selling line of suitcases to date.
Medication for the treatment of heart attacks and strokes

In 1979, Professor Désiré Collen of the Faculty of Medicine isolated and characterised tissue plasminogen activator (tPA), a key protein involved in the breakdown of blood clots. Administered as a medication, tPA treats heart attacks and strokes, and has saved numerous lives. Millions of patients have benefited from this medication. tPA was first licensed to the American biotech company Genentech, and is now produced and distributed under the name Actilyse® by Boehringer Ingelheim.

Professor Collen later founded the KU Leuven spin-off company ThromboGenics. ThromboGenics is a biopharmaceutical company focused on developing innovative medicines to treat eye diseases. The company’s lead product, ocriplasmin, has successfully completed two Phase III clinical trials for the pharmacological treatment of symptomatic Vitreomacular Adhesion (VMA). In October 2012, the U.S. Food and Drug Administration (FDA) approved ocriplasmin in the United States for the treatment of symptomatic VMA. Ocriplasmin is the first pharmacological agent to be approved for this indication.

Refined cochlear implants

The Australian company Cochlear, a global leader in implantable hearing solutions, collaborates closely with several partners in the Leuven region. KU Leuven and imec, together with the spin-off companies Easics, ICsense and AnSem, and the multinational company NXP Semiconductors have all contributed to refining cochlear implants. KU Leuven and Cochlear have partnered for more than ten years. Cochlear develops hearing implants that use electrical stimulation, known as cochlear implants (CIs), which consist of two parts: a surgically implanted component that electrically stimulates the auditory nerve, and a speech processor worn externally that receives the sound and converts it into a pulsed electrical code. This code is sent through a wireless radiofrequency (RF) connection to the internal implant, which then stimulates the auditory nerve.

Using a CI, profoundly deaf people can perceive sounds and can even understand speech under favourable conditions. At KU Leuven, Professor Jan Wouters of the Division of Experimental Otorhinolaryngology and Professor Marc Moonen of the SCD Division of the KU Leuven Department of Electrical Engineering are working with Cochlear to improve the performance of CIs. Specifically, the research is focused on developing software to process auditory signals in order to filter out noise so that CI users can perceive speech and music more easily. 70% of all CIs worldwide are equipped with an algorithm that is developed at KU Leuven.

NXP Semiconductors, whose Personal Health division is headquartered in Leuven, develops and manufactures powerful, low-energy logic chips for cochlear implants, allowing for smaller batteries and less visible speech processors. Cochlear Australia and ICsense have developed circuits that
stimulate the auditory nerve. Easics has reduced the energy consumption of the speech processor by dividing functionalities into several smaller tasks that are only activated when necessary. Imec, together with Cochlear, has optimised the layout of the chip and manufactures both the prototypes of the chip and the end product. AnSem develops circuits that control the electrical charge inside cochlear implants. Taken together, these innovations all contribute to the next generation of refined cochlear implants. Over 250,000 people have gained hearing thanks to cochlear implants.

The world's first patient-specific lower jaw

LayerWise is a KU Leuven spin-off company that specialises in Additive Manufacturing (AM), a technology developed to build up materials in layers. This technology was used to produce the world's first patient-specific titanium lower jaw implant, developed in collaboration with project partners from the medical industry and academia. The tailor-made jaw implant was successfully used to treat near-total progressive osteomyelitis in the lower jawbone of an elderly patient. To start, AM technology specialists at LayerWise used a 3D printer to create the complex implant design, which incorporates articulated joints and dedicated features. The reconstruction – postprocessed with dental suprastructure provisions, polished joint surfaces and a bioceramic coating – was implanted successfully into the patient, where it restored her facial aesthetics and allowed her to regain her speech within hours. The dental division of LayerWise, called DentWise, also restored the teeth of the patient, by manufacturing a dental prostheses that was screwed into the titanium jawbone implant after a healing period. In 2014, LayerWise was acquired by 3D Systems.

Rice with improved eating quality and reduced cooking time

Professor Jan Delcour and his team at the KU Leuven Laboratory for Food Chemistry and Biochemistry have generated new insights into the patented production process of Uncle Ben’s long grain parboiled (partially boiled) rice, which has a cooking time of 10 minutes. The research focused on improving the eating quality of the rice and was conducted for Mars NV. The production of white, parboiled rice starts with the removal of the outer rice layer, the husk, to produce brown rice. Secondly, the brown rice is hydrothermally treated. This treatment consists of three different steps: soaking, steaming and drying of brown rice. In a final phase, the parboiled brown rice is polished to remove the bran, resulting in white, parboiled rice. White, parboiled rice has a higher nutritional value (more vitamins and minerals) than white rice that has not been parboiled, since parboiling drives nutrients from the bran fraction into the centre of the rice kernel. Furthermore, parboiled rice is harder and less sticky and has a slight amber colour. The rice cooking time, hardness and stickiness depend on the conditions used during parboiling, and it is in this area that the team of Professor Jan Delcour has realised breakthroughs.
Secure smartphones, PCs, online banking apps and internet infrastructure

Professor Vincent Rijmen of the COSIC Division of the KU Leuven Department of Electrical Engineering and professor Joan Daemen (STMicroElectronics) have worked together since 1993 on several research projects in cryptography. One of their co-operations resulted in the encryption algorithm Rijndael. In 2000, it was selected by the US National Institute for Standards in Technology (NIST) to become the Advanced Encryption Standard (AES, FIPS 197). NIST motivated their choice referring to the strong security of Rijndael and its excellent performance on a wide range of computing platforms (servers, PCs, embedded devices, smartcards, dedicated hardware). The design methodology of Rijndael is based on discrete mathematics and coding theory. It has been adopted by many other designers since. After the standardization by NIST, AES has been used by many organizations and manufacturers to secure their applications: mobile phones, WiFi, credit cards, online banking apps, https websites, secure remote controls, … The algorithm is implemented both in software and in hardware.

All PC’s constructed after 2011, all smartphones, all WiFi access points using WPA2 and the entire internet infrastructure are secured by the algorithm. Today, AES is used in over two billion devices. Since 2011, Intel and AMD include special AES instructions in all their processors in order to speed up the algorithm even further. Both Microsoft’s BitLocker and Apple’s FileVault disk encryption software are based on AES.

Reduced tire noise

The KU Leuven Noise and Vibration group and the Tire-Vehicle Mechanics department at the Goodyear Innovation Center in Luxembourg have been partners for several years. The European research project TIRE-DYN, which aims to obtain a more fundamental understanding of the effects of rotation on the tire dynamics, contributes to the continuous effort of Goodyear/Dunlop to further reduce tire/road noise. By means of state of the art experimental and numerical analyses, the effects of rotation on the tire dynamic behavior are quantified. The industry-academia partnership has proven to be a great driver for technological innovation and a perfect platform for the exchange of people, knowledge and experience.